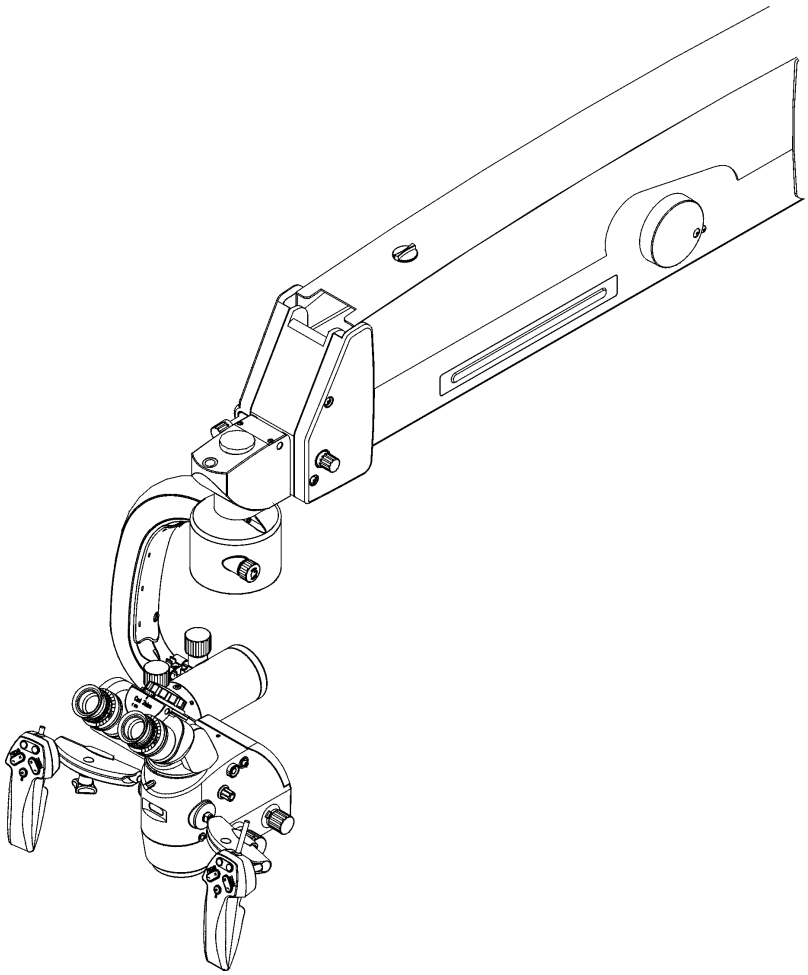
S88 / OPMI® Vario
S8 / OPMI® Vario
S81 / OPMI® Vario



Instructions for Use

G-30-1607-en

Version 6.2

1/18/2013

About this manual

These Instructions for Use are part of the delivery package.

- Carefully read them before using the device.
- Keep them at the site of use of the device.
- Store them for the entire service life of the device.
- Pass them on to every subsequent owner or user of the device.

Orientation aids

– The chapter overview at the beginning of these Instructions for Use provides a summary of all subjects.

– The contents of each chapter are specified in detail at the beginning of each chapter.

– A list of abbreviations, key words and technical terms in the annex facilitates the search for specific terms.

Scope

The following Instructions for Use apply to the OPMI® Vario with the following suspension systems and identifications:

– S88 floor stand, reference number: 000000-1154-525

– S88 floor stand with lifting column, reference number: 000000-1169-820

– S81 ceiling mount, reference number: 000000-1176-969

– S8 ceiling mount, reference number: 000000-1176-968

Trademarks

– OPMI® is a registered trademark of Carl Zeiss.

Manufacturer

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Chapter overview

Safety Measures

Key to symbols

We would like to inform you 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.

Hazard symbols

The following safety information has been incorporated into the Instructions for Use. Please note this information and be particularly careful in these cases.

⚠ **WARNING**	Warning label, which may refer to **fatal injuries** or **severe injuries** if precautions are not followed.
⚠ **CAUTION**	Indicating a hazard, which may lead to **moderately severe injuries** if risks are not avoided.
NOTE	Warning label, which may refer to **minor injuries** and **property damages** if precautions are not followed.

Information symbols

The following information symbols are used in these Instructions for Use:

– Listing

✓ Requirements for an action

• Prompt for action

→ Result of an action

ⓘ Additional information and hints

Target group

These Instructions for Use are intended for physicians, nurses and other medical staff who prepare, operate or maintain the device after appropriate training. It is the duty of the customer or institution operating the system to train and instruct all staff using the system.

Additional service activities are not part of these Instructions for Use. They will be performed by staff especially trained for this purpose by Carl Zeiss.

Field of application

Intended use

OPMI Vario is a surgical microscope intended for the illumination and magnification of the surgical area and for the support of visualization in surgical procedures.

Normal use

The OPMI Vario is a surgical microscope designed to provide the user with optical magnification and illumination of the surgical area during surgical procedures.

The system is intended for use in clinics and other human medicine institutions.

⚠ **CAUTION**

Injury to the patient's eye!

Never use xenon illumination for ophthalmic procedures!

- Make sure that no xenon light enters the patient's eyes.

⚠ **CAUTION**

Not for diagnostic purposes!

Do not use the recorded video sequences, video clips (cut sequences) and single images for diagnostic purposes. The visualized images may include deviations in shape, contrast and color.

Liability and warranty

Warranty and liability depend on the applicable contractual stipulations.

NOTE

Loss of warranty

Modifications to this system are not permissible. The manufacturer is not liable for damage caused by unauthorized persons tampering with the system. Furthermore, this will forfeit any rights to claim under warranty.

Notes for the operator

The correct use of the device is absolutely vital for safe operation. Therefore, please thoroughly familiarize yourself with the content of these Instructions for Use before starting up the device. Please also observe the Instructions for Use of additional instrument equipment. Further information is available from our service department or from authorized representatives.

- Only operate the device within the scope of its intended use.
- 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.
- Please keep these Instructions for Use where they are easily accessible at all times for the persons operating the system.
- Please observe all symbols and labels attached to the device! (see Page 28)
- Please only use approved original accessories or consumables.

Legal regulations

- Observe the legal regulations for accident prevention and occupational health and safety applicable in the country concerned.
- This equipment must not be modified without the manufacturer's approval. If the equipment is modified after consulting the manufacturer, appropriate examinations and tests must be performed to guarantee the further secure use of the device.
  The manufacturer is not liable for any damage caused by unauthorized use of the equipment. Furthermore, this will forfeit any rights to claim under warranty.
- If required by the regulations and directives applicable in the country of use, connect the system to a special emergency backup power supply.

Ambient requirements

- Do not operate the system contained in the delivery package
  - in explosion-risk areas,
  - if inflammable anesthetics or volatile solvents such as alcohol, benzine or similar chemicals are present at a distance of less than 25 cm.
- Do not station or use the instrument in damp rooms. Do not expose the instrument to water splashes, dripping water or sprayed water.
- Do not place any fluid-filled containers on top of the instrument. Make sure that no fluids can seep into the instrument.

- Ensure that the installation requirements and the operation of the device concur with the surgical conditions:
  - minimum vibration
  - clean environment
  - do not use the device under extreme mechanical stresses

Electrical safety

- Always switch off the system before disconnecting it from / connecting it to line power, for cleaning its surface or if it will not be used for a prolonged period of time.
- Switch off the unit at the power switch if you notice any smoke, sparks or unusual noise. Do not use the system until it has been repaired by our service team.
- A potential equalization connector is provided on the connector panel. This connector can be used for placing other active devices at the same ground potential or for redundant grounding to protective earth.
- Do not use multiple sockets!
- Never open the device! The device contains freely accessible live components. If you remove the housing, you run the risk of electric shock.
- Do not touch the system if your body is electrostatically charged and the system is not grounded.
- Please note the information on EMC (electromagnetic compatibility) in the chapter "System Data" on Page 255.

Transport & service

- Over longer distances (e.g. removal, return for repair, etc.) the system 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.
- This system is a high-grade technological product. To ensure optimum performance and safe working order, we recommend having it checked by our service representative as part of regular scheduled maintenance.
- In order to prevent any impairment of the device's safety due to age, wear, etc., the user must ensure that the device is subjected to the necessary safety checks (see section "Care and Maintenance").
- Modifications and repairs of this device or any equipment operated together with this device may only be performed by Carl Zeiss service staff or other persons authorized by Carl Zeiss.

Optics and light

- Never directly look into the sun with binocular tube, object lens or an eyepiece.

- Avoid looking directly into the light source, e.g. into the microscope objective lens or into the light guide, in order to prevent damage to the eye!
- Start with the lowest brightness setting and gradually increase brightness up to the necessary and still admissible level.
- With increasing age of the light source, the actual illumination intensity delivered at the respective setting decreases (this is a normal property of the system).

Requirements for operation

Prior to the very first use

Carl Zeiss Service or a person authorized by Carl Zeiss will install the device. Please make sure that the following requirements continue to be met for further operation:

- ✓ The connecting components have been properly connected. The screw connections have been firmly tightened.
- ✓ All cables and plugs are in perfect condition.
- ✓ The voltage set on the system corresponds to the rated line voltage on the site of installation.
- ✓ The power cord being used is the one designed for use with this system.
- ✓ When connecting the device to any network, please ensure the network is free of dangerous voltages.

More specific information about the floor stand:

- ✓ The main plug shall only be connected to a socket with a faultless protective ground conductor.

More specific information about the ceiling mount:

- ✓ The device may only be connected to a power supply network which has a faultless protective ground conductor.

Before every use

- When adding accessories and/or components, please ensure the permissible total weight of the device is not exceeded (see label "Maximum load" or section "Technical Data").
- Before every use, make certain to compensate for any added weight; this will enable the surgical microscope to maintain its balance in all positions of the working range.
- Before every use, limit the stroke of the suspension arm to prevent any contact with the patient if the surgical microscope is lowered accidentally.

- Check the surgical microscope for sufficient freedom of movement. The device itself or accessories may be damaged if conflicting with each other.
- To prevent accessories from falling down, check before every use that accessories are securely locked in position and securing screws are firmly tightened.
- When connecting accessories make sure that sufficient free space is provided and that the surgical microscope does not touch the patient.
- In order to prevent an unexpected response by the device, check the user settings of the software before every use.
- Always run cables in a manner that will not impede the user's movements.
- If you operate the device in a sterile area, make sure that you use the corresponding sterile accessories for the device.
- Never cover any ventilation openings. This may cause the light source of the device to overheat and fail.
- Never attempt to forcefully attach any electrical connections (plugs, bushings). If a plug cannot be connected easily, check again whether the plug and socket are made to fit. If the plug connection is damaged, please call our service department. They will be happy to assist you.
- Before using the wireless, foot control panel FCP WL ensure its batteries are fully charged. Inadequate power supply of the wireless foot control panel may lead to malfunctions of the device.
- Go through the checklist in the chapter "Operation".

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

- When draping the system, make sure there is enough slack in the drapes to allow for movement of the microscope carrier and surgical microscope.

More specific information about the floor stand:

- Secure the system in position by pressing at least three of the locking tabs on the stand base to prevent the stand from rolling away inadvertently.

During use

- Never look directly into the light source, e.g. a microscope objective lens or a light guide, as this might cause phototoxic injury to the eye.
- Never leave a device unattended with the light source still switched on.

- Defective or unidentified accessories may lead to increased leakage current on the system and injure the patient. Never connect any defective or unidentified accessories and never touch the power outlet or video interfaces while in contact with the patient.
- If the xenon lamp is used beyond its maximum service life of 500 hours, a sudden failure may occur. Replace the xenon lamp in due time and reset the service hour counter to "0".
- If you change the lamp shortly after it has failed, the lamp will still be very hot. Use heat-resistant protective gloves when replacing the lamp to prevent burns.
- Malfunctions in the motor's electronic system may cause failure of the main functions (focus, zoom, light control) and impair other functions. Switch to manual mode.
- If a failure occurs which you cannot correct with the aid of the chapter "What to do in the event of malfunctions", attach a sign to the device stating it is out of order and contact our service representative.
- Do not pull at the light guide, power cord or any other connecting cables.
- Never operate the system unattended.
- Risk of crushing - mind your fingers!
  Fingers may be crushed in the areas marked with the "Risk of crushing" label.
  Do not touch these areas while the system is being moved.

After every use

- Always use the master switch to turn off the device if it is not in use.
- Insufficient, incorrect or wrong cleaning or disinfection not complying with these Instruction for Use can expose the patient or medical staff to a considerable risk of infection.

Connecting a laser micromanipulator

The link-up of a laser micromanipulator with the surgical microscope results in a medical system for which the system manufacturer must meet the necessary requirements (approval, qualification, laser protection, etc.). Please note

the Instructions for Use provided by the laser micromanipulator manufacturer and laser manufacturer. For more information, contact our service department or authorized dealerships.

Connecting navigation systems (option)

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

- The manufacturer of the external navigation system (system supplier) is responsible for the following:
  - Confirming 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.
  - Providing 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.
  - Implementing 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.
  - Conducting complete functional testing, alignment and calibration (landmark test) of the navigation system after every subsequent installation or exchange of navigation system components
  - Incorporating 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 immediate detection of any data transmission errors.

- 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.
- Avoid using rotatable dovetail mounts for tubes while a navigation system is connected to the surgical microscope. If mounts of this type have been attached to the microscope, they must be carefully locked in their central positions (tighten the knurled screw for rotation).

Risk of burn injuries caused by high illumination intensity

General

The xenon illumination is a light source with high intensity. If used improperly, excessive illumination intensities may lead to third-degree burns. Keep the illuminated tissue moist and make sure it is sufficiently rinsed. Carefully monitor the effect of the illumination on the tissue, particularly under the following circumstances:

– During longer interventions on skin and tissue using objective lenses with short focal depth (short working distance),

– During interventions on poorly perfused tissue,

– When the brightness control for the xenon lamp is set to a high illumination intensity.

- Only change the xenon lamp module after switching off the system. The igniter generates a high voltage when the lamp is on.
- Any type of radiation has a damaging effect on biological tissue. This is also true for the light illumination the surgical field. Your should therefore reduce brightness and the light exposure time to the absolute minimum required.

Various factors contribute to the risk of burn injuries:

System-related factors

– The wavelength range is limited by filters to the visible range between 400 nm and 700 nm. These filters remain stable over a very long period of time and cannot be exchanged by the user.

– The illumination intensity decreases with the increasing number of operating hours of the light source. In case of a lamp exchange, illumination increases to the originally high value.

Surgery-related factors

– The selected intensity of the light source is a major factor for the risk of injury. It should always be set to the minimum required for the surgical procedure to be performed.

– The size of the illuminated field influences the injury risk in two respects:

  – For a large illuminated-field diameter, areas of the skin are illuminated which are not monitored as strictly by the surgeon and which are not moistened sufficiently. These areas represent a particular injury risk. These injuries can be prevented by adjusting the illuminated-field diameter to the smallest size required for that particular surgical procedure.

  – If the illuminated field is reduced in size, the intensity increases because the light is focused more. So, if possible, the intensity should be lowered as soon as the size of the illuminated field is reduced.

– A long surgical procedure increases the risk of injury, in particular if a standard procedure takes considerably longer than usual.

– Injuries in the peripheral area can be prevented by covering this area with wet, sterile gauze. The risk is increased if dry drapes are used to cover such areas.

– The interaction of heat and antimicrobial substances in incision foils may lead to an increase in the patient's reaction to these substances.

– It should also be taken into account that some areas of the body may be more sensitive than others.

– Certain preparations of the surgical field, local vasoconstrictive medications and incision drapes may also result in a higher risk of injury.

Patient-related factors

– The general condition of a patient's health may contribute to the risk of injury.

– The skin type may also play a major role for the risk of injury.

– Certain medications affect the sensitivity to light.

Recommendations

Due to the large number of different factors involved and the lack of scientific publications on this topic, Carl Zeiss cannot provide guidance on acceptable illumination intensities and exposure durations. However, the surgical micro-

scope has several features that can help the user to reduce the risk of burn injuries:

– Using the buttons on the hand grip or foot control panel, the surgeon can then set the illumination intensity to the value required for the procedure. Please note that the intensity increases with decreasing illuminated-field size if the Spot function is used. For this reason, the intensity should only be set after the size of the illuminated field has been changed.

– Never leave a device unattended when its light source is switched on.

– Switch off the light when the microscope is not used, and make sure that it is not pointed at unprotected bare skin.

Please note that most burns affect the skin around the incision. The most important measure for prevention of burn injuries are reduction of the size of the illuminated field by the spot function and the coverage of peripheral areas by sterile, wet gauze. The area of the incision should be constantly irrigated.

Final remark

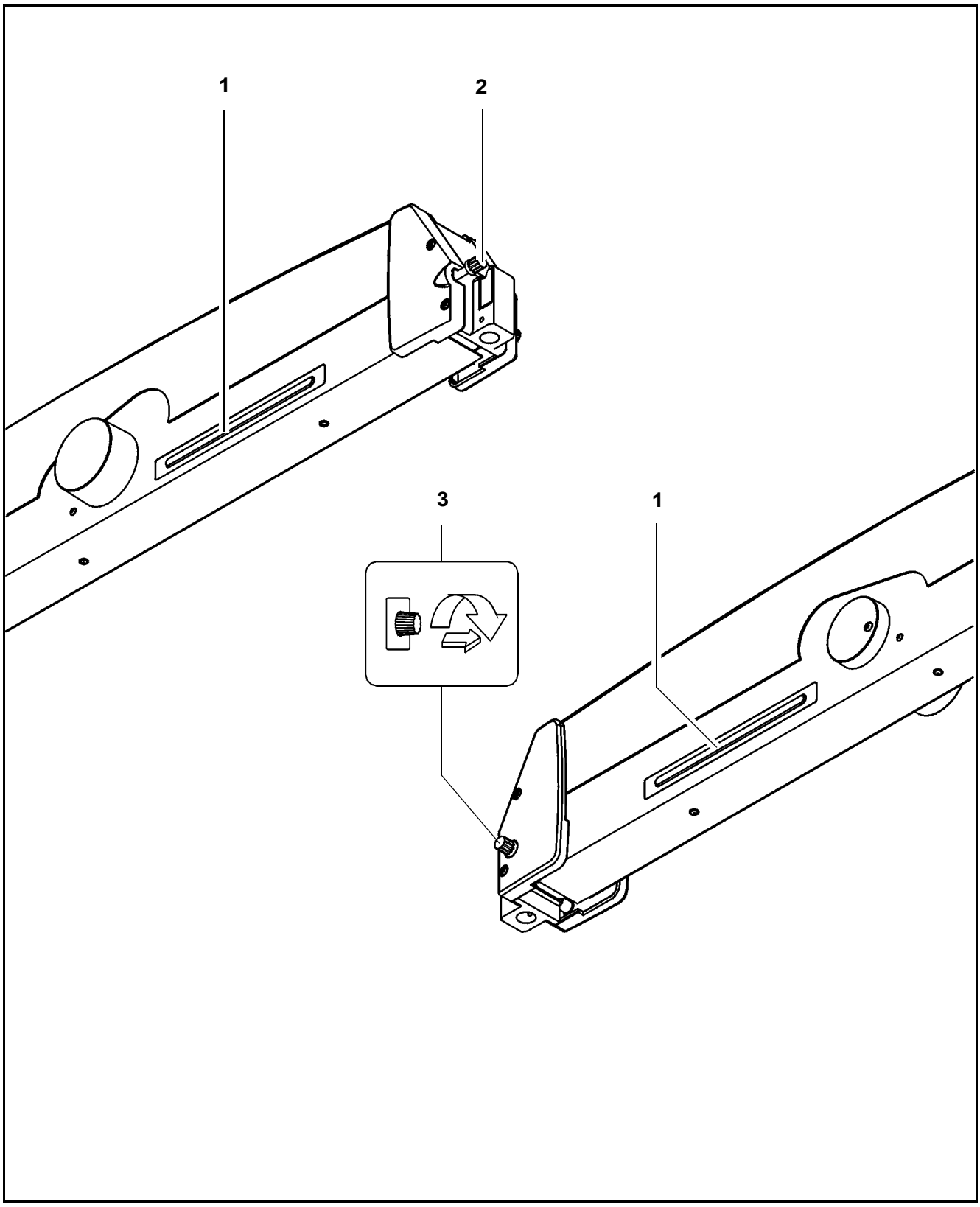
Carl Zeiss recommends to reduce illumination of the surgical field in that possible extent to ensure the patient's security and a good microscopic image. Please refer to the warnings and precautions in this case.

Safety devices of the suspension systems

1 Release bar
allows non-sterile persons to unlock the magnetic brakes of the suspension system.

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

3 Locking knob
for the horizontal position of the suspension arm.
Before removing or attaching a module (microscope, tube, etc.) move the suspension arm into its horizontal position. Pull out the locking knob 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. Now the suspension cannot swing upward due to missing mass. After mounting the module, unlock the suspension arm and perform the balancing procedure.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Stand lifting column

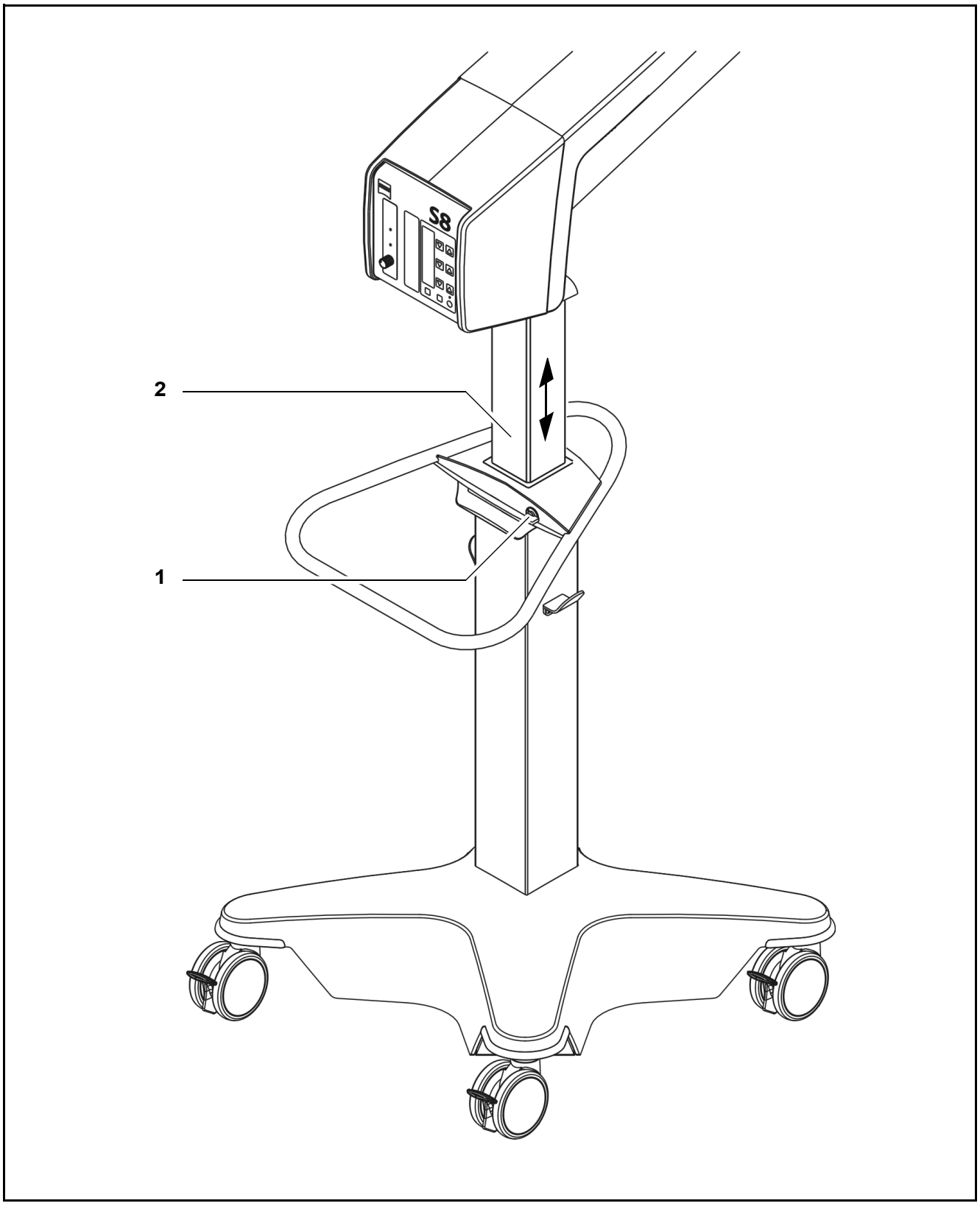
1 Key
to set the optimum viewing height of the surgical microscope or for downward movement into the transport position.
As long as you keep switch (1) pressed down, the lifting column (2) in the stand base moves upwards or downwards, depending on the position of the switch. When you release the switch, the lifting column stops immediately.

– Before raising or lowering the suspension system, make sure that there is sufficient clearance from other objects so that any collision is avoided.

NOTE

Injury to the patient!

- Do not activate the lifting column during surgery!
- Do not use the lifting column for focusing.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S8

Xenon illumination system

CAUTION

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

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

- Please replace the xenon lamp in due time.
- Reset the service hour counter to "0" after replacing the lamp.

CAUTION

Risk of injury caused by lamp rupture!

Lamp rupture (audible as a loud bang) may lead to jamming of the lamp module and/or failure of the electronics modules.

- Before opening the lamp housing, ensure that the device is moved to a position in which possibly falling particles cannot put the patient or user at risk.
- Do not continue using the system if the lamp module is jammed or the illumination is no longer operational due to defective electronics modules. Contact our service department.

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 (7). The lamp module is partially ejected.
- Pull out the lamp module as far as it will go.
- Turn knob (1) through 180° until it snaps in place. This moves the backup lamp into the illumination beam path.
- Push the lamp module all the way back into the lamp housing.
- Reset service hour counter (6) to "0". Use a pointed object and press it into the recess of reset button (5).

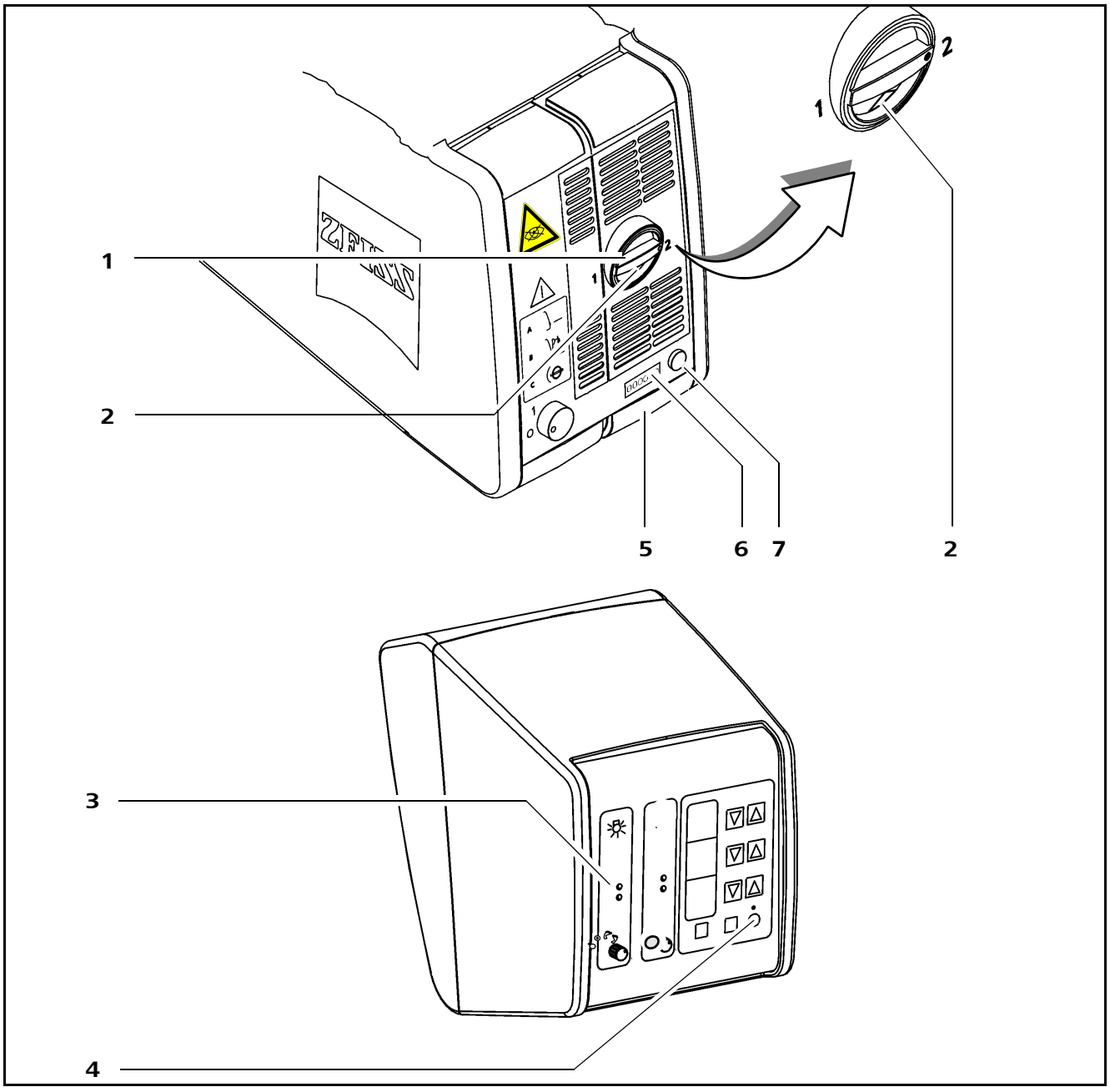
2 Indicator: Backup lamp is in use
When the red segment in knob (1) lights up, the backup lamp is in use.

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

3 Yellow indicator lamp
is lit when the lamp has failed, or if the lamp module is defective. After activation and ignition of the backup lamp, the yellow indicator lamp turns off again.

4 Manual mode

When the manual mode has been activated, all electrical control systems are disabled. The lamp brightness is automatically adjusted to a fixed setting.



Manual function

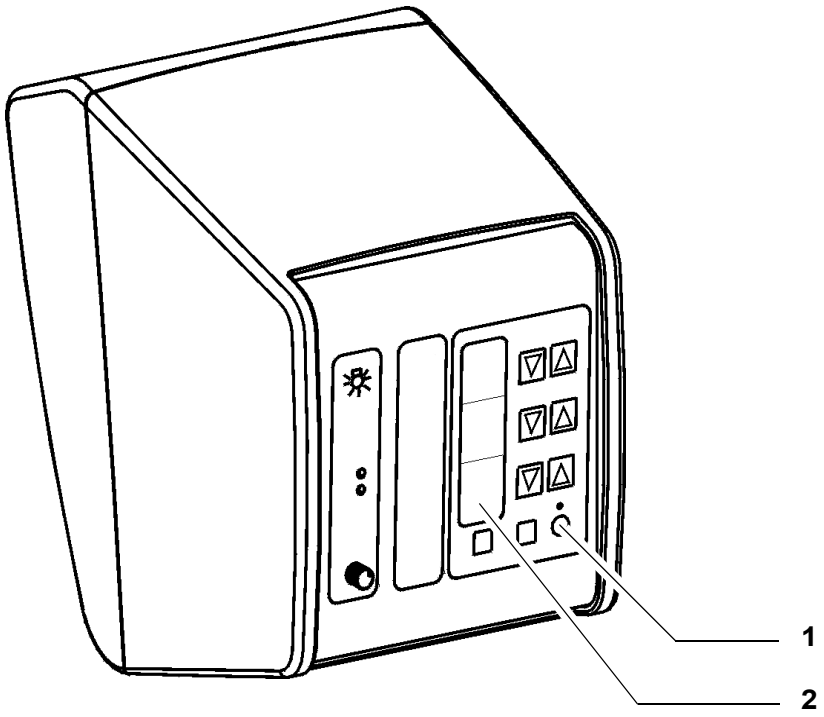
1 Manual button
The Manual button permits you to switch to manual operation. The motorized functions of the surgical microscope are deactivated. The lamp brightness is automatically adjusted to a default setting. This lamp brightness value is displayed in the first display field..
When you have switched to the manual mode, the yellow LED is lit and the blinking text "MANUAL" appears in the third display field

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

The manual mode is retained even if you switch the system off and back on at the power switch.

Press the Manual button a second time to reactivate electronic control. The basic mode is displayed again on the display and control panel.

2 Display fields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Symbols and labels on the device

CAUTION

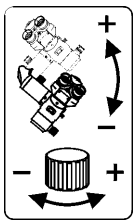
Note the warning labels and notes!

- If you notice that any label is missing on your system or has become illegible, please contact us or one of our authorized representatives. We will supply a replacement.

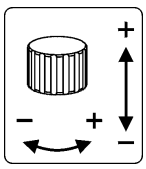
OPMI Vario

1 "OPMI Vario" device label
The device label contains the following information:

- Manufacturer
- Device name
- Cat. No.
- Serial number

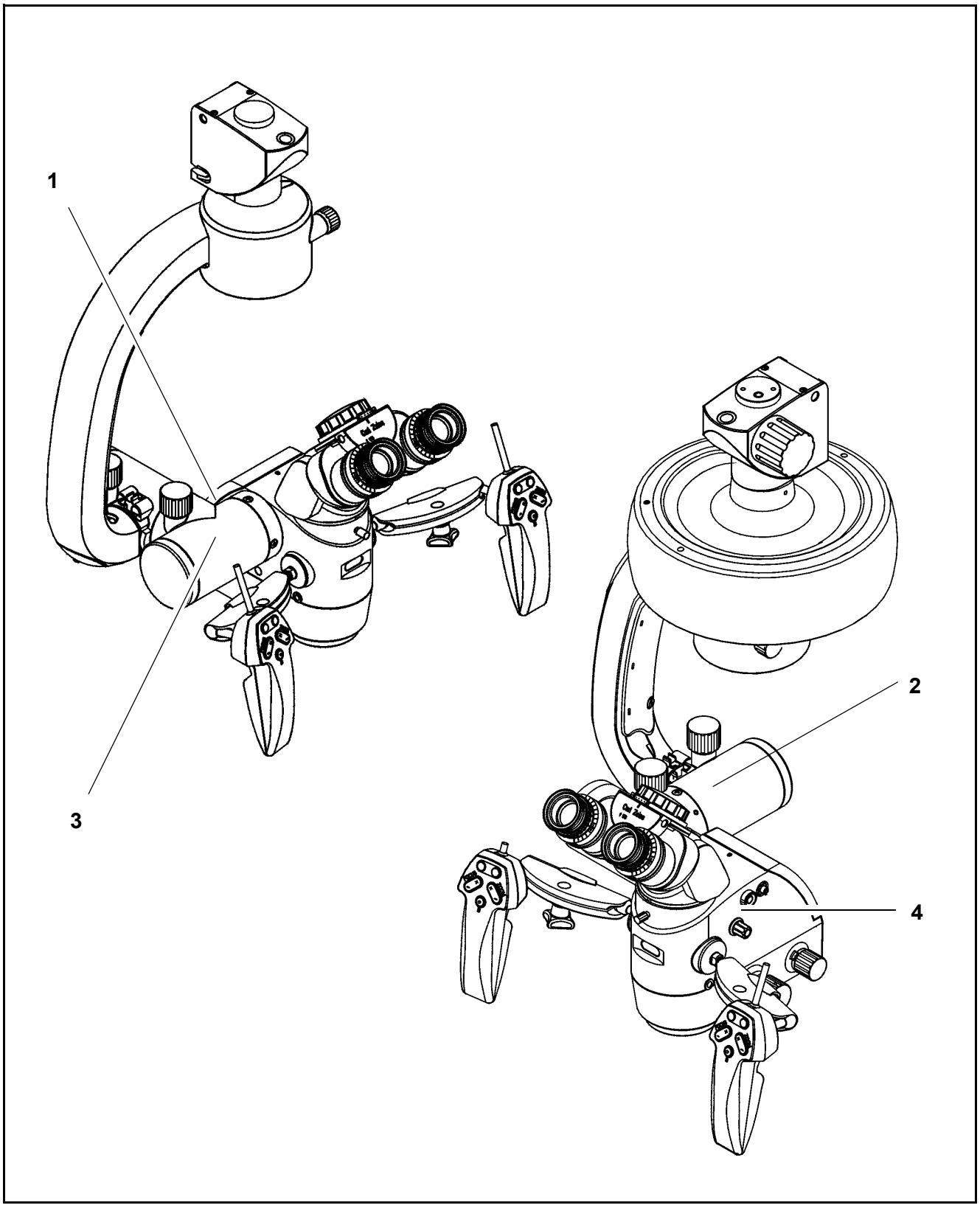


2 Knob for balance setting of the lateral tilt motion



3 Knob for balance setting of the front-to-back tilt motion

4 "Instructions for Use" label
Observe the Instructions for Use or accompanying documents.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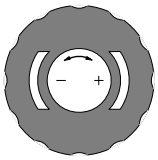
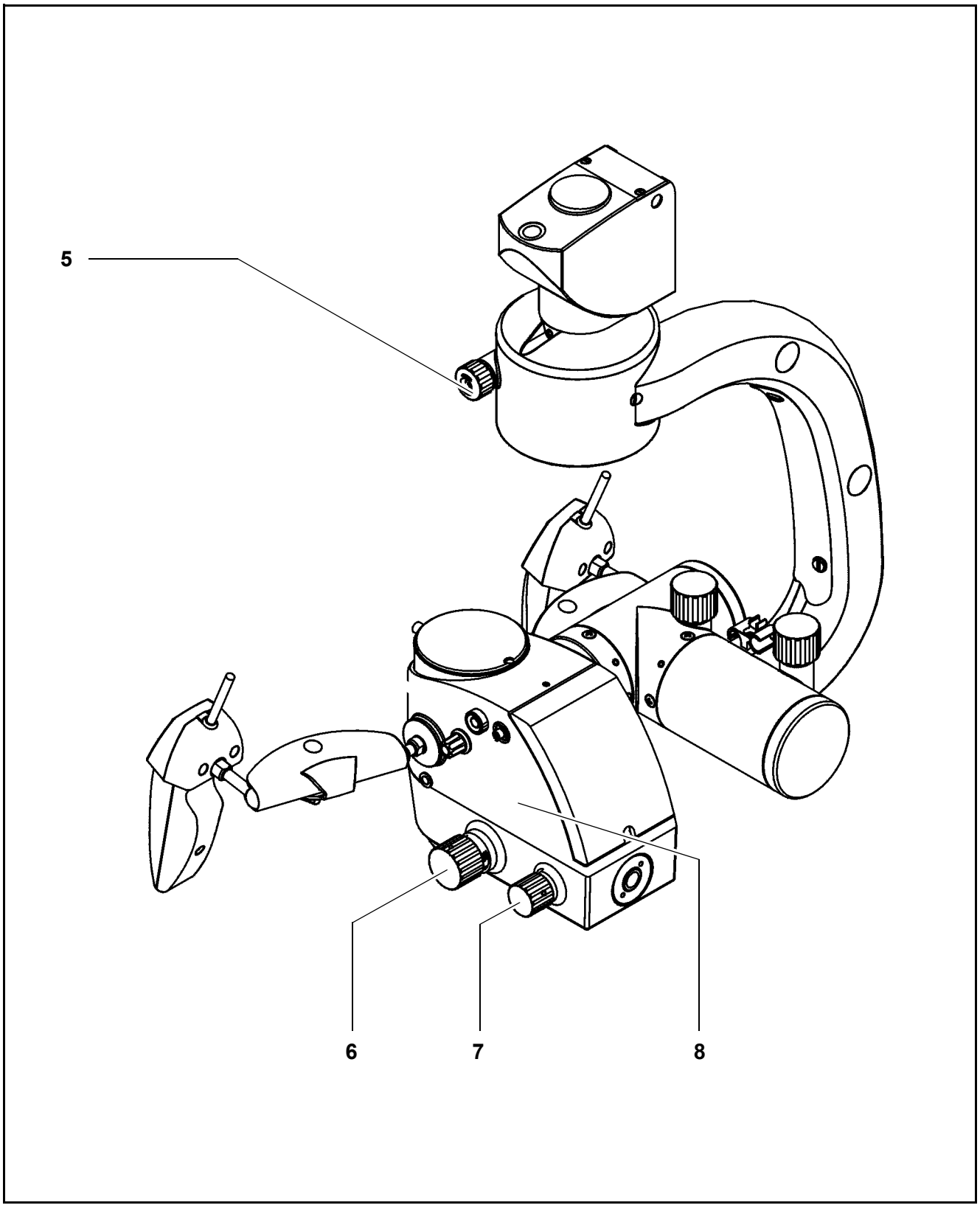


5 Friction adjustment of vertical axis

6 Scale on focusing knob

7 Scale on illuminated-field knob

8 Device name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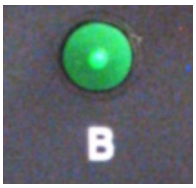
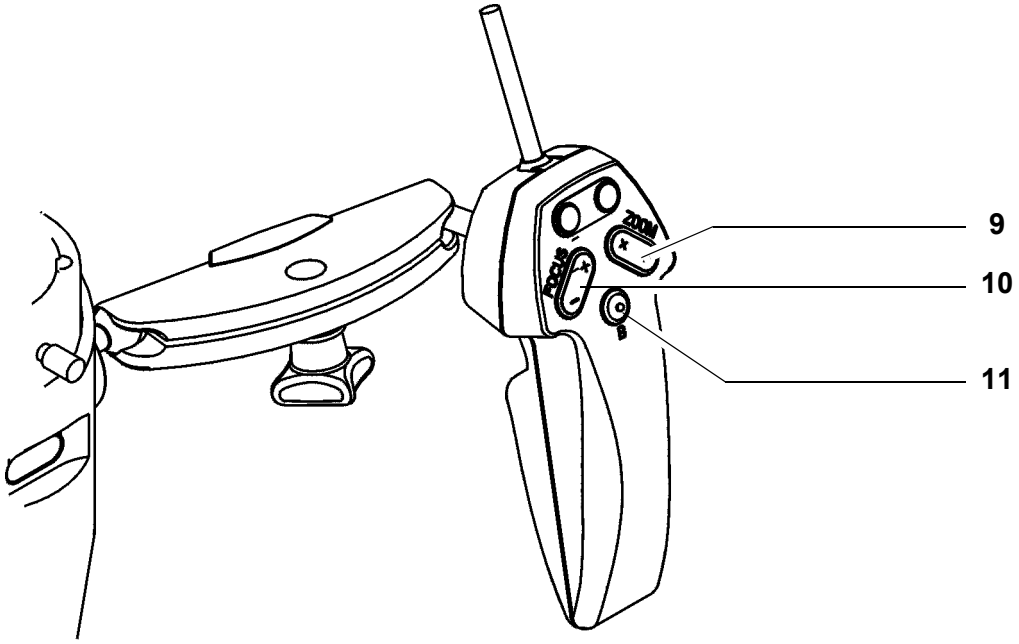
9 Zoom release button

10 Focus release button



11 Release button for magnetic brakes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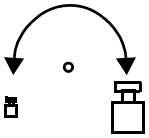
Labels on the S88 floor stand

1 "Maximum load" warning label
The maximum load (accessory equipment) on the microscope body must not exceed 20 kg!

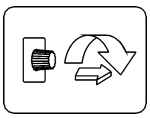
2 "Risk of crushing" warning label
Fingers may be crushed. Do not touch this area while moving the surgical microscope or parts of it.



3 Weight compensation of suspension arm
After all accessory tools have been attached to the surgery microscope, this adjustment screw can be used to balance the weight of the suspension arm.

4 "Observe Instructions for Use" label

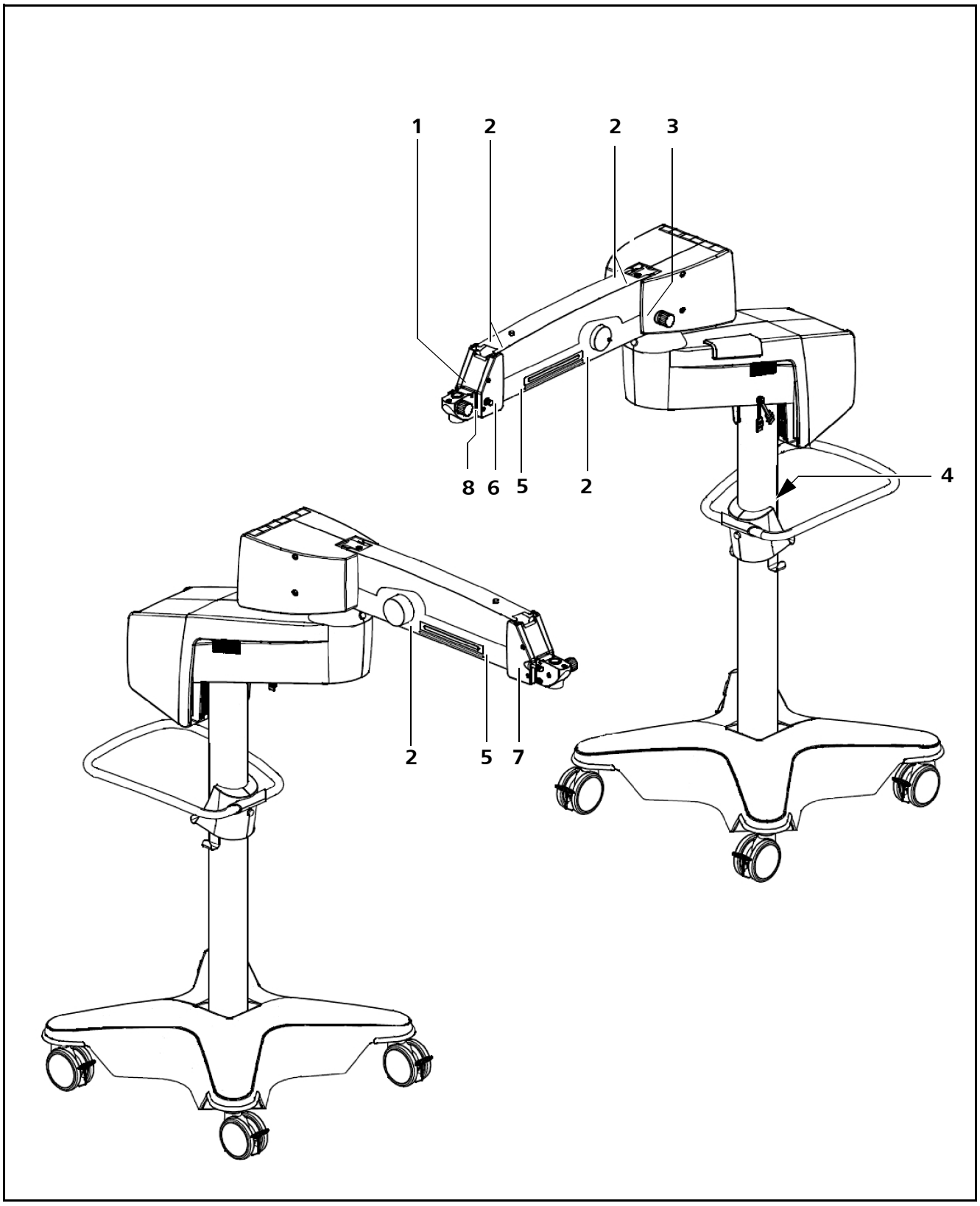
5 Releasing the magnetic brake
This symbol identifies the bar that must be pressed in order to release the magnetic brake on the suspension arm.



6 Locking the movement of the suspension arm.
This symbol indicates that the suspension arm can be secured to prevent an abrupt upward movement.

7 "Instructions for Use" label
Observe the Instructions for Use or accompanying documents.

8 Friction adjustment
Indication for friction setting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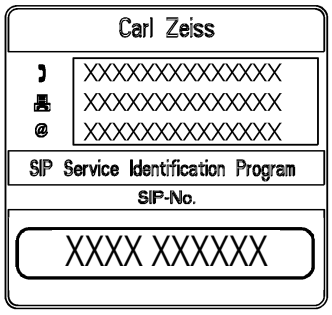
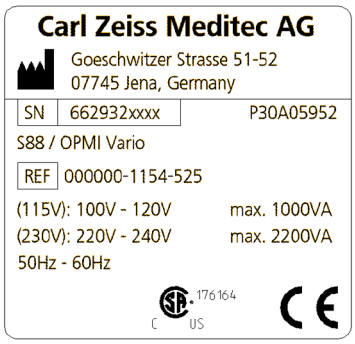


9 SIP label

The SIP label contains the following information:

- Manufacturer (company name)
- Your options to contact the device manufacturer, i.e., phone number, fax number and email address of the local contact of the national Carl Zeiss sales organization.
- SIP No.
  A unique identification number assigned to your device.



10 Rating label

The rating label provides the following information:

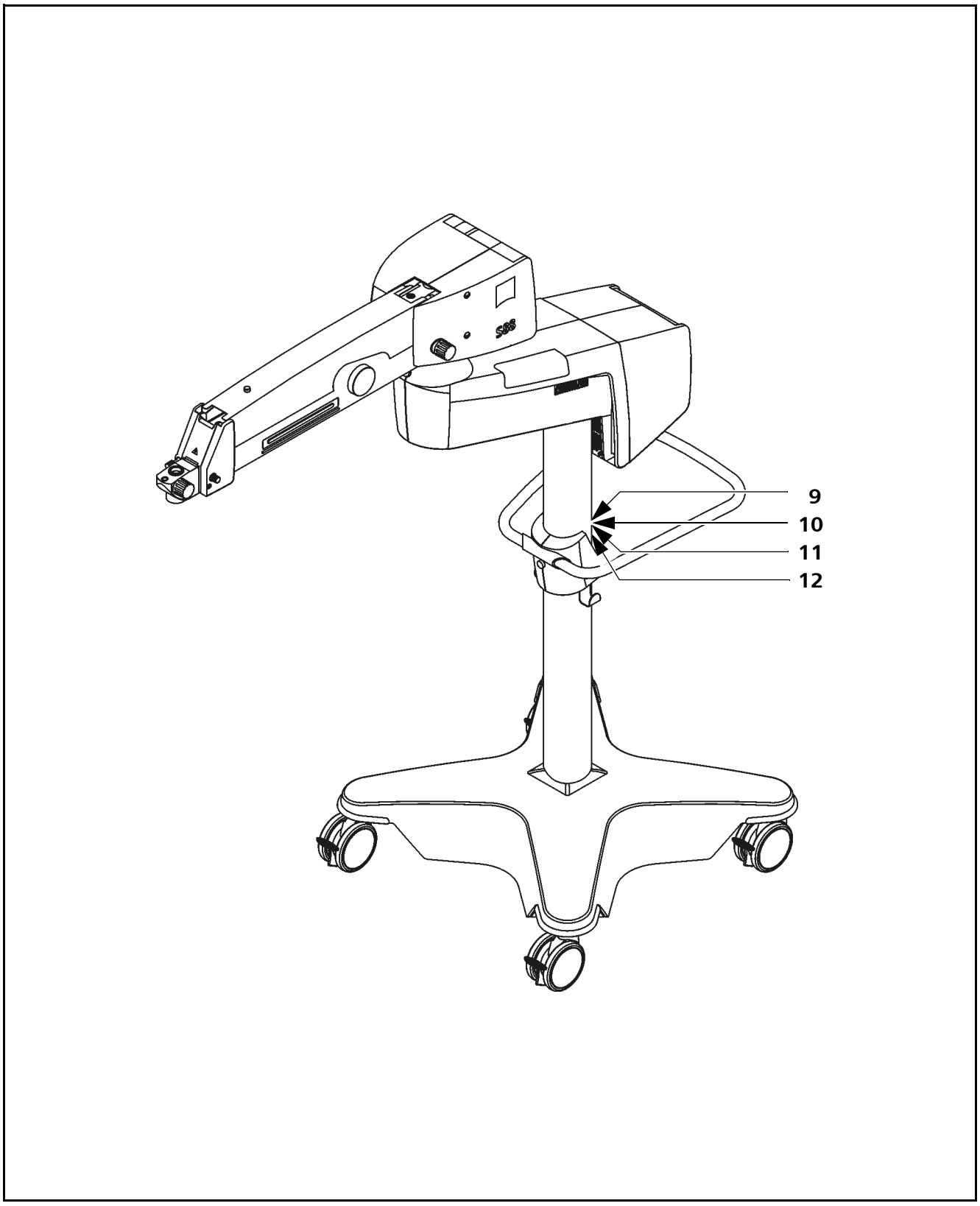
– Manufacturer (company name)	Carl Zeiss Meditec AG
– Manufacturer's symbol	
– Manufacturer's address	Goeschwitzer Strasse 51-52 07745 Jena, Germany
– Serial number	SN
– Project classification	P30A05952
– Device name	S88 / OPMI Vario
– Reference number	REF
– Rated voltage	(115 V): 100 V - 120 V (230 V): 220 V - 240 V
– Connected load	(115 V): max. 1000 VA (230 V): max. 2200 VA
– Line frequency range	50 Hz - 60 Hz
– CSA certification	
– CE label	

11 Date of manufacturing

This graphical symbol indicates the manufacturing date of the device.

12 Please follow disposal regulations

Do not dispose of electrical and electronic waste with domestic waste. Additional information pertaining to the disposal of electrical and electronic waste can be found in Chapter "Maintenance and care"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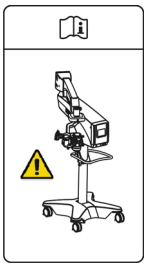
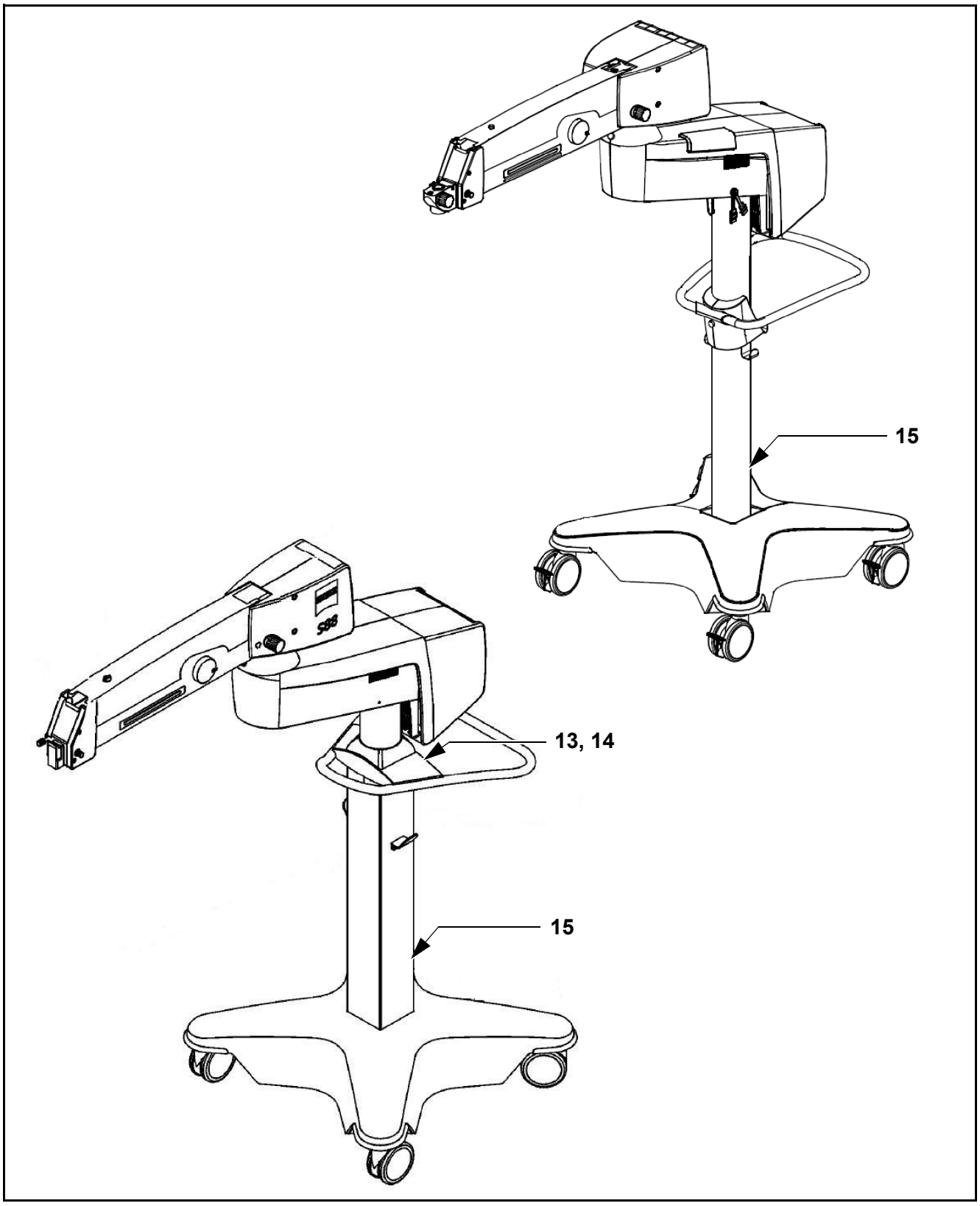
13 Height adjustment (optional)
Identifies the direction of movement of the stand with lifting column for the respective switch position.

14 Lifting column activation time
This label represents the maximum permissible operating time as well as the subsequent mandatory rest phase for the lifting column and indicates the ratio between the operating time and the rest phase.
Example: If the maximum actuation time of one minutes, the lift arm must be turned off for at least nine minutes because the motor of the lift arm might overheat otherwise.



15 "Moving position" warning label
Indicates the transport position of the device. Always make sure the device is in this position before transport to avoid damaging the device.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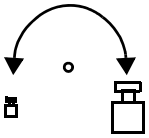
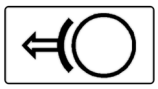
Labels on S8 ceiling mount

1 "Maximum load" warning label
The maximum load (accessory equipment) on the microscope body must not exceed 20 kg!

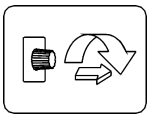
2 "Risk of crushing" warning label
Fingers may be crushed. Do not touch this area while moving the surgical microscope or parts of it.



3 Weight compensation of suspension arm
After all accessory tools have been attached to the surgery microscope, this adjustment screw can be used to balance the weight of the suspension arm.



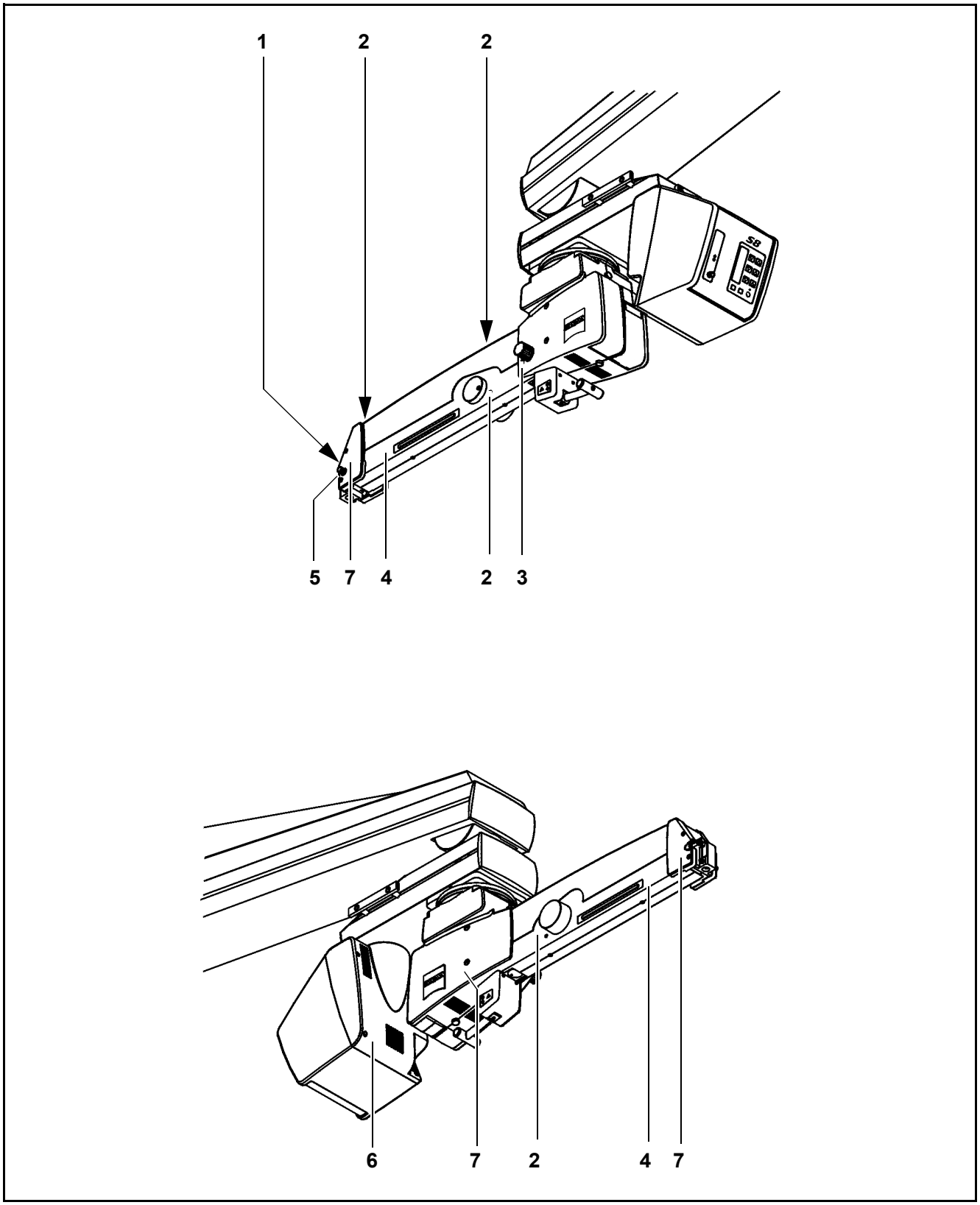
4 Releasing the magnetic brake
This symbol identifies the bar that must be pressed in order to release the magnetic brake on the suspension arm.



5 Locking the movement of the suspension arm.
This symbol indicates that the suspension arm can be secured to prevent an abrupt upward movement.

6 "Observe Instructions for Use" label

7 "Instructions for Use" label
Observe the Instructions for Use or accompanying documents.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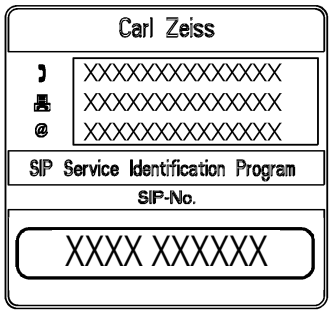
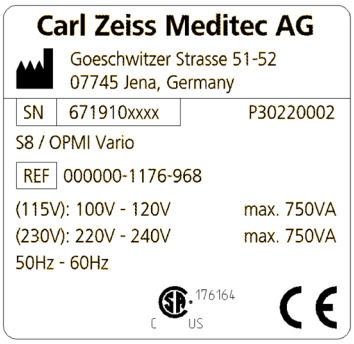


8 SIP label

The SIP label contains the following information:

- Manufacturer (company name)
- Your options to contact the device manufacturer, i.e., phone number, fax number and email address of the local contact of the national Carl Zeiss sales organization.
- SIP No.
  A unique identification number assigned to your device.



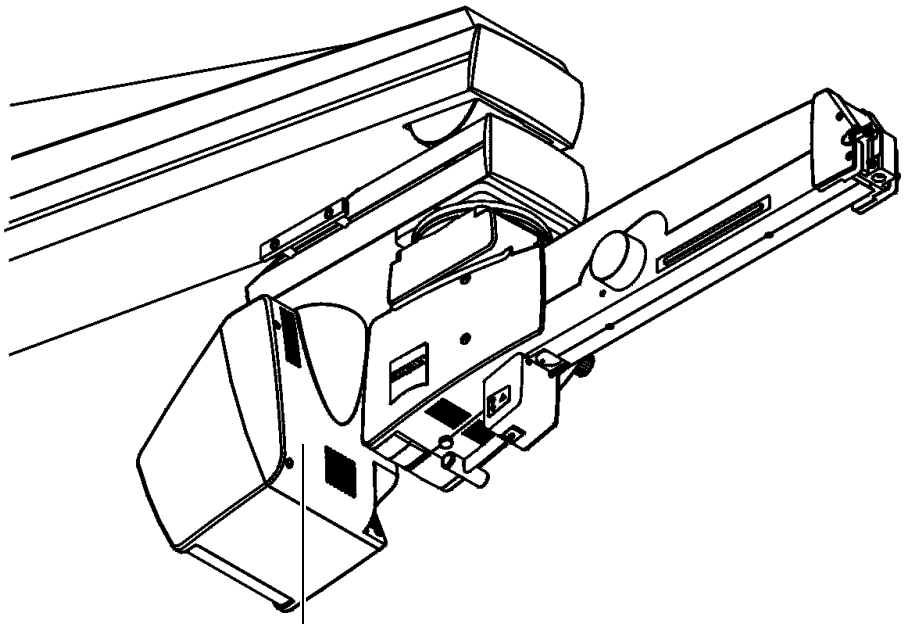
9 Rating label

The rating label provides the following information:

– Manufacturer (company name)	Carl Zeiss Meditec AG
– Manufacturer's symbol	
– Manufacturer's address	Goeschwitzer Strasse 51-52 07745 Jena, Germany
– Serial number	SN
– Project classification	P30220002
– Device name	S8 / OPMI Vario
– Reference number	REF
– Rated voltage	(115 V): 100 V - 120 V (230 V): 220 V - 240 V
– Connected load	(115 V): max. 750 VA (230 V): max. 750 VA
– Line frequency range	50 Hz - 60 Hz
– CSA certification	
– CE label	

10 Date of manufacturing

This graphical symbol indicates the manufacturing date of the device.



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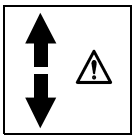
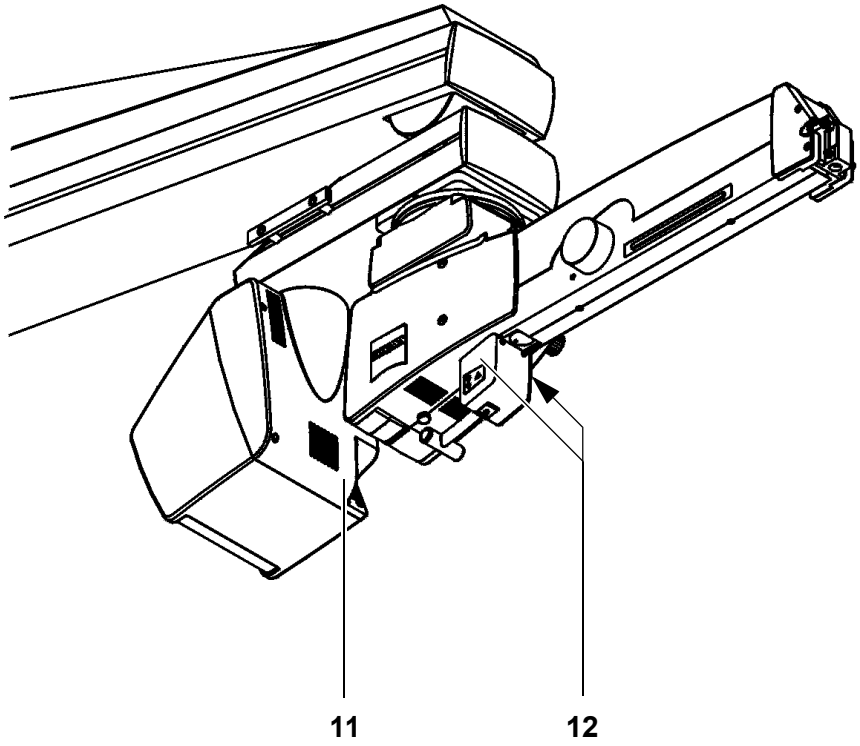
11 Observe disposal regulations
Do not dispose of electrical and electronic devices along with normal domestic waste. For more information on the disposal of electrical and electronic devices, please see "Maintenance and care".



12 "Vertical movement" indicating label
This label identifies the operating handle for the vertical movement of the ceiling mount.
Contact Carl Zeiss Service when moving the ceiling mount to its standby position requires excessive force.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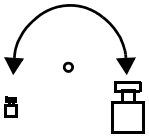
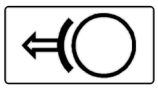
Labels on S81 ceiling mount

1 "Maximum load" warning label
The maximum load (accessory equipment) on the microscope body must not exceed 20 kg!

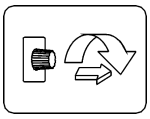
2 "Risk of crushing" warning label
Fingers may be crushed. Do not touch this area while moving the surgical microscope or parts of it.



3 Weight compensation of suspension arm
After all accessory tools have been attached to the surgery microscope, this adjustment screw can be used to balance the weight of the suspension arm.



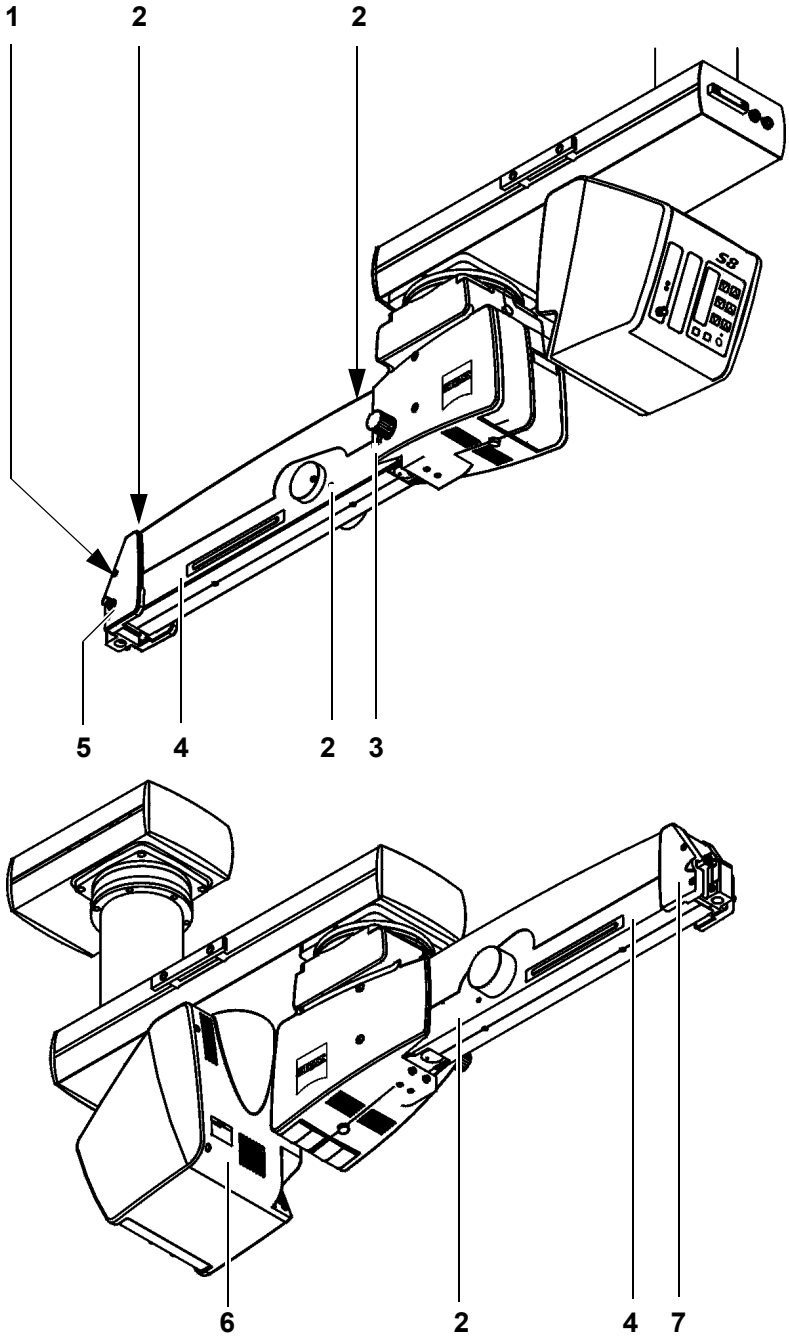
4 Releasing the magnetic brake
This symbol identifies the bar that must be pressed in order to release the magnetic brake on the suspension arm.



5 Locking the movement of the suspension arm.
This symbol indicates that the suspension arm can be secured to prevent an abrupt upward movement.

6 "Observe Instructions for Use" label

7 "Instructions for Use" label
Observe the Instructions for Use or accompanying documents.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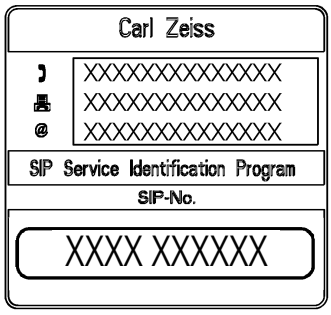
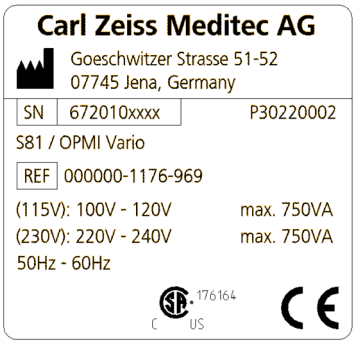


8 SIP label

The SIP label contains the following information:

- Manufacturer (company name)
- Your options to contact the device manufacturer, i.e., phone number, fax number and email address of the local contact of the national Carl Zeiss sales organization.
- SIP No.
  A unique identification number assigned to your device.



9 Rating label

The rating label provides the following information:

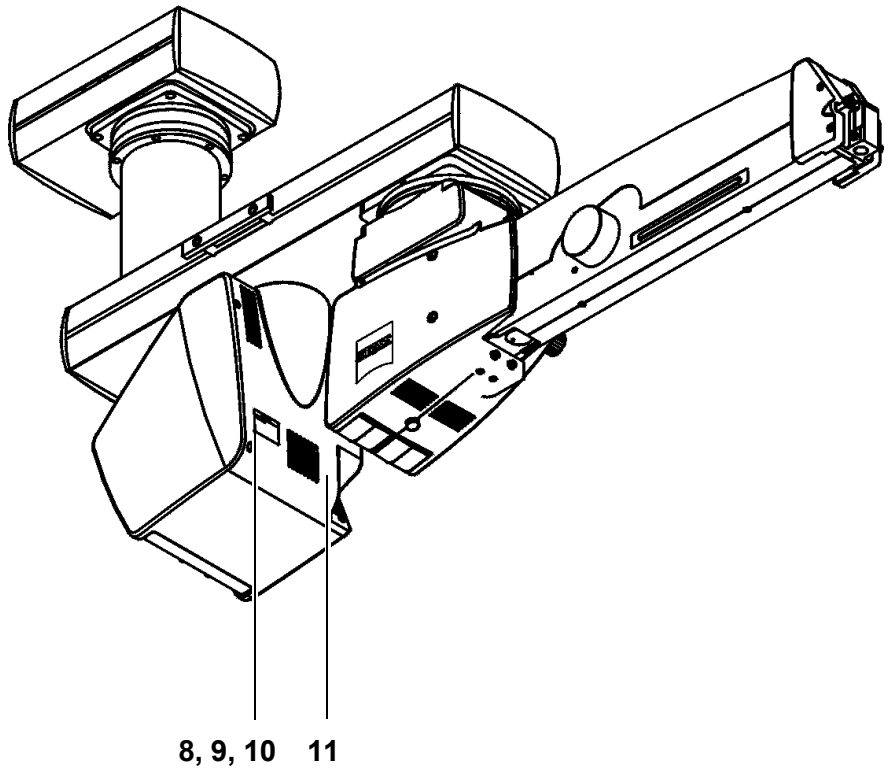
– Manufacturer (company name)	Carl Zeiss Meditec AG
– Manufacturer's symbol	
– Manufacturer's address	Goeschwitzer Strasse 51-52 07745 Jena, Germany
– Serial number	SN
– Project classification	P30220002
– Device name	S81 / OPMI Vario
– Reference number	REF
– Rated voltage	(115V): 100V - 120V (230V): 220V - 240V
– Connected load	(115V): max. 750 VA (230V): max. 750 VA
– Line frequency range	50 Hz - 60 Hz
– CSA certification	
– CE label	

10 Date of manufacturing

This graphical symbol indicates the manufacturing date of the device.

11 Please follow disposal regulations

Do not dispose of electrical and electronic waste with domestic waste. Additional information pertaining to the disposal of electrical and electronic waste can be found in Chapter "Maintenance and care"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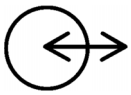
Labels on the suspension system's connector panel



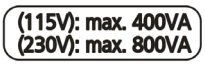
1 "Remote connector" label
Identifies a connector to which devices with a maximum breaking capacity of 24 V / 0.5 A may be connected.

2 "Connector of wired foot control panel" label

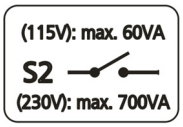
S2

3 "Power switch S2" label
When the stand is on, the green indicator lamp in the switch is lit.

4 Power output socket warning label
Only connect devices with the correct electrical ratings.

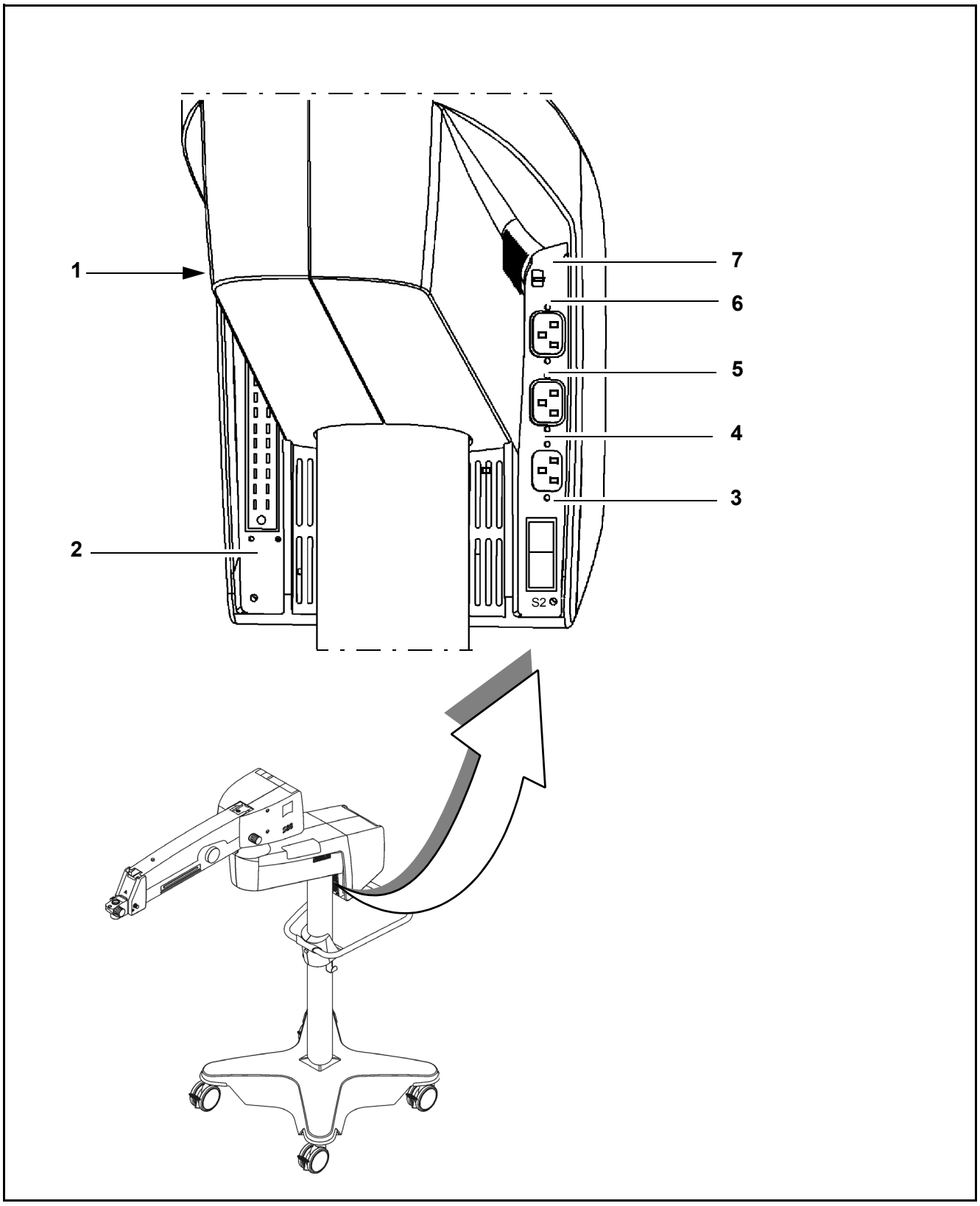


5 Power output socket
with permissible electrical values for connected devices.



6 Power output socket
with permissible electrical values for connected devices.
The current in this power output is switched on/off using power switch S2.

7 Potential equalization
Here, the system can be connected to the potential equalization system.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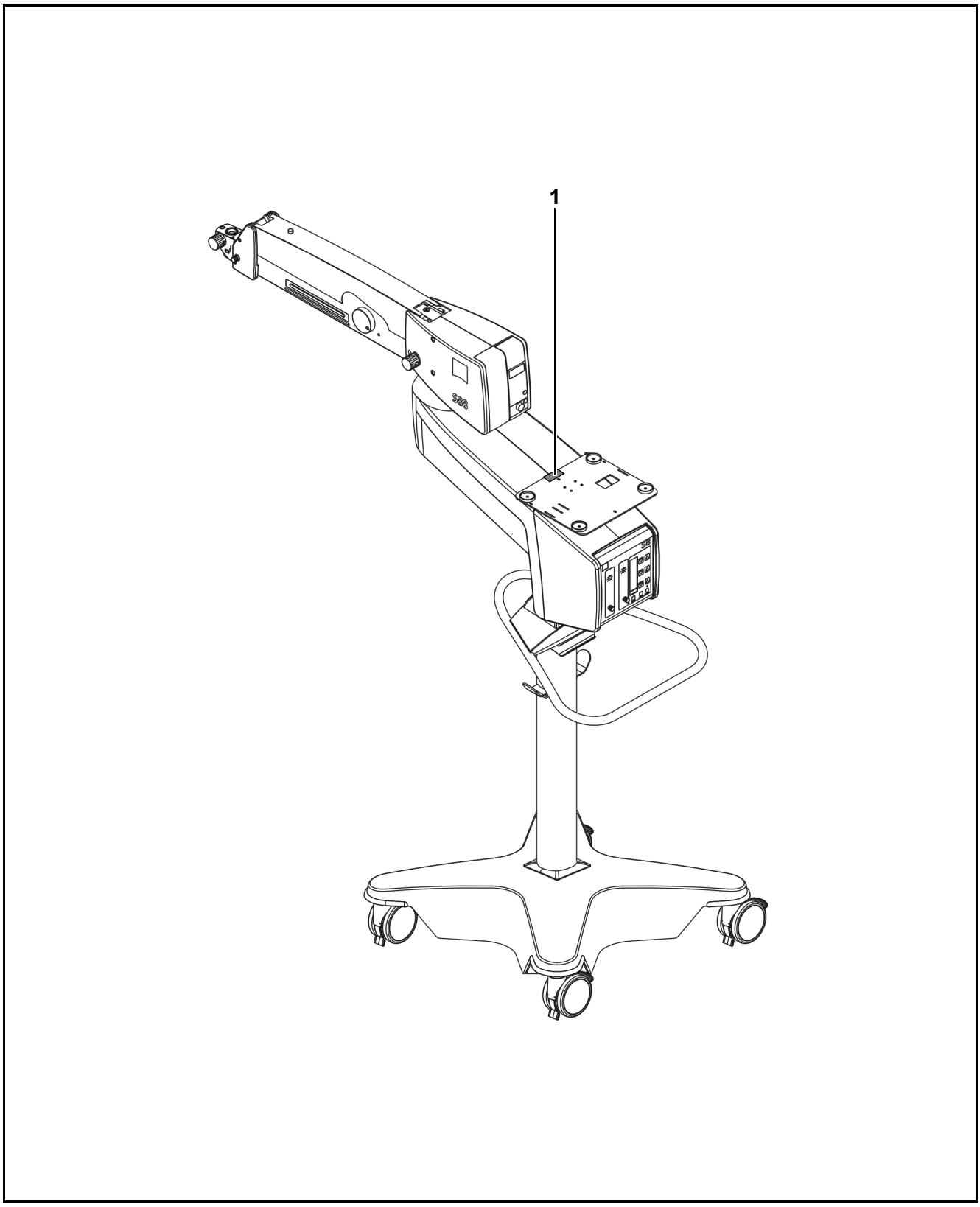
S2

Additional label on the S88 floor stand (Instrument tray option)

1 "Maximum load on instrument tray" indicating label
The maximum load of accessories on the instrument tray must not exceed 13 kg.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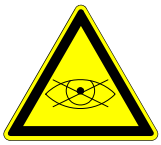
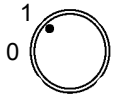
Labels on the light sources of the suspension systems

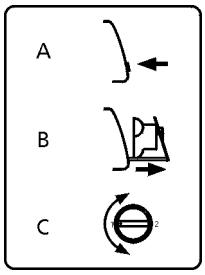


1 "Warning of a hazard area" indicating label
The Superlux light source is equipped with an integrated xenon illumination system. The xenon illumination must not be used for ophthalmic surgery.

2 Indicates a potential hazard during the exchange of lamps
Refer to the Instructions for Use. (See Page 24.)



3 "Filter selector for light source" indicating sign
This label indicates the position of the filter wheel.



4 Changing the lamps
The label shows the three steps for the replacement of a lamp.

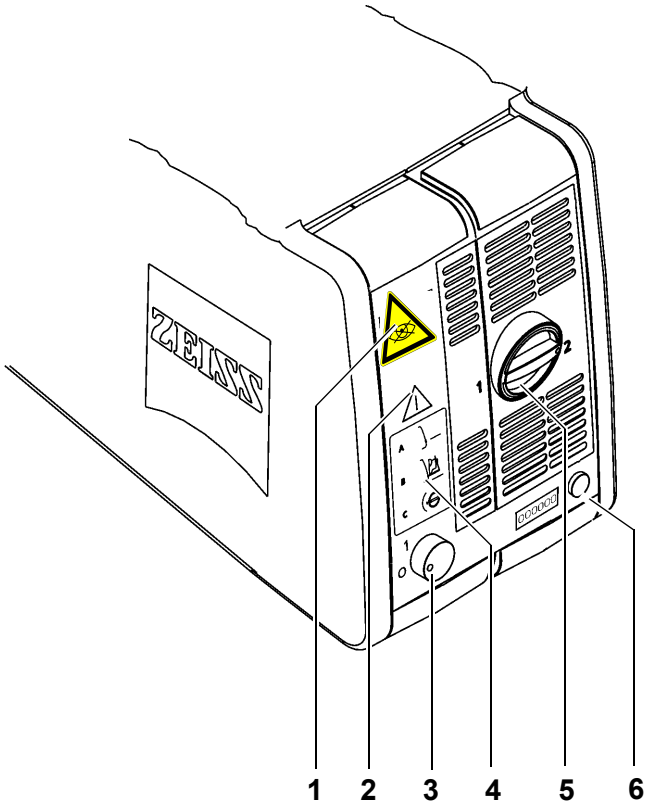
A - push button

B - pull out lamp module

C - replace lamps

5 "Manual switching to backup lamp" indicating label
These numerical symbols refer to switching from the standard lamp to the backup lamp.

6 "Instructions for Use" label
Observe the Instructions for Use or accompanying documents.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System Overview

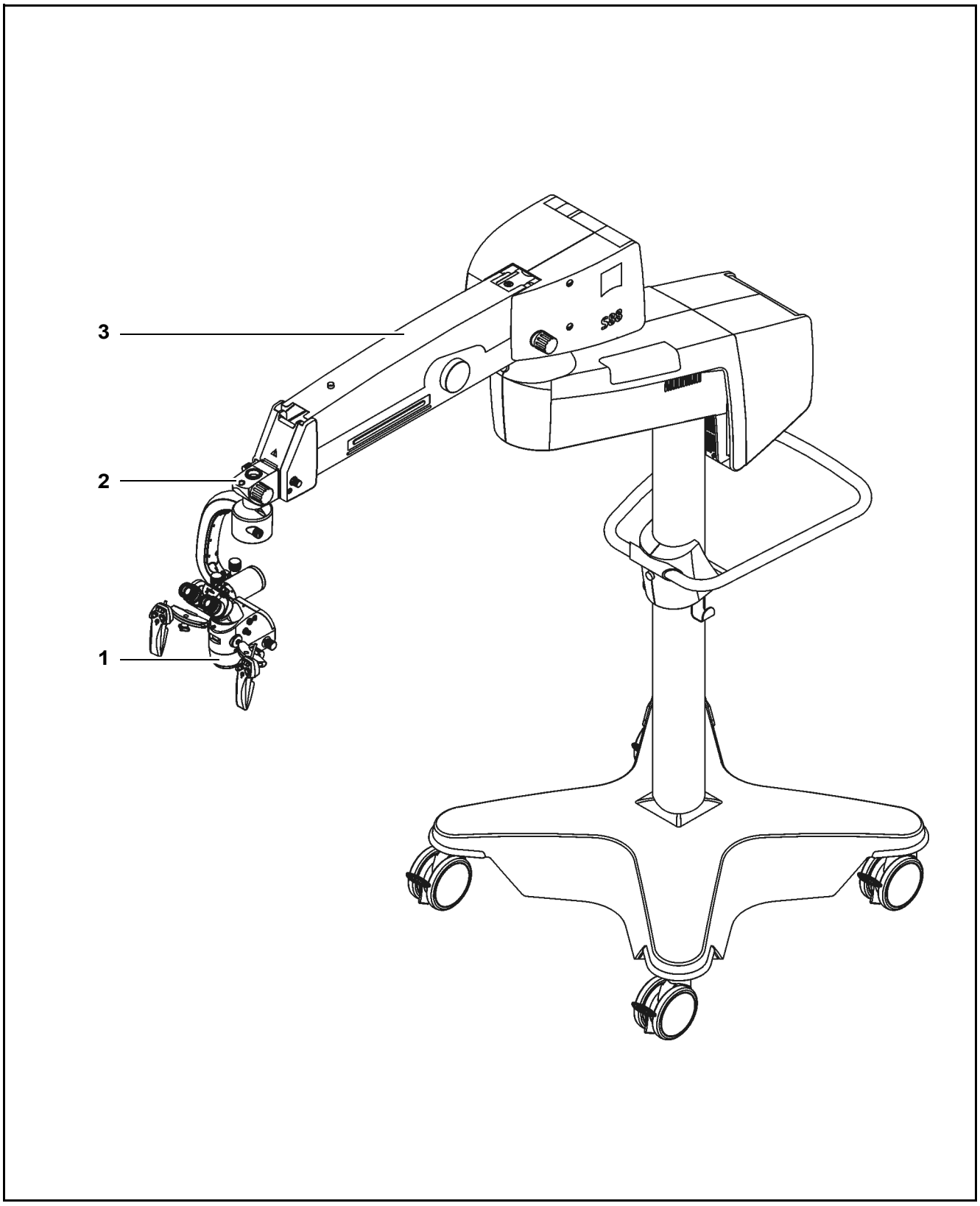
S88 / OPMI Vario

Design

1 Surgical microscope (see Page 69)

2 Coupling

3 S88 floor stand (see Page 94)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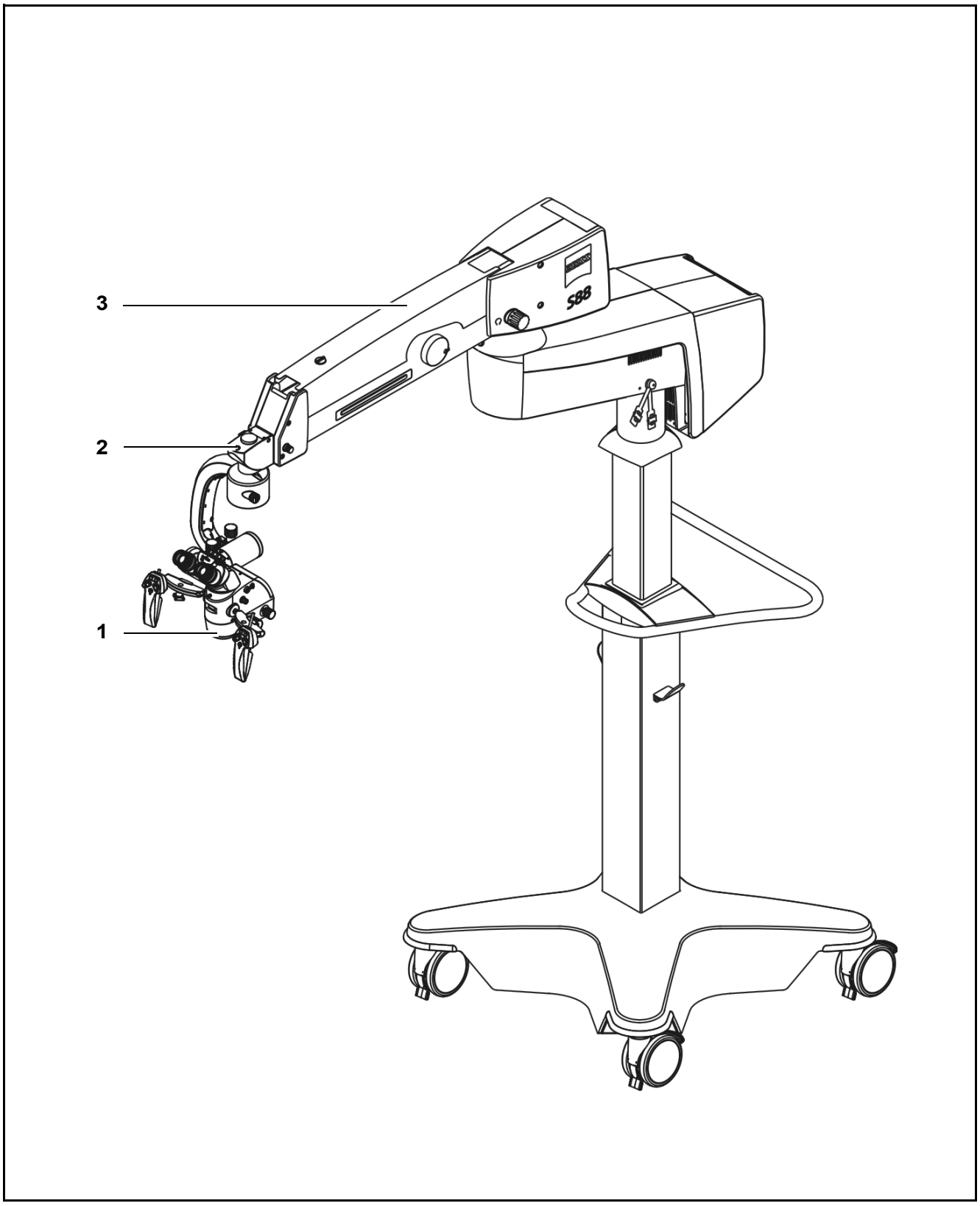
S88 / OPMI Vario with lifting column

Design

1 Surgical microscope (see Page 69)

2 Coupling

3 S88 floor stand with lifting column (see Page 112)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S88

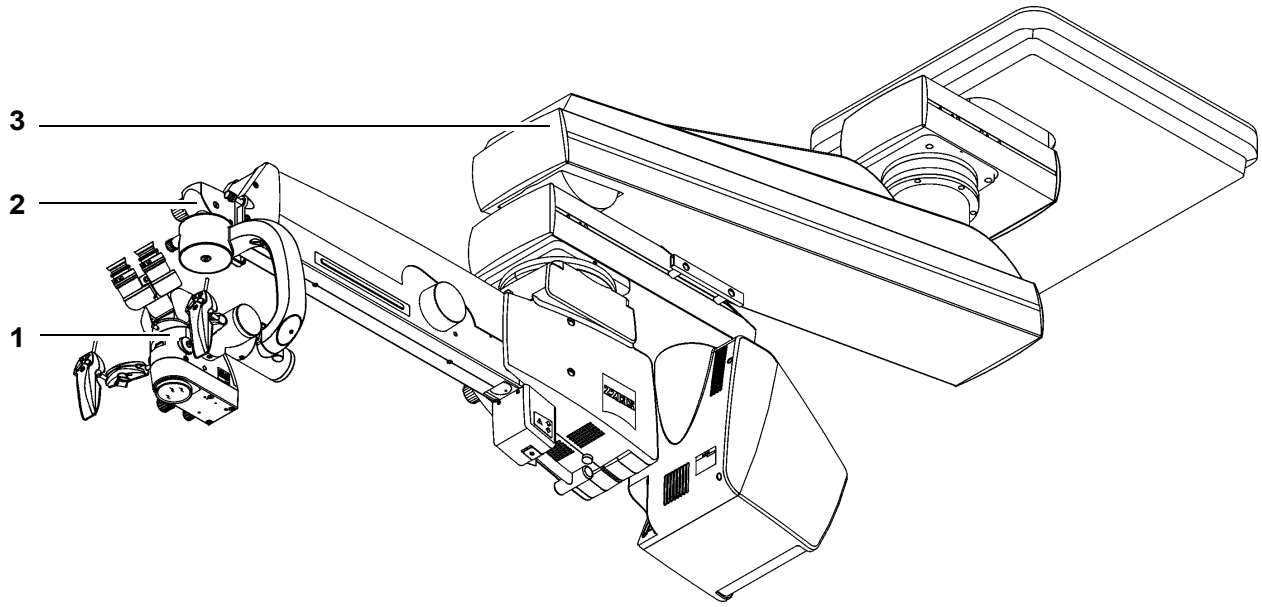
S8 / OPMI Vario

Design

1 Surgical microscope (see Page 69)

2 Coupling

3 S8 ceiling mount (see Page 120)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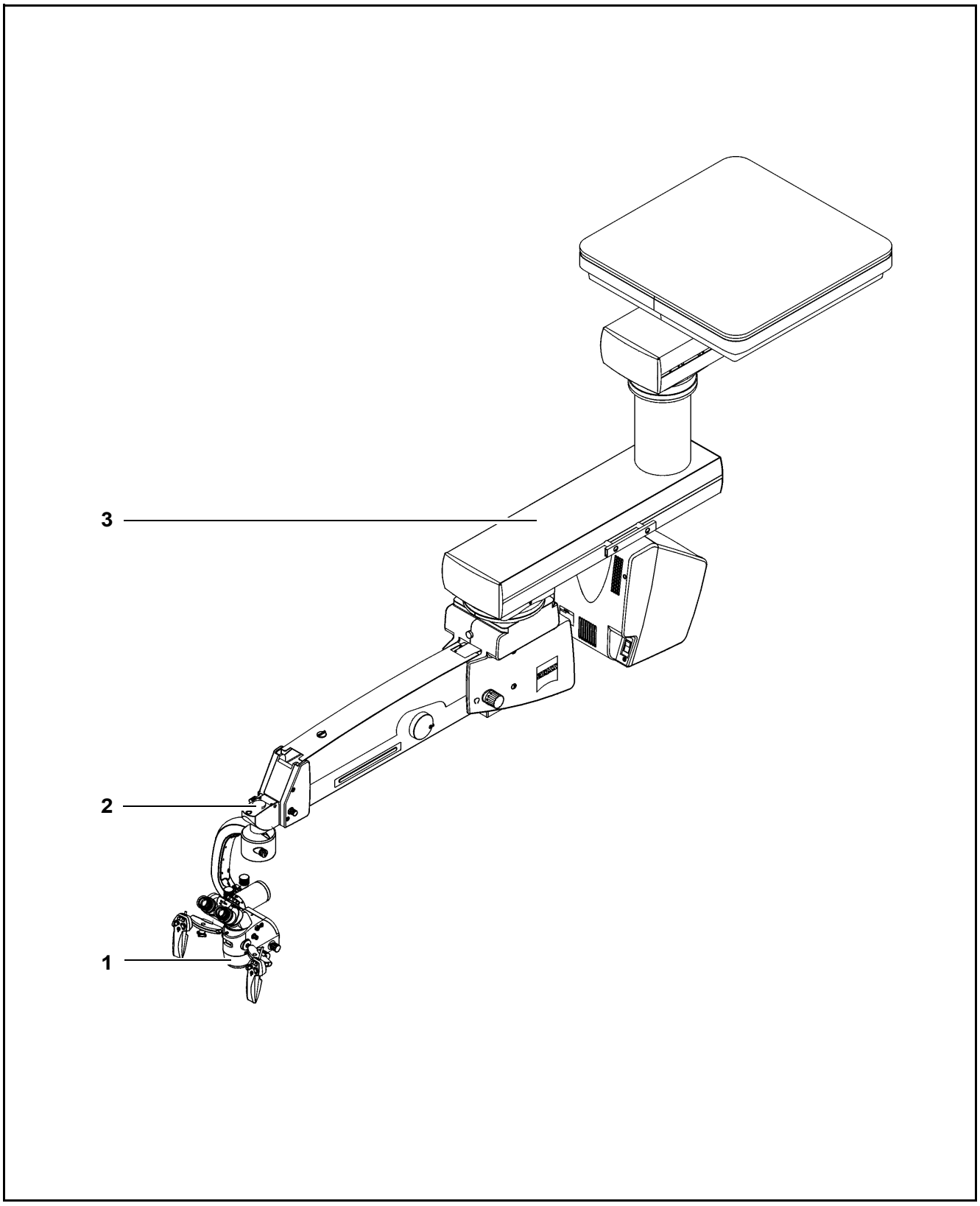
S81 / OPMI Vario

Design

1 Surgical microscope (see Page 69)

2 Coupling

3 S81 ceiling mount (see Page 126)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Surgical microscope

Special features

The apochromatic optics of the OPMI Vario surgical microscope provide superb optical quality. The microscope image displays optimum contrast and superb detail recognition along with excellent depth of field. An integrated, motorized Varioskop objective lens allows the working distance from the surgical field to be adjusted between 200 and 415 mm. A motorized zoom system permits continuous magnification adjustment. The zoom ratio is 1:6. Various tubes and accessories from our range of accessories can be mounted on the standard tube port.

The carrier arm of the device is equipped with magnetic brakes in all axes and with a balancing system. Handgrips allow the reliable control of the unit and the operation of important functions.

Additional useful functions:

- magnetic couplings for virtually effortless positioning
- brightness control via the foot control panel
- reset of X-Y coupling (option), focus and zoom
- user-defined basic settings for a maximum of nine users:
  - lamp brightness
  - speeds for focus, zoom and X-Y coupling
- programmable buttons on the foot control panel for focus memory, XY reset (option), zoom memory, camera release, triggering an AUX signal.

Design

The surgical microscope comprises the following modules:

1 Coupling
for mounting the surgical microscope on the suspension system.

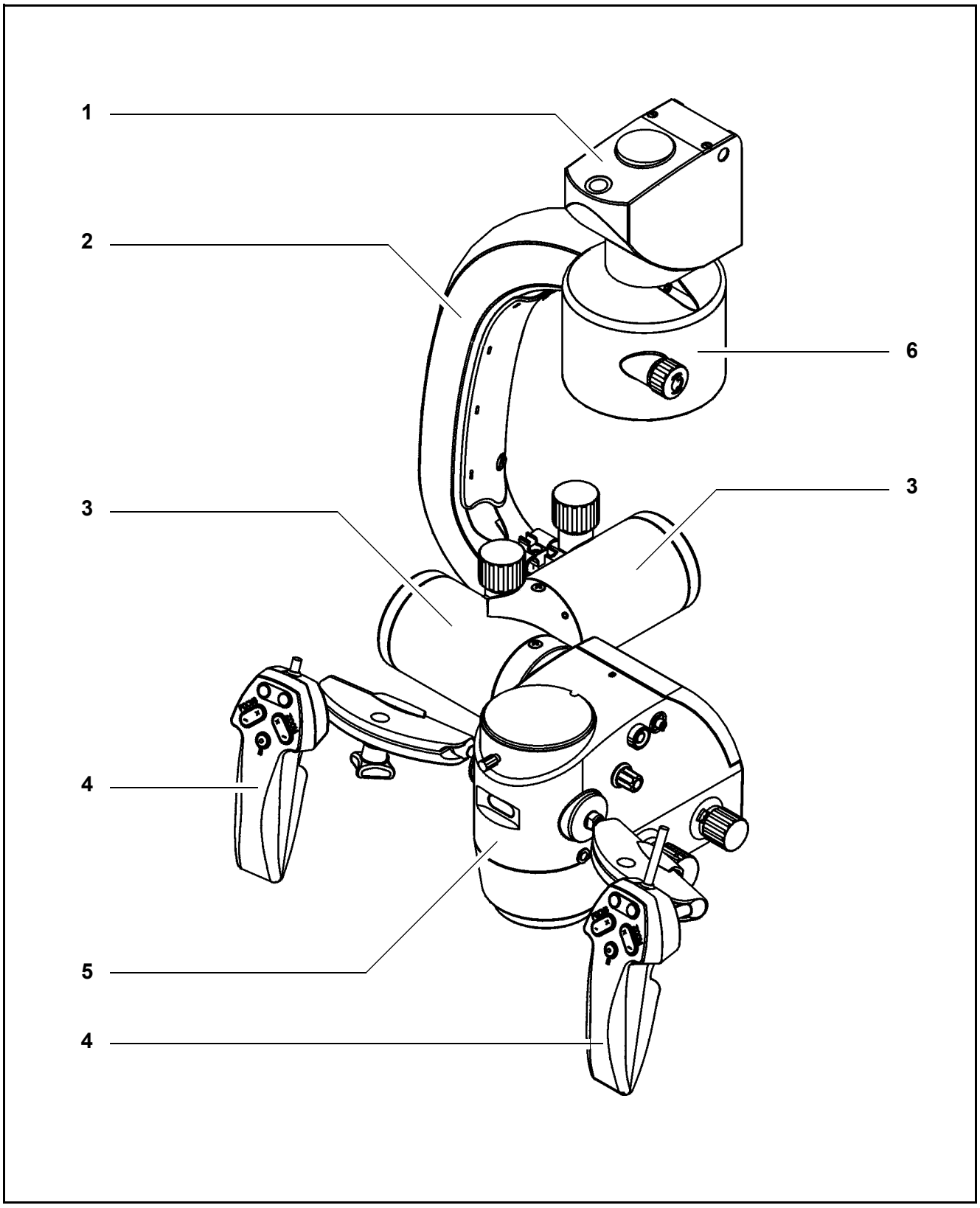
2 Carrier arm for the surgical microscope

3 Balancing system including magnetic brakes
This system allows balancing of the surgical microscope. When the magnetic brakes are unlocked, the surgical microscope can be positioned almost effortlessly.

4 Handgrips
for moving the surgical microscope. The buttons on the handgrips permit you to control major microscope functions such as unlocking/locking the magnetic brakes, focusing, zooming.

5 Microscope body
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 1:6 ratio zoom system allows the magnification of the overall system to be set as required by the surgical procedure.

6 Magnetic brake
for the vertical axis.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Controls, displays, connections

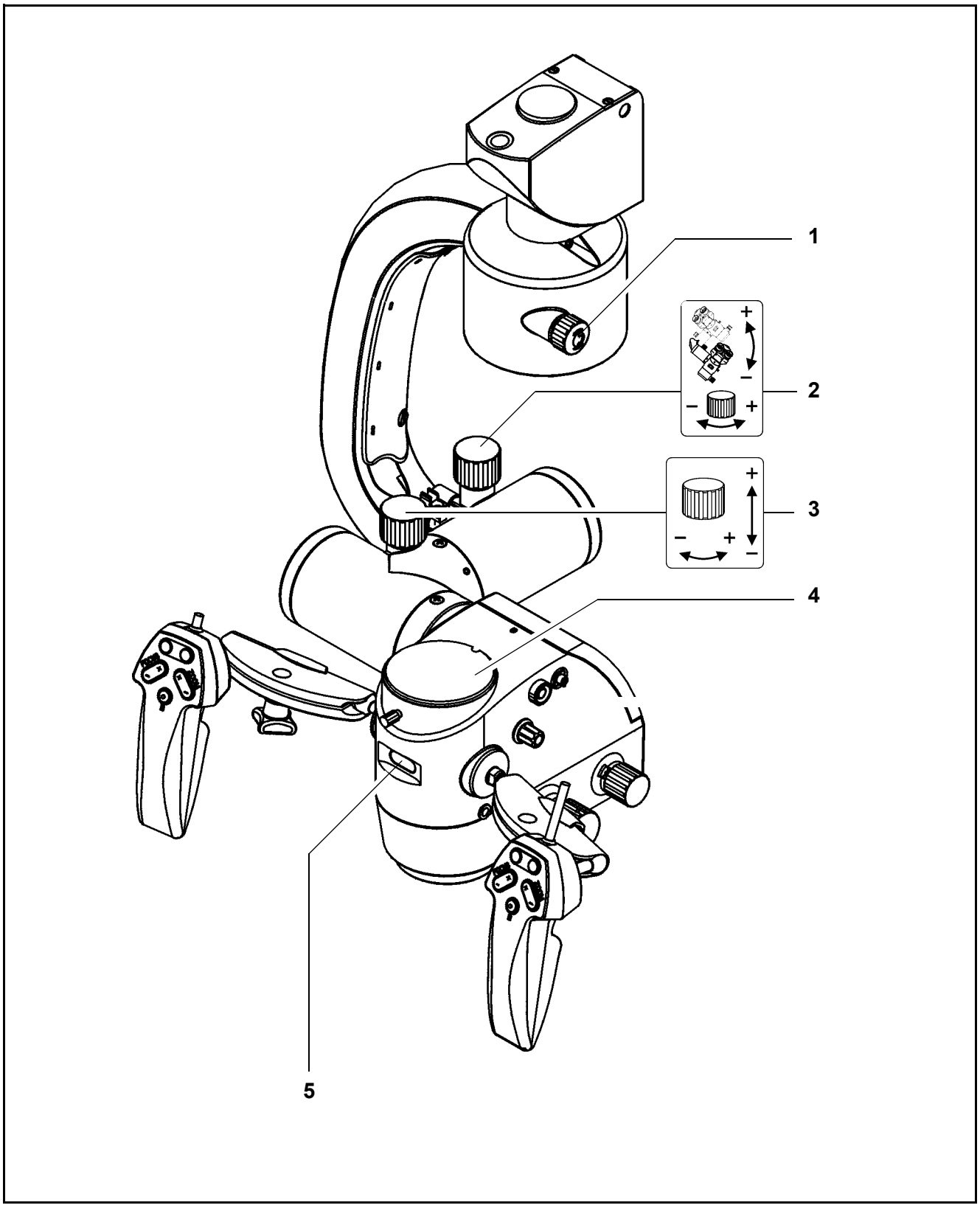
1 Friction adjustment of vertical axis
Use this knob to adjust the friction of the vertical axis as required.

2 Balance setting of lateral tilt motion
Use this knob to adjust the balance setting of the lateral tilt motion.

3 Balance setting of front-to-back tilt motion
Use this knob to adjust the balance setting of the front-to-back tilt motion.

4 Dust cover

5 Viewing window
for reading off the magnification factor γ of the zoom system.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6 Focus stop button
This button permits you to deactivate the electrical drive of the focusing system. After you have pressed the focus stop button, you can only focus manually on the surgical field using knob (9). The focus stop button is lit. To release the stop, press the focus stop button again (light in the button goes out).

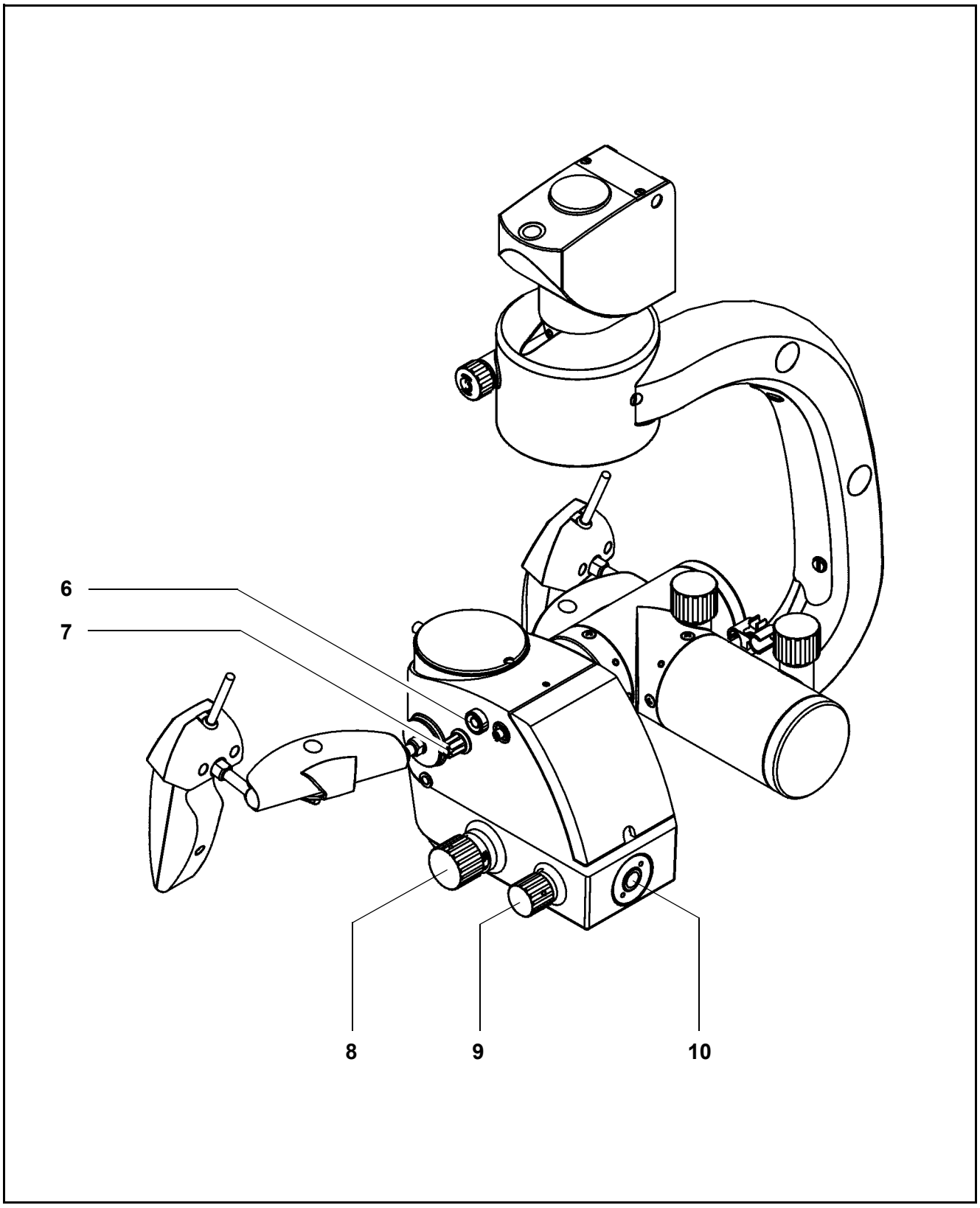
The use of a micromanipulator for laser applications is described in the section "Surgical microscope with laser micromanipulator", (see Page 165).

7 Zoom knob
Use this knob for manual setting of the magnification.

8 Focusing knob
for manual adjustment of the image definition (focus, working distance).

9 Illuminated-field knob
for manual setting of the illuminated-field diameter.

10 Socket for S light guide
Insert the S light guide into the socket until it snaps in.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11 Freely programmable release buttons
Specific functions of the suspension system can be assigned to these buttons, e.g.: increasing / reducing brightness etc.

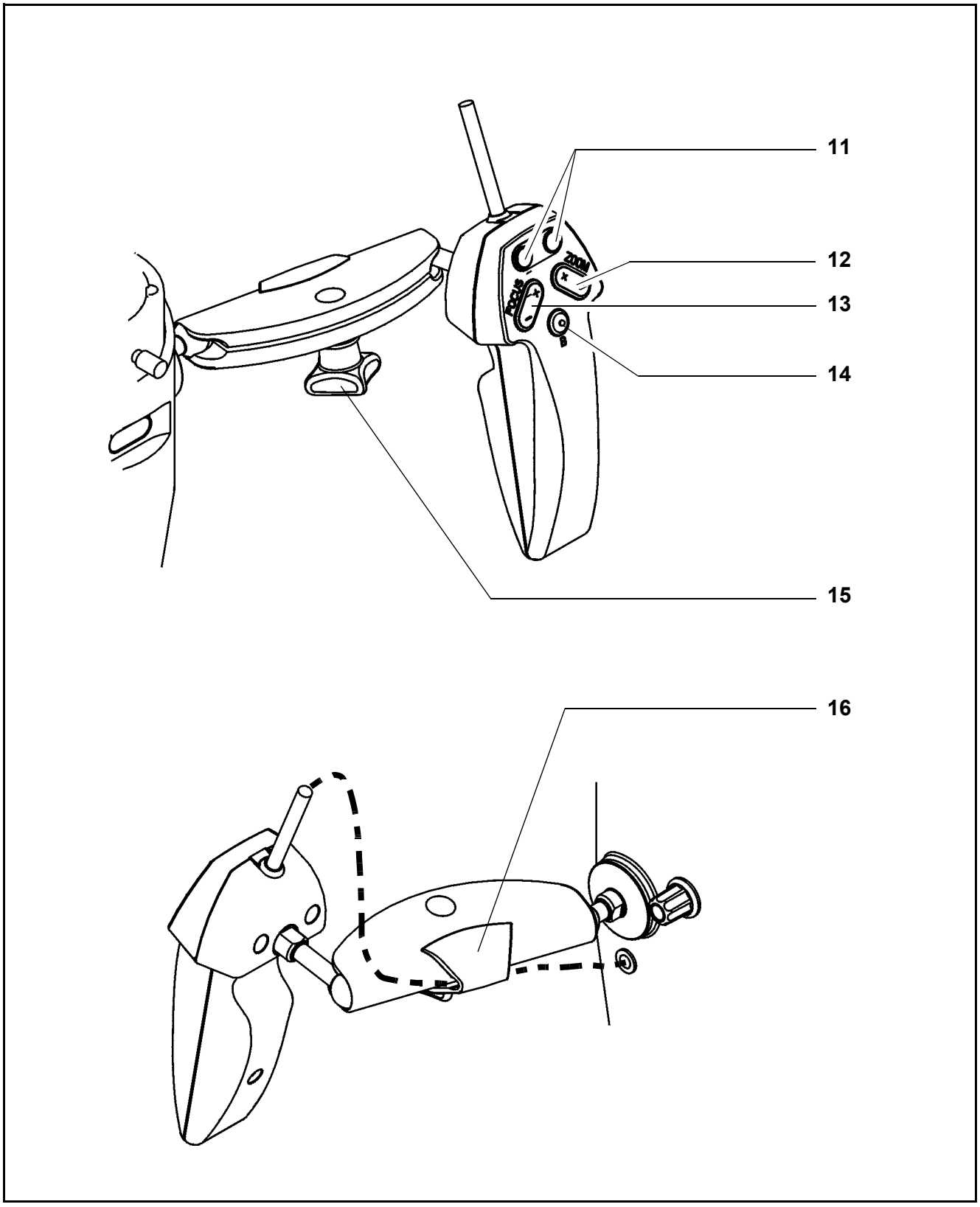
12 Zoom release button
for setting the magnification factor from 0.4x to 2.4x.

13 Focus release button
for continuous focusing within the working distance of 200 to 415 mm.

14 Release button for magnetic brakes
The magnetic brakes of the surgical microscope and suspension system are released for as long as you press this button.

15 Locking the handgrips in position
Using this screw, you can lock each handgrip in almost any position. You can swing the handgrips backward by 180° to permit a second surgeon to operate the microscope in the 180° position.

16 Cable holder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ZOOM

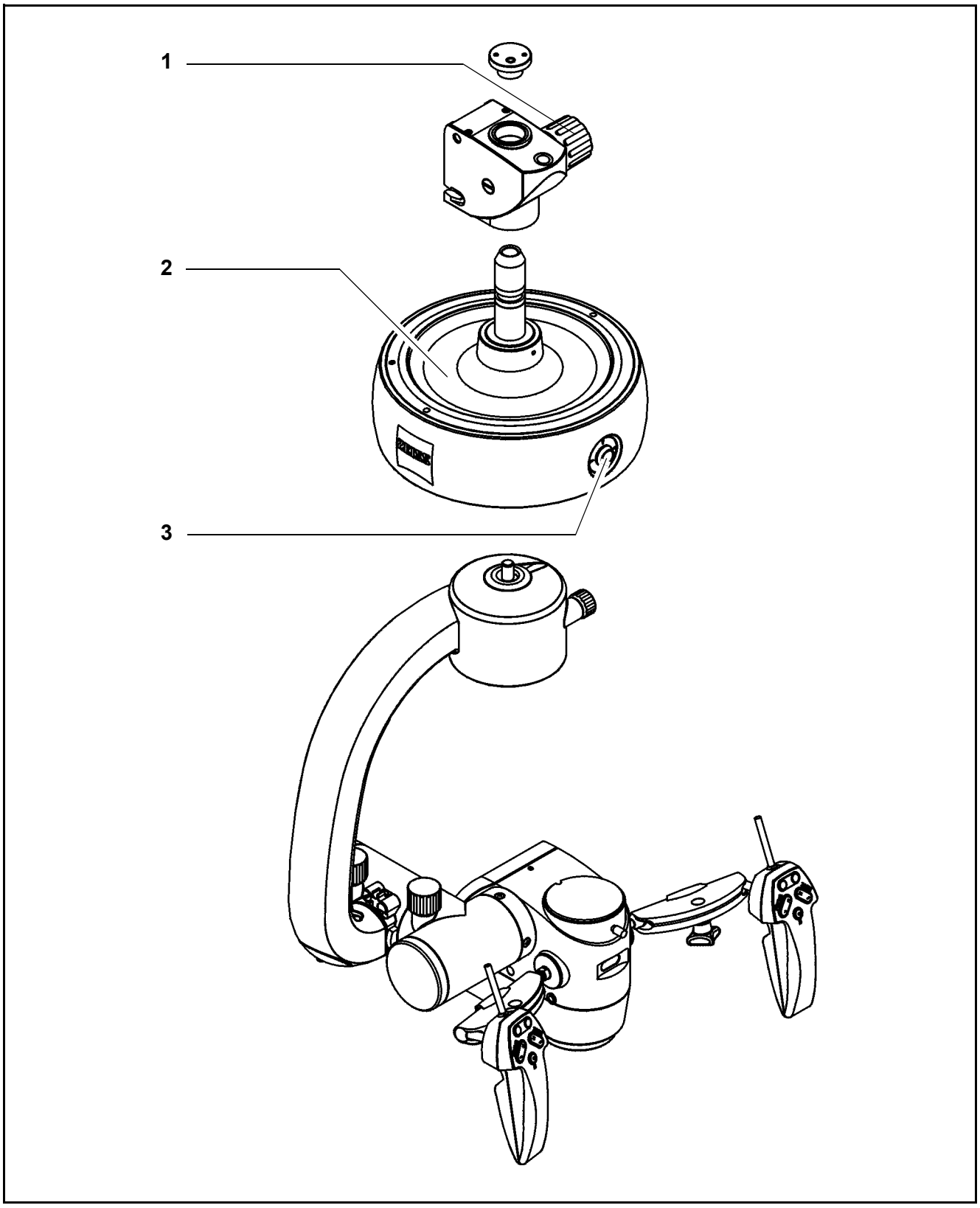
X-Y coupling (option)

The OPMI Vario can be equipped (and also retrofitted) with an X-Y coupling (2). Our service team or an authorized person will install the X-Y coupling for you.

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 display field of the suspension system.
The X-Y coupling is provided with a recentering mechanism. When you press button (3), the X-Y coupling moves back into its center position.
You can also trigger the recentering function using the freely programmable buttons on the handgrips or foot control panel.

Knob (1) permits you to adjust the friction of the microscope's rotary axis.

Also see "Aligning the X-Y coupling“ (see Page 142).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Binocular tubes and eyepieces

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

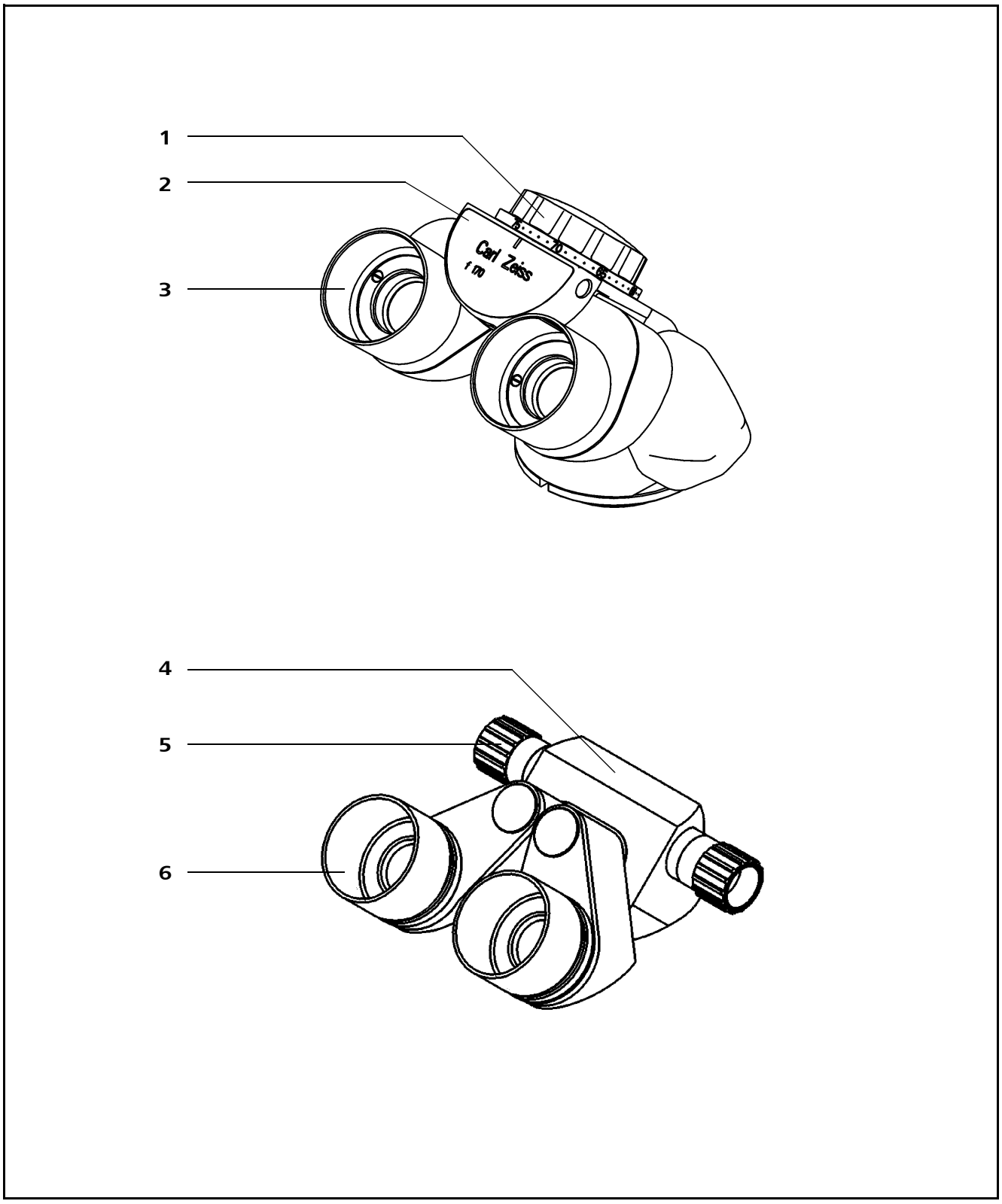
3 Eyepiece mount

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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Widefield eyepieces with magnetic coupling

NOTE

Eyepieces have a magnetic field!

Please note that the usual rules for the handling of magnets must be observed for eyepieces removed from the tube:

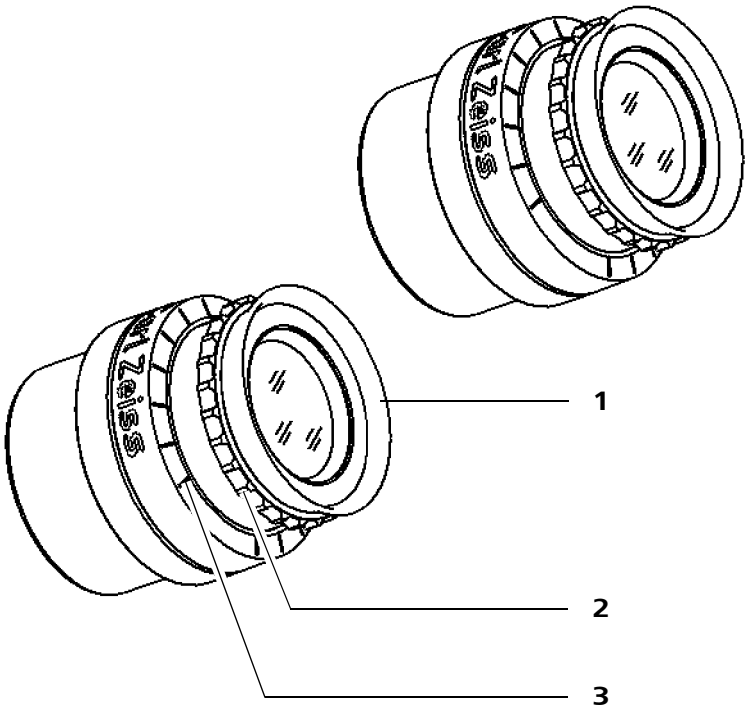
- Do not place the eyepiece near instruments which may be magnetizable.
- Do not place the eyepiece on sensitive electronic instruments such as infusion pumps, heart pacemakers, measuring instruments or magnetic data carriers such as disks, audio/video tapes or credit cards.
- Always store the eyepiece in its original packaging when not using it.

1 Eyecups
Always adjust the eyecups in such a way that the entire field of view can be seen.

– Viewing with eyeglasses:	Screw-in the eyecups all the way.
– Viewing without eyeglasses:	Rotate the eyecups out in order to adjust them to the field of view of the observer.

2 Diopter setting ring
The eyepieces provide ametropia compensation between - 8 D and + 5 D. Eyeglass wearers who wear eyeglasses during their work set the diopter setting ring to the zero position.
Turn the ring until the optimum setting has been achieved. An integrated brake holds the setting ring in the position set.

3 Diopter scale
Shows the set refraction value.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Xenon illumination system

CAUTION

Injury to the patient's eye!

Never use xenon illumination for ophthalmic procedures!

- Make sure that no xenon light enters the patient's eyes.

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.

NOTE

Overheating of the lamp module!

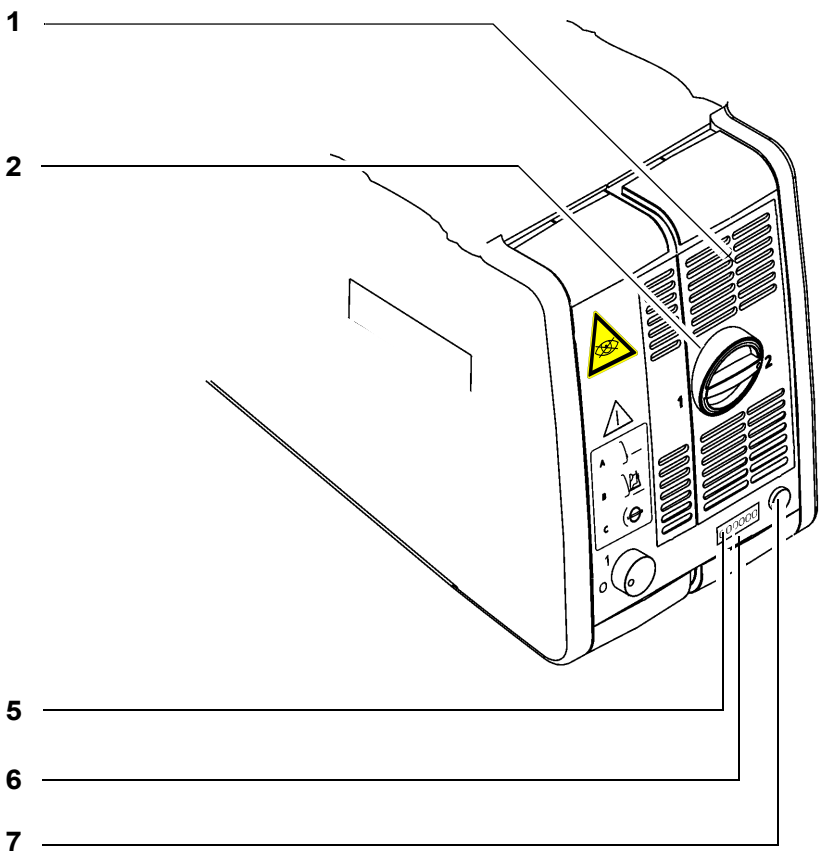
If ventilation grids are covered e.g. by drapes, this may lead to overheating of the ventilation modules and deactivation of the lamp.

- Never cover the ventilation grids!
- Lamps switched off due to overheating will be automatically switched on again when they have cooled down.

1 Lamp module

2 Manual activation of the backup lamp

- If the xenon lamp fails, open the lamp module as follows: Press button (7). The lamp module is partially ejected.
- Pull out the lamp module as far as it will go.
- Turn knob (2) through 180° until it snaps in place. This moves the backup lamp into the illumination beam path.
- Push the lamp module all the way back into the lamp housing.
- Reset service hour counter (5) to "0". Use a pointed object and press it into the recess of the reset button (6).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When inserting a new lamp module, make sure that the knob (2) is set to "1". If the first lamp fails, switch to the second lamp in logical sequence.

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

4 Filter selector
The filter selector knob has two positions:

0 no filter

1 filter swung in
(No integrated filter in the standard configuration)

5 Counter
The counter records the service hours of the xenon light source.

- Change the xenon lamps after a maximum operating time of 500 hours to avoid any rupture of the xenon lamps. Then reset the counter to "0" by pressing the reset button (6).

6 Reset button
The reset button resets the service hour counter to "0".

7 Opening the lamp module
When you press this button, the lamp module is partially ejected.

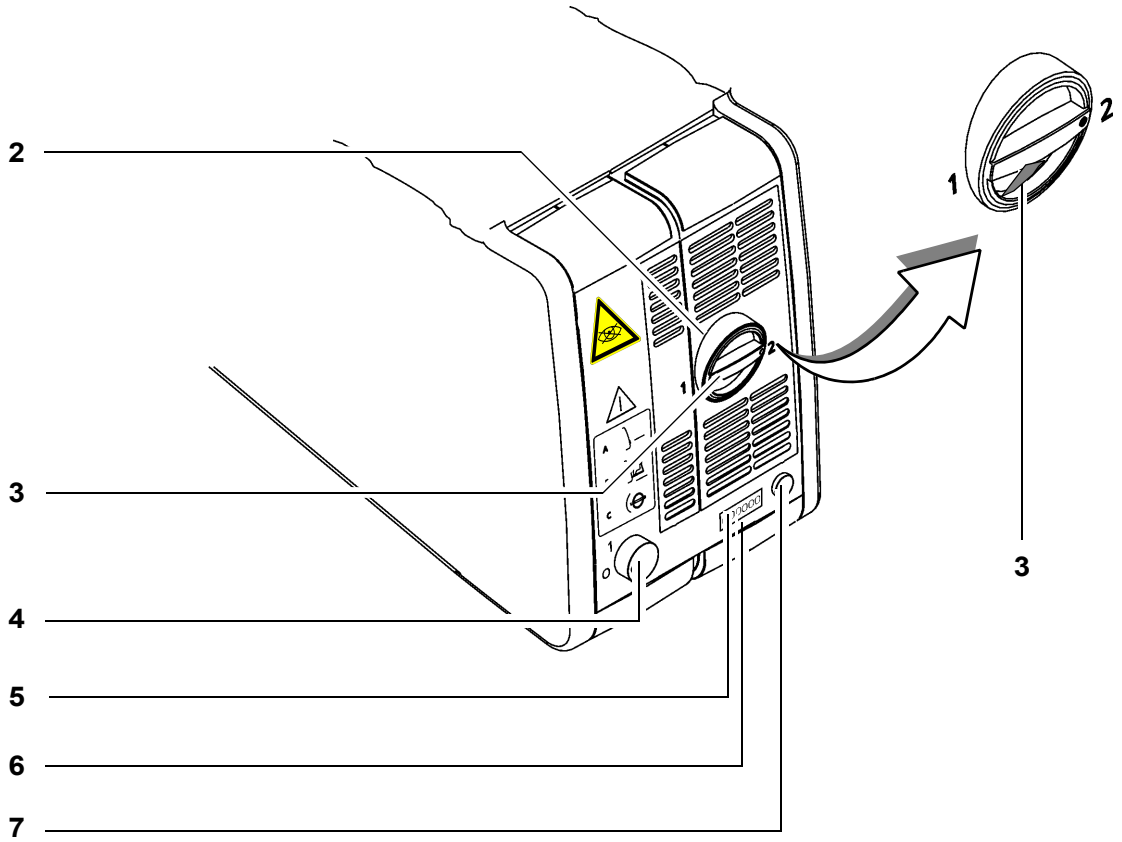
- To change the lamp, pull out the lamp module as far as it will go. Turn the knob (2) through 180° until it snaps in place. This moves the backup lamp into the illumination beam path.

CAUTION

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

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

- Please replace the xenon lamp in due time.
- Reset the service hour counter to "0" after replacing the lamp.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8 Brightness control
You can adjust the brightness using the two control keys on the control panel.

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

9 Yellow indicator lamp
is lit when the lamp has failed, or if the lamp module is defective. After activation and ignition of the backup lamp, the yellow indicator lamp turns off again.

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.

10 Green indicator lamp
is lit when the illumination has been switched on.

11 Selector switch:

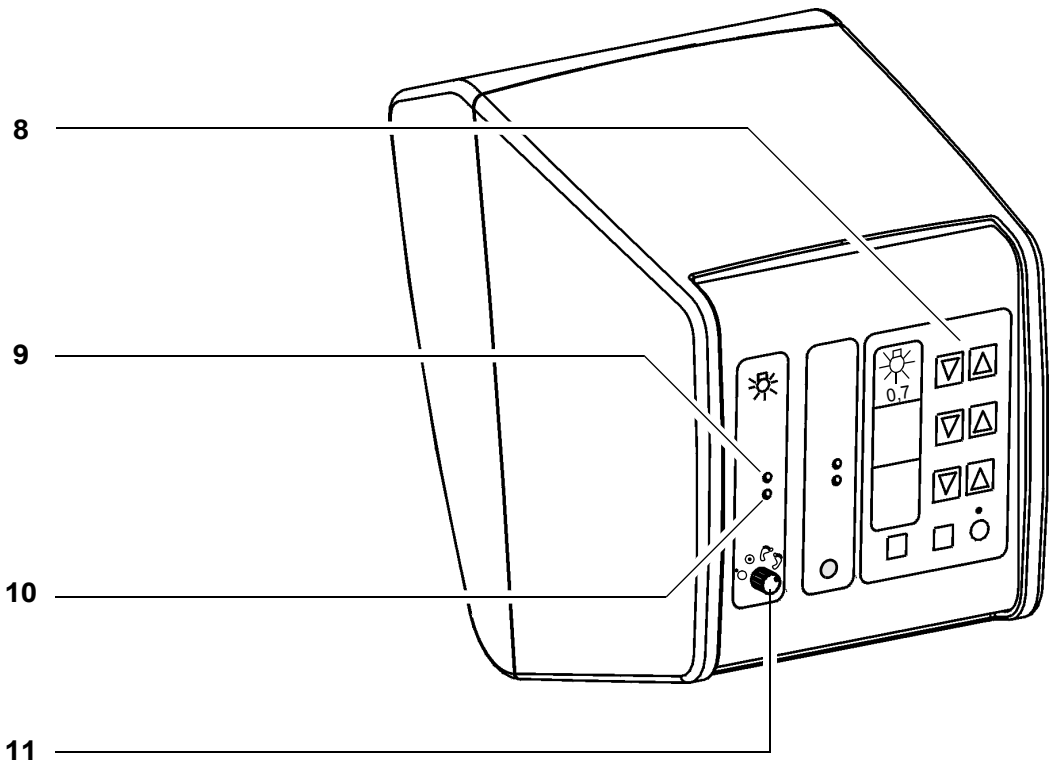
Illumination is off.

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.

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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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 travel
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 travel clockwise as far as it will go. Adjust the downward travel limitation before each surgical procedure.

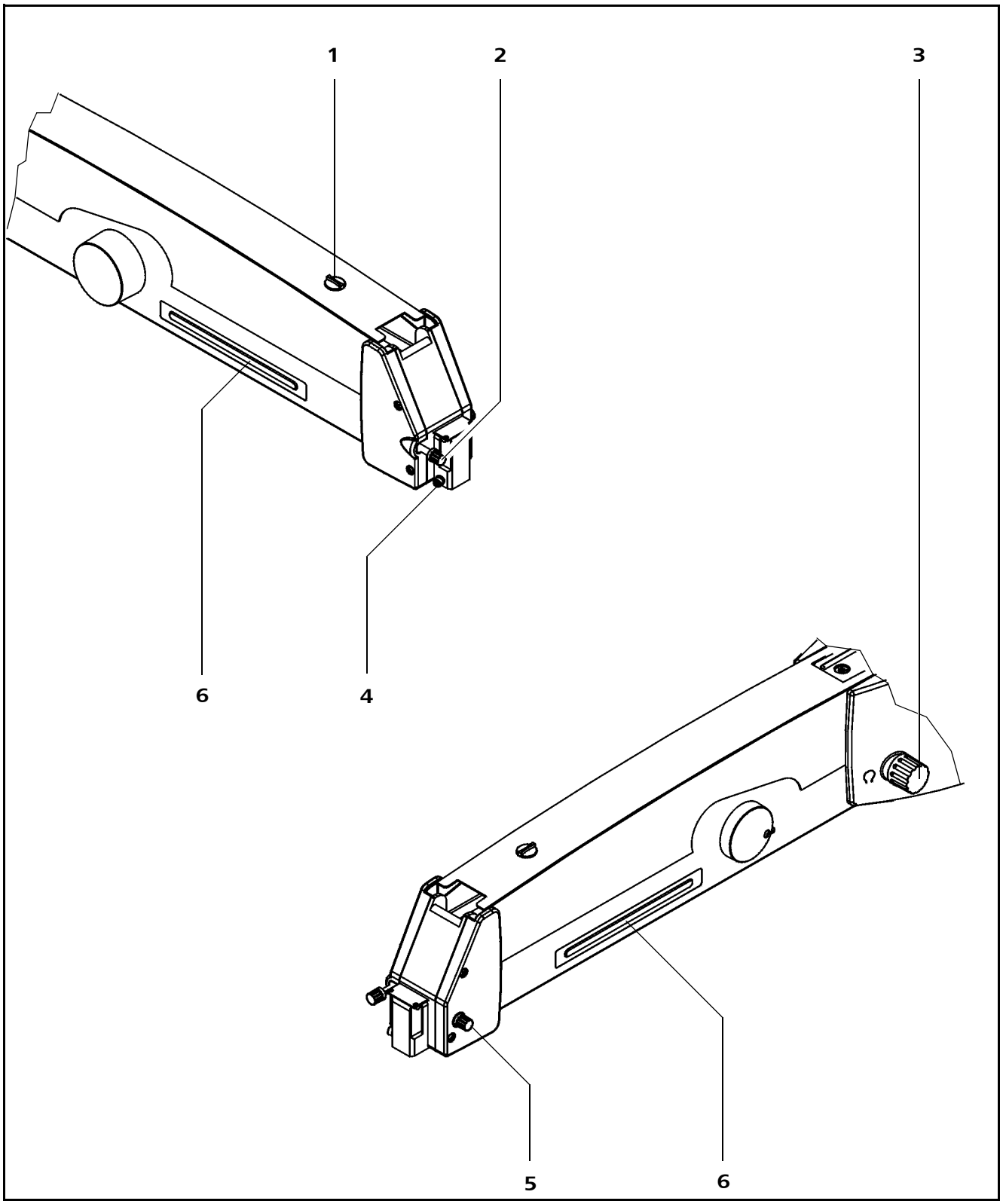
3 Balance adjustment screw
After mounting the surgical microscope including all accessories, adjust the balance setting of the suspension arm using this screw. Balance setting is described in detail in the chapter "Operation".

4 Securing screw
for fastening the microscope coupling.

5 Locking knob
for locking the suspension arm in a horizontal position for mounting the surgical microscope. Now the suspension cannot swing upward due to missing mass.

6 Release bar
allows non-sterile persons to unlock 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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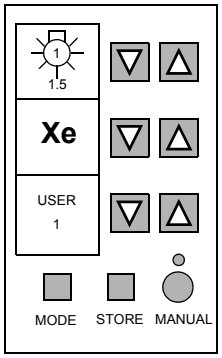
Display field with control keys

Basic mode



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 (xenon) in the upper display field,

– Xe for xenon in the middle display field,

– the current user ID in the lower display field.

Key row

Three keys and an LED are provided below the display fields.
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
Use the "STORE" key to save the current focus and zoom settings.

"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.

S88 floor stand

Features

The S88 floor stand is a carrier system for the surgical microscope. 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.

Further useful functions include, for example:

- magnetic brakes for almost effortless positioning,
- 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 buttons on the foot control panel for focus memory, XY inversion, camera release, swinging SDI in/out and triggering an AUX signal.

Description of the modules

The S88 floor stand comprises the articulated arm, the stand column and the 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. These motorized functions can be activated using a foot 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 travel of the suspension arm can be limited as required.
A maneuvering handle mounted on 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. Locking pedals are provided to lock the S88 floor stand quickly and reliably into position.

The mass may be underestimated as the suspension system can smoothly be moved. Therefore, move the suspension system slowly and carefully!

Design

1 Control panel

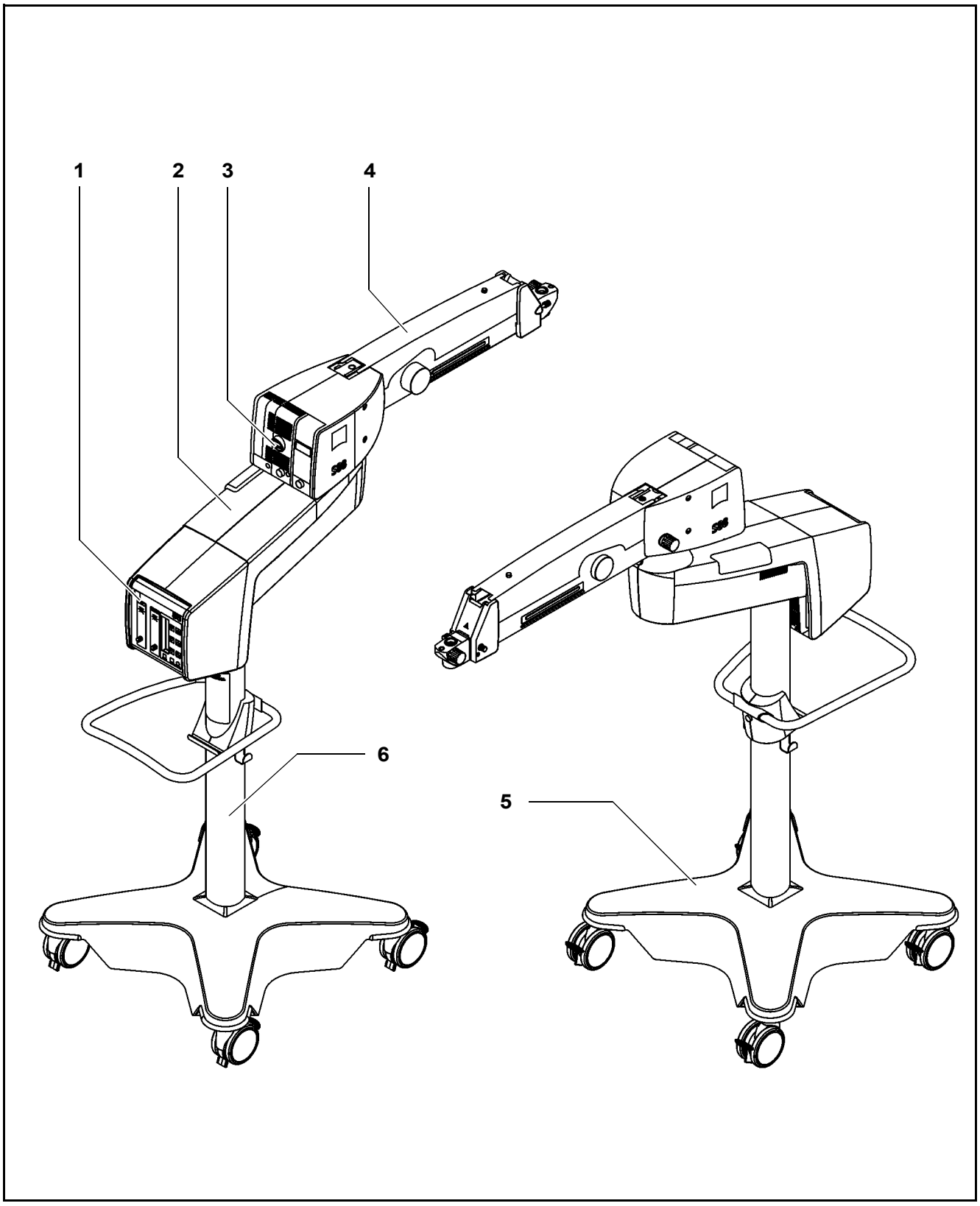
2 Carrier arm

3 Xenon illumination system, see Page 84)

4 Suspension arm

5 Stand base

6 Stand column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Stand base with column

1 Maneuvering handle
for moving the stand.

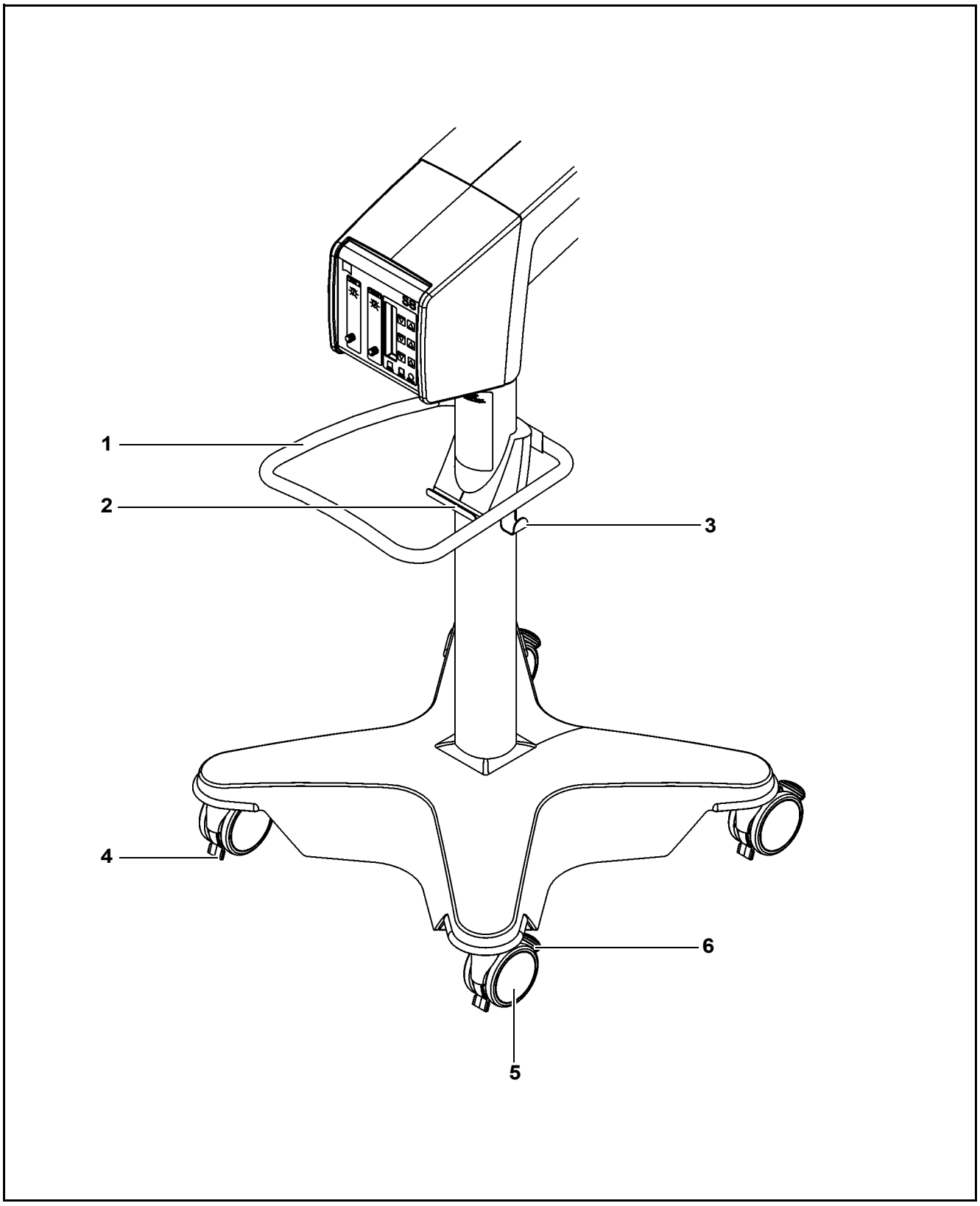
2 Support
for hanging up the foot control panel during transport.

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

4 Cable deflector
protects the cables lying on the floor from damage caused by rolling over them with the stand base.

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

6 Locking tab
Press once to lock the stand in position.
For unlocking, press the locking tab upward with the tip of your foot.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Connector panel

1 Remote 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 or operating chair with an appropriate footswitch.

3 Potential equalization connector

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.

CAUTION

Danger! Electrical voltage!

- Only connect accessories and medical devices designated by Carl Zeiss for use with this system to the power outlet sockets. When connecting other devices, make sure that safety is guaranteed regarding admissible touch currents and ground leakage currents as per IEC 60601-1.

CAUTION

Risk of patient injury caused by electrical voltage!

- Do not touch the power outlet socket or any other signal interfaces while in contact with the patient.

5 Power output socket
for medical devices with the following power consumption:
115V: max. 60VA
230V: max. 700VA

The current of this power outlet is switched on/off using power switch S2 (8).

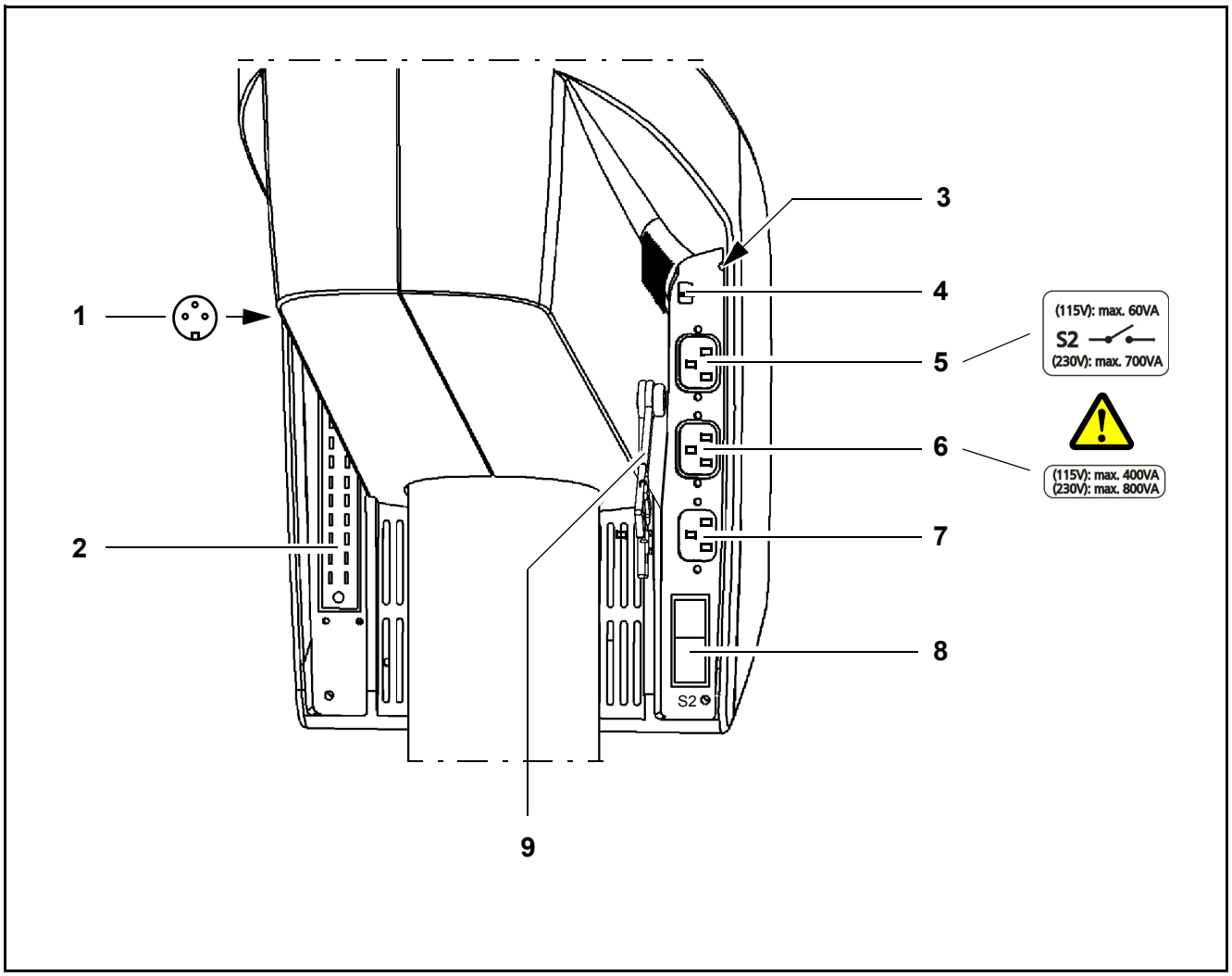
6 Power output socket
for medical devices with the following power consumption:
115V: max. 400VA
230V: max. 800VA

7 Power input socket

8 Power switch S2
When the stand is on, the green indicator lamp in the switch is illuminated.

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

- Power cable.
- connecting cable for foot control panel or operating chair with appropriate foot switch.



Instrument tray (option)

The S88 floor stand and the S88 floor stand with lifting column 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. The tray has been designed, for example, for mounting MediLive Trio from Zeiss:

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

⚠ **CAUTION**

Risk of injury caused by accessories falling down!

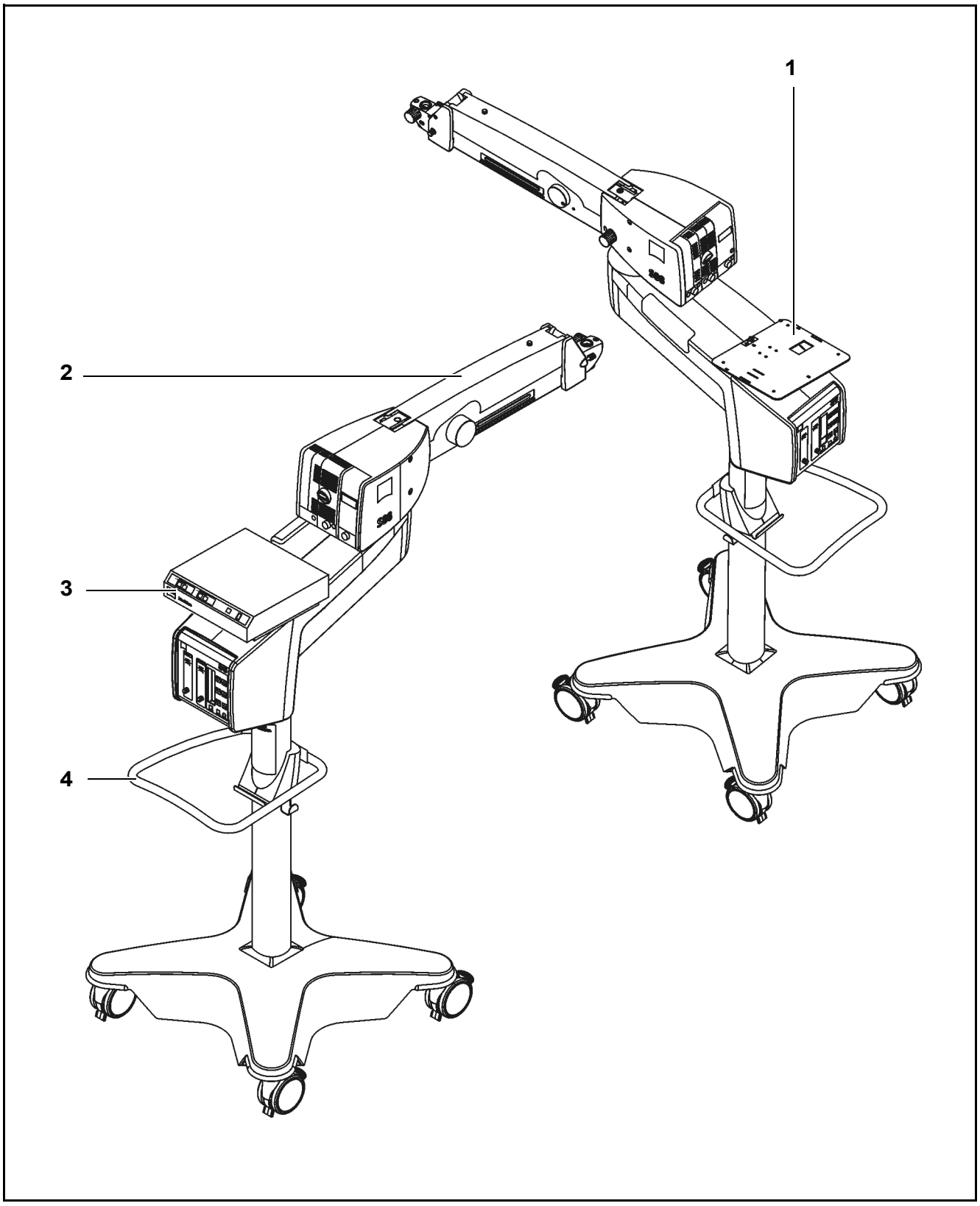
- Protect the MediLive Trio from being pulled accidentally downwards with the aid of the strap provided.

Further accessories can be installed on the instrument tray using the strap provided.

⚠ **CAUTION**

Risk of injury caused by non-observance of the following information!

- Make sure that theaccessory equipment is positioned as securely as possible on the instrument tray. Attach the second and, if required, further pieces of 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 (2) is folded to its moving position. A "Risk of crushing" warning label is therefore attached on the left and right of suspension arm (2).
- Please read the relevant Instructions for Use before starting up the accessory equipment.
- Never pull or push at the accessory equipment (3) in order to move the S88 floor stand. Always use only handle (4) to move the S88 floor stand.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Video monitor (option)

The S88 floor stand and the S88 floor stand with lifting column an be equipped or retrofitted with a TFT monitor (1). In the case of retrofitting, our service staff or an authorized person will install the TFT monitor (1) on the stand.

The TFT monitor (1) features a 15" screen and permits the scrub nurse and other OR staff to follow the surgical procedure. For optimum viewing, the TFT monitor (1) can be positioned exactly using flexible arm (2).

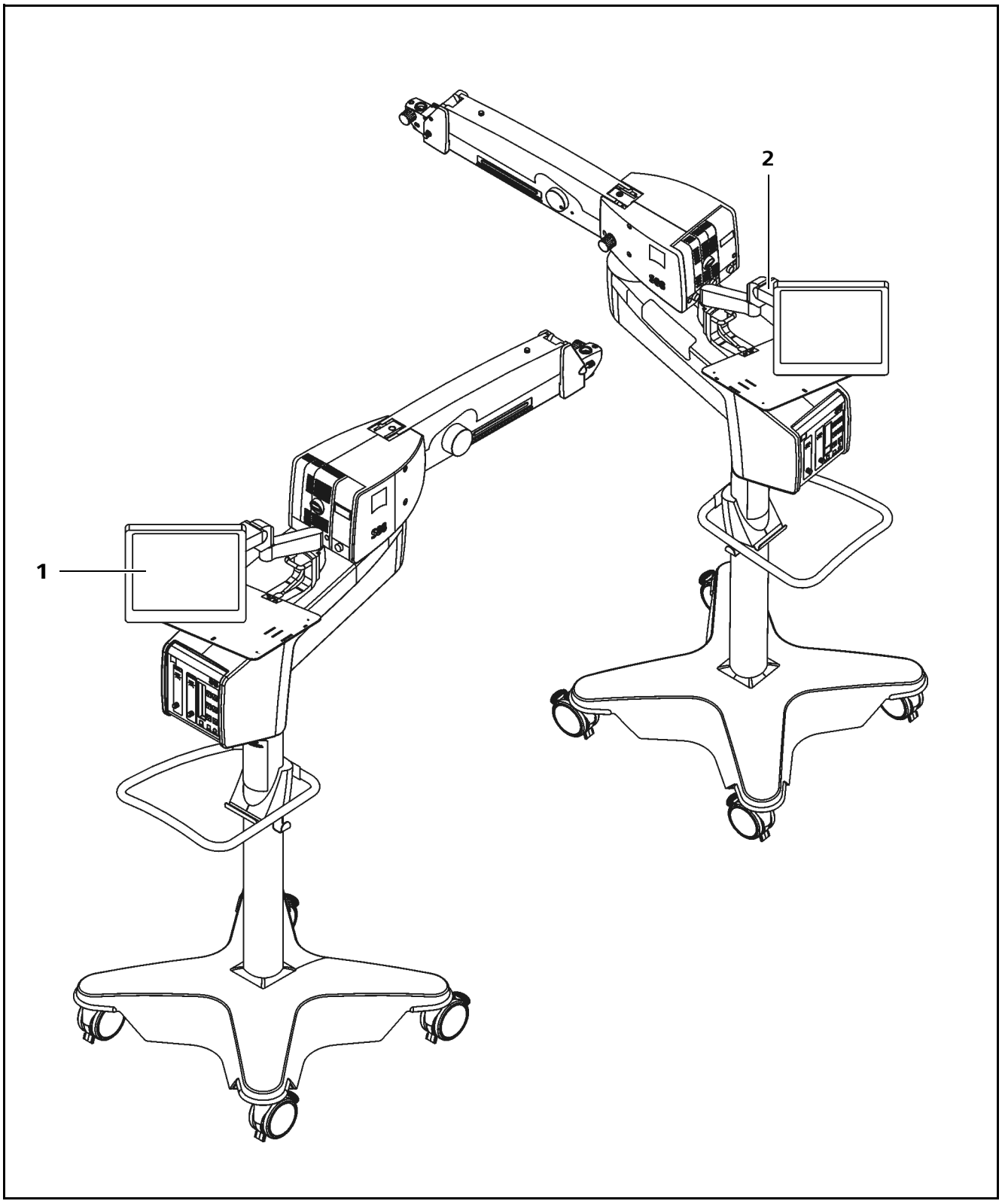
CAUTION

Video images not for diagnostic purposes!

The visualized images may include deviations in scale, shape and color.

- Do not use video images for diagnostic purposes as the video camera is not calibrated for these purposes.

The background illumination of the LCD display has a limited service life. If you notice that the display is getting darker or starts to flicker, contact your Zeiss dealer.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Components

The principal component of the TFT monitor is the 15" screen which delivers flawless, sharp images even at low frame rates of 50 Hz.

The connectors and controls are located under cable cover (2) on the back of the TFT monitor. To access the connectors and controls, proceed as follows:

- Remove two screws (3) from cable cover (2) by turning them counterclockwise.
- Remove cable cover (2) by pushing it upward.

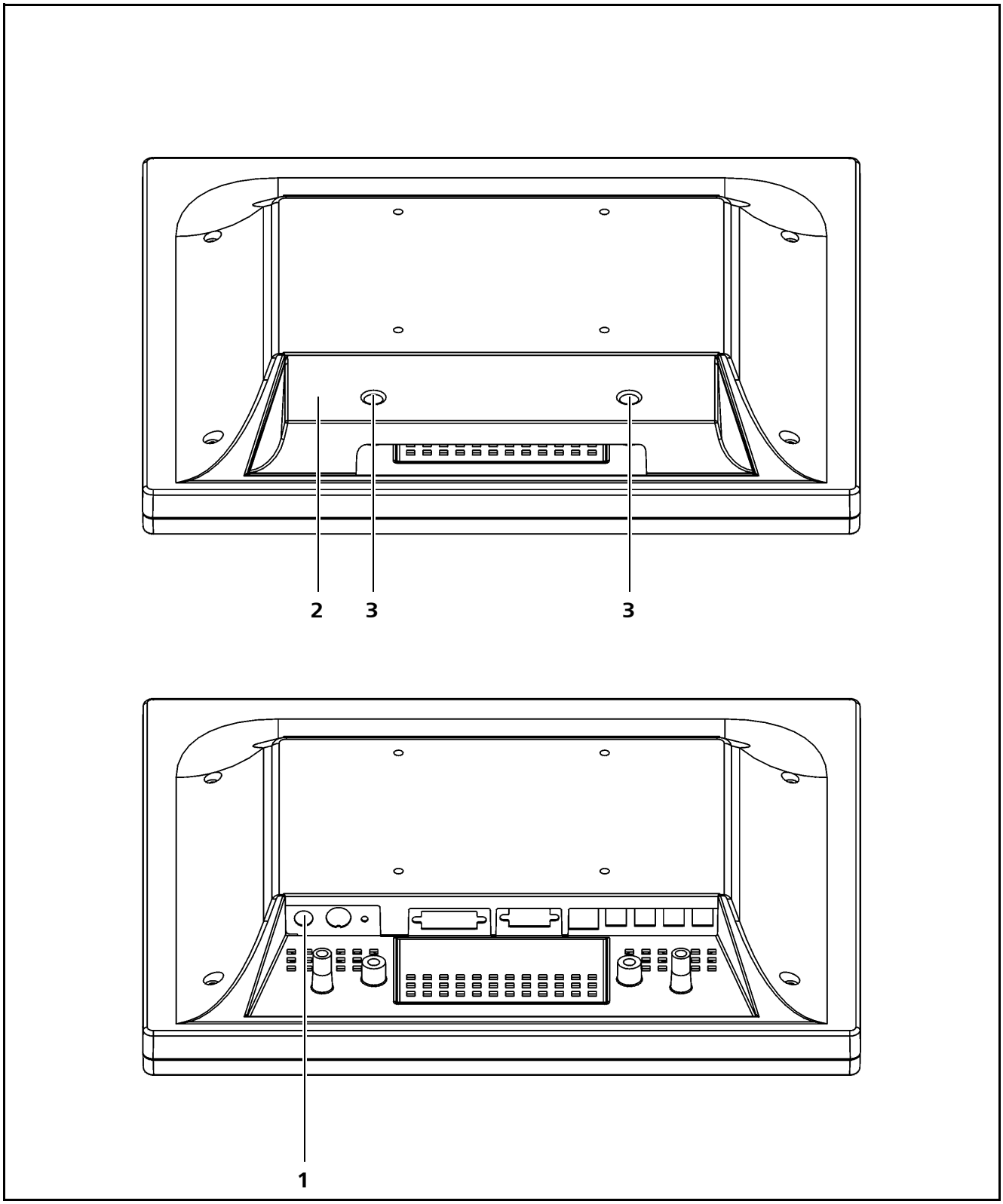
Controls

1 Auto adjust button
The Auto Adjust function permits automatic image adjustment of the TFT monitor to obtain a sharp, optimally positioned image. Perform the automatic adjustment when initially starting up the TFT monitor or after making any changes to the system.

Note:

– The Auto Adjust function can only be executed if a VGA signal source is connected.

– Always use a standard camera picture when adjusting the automatic image setting. Do not use the test pattern after switching on the monitor or if the camera head is not connected.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Connector panel

CAUTION

Risk of injury caused by wrong accessories!

- Only operate the device with the power cable included in the delivery package!

2 Power supply
for power and voltage supply of the device.

3 DVI connection
DVI stands for Digital Video Interface and is the latest technology for digital data transmission. The cable length for this connector must not exceed 4.5 m.

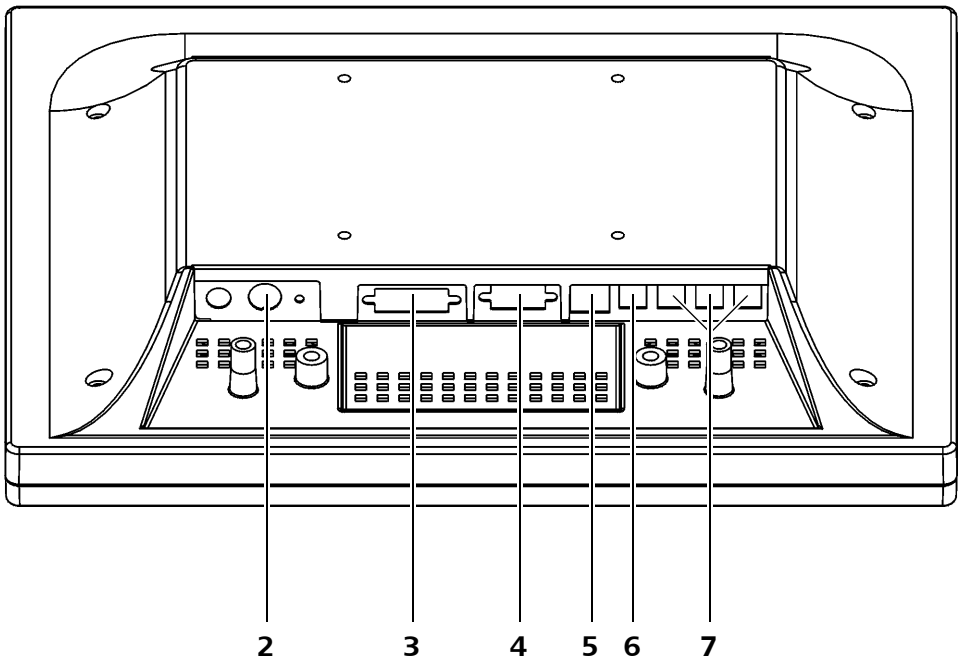
We recommend the DVI connector for the connection of a camera, as it delivers the best image quality in comparison with the other connectors. The DVI cable is part of the delivery package.

4 VGA connector
VGA (Video Graphics Array) is an analog interface for the transmission of video data between graphic cards and display devices.

5 S-Video connector
S-Video - also known as separate video or Y/C - is an analog interface that transmits brightness and color information as separate signals. This standard allows for a better video quality than composite video. The cable length for this type of connection must not exceed 10 m. For longer lines a composite video connection is recommended.

6 Composite video connector (1x cinch)
This is an analog interface that transmits the composite video signal via a single channel (yellow cinch connector). This connection is particularly suitable to transmit video signals across longer distances.

7 Component connector (3x cinch)
This is an analog interface that transmits the component video signal via three channels (red, yellow, green cinch connector).
Each channel transmits one so-called primary color.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Powering on the TFT monitor

To facilitate the operation of the TFT monitor, it is automatically activated when the suspension system is switched on.

While the system is booted up, the TFT monitor executes a power-on sequence that verifies the signals of all ports (DVI, VGA, S-Video, Composite and Component). After detection of the signal available, the correct screen resolution and frame rate are set automatically.

If a signal source is present at the VGA connector, the image settings can be optimized using the Auto Adjust function as described on Page 106.

Aligning the TFT monitor

The best visualization is obtained when you are looking straight at the screen of the TFT monitor.

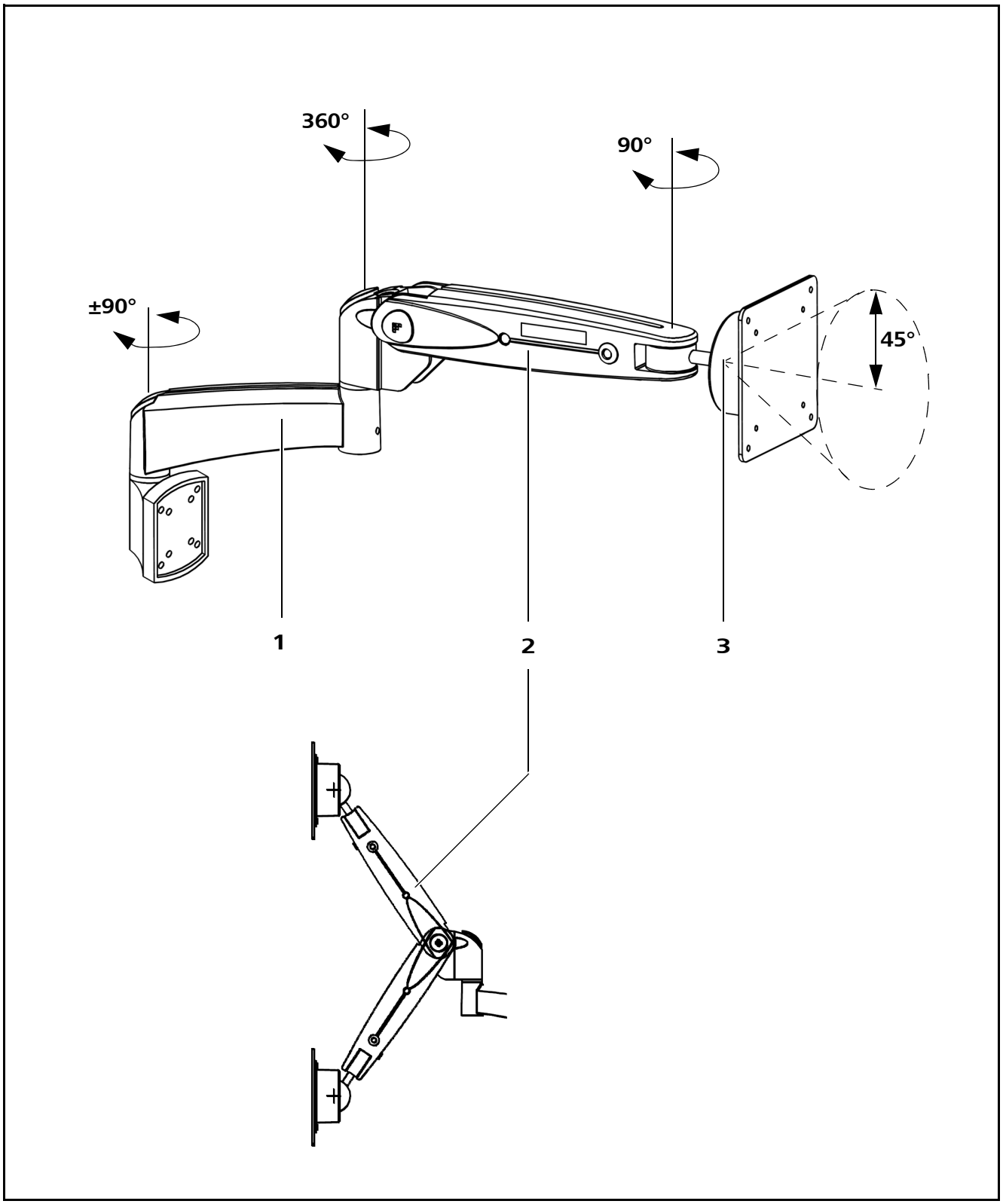
NOTE

Take care not to damage the video cable!

The video cable can be damaged by excessive pivoting of the suspension arm.

- Pivot the suspension arm (2) carefully and do not exceed the range described in the illustration.

- Pivot the carrier arm (1) and the suspension arm (2) in the desired horizontal position.
- Tilt the suspension arm (2) upward or downward until the proper height is reached.
- Hold the upper corners of the TFT monitor and adjust it to the required angle via ball joint (3).


360°
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S88 floor stand with lifting column

Features

The S88 floor stand with lifting column is a suspension system for surgical microscopes. 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. A motorized lifting column permits the viewing height to be perfectly matched to the surgeon's requirements. 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.

Further useful functions include, for example:

- magnetic brakes for almost effortless positioning,
- 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:
  - lamp brightness
  - speeds for focus, zoom and X-Y coupling,
  - and configurable buttons on the foot control panel for focus memory, XY inversion, camera release, swinging SDI in/out and triggering an AUX signal.

Description of the modules

The S88 floor stand comprises of the articulated arm, the motorized stand lifting column and the stand base. The articulated arm comprises a carrier arm and a suspension arm.
The carrier arm contains the control panel with all electrical supply systems required for the control of a motorized surgical microscope. These motorized functions can be activated using a foot 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. This permits the reliable balancing of the microscope even with heavy accessory equipment. The downward travel of the suspension arm can be limited as required.
The height of the stand column can be adjusted via a motorized function. The lifting column allows continuous positioning of the surgical microscope within a lifting range of 530 mm to set the optimum viewing height of the microscope or to move downwards into the transport position.
The lifting column is not designed for continuous operation. Therefore, please observe the details concerning the operating and rest periods.

A maneuvering handle is mounted on the stand column. It 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. Locking pedals are provided to lock the S88 floor stand quickly and reliably into position.

The mass may be underestimated as the suspension system can smoothly be moved. Therefore, move the suspension system slowly and carefully!

Design

1 Control unit

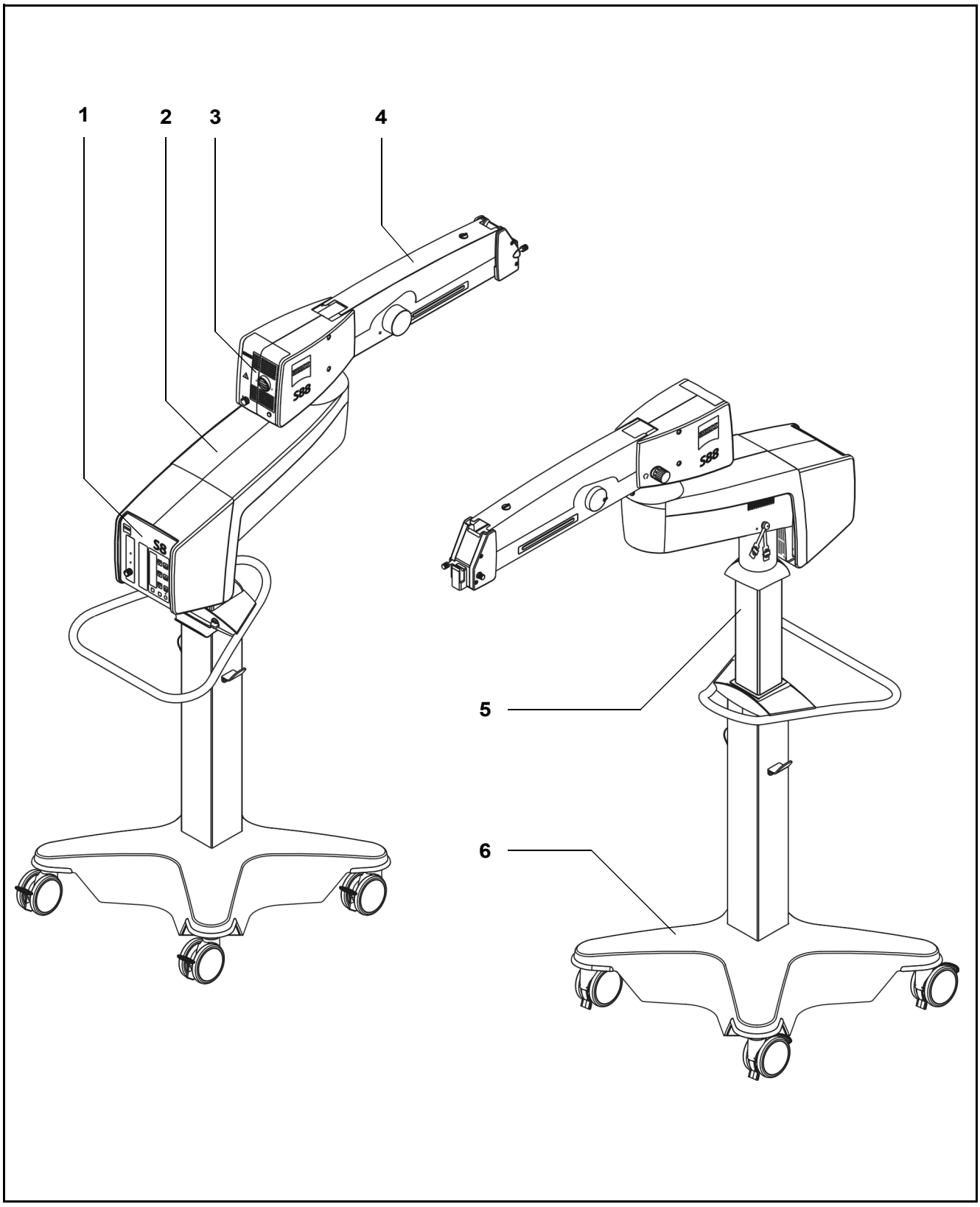
2 Carrier arm

3 Lamp housing with Xenon illumination

4 Suspension arm

5 Motorized stand lifting column

6 Stand base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Stand base with lifting column

1 Lifting column

2 Handgrip
for moving the floor stand.

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

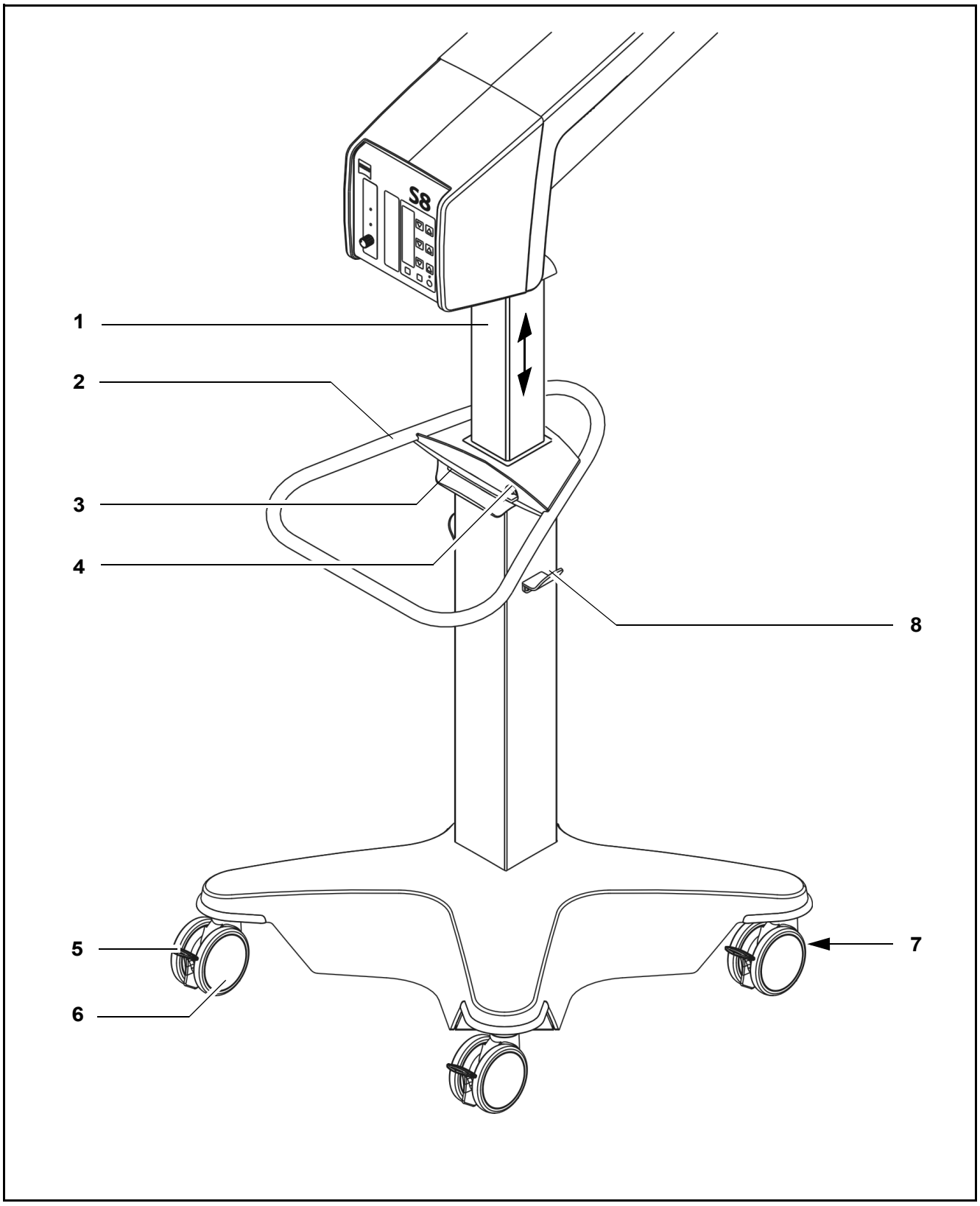
4 Up/down switch
for setting the optimum viewing height of the surgical microscope, for moving the system up into the standby position or down into the transport position.
As long as you keep switch (4) pressed, lifting column (1) in the stand base moves upward or downward, depending on the switch position. When you release the up/down switch, the lifting column stops immediately. The switching technology causes a dead time of approx. 2 seconds at the upper and lower end positions of the lifting column. After this time, you can move in the opposite direction again by activating switch (4).

5 Locking pedal
Press once to lock the stand in position.
For unlocking, press the locking tab upward with the tip of your foot.

6 Steerable casters
The four steerable casters on the stand base permit easy positioning in the OR.

7 Cable deflectors
are provided to prevent cables on the floor from being run over and damaged.

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

1 Remote 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 or operating chair with an appropriate footswitch.

3 Potential equalization connector

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.

CAUTION

Danger! Electrical voltage!

- Only connect accessories and medical devices designated by Carl Zeiss for use with this system to the power outlet sockets. When connecting other devices, make sure that safety is guaranteed regarding admissible touch currents and ground leakage currents as per IEC 60601-1.

CAUTION

Risk of patient injury caused by electrical voltage!

- Do not touch the power outlet socket or any other signal interfaces while in contact with the patient.

5 Power output socket
for medical devices with the following power consumption:
115V: max. 60VA
230V: max. 700VA

The current of this power outlet is switched on/off using power switch S2 (8).

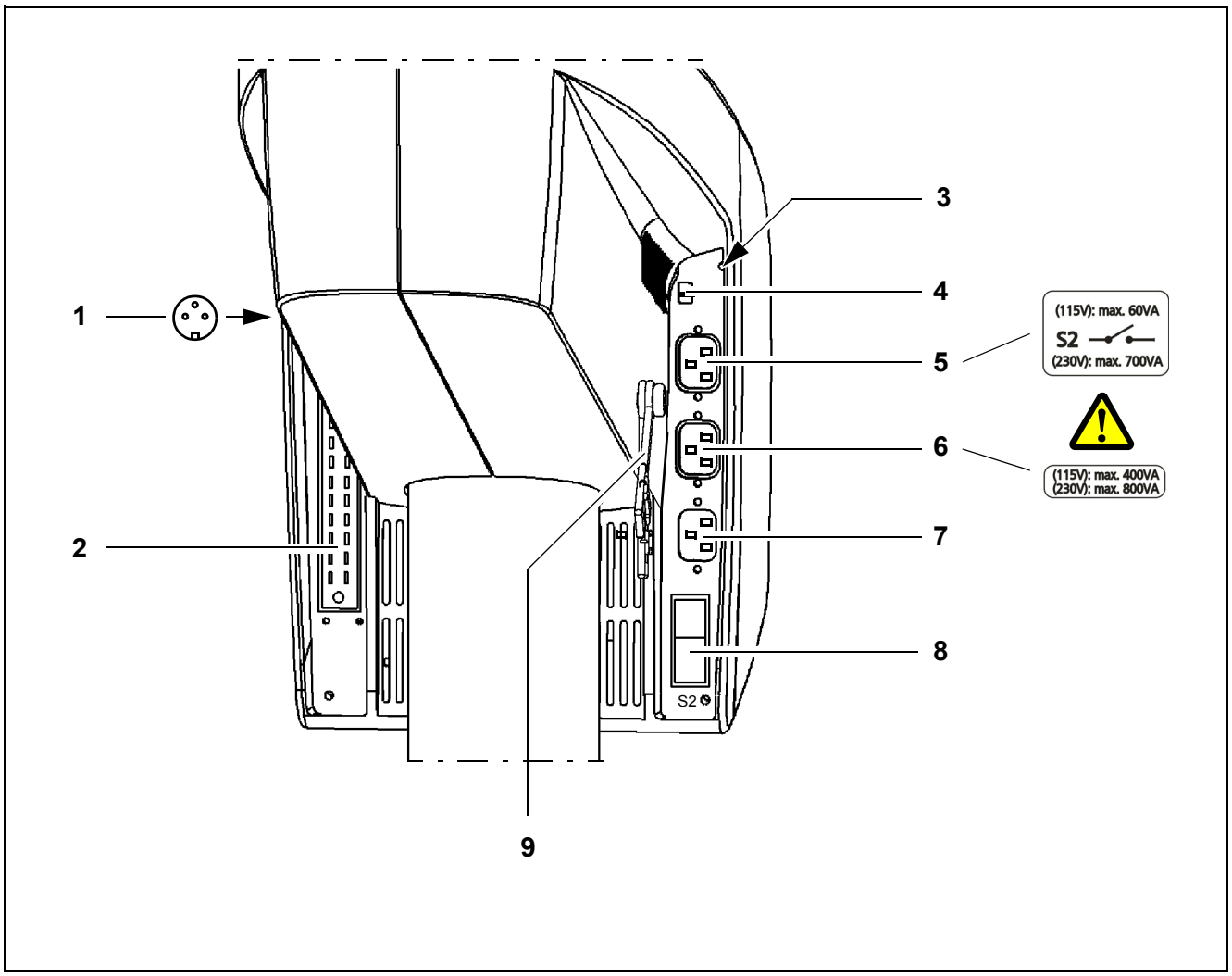
6 Power output socket
for medical devices with the following power consumption:
115V: max. 400VA
230V: max. 800VA

7 Power input socket

8 Power switch S2
When the stand is on, the green indicator lamp in the switch is illuminated.

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

- Power cable.
- connecting cable for foot control panel or operating chair with appropriate foot switch.



S8 ceiling mount

Features

The S8 ceiling mount is a carrier system for the surgical microscope. 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. The motorized functions can be activated using a foot control panel.

Further useful functions include, for example:

- magnetic brakes for almost effortless positioning,
- 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 buttons on the foot control panel for focus memory, XY inversion, camera release, swinging SDI in/out, triggering an AUX signal.

Description of the modules

The S8 ceiling mount comprises an articulated arm, a suspension arm with the illumination system 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 illumination system and the control unit is mounted on the carrier arm. The control unit is rotatable through 180° and contains all electrical supply systems required for the control of a motorized surgical microscope. The motorized functions can be activated using a foot 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

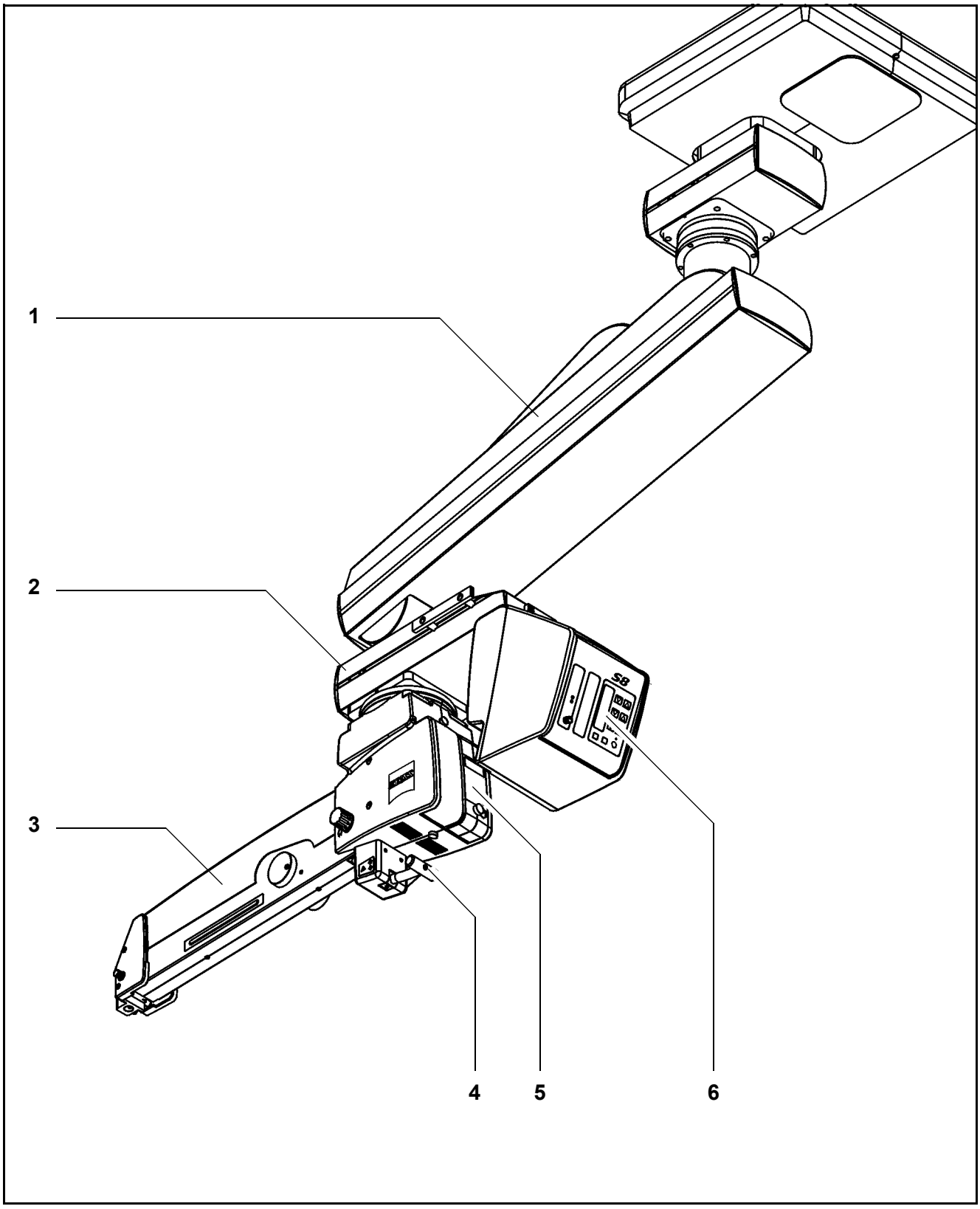
2 Carrier arm

3 Suspension arm

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

5 Xenon illumination system (see Page 84)

6 Control panel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Power switch with connector (option)

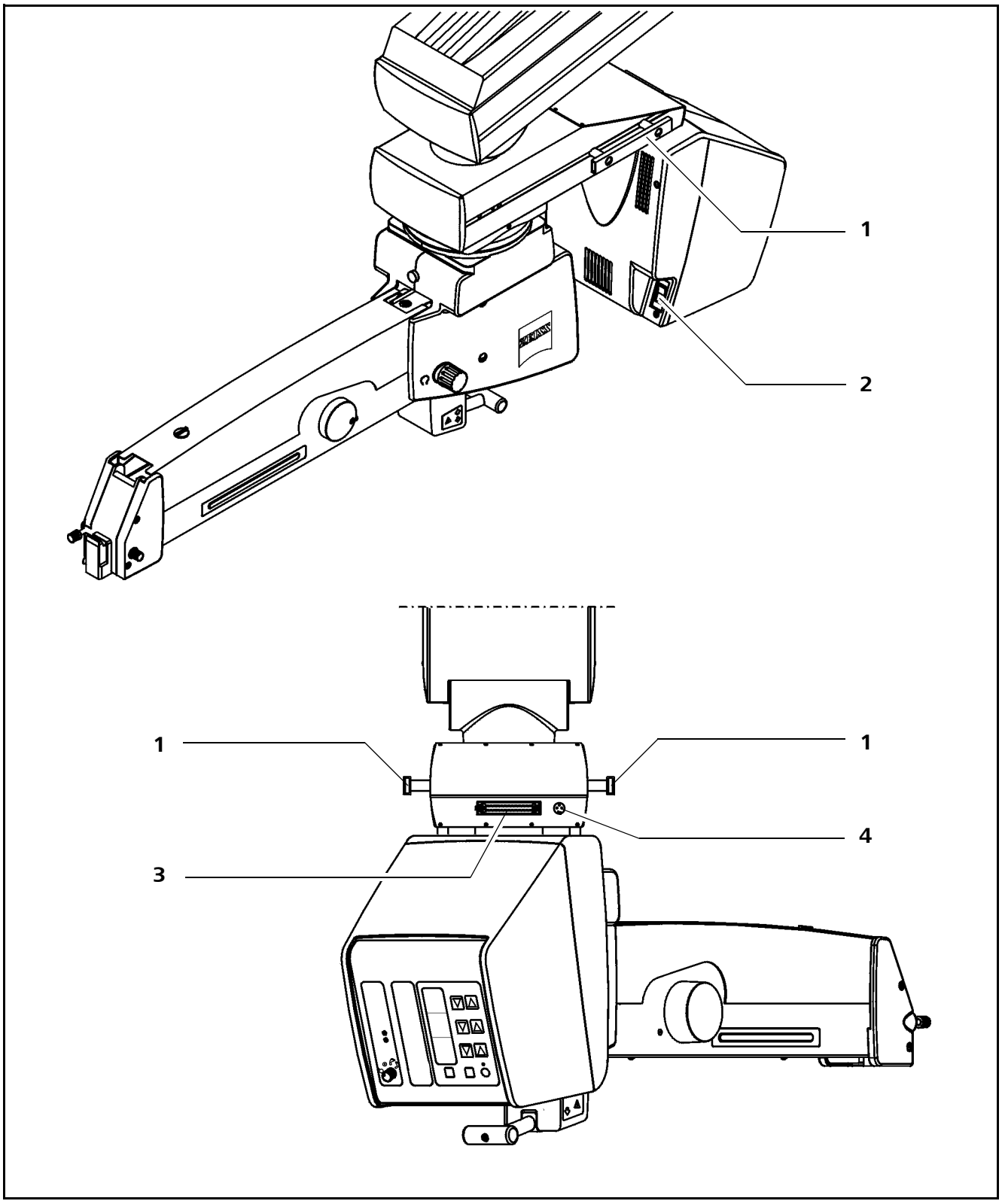
The power switch and the connector can be either installed in the OR, or they can be integrated in the ceiling mount, at the back of the carrier arm (see illustration).

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)
Permits optional connection of a foot control panel. (In the standard version, the connector is integrated in the wall console).

4 Remote 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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Ceiling mount S81

Features

The S81 ceiling mount is a carrier system for the surgical microscope. 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. The motorized functions can be activated using a foot control panel.

Further useful functions include, for example:

- magnetic brakes for almost effortless positioning,
- 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 buttons on the foot control panel for focus memory, XY inversion, camera release, swinging SDI in/out, triggering an AUX signal.

Description of the modules

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

The suspension arm with the illumination system and the control unit is mounted on the carrier arm. The control unit is rotatable through 180° and contains all electrical supply systems required for the control of a motorized surgical microscope. The motorized functions can be activated using a foot 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

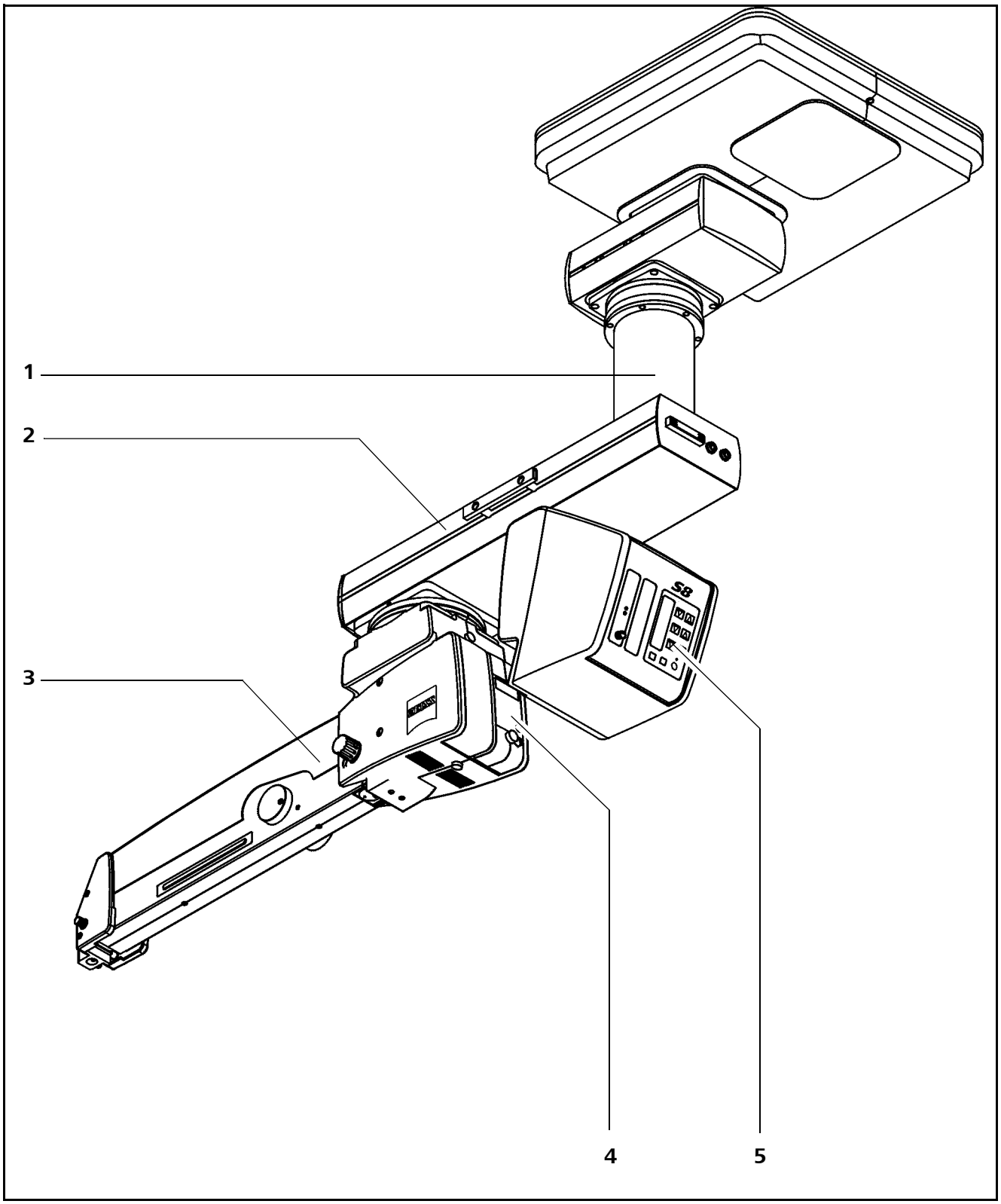
1 Column

2 Carrier arm

3 Suspension arm

4 Xenon illumination system (see Page 84)

5 Control panel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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).

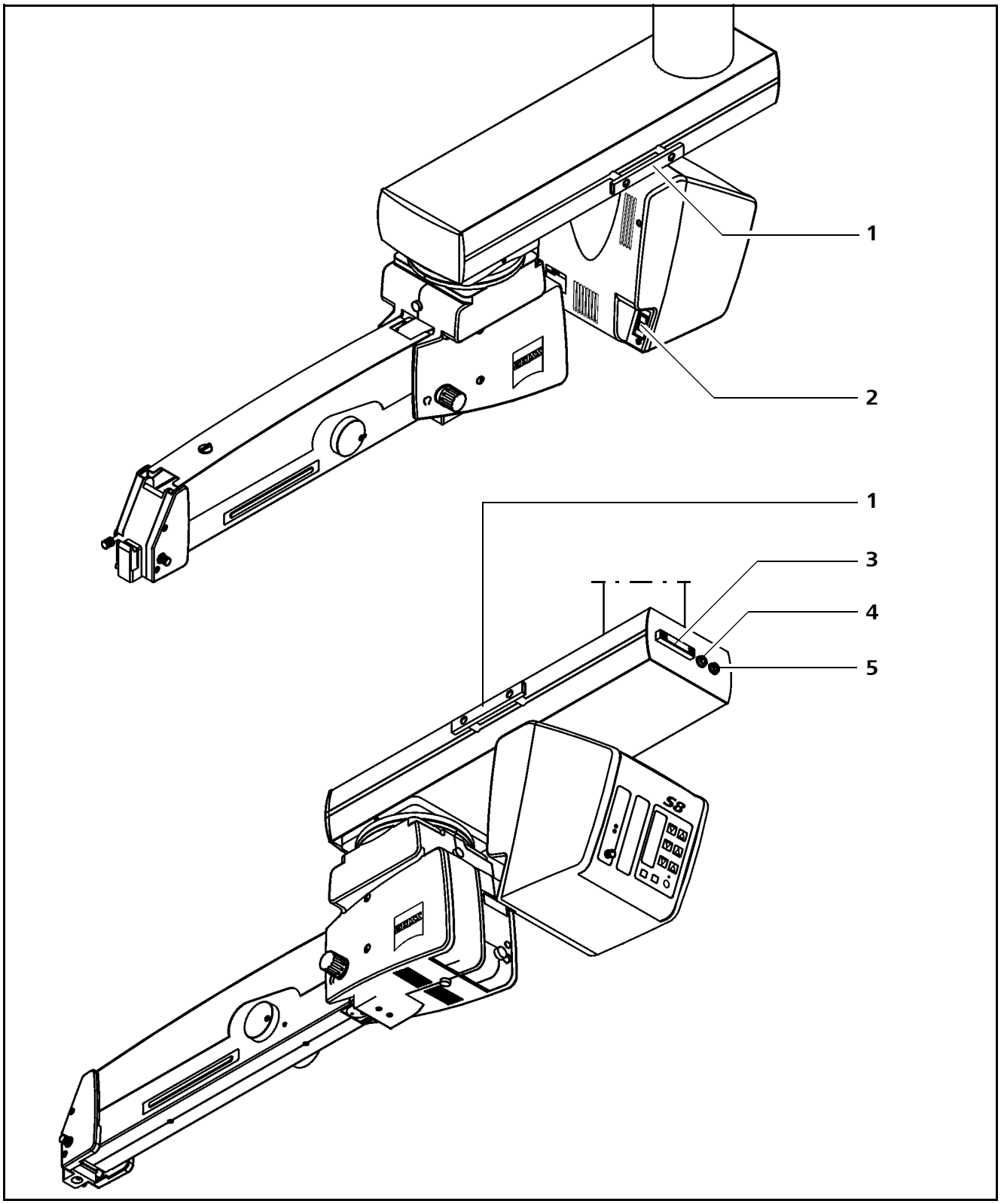
1 Rail
The delivery package contains a cable clip which is used to guide the cable of the foot control panel away from the operating table. The cable clip can be easily attached to rail (1) either on the left or right side of the arm.

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

3 Connector for control component (option)
Here, a foot control panel can be connected.

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

5 Remote 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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Preparations for use

Attaching the equipment

⚠ **CAUTION**

Risk of injury caused by lowering of the surgical microscope or accessories falling down!

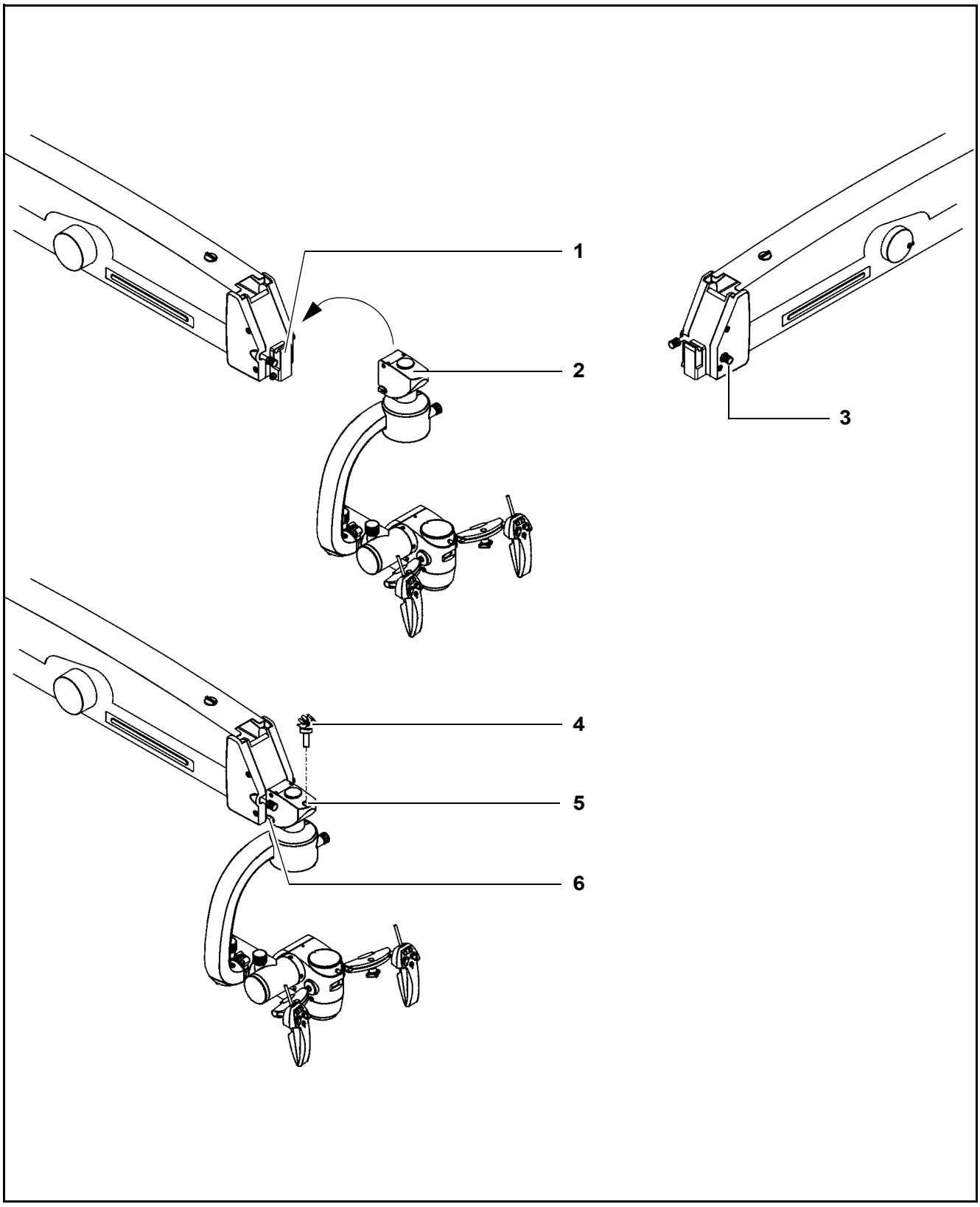
- Never change modules and accessories during a surgical procedure or above the patient.
- Attach the accessory modules to the microscope and firmly tighten the respective securing screw.
- Before every use and after re-equipping the instrument, make sure that the modules are securely locked in position.
- Make sure that all securing screws are firmly tightened!

Mounting and removing modules and accessories may lead to unintended lowering of the surgical microscope.

- Always make sure that the maximum permissible load is not exceeded.
- Always re-balance the surgical microscope after re-equipping the system.

Mounting the surgical microscope

- Bring the suspension arm into its horizontal position, pull out locking knob (3) and turn it clockwise or counterclockwise through 180°. Move the suspension arm slightly upward and downward until the lock snaps in. Now the suspension cannot swing upward due to missing mass.
- Make sure that the unit has been switched off.
- Hook coupling (2) with the attached surgical microscope at a slight angle from above into receptacle (1) on the suspension arm, and tilt the coupling downward into its vertical position.
- Tighten securing screw (6) firmly using a hex key.
- Insert cable clip (4) into opening (5) of the coupling.
- Perform the balance setting procedure.
- Before every use and after re-equipping the system, make sure that securing screw (6) has been firmly tightened!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Attaching accessories

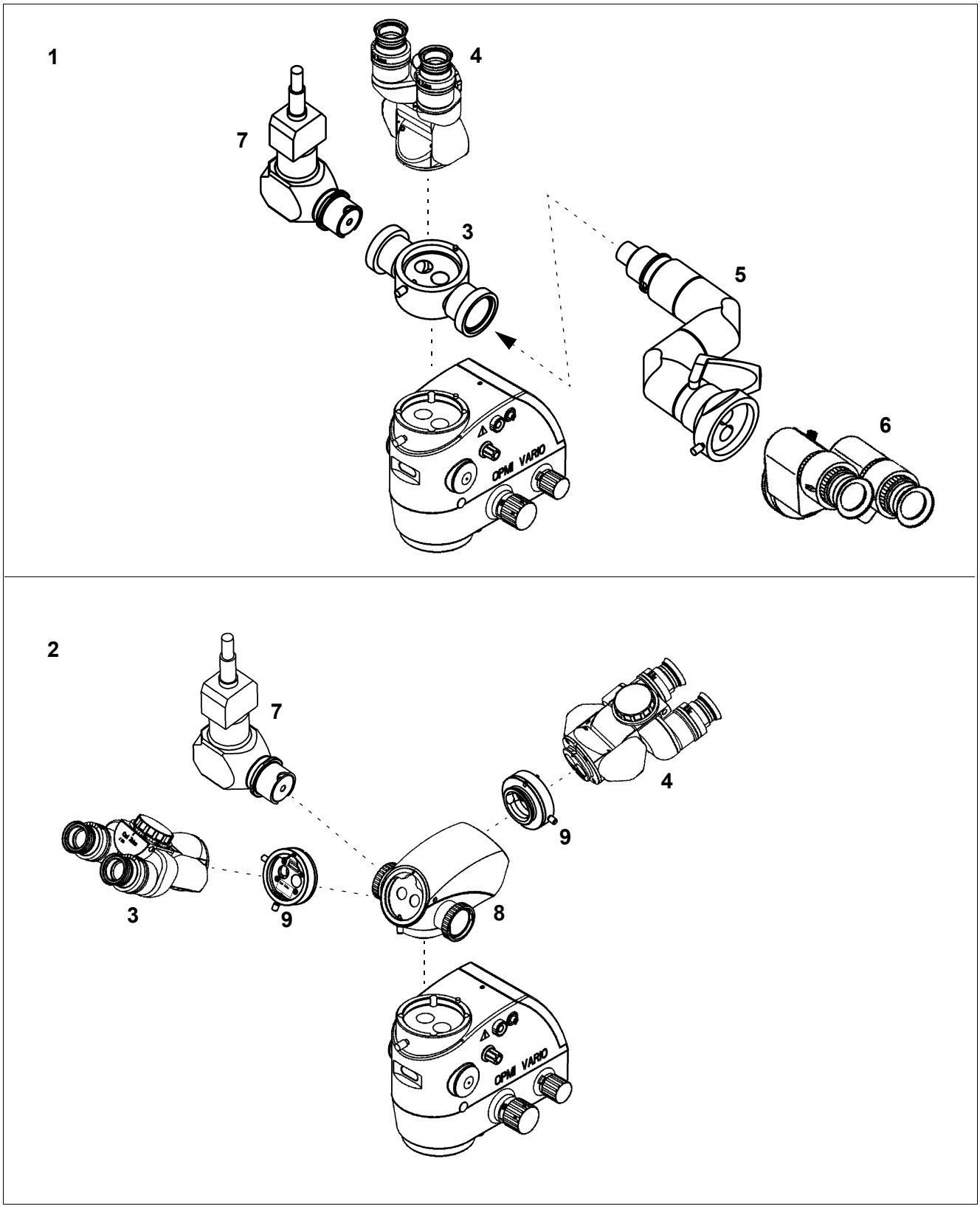
The comprehensive accessory program permits the OPMI Vario surgical microscope to be configured to your specific needs.

Make sure not to exceed the maximum admissible load in order to ensure optimum mobility and reliable operation of your OPMI Vario. The weight of the complete accessory configuration must not be higher than 9.0 kg. For example, the combined accessory modules of configuration (1) without the video objective lens and video camera have a weight of 3.9 kg.

- Select your configurations so that the weight distribution is as symmetrical as possible.

1 Recommended configuration for lateral coobservation, left or right
Accessory modules: beam splitter (3), 180° tiltable tube (4), stereo coobservation tube (5) with straight tube (6), video objective lens with video camera (7).

2 Recommended configuration for face-to-face coobservation
Accessory modules: stereo bridge (8), 2 x rotary adapter (9) and 180° tiltable tube (4), video objective lens with video camera (7).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Mounting the tube and eyepieces

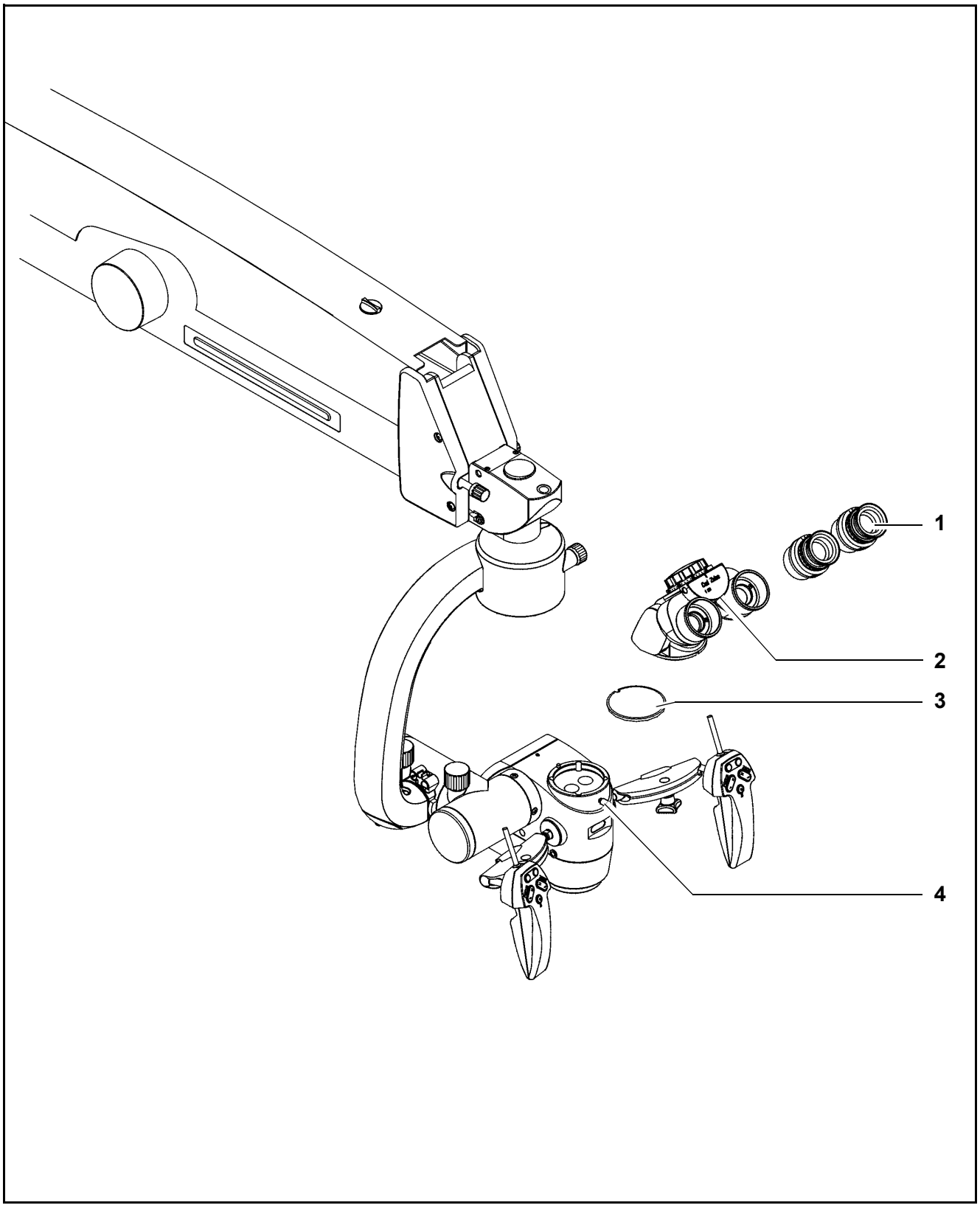
- Loosen securing screw (4) by a few turns.
- Remove cover (3) and store it in a safe place.
- Place binocular tube (2) on the surgical microscope and firmly tighten securing screw (4).
- You can install further accessories between the binocular tube and the microscope body. Lock these units in position in the same way using securing screw (4).
- Insert widefield eyepieces (1) as far as they will go in the mounts provided on the binocular tube. The magnetic coupling reliably secures them in position.

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.

CAUTION

Risk of injury caused by parts falling down!

- Before every use and after re-equipping the system, make sure that binocular tube (2) is securely locked in position. Make sure that securing screw (4) has been firmly tightened!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Connections

Connecting the surgical microscope

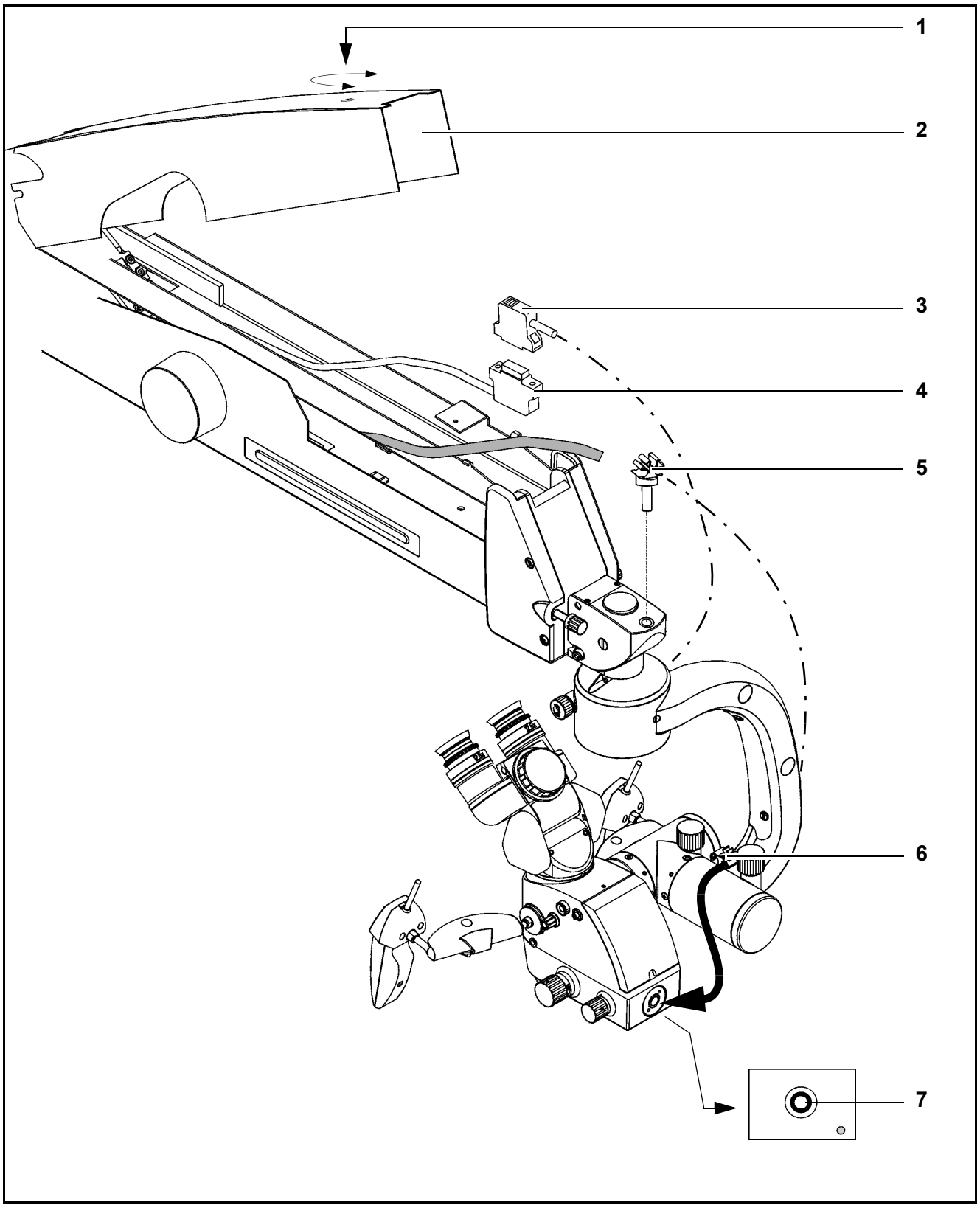
- Turn locking cap (1) by a quarter turn to the right or left and pull up cover (2).
- Plug microscope connector (3) into socket (4) on the suspension system and firmly tighten the securing screws on the connector.
- Press the microscope cable into the cable clip (5). Install the cable in such a way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

The illustration on the right shows the surgical microscope in a rotated position.

Mounting the light guide

- Switch off the illumination system.
- 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).
- Make sure that the light guide has been routed with sufficient slack so that the movement of the carrier system and surgical microscope is not restricted and that they can be moved without stretching, extreme bending or twisting of the light guide.

Make sure that the light guide is not stretched or bent when the microscope is turned or tilted.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Aligning the X-Y coupling

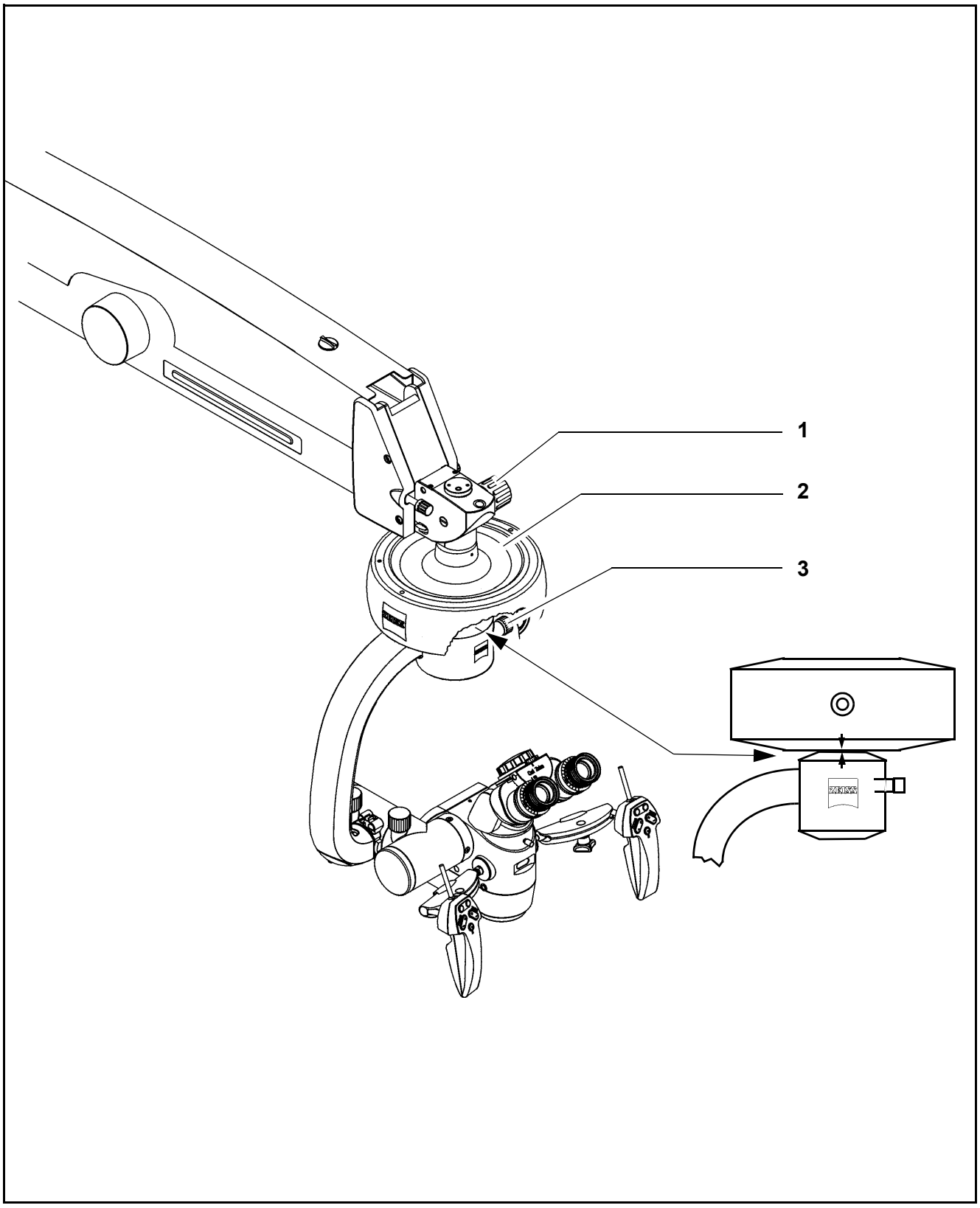
The OPMI Vario can be equipped (and also retrofitted) with an X-Y coupling. Our service team or an authorized person will install the X-Y coupling for you.

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 (see Page 187).

To ensure that the X-Y coupling of the surgical microscope is accurately positioned in the X and Y directions, proceed as follows:

- Tighten the friction adjustment knob (1) to secure the x-y coupling against twisting.
- Loosen locking screw (3) by a few turns.
- Arrows are provided at the bottom of X-Y coupling (2) and at the top of the magnetic brake. Turn the surgical microscope until the arrows point towards each other.
- Firmly tighten knob (3).

  → The surgical microscope and X-Y coupling are now permanently connected.
- Adjust the friction of the microscope rotary axis using knob (1).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Strain relief device on S88 floor stand

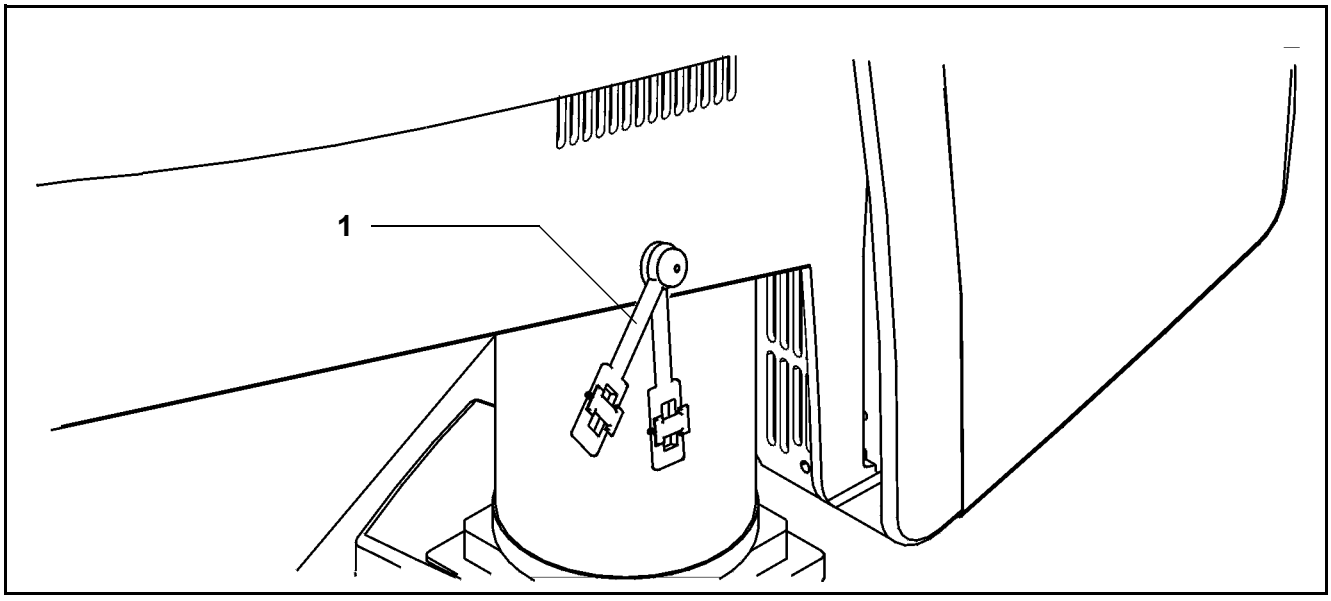
You can secure the power plug and the multipoint connector of the switching component against inadvertent loosening by installing the two cables in strain relief device (1).

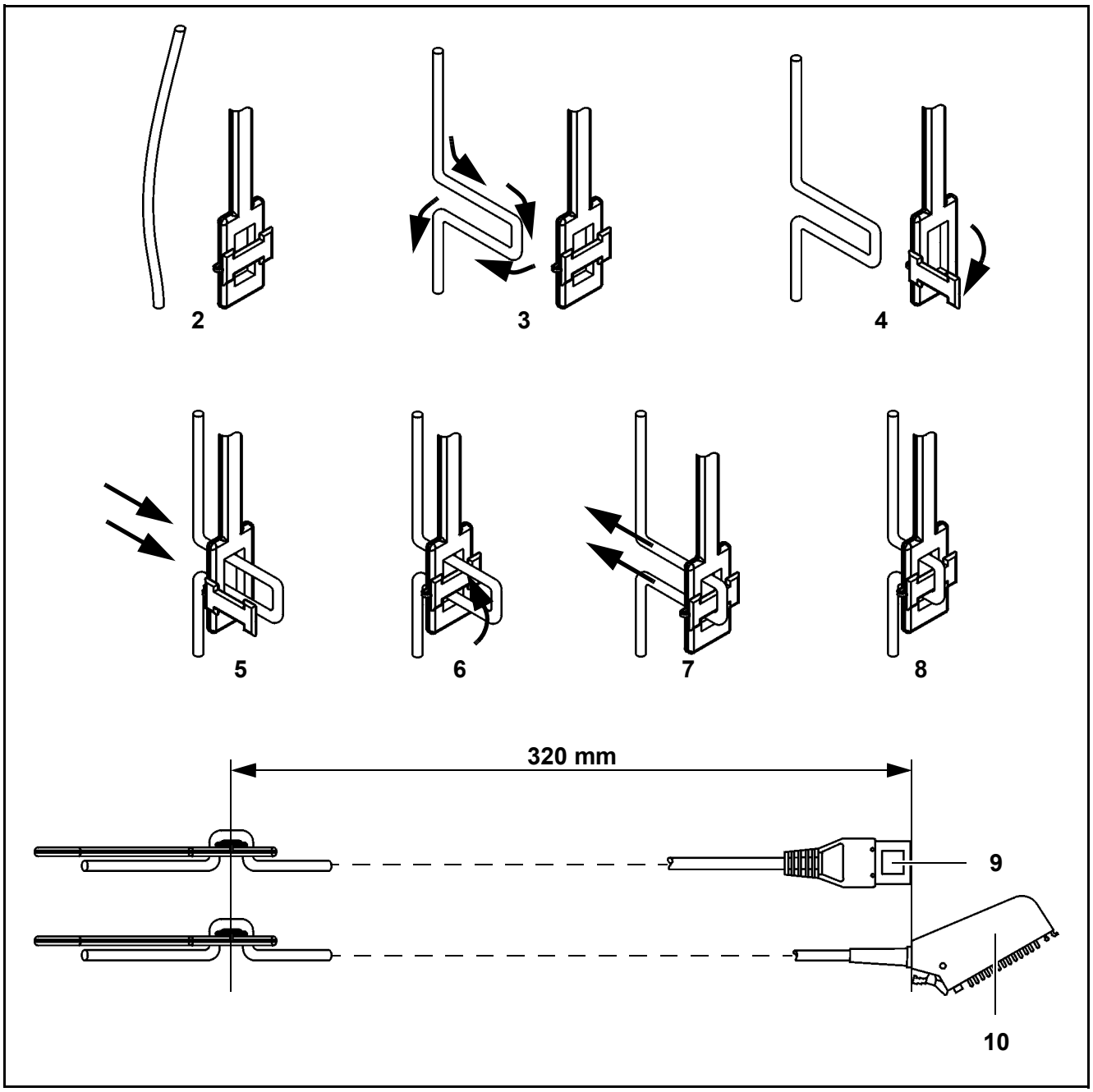
After you have mounted strain relief device (1), the cable must have the following length:

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

– 320 mm from the strain relief device up to connector (10) of the foot control panel or of an operating chair with appropriate 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).

The suspension system is set at the factory to the rated voltage used in the country of destination. The rated voltage indicated at window (3) must correspond to the rated voltage available on the site of installation.

- If the rated voltage has not been correctly set, adjust the sliding switch (3) using a suitable tool.

Insert or remove connectors at (2), (4) and (5) only if the power switch is off.

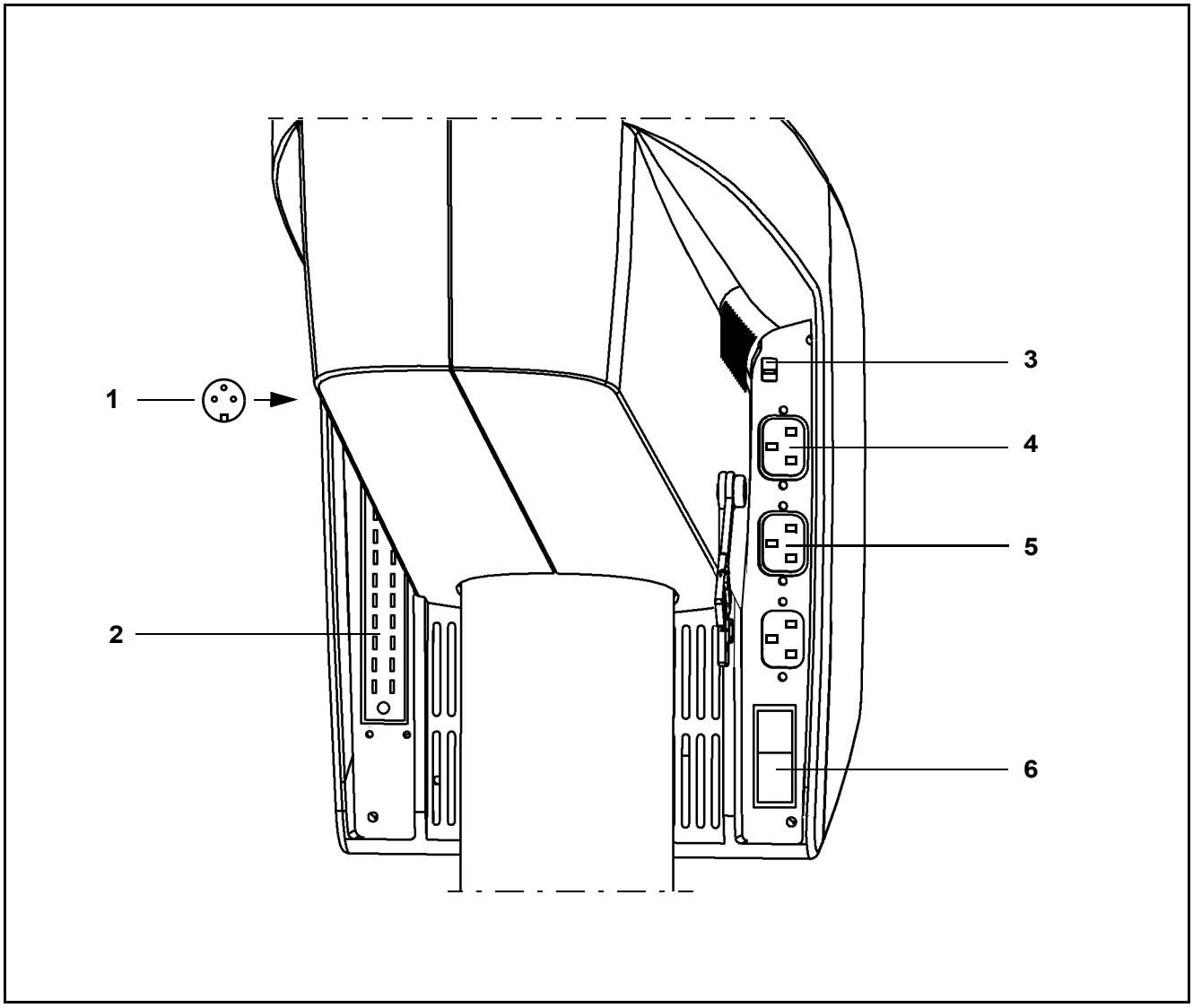
- Plug the connector of the foot control panel or operating chair into connector (2) of the suspension system.

Before using a cordless foot control panel, ensure its batteries are fully charged. The system may malfunction if the FCP WL is not provided an adequate level of power.

- Secure the microscope cable in the cable clip in such a way that it is not stretched or bent when the microscope is turned or tilted.
- Secure the light guide in the cable clip and insert the light guide into the light guide socket on the microscope as far as it will go. Make sure that the light guide is not stretched or bent when the microscope is turned or tilted.

Use remote control socket (1) to connect external devices with max. 24V/ 0.5A which can be switched on/off via an AUX signal using the freely programmable buttons on the foot control panel.

Connect the suspension system to line power using the power cord intended for it. Only use a power outlet which is provided with a properly connected protective earth conductor.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Relocating the unit

CAUTION

Risk of crushing - mind your fingers!

Fingers may be crushed in the areas marked with the "risk of crushing" label.

- Do not touch these areas while the system is being moved or brought in its working / transport position.

CAUTION

Risk of toppling during transportation of the system!

If the following precautions are not observed, the system may topple over and injure persons!

- Use the maneuvering handle for moving the stand.
- Mind the maximum passage height when passing through doorways.
- Avoid collisions of any kind.
- To cross over steps and edges, two persons are needed to jointly hold and lift the device!
- Be extremely careful when moving over slopes.
- Do not park the stand on slopes.

Please observe the following points when relocating the stand:

- Turn off the device at the power switch.
- Remove the power plug from the power socket.
- Move the suspension arm into its transport position (see illustration on the right).
- 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.
- Unlock all arrestors of the casters.
- Hold the device by the bracket and carefully push it to its new position. Ensure the device is standing on even ground.
- Press at least three of the arrestors and make sure that the suspension system is no longer able to roll away by itself.

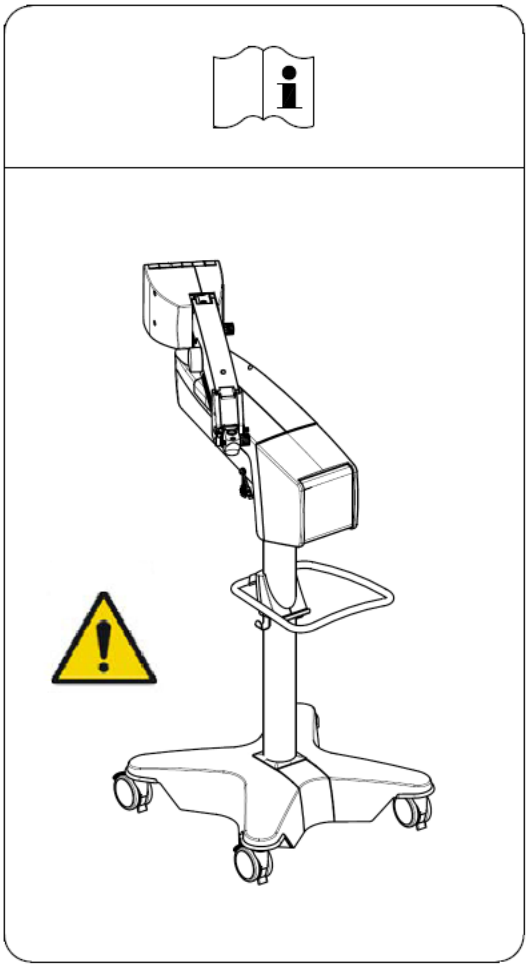
The mass may be underestimated as the suspension system can smoothly be moved. Therefore, move the suspension system slowly and carefully!

NOTE

Transport over long distances!

Over long distances (e.g. removal, return for repair, etc.) the device must always be transported in the original packaging or in special return packaging.

- For details, please contact your dealer or the Carl Zeiss Service.



Adjusting the supension system

S88 floor stand with lifting column - Setting the ergonomic working height

Bring the surgical microscope into a position convenient for you before each surgical procedure, and set the optimum ergonomic working height of the suspension system via the lifting column (without patient!).

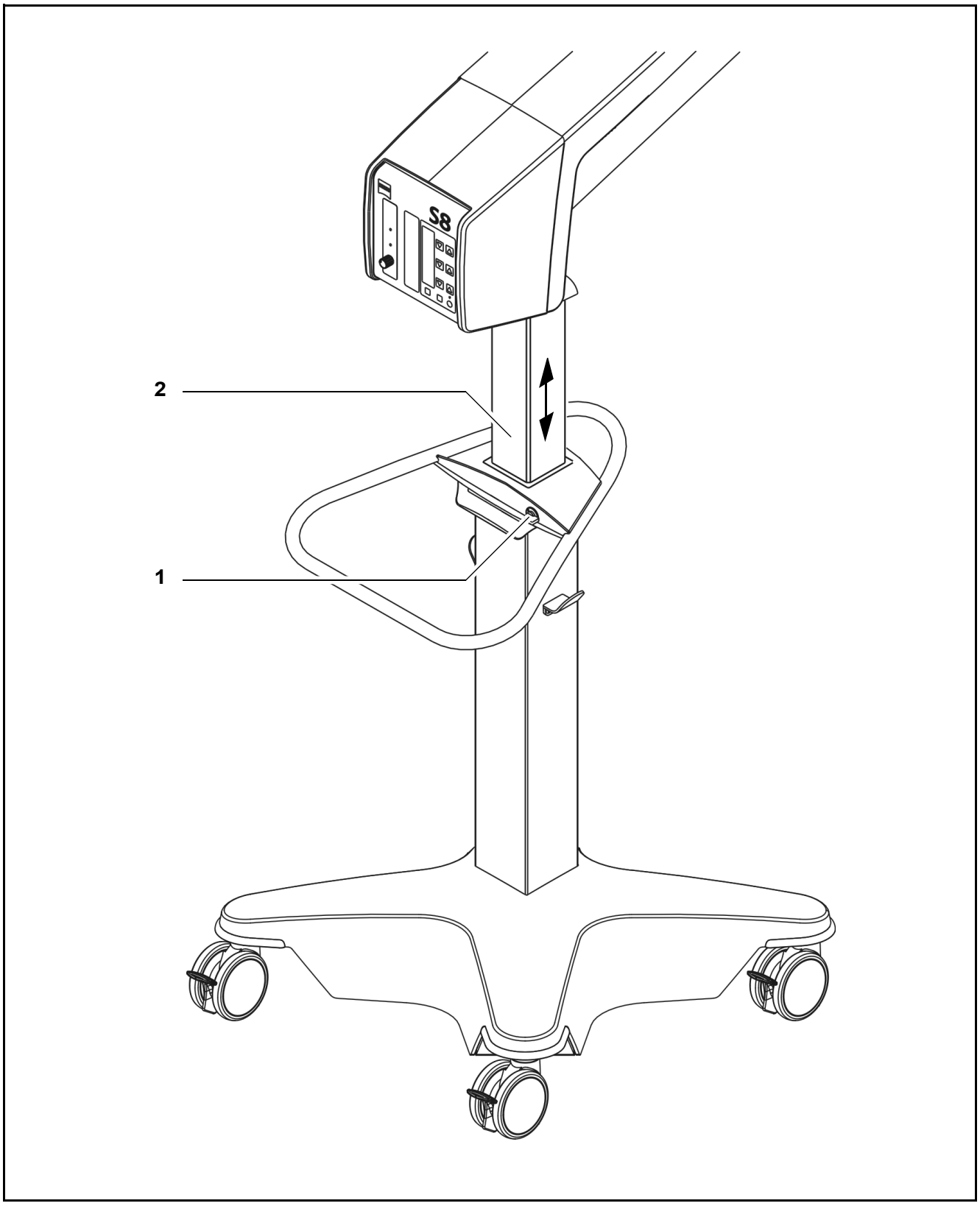
As long as you keep switch (1) pressed down, the lifting column (2) in the stand base moves upwards or downwards, depending on the position of the switch. When you release the switch, the lifting column stops immediately. The switching technology causes a dead time of approx. 2 seconds at the upper and lower end positions of the lifting column. After this time, you can move in the opposite direction again by activating switch (1).

The lifting column is used to move the microscope into position for surgery prior to the surgical procedure.
Do not constantly move the lifting column up and down, since a thermal cut-out will then automatically deactivate the drive motor. If this occurs, the lifting column cannot be moved until the motor has cooled down.

NOTE

Injury to the patient!

- Do not activate the lifting column during surgery!
- Do not use the lifting column for focusing.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Adjusting the balance setting of the suspension arm

CAUTION

Risk of crushing - mind your fingers!

Fingers may be crushed in the areas marked with the "risk of crushing" label.

- Do not touch these areas while the system is being moved or brought in its working / transport position.

NOTE

Risk of injury caused by lowering of the surgical microscope!

- Balance the completely equipped surgical microscope before surgery without the patient.
- Hold the surgical microscope tightly at its handgrips before releasing the magnetic brakes.

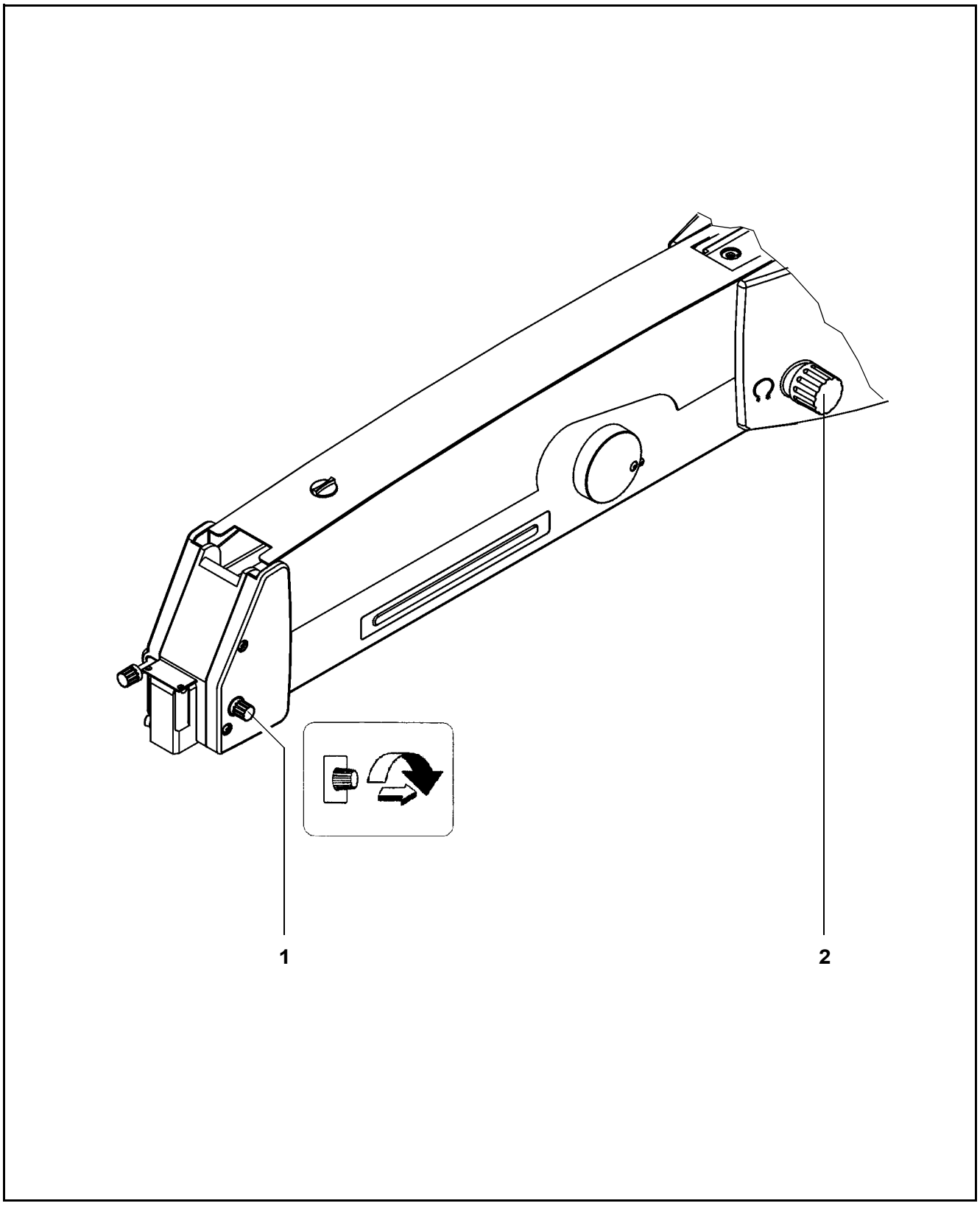
- Only perform the balance setting procedure with the complete microscope equipment attached!

Prior to fine balancing of the suspension arm, it is recommended to roughly balance the suspension arm first. To do this, the suspension arm must be locked in the horizontal position.

- To roughly balance the suspension arm, slightly move the arm up and down while tightening the adjustment screw (2). Continue tightening the screw until sufficient spring force is obtained to compensate for the weight of the surgical microscope and the accessories.

Rotating clockwise increases the spring force, turning the screw counterclockwise reduces the spring force.

- Hold the suspension arm in place and pull out the adjustment knob (1). No excessive force should be necessary. Otherwise, use the adjustment screw (2) to re-adjust the spring force.
- 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 the 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 travel

CAUTION

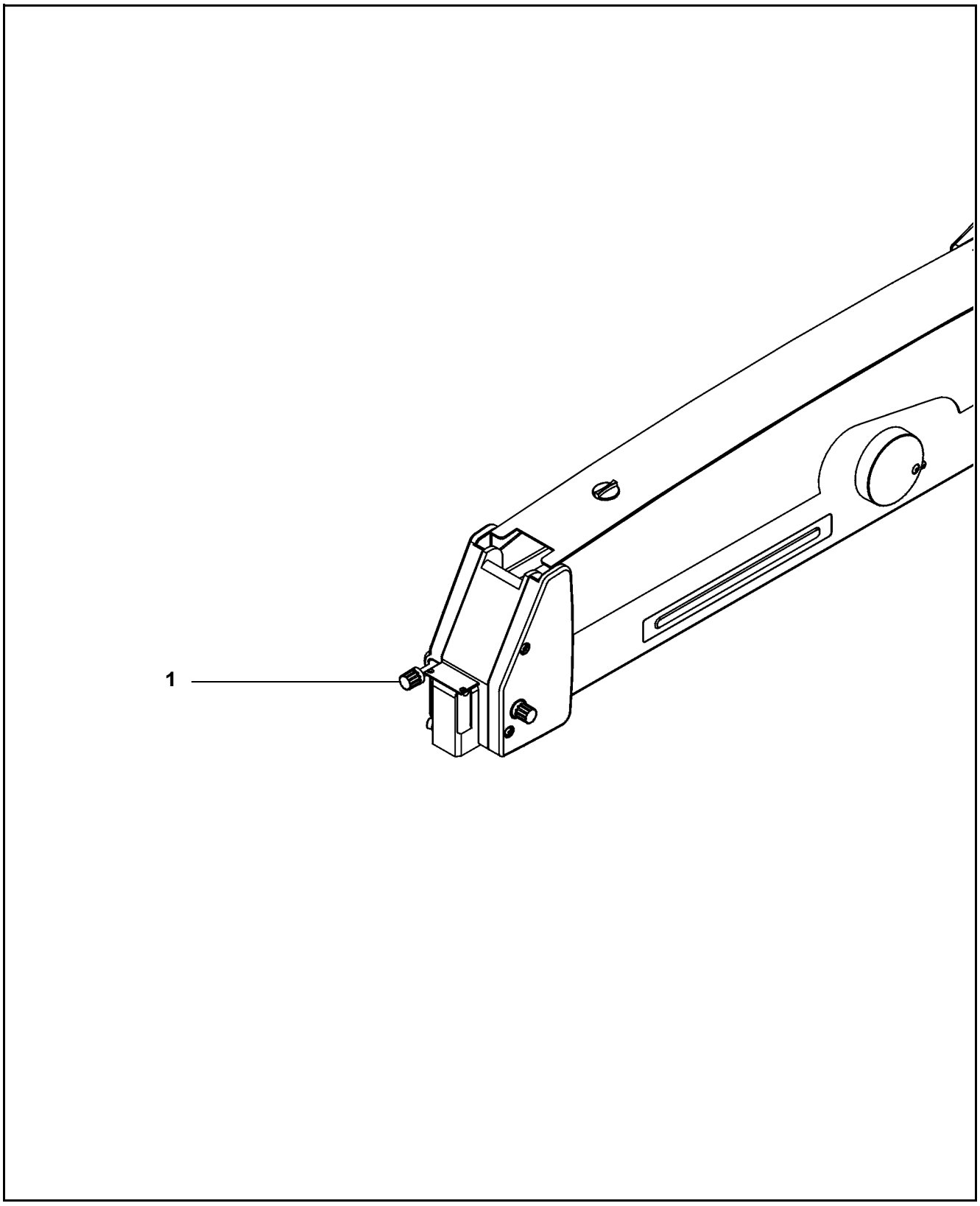
Risk of injury caused by lowering of the surgical microscope!

- Do not adjust the position of the suspension arm over the patient.
- Always limit the downward travel of the suspension arm to prevent any contact with the patient in case the surgical microscope is lowered accidentally.

Ceiling mounts:

- Do not adjust the position of the carrier arm/lift arm over the patient.
- Move the carrier arm/lift arm down to its lower end position before adjusting the downward travel limitation.

- Loosen the adjustment screw (1) by a few turns.
- Press one of the release buttons for the magnetic brake on the surgical microscope and lower the microscope to a point where focusing in the surgical field is still possible (depending on the focal distance of the objective lens). Ensure sufficient safety distance to the surgical field will still remain.
- Turn the adjustment screw (1) clockwise as far as it will go.
- Lower the surgical microscope again to the lowest limit stop and check the safety distance.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Positioning the S8 ceiling mount

1 Working position

2 Standby 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).

Standby position

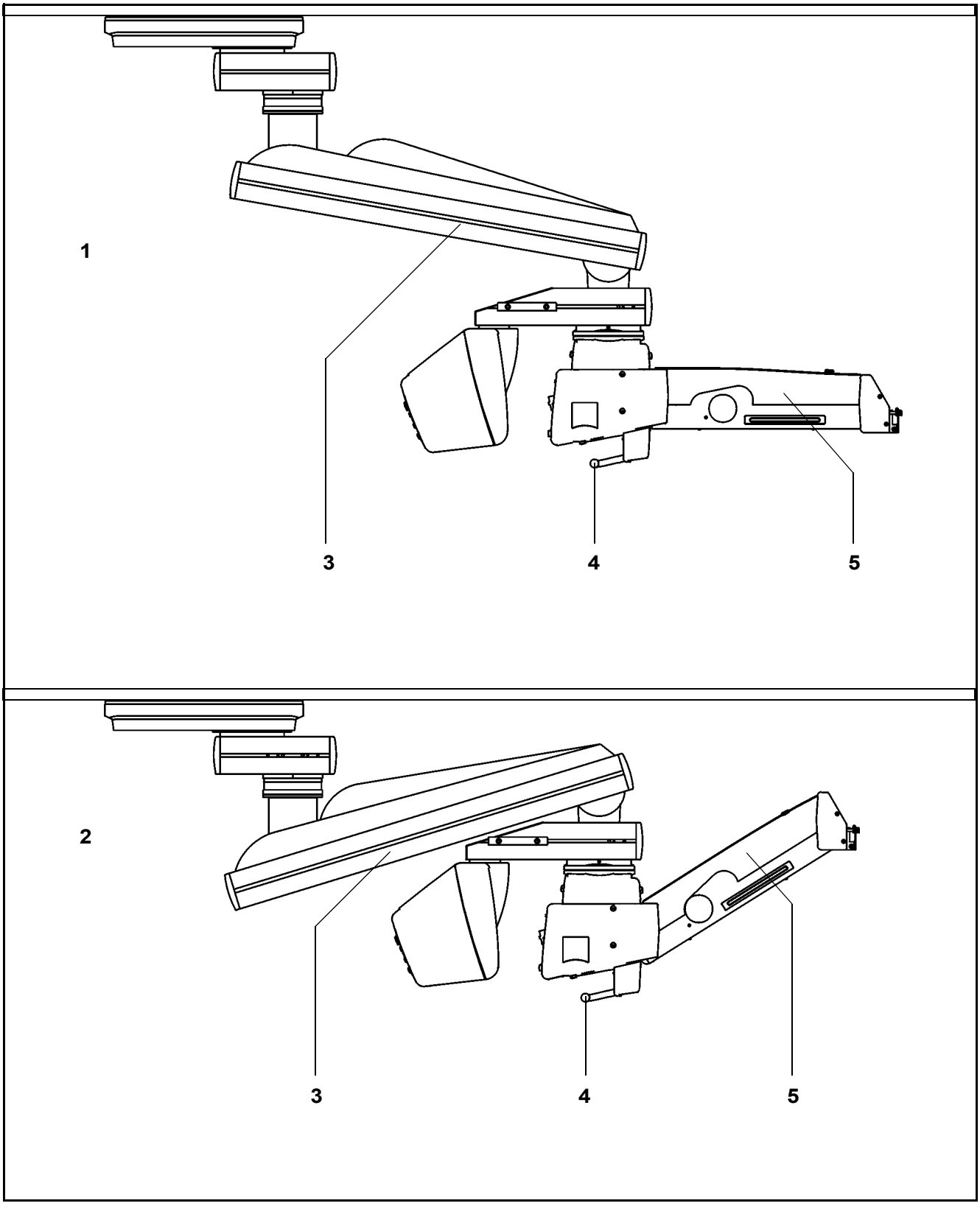
- Press the release key of the magnetic brakes on the surgical microscope. Move the suspension arm (5) to the highest possible position.
- Push the ceiling mount upward into the parking position using the handle (4). The standby position is the highest possible position.
- When you release the handle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

NOTE

Risk of injury caused by suspended systems!

Parts of the suspension system are positioned at head level and pose a risk of injury.

- Move the system into the standby position after use and make sure that sufficient headroom is available.
- Contact Carl Zeiss Service when moving the suspension system to its standby position requires some force.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Attaching sterile drapes

CAUTION

The use of third party drapes may affect navigation systems

Certain third party drapes (e.g. drapes with curved protective lens covers) may influence the accuracy of navigation systems due to an optical distortion caused by the convex shaped protective lens cover.

Although there may be no perceptible impairment to the visual image quality observed through the microscope eyepieces (oculars), there is an imaging effect which displaces the microscope's focal point displayed by the navigation software. Due to this effect the focal point displayed by the navigation software may not be correctly aligned to the patient's image information from the navigation system (i.e. the patient data set).

Consequently the microscope-related reconstruction of the patient data set by the navigation system could display a wrong focal plane that does not comply with the real focal plane of your surgical microscope.

In systems with such features, depending on the distortion caused by the lens, the object contours of a pre-planned anatomical structure displayed in the microscope video of the navigation software, or in the heads-up-display, may show an incorrect size and/or incorrect position in relation to the actual image in your surgical microscope.

If not noticed by the user, incorrectly displayed information could influence clinical decisions during a navigated surgery. Those clinical decisions could be incorrect and potentially result in ineffective treatment or in serious injury to the patient.

- Always follow the Instructions for Use of the navigation system manufacturer for calibration, calibration verification and operation.

Please observe the Instructions for Use of the sterile drape and make sure that the applied drape leaves sufficient room for tilting and rotating movements of the surgical microscope.

Settings on the control and display panel

Setting up 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: setting range: 1 ... 10
- Set the values required for
  - motor speeds of the functions zoom,
  - focus and
  - X-Y coupling.

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

Balancing the surgical microscope

NOTE

Risk of injury caused by lowering of the surgical microscope!

- Balance the completely equipped surgical microscope before surgery without the patient.
- Hold the surgical microscope tightly at its handgrips before releasing the magnetic brakes.

To adjust the balance of the microscope's axis of rotation, the lateral and front-to-back tilt axes and the friction of the axis of rotation, press the magnetic brake release button on one of the handgrips.

When adjusting balancing knobs (2 and 3), carefully turn them in either direction shown on the labels. To avoid damaging the balancing system, do not use force by turning the knobs too far.

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

Adjusting the friction of the microscope's axis of rotation

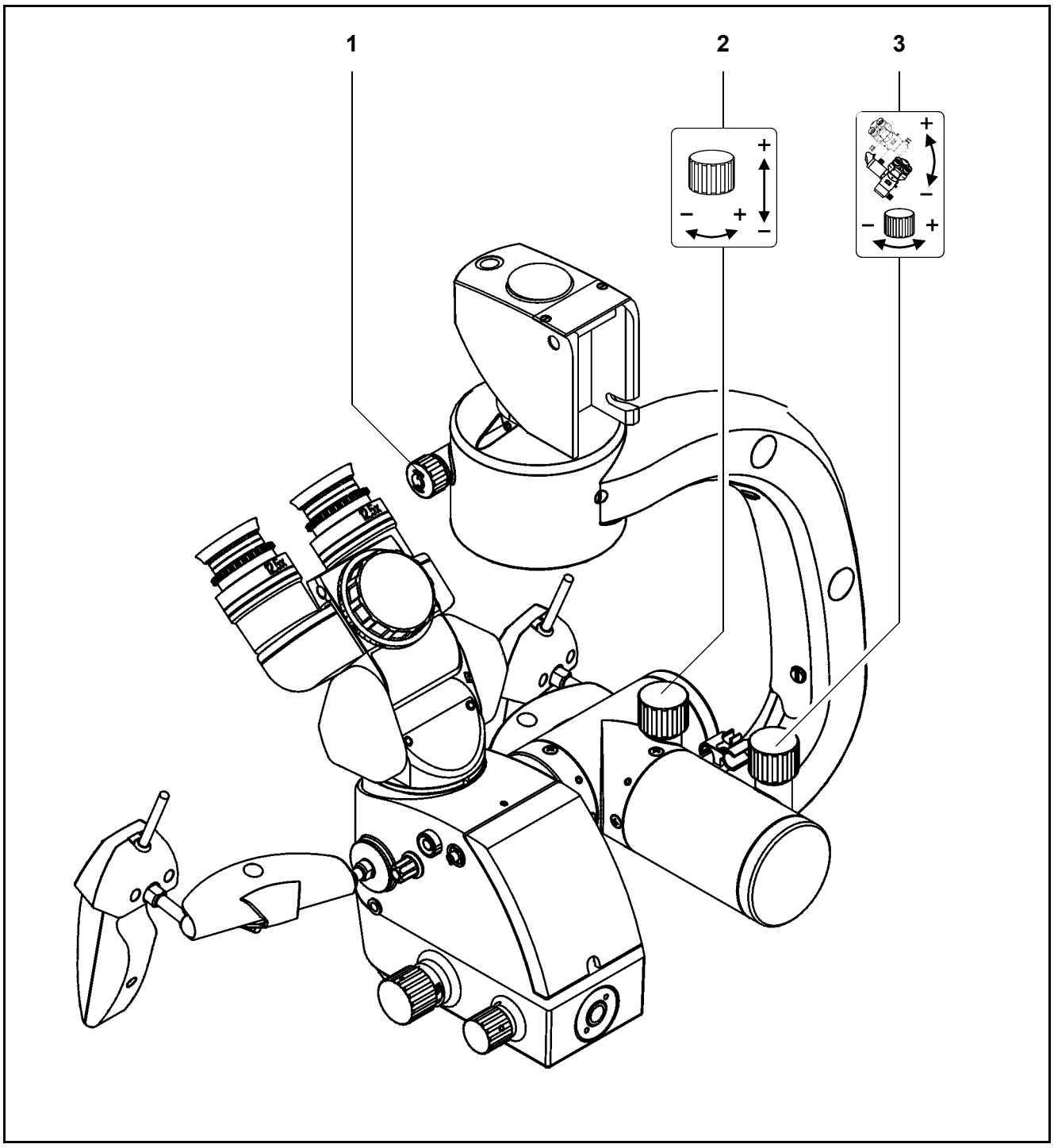
- Use knob (1) to adjust the friction of the microscope's axis of rotation as required.

Balancing the front-to-back tilt motion

- Use knob (2) to adjust the spring force in such a way that the surgical microscope is balanced about its front-to-back tilt axis and remains stationary in the viewing direction required.

Balancing the lateral tilt motion

- Use knob (3) to adjust the spring force in such a way that the surgical microscope is balanced about its lateral tilt axis and remains stationaryin the viewing direction required.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Adjusting the surgical microscope

Notes on adjustment

– It is recommended to provide the interpupillary distance as well as the refraction values for the different users to adjust the surgical microscope more quickly and to preset the values in the scope of the preparation.

– Do not wear multifocal or varifocal glasses during adjustment or during the operation of the microscope.
Such glasses make a proper diopter adjustment ring setting impossible and result in unsatisfactory imaging.

– Optimum image clarity in the eyepieces and at the optical port for documentation equipment (photo, video) can only be achieved through careful focusing and precisely adjusting the binocular tube.

Adjusting the binocular tube

Adjusting the interpupillary distance

- Move the microscope to a vertical position above a flat object, e.g. a sheet of paper with writing.
- Adjust the distance of the eyepieces at the binocular tube to your iinterpupillary distance so that the two eyepiece images (object and edge of visual field) merge into one.

Adjusting the eyepieces

The following procedure must be performed separately for each eyepiece in the order described.

- Set the microscope to minimum magnification.
If your system is equipped with a Varioskop, select the shortest possible working distance (approx. 25 mm).
- Set the diopter setting ring on the eyepiece to 0 D. (Diopters).
- Look through the eyepiece and move the microscope body to focus the image.
- Set the microscope to maximum magnification and adjust the fine focusing system until the image is sharply defined.
- Then reset the microscope to minimum magnification without changing the working distance.
- Set the diopter setting ring to the maximum plus value (e.g. +5 D).
- Look through the eyepiece and turn the diopter setting ring slowly towards the negative values until the image is sharply defined.
- Repeat the entire procedure for the second eyepiece.

→ Now, the microscope is adjusted in such a way that the image is sharply defined over the complete magnification range without any renewed focusing during the magnification setting.
If this is not the case, repeat the procedure.

Adjusting the eyecups

- Adjust the eyecups of the eyepieces in such a way that the entire visual field can be seen.
  - Viewing with eyeglasses: Rotate eyecups in.
  - Viewing without eyeglasses: Rotate eyecups out.

Adjusting the working distance and magnification

- Position the microscope above the surgical field so as to ensure convenient work.
- Roughly focus the object by changing the distance between microscope and object.
- Set the microscope to maximum magnification and adjust the fine focusing system until the image is sharply defined.
- Set the microscope to the required magnification. The focal plane is retained in this process.

Surgical microscope with a laser micromanipulator

Please observe the separate Instructions for Use of your laser micromanipulator.

NOTE

Risk of injury caused by laser micromanipulator!

It is absolutely vital that the focal planes of the surgical microscope and of the laser micromanipulator are identical.

- When operating a third-party micromanipulator, activate the "Focus stop" function. This prevents inadvertent motor-driven readjustment of the selected focus.

Before every laser application of the surgical microscope using a laser micromanipulator, you must adjust the focal plane of the microscope to the focal plane of the laser micromanipulator. After correct matching of the two focal planes, the focus of the surgical microscope (Varioskop) must not be changed in order to avoid any deviations in the focal planes and, as a result, an unfocused laser beam during the laser application.
Always check the correct adjustment before surgery (without patient!) and before every laser application as follows (recommended procedure):

- Set the microscope to maximum magnification.
- Some micromanipulators offer the possibility of targeted laser beam defocusing in the focal plane. Make sure that the laser is in the position for the smallest possible laser spot for this check. Please observe the separate Instructions for Use for your laser micromanipulator.
- Hold a wooden spatula in the focal plane in such a way that you see it sharply focused.
- Trigger a few trial shots of the laser at the spatula, slightly changing the spatula position relative to the focal plane for each shot.
  The therapy beam of the laser displays its maximum effect in the focal plane of the laser micromanipulator. The wooden spatula must be sharply focused in this position. Only then will the two focal planes coincide. If this is not the case, correct the adjustment of the two focal planes.
- Repeat the test until full coincidence of the focal planes has been obtained.

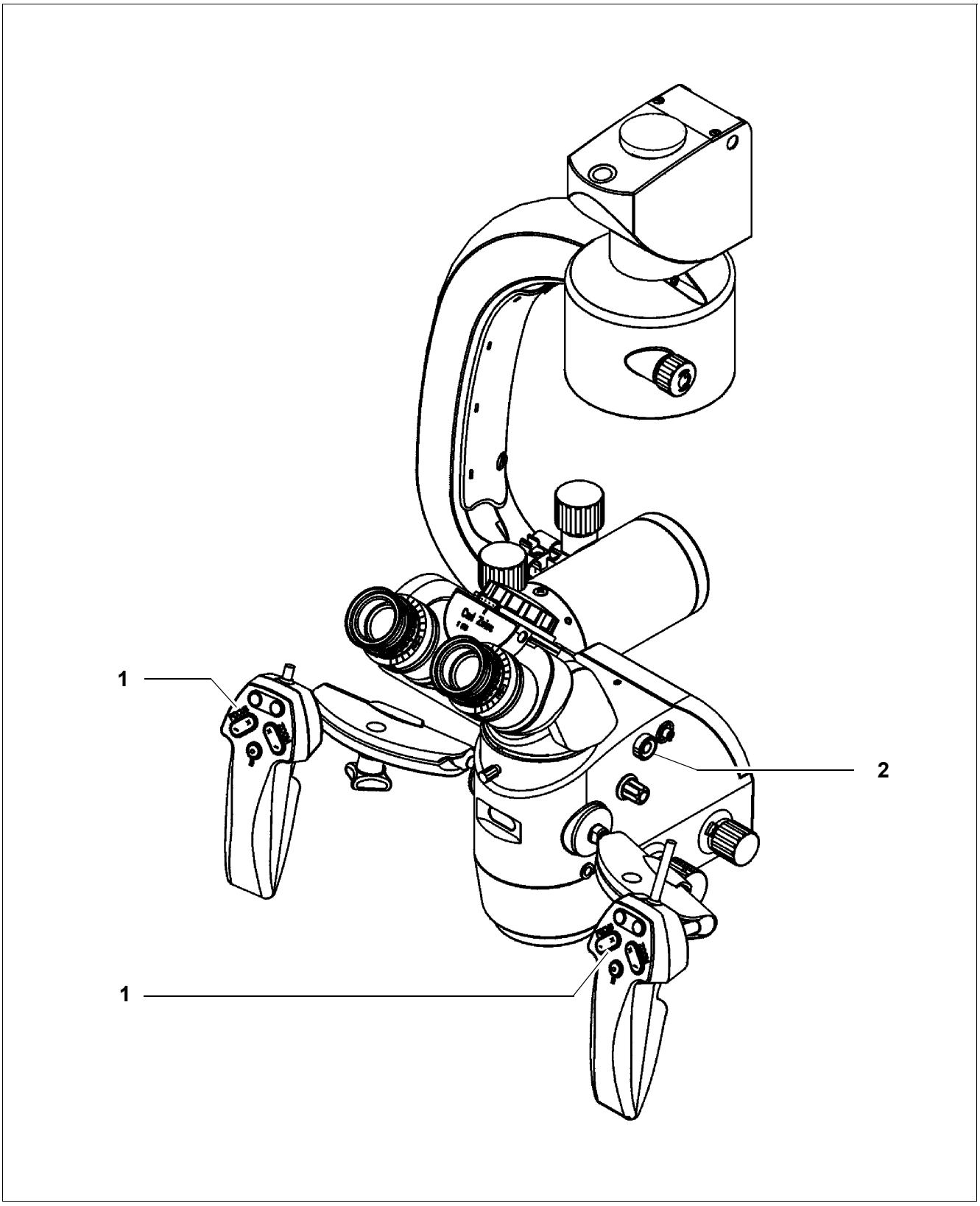
Adjusting the surgical microscope and laser micromanipulator to the same focal plane

The OPMI Vario is equipped with a motorized Varioskop zoom system which is operated via the focusing buttons of handgrip (1) or the foot control panel.

The Varioskop is used for the motorized setting of the working distance (coarse focus) and the motorized adjustment of image definition (fine focus). The focusing buttons allow you continuous adjustment of the working distance between 200 mm and 415 mm.

- Set the working distance (coarse focus) to the focus value of the laser micromanipulator. The display shows the focus value currently set.
- Use the previously described, recommended procedure to check that the focal planes coincide.
- If necessary, correct the focus setting by appropriate minor adjustment (fine focus).

Focus stop button (2) permits you to deactivate the electrical drive of the focusing system.
When activated, the focus stop button lights yellow. This function prevents the focal plane setting from being inadvertently changed by motorized movement.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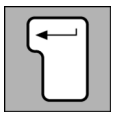
Operation



Checklist

CAUTION

Risk of injury!

Incorrect configuration settings may lead to unexpected behavior of the device and may cause injury to the patient.

- Always check the settings of the selected user profile before using the system.

CAUTION

Risk of injury caused by failure of a function!

If a function fails, do not use the system for safety reasons.

- If possible, correct the malfunction (see "What to do in the event of malfunctions") or contact the Zeiss service department.

Always check the function of the system before surgery (without patient!) using the following checklist:

Prerequisites:

✓ Check that the correct rated voltage has been set on the suspension system.

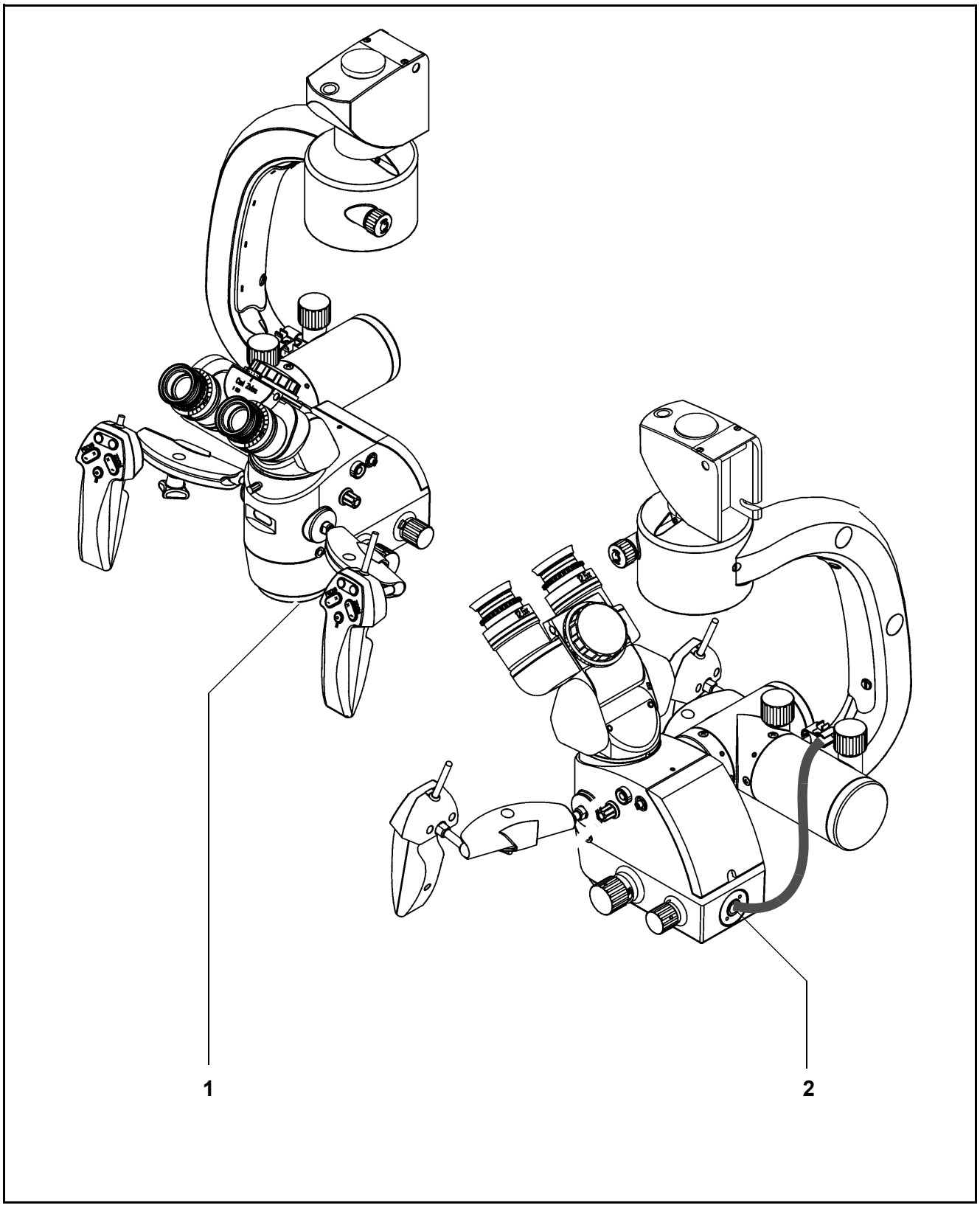
✓ Check that all cables are connected and pose no trip hazards.

✓ Check that the light guide (2) has been connected.

✓ Check that there is enough clearance from the accessories installed.

✓ Check that the OPMI protective cover (1) has been removed.

- Turn on the system at the power switch of the suspension system.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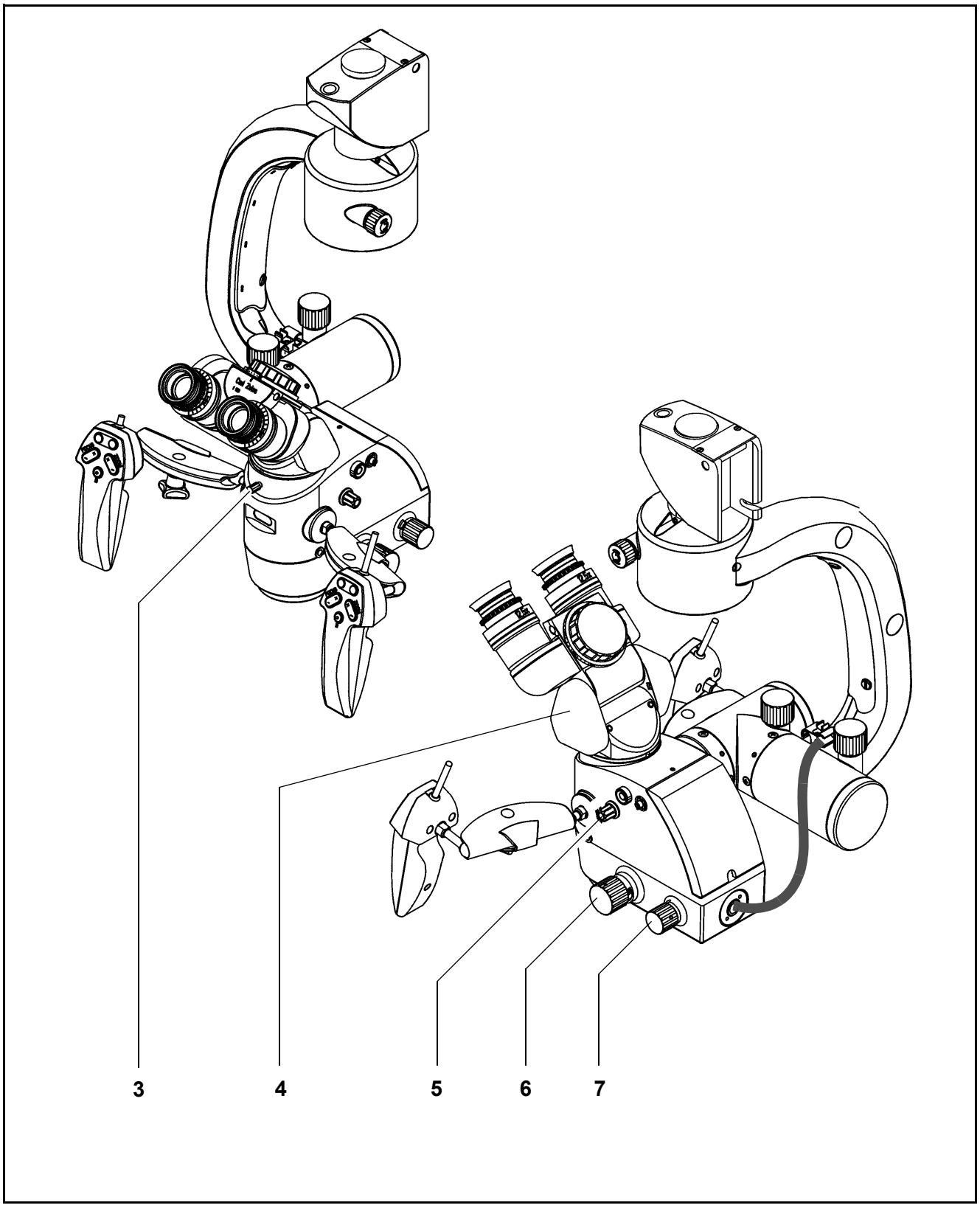
Zoom
- ✓ Check this function using the appropriate key.

Focus
- ✓ Check this function using the appropriate key.

Knobs
- ✓ Check the friction of the knobs for zoom (5), focusing (6) and illuminated-field size (7).

Eyepieces / binocular tube
- ✓ Check that binocular tube (4) has been securely mounted.
- ✓ Check that securing screw (3) has been firmly tightened.
- ✓ Check that the surgical microscope and the tube are in an ergonomic position.
- ✓ 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 the image quality is correct throughout the entire magnification range.

Balance
- ✓ Check that the surgical microscope has been correctly balanced.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Suspension systems

After the system has been switched on, it automatically performs a self-test. The self-test is completed after approx. five seconds.

xenon illumination

✓ A beep sound is emitted after activation. The sound stops on error-free ignition of the xenon lamp.
If the beep does not stop, the system must not be used.

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

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.

CAUTION

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

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

- Please replace the xenon lamp in due time.
- Reset the service hour counter to "0" after replacing the lamp.

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.

Like any technical device used in the OR, this illumination may fail. It is thus recommended to have a suitable backup lamp, such as an OR illuminator, ready at hand during surgery.

Lamp brightness

- Check that the lamp brightness display shows the minimum level (1.0) 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).

S88 floor stand only: Lifting column

✓ Check that the upward/downward movement function is OK.

✓ Check that the surgical microscope is in a convenient position and that you have set the optimum ergonomic working height of the stand via the lifting column.

Balancing the

✓ 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.

Limiting

✓ 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 at least three locking tabs have been pressed and the stand is securely locked in position.

Only for S8 ceiling mount: Handgrip

✓ Check that the working position has been set.

Check the accessories

- Using the respective Instructions for Use provided, check that the other equipment (surgical microscope, coobservation tube, video system, etc.) is functioning properly.

Foot control panel (option)

✓ The plug of the foot control panel has been connected.

✓ The power switch of suspension system has been switched on.

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

Positioning the S88 floor stand

Please also read the chapter: "Relocating the device" (see Page 148).

- Unlock the activated locking tabs (2).

NOTE

Unintentional movement of the system!

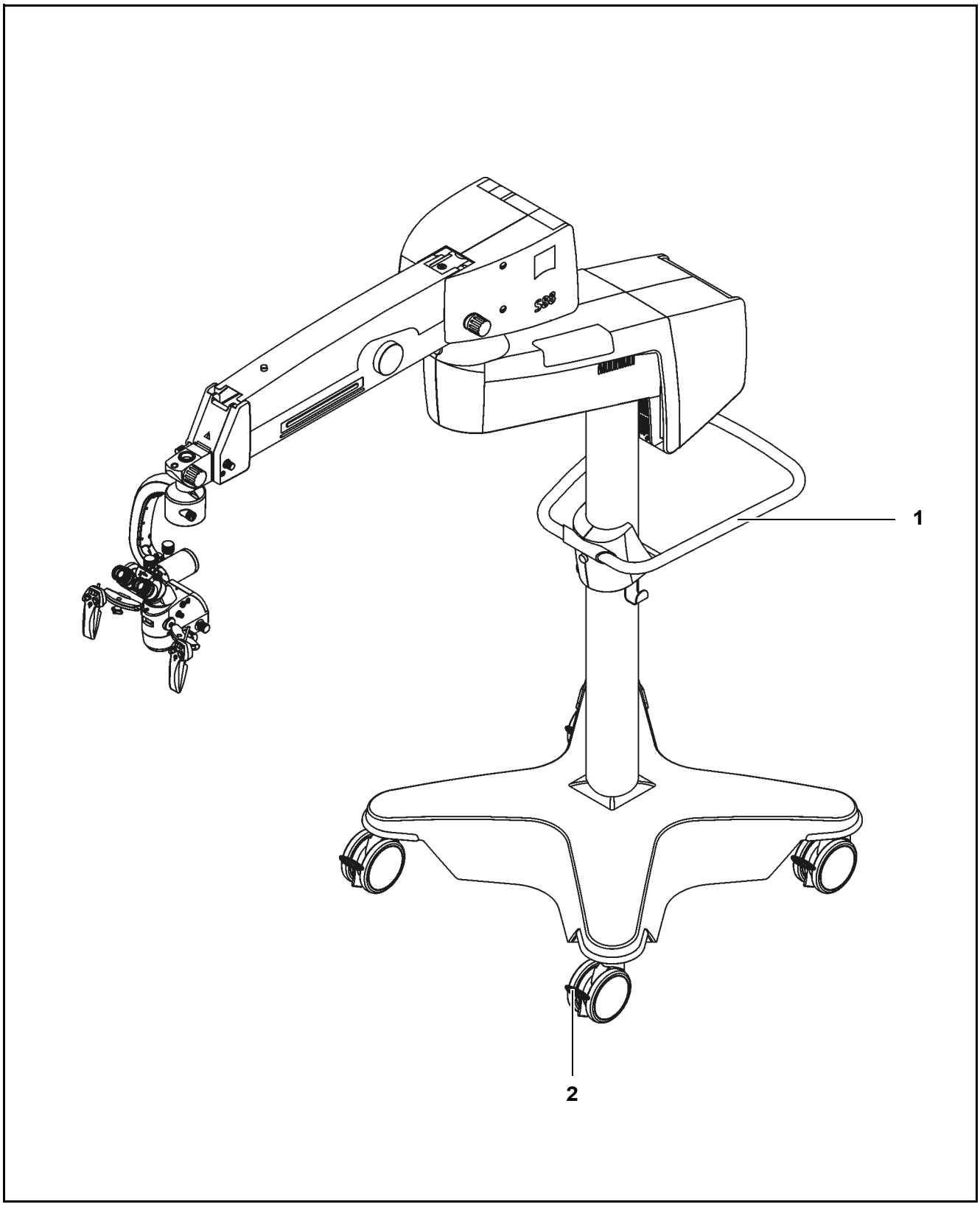
- Position the suspension system in such a way that you can slide it away from the patient at any time.

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

CAUTION

Unintentional movement of the suspension system!

- Press down at least three of the locking tabs (2) and make sure that the stand is securely locked in position and cannot roll away by itself.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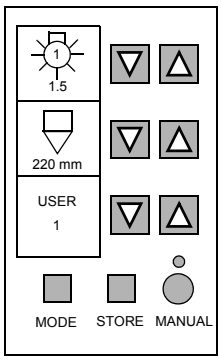
Using the display and key field

General functions



Operating keys "∇" and "Δ"

The keys "∇" and "Δ" are always assigned to the display field on their left.

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.

The keys "Δ" and "∇" have a repeat function. If f you hold down one of these keys, the relevant value is automatically incremented or decremented by the predefined steps until the maximum or minimum value is reached.∇

Operating key row

"MODE" key
Use the "MODE" key to switch from basic mode to speed mode. When in speed mode, use the "MODE" key to switch back to basic mode.

The "MODE" key also permits you to switch from the configuration modes back to the basic mode.

"STORE" key
The "STORE" key permits you to save the selected settings for a specific user.

"MODE" key and "STORE" key
Press the "MODE" and "STORE" keys simultaneously to switch from basic mode to configuration mode 1. When one of the configuration modes is active and you press the "MODE" and "STORE" keys simultaneously, you will switch to the next configuration mode. From the last configuration mode you switch back to configuration mode 1Page 182.

After switching to any other mode, the system returns to basic mode 20 seconds after you have stopped pressing any keys on the control panel.

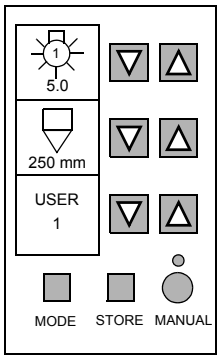
"MANUAL" key
The "MANUAL" key permits you to switch to manual operation. The motorized control functions of the surgical microscope are deactivated. The lamp brightness is automatically adjusted to a fixed setting, the value being shown in the first display.
When the manual mode is activated, the yellow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



Basic mode

The basic mode is always displayed in the normal operating status and after power-on of the system.

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	for OPMI® Vario on the suspension system: either the working distance or the total magnification
In the lower display field	the user ID

Setting the user ID (USER)

The lower display field in the basic mode generally shows the current USER, i.e. the user ID selected when the system was last switched off is displayed. When the user is changed, all settings for the newly selected user will be loaded, except the lamp brightness which is always set to the minimum value.

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

Use buttons "∇" and "Δ" assigned to the lower display field 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.

Each user should be assigned a user ID, so he or she can enter and save settings under the respective user ID. The user ID allows each user to call and apply his or her own settings.

CAUTION

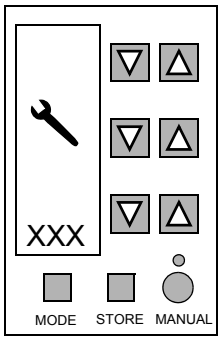
Risk of injury due to changes made to user settings!

- Make sure that you do not change the settings of another user. It is best to always work under one's own user number. This is the case because all settings made are saved to the current user.

Acoustic signals

Three successive beeps	– Error message during the software check after power-on of the suspension system. – Error message for 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



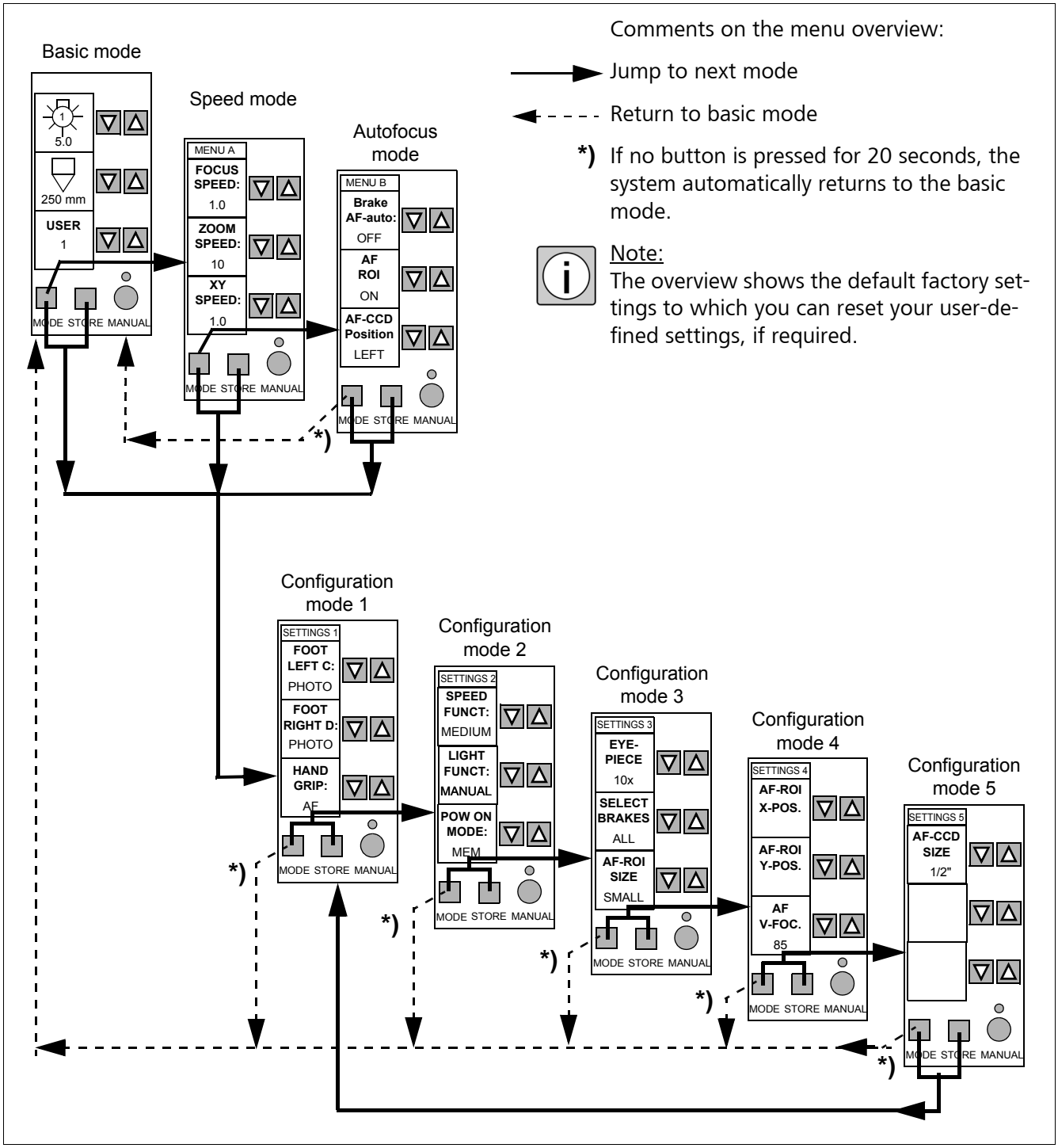
In the event of an error, e.g. during the system check after power-on of the suspension system, an error message appears in the control and display panel: a wrench symbol and an error code (XXX) are displayed and three successive beeps are heard.

Inform the service department, telling them the error code and the serial number of the system.

Motorized control of the surgical microscope is then no longer possible. All microscope functions except recentering of the X-Y coupling can only be operated manually.
However, you can still release the magnetic brakes using the appropriate button on the left and right handgrips of the microscope.

When you press the "MANUAL" key, the surgical microscope can no longer be operated via the foot control panel, the handgrips or the control and display panel.
You can continue using the illumination system, but the lamp brightness is automatically adjusted to a fixed setting. You can use the foot control panel to switch the illumination system on and off.

OPMI Vario on the suspension system, user interface with SpeedFokus option



Overview:
Control functions for OPMI Vario with SpeedFokus (autofocus).

Basic mode see Page 180 – Setting the lamp brightness – Display of working distance or total magnification, display switchover – Setting the user ID	**Speed mode** **(Menu A)**, see Page 187 – Setting the speed for focusing – Setting the speed for the zoom function – Setting the speed for the X-Y coupling	**Autofocus mode** **(Menu B)**, see Page 188 – Automatic focusing after locking of the magnetic brakes (on / off) – Display of the ROI (region of interest) on/off – Entering the video camera orientation (left/right)
Configuration mode 1 **(Settings 1)**, see Page 190 – Assigning a function to button C of the foot control panel – Assigning a function to button D of the foot control panel – Assigning a function to the freely configurable handgrip buttons	**Configuration mode 2** **(Settings 2)**, see Page 193 – Setting the focus speed depending on the zoom setting – Setting the brightness depending on the zoom setting – Setting the power-on behavior	**Configuration mode 3** **(Settings 3)**, see Page 196 – Entering the current eyepiece magnification for the calculation of the total magnification displayed in the basic mode. – Selecting the magnetic brakes to be unlocked by pressing handgrip buttons B – Setting the ROI size
Configuration mode 4 **(Settings 4)**, see Page 199 – Defining the position of the ROI. – Entering the video focal length	**Configuration mode 5** **(Settings 5)**, see Page 201 – Entering the size of the video camera's CCD array	

The control functions are explained in more detail in the following sections.

The functions of the SpeedFokus (autofocus) option are only displayed in the user interface for OPMI Vario on a suspension system if this option has been actually installed. The special functions of the SpeedFokus (autofocus) option comprise:

– Video-AF mode (MENU B), complete

– AF-ROI SIZE function in configuration menu 3 (SETTINGS 3)

– Configuration menus 4 and 5 (SETTINGS 4 and 5), complete

"STORE" key
The focusing and zoom values currently set on the surgical microscope are saved for the user currently selected. The function of the "STORE" key is the same in all modes.
The current focusing and zoom values are stored as focus memory (FOC-MEM) and zoom memory (ZOOM-MEM).
To set the instrument to these stored focusing and zoom values, press keys C and D on the foot control panel or the freely configurable keys on the handgrips, see configuration mode 1.

⚠ **CAUTION**

Risk of injury due to changes made to user settings!

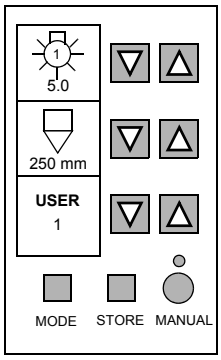
- Make sure that you do not change the settings of another user. It is best to always work under one's own user number. This is the case because all settings made are saved to the current user.

Adjusting the settings
The associated buttons "∇" and "Δ" allow you to change the settings in defined steps.

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

Basic mode for OPMI Vario

Basic mode



The basic mode for OPMI Vario comprises the following functions:

- Setting the lamp brightness
- Switching the display between working distance and total magnification
- Setting the user ID, menu item "USER".
  For details, please see Page 180

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

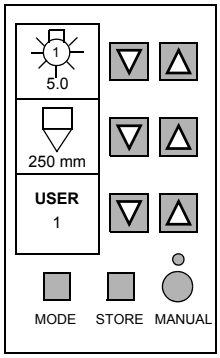
Setting the lamp brightness

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.

Setting the lamp brightness:
Use the associated buttons "–" and "Δ" to adjust the lamp brightness. The brightness can be varied in a range from 1 to 10 in steps of 0.5.
The last setting of the lamp brightness is automatically saved under the current user ID.

- During the adjustment of lamp brightness, you set a fixed basic value for the illumination intensity. In configuration mode 2, you can select "automatic" (AUTO) for "Brightness as a function of the zoom position" (LIGHT FUNCT:).
  The automatic function always ensures uniform brightness of the image over the full zoom range (0.4 through 2.4). The transmission of the optical system decreases with increasing magnification from zoom value 1 onwards. This is compensated by the automatic function which increases the lamp brightness accordingly.
  If you have selected a relatively high basic brightness for a large field of view (low zoom value), the automatic function is unable to sufficiently compensate for the reduced transmission of the optical system resulting from high zoom values.
- The brightness of the lamp can also be adjusted by pressing the appropriate buttons on the foot control panel or handgrip.
  In configuration mode 1, you can assign the increase/reduce brightness function to the freely configurable buttons on the handgrip.

Basic mode



Display of the working distance or total magnification
This function permits you to switch between displays.

In the basic mode, either the working distance (in mm) or the total magnification (as a factor) is displayed in the middle display field.
The associated buttons "–" and "Δ" allow you to switch between these displays.

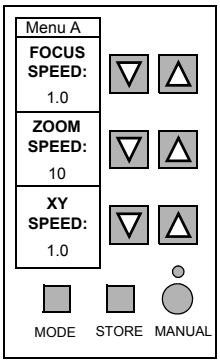
Displaying the working distance:
The working distance is displayed as a symbol and a numeric value which indicates the current working distance in millimeters. The current working distance is displayed in 5 mm steps.

Displaying the total magnification (MAG):
The total magnification is displayed as the abbreviation "MAG" and a numeric value (factor) which indicates the current total magnification in steps of 0.1. The total magnification is calculated by the software. For this purpose, the magnification of the eyepieces currently used must be known to the software. Use configuration menu 3 to enter the current eyepiece magnification.

Setting the user ID
Menu item USER, for details see Page 180.

Path: To access the speed mode (MENU A), press the MODE button in the basic mode.
To change to configuration mode 1 (SETTINGS 1), press the MODE and STORE buttons simultaneously.

Speed mode



Speed mode (MENU A)

This mode permits you to set the adjustment speeds for the following microscope functions:

- Focusing
- Zoom function
- Adjustment of the X-Y coupling

Path: Every time you switch on the system, the basic mode is automatically displayed. Press the MODE button to access the speed mode (MENU A).

Adjusting the settings
The speed mode is the user interface which allows you to set the speeds of the microscope functions.

Each of the three adjustment speeds can be set in a range from 1 min. to 10 max. in steps of 0.5.

Optical systems provide a large depth of field if small zoom values are used. In the case of a large depth of field, the focusing system must travel a large range until the image is in focus. This means that the X-Y coupling must be adjusted over a large range until the required position is reached. This will take some time. A high adjusting speed is therefore a great benefit.
On the other hand, optical systems provide a small depth of field if high zoom values are used. This requires precise positioning of the focusing system in a small range to ensure that the image is in focus. This means that the X-Y coupling must be precisely adjusted within a small range until the required position is reached. A low adjusting speed is of advantage in this case.
Select the adjusting speed for the focus as appropriate for your working method.

In configuration mode 2, the "SPEED FUNCT" function permits you to select dynamic speed control for focus and X-Y coupling as a function of the zoom setting.
You can choose large, medium, small or no speed change.
If you have already set a high adjustment speed for focusing and the X-Y coupling here 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. Further explanations see configuration mode 2.

Path: To return to the basic mode, press the MODE button in the speed mode (MENU A), or do not press any button for 20 seconds. To change to configuration mode 1 (SETTINGS 1), press the MODE and STORE buttons simultaneously.

SpeedFokus autofocus option

The "SpeedFokus (Autofocus)" option enables you to select an object in the ROI (**R**egion **O**f **I**nterest, measuring field) in the image of the surgical field and to automatically focus it. Prerequisite for the SpeedFokus (autofocus) option: a suitable video system must be installed on your surgical microscope and must be switched on.
SpeedFokus (autofocus) is based on the analysis of the video image contrast: during focusing of the microscope's Varioskop optics, SpeedFokus continuously determines the video image contrast in the selected ROI. In this way, SpeedFokus controls the microscope's Varioskop optics and adjusts it to the point of maximum contrast. This corresponds at the same time to the point of greatest image sharpness.

Glare in the video image may impair the SpeedFokus function.

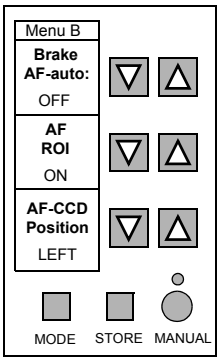
Autofocus mode (MENU B)

The autofocus mode (Menu B) is only displayed if the SpeedFokus (autofocus) option has been installed in your system.

Path: Every time you switch on the system, the basic mode is automatically displayed. Press the MODE button twice to access the autofocus mode (Menu B).

The autofocus mode (Menu B) permits you to make the following settings:

Autofocus mode



- Brake AF-auto, ON / OFF: Automatic focusing after locking of the magnetic brakes (on / off)
- AF ROI, ON / OFF: Activating / deactivating the ROI display on the video monitor
- AF-CCD Position, LEFT / RIGHT: Orientation of the video camera (left/right)

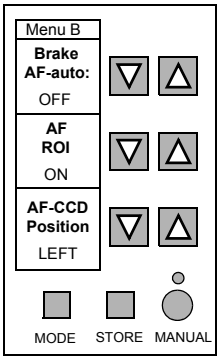
Further settings for the SpeedFokus (autofocus) option can be made in configuration menus 3, 4 and 5 (SETTINGS 3, 4 and 5). For details, please see the description of the configuration menus.

<u>Automatic start of focusing on / off</u>
Menu item "Brake AF-auto, ON / OFF" permits you to activate or deactivate the automatic start of the focusing process.

For changing the position of the surgical microscope, you have to release the magnetic brakes of the suspension system. Press the release button for the magnetic brakes on one of the handgrips. The magnetic brakes of the suspension system are unlocked for as long as you press one of these release buttons.

If you have selected "Brake AF-auto, ON", focusing by the SpeedFokus (autofocus) option will start automatically as soon as the magnetic brakes have been locked, i.e. as soon as you let go of the release buttons.

Autofocus mode



If you have selected "Brake AF-auto, OFF", focusing by the SpeedFokus (autofocus) option will not start automatically when the magnetic brakes are locked, i.e. when you let go of the release buttons
You can trigger the focusing process using the handgrips or the foot control panel. Prerequisite: AF, the SpeedFokus (autofocus) option, has been selected in foot control panel menu "FOOT LEFT C:" or "FOOT RIGHT D" (for foot control panels with 8 or 14 functions) or in handgrip menu "HANDGRIP:".

You can stop focusing by the autofocus option by pressing one of the release buttons on the handgrips or on the foot control panel (with 8 or 14 functions) during the focusing process.

ROI display on the video monitor on/off
The position and size of the ROI are displayed on the video monitor in the form of a square frame.
Use the "AF ROI, ON / OFF" function to activate or deactivate this display on the video monitor.

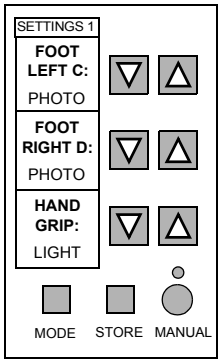
Entering the video camera orientation
If you are using an external video camera, the orientation of the video camera must be known to the SpeedFokus (autofocus) option.

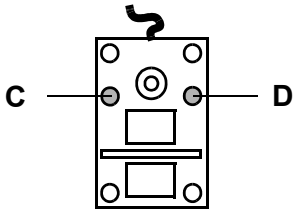
The OPMI Vario surgical microscope can only be equipped with an external video camera. An integrated video camera is not possible.

The video image must have the same orientation as the image in the main eyepieces of the surgical microscope.
In addition, SpeedFokus needs the information whether the video camera is connected on the left or right, i.e. whether it is connected to the LEFT or RIGHT main beam path, to enable the function to perform corrections in the right direction during the focusing process. Use the menu item "AF-CCD Position, LEFT / RIGHT" to enter the orientation of the video camera.

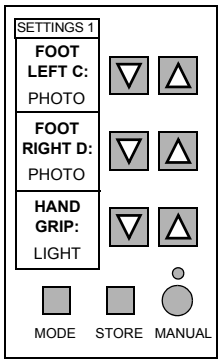
Path: You return to the basic mode if you press the MODE button in the Autofocus mode (MENU B) or if you do not press any button for 20 seconds.
To change to configuration mode 1 (SETTINGS 1), press the MODE and STORE buttons simultaneously.

Configuration mode 1





Configuration mode 1



Configuration mode 1 (SETTINGS 1)

Configuration mode 1 permits you:

- to assign functions to buttons C and D of the foot control panel, menu items "FOOT LEFT C:" and "FOOT RIGHT D:"
- to assign functions to the freely configurable handgrip buttons, menu item "HANDGRIP:"

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.

Assigning functions to buttons C and D of the foot control panel
Buttons C and D of the foot control panel can be configured as required.

Use the menu items "FOOT LEFT C:" and "FOOT RIGHT D:" 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	X-Y recentering ("RESET")		
FOC-MEM	Focus memory	pressed for < 2 sec: pressed for > 2 sec:	triggers positioning saves position
ZOOM-MEM	Zoom memory	pressed for < 2 sec: pressed for > 2 sec:	triggers positioning saves position
PHOTO	Triggering an exposure via the camera interface, i.e. triggers the shutter of a connected 35 mm camera.		
AUX	Triggering an AUX signal at the AUX interface, e.g. to switch an external device on or off (see remote control socket on the connector panel of the suspension system).		
AF	Triggering the autofocus option		

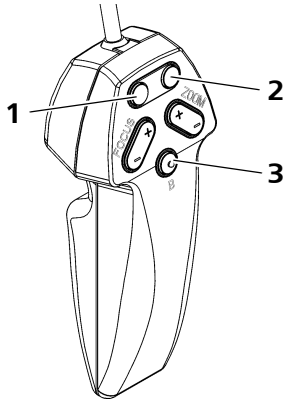
FOOT LEFT C:
Use the upper display and key field (FOOT LEFT C:) to assign one of the possible functions to button C of the foot control panel.

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

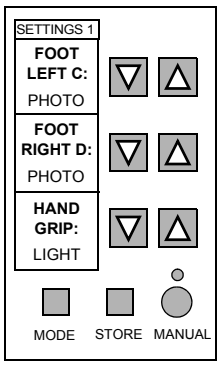
Roll-over procedure:

→ AF → XY-RES → FOC-MEM →
↑ ↓
← AUX ← PHOTO ← ZOOM-MEM ←

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).



Configuration mode 1



Assigning a function to the freely configurable handgrip buttons

The two upper buttons (1 and 2) on the left and right handgrips of the OPMI Vario surgical microscope are freely configurable.

Use the menu item "HAND GRIP:" to assign one of the following functions to the handgrip buttons:

Display	Function of the left button (1)	Function of the right button (2)
LIGHT	Reducing brightness	Increasing brightness
MEM	Focus memory pressed for < 2 sec: triggers positioning pressed for > 2 sec: saves position	Zoom memory pressed for < 2 sec: triggers positioning pressed for > 2 sec: saves position
PH/AUX	Camera release at the camera interface	Triggering an AUX signal at the AUX interface
XY-RES	X-Y recentering ("Reset")	X-Y recentering ("Reset")
AF	Triggering the autofocus option	

Roll-over procedure:

→ XY-RES → AF →
↑ ↓
← PH / AUX ← MEM ← LIGHT ←

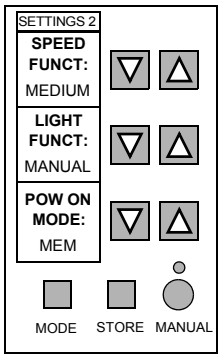
If the memory function (MEM) has been set for buttons (1) and (2) of the handgrips, you can determine whether a positioning run is triggered or whether the position is saved - simply by pressing the buttons for a longer or shorter time.
If you press button (1) for less than 2 seconds, focus positioning is triggered; if you press the button for more than 2 seconds, the current focus position is saved.

If you press button (2) for less than 2 seconds, zoom positioning is triggered; if you press the button for more than 2 seconds, the current zoom position is saved.

Path: To return to the basic mode, press the MODE button in configuration mode 1 (SETTINGS 1), or do not press any button for 20 seconds.
To change to configuration mode 2 (SETTINGS 2), press the MODE and STORE buttons simultaneously.

Configuration mode 2 (SETTINGS 2)

Configuration mode 2

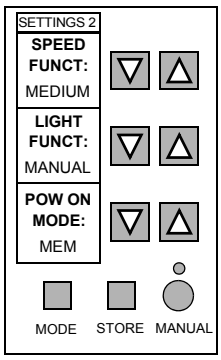


Configuration mode 2 permits you:

- to set the adjustment speeds of focus and X-Y coupling as a function of the zoom setting, menu item "SPEED FUNCT:",
- to set the lamp brightness as a function of the zoom setting, menu item "LIGHT FUNCT:",
- to define the power-on behavior of the system, menu item "POW ON MODE".

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.

Configuration mode 2



<u>Setting the adjustment speeds of focus and X-Y coupling as a function of the zoom setting</u>

Menu item "SPEED FUNCT:" permits you to select dynamic speed control for the X-Y coupling and focus.

The depth of field of the optical system changes according to the zoom setting:

- The depth of field is large for a large field of view (small zoom value), and the focus needs to be adjusted over a large range for focusing the image. This means that the XY-coupling must be adjusted over a large range until the required position is reached. A high adjustment speed should therefore be used in this case.
- The depth of field is small for a small field of view (high zoom value), and the focus needs to be precisely adjusted in a small range for focusing the image. This means that the X-Y coupling must be precisely adjusted within a small range until the required position is reached. A low adjustment speed should therefore be used in this case.

It is therefore advisable to vary the adjustment speeds of the focus and X-Y coupling in accordance with the zoom setting.

The instrument has been factory-adjusted for MEDIUM 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 <4.0 has been selected in the speed mode.

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.

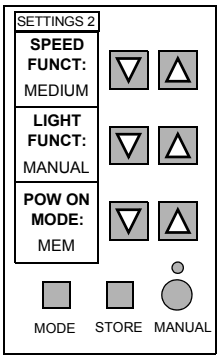
In the extreme case, if you have set the basic speed for focusing and the X-Y coupling to the maximum value of 10, dynamic speed control will have no effect at all.

The upper display and key field (SPEED FUNCT:) in configuration mode 2 permits you to select high, medium or low speed adjustment, or none at all.

Roll-over procedure :

→ OFF → HIGH →
↑ ↓
← LOW ← MEDIUM ←

Configuration mode 2



Setting the lamp brightness as a function of the zoom setting
Menu item "LIGHT FUNCT:" permits you to select dynamic control of the lamp brightness depending on the current zoom setting.

The lamp brightness you set in the basic mode is a fixed basic value of the illumination intensity. Configuration mode 2 (LIGHT FUNCT:) permits you to select automatic brightness control (AUTO) depending on the zoom setting. The automatic function ensures uniform brightness of the image over the full zoom range (0.4 to 2.4).

The transmission of the optical system decreases with increasing magnification from zoom value 1 onwards. This is compensated by the automatic function which increases the lamp brightness accordingly.

Use the middle display and key field (LIGHT FUNCT:) in configuration mode 2 to choose between automatically controlled or constant brightness of the lamp:

AUTO	MANUAL

CAUTION

Risk of causing tissue damage in the patient!

Starting out from the basic brightness set in the basic mode, dynamic brightness control adjusts the lamp brightness to higher zoom values by increasing it up to the maximum. As a result, the tissue in the surgical field may be subjected to excessive radiation.

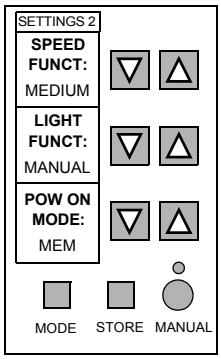
You will not be aware of this while looking through the surgical microscope, as the image you see displays constant brightness throughout the zoom range. Only when looking directly at the surgical field will you notice that the brightness of the illumination varies, depending on the zoom setting.

If you have selected a relatively high basic brightness in the basic mode, the automatic function may not be able to sufficiently compensate for reduced transmission of the optical system.

Defining the power-on behavior of the system

The "POW ON MODE" function permits you to define how the system should behave immediately after it has been switched on.

Configuration mode 2



You have the choice between the following power-on modes:

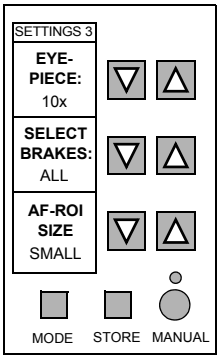
Display	Function
OFF	No positions are changed when you switch on the system. After power-on, you can use the appropriate buttons of the foot control panel or handgrips to **manually** set the focus and zoom to the user-defined values saved in the memory function.
PRESET	On power-on, the focus (working distance) and zoom are automatically set to the default factory settings: focus = 250 mm and zoom = 0.5. These two values are also saved in the memory function (FOC-MEM and ZOOM-MEM).
MEM	After power-on, the focus (working distance) and zoom are automatically set to the user-defined focus and zoom values saved in the memory function. The values in the memory functions FOC-MEM and ZOOM-MEM can be saved for specific users by pressing the STORE button.

Roll-over procedure:

→ MEM → OFF →
↑ ↓
← PRESET ←

Path: To return to the basic mode, press the MODE button in the configuration mode, or do not press any button for 20 seconds.
To change to configuration mode 3 (SETTINGS 3), press the MODE and STORE buttons simultaneously.

Configuration mode 3



Configuration mode 3 (SETTINGS 3)

Configuration mode 3 permits you:

- to enter the eyepiece magnification for the calculation of the total magnification, menu item "EYE PIECE:"
- to select the magnetic brakes to be unlocked, menu item "SELECT BRAKES:"
- to select the ROI size, menu item "AF-ROI SIZE" This menu item is only displayed if the autofocus option has been installed.

Path: Every time you switch on the system, the basic mode is automatically displayed.
To access configuration mode 3 from the basic mode, go via configuration modes 1 and 2 by simultaneously pressing the "MODE" and "STORE" buttons three times successively.

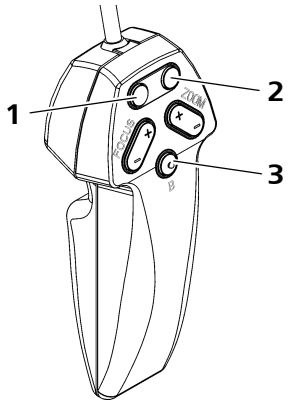
<u>Entering the eyepiece magnification for the calculation of the total magnification</u>

In the basic mode, you can display the total magnification (MAG) of the optical system as a factor in the middle display and key field. The total magnification is calculated by the software. For this purpose, the magnification of the eyepieces currently used must be known to the software.

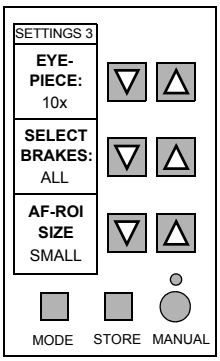
Use menu item "EYE PIECE:" to select one of the eyepiece magnifications available.

Roll-over procedure:

→ 16x → 10x →
↑ ↓
← 12,5x ←



Configuration mode 3



Selecting the magnetic brakes to be unlocked

You can define which magnetic brakes should be unlocked when you press button B (3) of the left and/or right handgrip.

Menu item "SELECT BRAKES:" offers you the following options for selection:

XY - Z	The magnetic brakes for X-Y movement and Z movement can be unlocked separately by pressing button B (3) on the left or right handgrip. • To release the magnetic brakes for X-Y movement only: press button B (3) on the left handgrip. • To release the magnetic brakes for Z movement only: press button B (3) on the right handgrip. • To release all magnetic brakes, i.e. the magnetic brakes of the suspension system (for X-Y and Z movements) and of the surgical microscope (for rotary and tilt movements): simultaneously press buttons B (3) on the left and right handgrip.
All	All magnetic brakes are always unlocked, i.e. the magnetic brakes of the suspension system (for X-Y and Z movements) and of the surgical microscope (for rotary and tilt movements), no matter whether you press button B (3) on the left or right handgrip.

Setting the size of the ROI

In an OPMI Vario equipped with the SpeedFokus (autofocus) option, the size of the ROI can be set using the menu item "AF-ROI SIZE". Three different ROI sizes are available for selection:

– SMALL
– MEDIUM
– LARGE

The default setting for Standard User is the large ROI. You can change the size of the ROI, but the change cannot be saved for the Standard User. For specific users, the ROI size can be set and saved for each user as required.

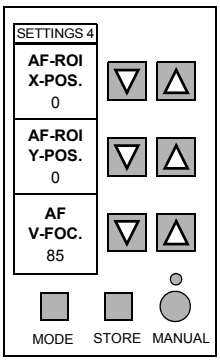
While you are setting the size of the ROI, the ROI is displayed as a square frame in the video image on the monitor. A few seconds after your last action, the frame disappears from the screen.

Roll-over procedure:

→ SMALL → MEDIUM →
↑ ↓
← LARGE ←

Path: To return to the basic mode, press the MODE button in the configuration mode, or do not press any button for 20 seconds.
To change to configuration mode 4 (SETTINGS 4), simultaneously press the MODE and STORE buttons in configuration mode 3.

Configuration mode 4



Configuration mode 4 (SETTINGS 4)

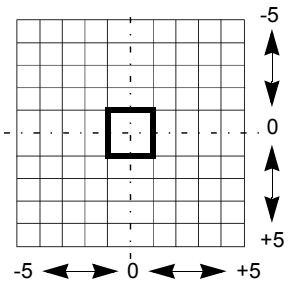
Configuration mode 4 permits you:

– to define the horizontal and vertical ROI position, menu items "AF-ROI X-POS." and "AF-ROI Y-POS."

– to enter the video focal length, menu item "AF V-FOC"

Path: Every time you switch on the system, the basic mode is automatically displayed.
To access configuration mode 4 from the basic mode, go via configuration modes 1, 2 and 3 by simultaneously pressing the "MODE" and "STORE" buttons four times successively.

<u>Defining the position of the ROI</u>
The two menu items "AF - ROI X- POS." and "AF - ROI Y- POS." permit you to define the position of the ROI within the field of view of the microscope.



When you start your system, the ROI is always positioned at the center of the field of view. The ROI is visualized as a square in the graphic display.
Starting from the center position in the field of view, the ROI can be moved in all directions by a maximum of 5 steps.

Use the arrow keys to shift the ROI:

– to the left or right using menu item "AF-ROI X-Pos."

– up or down using menu item "AF-ROI Y-Pos."

<u>Entering the video focal length, menu item "AF-V-FOC"</u>

This setting is performed during the installation of the SpeedFokus (autofocus) option. It is a camera-specific setting which only needs to be changed when a different video camera is installed.

The video focal length of the video camera currently used must be known to the SpeedFokus (autofocus) option. This menu item is used to specify this camera-specific value to the SpeedFokus (autofocus) option.
This setting must always conform to the technical specifications of the video camera used. The SpeedFokus (autofocus) option does not function properly if parameters have not been correctly set.

You can select the relevant focal length from the values offered.

Roll-over procedure:

→ 50 → 60 →
↑ ↓
← 105 ← 85 ←

Path: To return to the basic mode, press the MODE button in the configuration mode, or do not press any button for 20 seconds.
To change to configuration mode 5 (SETTINGS 5), simultaneously press the MODE and STORE buttons in configuration mode 4.

Configuration mode 5 (SETTINGS 5)

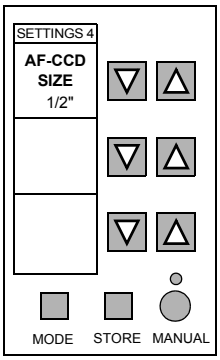
Menu item "AF-CCD SIZE" in configuration mode 5 permits you to enter the size of the CCD array.

Path: Every time you switch on the system, the basic mode is automatically displayed.
To access configuration mode 5 from the basic mode, go via configuration modes 1, 2, 3 and 4 by simultaneously pressing the "MODE" and "STORE" buttons five times successively.

Entering the size of the CCD array, menu item "AF-CCD SIZE"

This setting is performed during the installation of the SpeedFokus (autofocus) option. It is a camera-specific setting which only needs to be changed when a different video camera is installed.

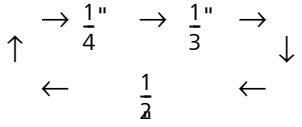
Configuration mode 5



The size of the CCD array (chip size) of the video camera currently used must be known to the SpeedFokus (autofocus) option. This menu item is used to specify this camera-specific value to the SpeedFokus (autofocus) option. This setting must always conform to the technical specifications of the video camera used. The SpeedFokus (autofocus) option does not function properly if parameters have not been correctly set.

You can select the relevant size of the CCD array from the values offered.

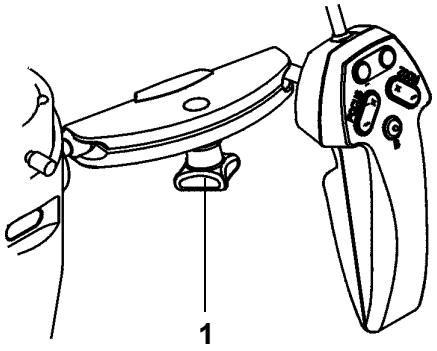
Roll-over procedure:



Path: To return to the basic mode, press the MODE button in the configuration mode, or do not press any button for 20 seconds.

Procedure

- Turn on the system at the power switch of the suspension system.
- Set the required brightness of the surgical field illumination on the suspension system.
- 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 moves to its center position.
  - The focus adopts its initial position in the focusing range.
- Select the lowest magnification (zoom).
- Look through the eyepieces and lower the surgical microscope until the surgical field comes into focus. This is to achieve rough focusing.
- Select the highest magnification (zoom).
- Look through the eyepieces and activate the focusing function until the image of the surgical field appears sharply focused.
- Select the magnification required (zoom). Look through the eyepieces of the binocular tube. Adjust the eyepieces so that both the edge of the field of view and the microscope image are sharply focused.
- Bring the handgrips into a position convenient for the procedure planned and tighten locking screws (1).
- Switch off the system when not in use.



What to do in the event of malfunctions

Failure of main functions

NOTE

Failure of main functions!

In the event that one of the major functions fails (XY movement, focus, zoom, light control), leading to the impairment of further functions, you can switch to the manual mode to complete an already started surgical procedure.

Failure of lamp control system

In the event that the lamps can no longer be controlled via the control panel, adjust the brightness manually at the suspension system.

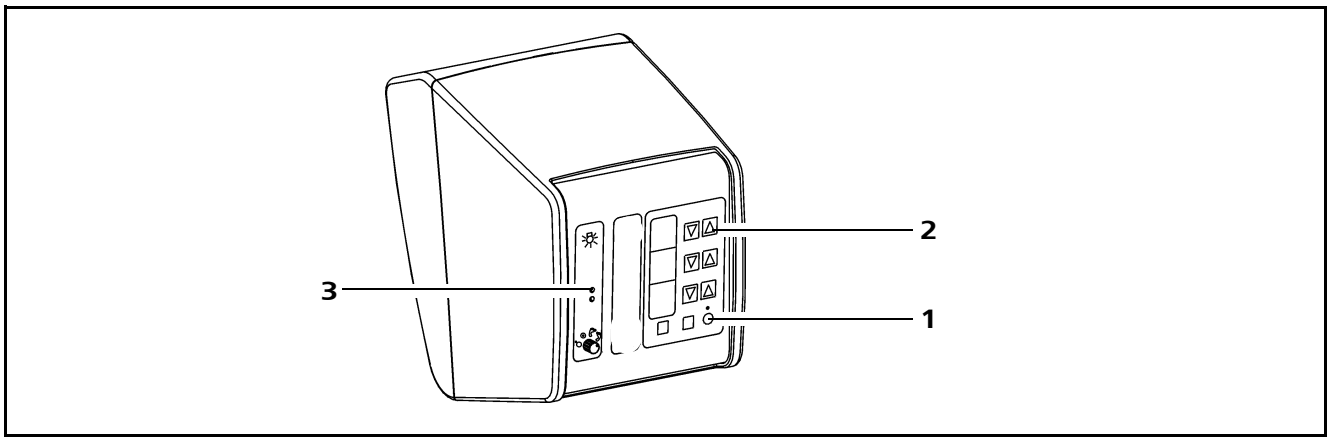
- Press the Manual button (1) on the control panel.

When the manual mode has been activated, all electrical control systems are disabled. The lamp brightness is automatically adjusted to a fixed setting.

- If you wish to change the preset lamp brightness, use the arrow keys (2) on the control panel to set the lamp brightness to the desired level:
  - 0.5... 10 in steps of 0.5
    Level 0.5 corresponds to the lowest, level 10 to the highest lamp brightness.

Failure of the focusing function

- Press Manual button (1) if, for example, the focusing system keeps moving to the upper or lower end position.
- Use the suspension arm of the suspension system for focusing.



Failure of a xenon lamp

CAUTION

Risk of injury caused by lamp rupture!

Lamp rupture (audible as a loud bang) may lead to jamming of the lamp module and/or failure of the electronics modules.

- Before opening the lamp housing, ensure that the device is moved to a position in which possibly falling particles cannot put the patient or user at risk.
- Do not continue using the system if the lamp module is jammed or the illumination is no longer operational due to defective electronics modules. Contact our service department.

NOTE

Overheating of the lamp module!

If ventilation grids are covered e.g. by drapes, this may lead to overheating of the ventilation modules and deactivation of the lamp.

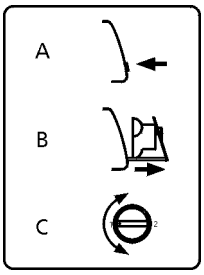
- Never cover the ventilation grids!
- Lamps switched off due to overheating will be automatically switched on again when they have cooled down.

Yellow indicator lamp (3) 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 turns off again.

Switching to the backup lamp

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

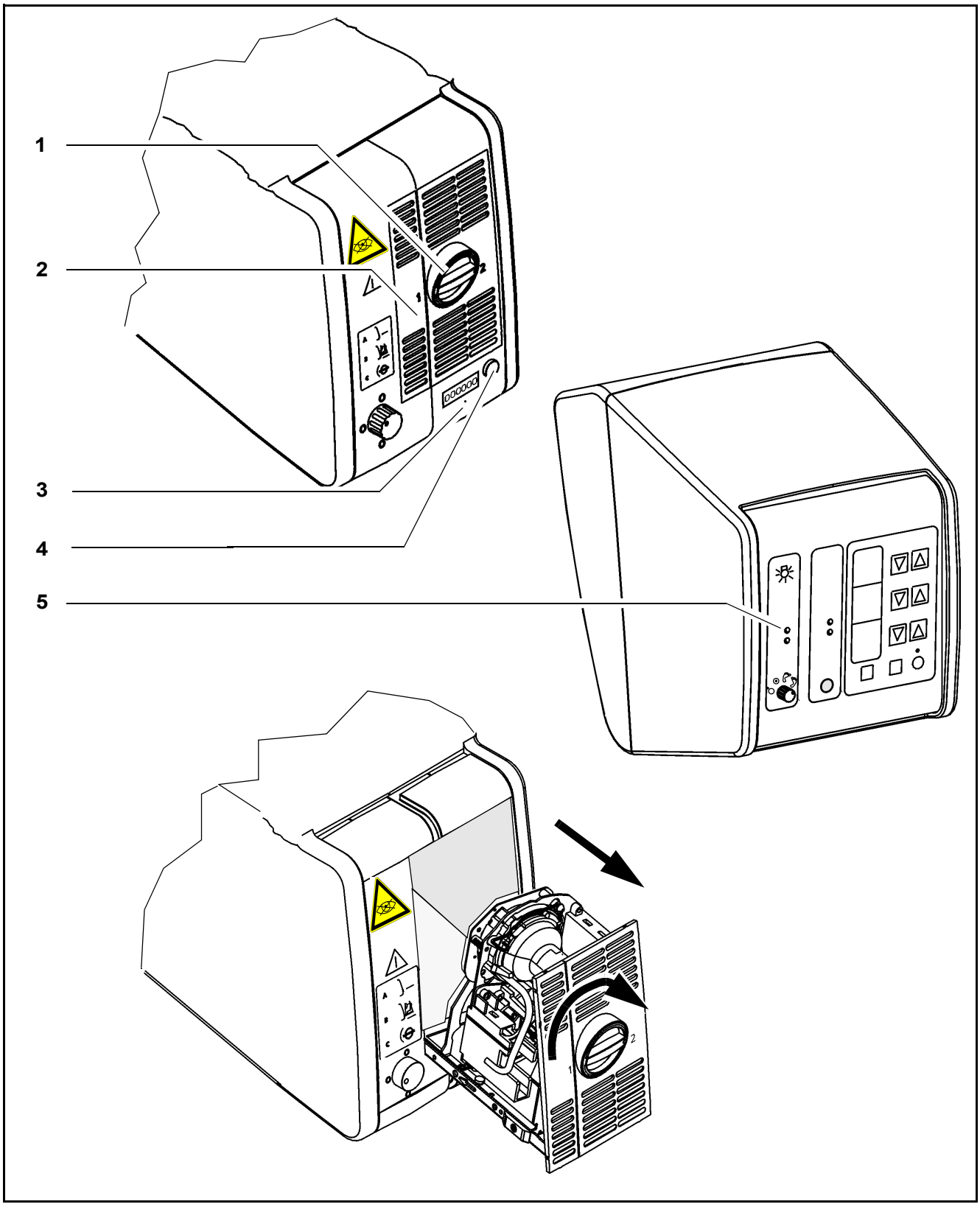
The lamp module contains two xenon lamps. The second lamp is used as a backup lamp which can be swung into the illumination beam path when the first lamp fails.
If the first xenon lamp fails, you can open lamp module (2) as follows:



- Press button (4). 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.
- Reset the service hour counter to "0". Use a pointed object and press it into the recess of reset button (3).
- Switch the suspension system back on again at the power switch.

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

- Check brightness after switching to backup lamp.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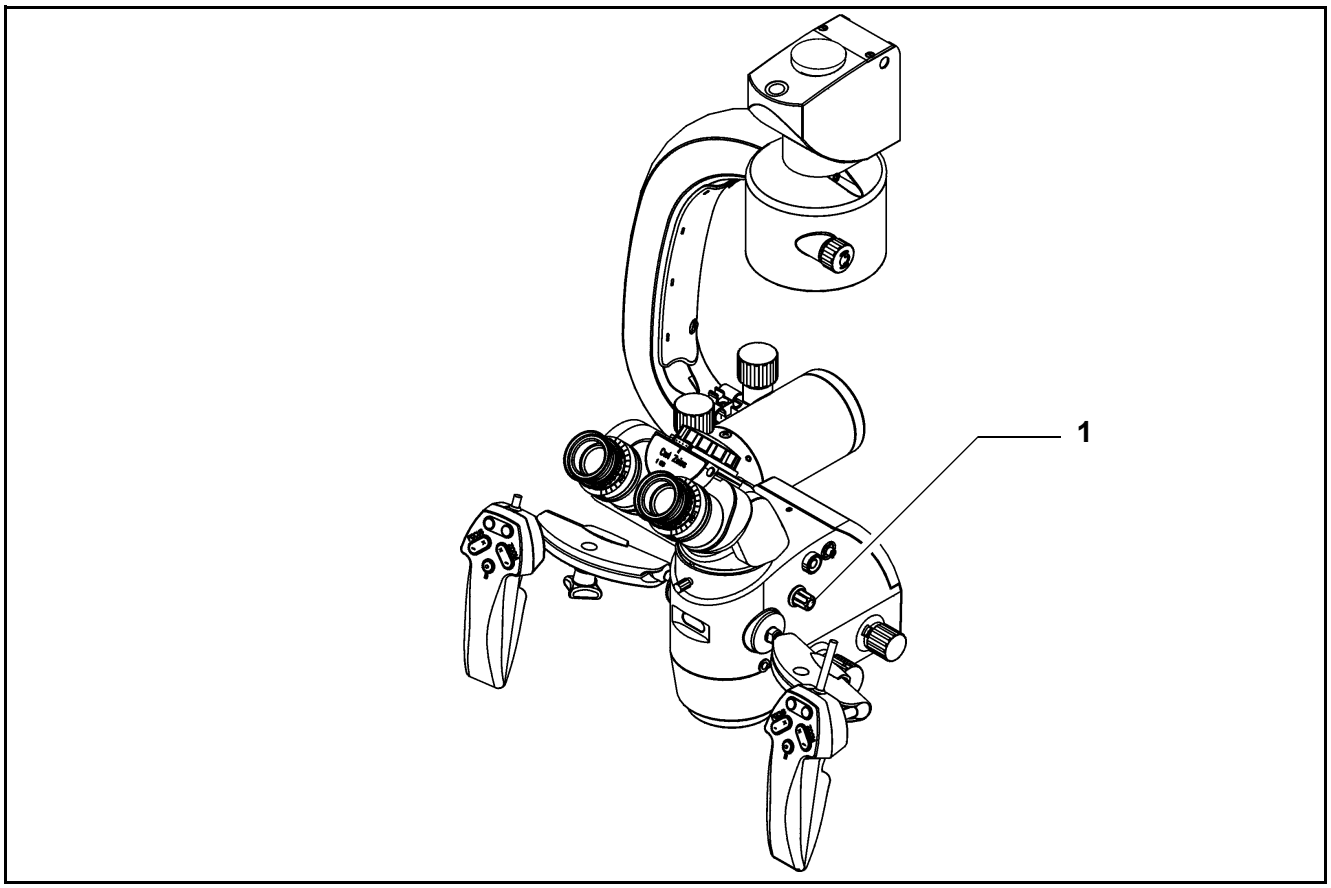
Failure of magnetic brakes

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 zoom function

- Adjust the magnification manually using zoom knob (1).
- If the zoom drive moves into an end position, press the "MANUAL" button on the control panel of your suspension system. The "MANUAL" button permits you to switch to manual operation. The motorized functions of the surgical microscope are deactivated.
  - Continue surgery by manually operating the suspension system and the surgical microscope.

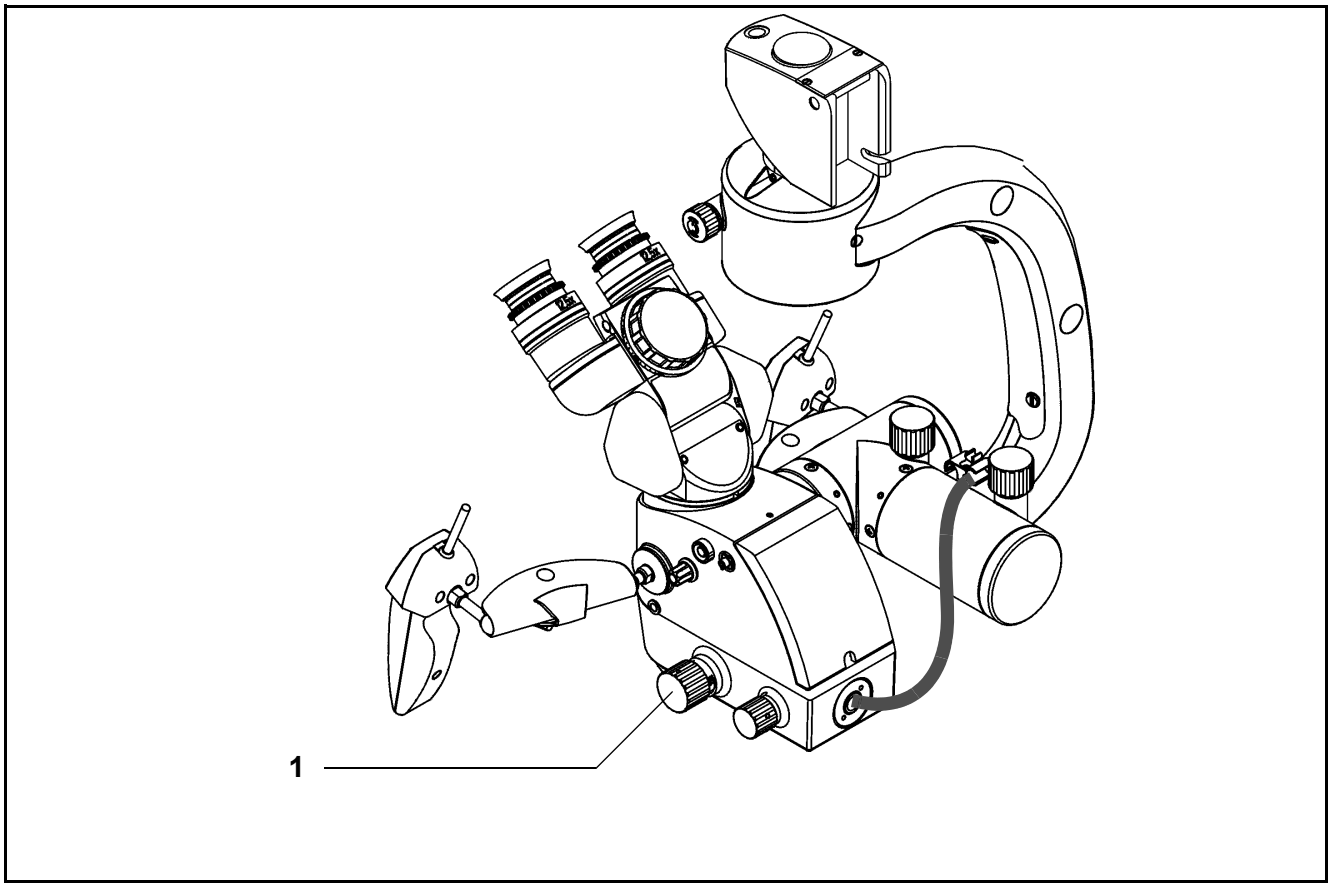


Failure of the focusing function

- Adjust the focus manually using focusing knob (1).
- If the focus drive moves into an end position, press the "MANUAL" button on the control panel of your suspension system. The "MANUAL" button permits you to switch to manual operation. The motorized functions of the surgical microscope are deactivated.
  - Continue surgery by manually operating the suspension system and the surgical microscope

  or

  - Manually focus the surgical microscope by moving the suspension arm or using the lifting column of the suspension system.



Causes of malfunctions and remedies

For your safety

- This system is a high-grade technological product. To ensure optimum performance and safe working order, we recommend having it checked by our service representative as part of regular scheduled maintenance. If a failure occurs which you cannot correct with the aid of the chapter "What to do in the event of malfunctions", attach a sign to the system stating it is out of order and contact our service representative.

Microscope

Problem	Possible cause	Remedy	See
No function at all.	Suspension system turned off.	Turn on the suspension system.	
	Line power failure.	Contact in-house electrician.	
Surgical field illumination inoperative.	Illumination system is switched off.	Switch on illumination system.	
	Defective lamp.	Change the lamp.	Page 222
	Light guide not properly inserted in lamp or microscope.	Insert light guide as far as it will go.	Page 140
	Lamp module has no contact.	Insert lamp module as far as it will go.	
	Failure of electronics.	Illuminate surgical field using an OR illuminator. Contact service.	
Insufficient illumination of surgical field.	Brightness level set too low.	Adjust brightness using the brightness control on the illumination system.	
	Light guide not properly inserted in lamp and/or microscope.	Insert light guide as far as it will go.	Page 140
	Defective light guide (illumination not uniform).	Contact service.	

Problem	Possible cause	Remedy	See
Zoom system inoperative.	Defective motor.	Adjust magnification manually using the zoom knob. Contact service.	
	Zoom system always moves to upper or lower end position.	Switch suspension system to MANUAL" mode. Adjust magnification manually using the zoom knob. Contact service.	
Focusing system inoperative.	Focus stop button pressed.	Press the focus stop button again. The button must not be lit.	
	Defective motor.	Adjust the working distance manually using the focusing knob. Contact service.	
	Focusing system always moves to upper or lower end position.	Switch suspension system to MANUAL" mode. Adjust the working distance manually using the focusing knob. Contact service.	
Total magnification is incorrectly displayed.	Eyepiece magnification has not been correctly entered.	Enter current eyepiece magnification at EYEPIECE in configuration menu 3.	
Zoom and focus are not set to stored memory values after power-on of the system.	Power-on mode not correctly selected.	Select the desired power-on behavior at POW ON MODE in configuration mode 2.	
Lamp brightness changes with magnification.	Dynamic brightness control has been activated.	Select the mode required at LIGHT FUNCT in configuration mode 2.	

SpeedFokus (Autofocus) option

Fault	Possible cause	Remedy	Cross-reference
SpeedFokus (Autofocus) option is inoperative	Camera control unit (CCU) switched off. Error code: E20	Switch on MediLive controller (CCU).	
	Monitor switched off	Switch on the monitor.	
	Failure of the SpeedFokus (Autofocus) option	Contact service.	
Poor focusing result	Focusing of the video camera not matched to focusing of the surgical microscope.	Focus the microscope image, then the video image.	
	Measuring field (ROI) incorrectly positioned.	Correct the measuring field position (ROI) in configuration mode 4.	Page 199
	Suspension system moved during focusing.	Do not move suspension system during focusing.	
	No object in focusing range	Reposition surgical microscope.	
	No object with sufficient contrast in focusing range	Reposition surgical microscope or focus manually.	
	Incorrect entry for camera orientation (left/right), menu item "AF-CCD Position"	Activate the Video-AF mode and change the video camera orientation.	Page 189
	Incorrect entry for the video focal length in menu item "AF-V-FOC."	Activate configuration mode 4 and enter the correct focal length.	Page 199
	Video camera not correctly oriented	Turn video camera so that the video image corresponds to main observer's viewing direction.	
Focused video image on monitor, but unfocused image in surgical microscope	Setting of diopter rings on eyepieces has been changed	Set diopter rings to zero or to the correct value.	
Focused image in surgical microscope, but unfocused video image on monitor	Focusing of video camera has not been matched to focusing of surgical microscope.	Focus the microscope image, then the video image.	

Fault	Possible cause	Remedy	Cross-reference
Focusing cannot be activated	Different function assigned to handgrip button 1 or 2	Activate configuration mode 1 and assign the AF (Autofocus) function to handgrip button 1 or 2.	Page 191
	Foot control panel button C or D configured with different function	Activate configuration mode 1 and assign the "AF" (Autofocus) function to foot control panel buttons C or D.	Page 190

Suspension system

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.	
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.	
Lamp brightness cannot be adjusted.	Manual mode is activated. (Yellow LED above the button is lit).	Switch off manual mode.	
Motorized focusing and zoom functions of surgical microscope are inoperative.	Manual mode is activated. (Yellow LED above the button is lit).	Switch off manual mode.	
Suspension arm is in horizontal position and cannot be moved upwards or downwards.	Suspension arm still locked.	Pull out locking device and turn through 180°.	
 XXX In combination with three successive beeps and display of the error code (XXX).	– Error message during the software check after power-on of the suspension system. – Error message for an internal system error.	Manual operation is possible. Contact service dept., specify error code and serial No.	
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 tilt axis.	

Xenon 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 set in such a way that illumination can be switched on using foot control panel.	Switch on illumination using foot control panel (button A or B).	
	Defective xenon lamp.	Switch to backup lamp.	
		Keep a new xenon backup lamp module ready at hand.	
	Xenon lamp module has no contact.	Insert xenon lamp module as far as it will go.	
	Failure of floor stand electronics.	Illuminate surgical field using an OR illuminator. Contact service.	
Insufficient illumination of surgical field.	Brightness level set too low.	Adjust brightness on suspension system's display field or using foot control panel.	
	Aged xenon lamp.	Switch off the illumination. Illuminate surgical field using an OR illuminator.	
		Change xenon lamp module.	Page 222
Surgical field illumination too bright.	Brightness level set too high.	Adjust brightness on suspension system or foot control panel.	
		Switch off the illumination. Illuminate surgical field using an OR illuminator. Contact service.	
No surgical field illumination.	Xenon lamp does not ignite.	Switch off the illumination. Illuminate surgical field using an OR illuminator. Contact service.	

Problem	Possible cause	Remedy	See
Xenon lamp is lit, but beep sounds intermittently.	Defective lamp control system.	Switch off the illumination. Illuminate surgical field using an OR illuminator. Contact service.	Page 181

Video monitor

Problem	Possible cause	Remedy	See
No image display.	Main switch is switched off.	Switch on the main switch.	
	Power cable not correctly plugged in.	Plug in the power cable.	
Displayed message "NO SIGNAL"	No signal source connected.	Connect a signal source.	
	No camera connected.	Connect the camera.	
	Connected video cable is defective.	Connect an intact video cable.	
Image is not centered.	A signal source is present on the VGA port, and no automatic image adjustment has been performed.	Perform automatic image adjustment.	Page 106
Image is too dark or too bright.	A signal source is present on the VGA port, and no automatic image adjustment has been performed.	Perform automatic image adjustment.	Page 106

Care and Maintenance

Care of the device

Cleaning

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 of the optics or by a fingerprint. 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 objective lenses, eyepieces and accessories in dust-free cases when they are not being used.

Clean the exterior surfaces of the optical components (eyepieces, objective lenses) only when necessary:

- Do not use any aggressive or abrasive cleaning agents.
- Remove dust from the optical surfaces using a squeeze blower or a clean, grease-free brush.

For the regular cleaning of objective lenses and eyepieces of the surgical microscope, we recommend the optics cleaning set available from ZEISS. For the catalog number, please see the section "System data - Ordering data".

Prevention of fogging

To protect the eyepiece optics from fogging, we recommend using an anti-fogging agent. 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 eyepiece optics. They also clean the eyepiece optics and protect them from dirt, grease, dust, fluff and fingerprints.

Cleaning mechanical surfaces

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

Clean off any residue using 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 and hand grips which can be sterilized in autoclaves. For detailed information on sterilization please see the enclosed instructions "Preparation of resterilizable products" for the respective asepsis set.

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

- When draping the system, make sure there is enough slack in the drapes to allow for movement of the microscope carrier and surgical microscope.
- Do not cover any ventilation slots to permit sufficient cooling of the lamps and avoid lamp failure.

Disinfection

NOTE

Risk of damaging the paint on the device!

- Use a disinfectant based on aldehyde or alcohol. The addition of quaternary compounds is acceptable.
  To avoid damaging the surfaces, do not use any disinfecting components other than those specified below.

The maximum concentrations are:

– For alcohol (tested with 2 propanol): 60 %

– For aldehyde (tested with glutaraldehyde): 2 %

– For quaternary compounds (tested with DDAC): 0.2 %

Changing the xenon lamp module

CAUTION

Risk of injury caused by lamp rupture!

Lamp rupture (audible as a loud bang) may lead to jamming of the lamp module and/or failure of the electronics modules.

- Before opening the lamp housing, ensure that the device is moved to a position in which possibly falling particles cannot put the patient or user at risk.
- Do not continue using the system if the lamp module is jammed or the illumination is no longer operational due to defective electronics modules. Contact our service department.

NOTE

Injury caused by improper handling!

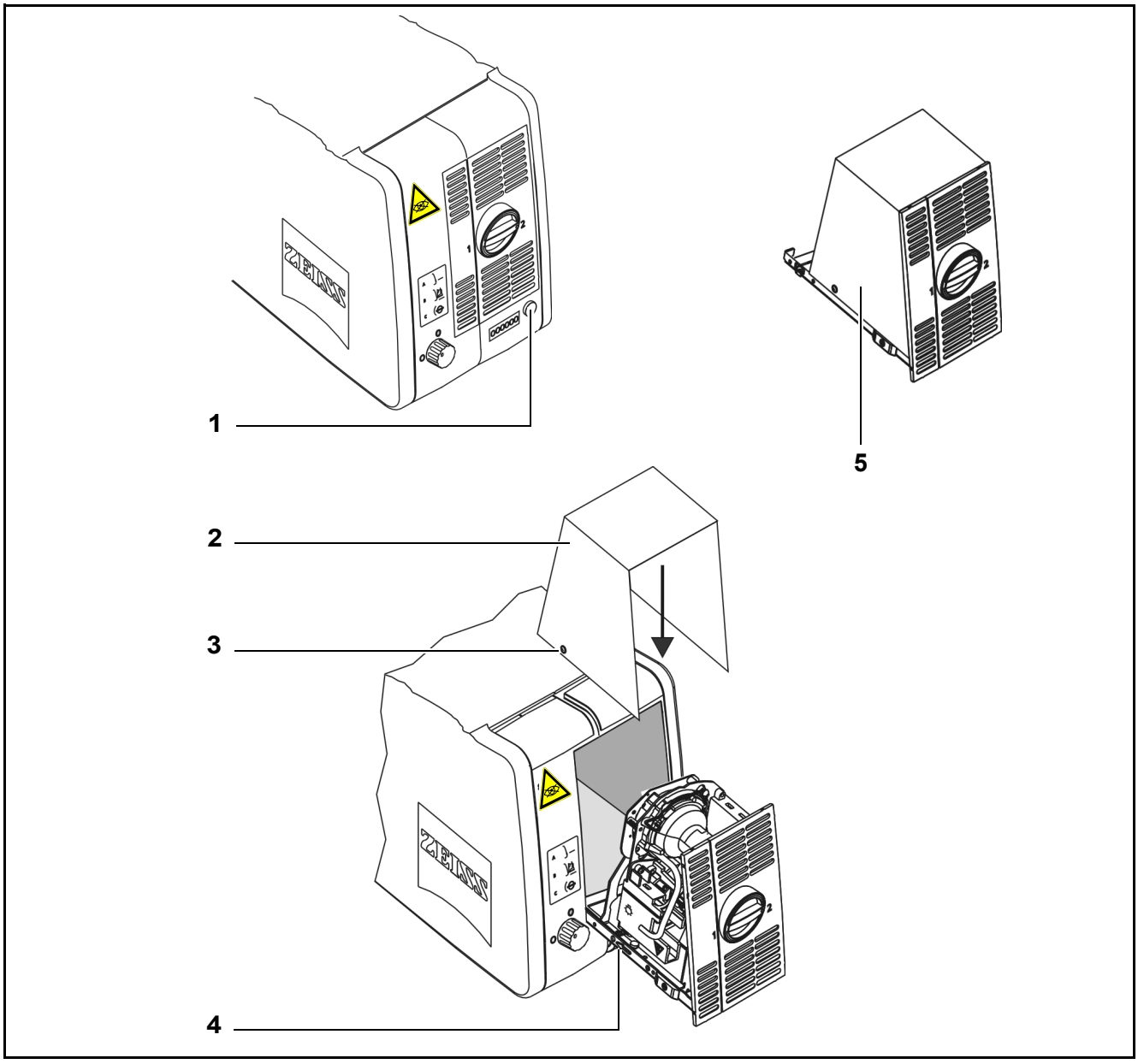
Improper handling of the xenon lamp may lead to damage or injury.

- The lamp module must only be changed by appropriately trained personnel.

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 case of malfunction, the high pressure inside the hot lamp may cause the lamp to burst. The hot surface of the xenon lamp may also cause burns.
- 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, Bolt (3) must engage in hole (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 packaging of the new lamp module. Fill in the enclosed return card and send the old lamp module to the nearest Zeiss service representative.

- Only use the original transport case (2), as it also provides explosion protection should Xenon lamps be defective.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Balancing the monitor arm

If the video monitor does not remain in place in every position required, the following readjustments can be performed.

Increasing the friction of left/right movement of the carrier arm.

- Slightly tighten screw (1) of the carrier arm by turning it clockwise using an M5 hex key.

Increasing the friction of left/right movement of the suspension arm.

- Remove plastic cover (2) on the suspension arm joint.
- Loosen securing screw (4) on the carrier arm by turning it counterclockwise using an M2.5 hex key.
- Tighten adjustment screw (3) of the suspension arm by turning it clockwise until the required friction has been obtained.
- Firmly retighten securing screw (4) on the carrier arm by turning it clockwise using an M2.5 hex key.
- Reattach plastic cover (2).

Readjusting the gas pressure spring

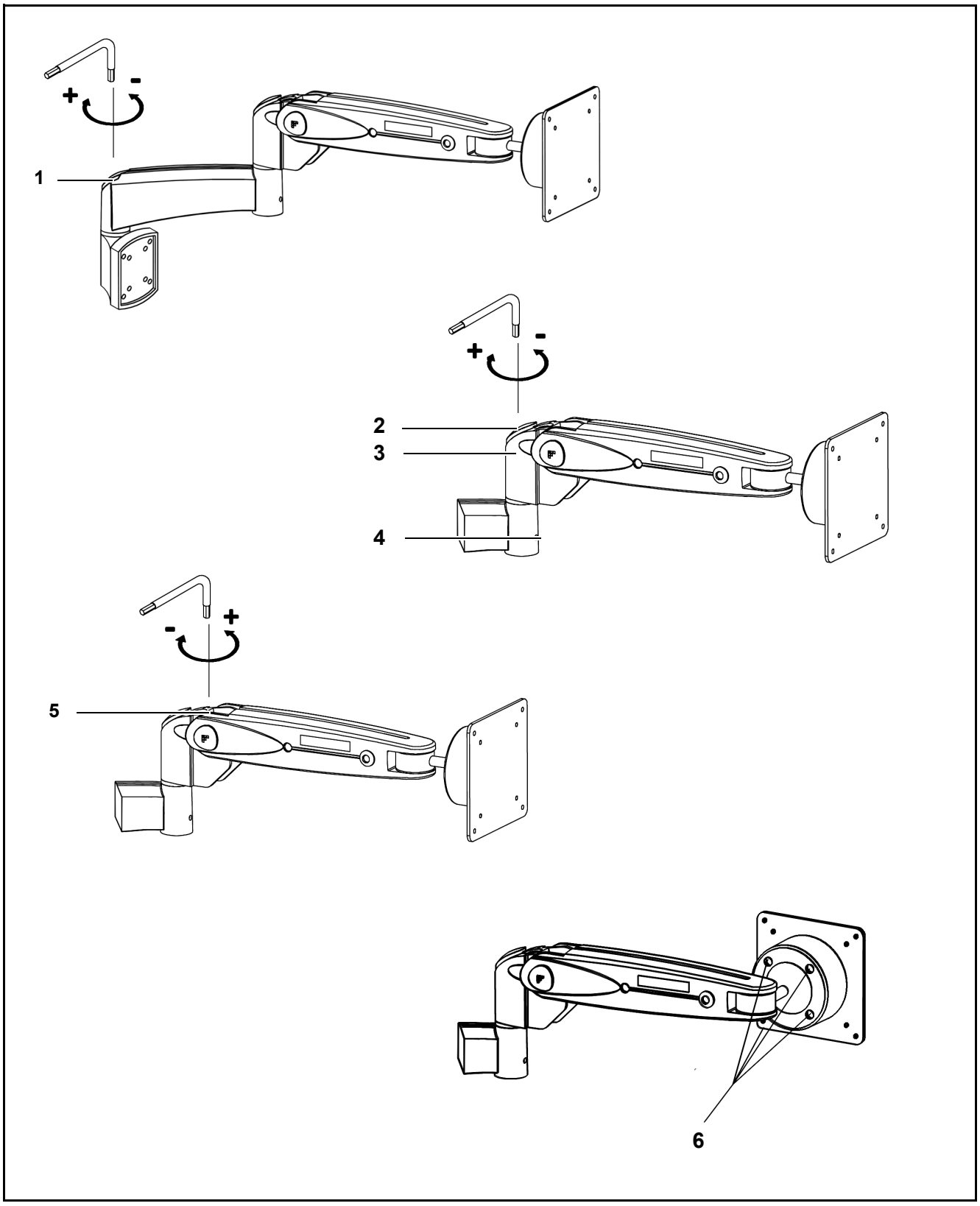
- For correct adjustment of the gas pressure spring, align the carrier and suspension arms in a horizontal position.
- Tighten setting screw (5) of the gas pressure spring by turning it **counterclockwise** with an M5 hex key until the suspension arm with the video monitor no longer moves downward by itself.

If the suspension arm with the video monitor continues to move downward, the gas pressure spring is defective.

- Please contact our service department.

Adjusting the friction of the video monitor's movement at the ball joint

- Tighten all of the four securing screws (6) of the ball joint by turning them clockwise until the video monitor remains in the required position.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6

Spare parts

Surgical microscope

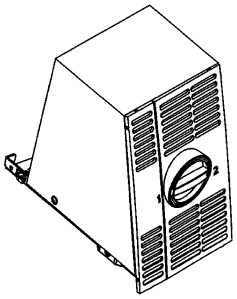
Description	Cat. no.
Light guide, 2.5 m long, with 90° adapter	303481-9225-000

Video

Description	Cat. no.
Y/C connection cable, 2 m long (2x)	301687-9102-000
Y/C extension cable, 12.5 m long	301687-9110-000
BNC (VBS) connection cable, 10 m long (2x)	301687-9101-000
Y/C connection cable (plug - plug), 5 m long	000000-0300-281
Y/C extension cable, 5 m long	HAMA Cat. no. 42734

Suspension systems - xenon illumination system

Xenon 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)	304977-9036-000

Technical safety check

CAUTION

Risk of injury!

- Make sure that the regular technical safety checks required for this system in accordance with the applicable national regulations are performed on schedule and to the stipulated extent.

To prevent any impairment of the system's safety as a result of ageing, wear, etc., the organization operating the system must ensure, in accordance with the applicable national regulations, that the regular technical safety checks defined for this system are performed on schedule and to the stipulated extent.

The safety checks must only be performed by the manufacturer or qualified personnel.
At a minimum, the scope of the safety checks of the system should comprise the following points:

– Availability of the Instructions for Use

– Visual inspection of the system and accessories for damage and legibility of the labels

– Leakage current test

– Test of the protective ground conductor

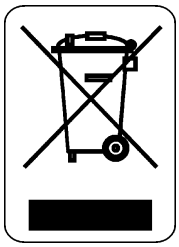
– Function and wear test of the steerable casters and locking tabs

– Function test of all switches, buttons, sockets and indicator lamps of the system

– Function test of manual mode without patient, every 6 months at the minimum

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.

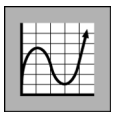
For end customers in the European Union

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.

System Data



Technical data

Surgical microscope

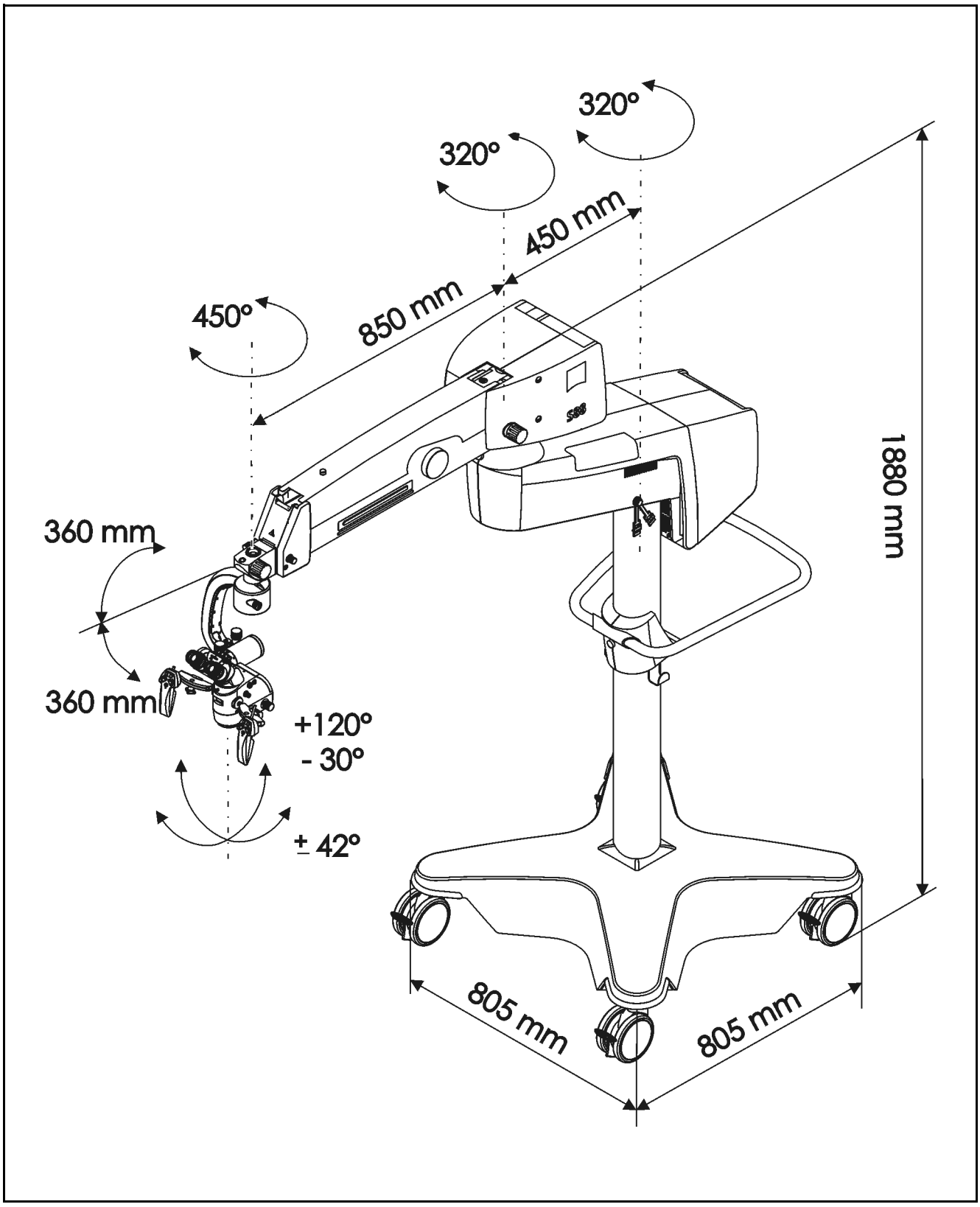
Component	Features
Magnification	Motorized zoom system, zoom ratio 1:6, magnification factor γ = 0.4x - 2.4x.
Total magnification with 10x eyepiece:	2.4x - 14.6x at a working distance of 200 mm 1.5x - 8.7x at a working distance of 415 mm
Total magnification with 12.5x eyepiece:	3.0x - 18.2x at a working distance of 200 mm 1.9x - 10.9x at a working distance of 415 mm
Fields of view with 10x eyepiece:	14 mm - 84 mm at a working distance of 200 mm 23 mm - 41 mm at a working distance of 415 mm
Fields of view with 12.5x eyepiece:	12 mm - 73 mm at a working distance of 200 mm 20 mm - 116 mm at a working distance of 415 mm
Focusing	Continuous motorized focusing via integrated Varioskop Focusing range 200 mm to 415 mm
Focal lengths f	at a working distance of 200 mm:f = 279 mm, at a working distance of 300 mm: f = 366 mm, at a working distance of 415 mm: f = 467 mm
Illuminated-field diameter	at a working distance of 200 mm min. 11 mm / max. 95 mm at a working distance of 415 mm min. 13 mm / max. 165 mm
Tubes / eyepieces	180° tiltable binocular tube, f = 170 mm 10x widefield eyepieces (option: 12.5x) with magnetic coupling
Weight	8.80 kg, OPMI Vario with standard suspension system (excl. tube and eyepieces) 12.25 kg, OPMI Vario with X-Y coupling (excl. tube and eyepieces)

Suspension systems

S88 floor stand

Mechanics

Component	Features
Suspension arm	Length: 850 mm Swivel angle: 320° Vertical lift: ±360 mm
Carrier arm	Length: 450 mm Swivel angle: 320°
Coupling	Swivel angle: 450°
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°
450 mm
850 mm
450°
1880 mm
360 mm
360 mm
+120°
- 30°
± 42°
805 mm
805 mm

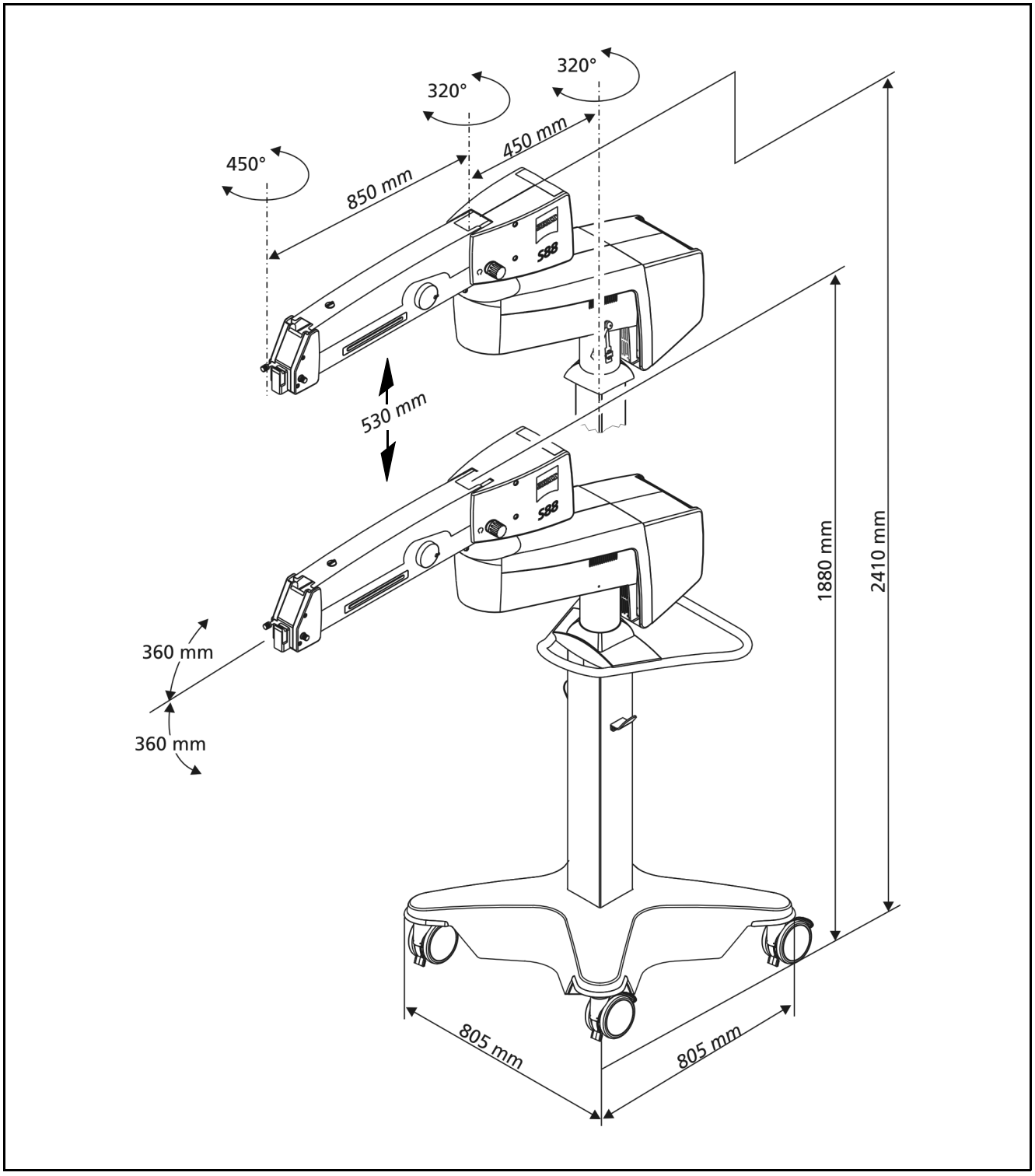
S88 floor stand with lifting column

Mechanics

Component	Features
Suspension arm	Length: 850 mm Swivel angle: 320° Vertical lift: ±360 mm
Carrier arm	Length: 450 mm Swivel angle: 320°
Coupling	Swivel angle: 450°
Stand height	1880 mm ... 2410 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. 240 kg

Technical data of lifting column

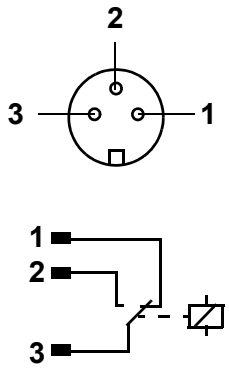
Rated voltage	24 VDC
Current consumption	5 A
Vertical lift, total	530 mm
Lifting force	2000 N
Lifting speed	5.5 mm/sec
Interval (operation / pause)	1 min / 9 min


320°
320°
450°
450 mm
850 mm
530 mm
360 mm
360 mm
1880 mm
2410 mm
805 mm
805 mm

Electrical data of S88 floor stand

Power connection	Only connect the suspension system to wall outlets which are provided with a properly connected protective ground conductor.
Rated voltage	115 V~(100 - 120 V~) 230 V~ (220 - 240 V~)
Current consumption	115 V~ max.1000 VA 230 V~ max. 2200 VA
Rated frequency	50...60 Hz
Fuses	Automatic circuit breaker
Electrical outputs	– Power output socket (115/230 V~) for medical devices with following power consumption: 115 V≒ max. 400 VA 230 V≒ max. 800 VA – Power output socket (115/230 V~) (using power switch) for medical devices with following power consumption: 115 V≒ max. 60 VA 230 V≒ max. 700 VA – X-Y coupling – Surgical microscope – Remote socket for an external signal with max. 24 V/0.5 A.

Remote socket
View of connector side



The system has been designed for continuous operation.

Xenon illumination system

Fiber optic illumination	Xenon short-arc reflector lamp Color temperature: approx. 5000 K Rated power: approx. 180 W Backup lamp in lamp housing, manually selectable.

Video monitor

LCD display	TFT color monitor
Screen size	15"
Resolution	1024 x 768
Reaction time	25 ms
Brightness	200 cd/m^2
Contrast ratio	200:1
Display colors	16.7 million
Sampling rate	Horizontal: 30 - 80 KHz, vertical: 50 - 75 Hz
Viewing angles	Horizontal: 178°, vertical: 178°
Video input ports	DVI, VGA, S-Video, cVBS (Video), Component
Power input	24 VDC ± 20 %
Power consumption	28 W
Weight	3.2 kg
Dimensions (H x W x D)	286 x 348 x 51 mm

S-Video mode, Composite mode

Resolution	Refresh rate (HZ)	Description
640 x 480	50	-
640 x 480	60	NTSC
720 x 576	50	PAL
720 x 576	60	-

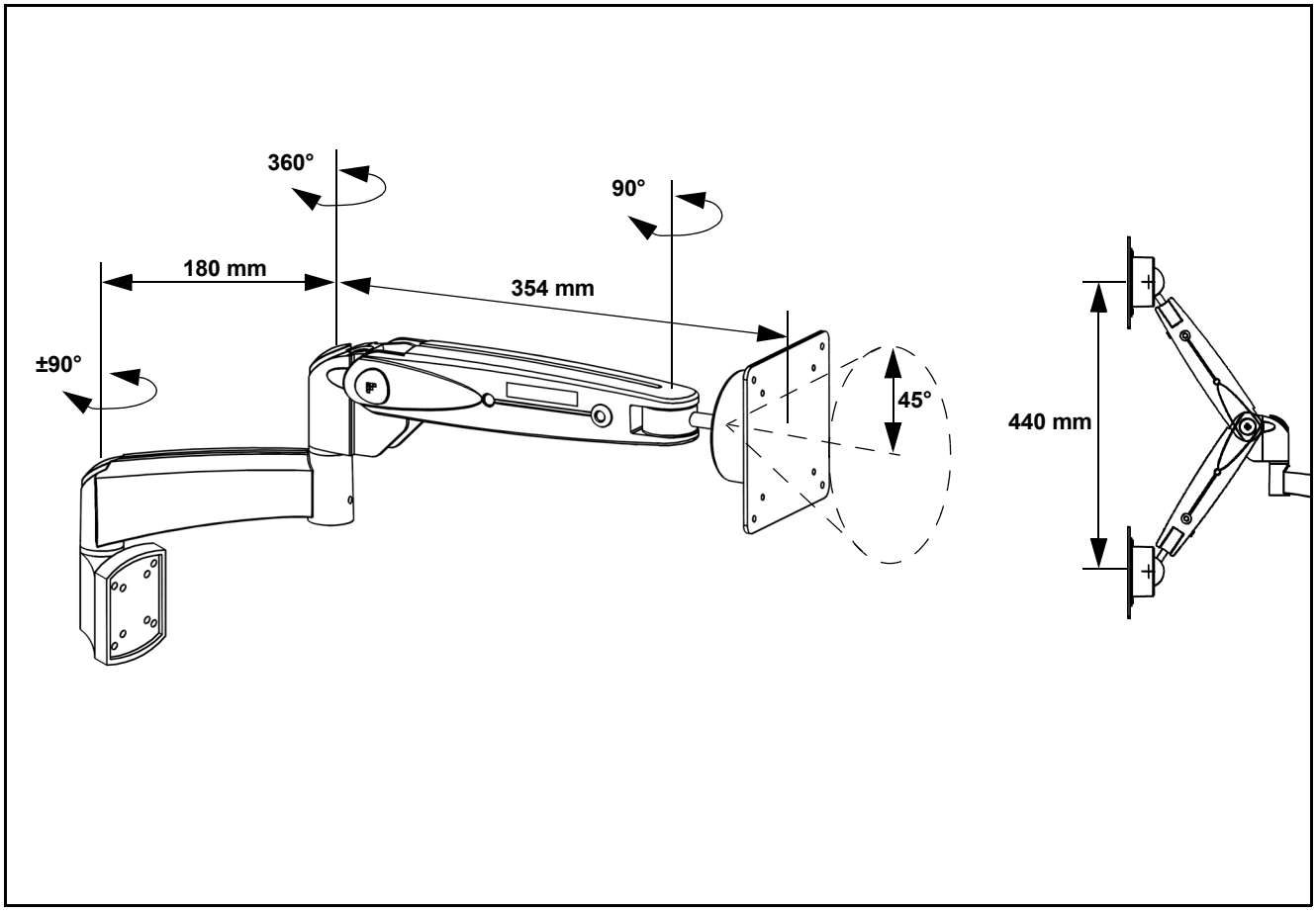
DVI mode,VGA mode, Component mode

Resolution	Refresh rate (HZ)	Description
640 x 480	50	-
640 x 480	60	-
720 x 576	50	-
720 x 576	60	-
800 x 600	50	-
800 x 600	60	VESA
800 x 600	70	VESA
800 x 600	75	VESA
1024 x 768	50	-
1024 x 768	60	VESA
1024 x 768	70	VESA
1024 x 768	75	VESA

Carrier arm for video monitor

Mechanics

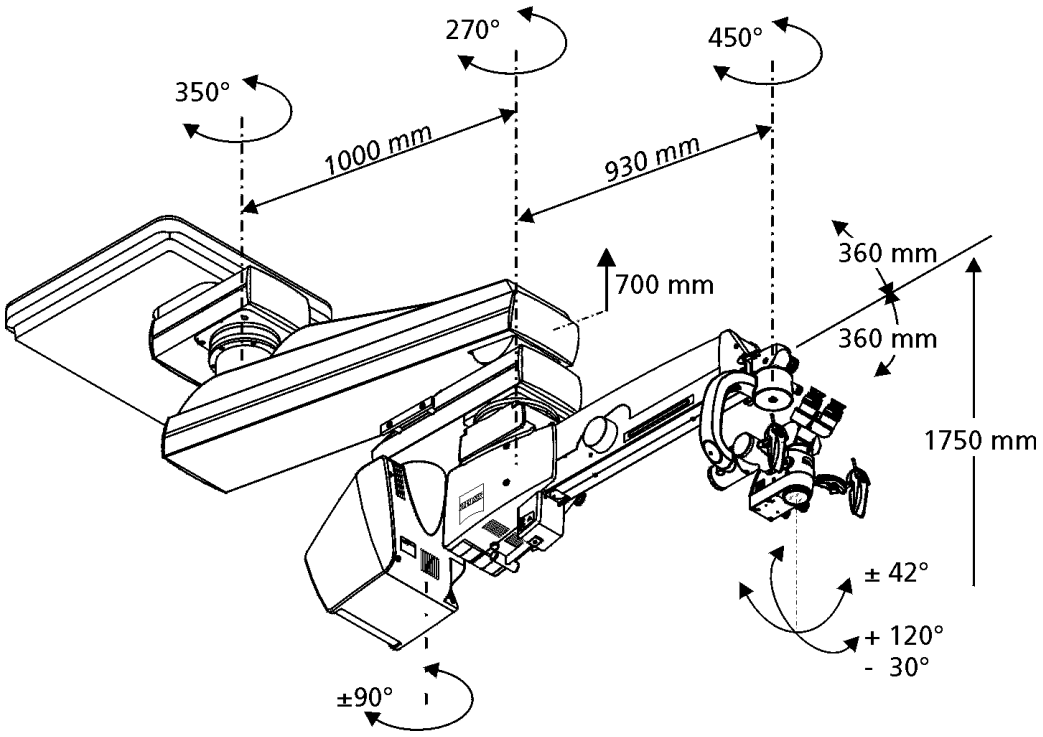
Component	Features
Suspension arm	length: 354mm
	swivel angle: 360°
	vertical lift: ±220mm
Carrier arm	length: 180 mm
	swivel angle: ±90°
Admissible max. load on the monitor arm	9.0kg
Total weight	Approx. 4.13kg



S8 ceiling mount

Mechanics

Component	Features
Suspension arm	Length: 930 mm Swivel angle: 270° Vertical lift: ±360 mm
Lift arm	Length: 1000 mm Swivel angle: 350°
Carrier arm	Swivel angle of control panel: 180° (±90°)
Coupling	Swivel angle: 450°
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

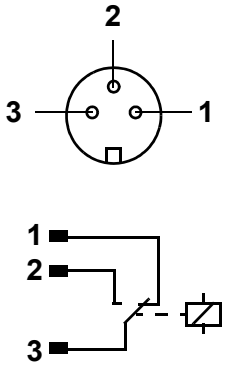

270°
450°
350°
1000 mm
930 mm
360 mm
700 mm
360 mm
1750 mm
± 42°
+ 120°
- 30°
±90°

Electrical data of S8 ceiling stand

Rated voltage	115 V~ (100 - 120 V~) 230 V~ (220 - 240 V~)
Current consumption	115 V: max. 750 VA 230 V: max. 750 VA
Rated frequency	50...60 Hz
Fuses	Automatic circuit breaker
Electrical outputs	– X-Y coupling – Surgical microscope – Remote socket for an external signal with max. 24 V/0.5 A.

The system has been designed for continuous operation.

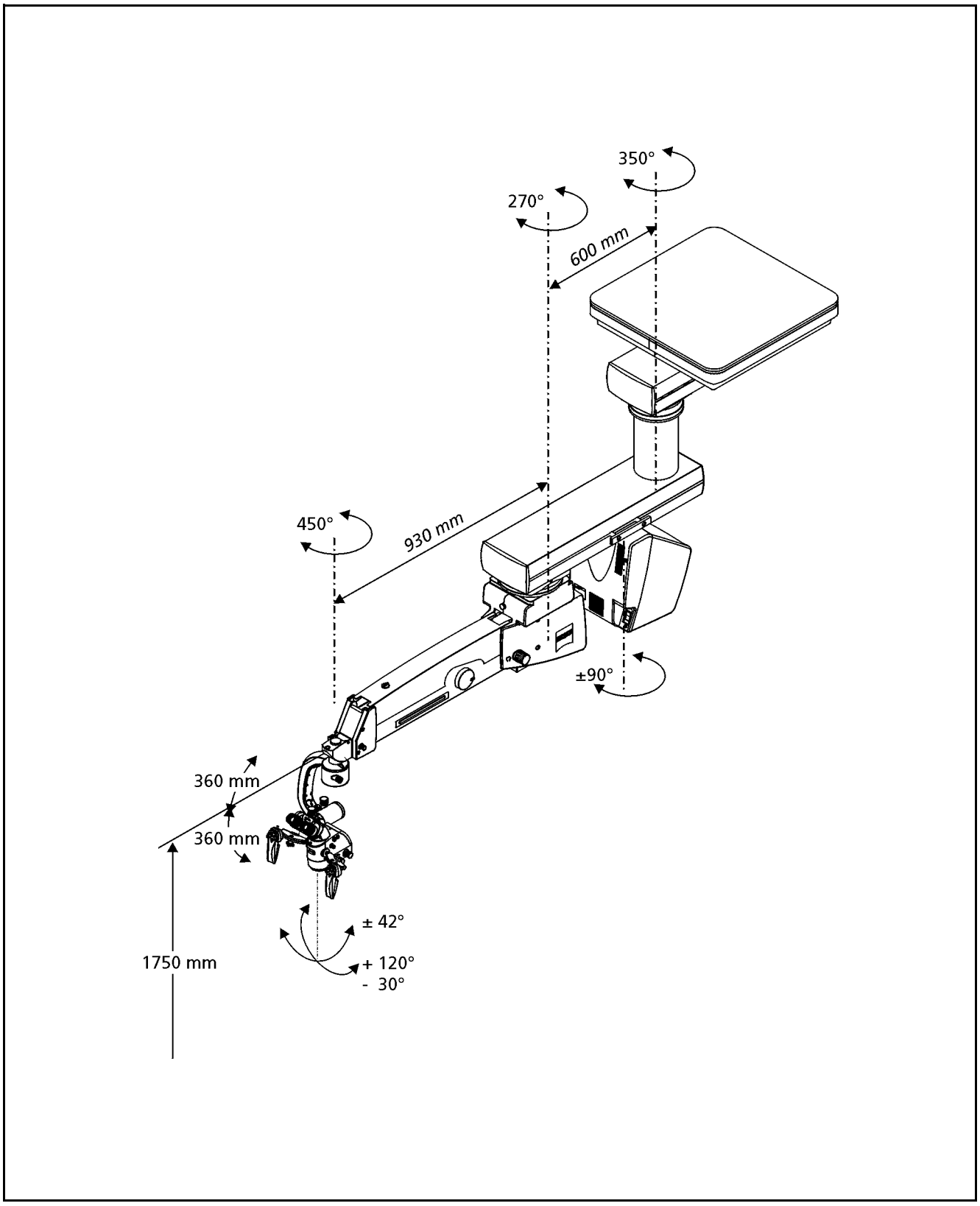
Remote socket
View of connector side



S81 ceiling mount

Mechanics

Component	Features
Suspension arm	Length: 930 mm Swivel angle: 270° Vertical lift: ±360 mm
Carrier arm	Length: 600 mm Swivel angle: 350° Swivel angle of control panel: 180° (±90°)
Coupling	Swivel angle: 450°
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

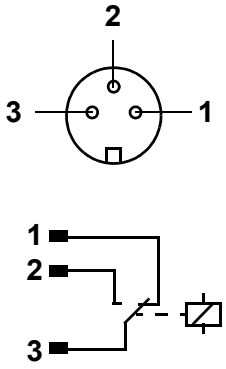

350°
270°
600 mm
450°
930 mm
±90°
360 mm
360 mm
± 42°
+ 120°
- 30°
1750 mm

Electrical data of S81 ceiling mount

Rated voltage	115 V~ (100 - 120 V~) 230 V~ (220 - 240 V~)
Current consumption	230 V~ max. 750 VA 120 V~ max. 750 VA
Rated frequency	50...60 Hz
Fuses	Automatic circuit breaker
Electrical outputs	– X-Y coupling – Surgical microscope – Remote socket for an external signal with max. 24 V/0.5 A.

The system has been designed for continuous operation.

Remote socket
View of connector side



Ordering data

Only operate the system with the accessories included in the delivery package and approved by Carl Zeiss. You will find the contact responsible for orders in your country on this website:

www.meditec.zeiss.com

The product configurations, accessories and spare parts that are applicable for authorized Carl Zeiss partners are stipulated by contract.
For more information, please contact your authorized Carl Zeiss partner.

Surgical microscope

Description	Weight [kg]	Cat. no.
Surgical microscope and suspension system	8.70	000000-1026-700
S8 coupling for OPMI Vario	0.80	000000-1026-772
S light guide, 2.5 m, with 90° adapter	-	303481-9225-000
Xenon illumination system for suspension systems S8 / S81 / S88	-	000000-1517-741
Dust cover, blue with Zeiss logo	-	000000-1055-278
Tiltable binocular tube, f = 170 mm, 180°	0.89	303791-0000-000
12.5x push-in widefield eyepiece, asph. (2x)	0.14	305543-9901-000

Suspension systems

Description	Cat. no.
S88 floor stand	000000-1154-525
S88 floor stand with lifting column	000000-1169-820
S8 ceiling mount	000000-1176-968
S81 ceiling mount	000000-1176-969

Tubes

Description	Cat. no.
Tiltable binocular tube, f = 170 mm, 180°	303791-0000-000
Tiltable binocular tube, f = 200 mm, 180°	303792-0000-000
Straight binocular tube, f = 170 mm	303765-0000-000
Folding tube, f = 170/260 mm,	303771-9020-000

Eyepieces

Description	Cat. No.
10x push-in widefield eyepiece	305542-0000-000
12.5x push-in widefield eyepiece, asph.	305543-9901-000

The eyepieces are also available with a focusing aid (1 eyepiece with "format" reticle).

Foot control panels

Description	Order number
Wireless foot control panel, 14 functions (FCP WL)	304970-9060-000
Wired foot control panel, 14 functions (FCP)	304970-9055-000
Cable for foot control panel (FCP and FCP WL), 3 m cable length (recommended for floor stand)	304970-8730-000
Cable for foot control panel (FCP and FCP WL), 6 m cable length (recommended for ceiling stand)	304970-8760-000
Wired foot control panel 2 (previous generation)	
Foot control panel 2 with 14 functions, 3 m cable, longitudinal configuration of focus and zoom	304979-9030-000
Foot control panel 2 with 14 functions, 3 m cable, transverse configuration of focus and zoom	304979-9035-000
Foot control panel 2 with 14 functions, 6 m cable, longitudinal configuration of focus and zoom	304979-9050-000
Foot control panel 2 with 14 functions, 6 m cable, transverse configuration of focus and zoom	304979-9055-000

Other accessories

Description	Order number
Stereo bridge	000000-1040-085
Stereo co-observation tube	000000-1063-869
Adapter with double iris diaphragm	303354-0000-000
Auxiliary lens for OPMI Vario + OPMI Neuro/NC 4 (for extending the focal length)	302580-9900-000
Instrument tray for S88 floor stand	000000-1352-729
SpeedFokus	000000-1227-873

Video accessories

For external video accessories for this surgical microscope, please refer to the separate product overview G-30-1888.

Asepsis

Description	Cat. no.
VisionGuard replacement lenses (sterile, 20/box)	306001-0000-000
Vision Guard lens protector (non-sterile, 10/box)	306002-0000-000
Zeiss sterile drapes, type 70, pack of 5	306070-0000-000
Zeiss sterile drapes, type 71, pack of 5	306071-0000-000
Zeiss sterile drapes, type 88, pack of 20	326088-0000-000
Set of sterilizable rubber caps for control knobs	305810-9008-000

Cleaning agents

Description	Cat. no.
Optics cleaning kit	000000-1216-071
Cleaning cloth for optics	304111-8200-000

Regulatory information

S88 / OPMI Vario

Electrical safety	The medical device complies with the requirements according to – IEC 60601-1:2005, – IEC 601-1:1988+A1:1991+A2:1995, – CAN/CSA-C22.2 No. 601.1-M90.
	Classification according to level of protection against electrical shock: Protection class 1
	Protection rating (acc. to IEC 60529): IP 20
Electromagnetic compatibility	The medical device is allocated to class A (acc. to IEC 61000-3-2) in line with IEC 60601-1-2:2007.
Classification	The medical device is allocated to class I in line with appendix IX of the Medical Device Directive 93/42/EEC.
CE label	The medical device meets the essential requirements stipulated in appendix I to the Medical Device Directive 93/42/EEC. In line with appendix XII of the Medical Device Directive 93/42/EEC the medical device is labeled with CE .

S8 / OPMI Vario

Electrical safety	The medical device complies with the requirements according to – IEC 60601-1:2005, – IEC 601-1:1988+A1:1991+A2:1995, – CAN/CSA-C22.2 No. 601.1-M90.
	Classification according to level of protection against electrical shock: Protection class 1
	Protection rating (acc. to IEC 60529): IP 20
Electromagnetic compatibility	The medical device is allocated to class A (acc. to IEC 61000-3-2) in line with IEC 60601-1-2:2007.
Classification	The medical device is allocated to class I in line with appendix IX of the Medical Device Directive 93/42/EEC.
CE label	The medical device meets the essential requirements stipulated in appendix I to the Medical Device Directive 93/42/EEC. In line with appendix XII of the Medical Device Directive 93/42/EEC the medical device is labeled with CE .

S81 / OPMI Vario

Electrical safety	The medical device complies with the requirements according to – IEC 60601-1:2005, – IEC 601-1:1988+A1:1991+A2:1995, – CAN/CSA-C22.2 No. 601.1-M90.
	Classification according to level of protection against electrical shock: Protection class 1
	Protection rating (acc. to IEC 60529): IP 20
Electromagnetic compatibility	The medical device is allocated to class A (acc. to IEC 61000-3-2) in line with IEC 60601-1-2:2007.
Classification	The medical device is allocated to class I in line with appendix IX of the Medical Device Directive 93/42/EEC.
CE label	The medical device meets the essential requirements stipulated in appendix I to the Medical Device Directive 93/42/EEC. In line with appendix XII of the Medical Device Directive 93/42/EEC the medical device is labeled with CE

Ambient conditions

For operation

Feature	Permissible range
Temperature	+ 10 °C ... + 40 °C
Rel. Humidity	30 % ... 75 %
Air pressure	700 hPa ... 1060 hPa

For transportation and storage

Feature	Permissible range
Temperature	- 40 °C ... + 70 °C
Rel. humidity (without condensation)	10 % ... 90 %
Air pressure	500 hPa ... 1060 hPa

EMC (electromagnetic compatibility)

When using the device, the EMC precautions specified below must be observed.

- Only use spare parts approved by Carl Zeiss for this device.
- Do not use any portable or mobile RF communication equipment in the vicinity of the device as this may impair the device's function.
- 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.
- Please note the EMC guidelines on the following pages.

Electromagnetic interference

The S88, S8, S81 / OPMI Vario is intended for operation in an electromagnetic environment as specified below. The customer or the user of the device S88, S8, S81 / OPMI Vario is responsible for ensuring that the device is operated in such an environment.

Interference measurements	Compliance	Electromagnetic environment - guidelines
RF emissions as per CISPR11	Group 1	The S88, S8, S81 / OPMI Vario uses RF energy only for its internal functions. As a result, RF emissions are very low and unlikely to cause any interference in nearby electronic devices.
RF emissions as per CISPR11	Class A	The device S88, S8, S81 / OPMI Vario is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions as per IEC 61000-3-2	not applicable	
Emission of voltage fluctuations/flicker as per IEC 61000-3-3	not applicable	

Electromagnetic immunity for ME equipment and ME systems

The S88, S8, S81 / OPMI Vario is intended for operation in an electromagnetic environment as specified below. The customer or the user of the S88, S8, S81 / OPMI Vario is responsible for ensuring that the device is operated in such an environment.

Immunity tests	IEC 60601 - test level	Compliance level	Electromagnetic environment - guidelines
Electrostatic discharge (ESD) as per IEC 61000-4-2	±6 kV contact discharge ±8 kV air discharge	±6 kV contact discharge ±8 kV air discharge	Floors should be made of wood or concrete or be covered with ceramic tiles. If the flooring contains synthetic materials, the relative humidity must be at least 30 %.
Fast transient/ burst immunity as per IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	The quality of the supply voltage should be that of a typical business or hospital environment.
Surges as per IEC 61000-4-5	± 1 kV phase-to-neutral voltage ± 2 kV phase/neutral to ground voltage	± 1 kV phase-to-neutral voltage ± 2 kV phase/neutral to ground voltage	The quality of the supply voltage should be that of a typical business or hospital environment.
Voltage dips, short interruptions and voltage variations as per IEC 61000-4-11	< 5 % U_T (> 95 % dip of U_T) for 0.5 cycle 40 % U_T (60 % dip of U_T) for 5 cycles 70 % U_T (30 % dip of U_T) for 25 cycles < 5 % U_T (95 % dip of U_T) for 5s	< 5 % U_T (> 95 % dip of U_T) for 0.5 cycle 40 % U_T (60 % dip of U_T) for 5 cycles 70 % U_T (30 % dip of U_T) for 25 cycles < 5 % U_T (95 % dip of U_T) for 5s	The quality of the supply voltage should be that of a typical business or hospital environment. If the user of S88, S8, S81 / OPMI Vario requires continued function even in the event of interruptions in the power supply, we recommend to power the device from S88, S8, S81 / OPMI Vario an uninterruptible power supply or a battery.

Immunity tests	IEC 60601 - test level	Compliance level	Electromagnetic environment - guidelines
Power frequency (50/60 Hz) magnetic field as per IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels typical of business and hospital environments.

NOTE: U_T is the AC supply voltage prior to application of the test level.

Electromagnetic immunity for non-life-supporting ME equipment and ME systems

The S88, S8, S81 / OPMI Vario is intended for operation in an electromagnetic environment as specified below. The customer or the user of the S88, S8, S81 / OPMI Vario is responsible for ensuring that the device is operated in such an environment.

Immunity tests	IEC 60601 - test level	Compliance level	Electromagnetic environment - guidelines
			Portable and mobile radio communication equipment should not be used closer to the S88, S8, S81 / OPMI Vario, including cables, than the recommended safety distance that is calculated using the equation applicable to the transmission frequency involved. Recommended safety distance:
Conducted RF disturbances as per EN 61000-4-6	3 $V_{effective\ value}$ 150 kHz to 80 MHz	3 V	$d = 1,\ 17\sqrt{P}$
Radiated RF disturbances as per EN 61000-4-6	3 $V_{effective\ value}$ 80 MHz to 2.5 GHz	3 V/m	$d = 1,\ 17\sqrt{P}$ for 80 MHz to 800 MHz $d = 2,\ 33\sqrt{P}$ for 800 MHz to 2.5 GHz Where P is the output power rating of the transmitter in watts (W) according to the transmitter manufacturer's specifications and d is the recommended safety distance in meters (m). Field strengths from stationary RF transmitters, as determined by a site survey[a], should be less than the compliance level in all frequency ranges.[b] Interference may occur in the vicinity of equipment marked with the following symbol: 
Note 1	At 80 MHz and 800 MHz, the higher frequency range applies.		

Immunity tests	IEC 60601 - test level	Compliance level	Electromagnetic environment - guidelines
Note 2	These guidelines may not apply in all situations. Electromagnetic propagation is influenced by absorption and reflection by structures, objects and persons.		

[a] Field strengths of stationary transmitters such as base stations for mobile telephones and mobile land radio equipment, amateur radio stations, AM and FM radio broadcast and TV broadcast transmitters cannot be theoretically predicted accurately. To assess the electromagnetic environment with respect to stationary RF transmitters, a site study of the electromagnetic phenomena should be considered. If the measured field strength in the location where the device is used exceeds the compliance levels indicated above, the device should be monitored to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the ME equipment or ME system.

[b] Field strengths should be less than 3 V/m over the frequency range from 150 kHz to 80 MHz.

Recommended safety distances between portable and mobile RF communication equipment and the S88, S8, S81 / OPMI Vario

The S88, S8, S81 / OPMI Vario is intended for use in an electromagnetic environment in which RF disturbances are controlled. The customer or the user of S88, S8, S81 / OPMI Vario can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communication equipment (transmitters) and the S88, S8, S81 / OPMI Vario, depending on the output power of the communication equipment as specified below.

Rated output power of transmitter [W]	Separation distance depending on transmission frequency [m]		
	150 KHz to 80 MHz	**80 MHz to 800 MHz**	**800 MHz to 2.5 GHz**
	$d = 1,17\sqrt{P}$	$d = 1,17\sqrt{P}$	$d = 2,33\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.69	3.69	7.38
100	11.67	11.67	23.33

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be determined using the equation indicated for each column, with P being the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer's specifications.

NOTE 1	At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 2	These guidelines may not apply in all situations. Electromagnetic propagation is influenced by absorption and reflection by structures, objects and persons.

System combinations

The device S88, S8, S81 / OPMI Vario can be extended with the accessories offered by Carl Zeiss (see ordering data / accessories) to form an already tested system. This system combination has been approved by Carl Zeiss.

⚠ **CAUTION**

In accordance with IEC 601-1-1:1990 and IEC 60601-1:2005, section 16.2, this system's power output socket is a multi-outlet power strip that is intended for an ME system. Connecting electrical devices not approved by Carl Zeiss can lead to a reduced level of safety on the ME system. When assembling your ME system (Use of the power output socket), make sure to observe the requirements of IEC 60601-1:2005, Section 16, and note the following:

- Never place multiple connectors on the floor.
- Never connect any additional multiple connectors.
- Only connect compatible components to the system.
- Ensure that you do not exceed the max. permissible load capacity of the multiple connectors.
- Use multiple connectors only for components which are part of the system.

NOTE

Any additional equipment, or equipment other than those specified above, which is connected to this system must demonstrably comply with the applicable standards or directives (e.g. IEC 60950 Standard for data processing equipment). Furthermore, all the configurations must comply with the normative requirements for medical systems
(see IEC 601-1-1:1990 or IEC 60601-1:2005, Section 16).

Anyone connecting additional equipment to the approved device combination is a system configurer and as such responsible for compliance of the system with the normative requirements for systems. Please note that local legislation takes priority over the above-mentioned normative requirements. If you have any questions, please contact your local dealer or Carl Zeiss Service.

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