Operation Microscope
OPMI MDO
OPMI MDO XY
on S5 Floor Stand

Instructions for use

G 30-1123-e 1993-05-14

Caution:
Safety is only ensured when this instrument is operated properly. Please read through this manual carefully before turning the instrument on. You may obtain further information from our service organization or authorized representatives.

Regulations

- This instrument was developed in accordance with the following regulations:
  - VDE
  - IEC
  - UL
  - CSA

  Manufacturing, inspection, installation and service are done in accordance with German and international regulations (Good Manufacturing Practice).
- The instrument must be connected to an emergency backup line supply in accordance with the regulations or guidelines which apply in your country for the specific application.
- It is the duty of the operator to ensure that applicable accident prevention regulations are observed.

Notes on installation and usage

General

- Do not operate the instrument in explosion-risk areas. Its use in the presence of volatile anesthetics or inflammable solvents such as alcohol, benzin or similar chemicals is prohibited.
- Do not station this instrument in damp rooms. Do not expose the instrument to water splashes, dripping water or sprayed water.
- Modifications and repairs on this instrument and on instruments used with the OPMI MDO and the S5 Floor Stand may only be performed by our service technicians or by other authorized persons.
- The manufacturer will not accept any liability for damage caused by unauthorized persons tampering with the instrument; such tampering will also forfeit any rights to claim under warranty.
- The operator must carefully read this user's manual together with the user's manuals of the other equipment.
- Keep the user's manuals where they are easily accessible at all times.
- The framed passages in this manual are safety notes and special information. Read these with special care and attention.
- Never look at the sun through the binocular tube.

- Never pull at the light guide cable, at the power cord or at other cable connections.
- Always handle the microscope stand cautiously to prevent accidents.
- This instrument is a high-grade technological product. In order to ensure perfect and safe working order of the instrument, we recommend that our service technicians inspect it regularly.

Important before turning on instrument for first time

Our service technician will install the microscope onto the stand. He will check the following points. The operator must ensure that these points are observed in future.

- Ensure that all mechanical connections (for example, screws, nuts, etc.) which serve to guarantee the safety of the instrument or perform a supporting function are correctly fitted and secure. Firmly tighten any parts which are loose or not tightened properly.
- Make sure the voltage at the voltage selector corresponds with rated voltage on site.
- Only plug the power cord into a power outlet which is equipped with a properly connected ground contact.
- Only use cables and plugs which are in good working condition.
- Always make sure the instrument and all accessory equipment is in proper working condition before operation.

Important each time before turning on instrument

- Go through the checklist on page 19.
- Make sure the instrument and all equipment is in good working condition.
- Make sure all securing elements such as screws, clamps and rings are properly installed and firmly secure.
- Re-attach or close any covers, panels or caps which have been opened or removed.
- Pay special attention to warning symbols on the instrument (triangular warning signs with exclamation marks) and labels (see figure 1). If any label is missing on your instrument, please contact us or our authorized representative. We will supply the missing labels.
- Do not cover any ventilation grids or slits.

Important when using the instrument

- The long extension of the stand base must always point in the direction of the surgical field.
- Never look directly into the light source, e.g. into the microscope objective or into a fiber light guide.
- When operating on the eye, always use UV protection filter GG 475 to protect the patient's eye from unnecessary UV radiation, which could damage the retina.

Important when you are finished using the instrument

- Always use the main power switch of the instrument to turn it off.
- After changing the equipment of the microscope, the stand must be re-balanced.

Re-equipping the microscope

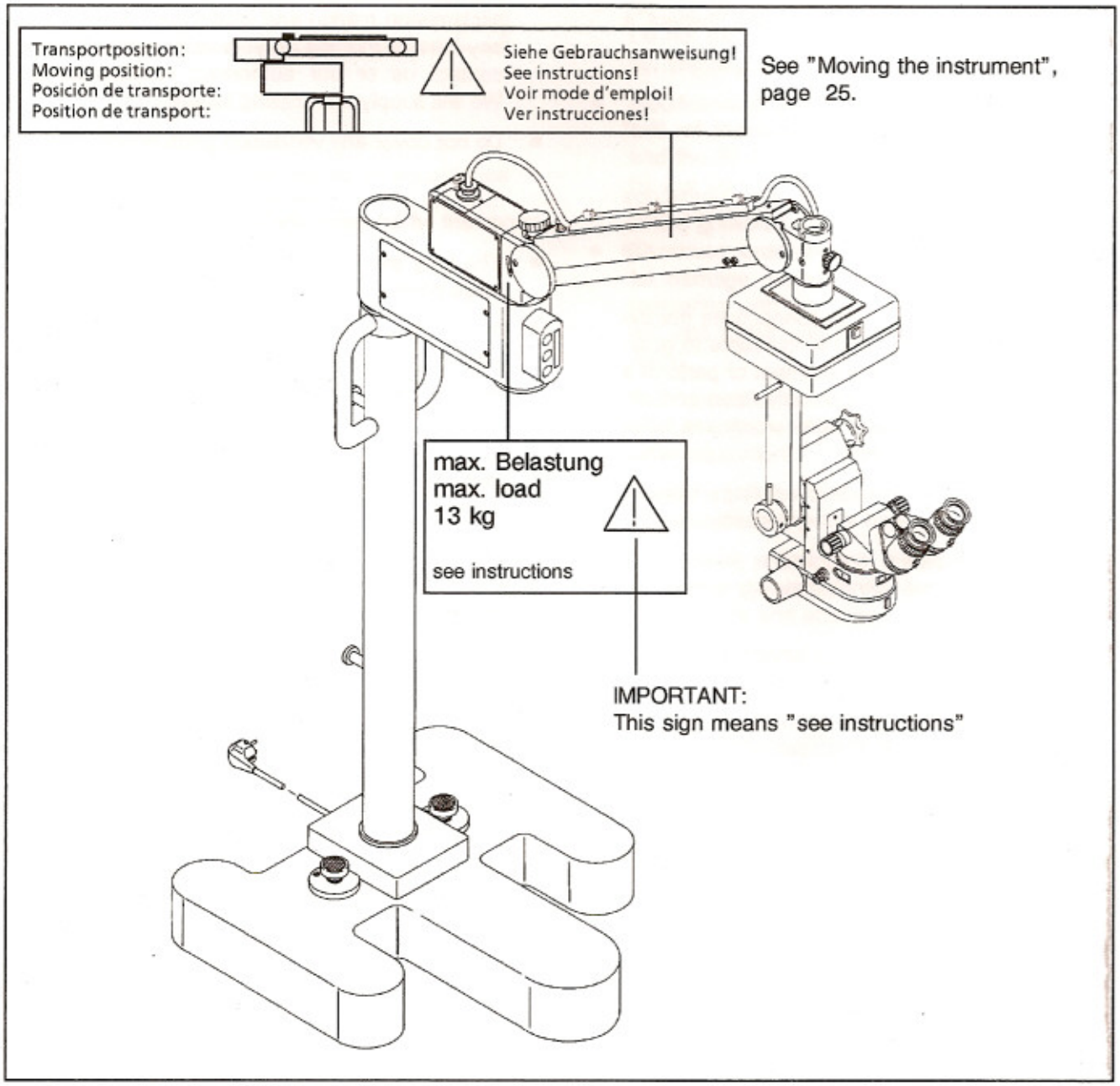
- After re-equipping the microscope always re-balance the stand.

Warning labels and notes

Caution:
Observe all warning labels and notes!

If any label is missing on your instrument, please contact us or our authorized representative. We will supply the missing labels.

1



General

The OPMI MDO operation microscope and the S5 Floor Stand were developed together for the special demands of ophthalmology. The surgeon can choose between two illumination systems:

- Coaxial illumination. This unit also contains a module for retro-illumination
- Inclined illumination. The inclined illumination does not strain the retina of the patient's eye and it creates a better impression of depth in the image of the surgical field.

The system is controlled over a foot control unit from which the surgeon my activate several motor-driven functions.

We offer the OPMI MDO in two versions:

	Order No.
OPMI MDO	30 26 31- 0000
OPMI MDO XY	30 26 32- 0000

The OPMI MDO-XY is equipped with an X/Y coupling.

In addition, we offer a program of accessory equipment such as co-observation tubes for assistants and photography/video adapters and equipment. An asepsis set containing sterilizable caps for the control elements on the operation microscope is also offered:

Asepsis set: 30 26 31- 9015

These caps can be sterilized in the usual manner.

The instrument shown in this user's manual consists of the following components:

OPMI MDO XY	30 26 32- 0000
S5 Floor Stand	30 59 12- 0000
Filter bracket with filters FG 6 and GG 475	30 33 65- 0000
Foot control panel	30 49 90- 9904
Binocular inclined tube f = 170 mm	30 37 84- 0000
Screw-type widefield eyepieces 10 x 22	30 55 30- 0000
Objective f = 200 mm	30 26 52- 9901

Operation microscope

1 Securing screw
This securing screw retains the microscope in the reception bore of the stand and secures it from falling out. Be sure to screw in this screw firmly as far as it will go.

2 Rotation shaft of microscope
When you insert the rotation axis of the microscope into the reception bore of the stand, screw the securing screw of the stand in firmly as far as it will go. The securing screw must engage in the groove of the rotation axis of the microscope.

3 OPMI MDO connector

4 Ground wire screw for additional grounding of the operation microscope

5 Clamping lever
You can use this lever to set the friction of the coarse adjustment of the microscope tilt or to clamp the tilt position of the microscope. The lever can be screwed in in the easiest position to work with or it can be removed to prevent the setting from being accidentally changed.

6 Light guide holder

7 Zoom knob
Using this knob, you may manually adjust the magnification of the microscope - especially in the event of a failure of the motor-driven zoom function.

8 Button for automatic centering of the XY coupling

9 Light guide holder

10 Securing screw
After attaching a binocular tube or another unit, tighten this screw firmly as far as it will go.

11 Indication window for magnification factor γ of zoom system

12 Cover cap
This cap can be removed for mounting a handle for positioning the microscope.

13 Connector for XY coupling

14 Knob for adjusting microscope tilt

15 Indication markings for focus range
The focusing is in the middle of the focus range when the pin and the dot meet.

16 Light guide receptacle
When connecting the light guide, be sure to insert the end into the recptacle all the way to the stop.

17 Light stop knob
You may choose among three positions:

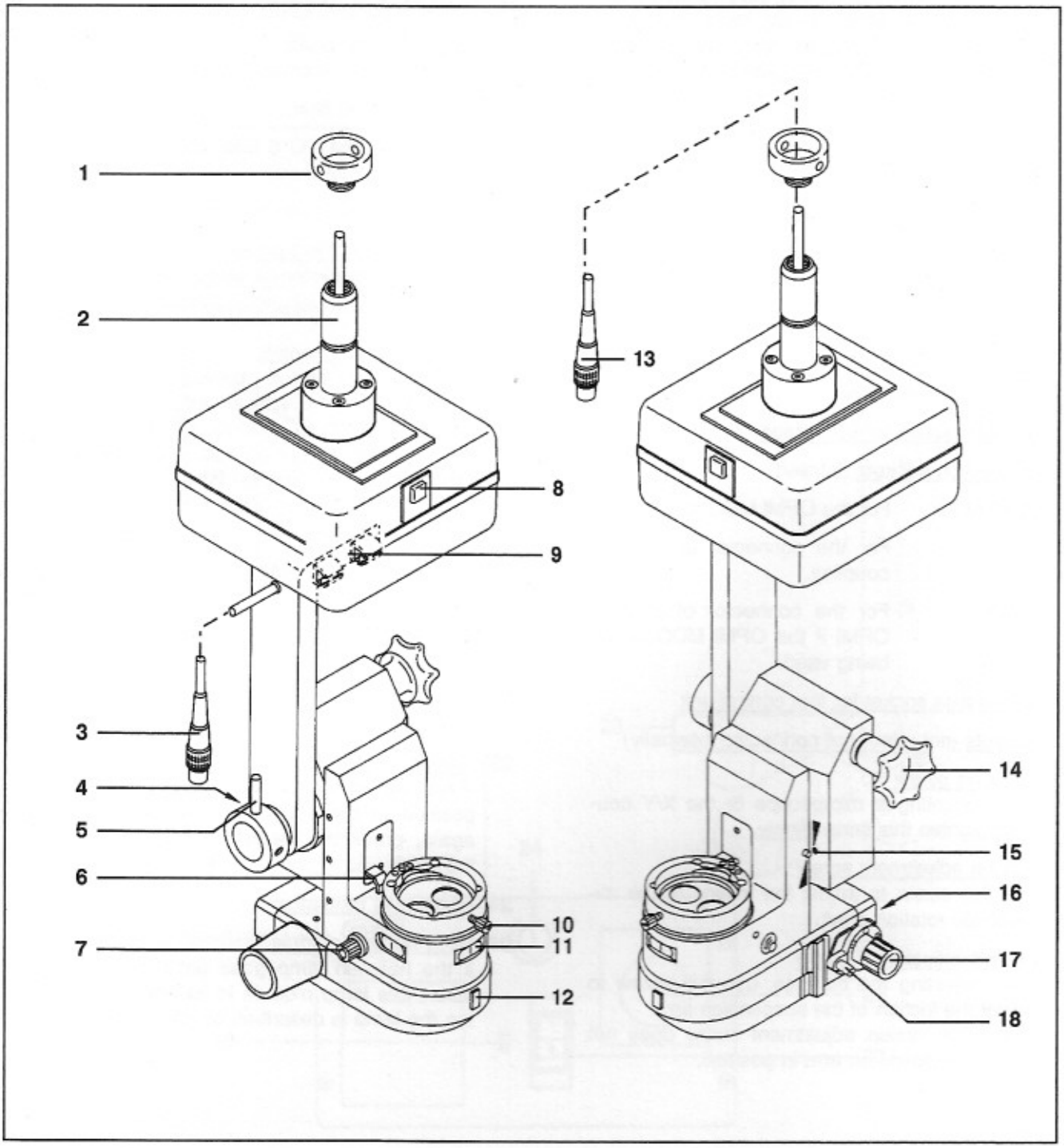
◎ Retro-illumination contrast stop. When using the f = 200 mm objective, the diameter of the field of illumination is 16 mm ± 1 mm.

○ Free aperture. The field of view is completely illuminated. Use this position when the inclined illumination is selected.

◉ Retinal protection device. The retinal protection device does not stop at a catch, and so it can be moved steplessly across

18 Shutter lever for coaxial illumination
The coaxial illumination can be gradually shuttered off with this lever. Shuttering off the coaxial illumination will increase the contrast for the red reflex.

2



Stand

1 Lamp module
If the lamp goes out during the operation, insert the back-up lamp module (25) in its place.
Note: Before removing the lamp module, turn the instrument off at power switch (27).
Exchanging the lamp is described on page 24.

2 Adjustment screw for limiting downward movement

3 Front panel
see positions (24) to (27).

4 Bolts for winding cable

5 Power cord

6 Cable clips
The cables for fastening accessory equipment can be fastened here.

7 Securing screw for light guide

8 Connection sockets (labeled)

OPMI MDO:	For the OPMI MDO connector.
XY:	For the connector of the X/Y coupling.
OPMI:	For the connector of another OPMI if the OPMI MDO is not being used.

9 Connection socket for foot control unit

10 Sockets (not used, not connected internally)

11 Securing screw
After mounting a microscope or the X/Y coupling, tighten this screw firmly.

12 Friction adjustment screw
Use this screw to adjust the friction of the microscope rotation shaft.

13 Friction adjustment screw
After adjusting the balance, use this screw to adjust the friction of the suspension arm.
Note: The friction adjustment screw does not lock the suspension arm in position.

14 Power rating plate

15 Cable hook for the foot control unit cable

16 Filter knob (optional)
You may choose among three positions:

O	No filter.
FG 6	The FG 6 filter improves the color impression.
GG 475	UV protection filter.

17 Balance adjustment screw
Balancing the system is described on page 16.

18 Weight compensation scale

19 Thermal circuit breaker
The thermal circuit breaker automatically switches off the electrical supply to the halogen lamp in lamp module (1) when it overheats. When this happens, first correct the cause of the overheating. When the lamp module has cooled down again, press the thermal circuit breaker back in.

20 Clamp screw for rotational movement of the suspension arm

21 Clamp screw for the rotational movement of the carrier arm

22 Handles
Use these handles when moving the stand.

23 Floor brake knobs
Press these knobs in with your foot to lock the position of the stand. To release the brakes again, press the toeplate located underneath the knob.

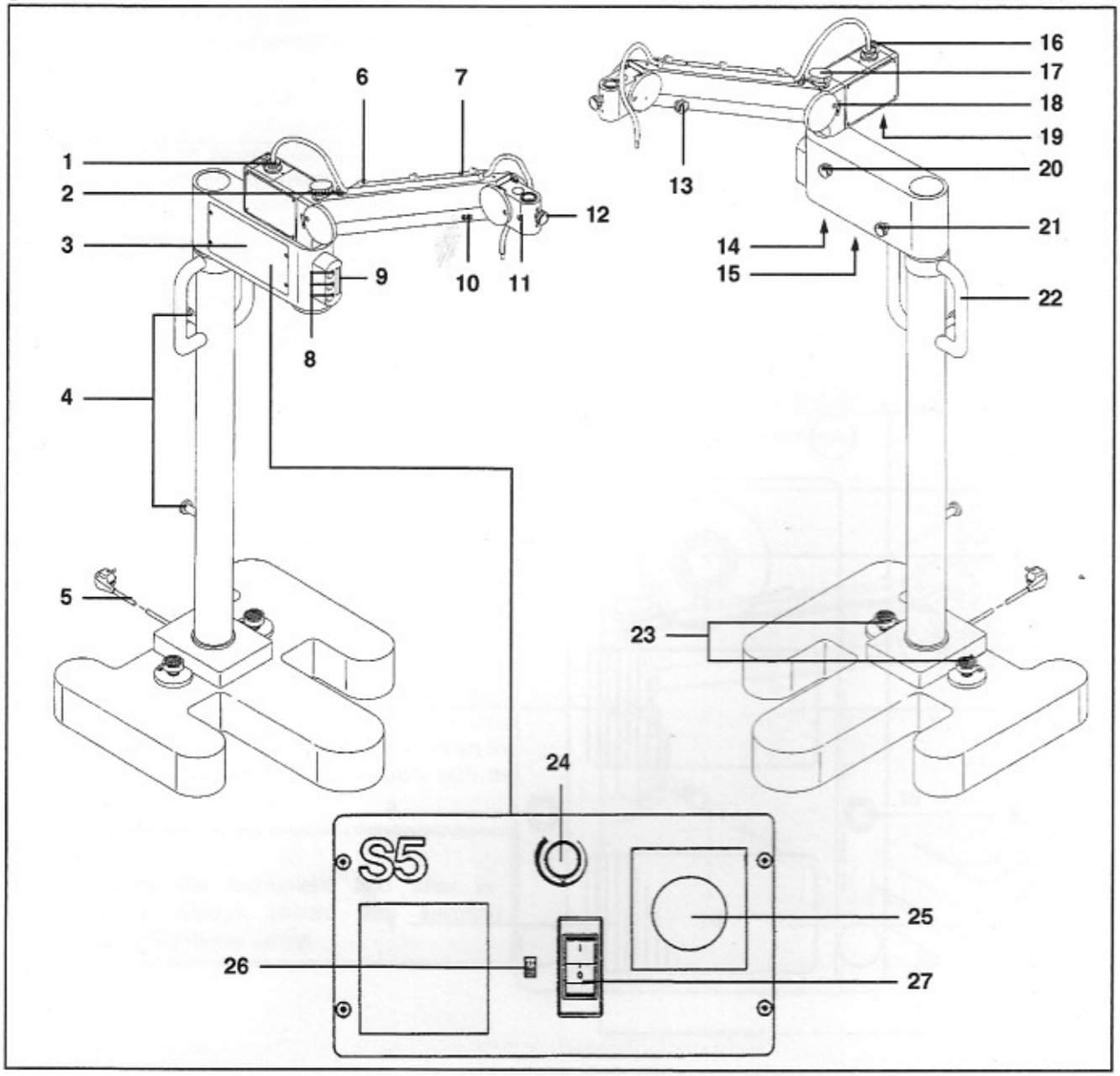
24 Brightness regulation

25 Back-up light module
If the halogen lamp goes out during surgery, insert this lamp module in its place. Exchanging the lamp is described on page 24.

26 Voltage conversion screw
The voltage indicated must correspond to the rated voltage on site. To change the voltage selected, turn the screw using a small screwdriver.

27 Power switch
The power switch contains a circuit breaker. If the circuit breaker shuts the instrument off, it can be switched on again at the power switch.

3



Foot control unit

The figure below shows the functions of foot control unit 30 49 90- 9904 as used with the OPMI MDO XY mounted on S5 Floor Stand. Our service technician can rewire the foot control unit if you prefer the functions to be located differently.

1 Joystick for X/Y coupling

2 Focus –

3 Focus +

4 Illumination on/off

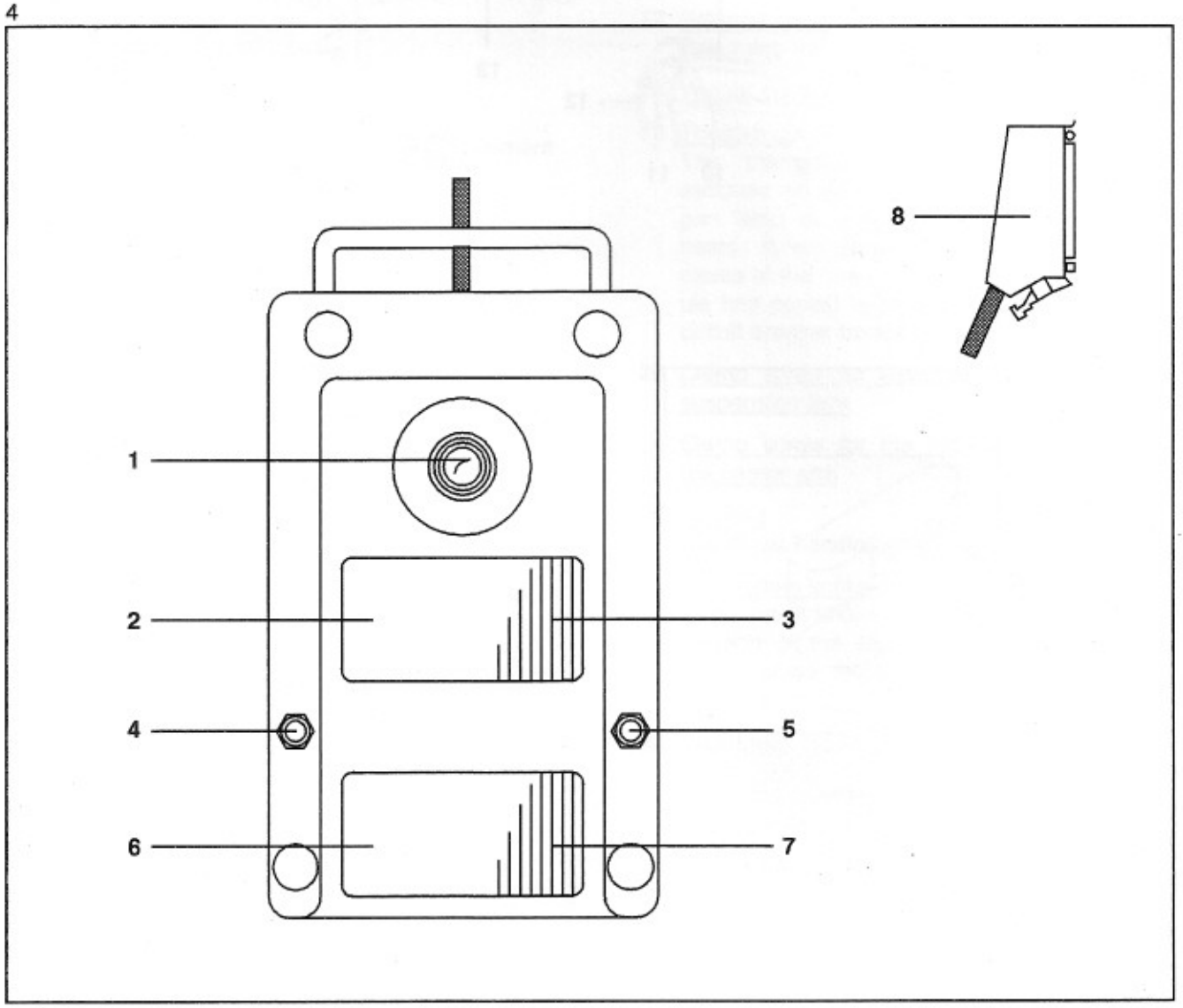
5 Toggle for coaxial illumination / retroillumination
When the inclined illumination is selected, turn the light stop knob to free aperture (see page 8, pos. 17).

6 Zoom –

7 Zoom +

8 Foot control unit connector

4



Caution:
Before assembling the microscope equipment, you must read chapter "notes on safety"!

Attaching the microscope

Caution:
Before using the instrument and after re-equipping it, always ensure that all fastening elements such as screws, clamps and rings are installed and properly tightened!

We recommend that two persons do the following work. This is especially useful when the microscope is equipped with an XY coupling.

- Turn the balance adjustment screw (9) clockwise until the weight compensation scale reads 13 kg.
- Remove securing screw (12).
- Lubricate the microscope rotation shaft (15) with a light grease such as vaseline.
- Feed the connection cable for the X/Y coupling (10) through the reception bore (14) of the suspension arm.
- Insert the microscope rotation shaft (15) into the reception bore of the suspension arm(14), screw in securing screw (12) and tighten firmly using a suitable tool. Securing screw (12) must go into groove (16), which is ensured when the head of securing screw (12) is flush with the outer surface.

Caution:
Before using the instrument and after re-equipping it, always ensure that securing screw (12) is tightened firmly!

- Tighten securing screw (11) firmly using a suitable tool (e.g. a pin key).

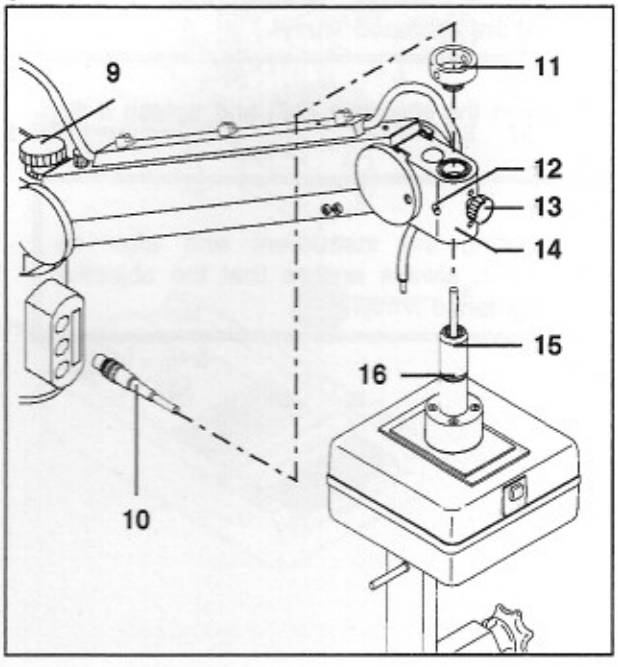
Caution:
Before using the instrument and after re-equipping it, always ensure that securing screw (11) is tightened firmly!

Removing the microscope

To change the microscope equipment, remove the microscope in the same manner as it was attached, but in reverse order. The following points are important:

- Move the suspension arm to the top position.
- Before removing the microscope, loosen the friction screw for the microscope rotation shaft (13).
- Hold the microscope securely when loosening the securing screws.

5



Mounting the tube, the eyepieces and the objective

- Loosen securing screw (13) a few turns.
- Remove the cap from the mount for the binocular tube and store it.
- Place the binocular tube (11) on the operation microscope and tighten securing screw (13) firmly.
  Note: Other equipment by be installed between the binocular tube and the microscope body. These units are secured using screw (13) in the same manner.

Caution:
Before using the instrument and after re-equipping it, always ensure that securing screw (13) is tightened firmly!

- Screw the eyepieces (12) onto the tube and tighten the knurled rings (14) firmly.

Caution:
Before using the instrument and after re-equipping it, always ensure that knurled rings (14) are tightened firmly!

- Screw in the objective (15) and tighten it firmly.

Caution:
Before using the instrument and after re-equipping it, always ensure that the objective (15) is tightened firmly!

Connecting the cables and light guides

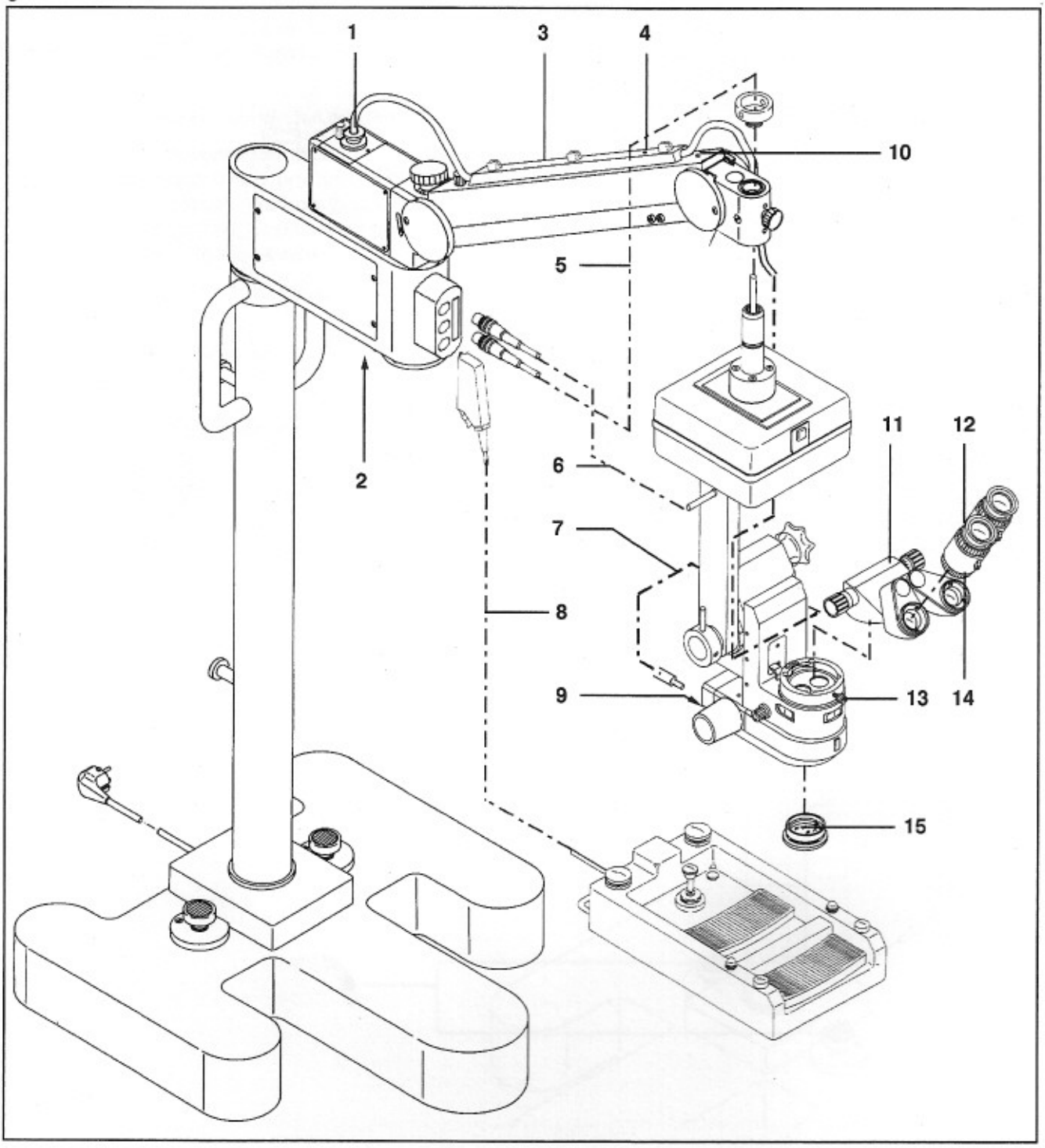
- Insert the X/Y coupling connector (5) into the socket labeled "XY" and tighten the sleeve firmly.
- Insert the OPMI MDO connector (6) into the socket labeled "OPMI MDO" and tighten the sleeve firmly.
- Insert the foot control unit connector (8).

Note: Only plug in or unplug these connectors when the power switch on the stand is turned off.

- Hang the cable to the foot control unit into hook (2).
- Remove two screws (10) and take off the U-shaped cover.
- Lay the connection cables for the operation microscope and the X/Y coupling along the top of suspension arm.
- Re-install the U-shaped cover and screw it down.
- Run the light guide through the cable duct (3) on top of the suspension arm.
- Insert the light guide (7) into light guide receptacle (9) of the microscope and into light guide receptacle (1) of the lamp module.

  The light guide must have enough slack on both sides so that the suspension arm can move freely without damaging the light guide.
- Screw in the clamping screw (4) for the light guide (not too tight).

6



Caution:
Before preparing for operation of the instrument, you must read chapter "Notes on safety".

Balancing the stand

- Loosen friction adjustment screw (2).
- Move the microscope by hand to about the middle of the vertical movement range and hold it there.
- Turn the balance adjustment screw (4) counterclockwise until the microscope no longer moves upwards when you let it loose.
- Loosen the balance adjustment screw (4) a few more turns.

When properly balanced, the microscope should remain in any position it is put into. The effort required to move it up and down should be the same.

Setting the stand

- Position the stand so that the long extension of the stand base points towards the field of surgery.
- Press down the floor brake knobs (8).
- Set the limit of downward movement.
  To do this push the microscope down to the lowest working position desired and turn the adjustment screw (3) for limiting the downward movement clockwise as far as it will go.
- Set the friction using knobs (1), (2), (5) and (6) as desired.
- Check the setting of the rated.
- Plug in power cord (7).
- Switch on the illumination and adjust brightness as desired.

Caution:
Before preparing for operation of the instrument, you must read chapter "Notes on safety".

Balancing the stand

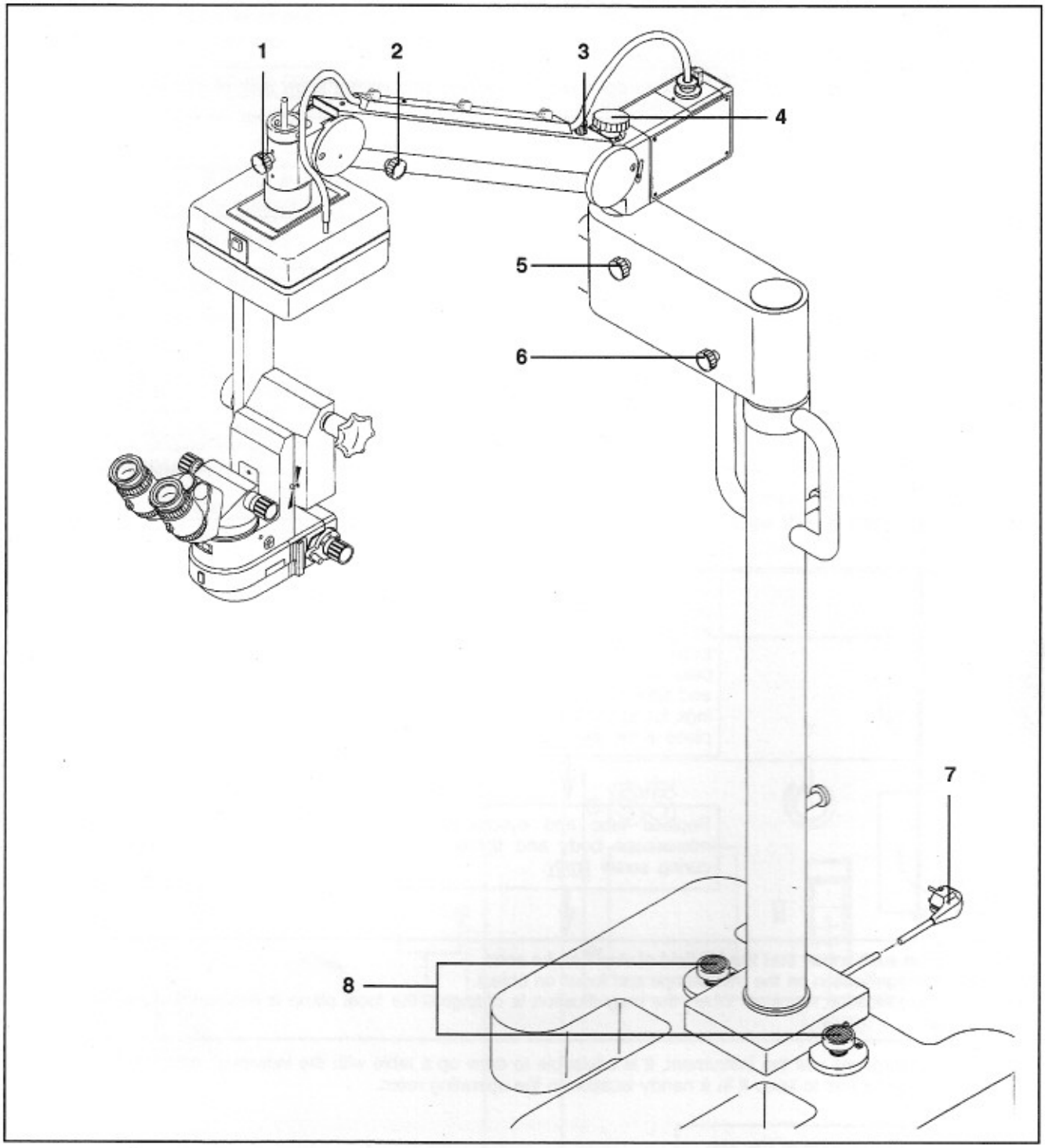
- Loosen friction adjustment screw (2).
- Move the microscope by hand to about the middle of the vertical movement range and hold it there.
- Turn the balance adjustment screw (4) counterclockwise until the microscope no longer moves upwards when you let it loose.
- Loosen the balance adjustment screw (4) a few more turns.

When properly balanced, the microscope should remain in any position it is put into. The effort required to move it up and down should be the same.

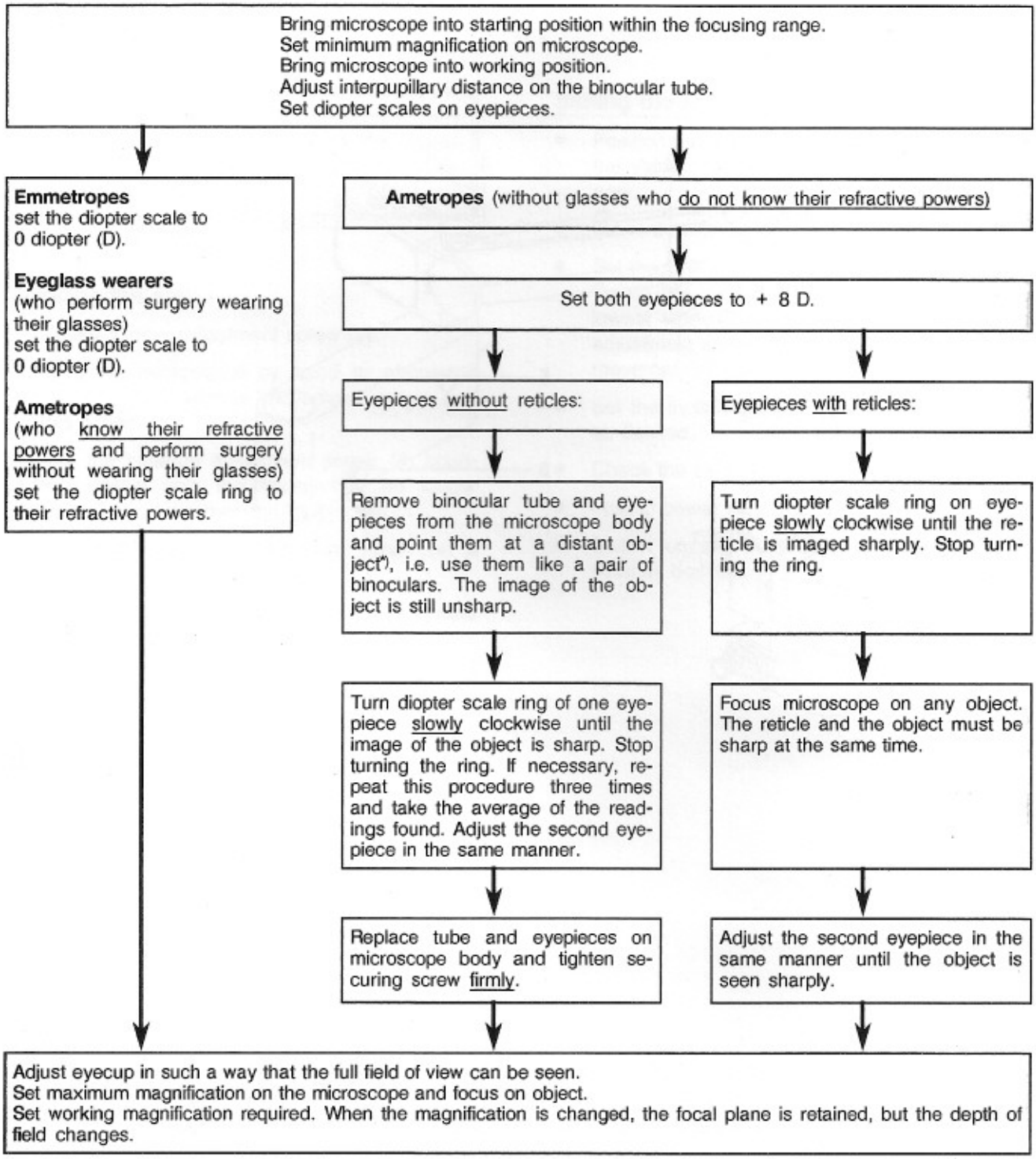
Setting the stand

- Position the stand so that the long extension of the stand base points towards the field of surgery.
- Press down the floor brake knobs (8).
- Set the limit of downward movement.
  To do this push the microscope down to the lowest working position desired and turn the adjustment screw (3) for limiting the downward movement clockwise as far as it will go.
- Set the friction using knobs (1), (2), (5) and (6) as desired.
- Check the setting of the rated.
- Plug in power cord (7).
- Switch on the illumination and adjust brightness as desired.

7



Setting the operation microscope



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

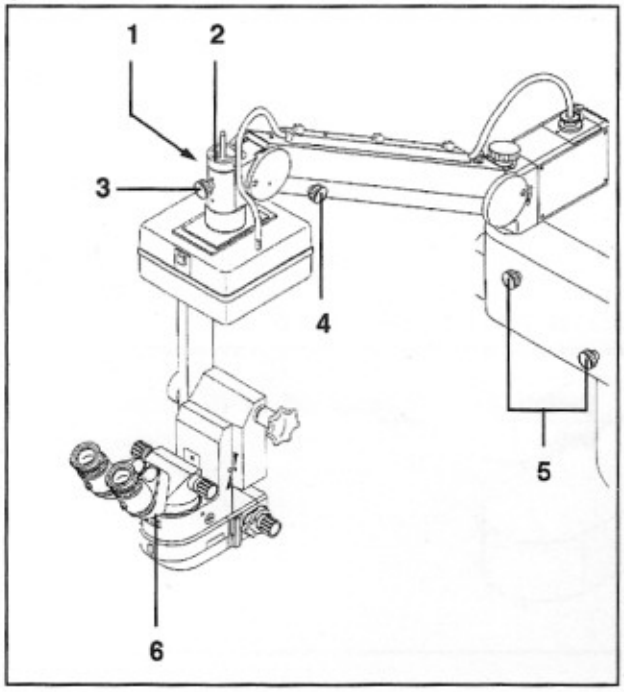
*) **Caution: Never point at the sun.**

The following points must always be checked (without the patient) before surgery:

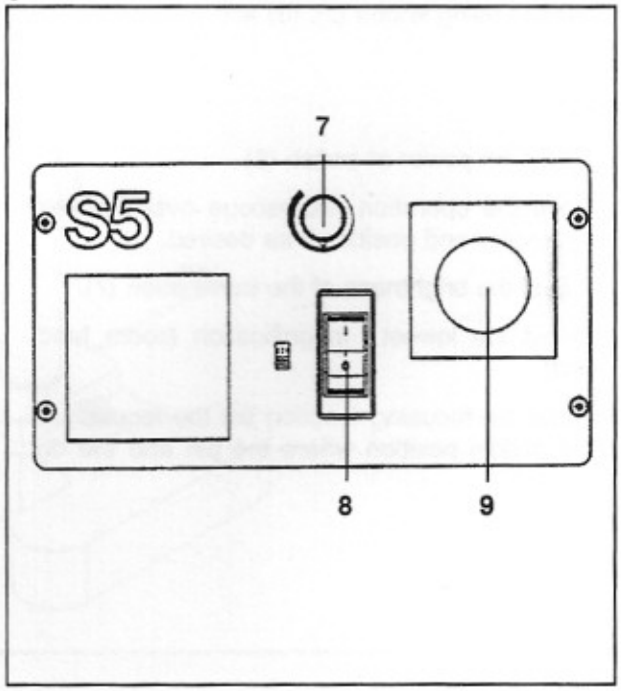
- Make sure the instrument equipment is in proper working condition.
- Make sure all cables are connected.
- Securing screws (1) and (2) must be tightened firmly.
- Securing screw (6), which fastens the binocular tube, must be tightened firmly.
- Make sure the foot control unit is connected.
- Switch on power at power switch (8).
- Check the illumination using brightness adjustment knob (7).
- Check the lamp in the back-up lamp module (9).
- Check the coaxial illumination / retroillumination and the inclined illumination.
- Check the limitation of downward movement of the microscope.
- Check the balance of the suspension arm.
- Check the friction of the microscope rotation and correct using knob (3), if necessary.
- Check the friction of the carrier and suspension arms and correct using knobs (4) and (5), if necessary.
- Check the functions of the X/Y coupling, the zoom and the focus over their entire ranges.
- Check the interpupillary distance setting on the binocular tube.
- Check the eyepiece settings.
- Check the optical image over the entire magnification range.

Caution:
If a malfunction is detected, for safety reasons it is not allowed to operate using this instrument. If possible, correct the fault (see troubleshooting table, page 22) or contact our service dept.

8



9



Caution:
Before using the instrument, you must read chapter "Notes on safety"!

Requirements

The stand, the operation microscope and the foot control unit are connected.

The instrument has been checked in accordance with the checklist.

- Place the stand in the desired position.

Caution:
The long extension of the stand base must always point in the direction of the surgical field!

- Re-check the limitation of downward movement.
- Press the floor brake knobs (10).
- If necessary, adjust the friction of the suspension arm, the carrier arm and the microscope rotation using knobs (2), (3) and (4).

Usage

- Switch on power at switch (9).
- Move the operation microscope over the field of surgery and position it as desired.
- Adjust the brightness of the illumination (7).
- Select the lowest magnification (zoom function).
- Using the focusing function set the focusing to the middle position where the pin and the dot meet (5).
- Press button (1) for automatic centering of the XY coupling.
- Looking into the eyepieces, lower the operation microscope using the suspension arm to where the image of the surgical field is visible. Re-adjust eyepiece setting if necessary (see page 18).
- Select the highest magnification (zoom function).
- Focus the image of the surgical field using the focusing function.
- Set to desired magnification (zoom function).

Caution:
When selecting the illumination, always take care to keep the strain on the patient's eye to a minimum. Only use the retroillumination when the surgical procedure requires red reflex. If red reflex is not necessary, move the retinal protection device into the beam path when using the coaxial illumination / retroillumination or switch over to inclined illumination!

Caution:
Never look directly into the light source, e.g. into the microscope objective or into a fiber light guide!

Caution:
When operating on the eye, always use eye-protection filter GG 475 to prevent damage to the retina of the patient's eye!

- Switch the instrument off at (5) when not in use.

What to do in an emergency

Lamp failure

- Switch the instrument off at (9) and disconnect the light guide. Install the back-up lamp module (8) in lamp house (6). Re-connect the light guide and switch the instrument back on.

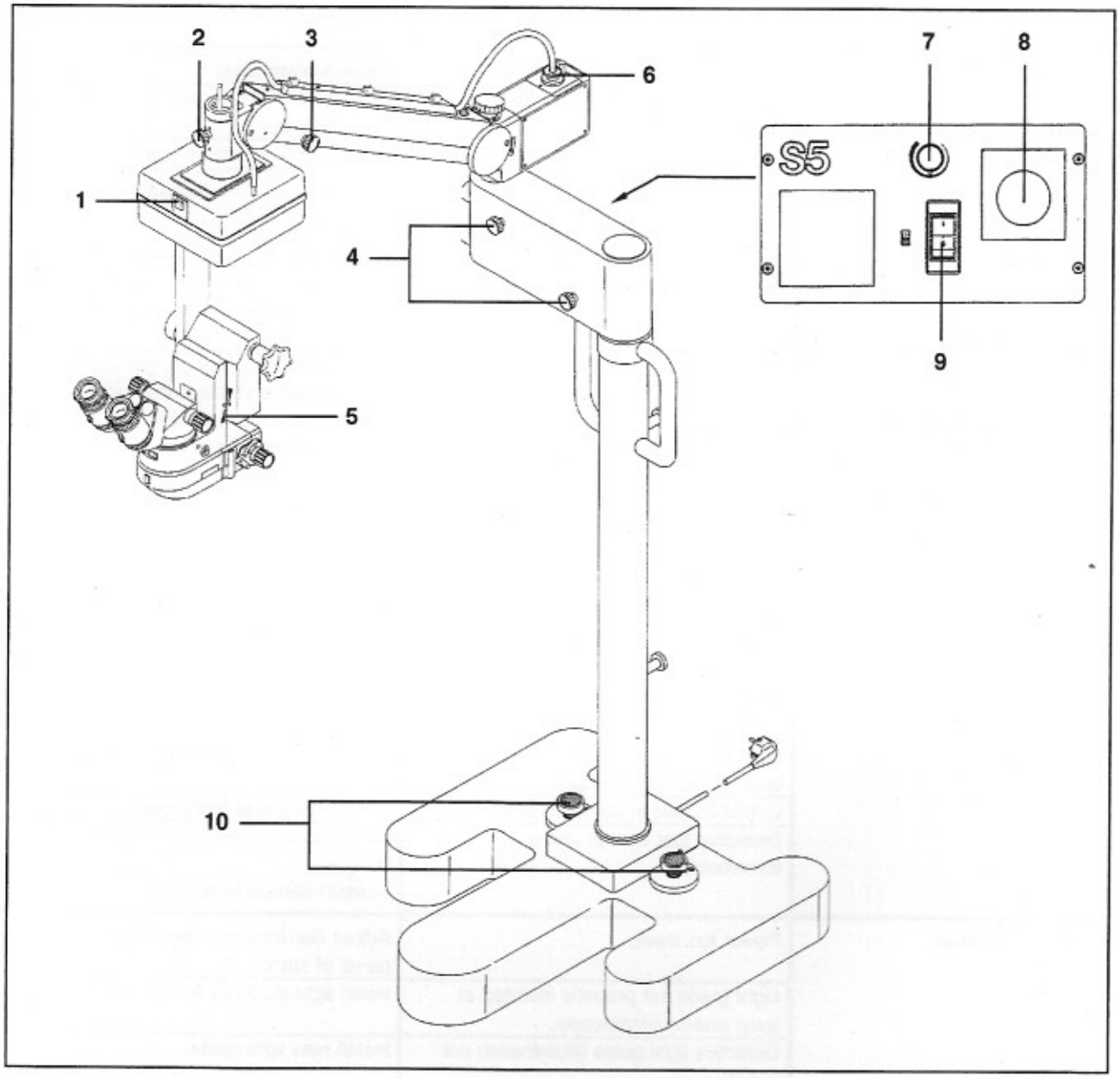
Failure of zoom function

- Set the magnification manually using the zoom knob.

Failure of focusing function

- Focus using the movement of the suspension arm.

10



Trouble-shooting table

Problem	Possible Cause	Remedy
No function at all.	Power plug not connected.	Connect power plug.
	Main power switch not pressed.	Press main switch. Green pilot light must come on.
	Circuit breaker in the power switch is activated.	Press the power switch again.
	Power failure.	Contact in-house electrician.
	Failure of stand electronics.	Contact service technician.
The microscope illumination is not working properly, but the green light in the power switch is on.	Halogen lamp is not turned on.	Turn on illumination at foot control unit. Adjust using the knob on front panel of stand.
	Halogen lamp defective.	Switch the instrument off, pull out the lamp module and insert the back-up module. Turn instrument back on. Change the lamp (see page 24).
	Thermal circuit breaker has switched lamp off.	First correct the cause of the overheating. When the lamp module has cooled down again, press the thermal circuit breaker (position 19, page 10) back in.
	Ceramic base does not have proper contact to halogen lamp.	Plug the ceramic base firmly onto the contacts of the halogen lamp
	Lamp module does not have proper contact.	Push in lamp module as far as it will go.
	Foot control unit not properly connected.	Connector must fit in with click.
	Light guide not properly inserted at lamp and/or microscope.	Insert light guide as far as it will go.
	Defective fuse in stand column.	Contact in-house electrician.
	Defective foot control unit or electronics.	Illuminate area of surgery with surgical lamp. Contact service technician.
Insufficient illumination.	Power too weak.	Adjust illumination using knob on front panel of stand.
	Light guide not properly inserted at lamp and/or microscope.	Insert light guide as far as it will go.
	Defective light guide (illumination not even).	Install new light guide.

Problem	Possible Cause	Remedy
Zoom system not functioning.	Foot control unit not connected properly.	The connector must click in.
	Defective fuse in stand column.	Contact in-house electrician.
	Defective foot control unit or motor.	Adjust the magnification manually using zoom knob on microscope. Contact service technician.
Focusing not functioning.	Foot control unit not connected properly.	The connector must click in.
	Defective fuse in stand column.	Contact in-house electrician.
	Defective foot control unit or motor.	Focus using the suspension arm of the stand. Contact service technician.
X/Y coupling not functioning.	Foot control unit not connected properly.	The connector must click in.
	Defective fuse in stand column.	Contact in-house electrician.
	Defective foot control unit or motor.	Position the microscope manually Contact service technician.
Microscope movement too sluggish or jammed.	The respective friction setting is too tight.	Loosen friction setting.
	Jammed (e.g. lacking lubrication)	Contact service technician.

Exchanging the lamp

Caution:
When you exchange the lamp shortly after it has gone out, wear heat-protective gloves to prevent burns!

Note: If the halogen lamp goes out during the operation, install the back-up lamp module. It is thus important to check the back-up lamp module before surgery begins.

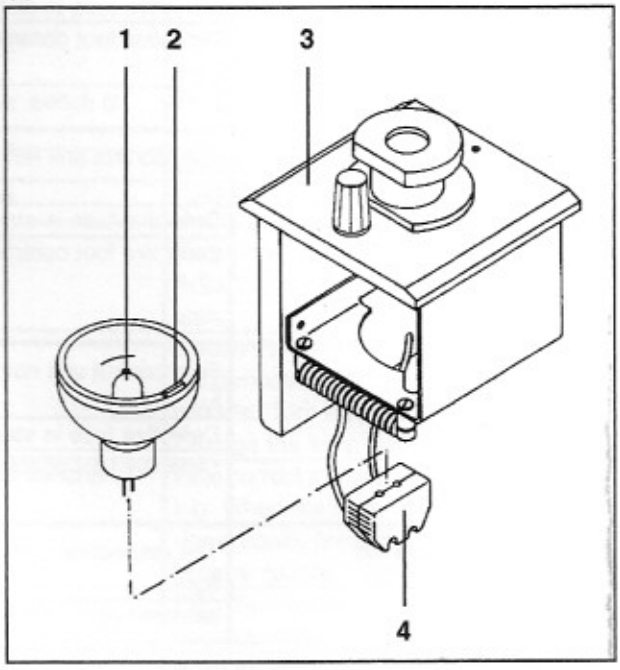
To change the halogen lamp, proceed as follows:

- Switch the instrument off
- Pull out lamp module (3).
- Pull the ceramic base (4) off of the contact pins of the halogen lamp.
- Pull the halogen lamp out of the spring holding device.
- Install the new halogen lamp. Observe the following points:
  - The centering nose (2) must fit into the hole.
  - Do not touch the lamp bulb or the interior of the lamp reflector.

Note: Only use 12 V, 100 W halogen lamps, order number INR 0079.904

- Slide the ceramic base (4) onto the contact pins of the lamp.
- Install the lamp module (3) with the new halogen lamp into the stand.
- Switch the instrument back on.

11

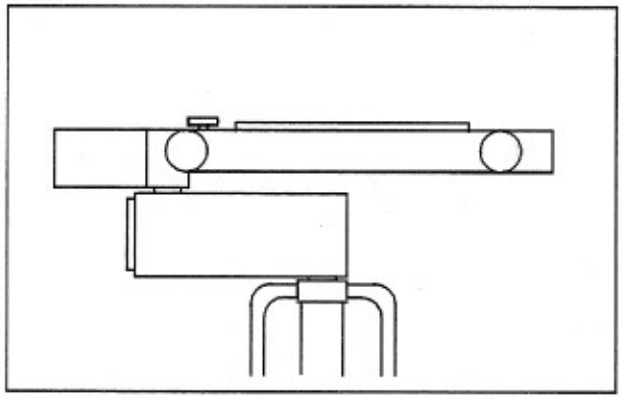


Moving the instrument

Observe the following points when moving the instrument:

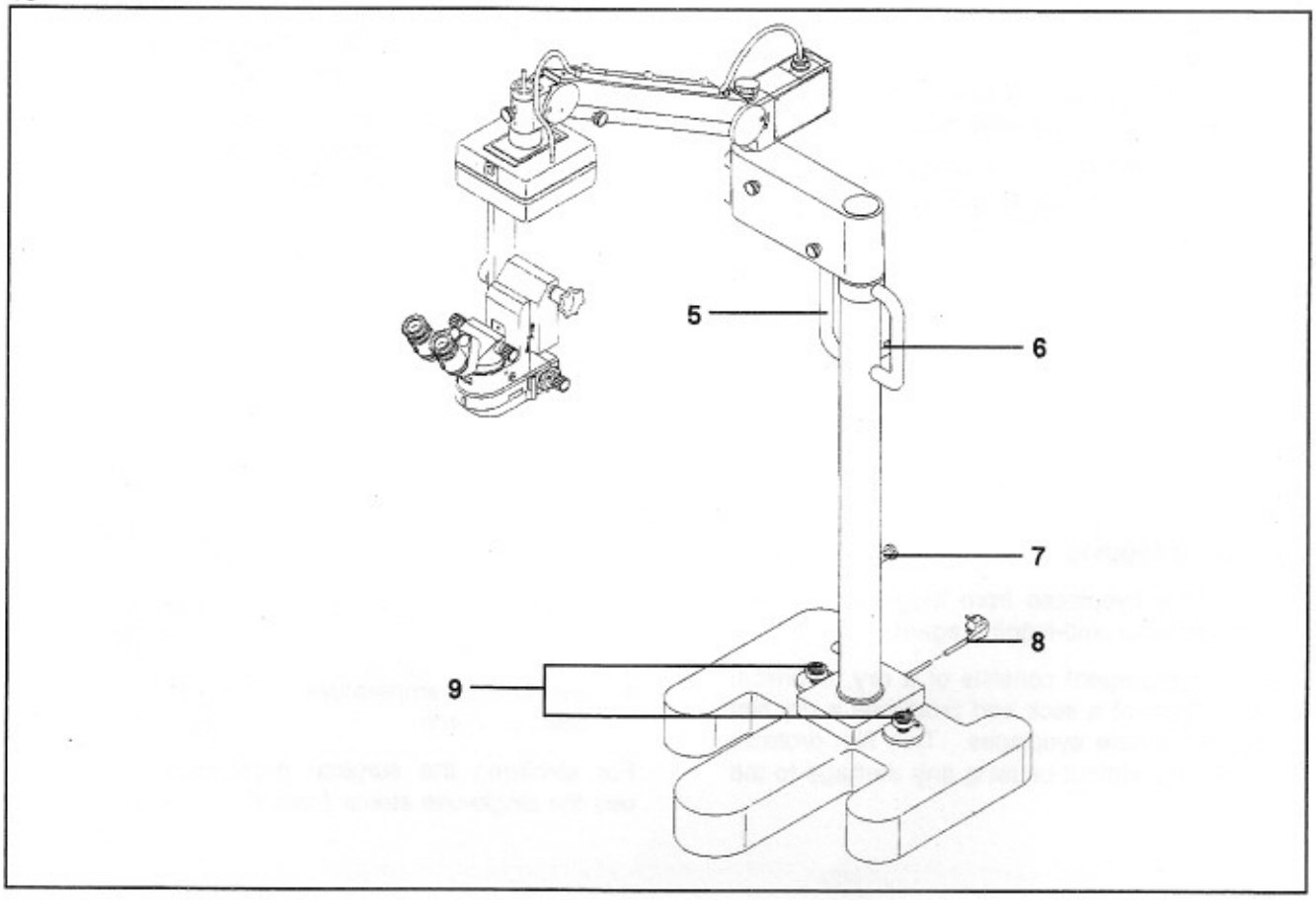
- Roll up the power cord (8) on bolts (6) and (7).
- Hang the foot control unit on the top bolt (6).
- Move the stand arm to its moving position (figure 12).
- Release the floor brake knobs (9). To do this, press the toeplate underneath the knob.
- When moving the stand, use handles (5).
- Avoid collisions of any kind.
- Do not go over steps or edges. The stand might topple!

12



- Be extremely careful when moving over slopes.
- Do not park the stand on a slope.

13



Care of the microscope

Cleaning optical surfaces

The multilayer T* (T-star) coating of our optical components (e.g. eyepieces and objectives) results in optimum contrast and high-quality observation and image quality.
These advantages, which provide a brilliant image, are markedly impaired by even slight contamination of the optics or by a fingerprint. In order to protect the internal optics from dust, when the instrument is not being used it should never be left without the objective, binocular tube and eyepieces installed. After use, cover the instrument to protect it from dust. Always store objectives, eyepieces and accessories which are not being used in dust-free cases.
The external surfaces of the optical components (eyepieces, objectives) should be cleaned on a regular basis:

- Blow off dust on the optical surfaces using a squeeze blower or a grease-free brush.
- Thorough cleaning is now extremely easy and can be quickly performed with our new antistatic cleaning cloths.
  Please follow the instructions on the packing of the cleaning cloths.

In this manner the optical image will remain brilliant and high in contrast.

Pack of 100 cleaning cloths:
Catalog no. 30 61 18- 0000

Prevention of fogging

To prevent the eyepieces from fogging, you may treat them with our anti-fogging agent.

The anti-fogging agent consists of a dry, chemical solid in the form of a stick and produces a dry film when applied to the eyepieces. This film protects against fogging without causing any damage to the coating. The anti-fogging agent contains neither wax nor silicone; it is unpoisonous and does not scratch glass.

The anti-fogging agent does not only ensure fog-free optics; it also cleans, polishes and protects the eyepiece optics against dirt, grease, dust, fluff and fingerprints.

Every pack of anti-fogging agent (contains 1 stick) includes instructions for use which we would ask you to observe.

Important: Spread the anti-fogging agent film with a dry cotton cloth - do not use paper!

Anti-fogging agent:
Catalog no. 30 55 50- 9910

Cleaning painted surfaces

All parts of the instrument 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 consisting of 50% ethyl alcohol and 50% distilled water plus a dash of household dishwashing liquid.

Sterilization

The asepsis set available from Carl Zeiss contains rubber caps, sleeves and grips which can be sterilized in conventional autoclaves. We recommend two programs for sterilization:

- Sterilization temperature : 120° C
  Sterilizing time : 20 minutes
- Sterilization temperature : 134° C
  Sterilizing time : 5 minutes

For sterilizing the surgical microscope you may use the single-use sterile drapes.

Magnifications / Fields of view

Using the magnification factor, which can be read in magnification window (11), page 8, you can calculate the total magnification of the microscope.

If:

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

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

γ is the factor set on the zoom system,

M_{eye} is the magnification of the eyepiece,

then the total magnification of the operation microscope can be calculated according to:

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

Example:

f_{tube} = 170 mm, f_{obj} = 200 mm, γ = 1.6 and M_{eye} = 10 x.

The total magnification is thus:

$$M_T = \frac{170}{200} \cdot 1.6 \cdot 10 = \underline{13.6}$$

If total magnification M_T of the operation microscope is known, the field of view diameter (FoV_D), i.e. the circular area of the surgical field which can be seen through the microscope when used properly, can be calculated according to:

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

FoV_N in the above formula stands for the field-of-view number, which is marked on our widefield eyepieces.

Using M_T = 13.6 from the example above, the field-of-view diameter is thus:

$$FoV_D = \frac{22 \text{ mm} \cdot 10}{13{,}6} = \underline{16.2 \text{ mm}}$$

Operation microscope OPMI MDO / OPMI MDO XY

Magnification	Zoom system with 1:6 zoom ratio, magnification factor γ = 0.4x - 2.4x. Total magnification with 10x eyepieces, f = 200 mm objective and f = 170 mm binocular tube: 3.4x – 20.4x. Zoom system control over foot panel (motor-driven) or manually.
Focusing	Motor-driven.
Illumination	Fiber-optic illumination, supplied from lamp house in stand. Simultaneous coaxial illumination and retroillumination. Can be switched over at foot control unit to integrated inclined illumination.
Light stops	Retinal protection device, red-reflex contrast light stop.
Electrical norms	In accordance with IEC 601-1, VDE 0750, UL 544, CSA C22.2 No. 125
XY coupling	Speed: 3 mm/s. Range of movement: ± 25 mm. Automatic centering.
Order numbers	OPMI MDO: 30 26 31- 9901.000 OPMI MDO XY: 30 26 32- 9901.000
Weights	OPMI MDO: 4.5 kg. OPMI MDO XY: 6.5 kg.

S5 Floor Stand

Rated voltage	115 V (90 V...132 V) 230 V (198 V... 253 V)
Frequency rating	50...60 Hz.
Power consumption	200 VA.
Circuit protection	Circuit breaker in power switch
Fiber-optic illumination	12 V 100 W halogen reflector lamp in quick-change lamp module for light guide. 1 back-up lamp module.
Weight compensation	4 - 13 kg.
Order Number	30 59 12- 0000.
Weight	approx. 110 kg.

Subject to change.

Sterilization Methods

Gas (ETO) Sterilization*

Standard ETO is acceptable for use with Kraton® thermoplastic rubber based compounds. The ETO gas will penetrate the Kraton, plasticize it and relieve molded in stresses or imposed stresses on the part.

Aeration time is greatly dependent on the size of the master carton and its permeability. One week is the minimum requirement to bring the ETO residuals below 1 PPM, as tested by the standard liquid extraction method. If the product is heated to 125-135 F in an aeration chamber with high airflow, the time can be accelerated to as little as four days.

Gamma Sterilization*

Kraton thermoplastic rubber can be sterilized using gamma radiation without suffering a large loss in physical properties even after extended storage.

Kraton G-2705 rubber was exposed to Cobalt 60 radiation doses of 3, 6, and 12 Mrads. The table below shows the effect of the radiation on the tensile properties of the material after being aged for 21 months.

Property	Original	0 Mrads	3 Mrads	6 Mrads	12 Mrads
Hardness, Shore A	55	50	48	48	43
Tensile Strength, psi	1200	+8%	+12%	-3%	-15%
300% Modulus, psi	350	+3%	-4%	-10%	-15%
Elongation, %	700	+3%	+10%	+8%	+12%

Steam Sterilization*

GLS Corporation can suggest the following maximum autoclave cycles for selected materials**

250 F for 17 minutes

240 F for 27 minutes.

There will be some slippage or creep with any Kraton thermoplastic rubber based products at these temperatures because of the relieving of molded in stress and the relaxation of imposed stresses. To minimize these effects, parts should be molded at the suggested processing conditions, and not autoclaved while being subjected to outside mechanical stresses.

* Information pertains only to Kraton G-based compounds
** Information pertains only to Kraton G-2705 compound.

Disposables

Endure Number		
	Spare Bulbs	
90-1200	Zeiss 6V 30W Bt58Z	390158
90-1201	Zeiss 6V 50W Bt86Z	390186
90-1202	Zeiss 12V 100W HLX #64626	380075 1020
90-1203	EFR Housing #900	
90-1204	Zeiss 15V 150W EFR	310198
90-1205	Zeiss 12V 100W HLX #64627	380079 9040
90-1206	Zeiss Superlux 40	
90-1207	Zeiss Superlux 175	
90-1208	Zeiss Superlux 300 with Cartridge	
90-1209	Zeiss Superlux 300 Bulb Only - No Housing or Meter	
90-1302	ELS 150 21V 150W EKE	
90-1400	ELS 250 24V 250W ELC	
90-1403	ELS 24 60V 24W Metal Halide	
90-1402	ILO 300W with Cartridge	
	Sterilizable Knob Covers	
91-0100	Zeiss Knob Cover, MD Zoom	302602 0203
91-0101	Zeiss Knob Cover, 0-60 PD Adjustment	303418 0000
91-0102	Zeiss Knob Cover, Small, 0-180 PD Adjustment	305810 0000
91-0103	Zeiss Knob Cover, Medium,	305807 0000
91-0104	Zeiss Knob Cover, Magnification Changer	303673 0000
91-0105	Zeiss Knob Cover, Large	305803 0000
91-0106	Zeiss Knob Cover, Extra Large	303674 0000
91-0110	Zeiss Handle Cover, CS/MD Short	302501 9060
91-0111	Zeiss Handle Cover, CS/MD Long	302627 9001
91-0112	Zeiss Handle Cover, F-Cover	305808 0000
91-0113	Zeiss Handle Cover, Pro Magis	
91-0114	Zeiss Hande Cover for MDU Post	305809 0000
	Dust Covers	
92-0010	Dust Cover, Large	
	Foot Control Covers	
92-0200	Endure Poncho Disposable Foot Control Cover, 20 per Case	
	Drapes	
93-8222	Sterile Drape, 50/180cm, 20/70", Zeiss 48mm, Zeiss OPMI 1/OPMI 6 w/o Side Observer, 20 per Case	
93-8214	Sterile Drape, 115/180cm, 45/70", Zeiss 48mm, Zeiss OPMI 1/OPMI 6 w/Side Observer, 20 per Case	
93-8296	Sterile Drape, 115/300cm, 45/118", Zeiss 65mm, MD/CS/11/111/ORL/Pro Magis/Neuro/ VISU 150/VISU 200, 20 per Case	