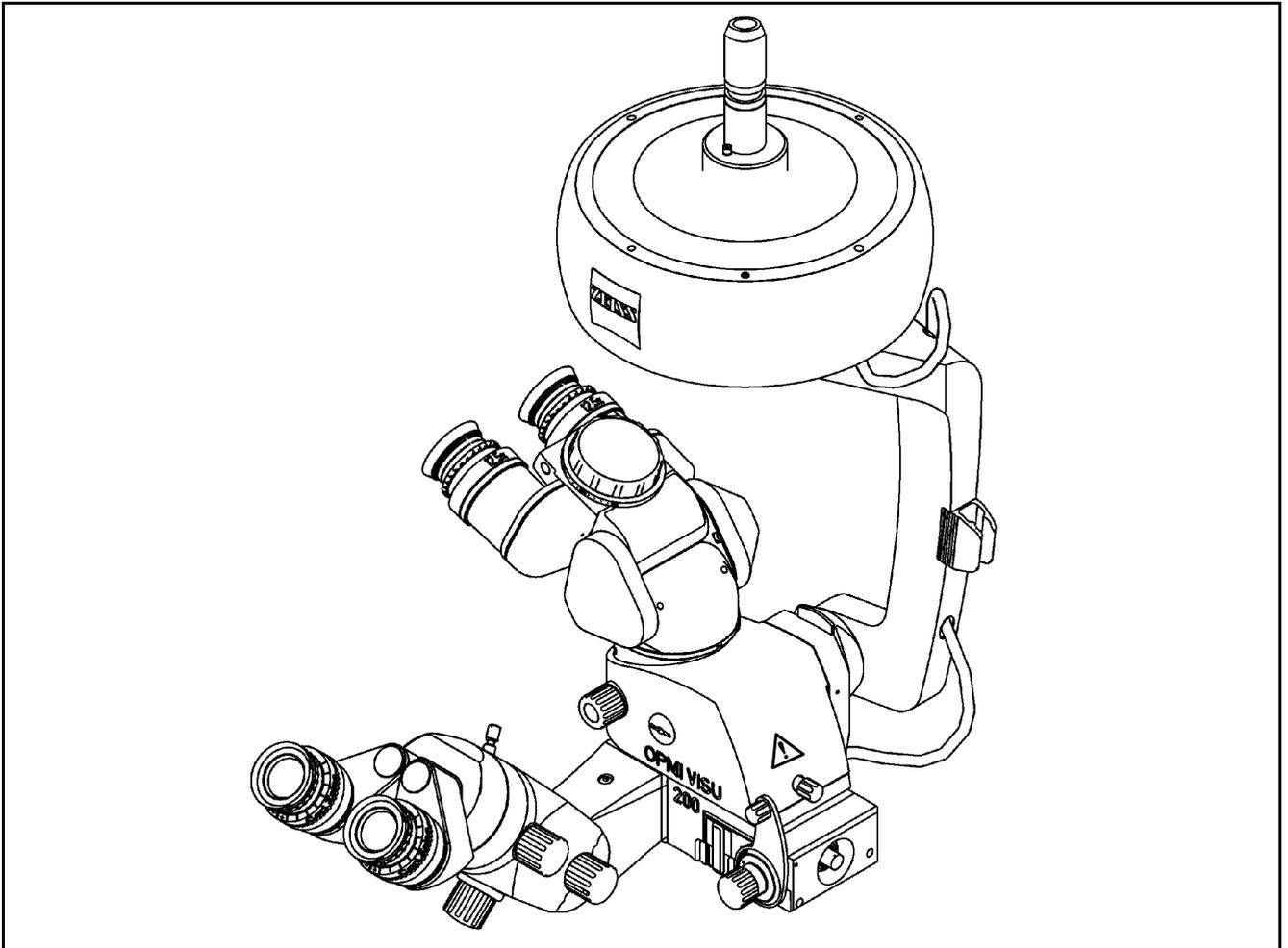


# OPMI® VISU 200 BrightFlex™ Surgical Microscope



Instructions for use

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# Functions at a glance

VISU 200 BrightFlex™ surgical microscope

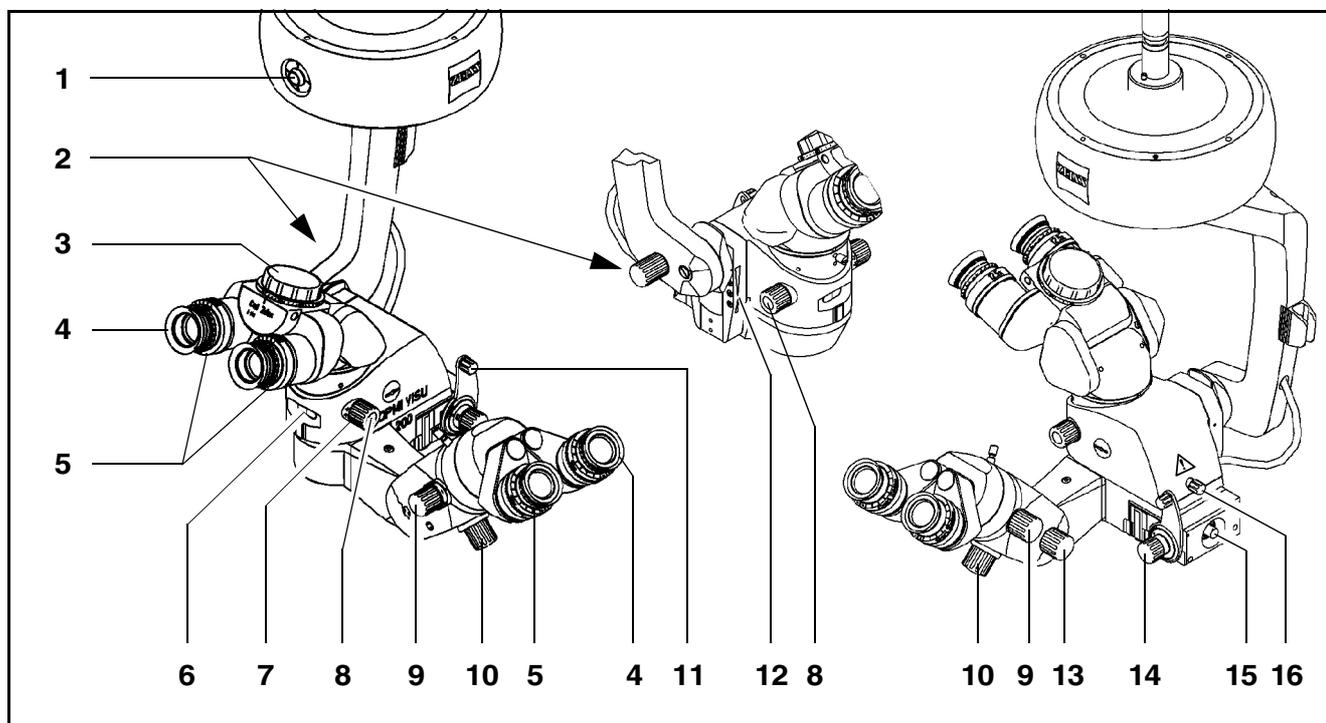
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Key to symbols

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## VISU 200 BrightFlex™ surgical microscope

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## Key to symbols

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



### **Warning!**

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



### **Caution:**

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



### Note:

The **hand** indicates hints on the use of the instrument or other tips for the user.

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# Safety

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The instrument described in this manual has been developed and tested in accordance with Carl Zeiss safety standards and with national and international regulations. A high degree of instrument safety is thus ensured.



We would like to inform you on the safety aspects involved in operating the instrument. This chapter contains a summary of the most important precautions to be observed.

Further safety notes are also contained in other parts of this user's manual; they are marked with a warning triangle containing an exclamation mark as shown here. Please pay special attention to these safety notes.

Safety is only ensured when this instrument is operated properly. Please read through this manual carefully before turning the instrument on. Also read through the user's manuals of the other equipment used with this instrument. You may obtain further information from our service organization or authorized representatives.

## Directives and standards

The instrument described in this manual has been designed in compliance with the following standards:

- EN
- IEC
- UL
- CSA

In accordance with Directive 93/42/EEC, the complete quality management system of the company Carl Zeiss has been certified by the DQS Deutsche Gesellschaft zur Zertifizierung von Managementsystemen mbH, a notified body, under registration number 250758 MR2.

- The instrument must be connected to a special emergency backup line supply in accordance with the regulations or directives which apply in your country.
- This is a class I instrument as defined by Directive 93/42 /EEC.
- Please observe all applicable accident prevention regulations.

## Notes on installation and use

### Safe working order

- Do not operate the equipment contained in the delivery package in
  - explosion-risk areas,
  - the presence of inflammable anesthetics or volatile solvents such as alcohol, benzine or similar chemicals.
- Do not station or use the instrument in damp rooms. Do not expose the instrument to water splashes, dripping water or sprayed water.
- Immediately unplug any equipment that gives off smoke, sparks or strange noises. Do not use the instrument until our service representative has repaired it.
- Do not place any fluid-filled containers on top of the instrument. Make sure that no fluids can seep into the instrument.
- Do not force cable connections. If the male and female parts do not readily connect, make sure that they are appropriate for one another. If any of the connectors are damaged, have our service representative repair them.
- Potential equalization: The instrument can be incorporated into potential equalization measures. For this purpose, contact our service department.
- Do not use a mobile phone in the vicinity of the equipment because the radio interference can cause the equipment to malfunction. The effects of radio interference on medical equipment depend on a number of various factors and are therefore entirely unforeseeable.
- Modifications and repairs on these instruments or instruments used with them may only be performed by our service representative or by other authorized persons.
- The manufacturer will not accept any liability for damage caused by unauthorized persons tampering with the instrument; this will also forfeit any rights to claim under warranty.
- Use this instrument only for the applications described.
- Only use the instrument with the accessories supplied. Should you wish to use other accessory equipment, make sure that Carl Zeiss or the equipment manufacturer has certified that its use will not impair the safety of instrument.

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

### **Requirements for operation**

Our service representative or a specialist authorized by us will install the instrument. Please make sure that the following requirements for operation remain fulfilled in the future:

- All mechanical connections (details in the user's manual) which are relevant to safety are properly connected and screw connections tightened.
- All cables and plugs are in good working condition.
- The voltage setting on the instrument conforms to the rated voltage of the line supply on site.
- The instrument is plugged into a power outlet which has a properly connected protective earth contact.
- The power cord being used is the one designed for use with this instrument.

### **Before every use and after re-equipping the instrument**

- Make sure that all "Requirements for operation" are fulfilled.
- Go through the checklist.
- Re-attach or close any covers, panels or caps which have been removed or opened.

- Pay special attention to warning symbols on the instrument (triangular warning signs with exclamation marks), labels and any parts such as screws or surfaces painted red.

**For every use of the instrument**

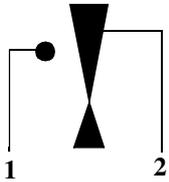
- Avoid looking directly into the light source, e.g. into the microscope objective lens or a light guide.
- Any kind of radiation has a detrimental effect on biological tissue. This also applies to the light illuminating the surgical field. Please therefore reduce the brightness and duration of illumination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

## When using a fundus imaging system (e.g. BIOM II)

When using a fundus imaging system (e.g. BIOM II from the company Oculus) which is usually installed between the surgical microscope and the patient, make sure that the patient is neither put at risk nor injured by the motorized focusing system or the movement of the stand arm.



### Risk of collision!



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

### Caution!

- With the fundus imaging system swung out of position, always position the microscope body in such a way that index dot (1) of the microscope's focus is in the middle of triangle (2) of the marking.
- Select a medium magnification (e.g. 1.0).
- Lower the surgical microscope towards the surgical field until you see the patient's cornea sharply defined.
- Turn the screw for limiting the downward movement clockwise as far as it will go.
- It is vital that you read the user's manual on the fundus imaging system (e.g. BIOM II from the company Oculus).

## Phototoxic retinal injury in eye surgery

### General

Several papers have been published dealing with the problems of phototoxicity during eye surgery. A comprehensive review of these publications reveals five aspects of particular concern:

- Illumination characteristics (spectral composition)
- Intensity of illumination
- Angle of illumination
- Focus of the light source
- Exposure time to light

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

### **Illumination characteristics (spectral composition)**

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

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

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

### **Intensity of illumination**

The majority of researchers suggest that the surgeon should use the lowest light intensity necessary to guarantee good viewing during surgery.

Carl Zeiss has addressed this concern by providing a device for continuously varying the brightness of the light source. This permits the surgeon to optimally adapt the light intensity at the patient's eye to the conditions existing in each case. Carl Zeiss strongly discourages the use of xenon or other high-intensity light sources in ophthalmology.

### **Angle of illumination**

A number of publications suggest that the microscope should be tilted to reduce the exposure of the macula to direct illumination.

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

- Tilting mechanism for the microscope body
- Oblique illumination with brightness control

### **Focus of the light source**

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

This is the reason why fiber optic illumination is used in surgical microscopes from Carl Zeiss.

### Exposure time to light

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

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

### Intensity scale

The intensity scale of our suspension system is calibrated in units of the "Spectrally weighted radiance for the photochemical hazard of the phakic eye ( $L_B$ )"

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

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

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

The value  $L_B = 500\text{mW/cm}^2 \text{ sr}$  is the reference value and is defined as 1.0 on the intensity scale of the suspension system as recommended in the ISO 10936-2 standard draft for surgical microscopes used in ophthalmic applications. At this reference value, photoretinitis might be expected to occur from the surgical microscope light source in a total retinal exposure time of 10 minutes. This applies to the exposure of a specific point on the retina with an uninterrupted illumination beam. In a cataract procedure, instruments such as the phacoemulsification handpiece, the

use of fluids in the eye, manipulation and movement of the eye, among other factors, result in the interruption of the illumination from the surgical microscope light source. Such factors would be expected to significantly extend the time at which photoretinitis might occur.

### In conclusion

Carl Zeiss recommends:

- Use of the GG 475 eye protection filter.
- Reduction of the illumination of the surgical area to the extent required for the patient's safety and for microscopic visualization.
- Tilting of the microscope body as required.
- Insertion of the retinal protection device.
- Maximum reduction of the exposure of the patient's eye to light from surrounding light sources.

These measures should help the surgeon to reduce the likelihood of phototoxic retinal injury.



#### Note:

The VISU 150 microscope always contains a UV blocking filter.

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

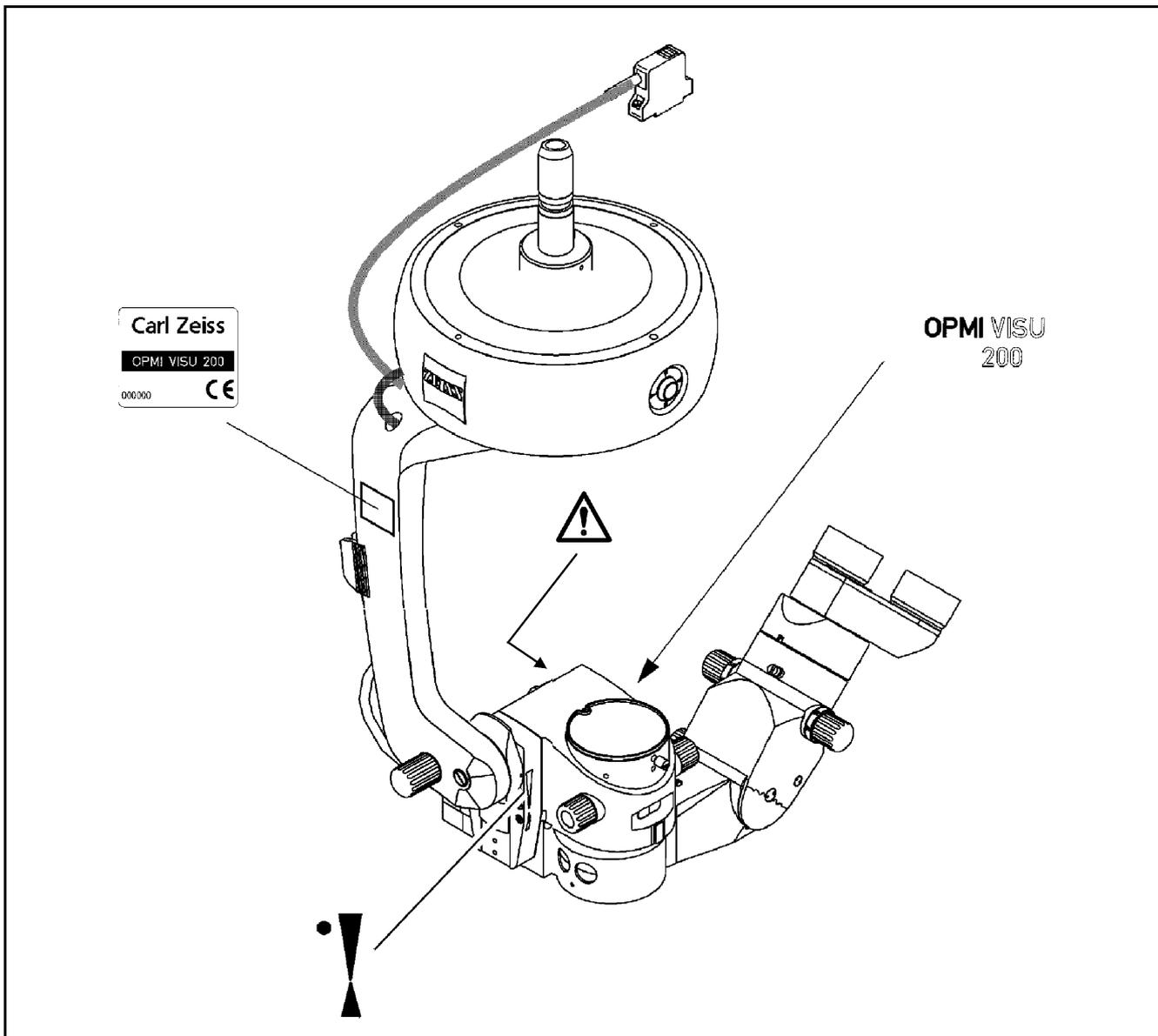
These measures help the surgeon to reduce the risk of phototoxic retinal injury.

## Warning labels and notes

**Caution:**

Observe all warning labels and notes!

If any label is missing on your instrument or has become illegible, please contact us or one of our authorized representatives. We will supply the missing labels.



# Description

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# VISU 200 BrightFlex™ Surgical Microscope

## Intended use

The VISU 200 BrightFlex™ surgical microscope has been designed for surgical procedures in the field of ophthalmology, i.e. the microscope meets the special requirements of this discipline.

## Description of the modules

The VISU surgical microscope is comprised of the following modules:

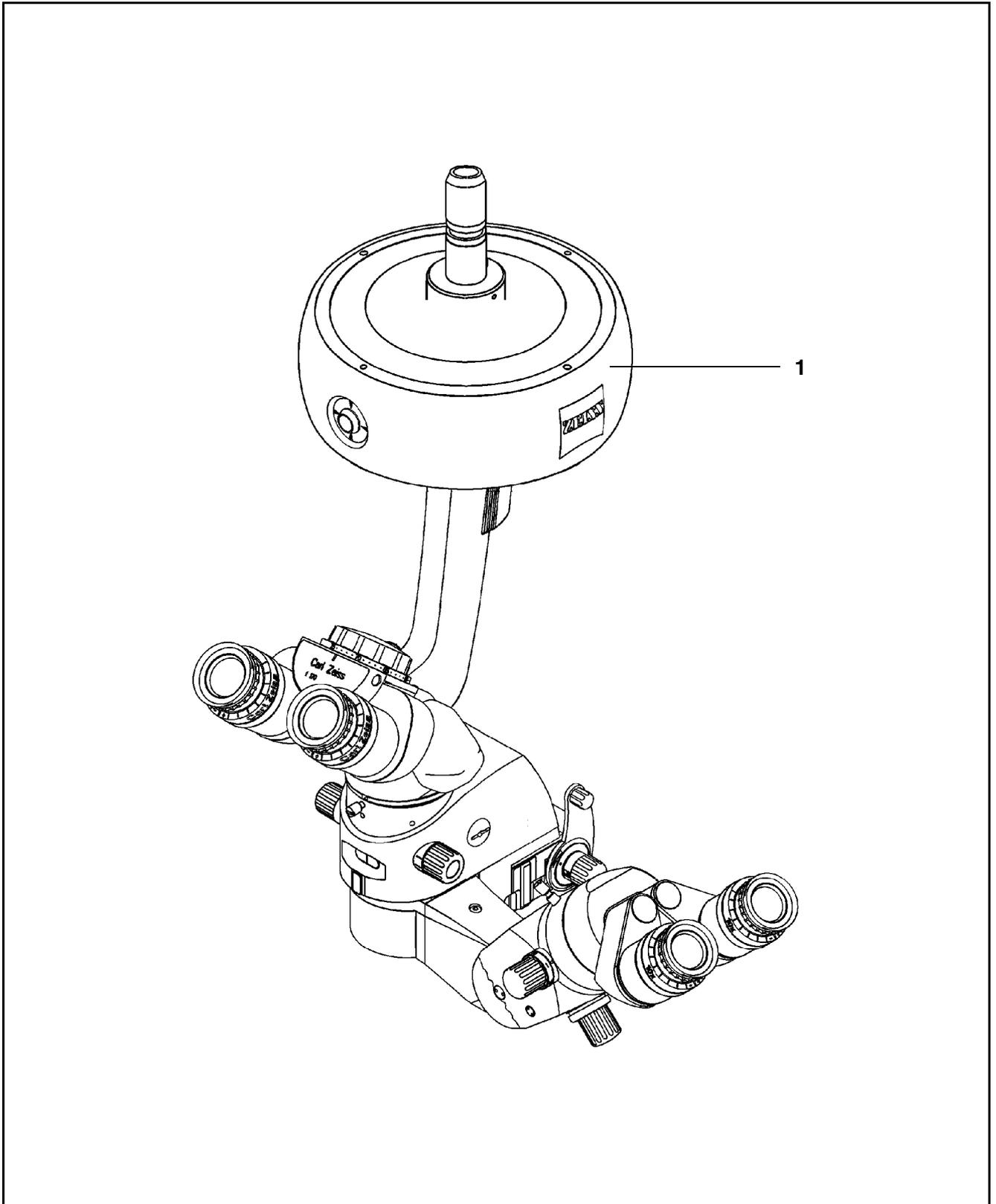
### 1 X-Y coupling

The X-Y coupling allows fine, motorized 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 the actuator button,

- the X-Y coupling adopts its center position,
- the focusing system of the surgical microscope is reset to its initial position and
- the zoom system will set a preselected magnification factor if the XYZ-RES function has been activated (possible with S8 suspension systems only).

You can also trigger the recentering movement using the foot control panel..



## 2 Support arm for the surgical microscope

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



### **Caution:**

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

## 3 Main microscope

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

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

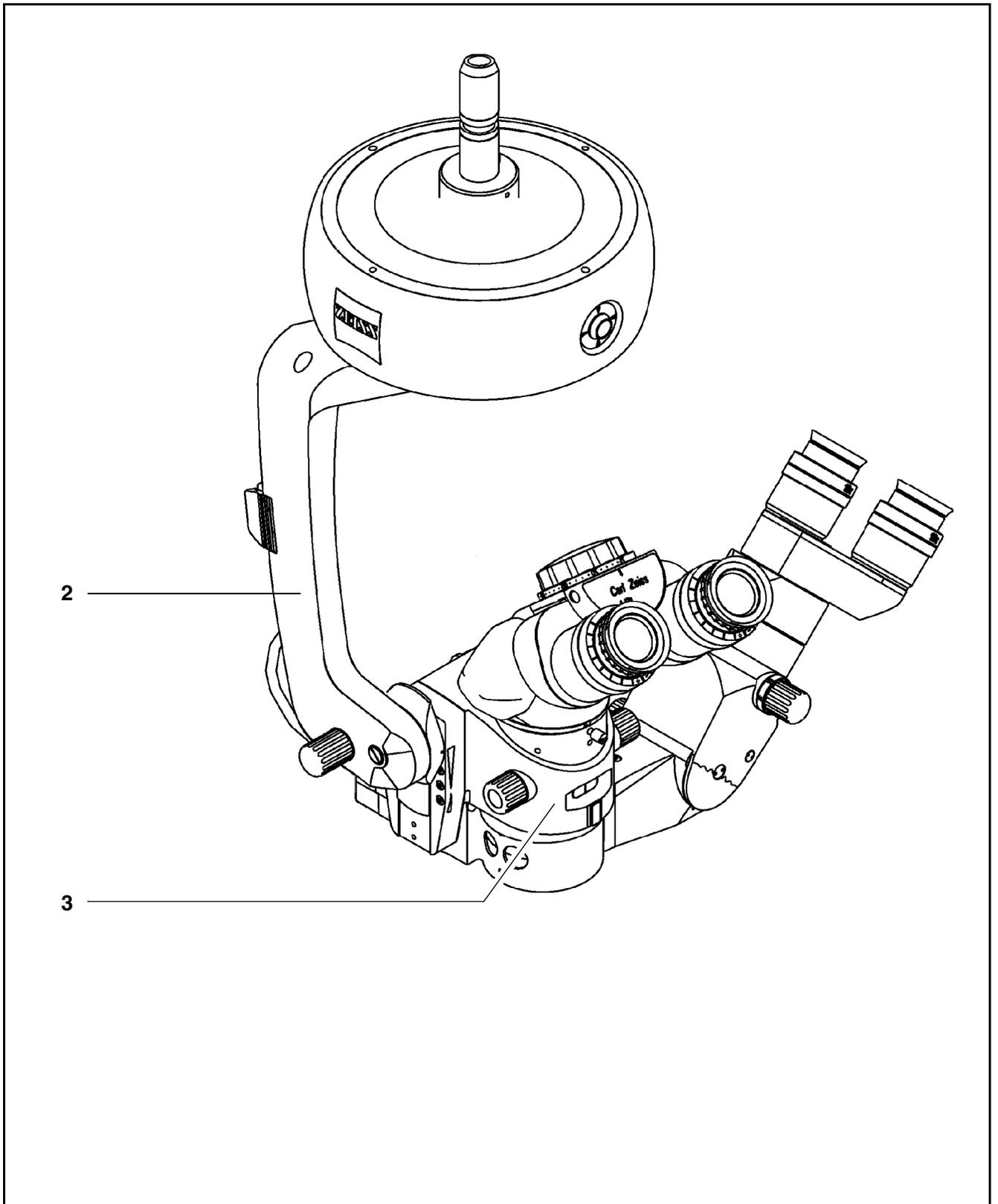
A 180° tiltable tube is used as a viewing device for the surgeon. The large tilt range allows work with minimum fatigue.

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

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

6° illumination can be continuously faded in. This allows the illumination intensity in the surgical field to be adjusted continuously, without changing the color of the light. The illumination of the surgical field at an angle of 6° produces an image with an outstanding impression of depth.

An additional illumination system produces an intensive red reflex even when the eye is decentered. The angle of illumination can be switched from +2° to -2°.



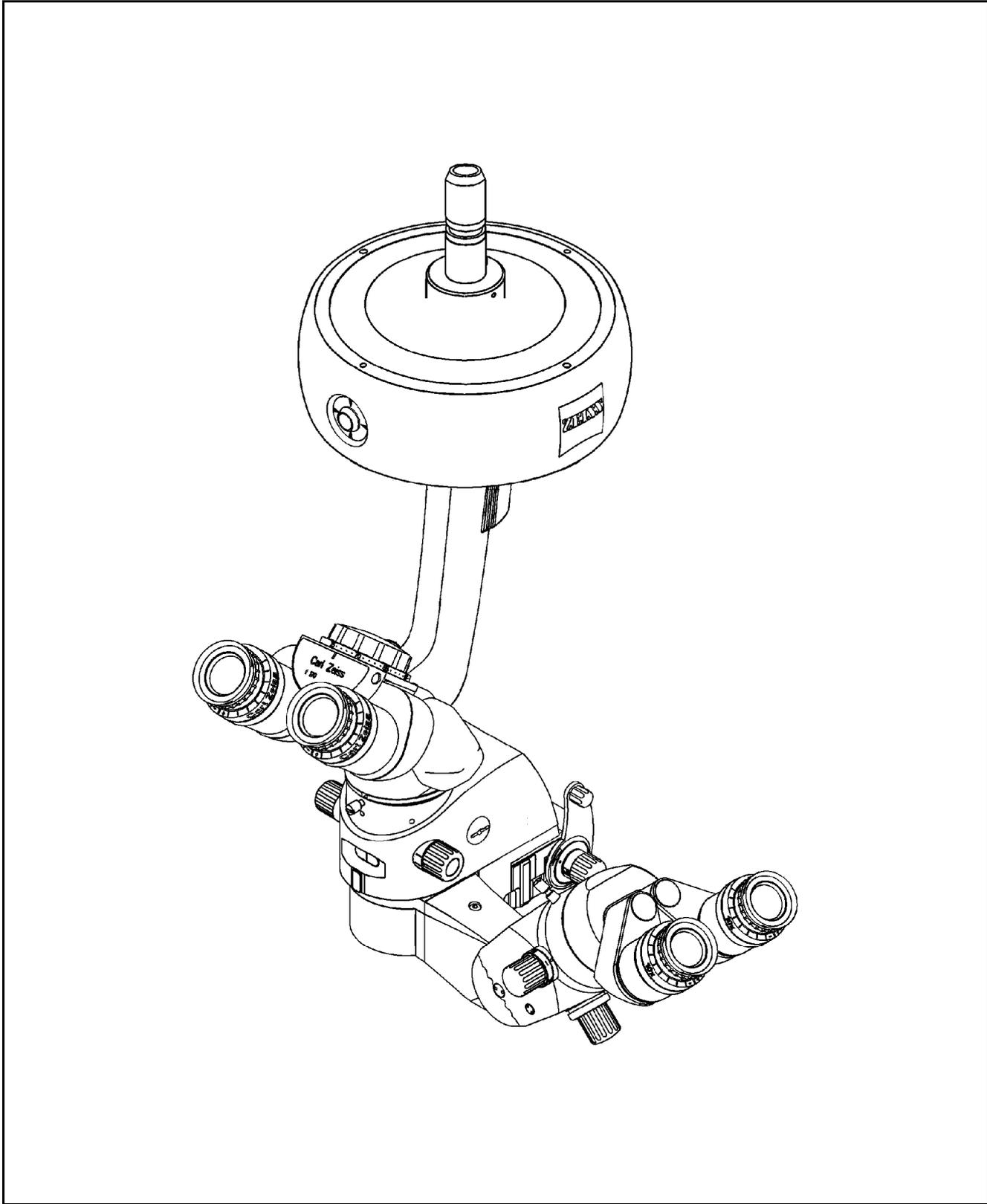
To protect the patient's eye against photo-retinitis, a retinal protection device is provided. This device can be swung into the illumination beam path, if no red reflex is required.

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

A video camera from our MediLive video camera line can be optionally connected to the VISU 200 surgical microscope. The light loss for the surgeon is only 20% and cannot be perceived subjectively.

**Caution!**

- Avoid looking directly into the light source, e.g. into the microscope objective lens or into the light guide!
- When selecting the brightness level for the patient's eye, always take care to keep the strain on the patient's eye to a minimum.
- If the red reflex is not necessary, move the retinal protection device into the beam path. Only use the retro-illumination contrast stop, if the surgical procedure requires a red reflex.
- When operating on the eye, always use a GG 475 eye protection filter to ensure that the patient's retina is not exposed to unnecessary (blue) radiation (retinal injury)!



#### 4 0° assistant's microscope

The assistant's microscope is an integral part of the VISU 200 BrightFlex™ surgical microscope, i.e. it cannot be separated from the main microscope. The assistant sees the same image as the main surgeon. The system's excellent image quality is also available to the assistant.

The assistant's microscope has two working positions. They are located on the right and left of the main surgeon at an angle of 90° to the main surgeon's viewing direction. No locking mechanism has been provided, allowing the assistant to move the microscope by a certain amount out of the 90° position, if necessary.



#### **Warning!**

To prevent the assistant's microscope from moving downward of its own accord when the main microscope is being tilted, the assistant's microscope must be adjusted and locked in position using screw (5) before surgery.

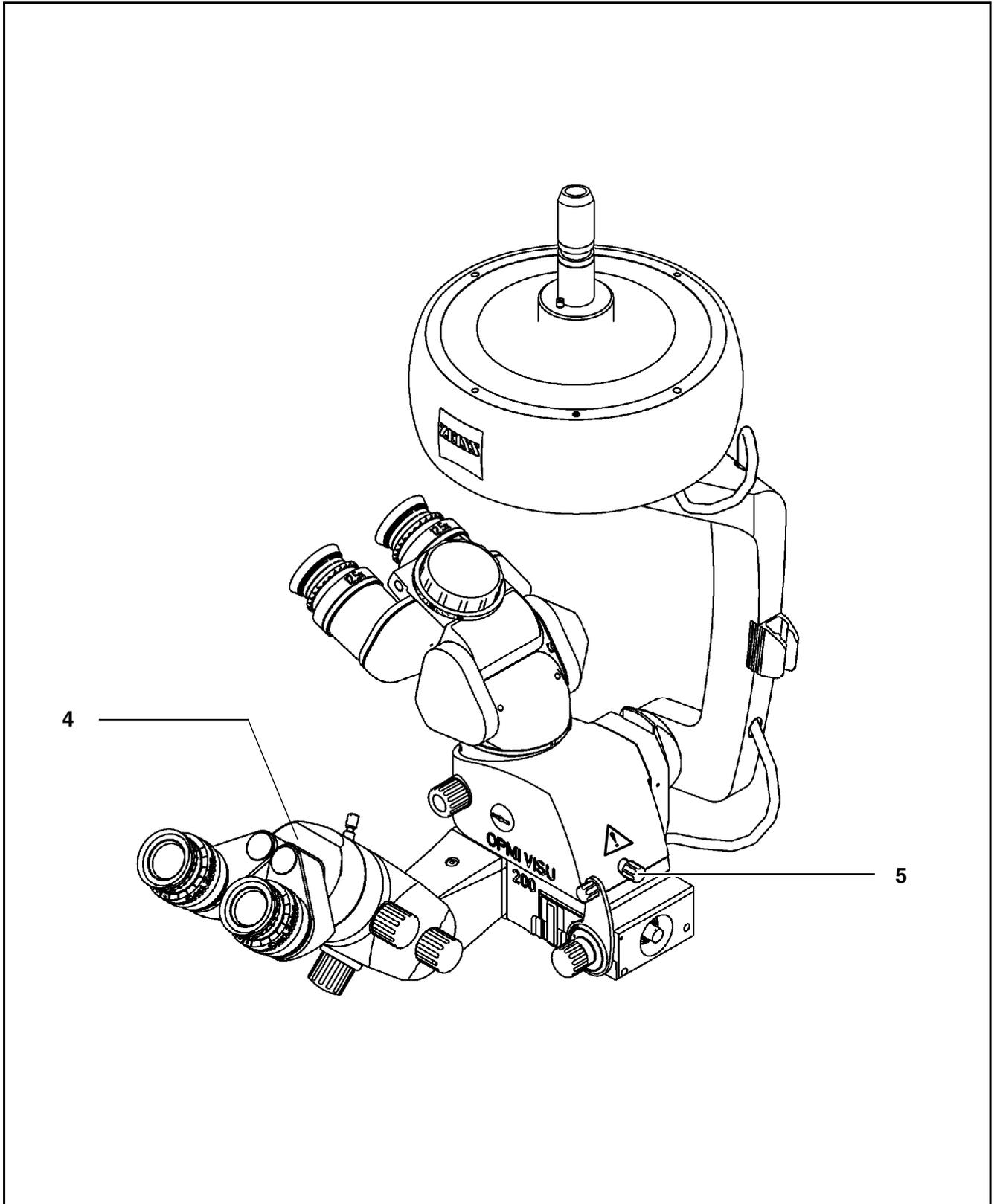
The assistant's microscope is equipped with a focusing system and a 5-step magnification changer. This enables the assistant to adjust his microscope image independently of the main surgeon.

The binocular tube can be turned by  $\pm 12^\circ$  about the optical axis of the assistant's microscope. In addition, the assistant's microscope can be tilted by  $15^\circ$ . If the assistant finds the viewing angle too steep, an optical wedge (option) can be installed between the microscope body and the binocular tube to permit horizontal viewing.

The standard equipment includes eyepieces with a magnification factor of 10x, providing a low initial magnification. This provides the benefit of a wide field of view and an improved overview of the surgical field. The assistant sees the red reflex in both eyepieces.

#### 5 Locking screw for assistant's microscope

After adjusting the assistant's microscope as required, secure it in position using this screw.



## Illumination system

### 6° illumination

You can continuously fade out the 6° illumination. This results in markedly reduced reflection from the cornea, while providing nevertheless a high-contrast, informative microscope image.

For cataract surgery, we recommend opening the 6° illumination system approx. 25%.

### 2° illumination

You can switch the illumination from +2° to -2°. This ensures good visibility of the red reflex even when the patient's eye is decentered.

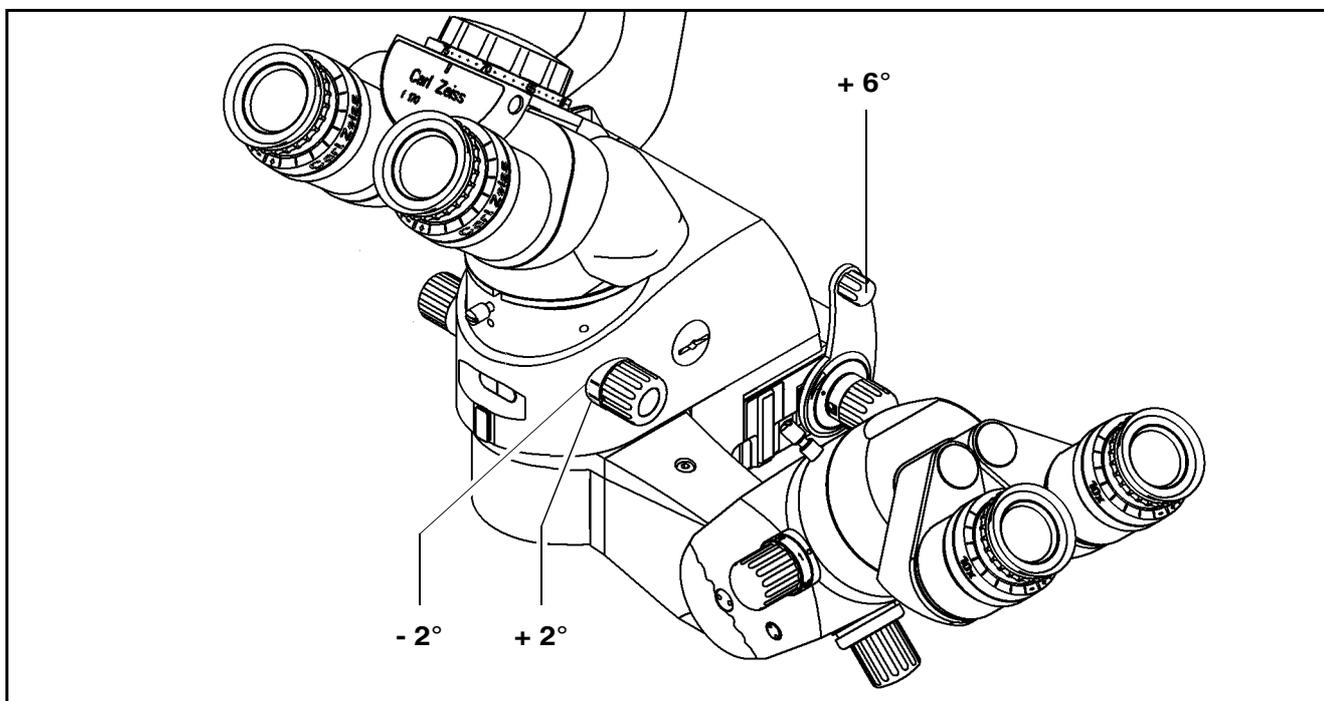
1 6° illumination and 2° illumination

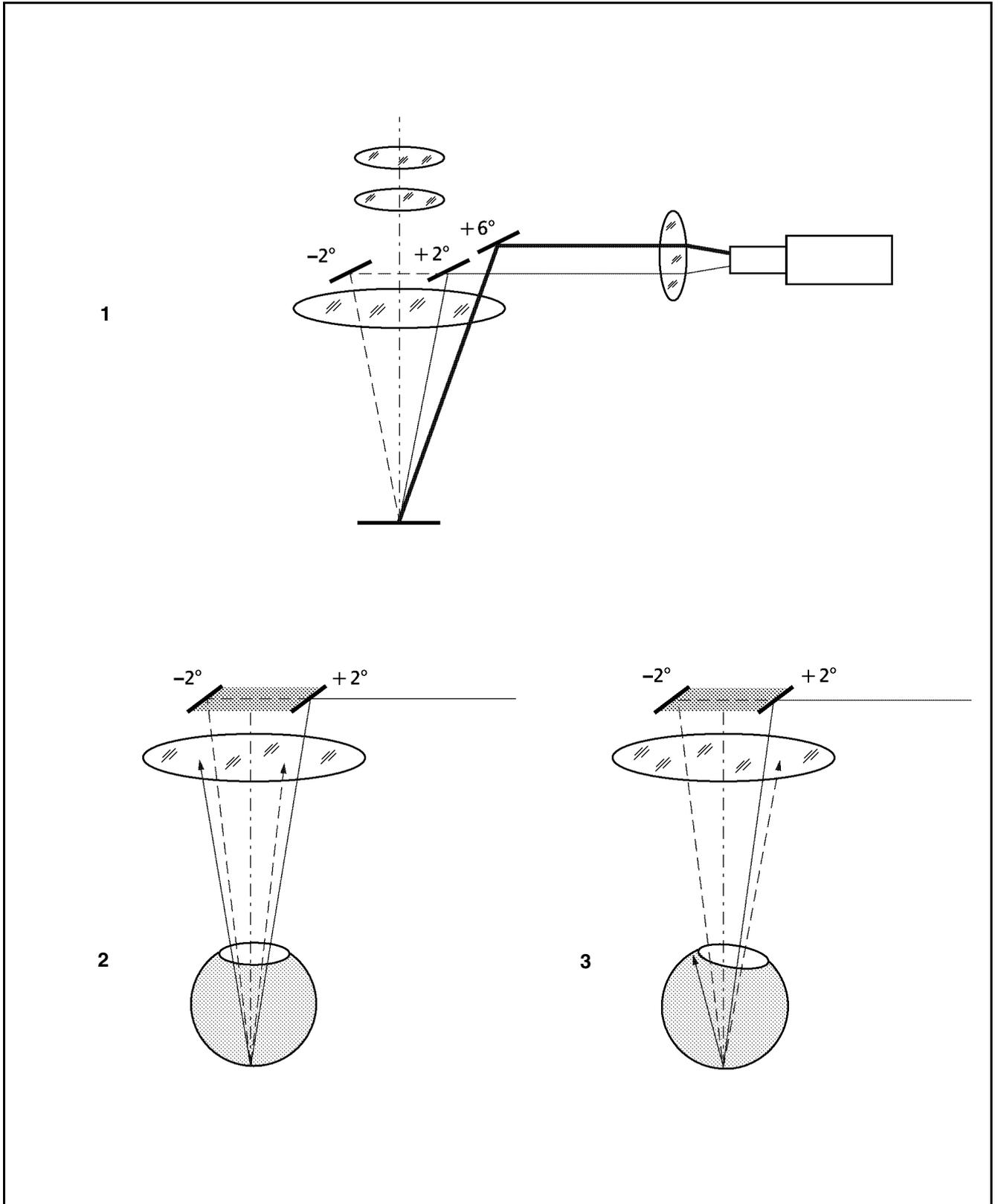
2 2° illumination with centered patient's eye

Here, the red reflex is clearly visible in both positions (+2° and -2°).

3 2° illumination with decentered patient's eye

The red reflex is no longer visible at +2°. After switching to -2°, the red reflex is again clearly visible.





## Controls, displays, connections

- 1 Instrument connector
- 2 Microscope shaft
- 3 X-Y coupling
- 4 Actuator button
  - recenters the X-Y coupling.
  - resets the focus to its initial position in the focusing range, and
  - the zoom system will set a preselected magnification factor if the XYZ-RES function has been activated (possible with S8 suspension systems only).



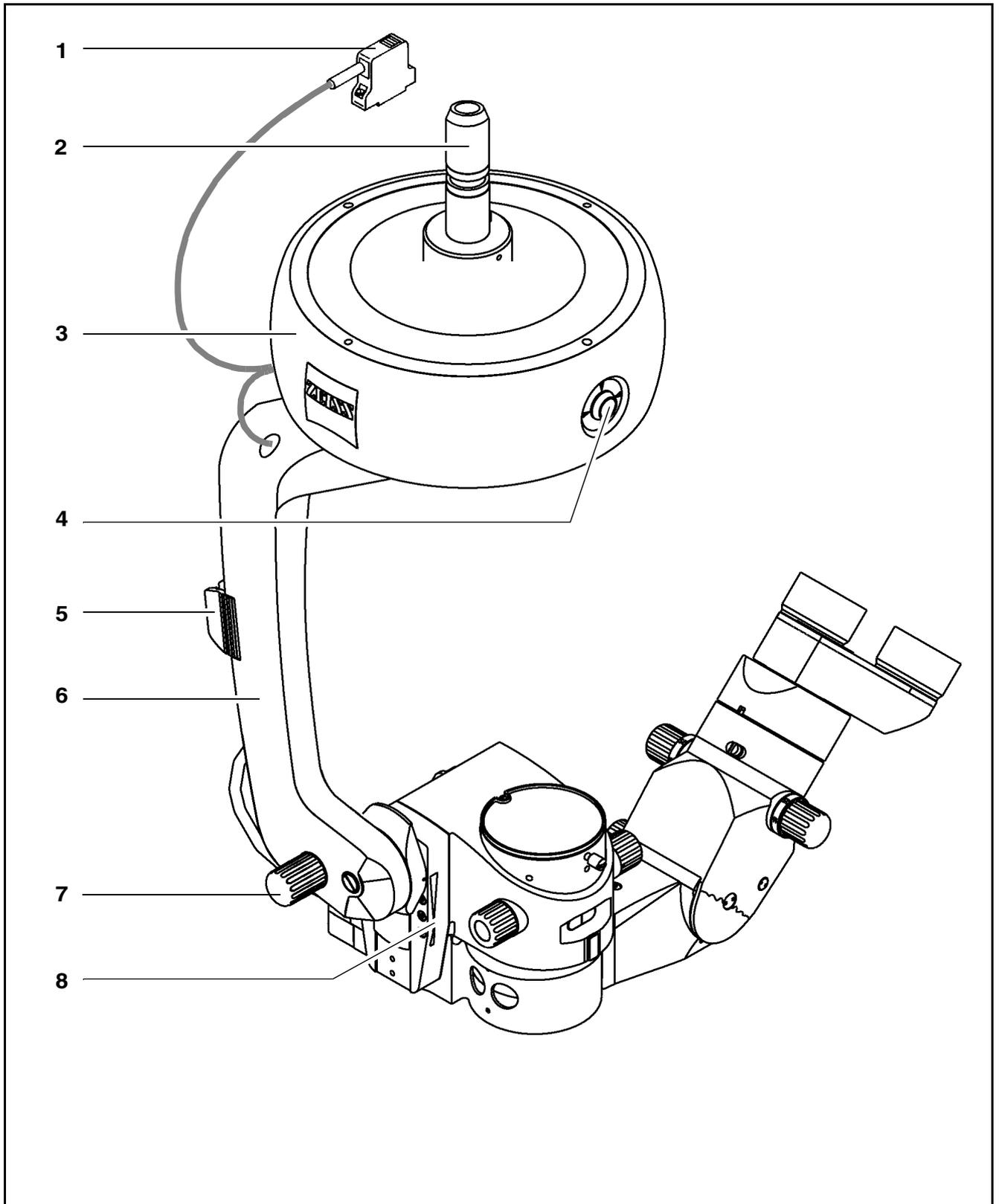
Note:

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

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

- 5 Cable and light guide clip
- 6 Support arm with tilt device
- 7 Knob

for setting the tilt angle of the surgical microscope;  
+180° in the direction of the surgeon,  
-180° in the opposite direction.
- 8 Arrows indicating the focusing range

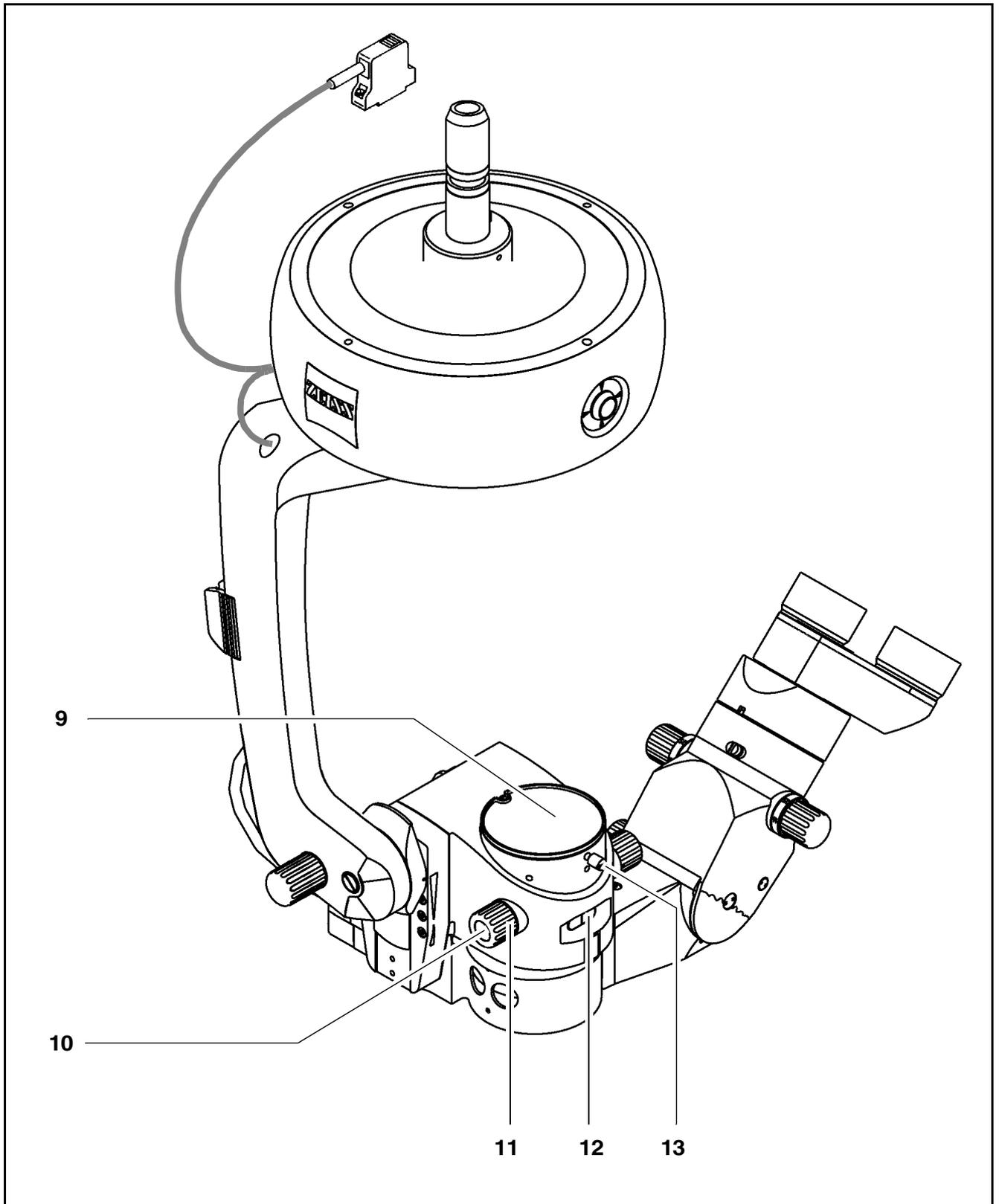


**9** Dust cover**10** Release buttons for the magnetic brakes of the stand

Only in connection with suspension systems with magnetic brakes.  
A second button with the same function is located on the opposite side in the knob for the additional red reflex illumination.

- Button pressed                    magnetic brakes are released, the unit can be moved as required.
- Button released                  magnetic brakes are locked, the unit cannot be moved.

**11** Maneuvering grip including release button. See (10).**12** Display of the magnification factor of the zoom system**13** Securing screw



**14 Manual adjustment of zoom system****15 Knob for adjusting the red reflex illumination**

The angle of illumination can be switched between + 2° and - 2°.

**16 Release button for magnetic brakes**

(A second button with the same function is located in maneuvering grip (10).

- Button pressed                      magnetic brakes are released, the unit can be moved as required.
- Button released                     magnetic brakes are locked, the unit cannot be moved.

**17 Securing screw**

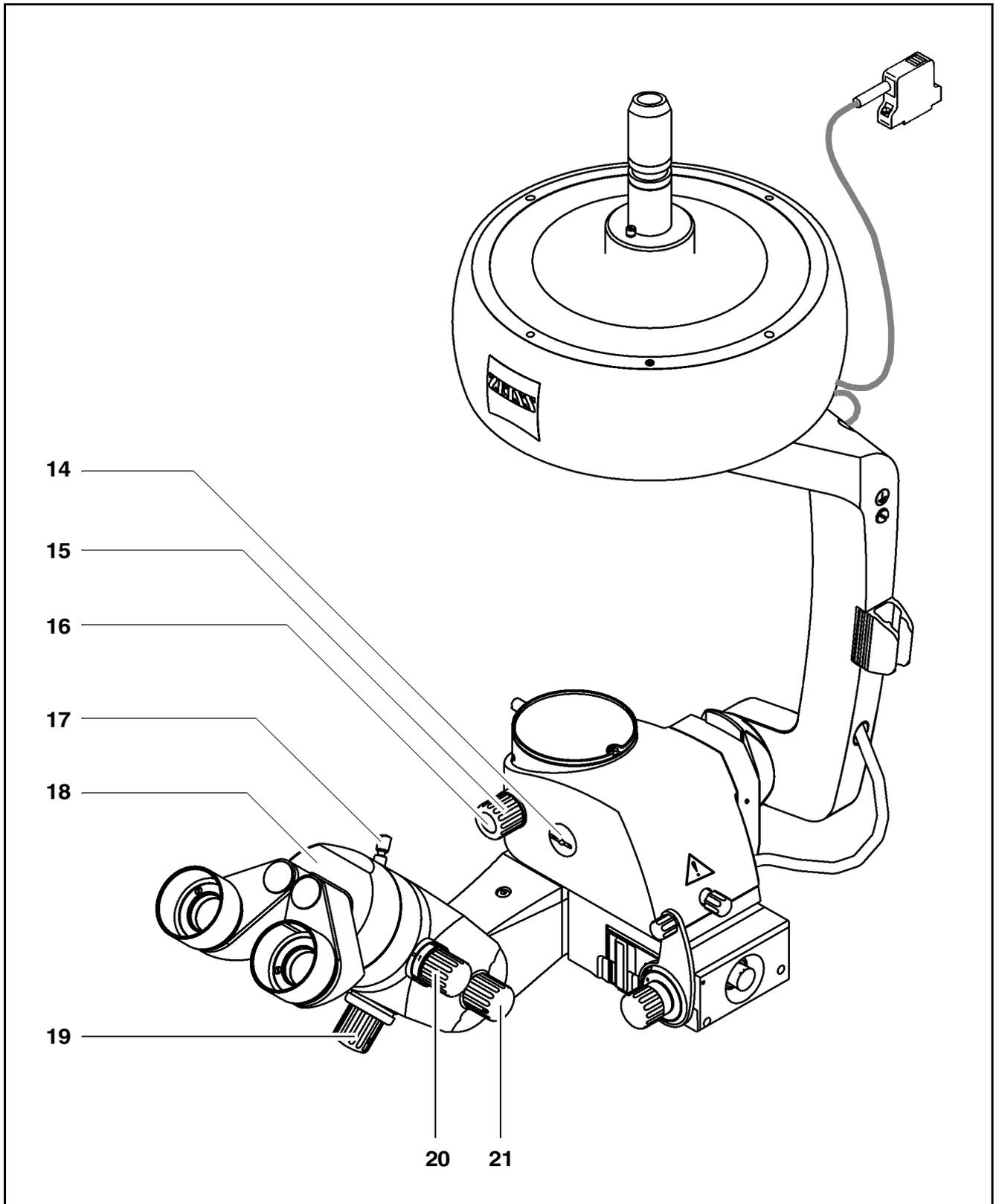
for locking the assistant's tube within its 12° range of movement.

**18 Binocular tube of the assistant's microscope****19 Focusing knob**

for adjusting the assistant's microscope independently of the main surgeon.

**20 Five-step manual magnification changer****21 Screw**

for locking the assistant's microscope within its 15° tilt range.



**22** Light stop knob

Retro-illumination contrast stop.

This stop reduces the straylight reflected from the sclera.  
Diameter approx. 16 mm (with objective lens  $f = 200$  mm): Free passage.

Diameter over approx. 16 mm: Partially transmitting periphery.



Free passage. The field of view is fully illuminated.



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

**23** Adjusting lever for the 6° illumination

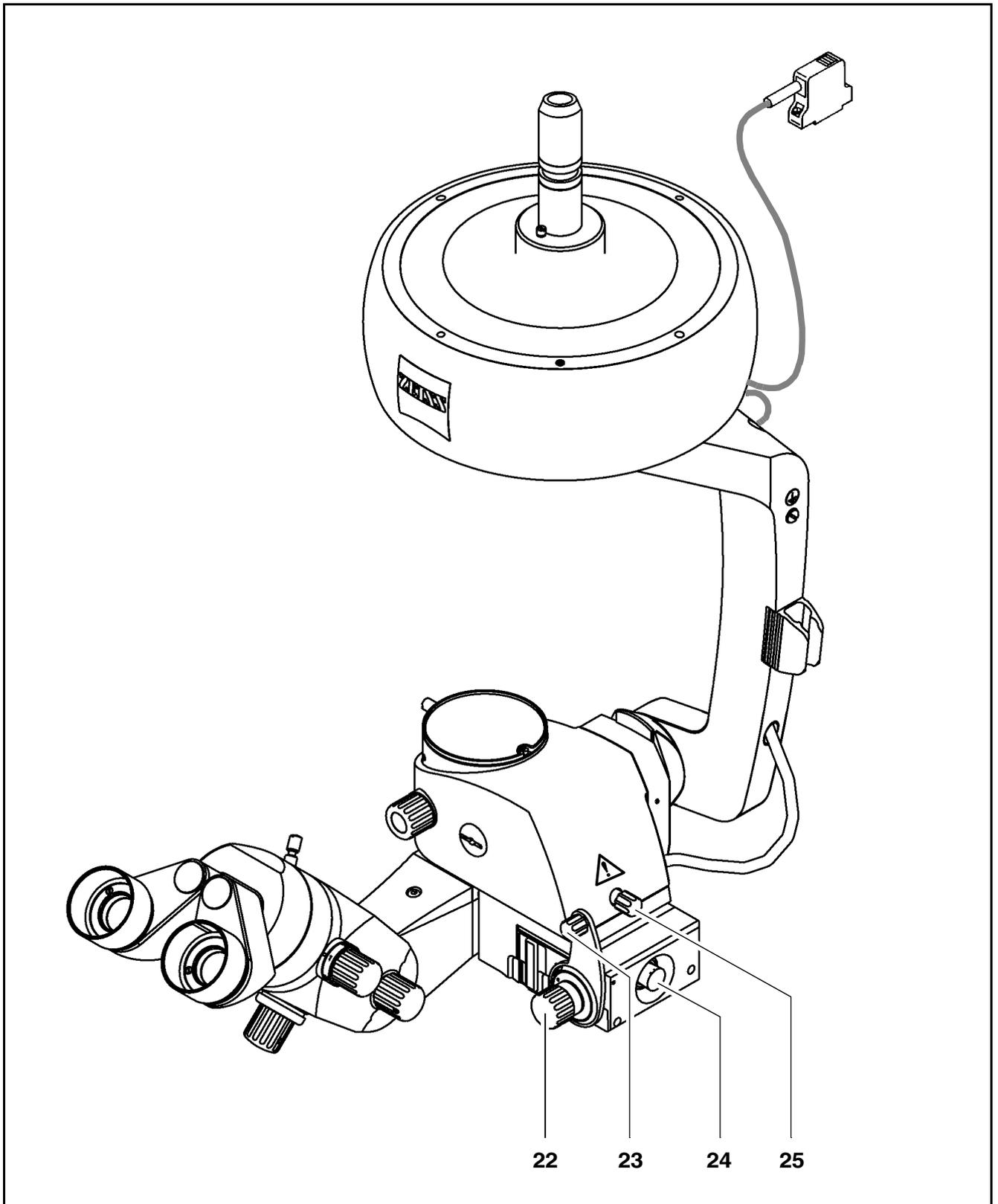
for gradual fading in/out the coaxial illumination. Fading out the 6° illumination improves the visualization of structures in retro-illumination.

**24** Connector socket for S light guide**25** Locking screw for assistant's microscope

for locking the assistant's microscope in both working positions on the right and left of the main microscope.

**Warning!**

To prevent the assistant's microscope from moving downward of its own accord when the main microscope is being tilted, the assistant's microscope must be adjusted and locked in position using screw (25) before surgery.



## Hand grips (option)

In addition to the maneuvering grips provided, larger hand grips can be mounted. The mounting procedure is described in the instructions enclosed.

This does not affect the functioning of the surgical microscope. Only the operation of the surgical microscope is slightly changed.

### 1 Maneuvering grip with integrated release button

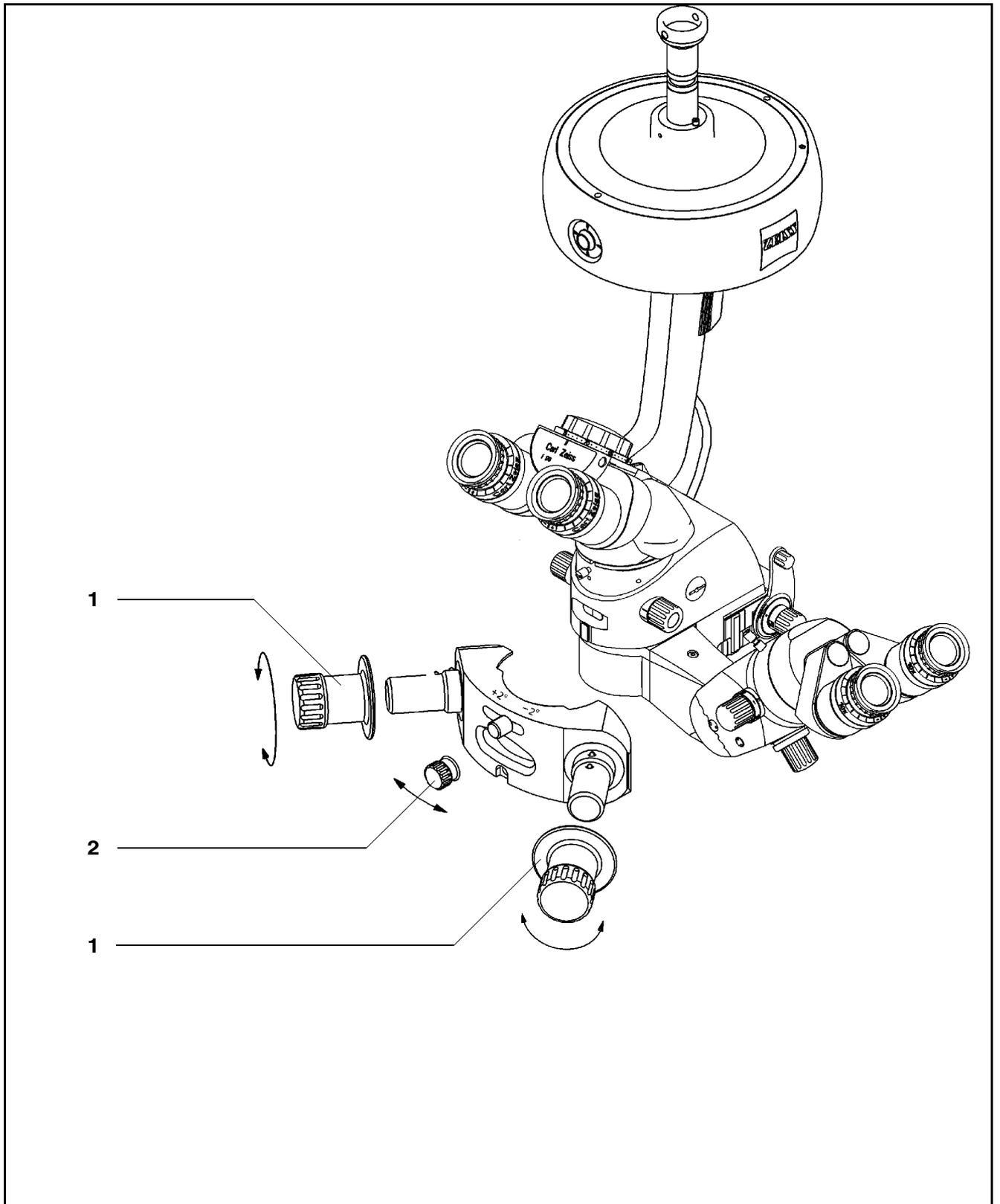
By turning one of the two maneuvering grips you will activate the button for magnetic brakes of the suspension system.

(Only in combination with suspension systems with magnetic brakes (e.g. S8 Floor Stand)).

- Button pressed                      Magnetic brakes are released, the unit can be moved as required.
- Button released                     Magnetic brakes are locked, the unit cannot be moved.

### 2 Knob for adjusting the red reflex illumination

By sliding the knob, you can switch the angle of illumination between + 2° and - 2°.



## Tube and eyepieces for main microscope

### 1 180° tiltable tube

### 2 PD adjustment knob

The correct interpupillary distance has been set when both eyepiece images merge into one.



### 3 Push-in widefield eyepiece

#### Note:

When you remove the eyepiece from the tube, please note that this eyepiece is fitted with a magnetic coupling. When mounted, the eyepieces display a very weak magnetic field. For this reason, the usual rules for the handling of magnets must only be observed with eyepieces which have not been mounted on the microscope:

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

### 4 Eyecup

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

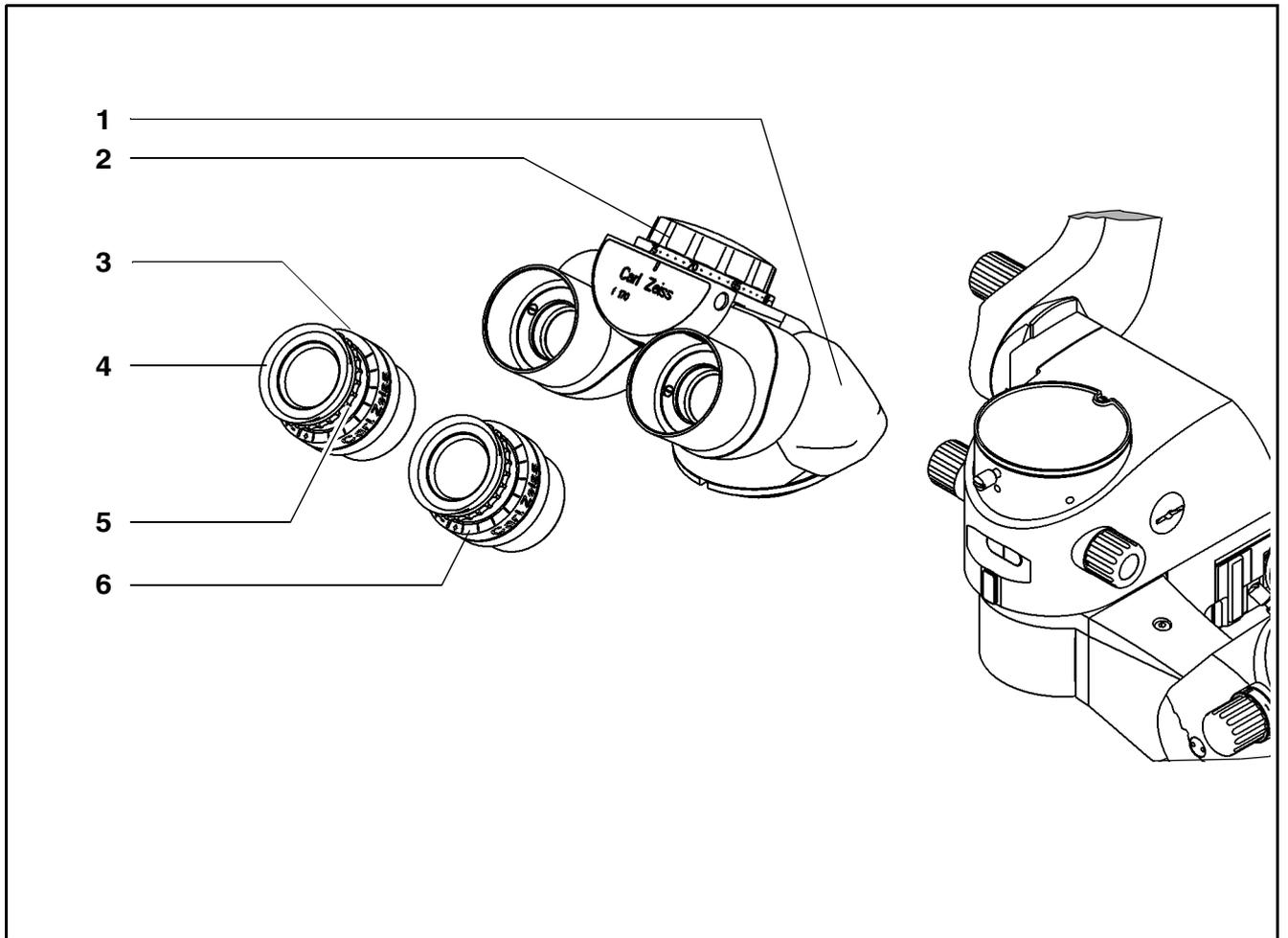
- |                               |   |
|-------------------------------|---|
| – Viewing with eyeglasses:    | Screw in eyecups all the way.                                   |
| – Viewing without eyeglasses: | Screw eyecups outward until you can see the full field of view. |

### 5 Diopter setting ring

The eyepieces provide ametropia compensation from -8 D to +5 D. If you wear your eyeglasses during work, adjust the ring to 0 D. Turn the ring until you have found the optimum setting. A built-in catch lever locks the ring in the position set.

### 6 Diopter scale

For reading the prescription set.



## Tube and eyepieces for assistant's microscope



### 7 Push-in widefield eyepiece

#### Note:

When you remove the eyepiece from the tube, please note that this eyepiece is fitted with a magnetic coupling. When mounted, the eyepieces display a very weak magnetic field. For this reason, the usual rules for the handling of magnets must only be observed with eyepieces which have not been mounted on the microscope:

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

### 8 Eyecup

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

- Viewing with eyeglasses- Screw in eyecups all the way.
- Viewing w/out eyeglasses- Screw eyecups outward until you see the full field of view.

### 9 Diopter scale

For reading the prescription set.

### 10 Diopter setting ring

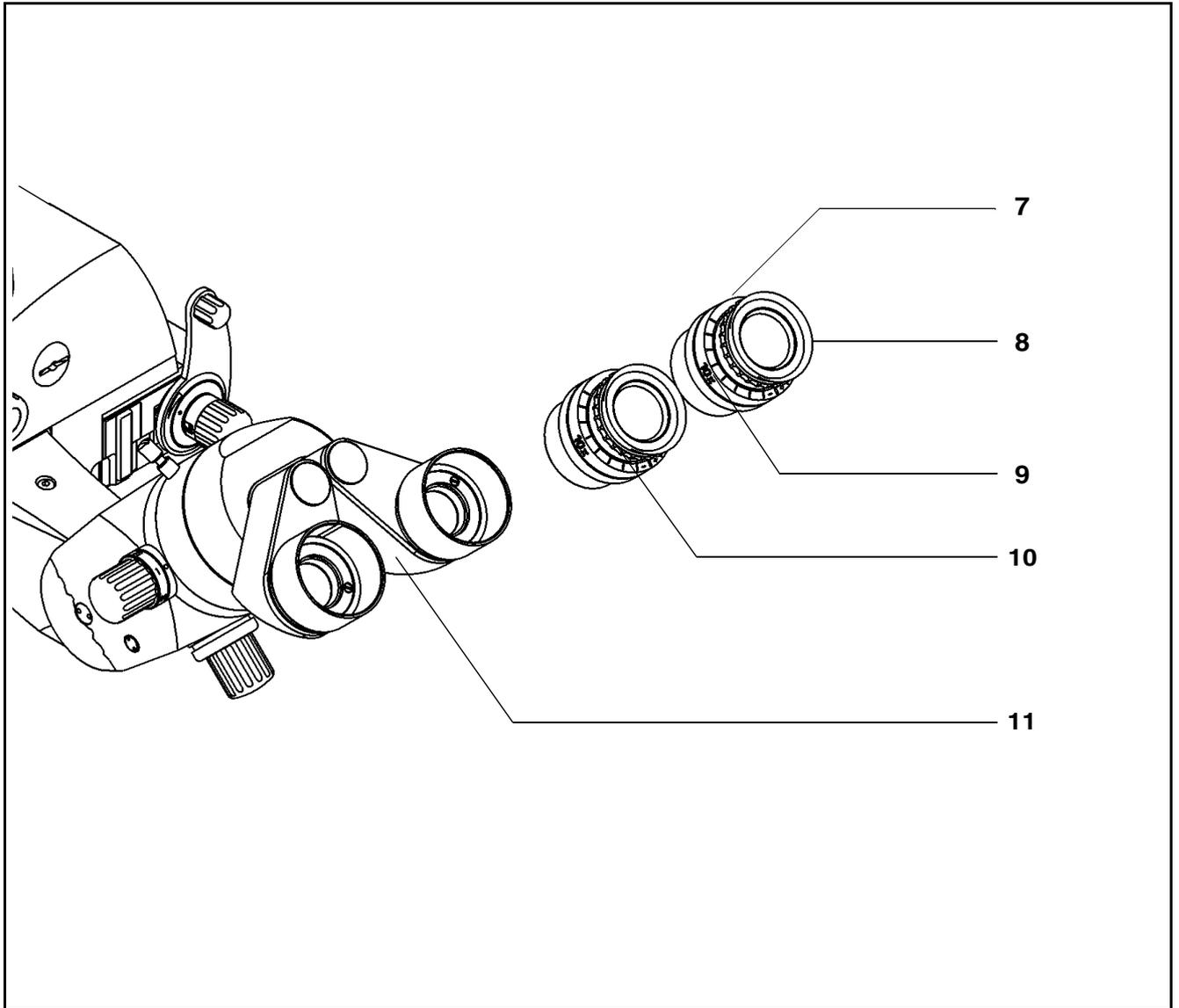
The eyepieces provide ametropia compensation from -8 D to +5 D. If you wear your eyeglasses during work, adjust the ring to 0 D. Turn the ring until you have found the optimum setting. A built-in catch lever locks the ring in the position set.



### 11 Binocular assistant's microscope

#### Note:

Always use the assistant's microscope with the appropriate (shown) binocular assistant's tube. If you use a different tube, you will obtain an inverted image.





# Preparations for use

Mounting the binocular tubes, eyepieces and the objective lens

46

## Mounting the binocular tubes, eyepieces and the objective lens



### Note:

Always use the assistant's microscope with the appropriate binocular assistant's tube (shown). If you use a different tube, you will obtain an inverted image.

- Loosen securing screw (5) by a few turns.
- Remove cover (1) and store it in a safe place.
- Place binocular tube (2) on the surgical microscope and tighten securing screw (5) firmly.
- You can install other units between the binocular tube and the microscope body. Lock these units in position in the same way using securing screw (5).
- Place binocular tube (10) on the assistant's microscope and tighten securing screw (7) firmly.
- You can install other units between the binocular tube and the microscope body (e.g. an optical wedge, 30°). Lock these units in position in the same way using securing screw (7).
- Insert **12.5x** widefield eyepieces (4) into the mounts intended for them (3) as far as they will go. The magnetic coupling reliably secures them in position.
- Insert **10x** widefield eyepieces (9) into the mounts intended for them (8) as far as they will go. The magnetic coupling reliably secures them in position.



### Note:

If a documentation device is used, one of the eyepieces can be delivered with a reticle to aid focusing. Retrofitting the reticle can only be performed at the factory or by our service representative. Always use the eyepiece with reticle on the same side of the binocular tube as the documentation device is installed.

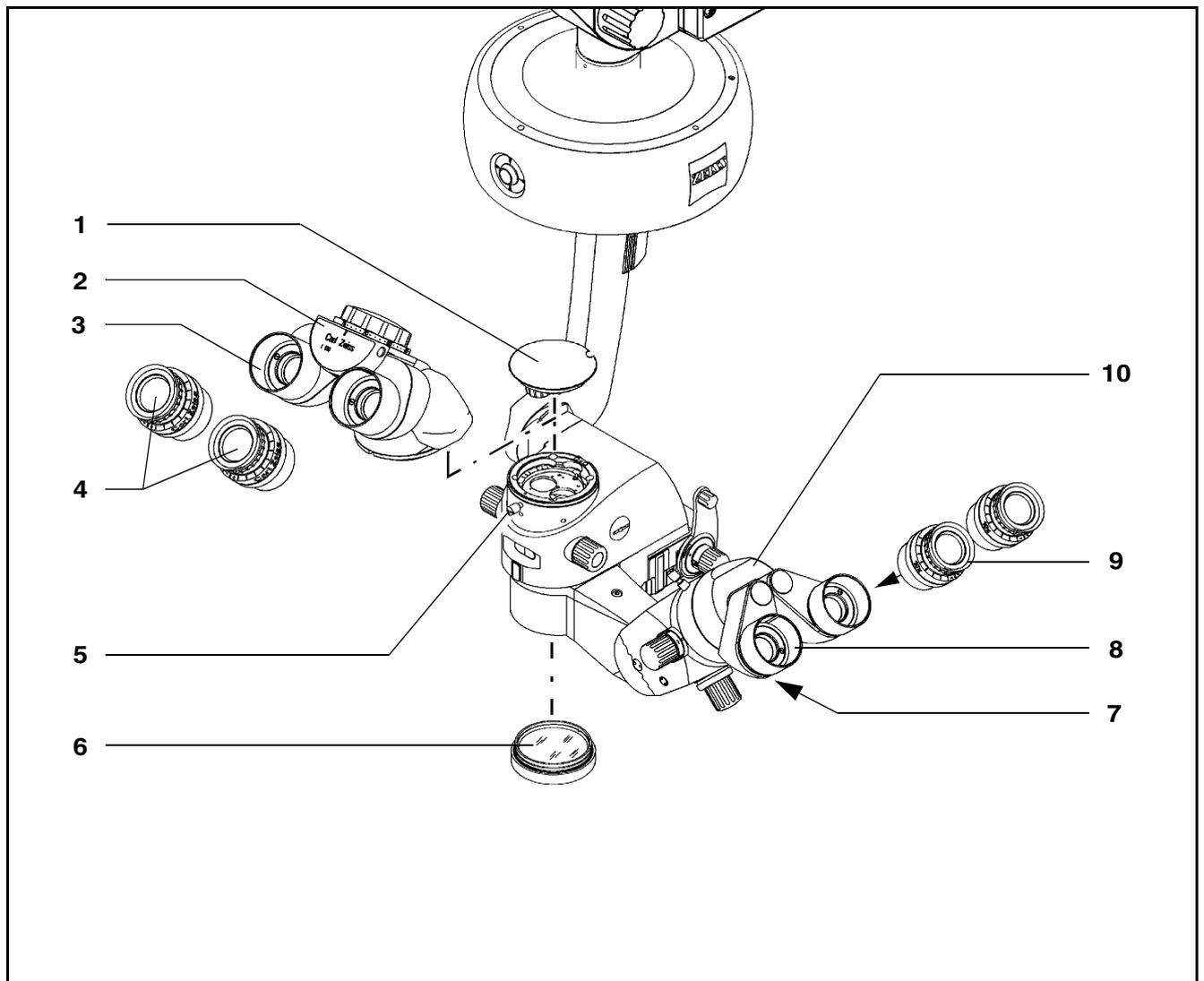
- Screw objective lens (6) into the microscope body and tighten it firmly.

**Caution:**

Before using and after re-equipping the unit, make sure that the two binocular tubes (2 and 10) are securely locked in position. Make sure that

- securing screws (5 and 7) and
- objective lens (6)

have been tightened firmly.





# Operation

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## Preparations for use

### Adjusting the tilt angle

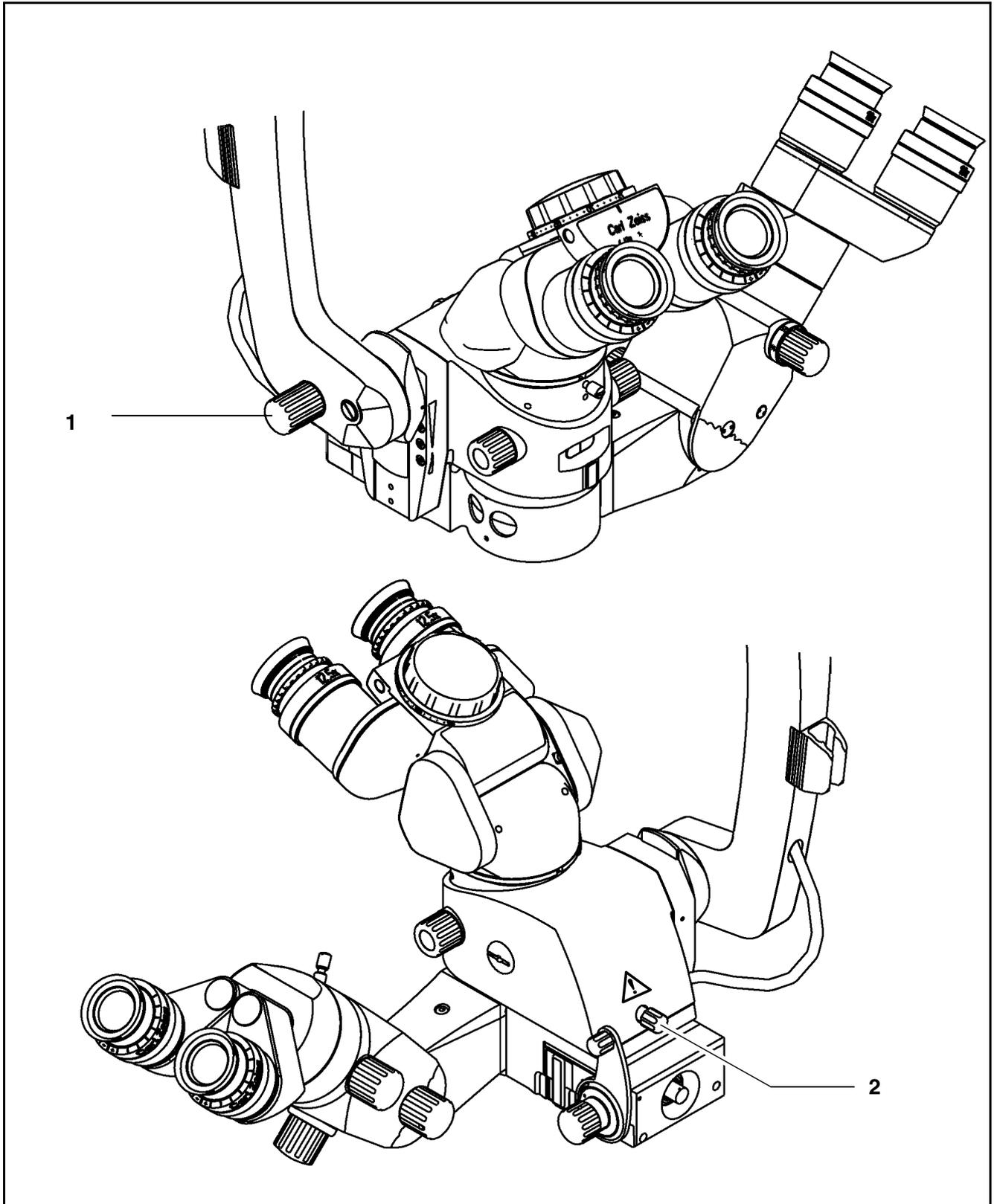
Using knob (1), you can position the surgical microscope in a range from  $+180^\circ$  to  $-180^\circ$  (+ in the direction of the surgeon and - in the opposite direction). The  $+90^\circ$  setting is ideal for surgery on patients in a seated position or lying on their side.



#### **Warning!**

- To prevent the assistant's microscope from moving downward of its own accord when the main microscope is being tilted, the assistant's microscope must be adjusted and locked in position using screw (2) before surgery.
- Check that the assistant's microscope is firmly seated.
- Do not tilt the main microscope beyond  $+ / - 180^\circ$ , as this could damage the microscope cable or the light guide.
  
- Using locking screw (2), secure the assistant's microscope in the working position set (on the left or right of the main microscope).
- Turn knob (1) until the surgical microscope is in the viewing position required.

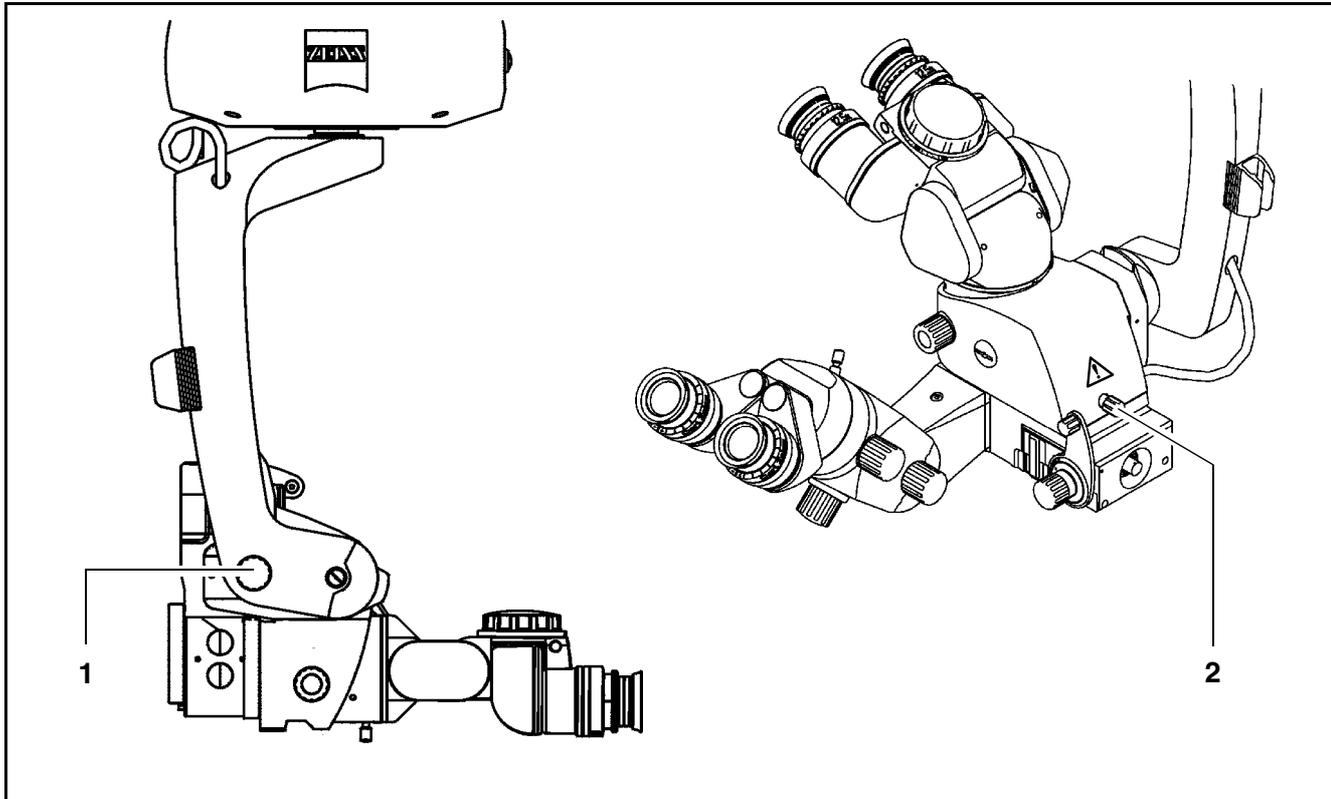
After the viewing angle has been set, the surgical microscope remains in this position. The gear drive is self-locking.



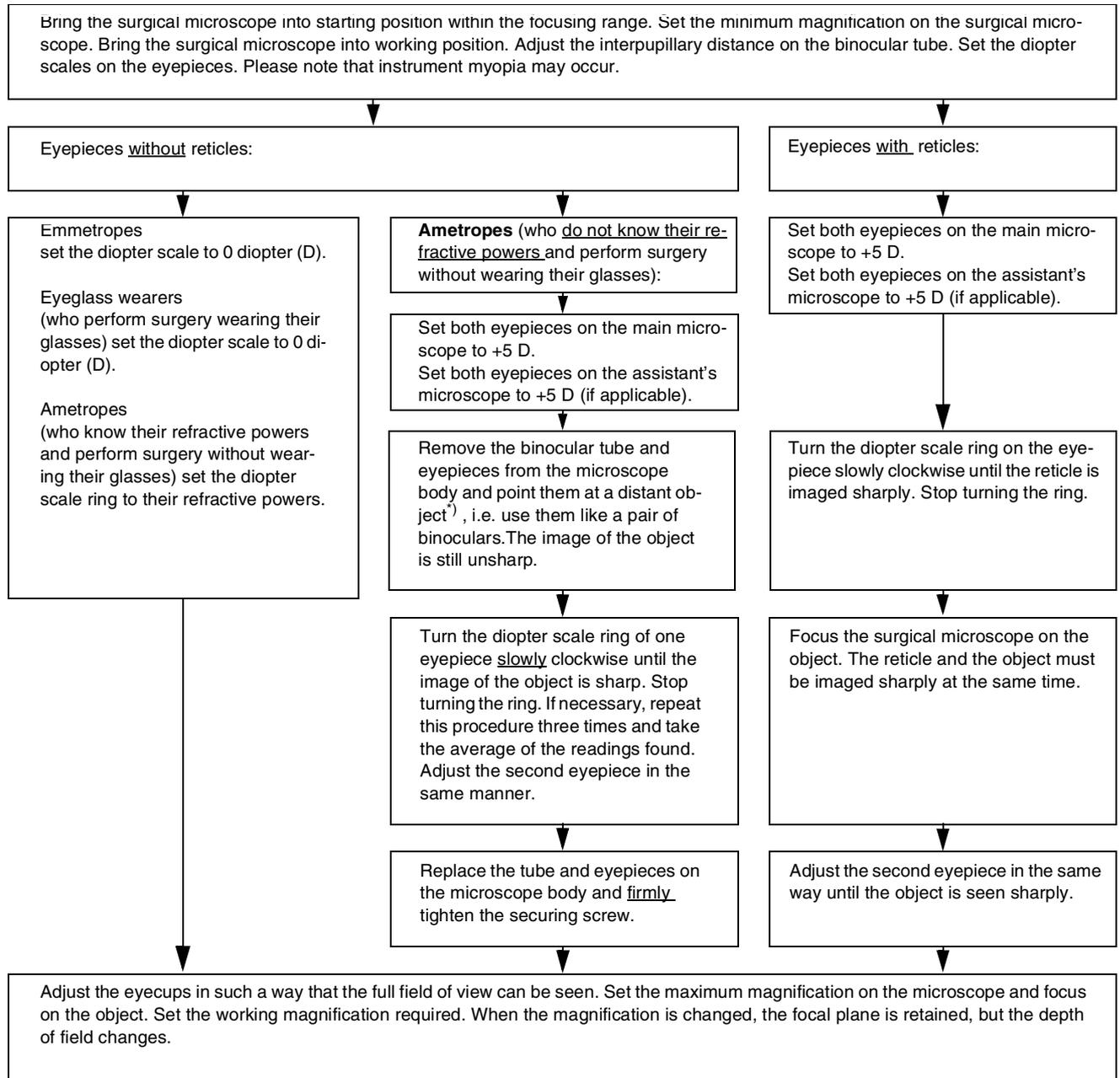
## Setting the microscope tilt to angles greater than 15°

- Using locking screw (2), secure the assistant's microscope in the working position set (on the left or right of the main microscope).
- Check that the assistant's microscope is firmly seated.
- Remove the binocular tube and all accessories mounted on the assistant's microscope.
- Remove all accessories mounted on the objective lens (e.g. 0° or 8° assistant's microscope).
- Turn knob (1) until the surgical microscope is in the viewing position required.

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



## Adjusting the surgical microscope



**Note:** If several surgeons use the instrument, it is advisable to draw up a table showing the individual refractive powers of each surgeon and to keep it in a handy location near the instrument.

**\*) CAUTION:** Never point the eyepieces at the sun!

## Checklist

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

### **VISU 200 BrightFlex™ surgical microscope**

- Check that the correct rated voltage has been set for the suspension system.
- Check that all cables have been connected.
- Check that the light guide has been connected.
- Turn on the instrument at the power switch of the suspension system.



#### Note:

After the system has been switched on, the S8 suspension system (ophthalmology) automatically performs a self-test. The self-test is completed after approx. five seconds.

#### Zoom

- Check this function using the appropriate key on the foot control panel.

#### Focus

- Check this function using the appropriate key on the foot control panel.

#### Friction adjustment of the surgical microscope

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

#### Locking the assistant's microscope in position

- Check that the assistant's microscope is locked in the working position required (on the right or left of the main microscope).

#### Speeds of the surgical microscope's functions

(only in connection with S8 suspension system (ophthalmology))

- Check that the speeds of the microscope's functions have been set as required on the S8 suspension system (ophthalmology).

#### Eyepieces / Tilttable binocular tubes

- Check that the tilttable tube of the main microscope and the assistant's microscope are in positions convenient for you.
- Check that the correct interpupillary distance has been set.
- Check that the eyecups have been adjusted in such a way that you can see the full field of view.
- Check that the correct prescription has been set on the diopter scale.

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

#### Accessories

- Using the relevant user's manuals, check that the other equipment (illumination system, video system, etc.) is working properly.



#### **Warning!**

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

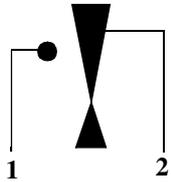
## When using a fundus imaging system (e.g. BIOM II)

When using a fundus imaging system (e.g. BIOM II from the company Oculus) which is usually installed between the surgical microscope and the patient, make sure that the patient is neither put at risk nor injured by the motorized focusing system or the movement of the stand arm.



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

### Risk of collision!



### Caution!

- With the fundus imaging system swung out of position, always position the microscope body in such a way that index dot (1) of the microscope's focus is in the middle of triangle (2) of the marking.
- Select a medium magnification (e.g. 1.0).
- Lower the surgical microscope towards the surgical field until you see the patient's cornea sharply defined.
- Turn the screw for limiting the downward movement clockwise as far as it will go.
- It is vital that you read the user's manual on the fundus imaging system (e.g. BIOM II from the company Oculus).

## Procedure

- Turn on the power switch of the suspension system.
- Adjust the brightness of the surgical field illumination as required on the stand.
- Check the unit using the checklist.
- Move the surgical microscope over the surgical field and bring it into a convenient position within the working distance.
- Press the activator button.
  - The X-Y coupling is recentered.
  - The focus is reset to its initial position in the focusing range.
- Select the lowest magnification (zoom function on the foot control panel).
- For coarse focusing, look through the eyepieces and lower the surgical microscope using the suspension arm until the surgical field comes into focus.
- Select the highest magnification (zoom function on the foot control panel).
- Look through the eyepieces and activate the focusing function on the foot control panel until the microscope is sharply focused on the surgical field.
- Select the magnification required (zoom). Look through the eyepieces of the binocular tube. Adjust the eyepieces (including those of the assistant's microscope) in such a way that you can see both the edge of the field of view and the microscope image sharply. Also see "Adjusting the surgical microscope".
- Switch the unit off when it is not in use.

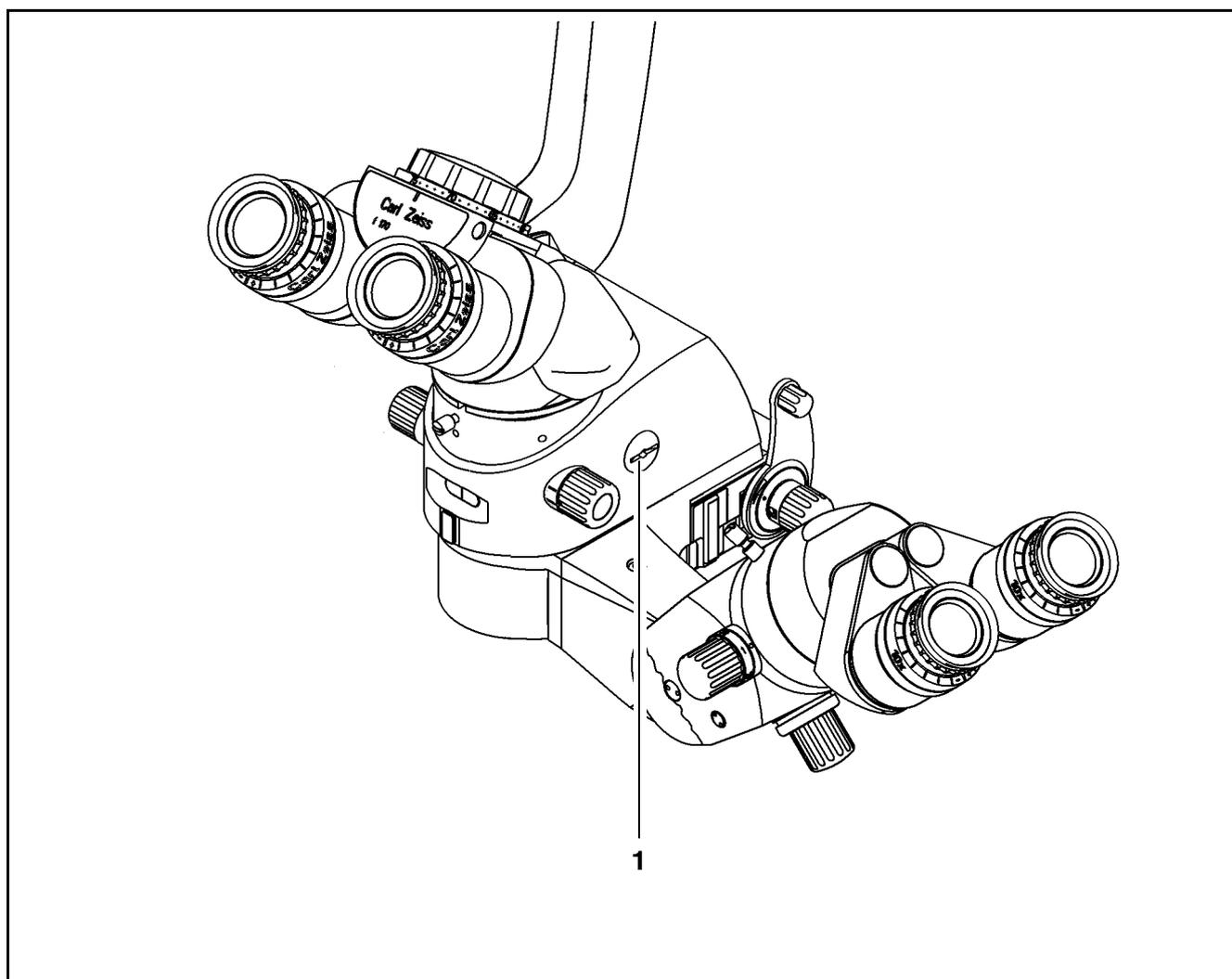
**Caution!**

- Avoid looking directly into the light source, e.g. into the microscope objective lens or into a fiber light guide!
- When selecting the brightness level for the patient's eye, always take care to keep the strain on the patient's eye to a minimum.
- If the red reflex is not necessary, move the retinal protection device into the beam path. Only use the retro-illumination contrast stop, if the surgical procedure requires a red reflex.
- When operating on the eye, always use a GG 475 protection filter to ensure that the patient's eye is not exposed to unnecessary (blue) radiation (retinal injury).

## What to do in an emergency

### Failure of zoom system

- Manually adjust the magnification using zoom control (1) on the microscope (if necessary, use a tool, e.g. screwdriver, coin, etc.).



## Failure of X-Y coupling

- If the X-Y coupling fails, you can manually position the surgical microscope utilizing the possibilities of the suspension system you are using.

## Failure of focusing system

- Disconnect the cable between the surgical microscope and the suspension system (illumination continues to be on.)
- Focus the surgical microscope by moving the suspension arm or the lift arm of the suspension system you are using.

# Maintenance / Further information

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## Trouble-shooting table

- This instrument is a high-grade technological product. To ensure optimum performance and safe working order of the instrument, its safety must be checked once every 12 months. We recommend having this check performed by our service representative as part of regular maintenance work.

If a failure occurs which you cannot correct using the trouble-shooting table, attach a sign to the instrument stating it is out of order and contact our service representative.

### VISU 200 BrightFlex™ Surgical Microscope

Problem	Possible cause	See	
No function at all.	Power cord of suspension system not plugged in.	Plug in power cord.	-
	Power switch of suspension system not on.	Press power switch. Green light in power switch must come on.	-
	Circuit breaker in suspension system power switch activated.	Press power switch again.	-
	Line power failure.	Contact in-house electrician.	-
	Lamp module has no contact.	Insert lamp module as far as it will go.	-
Surgical field illumination at microscope inoperative.	Illumination system of suspension system not switched on.	Switch on illumination system of suspension system.	-
	S light guide not properly inserted in lamp or microscope.	Insert S light guide as far as it will go.	-
	Failure of suspension system electronics.	Illuminate surgical field using an OR illuminator. Contact service dept.	-

Problem	Possible cause	See	
Insufficient surgical field illumination.	Brightness level set too low.	Adjust brightness on suspension system or using foot control panel.	-
	Defective S light guide (no homogeneous illumination).	Contact service dept. The light guide must probably be changed.	-
Focusing function inoperative.	Connectors on suspension system not correctly inserted.	Plug in connectors correctly.	-
	Focusing system always moves into upper or lower end position.	Check suspension system. Move the suspension arm to adjust the focus. Contact service dept.	-
Zoom function inoperative.	Connectors on suspension system not correctly inserted.	Plug in connectors correctly.	-
	Zoom system always moves into upper or lower end position.	Check suspension system. Manually adjust magnification using the zoom knob. Contact service dept.	page 34
X-Y coupling inoperative.	Connectors on suspension system not correctly inserted.	Plug in connectors correctly.	-
	Defective motor.	Position microscope manually. Contact service dept.	-
X-Y coupling always moves in opposite direction.	Function not correctly adjusted on suspension system.	Check suspension system.	-
Zoom and focusing functions inoperative.	Functions not correctly adjusted on suspension system.	Check suspension system.	-
Microscope motion too stiff.	Friction adjustment knob on suspension system tightened too firmly.	Loosen friction adjustment.	-

## Magnifications / Fields of view

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

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

where:

$f_{\text{tube}}$  is the focal length of the binocular tube

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

$\gamma$  is the magnification factor set on the zoom system

$M_{\text{eye}}$  is the magnification of the eyepiece

Example:

$f_{\text{tube}} = 170 \text{ mm}$ ,  $f_{\text{obj}} = 200 \text{ mm}$ ,  $\gamma = 1.6$  and  $M_{\text{eye}} = 12.5 \times$ .

The resulting total magnification is:

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

If the total magnification  $M_T$  of the surgical microscope is known, the field-of-view diameter  $\text{FoV}_D$  can be calculated using the formula:

$$\text{FoV}_D = \frac{\text{FoV}_N \cdot M_{\text{eye}}}{M_T}$$

The field-of-view diameter  $\text{FoV}_D$  is the diameter of the circular area of the surgical field which can be seen through the eyepieces.

$\text{FoV}_N$  in the above formula stands for the field-of-view number of the eyepiece. This number is marked on our widefield eyepieces.

Using  $M_T = 17.0$  from the example above, the field-of-view diameter obtained with a 12.5x eyepiece with a field-of-view number  $\text{FoV}_N$  of 18 mm is calculated as follows:

$$\text{FoV}_D = \frac{18 \text{ mm} \cdot 12.5}{17.0} = 13.2 \text{ mm}$$

## Care of the unit

### Cleaning optical surfaces

The multilayer T\* (T-star) coating of our optical components (e.g. eyepieces, objective lenses) results in optimum image quality.

Image quality is impaired by even slight contamination of the optics or by a fingerprint. In order to protect the internal optics from dust, the instrument should never be left without the objective lens, binocular tube and eyepieces installed when it is not in use. Always store objective lenses, eyepieces and accessories which are not being used in dust-free cases.

The external surfaces of optical components (eyepieces, objective lenses) should only be cleaned when required:

- Do not use any chemical cleaning agents.
- Blow off dust on the optical surfaces using a squeeze blower or remove the dust using a clean and grease-free brush.

### Fogging of optical surfaces

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



Note:

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

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

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

### Cleaning mechanical surfaces

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

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

## Sterilization

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

Sterilization temperature: 134° C

Sterilization time: 10 minutes

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



Note:

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

## Ordering data

### VISU 200 BrightFlex™ Surgical Microscope

Description	Cat.No.
VISU 200 BrightFlex™ surgical microscope including X-Y coupling and assistant's microscope	1179-101
180° tiltable tube	30 37 91-0000
10x eyepiece for assistant's microscope (2x)	30 55 42-0000
12.5x/18 B eyepiece for main microscope (2x)	30 55 43-0000
Objective lens, f = 175 mm	30 26 51-9902
Dust cover	1055-278

## Spare parts

### VISU 200 BrightFlex™ Surgical Microscope

Description	Cat. No.
S light guide (not shown) 2.0 m	30 34 81-9020
Dust cover (not shown)	1055-278
Asepsis set (not shown)	1009.100

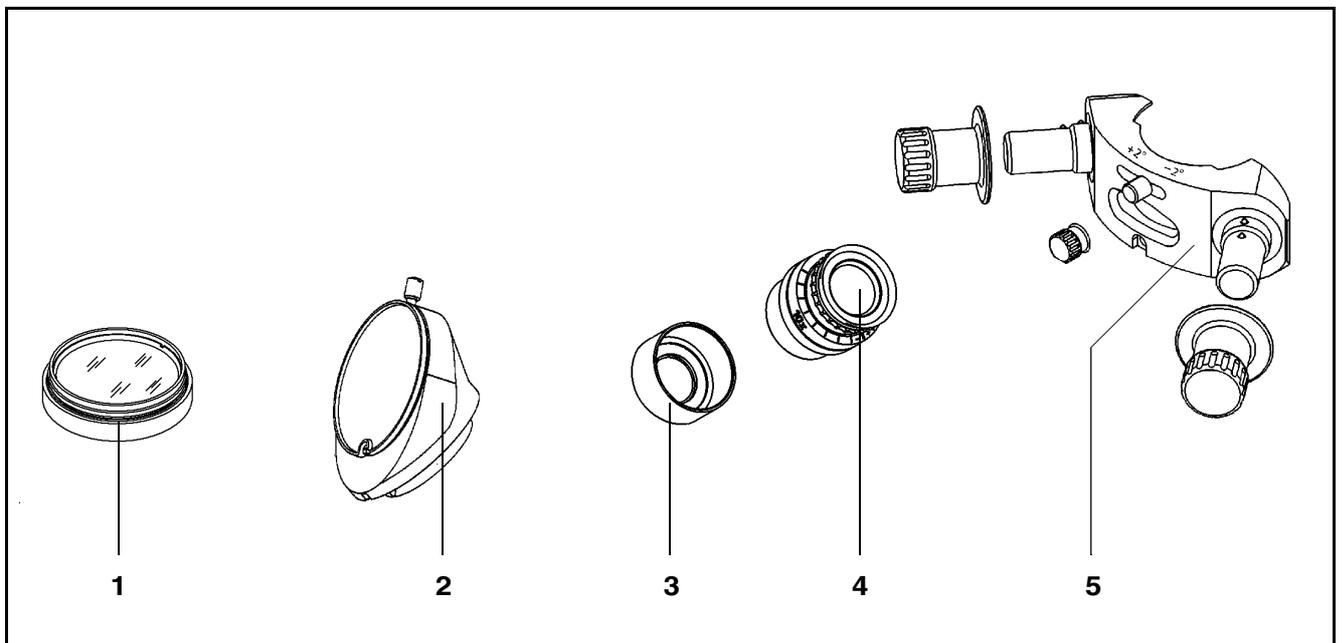
## Accessories

Please observe the following:

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

**VISU 200 BrightFlex™ Surgical Microscope**

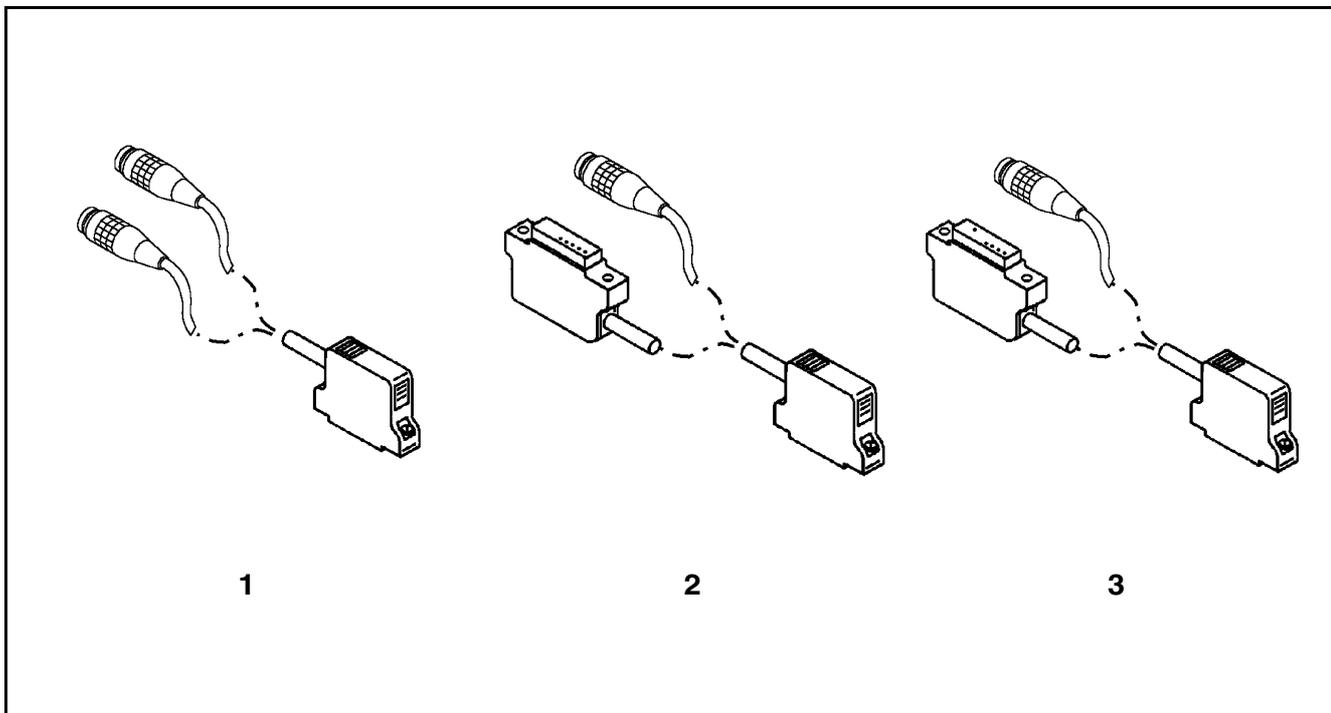
	Description	Cat. No.
1	Objective lens, f = 200 mm	30 26 52-9903
2	Optical wedge, 30°	1006-145
3	Sleeve (for insertion of eyepiece (4))	30 55 42-0107
4	10x eyepiece with magnetic coupling	30 55 42-0000
5	OPMI VISU hand grips	1049- 171
	Asepsis for OPMI VISU hand grips (1x included in delivery package 1049- 171)	1054- 074



## Adapter cables

for the electrical connection of the surgical microscope to different types of suspension system.

		Cat. No.
1	EMD II Electromechanical Ceiling Mount	30 26 02- 9053
1	S3 Ceiling Mount	30 26 02- 9053
2	S4 Ceiling Mount	30 26 02- 9054
1	S23 Ceiling Mount	30 26 02- 9053
3	S6 Ceiling Mount	30 26 02- 9055
3	S61 Ceiling Mount	30 26 02- 9055
1	S22 Floor Stand	30 26 02- 9053
2	S4 Floor Stand	30 26 02- 9054
1	S3 Floor Stand	30 26 02- 9053



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## Technical data

### VISU 200 BrightFlex™ Surgical Microscope

#### Optical data

Magnification	<p><u>Main microscope:</u></p> <p>4.9x - 29x</p> <p>Motorized zoom system with apochromatic optics, 1:6 zoom ratio, magnification factor <math>\gamma = 0.4x - 2.4x</math>.</p>
Focusing	<p>Motorized, focusing range 50 mm</p> <p>At the press of a button, the focusing drive returns to its initial position.</p>
Objective lens focal length	f = 175 mm (option: f = 200 mm)
Tubes / Eyepieces	<p><u>Main microscope:</u></p> <p>180° tiltable binocular tube, f=170 mm. 12.5x screw-type, widefield eyepieces (option: 10x ).</p> <p><u>Assistant's microscope:</u></p> <p>5-step magnification changer, separate fine focusing, adjustable tilt.</p> <p>Binocular tube, can be turned by <math>\pm 12^\circ</math> about its optical axis,</p> <p>10x widefield eyepieces with magnetic coupling.</p>
Illumination	<p>Fiber illumination with two lamp modules, each with two 12 V 100 W halogen reflector lamps,</p> <p>fully automatic lamp change in the event of lamp failure,</p> <p>filter against UV exposure,</p> <p>protection against IR exposure,</p> <p>6° illumination (continuous fading),</p> <p>patented 2° illumination for red reflex, usable in +2° and -2° positions</p> <p>Pat. No. DE40 28 60 5 C2</p>

Swing-in stops	Patented retinal protection device, Pat. No. DE 33 39 17 2 C2 Patented field stop for reduced glare, Pat. No. G 91 03 43 3.7
----------------	---

Mechanical data

Front-to-back tilt of microscope	With self-locking gear drive, manually adjustable using a knob. Tilt angle $\pm 180^\circ$
Swivel range of assistant's microscope	Swivel angle $\pm 90^\circ$ , manually lockable
X-Y coupling	Adjustment range: max. 40 mm x 40 mm Automatic centering at the press of a button
Weight	approx. 13 kg

## Ambient requirements

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

The unit meets the essential requirements stipulated in Annex I to the 93/42/EEC Directive governing medical devices. The unit is marked with:



Subject to change.

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