From Eye to Insight

Leica
MICROSYSTEMS

MEDICAL DIVISION

M320

User Manual

10734261 - Version 03

CE

Thank you for purchasing a Leica surgical microscope, M320.
In developing our systems, we have placed great emphasis on simple, self-explanatory operation. Nevertheless, we suggest studying this user manual in detail in order to utilize all the benefits of your new surgical microscope.
For valuable information about Leica Microsystems products and services, and the address of your nearest Leica representative, please visit our website:

www.leica-microsystems.com

Thank you for choosing our products. We hope that you will enjoy the quality and performance of your Leica Microsystems surgical microscope.

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Fax: +41 71 726 3334

Legal disclaimer

All specifications are subject to change without notice.
The information provided by this manual is directly related to the operation of the equipment. Medical decision remains the responsibility of the clinician.
Leica Microsystems has made every effort to provide a complete and clear user manual highlighting the key areas of product use. Should additional information regarding the use of the product be required, please contact your local Leica representative.
You should never use a medical product of Leica Microsystems without the full understanding of the use and the performance of the product.

Liability

For our liability, please see our standard sales terms and conditions. Nothing in this disclaimer will limit any of our liabilities in any way that is not permitted under applicable law, or exclude any of our liabilities that may not be excluded under applicable law.

Contents

1 Introduction

1.1 About this user manual

In this user manual the surgical microscope M320 is described. The present user manual applies to the M320 with the following stand variants: F12, C12, W12, FP12, TC12, LW12 and TP12.

In addition to notes on the use of the instruments this user manual gives important safety information (see chapter 3, "Safety notes").

► Read this user manual carefully before operating the product.

1.2 Symbols in this user manual

The symbols used in this user manual have the following meaning:

Symbol	Warning word	Meaning
⚠	**Warning**	Indicates a potentially hazardous situation or improper use that could result in serious personal injuries or death.
⚠	**Caution**	Indicates a potentially hazardous situation or improper use which, if not avoided, may result in minor or moderate injury.
	Note	Indicates a potentially hazardous situation or improper use which, if not avoided, may result in appreciable material, financial and environmental damage
!		Information about use that helps the user to employ the product in a technically correct and efficient way.
►		Action required; this symbol indicates that you need to perform a specific action or series of actions.

1.3 Required tools

Allen keys:

- Size 2.5 for installing accessories (dovetail interface)
- Size 3 for optimizing the balance of the optics carrier
- Size 4 for handle holder
- Size 8 for balancing the swing arm

Provided brake knob

2 Product identification

The model and serial numbers of your product are located on the identification label at the bottom of the horizontal arm.

► Enter this data in your user manual and always refer to it when you contact us or the service workshop regarding any questions you may have.

Type	Serial no.
...	...

3 Safety notes

The Leica M320 surgical microscope is state-of-the-art technology. Nevertheless, hazards can arise during operation. Always follow the instructions in this user manual, and in particular the safety notes.

3.1 Intended use

- The Leica M320 surgical microscope is an optical instrument for improving the visibility of objects through magnification and illumination. It can be applied for observation and documentation and for human and veterinary medical treatment.
- The Leica M320 surgical microscope is subject to special precautionary measures for electromagnetic compatibility.
- Portable and mobile as well as stationary RF communications equipment can have a negative effect on the reliability of the Leica M320 surgical microscope's functionality.
- The Leica M320 is intended for professional use only.

3.2 Indications for use

- The Leica M320 surgical microscope is suitable for surgical applications such as ENT and dental sugeries in hospitals, clinics or other human medical institutions.
- The Leica M320 surgical microscope may only be used in closed rooms and must be placed on a solid floor or mounted to the ceiling.
- This User Manual is intended for physicians, nurses and other medical and technical staff who prepare, operate or maintain the device after appropriate training. It is the duty of the device owner / operator to train and brief all the operating personnel.

3.3 Contraindications

Not for use in ophthalmology.

3.4 Information for the person responsible for the instrument

- ▶ The surgical microscope may be used by qualified and trained users only, with all covers fitted.
- ▶ Only use the surgical microscope if it is free of defects.
- ▶ Operate the system only with all equipment in its proper position (e.g. all covers fitted, doors closed).
- ▶ Regularly check to make sure the users are complying with safety requirements.
- ▶ Provide comprehensive instructions and explain the warning messages.
- ▶ Assign and monitor responsibilities for commissioning, operating and maintenance.
- ▶ Use the surgical microscope in proper condition only.
- ▶ Do not place the drape too close to the instrument, as otherwise it can overheat and shut off.
- ▶ Inform your Leica representative or Leica Microsystems (Schweiz) AG immediately if you detect a product defect that could potentially cause injury or harm.
- ▶ Only the following accessories may be used with the surgical microscope.
- ▶ Leica Microsystems accessories described in this user manual.
- ▶ Other accessories, provided that these have been expressly approved by Leica as being technically safe in the context.
- ▶ Use original accessories or approved Leica accessories only.
- ▶ Use only high-quality HDMI cables with a maximum length of 10 m.
- ▶ Use only monitors approved for medical purposes or equipped with an isolating transformer.
- ▶ Modifications or repairs may be carried out by authorized trained personnel only.
- ▶ Use only original Leica parts in maintenance work.
- ▶ After maintenance or technical modifications, readjust the instrument in accordance with our technical specifications.
- ▶ If the instrument is modified by or maintenance has been performed by unauthorized personnel, if the equipment is improperly maintained or if the instrument has been operated improperly, Leica disclaims all liability.
- ▶ The owner or operator shall be held liable for the function of the system if the system has been assembled incorrectly by individuals who do not belong to Leica Microsystems (Schweiz) AG.
- ▶ The influence on other devices by the Leica M320 surgical microscope has been tested in accordance with EN 60601-1-2. The system passed the emissions and immunity test. The standard preventive measures and safety regulations pertaining to electromagnetic and other radiation have to be observed.
- ▶ Only the supplied power cord may be used.

- The power cord must have a protective conductor and must be undamaged.
- Use of accessories and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.
- The Leica M320 surgical microscope may be used only in closed rooms and must be placed on a solid floor.
- Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the Leica M320, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.
- Like any other instrument in the operating theater, this system may fail. Leica Microsystems (Schweiz) AG therefore recommends that a backup system be kept available during the operation.
- Additional equipment connected to medical electrical equipment must comply with the respective IEC or ISO standards (e.g. IEC 60950 or IEC 62368 for data processing equipment). Furthermore all configurations shall comply with the requirements for medical electrical systems (see clause 16 of the latest valid version of IEC 60601-1). Anybody connecting additional equipment to medical electrical equipment configures a medical system and is therefore responsible that the system complies with the requirements for medical electrical systems. If in doubt, consult your local representative or the technical service department.

3.5 User qualifications

The Leica M320 surgical microscrope may be used only by physicians and medical assistance personnel with appropriate qualifications who have been instructed in the use of the instrument. Specific training is not required.

3.6 Directions for the user of the instrument

- Follow the user Manual.
- Follow the instructions given by your employer regarding the organization of work and safety at work.
- Do not modify the surgical microscope.
- Danger of tilting of the floor stand! When moving the floor stand, fold up the swing arm as described above and tighten the articulation brakes.
- Risk of injury from moving parts! Assemble and balance the accessories before the operation. Do not install it above the field of operation.
- Risk of injury from rolling of the floor stand! Always push the microscope to move it; never pull it. Do not roll it over anyone's feet. Do not roll over cables lying on the floor. Lock the foot brakes during the operation, and never move the device during operation.
- Do not shine lights in anyone's eyes.
- Do not switch off/on the surgical microscope during surgery.
- Do not unplug the system during surgery.
- Do not cover up the ventilation slot of the optics carrier.
- Before an extended period of non-use, remove the battery from the remote control.
- To avoid the risk of electric shock, this equipment must only be connected to a supply mains with protective earth.
- All parts of the M320 shall not be serviced or maintained while in use with a patient.
- Lamps shall not be changed while in use with a patient.
- Only use the surgery microscope if it is free of defects.

NOTE

Using accessories or cables other than those specified here or as approved by the manufacturer of the Leica M320 surgical microscope can lead to elevated electromagnetic emissions or reduced interference resistance.

The Leica M320 surgical microscope may not be used in direct proximity of other devices. If it is necessary to operate it in the vicinity of other instruments, the instrument should be monitored to ensure that it functions properly in this arrangement.

3.7 Dangers of use

WARNING

Risk of death from electrical shock!

► Connect the microscope to a grounded socket only.

WARNING

Danger of injury due to:

- **Uncontrolled lateral movement of the arm system,**
- **Tilting of the stand,**
- **Trapping of feet in lightweight shoes beneath the casing of the base.**
- **Abrupt braking of the surgical microscope at a threshold that cannot be crossed.**

► For transportation, always move the Leica M320 surgical microscope into the transport position.

► Never move the stand while the unit is extended.

► Never roll the stand or OP equipment over the cables lying on the floor.

► Always push the Leica M320 surgical microscope; never pull it.

WARNING

Risk of injury from the binocular tube falling down!

► Tighten the clamping screw securely.

WARNING

Danger of retinal damage!

► Do not shine lights in anyone's eyes.

WARNING

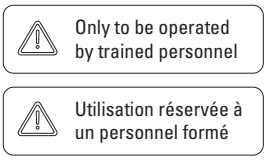
Do not use for ophthalmology.

4 Signs and labels

1

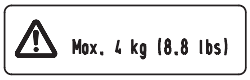
Tilting danger

2



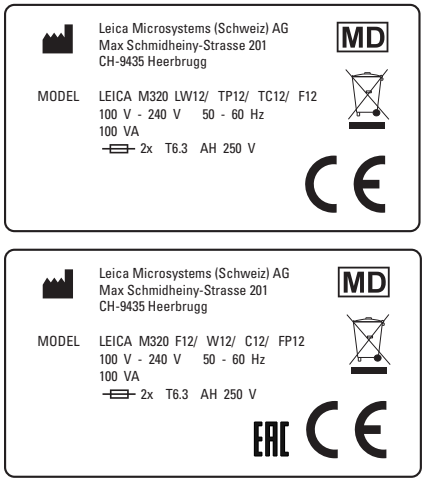
Trained personnel label

3



Max. load for optics carrier

4



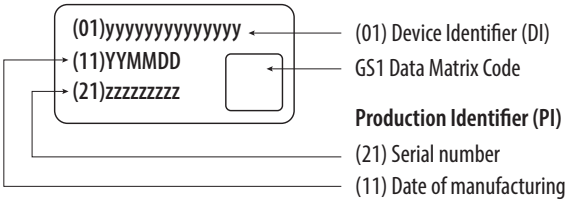
Type label

Medical device

5

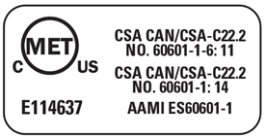
Mandatory label - read the user manual carefully before operating the product. Web address for electronic version of the user manual.

6



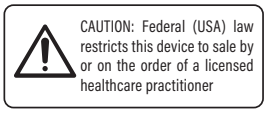
UDI Label

7



MET label
(only USA and Canada)

8



Presecription device (USA Only)

9

INMETRO label
(only Brazil)

10

ANVISA n°
xxxxxxxxxxx

ANVISA Registration number
(only Brazil)

11

Grounding reliability can only be achieved when EQUIPMENT is connected to equivalent receptacle marked "Hospital only" or "Hospital Grade". For US Canada only

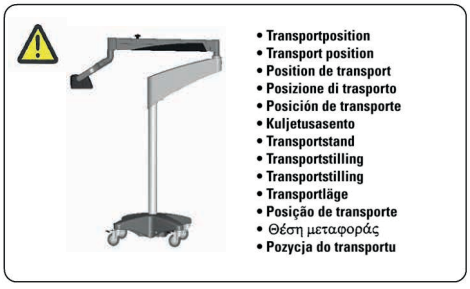
La fiabilité de la mise à la terre n'est assurée que si l'équipement est connecté à une prise équivalente, marquée "Hôpital seulement" ou "Qualité hôpital".

Grounding label
(only USA and Canada)

12

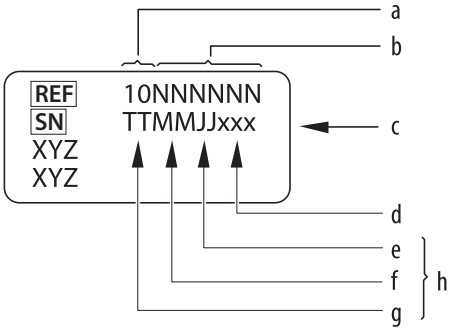
System weight label (F12)

13



Transport position
(F12 floor stand)

14



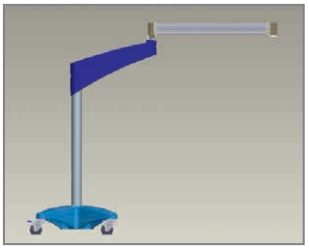
Fabrication label

a	Prefix number
b	Leica system article no.
c	Serial number
d	Incremental number starting at 1 for each batch
e	J = year (2 digits)
f	MM = month (2 digits)
g	TT = day (2 digits)
h	Production starting date

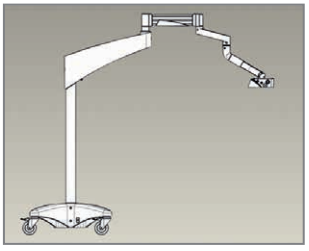
5 Design

5.1 Stands

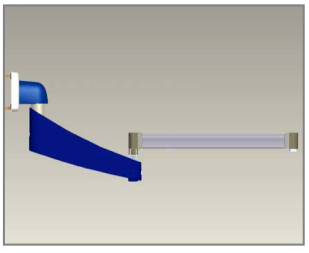
To assemble the stand, note the installation instructions provided.

1 

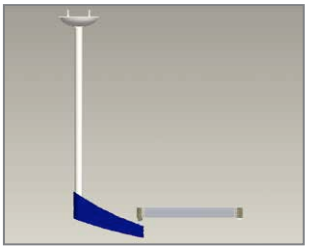
Rolling floor stand (F12), long swing arm
Reference model in current user manual

2 

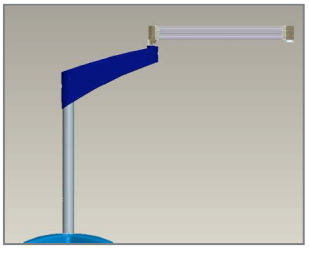
Rolling floor stand, short swing arm

3 

Wall stand (W12)

4 

Ceiling mount (C12)

5 

Floor stand/baseplate (FP12)

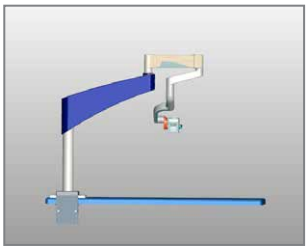
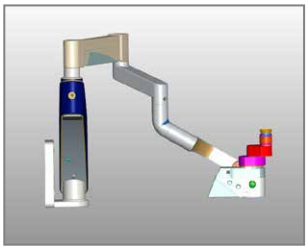
6 

Table stand with terminal (TC12)

7 

Wall stand (LW12)

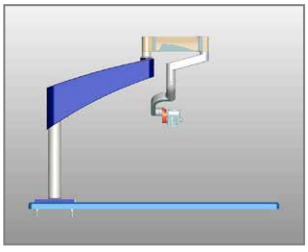
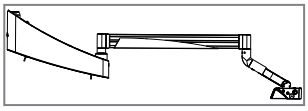
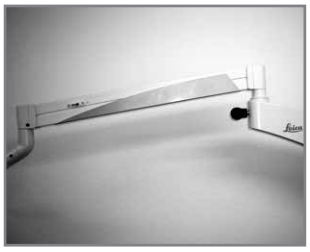
8 

Table stand with plate (TP12)

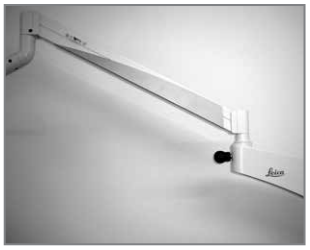
9 

Unit Mount*
* Japan Only
(UN12-D 4K)

5.2 Swing arm and horizontal arm

1 

Swing arm and horizontal arm

2 

Integrated tilt switch
Move the swing arm upwards. Light switches off automatically.

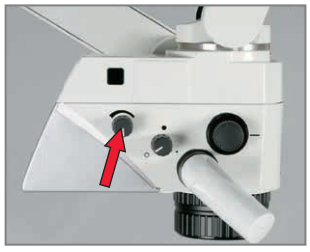
The integrated tilt switch is not available for models TC12, TP12 and LW12.

5.3 Optics carrier

Caps for magnification changer are steam- or gas-sterilizable.

1 

Magnification changer, both sides, increments: 6.4, 10, 16, 25, 40×

2 

Illumination control for illumination intensity.

3 

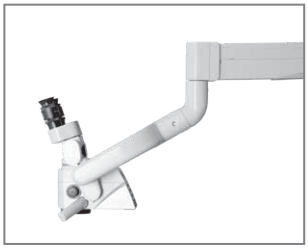
Filter and diaphragm controls for white light, orange filter and spot illumination.

4 

Counterweight for balancing when many accessories are used.

5.4 Microscope carrier

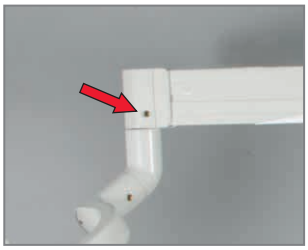
Two different versions are available.

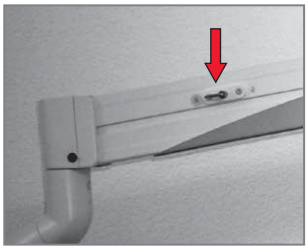
1  Inclined

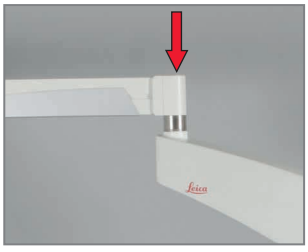
2  Upright

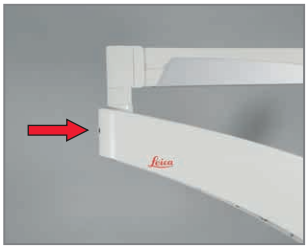
Upright installation is not possible for models TC12, TP12 and LW12

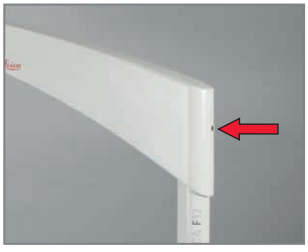
5.5 Brake knobs/articulation brakes

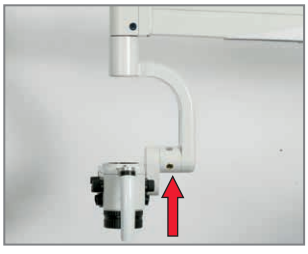
1  Articulation brake

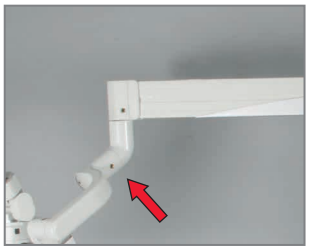
2  Lever for locking the vertical position.

3  Joint for balancing

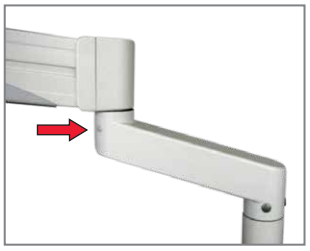
4  Articulation brake

5  Articulation brake

6  Tilt brake

7 

Rotary brake (inclined version)

8 

Articulation brake (LW12, TP12, TC12)

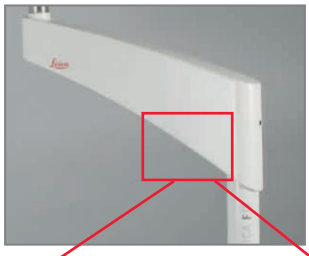
5.6 Connections

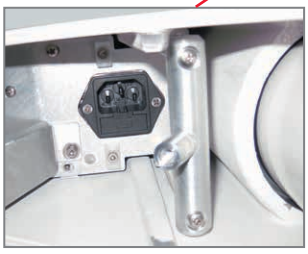
1 

Brake knob for setting the articulation brakes

2 

Main switch

3 



Power socket

Port for HDMI/USB cable

6 Functions

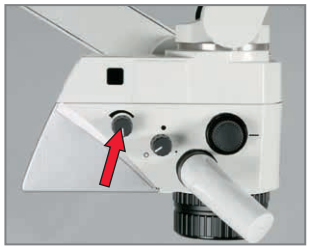
6.1 Illumination

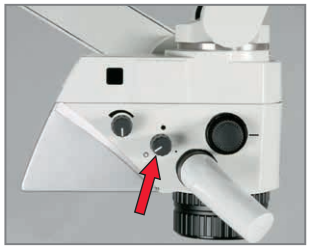
The illumination of the surgical microscope M320 consists of 2 LEDs. It is located in the optics carrier.

1 

Switch on the main switch.

2 
White LED illumination on the optics carrier lights up.

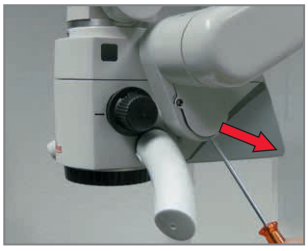
3 
Illumination control for illumination intensity.

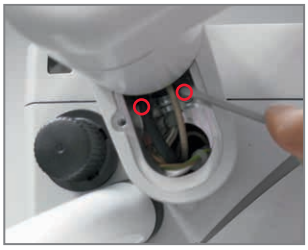
4 
Filter and diaphragm controls for white light, orange filter and spot illumination.

6.2 Balancing system

With a balanced surgical microscope Leica M320 F12 you can move the optics in any position without it tilting or falling.

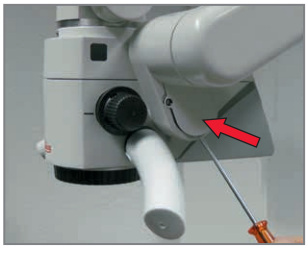
1 
Remove the screw.

2 
Remove the side cover.

3 
Remove the screws.

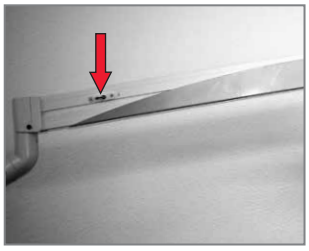
4 
Set the desired position. Four different positions can be set.

5 
Fasten the screws.

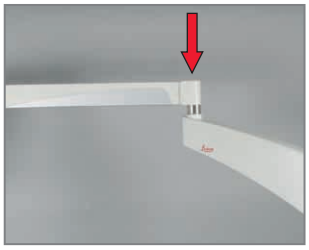
6 
Refit the side cover.

7 

Fasten the screw.

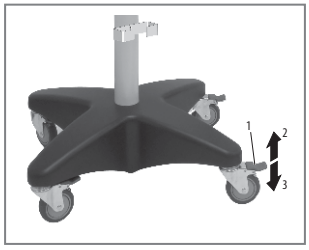
8 

Turn the lever for locking the vertical position.

9 

Adjust the balancing joint to the weight using an Allen key (size 8).

6.3 Footbrakes



Footbrakes are attached to each of the four wheels on the stand. The wheel is engaged and released with the footbrake engage/release lever (1).

- ▶ Press the footbrake engage/release lever down (3):
- ▶ The footbrake is engaged.
- ▶ Lift the footbrake engage/release lever (2):
- ▶ The footbrake is released.

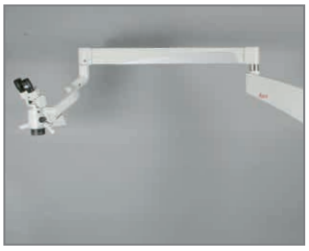
7 Preperation before surgery

7.1 Transportation

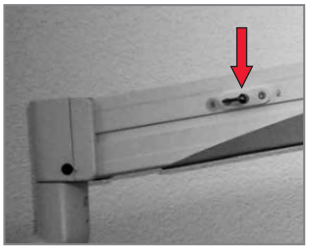
CAUTION

Risk of injury from outward movement of swinging arm!

- ▶ Do not shine lights in anyone's eyes.

1 

▶ Place swing arm in a horizontal position.

2 

▶ Tighten the brake knob for locking the vertical position.

3 

▶ Turn the optics/microscope carrier towards the outside.

4 

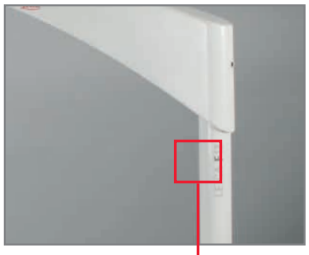
▶ Tighten the articulation brake.

5 

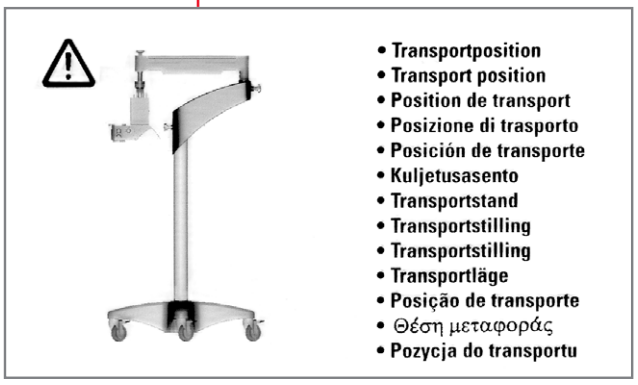
▶ Open the articulation brake.

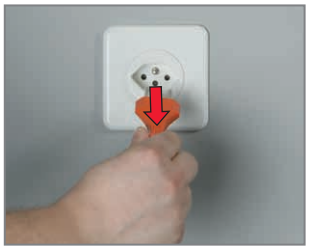
6 

▶ Fold the swing arm together. Tighten the articulation brake.

7 

▶ Compare the position of the swing arm with the attached sign.



8 

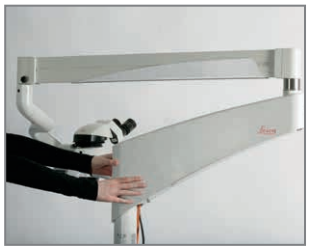
▶ Unplug the power cable.

NOTE

Possible damage of the cable! Always pull the plug, never the cable.

9 

▶ Release the footbrakes.

10 

- Push the microscope to the installation location and position it.

CAUTION

Risk of injury to feet!

- Always push the instrument to move it; never pull it.

11 

- Tighten the footbrakes.

CAUTION

Danger of microscope rolling away on its own!

- Tighten the footbrakes.

7.2 Installing the accessories

CAUTION

Risk of injury from downward movement of the swing arm!

- ▶ Before installing accessories, tighten the articulation brakes, see 7.1, "Transportation"

Installing the accessories, for example, ErgonOptic Dent. Install any other accessories in a similar manner.

1 

▶ Unscrew the clamping screw.

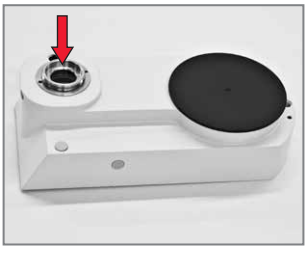
2 

▶ Push the accessory into the dovetail interface.

3 

▶ Tighten the clamping screw.

7.3 Documentation output



C-mount port for commercially available video camera

7.4 Handles

7.4.1 Installing and removing the front handle

NOTE

Install the front handle before the rest of the accessories

Gray handle sleeves are steam- or gas-sterilizable. White handle sleeves can be disinfected.

1 

▶ Screw on the handle sleeve holder.

2 

▶ Insert until the handle sleeve clicks into place.

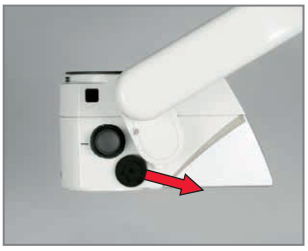
3 

▶ Push the knob and release the handle sleeve.

7.4.2 Installing the side handles

1 

▶ Screw the handle apart.

2 

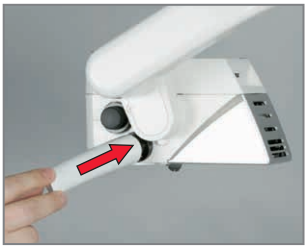
▶ Remove cover with key.

3 

▶ Screw open the bottom holder for the handle.
▶ Handle tilt is individually adjustable.

4 

▶ Refit the handle sleeve holder.

5 

▶ Insert until the handle sleeve clicks into place.

7.5 ErgonOptic Dent

Improves ergonomics at certain working positions: Turning range 45° with 180° binocular tube.

ErgonOptic Dent:
Optical extension for more comfortable work.
▶ For installation, see 7.2, "Installing the accessories".

7.6 ErgoWedge

The ErgoWedge gives a binocular with a fixed angle a variable viewing angle of 5° to 25°.

1 

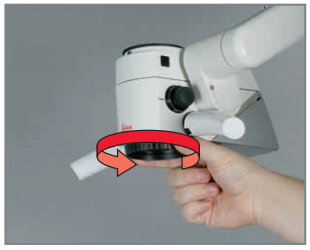
ErgoWedge.

2 

Ideal in combination with 45° inclined binocular tube.
▶ For installation, see 7.2, "Installing the accessories"

7.7 Objectives

Fixed and fine objectives available in various focal lengths.

1 

▶ Remove the cover from the optics carrier.

2 

▶ Screw in the objective.

3 

▶ Turn the fine focusing objective for fine focus.

7.8 Protective glass

The protective glass is used to protect the objective.
The glass is steam- or gas-sterilizable.

1 

Fine focusing objective:
The nose points forward.

2 

Fixed objective:
The nose points 90° towards the left or right.

7.9 Installing the binocular tube

Possible binocular tubes:
- binocular tube 5° - 25°
- inclined binocular tube
- binocular tube 180°, variable
- straight binocular tube
- variable binocular tube 30° - 150°
- inclined binocular tube 45°
- binocular tube 10° - 50°, type II, Ultra Low III

NOTE

▶ For installation, see 7.2, "Installing the accessories".

7.10 Eyepieces

Possible eyepieces:
- 10× eyepiece, standard (aside from with straight tube 12.5×)
- 10× eyepiece with crosshair graticule for easier image centering
- 12.5× eyepiece, shows image with similar magnification to that on the screen

1 

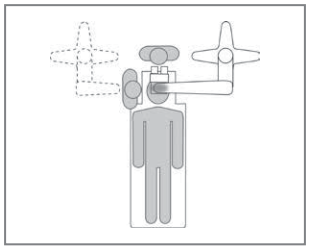
▶ Set the eyepiece in place.

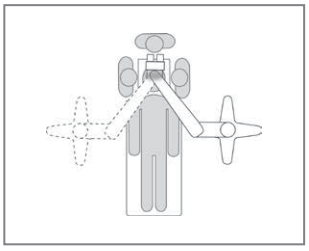
2 

▶ Tighten the rotary ring.

7.11 Positioning at the operating table

7.11.1 Positioning options





- ▶ Carefully move the surgical microscope at the column to the operating table and position it for the forthcoming operation.
- ▶ Tighten the footbrakes.

7.12 Mounting sterile components

CAUTION

Danger of infection!

- ▶ Avoid touching the sterile components.
- ▶ Allow sufficient free space.

- ▶ Do not install the sterile components until shortly before the operation.

Handle sleeves and caps for the magnification changer are steam and gas-sterilizable.

- ▶ Sterilize the handle sleeves and caps after use.

1

- ▶ Insert until the handle sleeve clicks into place.

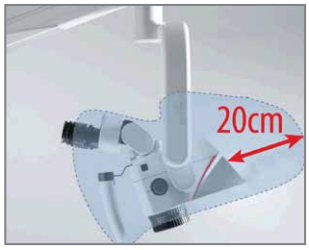
2

- ▶ Attach the caps.

3

- ▶ Attach protective glass on objective. The noise points forwards (fine focus objectives) or 90° to the left/right (fixed objectives).

7.13 Installing the drape



CAUTION

Danger of overheating!

- ▶ Do not wrap the drape around the microscope too tightly. The distance between the microscope and drape should be 20 cm.

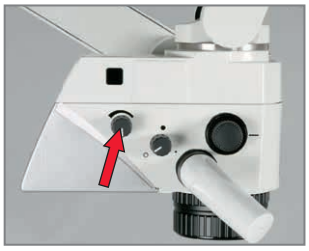
7.14 Balancing the swing arm

For general preparation see chapter 6.2, "Balancing system". Also check the movement of the swing arm before positioning the microscope over the patient.

7.15 Adjusting the interpupillary distance

- ▶ Look into the eyepieces. Depending on the model, move the tube manually or using the drive knob until a circular field is visible.

7.16 Checking the illumination



- ▶ Turn the rotary knob from zero to maximum brightness.

- ▶ For the general preparation see chapter 6.1, "Illumination".
- ▶ Also check the brightness and filters before positioning the microscope above the patient.

7.17 Changing the accessories of the surgical microscope and balancing the swing arm

WARNING

Risk of injury!

- ▶ Before re-equipping always lock the swing arm.

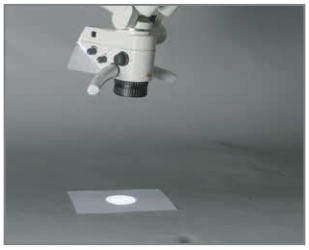
- ▶ When changing accessories ensure to balance the swing arm again.

7.18 Adjusting the parfocality with camera and monitor

Parfocal means that the sharpness remains constant over the entire magnification range.

- ▶ Adjust the diopter settings for both eyes separately and accurately.

1

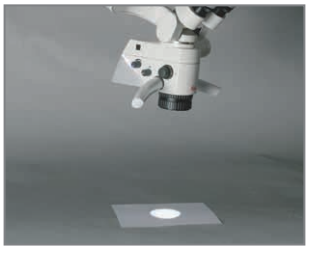


- ▶ Place a piece of paper with writing on it under the objective.

2

- ▶ Maximum magnification (40×).

3



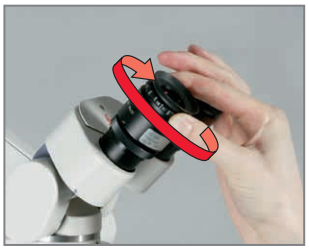
- ▶ Bring the writing on the sheet of paper into sharp focus on the monitor.

4

- ▶ Without looking into the eyepieces, set the minimum magnification (6.4×). The image on the monitor must remain sharp!

5

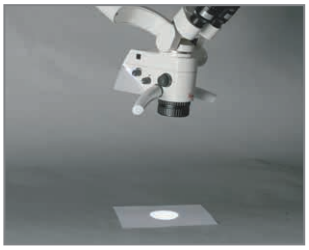
- ▶ Turn the dioptric correction on the eyepieces to "+5".

6 

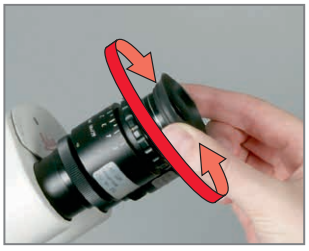
► Look into the eyepieces. Rotate each eyepiece individually clockwise, in the "–5" direction, until each eye sees the writing in sharp focus.

7 

► Set maximum magnification (40×).

8 

► Bring the writing on the sheet into focus.

9 

► Turn out the eyecups to the desired distance.

The writing should now remain sharp when you change the magnification.

► If it does not, repeat the procedure.

7.19 Adjusting the parfocality without camera and monitor

Parfocal means that the sharpness remains constant over the entire magnification range.

► Adjust the diopter settings for both eyes separately and accurately.

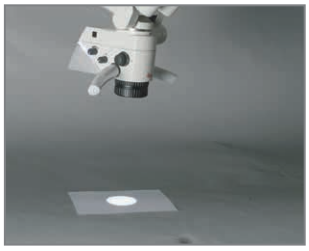
Personal diopeter setting known:

► Set dioptric correction on eyepieces.

Personal diopeter setting unknown:

1 

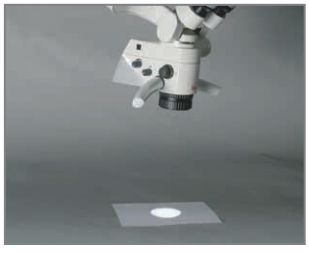
► Adjust the dioptric setting at the eyepiece to 0.

2 

► Place a piece of paper with writing on it under the objective.

3 

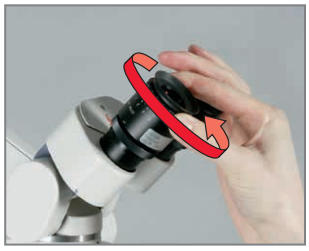
► Set maximum magnification (40×).

4 

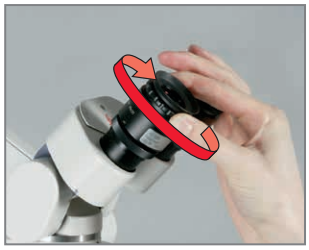
► Bring the writing on the sheet of paper into focus.

5 

► Without looking into the eyepieces, set the minimum magnification (6.4×).

6 

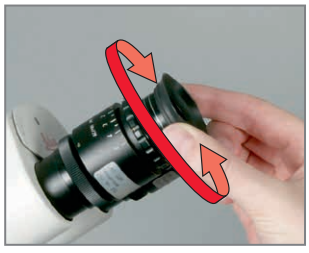
► Turn the dioptric correction on the eyepieces to "+5".

7 

► Look into the eyepieces. Rotate each eyepiece individually clockwise, in the "–5" direction, until each eye sees the writing in sharp focus.

8 

► Set maximum magnification (40×).

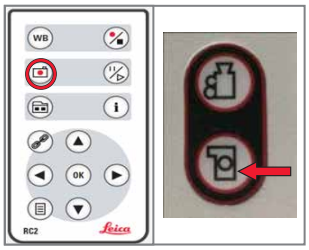
9 

► Turn out the eyecups to the desired distance.

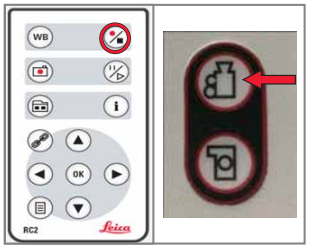
The writing should now remain sharp when you change the magnification.

► If it does not, repeat the procedure.

7.20 Check the remote control and camera



► Press on the remote control or on the video camera to capture still images.
A signal tone sounds.



► Press on the remote control or on the video camera to initiate video recordings.
A signal tone sounds.

► To end the video recording, press on the remote control or on the video camera.
A signal tone sounds.

7.21 Checklist before surgery

▶ Ensure the following prior to positioning the surgical microscope above the patient.

- Footbrakes tightened
- Proper fixation of all parts and accessories
- Proper positioning at the operating table
- Sterile components and drape installed
- Illumination working properly
- Remote control and camera working properly

8 Operation

8.1 Starting up

WARNING

Risk of death from electric shock!

► Connect the microscope to a grounded socket only.

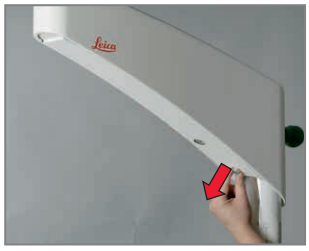
CAUTION

Additional equipment connected to medical electrical equipment must comply with the respective IEC or ISO standards (e.g. IEC 60950 or IEC62368 for data processing equipment).

The length of the HDMI cable must not exceed 10 m.

► Use only high-quality HDMI cables.
HDMI cables are available from Leica.

Use only monitors approved for medical purposes or equipped with an isolating transformer. Isolating transformers are available from Leica.

1 

► Remove cover of the horizontal arm.

2 

► Plug the power cable into the horizontal arm and fasten it using cable ties.

3 

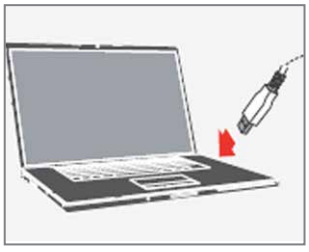
► Plug the HDMI cable and USB cable (optional) into the horizontal arm and fasten it using cable ties.

4 

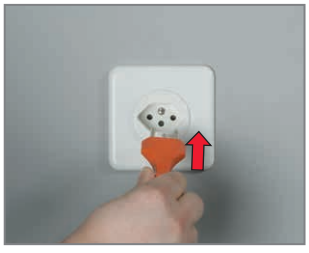
► Screw in the cover of the horizontal arm and tighten it.

5 

► Connect the HDMI cable to a suitable monitor or screen.

6 

► Connect the USB cable (optional) to the computer.

7 

► Connect the power cable.

8 

► Switch on the main switch.

9 

► White LED illumination on the optics carrier lights up.

8.2 Adjusting the design LED illuminator

There are five different dimming levels.

1 

▶ Switch on the main switch.

2 

▶ Remove cover of horizontal arm.

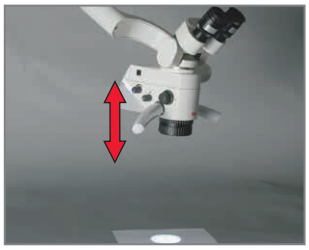
3 

▶ Using a ball-point pen or similar object, press the switch until the desired dimming level is reached.

4 

▶ Screw in the cover of the horizontal arm and tighten it.

8.3 Adjusting the working distance

1 

▶ Coarse focus by raising and lowering the microscope.

2 

▶ Fine focus via optional fine focusing objective.

▶ If the fine focus objective fails, adjust the focus manually by moving the optics carrier up and down.

NOTE

Manual emergency functions are available for focus.

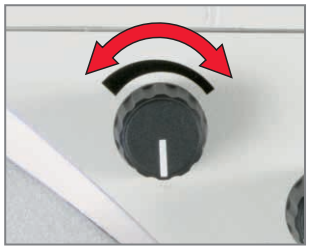
▶ Brakes could be overcome with muscle power.

8.4 Adjusting the illumination

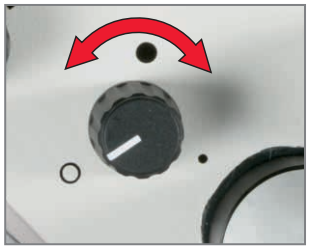
WARNING

Danger of retinal damage!

► Do not shine lights in anyone's eyes.

1 

► Set the desired illuminance.

2 

► Select the desired filter or diaphragm function:

○ White light

● Orange filter

• Spot illumination

In case of an illumination cooling fan failure an acoustic alarm appears (short beep every 5 seconds, lasting for 5 minutes).

8.5 Re-equipping during operation

WARNING

► Before re-equipping during the operation, first swing the microscope away from the operating field and lock the swing arm.

WARNING

► After re-equipping, always re-balance the microscope on the swing arm.

In case of a thermistor on the 2 LED array reaches 85 °C an acoustic alarm appears (2 short beeps every 5 seconds) and after 5 minutes of alarm the main illumination of the 2 LEDs is cut off.

8.6 Decommissioning

Possible loss of data!

► Before decommissioning the surgical microscope, end the video recording procedure.

1 

Bring the surgical microscope into transport position (see 7.1, "Transportation").

2 

Switch off the surgical microscope at the main switch.

8.7 Binocular tubes

1 

Binocular tube 5° - 25°

2 

Inclined binocular tube

3 

Binocular tube, 180° variable

4 

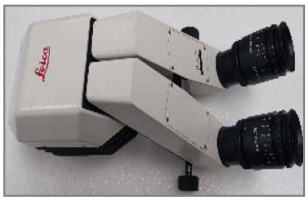
Straight binocular tube

5 

Binocular tube, variable 30° - 150°

6 

Inclined binocular tube 45°

7 

Binocular tube 10° - 50°, type II, Ultra Low III

For installation, see 7.2, "Installing the accessories".

8.8 External orange filter

Filters out the parts of the light spectrum that cause rapid curing of dental composite.

External orange filter: additional accessory for dentistry.

NOTE

- For installation, refer to the separate Assembly Instructions provided.

8.9 Double Iris Diaphragm

For enhancing depth of field

For installation, see 7.2, "Installing the accessories".

9 Video Camera

9.1 Information

Standard delivery

- Remote control
- SD card

Optional accessories:

- USB cable, 10 m
- HDMI cable, 10 m
- USB WiFi dongle

Requirements

- HDMI port: HDMI-capable screen or television set to the Full HD (1080p) or Ultra HD/ 4K (2160p) standard

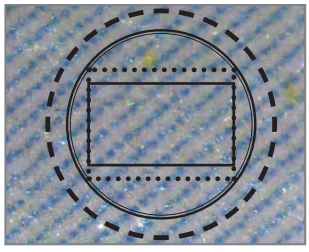
and/or

- USB port: Computer with USB 3.0 connector

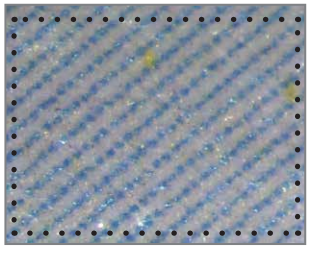
Effective displayed section

The live image and captured image do not show the same section one sees when looking through eyepieces.

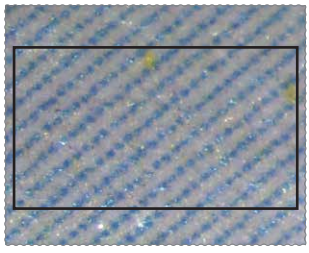
To simplify image centering, install 10× eyepiece with crosshair graticule.



- - - - 10× eyepiece
═══ 12.5× eyepiece
····· 4:3 aspect ratio
——— 16:9 aspect ratio



4:3 section



16:9 section

9.2 SD Memory Card

An SD memory card cannot be formatted in the video camera.

- ▶ Format it at a computer or external digital camera.
- The video camera is designed for SD memory cards up to 1 TB.
- Leica recommends SD memory cards from SanDisk (Speed Class UHS-3 or better).

1

- ▶ Push down the cover flap.
- ▶ Insert the SD memory card into the video camera.

2

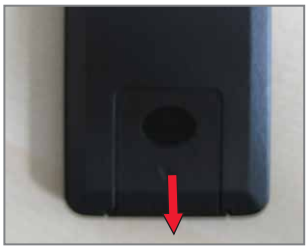
- ▶ Push in the SD memory card and remove it.

Do not remove SD memory card while video recording is on.

9.3 Remote control

9.3.1 Changing the battery

1

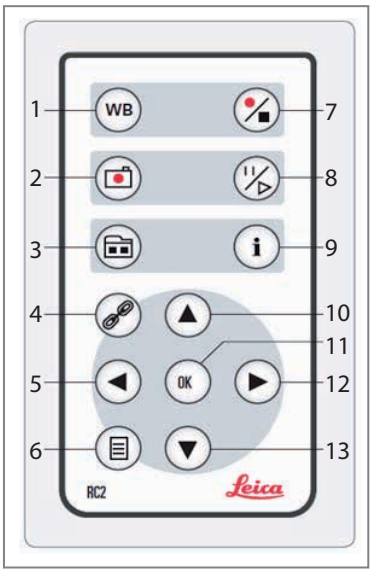


- ▶ Remove the battery insert from the rear side.

2

- ▶ Replace the battery. (Button battery type CR2032)

9.3.2 Overview



1 Perform white balance adjustment
2 Save still image to SD Card
3 Thumbnail mode / live view mode
4 Perform remote control pairing
5 Arrow keys for navigation / ALC mode
6 Enter / exit Camera Menu / live view mode
7 Start / stop video recoding
8 Freeze live view / play video / pause video
9 Show / hide information menu
10 Arrow keys for navigation / Quick Menu
11 OK / confirm
12 Arrow key for navigation / orange filter mode
13 Arrow key for navigation / camera capture mode

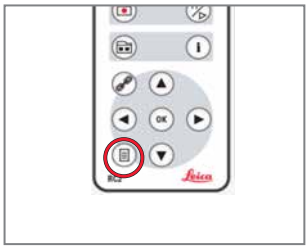
9.4 On Screen Menu

Camera menu

1

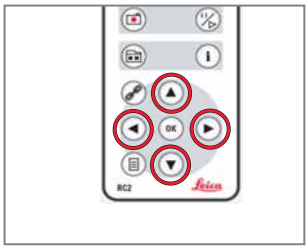
▶ Point the remote control towards the camera.

2



▶ Call up the Camera Menu with ⊟ button.

3



▶ Navigate with arrow keys.

4

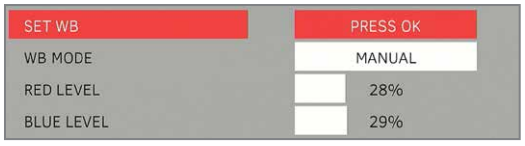
▶ Press OK to confirm.

9.4.1 Color (white balance)

Use neutral white or gray color chart for manual white balance adjustment.

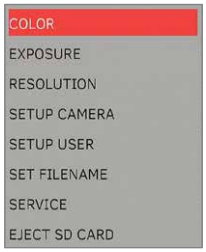
- Lay a neutral white paper or gray chart under the focus of the microscope. Press "WB" on the remote control.

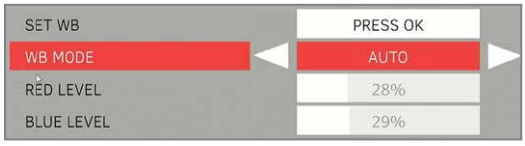
Manual White Balance (recommended)



- Select “MANUAL” for manual white balance mode (WB mode) - recommended.
- Lay a neutral white paper or gray chart under the focus of the microscope.
- Select “SET WB” and press OK. Then, adjust ‘RED LEVEL’, ‘BLUE LEVEL’ as needed.

Automatic white balance





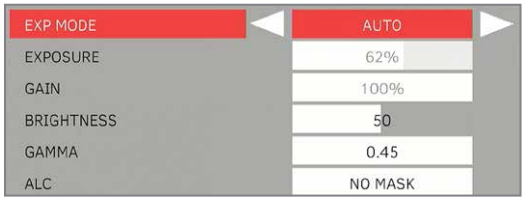
- Select “AUTO” for automatic white balance adjustment. White balance is adjusted automatically in real-time.

9.4.2 Exposure

Manual exposure

- Select "MANUAL" for manual exposure.
- Correct the values for "EXPOSURE", "GAIN", and "GAMMA".

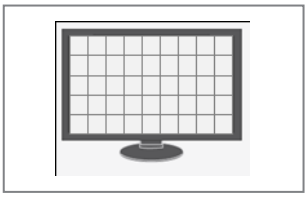
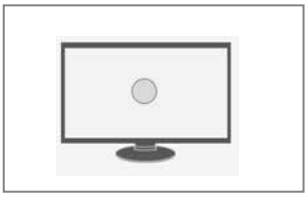
Automatic exposure



- Select "AUTO" for automatic exposure.
- Correct the values for "BRIGHTNESS" and "GAMMA".

Automatic Light Control (ALC)

► For automatic exposure, 5 types of "ALC" can be selected:
"NO MASK", "GRID", "S CIRCLE", "M CIRCLE" and "L CIRCLE"

No Mask		The exposure is automatically adjusted based on the entire image seen on the screen.
Grid		The exposure is automatically adjusted based on the grid(s) selected.
S Circle		The exposure is automatically adjusted based on the small sized circle ("S CIRCLE"), as indicated on the screen.
M Circle		The exposure is automatically adjusted based on the medium sized circle ("M CIRCLE"), as indicated on the screen.
L Circle		The exposure is automatically adjusted based on the large sized circle ("L CIRCLE"), as indicated on the screen.

9.4.3 Resolution

> 3840x2160 and 2704x2028 resolution is applicable to 4K video camera only

Live

- Select the resolution for live view.

Captured

- Select resolution for still image.
- Select quality for still image.

Movie

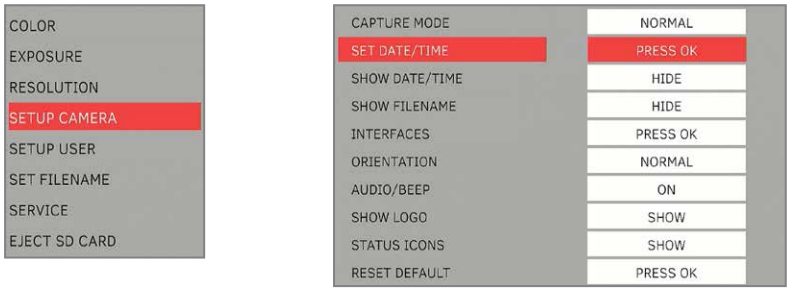
- Select resolution for video file.
- Select quality of video file.

9.4.4 Setup camera

Capture mode

▶ Select the still image capture mode:
- Normal: Normal capture mode (Recommended)
- Burst: 3 images will be captured consecutively

Set date/time



▶ Set the date/time and select the format:
- "DMY" = Day/Month/Year.24h
- "MDY" = Month/Day/Year.12h (AM/PM)
- "YMD" = Year/Month/Day.24h

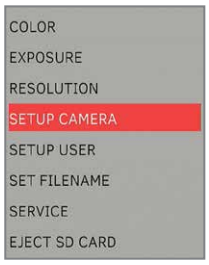
Show date/time

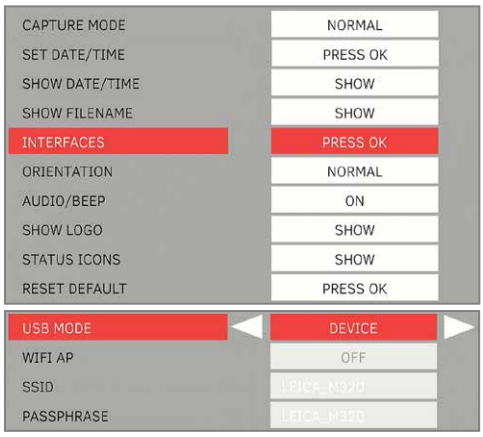
▶ Select the option for Show Date/Time:
- Show: Date/Time can be shown during playback of still image or recorded video.

Show filename

▶ Select the option for Show Filename:
- Show: File name can be shown during playback of still image or recorded video.

Interfaces





► Set the USB mode for data transfer or WiFi function.

USB Mode

- Device: Set the USB to device mode to connect to PC for data transfer.
- Host: Set the USB to host mode to connect to a WiFi dongle for streaming

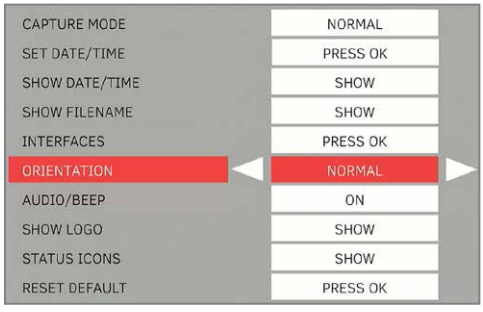
WiFi AP:

- OFF: Disable the camera as a WiFi Access Point.
- ON: Enable the camera as a WiFi Access Point.
- SSID: Set the WiFi AP SSID (network name).
- Passphrase: Set the WiFi AP password.

Default SSID: LEICA_M320
Default Password: LEICA_M320

Device mode is applicable to USB port at horizontal arm only.
Host mode is applicable to USB port at video camera only.

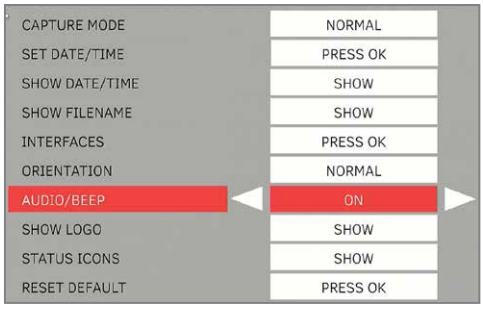
Orientation



► Select the option for the image orientation:

- Normal: Original orientation
- Flip Horizontal: Image is mirrored horizontally
- Flip Vertical: Image is mirrored vertically
- Flip Both: Image is rotated 180^{0}

Audio/beep

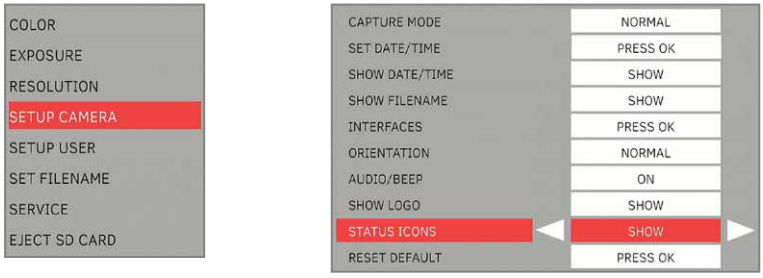


► Select "ON" to have audio signal when capturing still images or initiating video recordings.

Show Logo

► Select “SHOW” to have “Leica” Logo on the “Live” view.

Status Icon



► Select “SHOW” to have status icons appear on the top right of the screen.

The following icon status will NOT be hidden:


Wi-Fi enabled indicator


No SD Card indicator


Low disk space indicator

Reset Camera

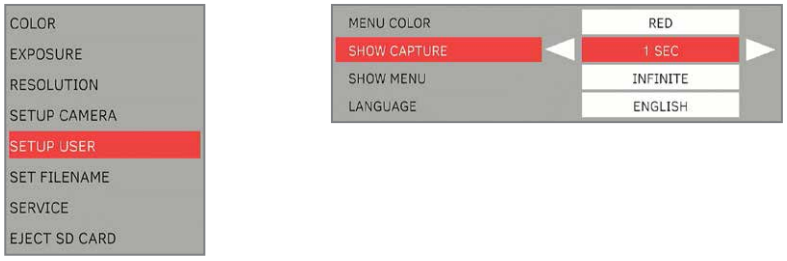
► Press OK to restore all settings of the video camera to the factory settings.

9.4.5 Setup user (user-defined settings)

Menu color

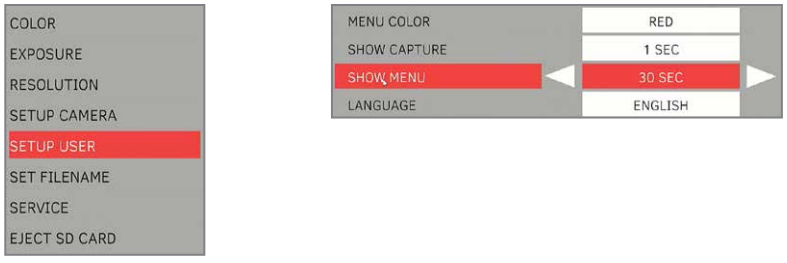
- ▶ Select color scheme for menu:
- "RED": Default color
- "BLUE": Alternative color

Show capture



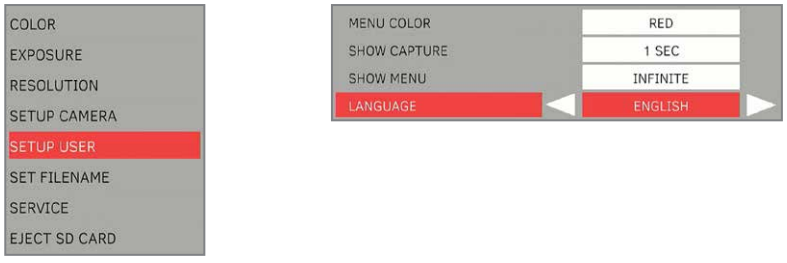
- ▶ Select the display mode & display duration of the image after it is captured:
- "OFF"
- "1 SEC"
- "3SEC"

Show menu



- ▶ Select the display duration of the Camera Menu on the screen:
- "15 SEC"
- "30 SEC"
- "INFINITE"

Language



- ▶ Select the language.

Set filename

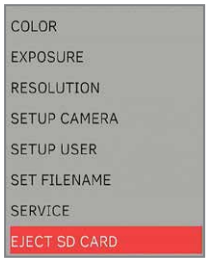
► Set the first 4 characters of the filenames using virtual keyboard for still captures and video recording.

All the files will be saved in a folder, where the name of the folder is generated based on the file name set.
e.g. Set Filename = m320
Filename = m32000001.JPG
Folder name = 100m320_

Service

For service use only

Eject SD Card

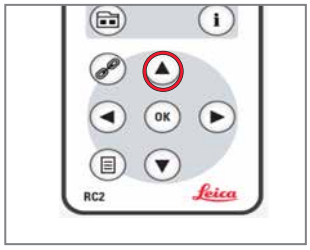


► Select 'EJECT SD CARD' before removing SD card from the camera

Always eject the SD card before removal to prevent corruption of the SD card.

9.4.6 Quick menu

File transfer mode

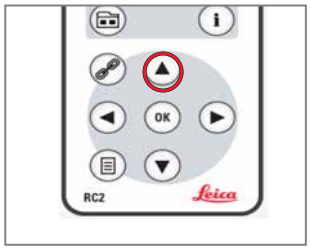


- ► Press ▲ to call up the “QUICK MENU”.
- ► Use ◀ ▶ to select “FILE TRANSFER”, and press OK.

> In “FILE TRANSFER” mode, the SD card will appear as ‘Removable Disk’ on the PC, and files can be copied from the SD card and pasted to the local PC.

> Applicable to USB port at horizontal arm only.

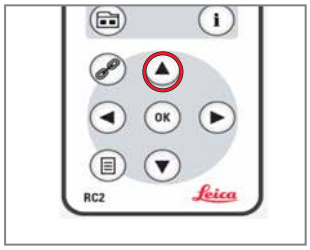
Set filename



- ► Select “SET FILENAME” to enter “SET FILENAME” menu.

> Refer to "Set filename" section on page 40

Wifi streaming/data transfer



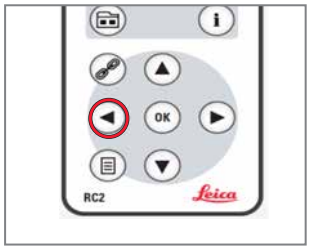
- ▶ Insert the WiFi dongle into the USB port on the IVC3.
- ▶ Select “WIFI STREAMING ON” and press OK. The camera will act as an RTSP server and stream the recorded ‘live’ view.
- ▶ When “WIFI STREAMING ON” is shown, the camera will act as an RTSP server and stream the ‘live’ view.
- ▶ Connect your PC/Phone to the camera’s WiFi network.
- ▶ The SSID can be found in the info screen.
- ▶ User can use application that support rtsp/tcp (e.g. vlc, potplayer) to view the streaming by entering the URL rtps://192.168.2.1:8554/video
- ▶ Set to “WIFI STREAMING OFF” by pressing OK to stop the streaming.

SD Card must be inserted to start Wifi streaming/ data transfer function.
The camera cannot do still capture or recording to SD card while Wifi streaming is enabled.

Recommended software for Wifi streaming
- iOS - Leica developed App and VLC
- Android - Leica developed App and VLC
- Windows - VLC and potplayer

Recommended software for Wifi data transfer:
- iOS - Leica developped App
- Android - Leica developed App

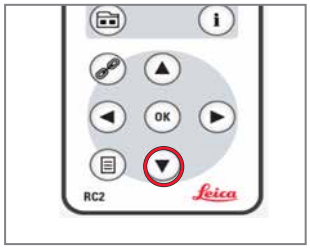
Automatic light control



- ▶ Press ◀ to select the ALC mode:

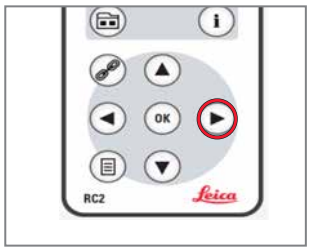
“NO MASK”, “GRID”, “S CIRCLE”, “M CIRCLE” and “L CIRCLE”

Camera mode



- ▶ Press ▼ to select the camera capture mode:
- “NORMAL” : Capture 1 image.
- “BURST”: Capture 3 images.

White balance (orange filter)

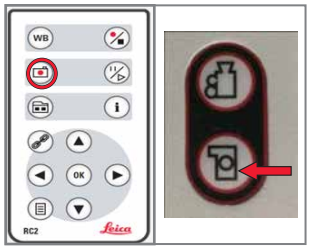


▶ Press ▶ to apply the pre-set color profile for white-balance correction of the Orange Filter and press OK.

9.4.7 Acquisition

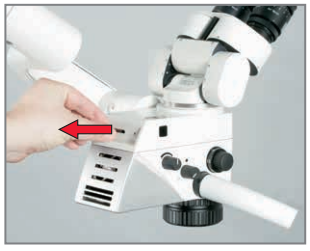
Images

1



▶ Press ◉ on the remote control or ◉ on the video camera to capture still images.
A signal tone sounds.

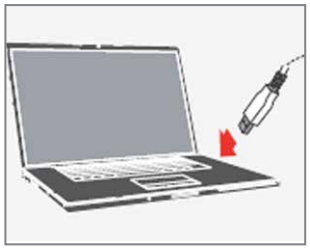
2



Files can be transferred to PC by:

▶ 1. Removing the SD card from the camera and insert the SD card into the SD card reader on the computer.

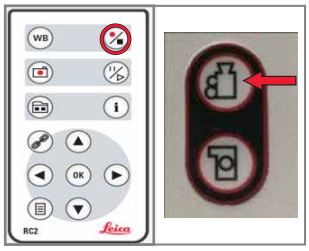
3



▶ Entering “FILE TRANSFER MODE” and the SD card will appear as “Removable Disk” on the computer.

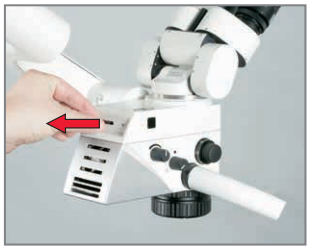
Videos

1



▶ Press ◉ on the remote control or ◉ on the video camera to initiate video recording.
A signal tone sounds.

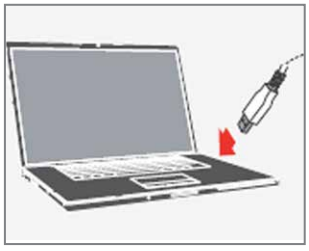
2



Files can be transferred to PC by:

▶ 1. Removing the SD card from the camera and insert the SD card into the SD card reader on the computer.

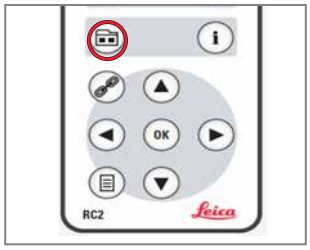
3



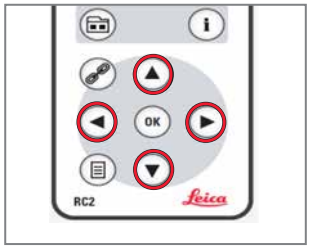
▶ Entering “FILE TRANSFER MODE” and the SD card will appear as “Removable Disk” on the computer.

The camera cannot do still capture or recording to SD card while Wifi streaming is enabled.

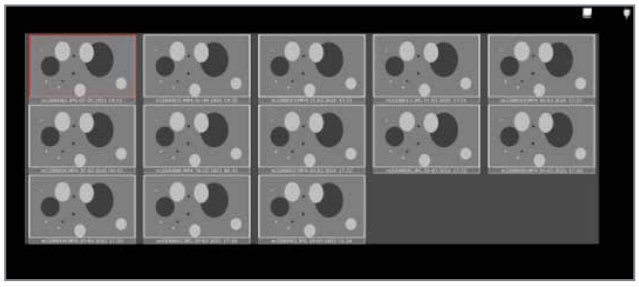
Viewing images

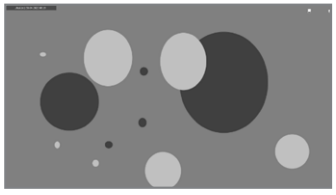
1 

- Press to enter thumbnail mode.

2 

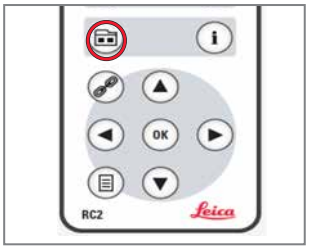
- Navigate by using the arrow keys.
- Press OK to select the image.

3 

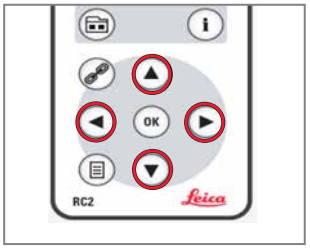
4 

- Image selected will be displayed in full screen.

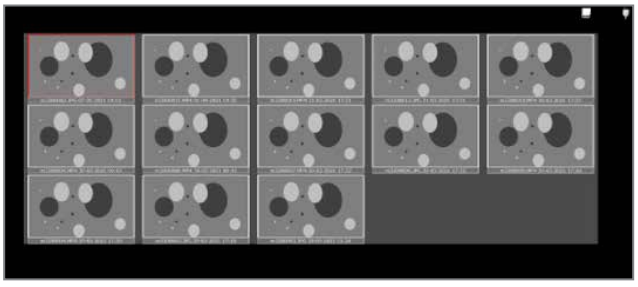
Viewing videos

1 

- Press to enter thumbnail mode.

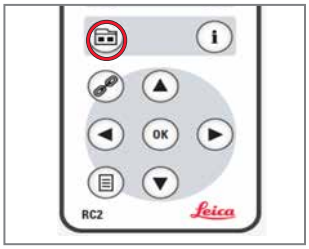
2 

- Navigate by using the arrow keys.
- Press OK to play the video.

3 

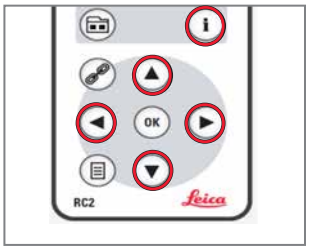
Deleting Files

1



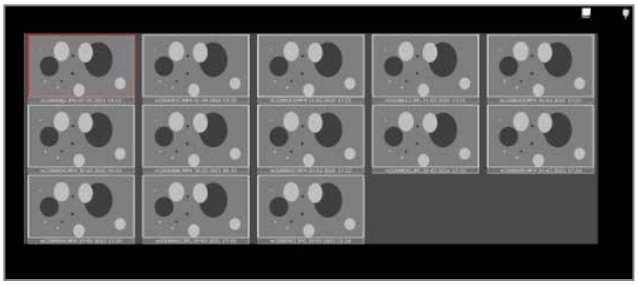
- Press to enter thumbnail mode.

2



- Navigate by using the arrow keys.
- Press to select the image for deletion.

3



4

Confirm the file name to be deleted.

- Select “OK” to permanently delete the file from SD card.
- Select “CANCEL” to cancel the file deletion process.

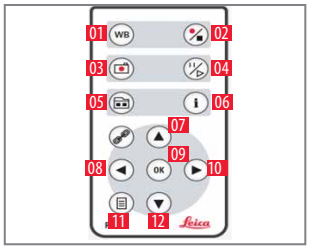
9.4.8 Pairing remote control

Remote control pairing allows the camera to only respond to the one specific remote control, which had been paired to the camera previously.
This is helpful when there are multiple cameras and remote controls in the same room.

1

- Press to start or end the pairing.
- Press and hold the button on the remote control, to define the pairing button, until the confirmation message is displayed on the screen.

2



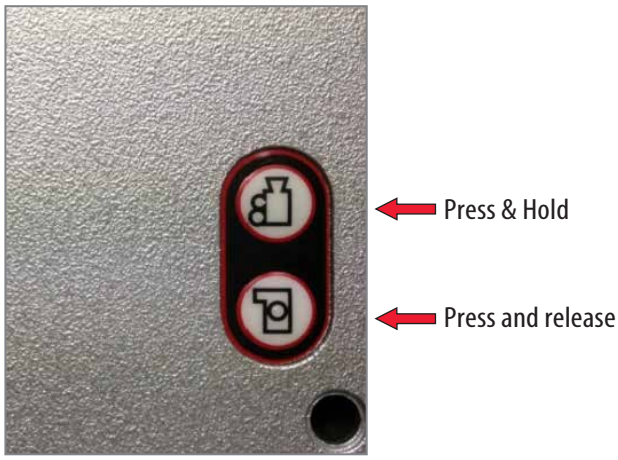
All of the buttons (01–12) except the button can be used for this.
Upon completion, a ‘beep’ sound will be generated and the camera will only respond to this particular remote control after pairing.

In order to achieve successful pairing and avoid pairing by mistake, the second step must be performed within 4 seconds.

- If a “timeout” is displayed after 4 seconds, press the “Pair” button again to start the process.

9.4.9 Switching live resolution

Press and hold while pressing once on will switch the resolution between 3840x2160, 2704x2028, 1920x1080 and 1920x1440.



10 Care and maintenance

We recommend concluding a service contract with Leica Microsystems Service.

10.1 Care instructions

- Put a dust cover over the instrument during breaks in work.
- Keep accessories in a dust-free place when not in use.
- Remove dust with bellows and a soft brush.
- Clean the objectives and eyepieces with special optics cleaning cloths and pure alcohol.
- Protect the surgical microscope and accessories from moisture, vapors, acids, alkalis, and corrosive substances.
- Do not keep any chemicals near the instruments.
- Protect the surgical microscope from improper handling.
- Install other device sockets or unscrew optical systems and mechanical parts only when explicitly instructed to do so in this user manual.
- Protect the surgical microscope from oil and grease.
- Never oil or grease the guide surfaces or mechanical parts.
- Remove coarse debris with a moistened disposable cloth.
- To disinfect the surgical microscope, use compounds from the surface disinfectant group based on the following active ingredients:
  - Aldehydes
  - Alcohols
  - Quaternary ammonium compounds

Due to potential damage to the materials, never use products based on:

  - Halogen-donating compounds
  - Strong organic acids
  - Oxygen-donating compounds
- Follow the disinfectant manufacturer's instructions.
- We recommend concluding a service contract with Leica Service.

10.2 Maintenance

- ► Keep accessories away from dust when not in use, e.g. protect them using a dust cover.
- ► Remove dust with a pneumatic rubber bulb and a soft brush.
- ► Clean lenses and eyepieces using special optics cleaning cloths and pure alcohol.
- ► Thoroughly clean the optics carrier using germicidal disinfectant after each time it is handled.
- ► Protect your microscope from moisture, fumes and acids and from alkaline and caustic materials. Do not store chemicals close to the instrument.
- ► Protect from improper use. Never install other device sockets or unscrew optical systems and mechanical parts unless explicitly instructed to do so in this User Manual.
- ► Protect the microscope from oil and grease. Never oil or grease the guide surfaces or mechanical parts.
- ► Remove coarse contamination using a damp disposable cloth.
- ► Use disinfectants based on the following active ingredients: aldehydes, alcohols, quaternary ammonium compounds.
- ► Do not use preparations based on the following: halogen-splitting compounds, strong organic acids, oxygen-splitting compounds.
- ► Camera: Keep optical components clean. Clean optical surfaces using a lint-free cloth. Soak the cloth using a little methanol or glass cleaner. Do not use alcohol.
- ► Do not use ethanol or spirits.

10.2.1 Tropical environment/fungus

Leica Microsystems employs certain safety precautions in its manufacturing techniques and materials. Other preventive measures include:

- ► Keep optical parts clean.
- ► Use and store them in a clean environment only.
- ► Store under UV light when not in use.
- ► Use in continuously climate-controlled rooms only.
- ► Keep moisture away and cover using a plastic cover filled with silica gel.

10.2.2 Notes on reprocessing of resterilizable products

Limitations on reprocessing

- ► Observe local legal regulations when processing medical products used to treat patients who have or are suspected to have Creutzfeldt-Jakob disease (CJK) or its variant (vCJK). Usually, these resterilizable medical products can be safely disposed of by burning.

Occupational safety and health protection

- ► Observe work safety and health protection of persons responsible for processing contaminated products.
- ► Current regulations of hospital hygiene and prevention of infection must be observed in the preparation, cleaning and disinfection of the products.

10.2.3 Instructions

Workplace

- ► Remove surface contamination with a paper towel.

10.3 Notes on reprocessing of resterilizable products

Recommended: reprocess a product immediately after use.

Limitation of reprocessing
Frequent reprocessing has little effects on the product. The end of the product life cycle is usually determined by wear and tear and damage through use.

Sterilization

		Permissible sterilization methods	
Article No.	**Designation**	**Steam autoclave 134 °C, t > 10 min.**	**Ethylene oxide max. 60 °C**
10180591	Clip-on handle	✓	
10428328	Rotary knob, binocular tube T	✓	
10384656	Rotary knob, transparent	✓	
10443792	Lever extension	✓	
10446058	Protective glass, multifocal lens		✓1)
10446469	Protective objective glass, Leica M680/FL400		✓1)

10446467	Protective objective glass, Leica M840/M841		✓1)

10445341	Handle for Leica M655, sterilizable	✓	
10445340	Cap for Leica M655/M695, sterilizable	✓	

10446842	Handle for Leica M400, sterilizable	✓	
10448440	Cover, sterilizable for Leica M320 handle	✓	
10448431	Protective objective glass, Leica M320		✓1)
10448296	Objective protective glass, Leica M720, spare part (package of 10)		✓1)
10448280	Protective objective glass, Leica M720, complete, sterilizable		✓1)
10448581	Cover, sterilizable for RUV800	✓	

1) Products with optical components can be steam-autoclaved using the conditions listed above. However, this may cause a layer of dots and streaks to form on the glass surface, which may reduce the optical performance.

Cleaning

Needed: water, detergent, spirits, microfiber cloth

1 Flush the surface with running water (<40 °C), using a little detergent if necessary.
2 Also use spirits to clean optical components.
3 Dry optical components using a microfiber cloth, dry the rest of the product using a paper towel.

Disinfection

- ► After disinfection, thoroughly clean optical surfaces using running water/fresh drinking water and then rinse using fresh, demineralized water.
- ► Dry the products completely before the subsequent sterilization.

Leica Microsystems (Schweiz) AG validates:
The instructions above are suitable for preparing a product to be reused. The processor is responsible for the desired results. Before deviating from the instructions provided, first verify the deviations for effectiveness and possible consequences.

Maintenance

The Leica M320 surgical microscope is maintenance-free. To ensure operational safety and reliability, Leica Microsystems (Schweiz) AG recommends taking the precaution of contacting the responsible service organization. There, periodic inspections can be agreed or a maintenance contract can be concluded.

10.4 Changing fuses

WARNING

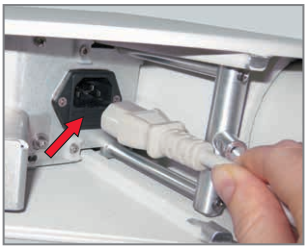
Danger of fatal electric shock!

- ▶ Disconnect the power cable from the instrument power socket before changing fuses.

Limitation of reprocessing

The fuse is in a fuse holder (arrow) in the device power socket.

- ▶ Remove cover of the horizontal arm.



- ▶ Push out fuse holder with screwdriver.
- ▶ Remove fuse from the fuse holder (arrow) and replace.

- ▶ Screw in the cover of the horizontal arm and tighten it.

11 Disposal

- ▶ The respective applicable national laws must be observed for disposal of the products, with the involvement of corresponding disposal companies.
- ▶ The unit packaging is to be recycled.

12 What to do if ... ?

12.1 Microscope

Problem	Solution	Location
Swing arm moves up/down by itself.	Balance system/swing arm.	See 7.14, "Balancing the swing arm"
Swing arm is lowered when the articulation brakes are engaged.	Reduce the total weight (at the optics carrier). Tighten the brake knob for locking the vertical position.	See 7.14, "Balancing the swing arm"
Microscope moves with difficulty or not at all.	Loosen/reset the articulation brakes.	See 5.5, "Brake knobs/articulation brakes"
No light.	Check/replace lamp. Check illumination control and illuminance. Check the filter and diaphragm control. Lower the swing arm, the tilt switch may be active. Check the socket and fuse. Contact service technician.	Instructions for replacing the LED
Insufficient light.	Check illumination control and illuminance.	See 8.4, "Adjusting the illumination"
Image is not sharp.	Screw in eyepieces firmly. Set the parfocality and diopter settings correctly.	See 7.10, "Eyepieces"
Microscope tilting.	Balance system/swing arm. Tighten the articulation brakes.	See 7.14, "Balancing the swing arm"
Interference from light reflections.	Turn the protective glass, must be at an oblique angle relative to the work surface.	
Streaks in the image.	Clean optics.	
No image.	Magnification control not engaged.	
Beep every 5 seconds, light switches off automatically after five minutes.	Contact service technician, have fan replaced.	
Double beep every 5 seconds, light switches off automatically after 5 minutes.	Allow the LED to cool off, switch off the instrument.	

12.2 Video camera

Problem	Solution	Location
No acquisition possible, "SD card Lock" appears on the screen.	Push the slide bar for write protection on the SD memory card upwards.	
No acquisition possible.	Insert SD memory card.	See 9.2, "SD Memory Card"
Remote control does not work.	Check battery. Point remote control at video camera, not at screen. Remote control defective. Camera main function control available on the optics carrier.	See 9.3, "Remote control" See 7.20, "Check the remote control and camera"
Specimen out of focus.	Focus accurately. Use eyepiece with crosshair reticle.	
No image on screen.	Check cable connection. Check screen.	
Photo is too dark.	Reset colors.	See 9.4.1, "Color (white balance)"
Colors not accurate.	Carry out white balance.	See 9.4.1, "Color (white balance)"
File Transfer not possible.	Check USB cable connection.	

If your instrument has a malfunction that is not described here, contact your Leica representative.

13 Specifications

13.1 Electrical data

Power socket	
Stand F12, W12, C12, FP12, TC12, TP12, LW12	Centrally located on the control unit 100-240 V AC, 50/60 Hz
Fuse	2 × T 6.3 AH/250 V
Power consumption	Leica M320 F12/C12/W12/FP12/TC12/TP12/LW12: 100 VA
Safety class	Class I
Control unit	Connection sockets for - Power cable - HDMI - USB

13.2 Surgical microscope

Magnification	Manual apochromatic 5-step magnification changer 6.4/10/16/25/40×
Stereo base	24 mm
Fix Objective (standard) Fix Objective (optional)	f=250 mm f=200, 225, 250, 300, 350, 400 mm
Manual fine focus Objective (optional)	f=200, 250, 300 mm
Eyepiece (standard) Eyepiece (optional)	10 × 21B 12.5 × 17B, 8.33 × 22B, eyepiece 10 × 21B with centered crosshair graticule
Tilt	–30°/+100°
Reset functions	Limit switch for light on/off

13.3 Lamps

Light source	Direct and long-lasting 2-LED illumination Average service life of 60,000 h for an end-of-life criterion of 70 % of the initial brightness;
UV filter	UV and IR-free LED illumination
Orange filter	OG530
Light intensity adjustment	Using a drive knob on the optics carrier

13.4 Stands

Leica M320 F12 Floor stand	
Max. extension range	1775 mm (Fully stretched for the inclined version)
Travel range (up/down)	800 mm
Base	Footprint: 608 × 608 mm
Transportation height, min.	1621 mm
Balancing Range	Min. 1.1 kg to max. 4 kg load on the optics carrier
Brake system	Fine adjustable mechanical brakes for all rotation axis with detachable brake knob.
Rotation ranges	At column: 360° For the swing arm: +190°/–125° For the microscope carrier at swing arm: ±155° For the lateral microscope carrier movement: ±60°
Weight of the whole	
System with max. load	ca. 116 kg

13.5 Optical data

	Objective f = 250 mm			
Eyepiece	**Total magnification (mm)**		**Field of view Ø (mm)**	
	min.	**max.**	**max.**	**min.**
8.33 × 22	2.1	13.4	86.2	13.6
10 × 21	2.6	16.2	82.2	13.1
12.5 × 17	3.2	20.2	66.6	10.6

13.6 Accessories

Binocular tube - with fixed angle - variable	 3 different selection options 3 different selection options
Handles	2 variants: Sterilizable/disinfectable or disinfectable
Rotary knobs	Sterilizable
Protective glass	Sterilizable
Orange filter	External UV light filter up to 530 nm for illumination and observation
ErgoWedge	5°- to 25°-angle for binocular tubes with fixed angle
ErgonOptic Dent	With 52° swivel angle, for binocular tubes variable from 0° to 180°

Remote control	IR remote control for the integrated video camera
Counterweight	Weight for balancing the optics carrier
Eyepieces	8.33×, 10×, 10× with crosshair graticule, 12.5×

13.7 Video accessories

M320 4K/FULL HD Video & Photo Camera	
Integrated (optional) video camera	3840×2160/1902x1080 px video resolution and 12Mpx photo resolution
Functions	Playback function for video and photo and thumbnail view
Storage	Video and photo on SD card
Video signal	Available in HDMI
Video/photo control	IR remote control and two hard keys on camera body, all camera settings with on screen menu
M320 IVA Integrated Video Adapter	
Adapter	Integrated (optional) video adapter for attachment of external c-mount cameras
Length of optics	Focal length of optics f=55 mm

13.8 Ambient conditions

Use	+10 °C to +40 °C +50 °F to +104 °F 30 % to 75 % relative humidity 780 mbar to 1013 mbar atmospheric pressure
Storage	–30 °C to +70 °C –22 °F to +158 °F 10 % to 100 % relative humidity 500 mbar to 1013 mbar atmospheric pressure
Transport	–30 °C to +70 °C –22 °F to +158 °F 10 % to 100 % relative humidity 500 mbar to 1013 mbar atmospheric pressure

13.9 Electromagnetic compatibility (EMC)

13.9.1 Environment for which the instrument is suitable

Normal environmental conditions as well as hospital

13.10 Compliance IEC 60601-1-2

Emissions

- CISPR 11, Class B, Group 1
- Harmonic distortion per IEC 61000-3-2 Class A
- Voltage fluctuation and flicker per IEC 61000-3-3 Class A, Figures 3-7

Immunity

Electrostatic discharge	CD ±8 kV, AD ±15 kV
Radiated RF EM fields	80 - 2700 MHz: 10 V/m
Proximity wireless fields	380 - 5785 MHz: 9 V/m; 28 V/m
Electrical fast transients and bursts	±2 kV power supply lines
Surges	±1 kV differential mode; ±2 kV common mode
Conducted disturbances, induced by RF fields	10 V rms
Rated power-frequency magnetic field	30 A/m
Voltage dips and interruption	according to IEC 60601-1-2:2014
Rated power-frequency magnetic field	Not applicable

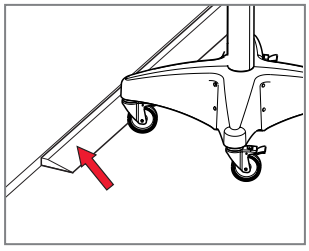
13.11 Standards fulfilled

CE conformity

- Medical electrical equipment, part 1: General requirements for Safety IEC/60601-1; EN/60601-1; UL60601-1; CAN/CSA C22.2 NO 60601-1-14:2014.
- Electromagnetic compatibility IEC/60601-1-2; EN/60601-1-2.
- Leica Microsystems (Schweiz) AG, Medical Division has a management system which corresponds to the requirements of the international standard ISO/13485 for quality management and quality assurance.

13.12 Limitations on use

- The Leica M320 surgical microscope may be used in enclosed rooms and on flat surfaces with max. 0.3° unevenness and on stable walls or ceilings that fulfill our specifications (see Installation Manual).
- Not intended for ophthalmology.
- The Leica F12 stand is not intended to be moved down steps of more than 20 mm in height.
- To move the surgical microscope over thresholds of 20 mm, the wedge (arrow) included in the packaging can be used.
- Without auxiliary equipment, the Leica M320 can only be moved across thresholds up to a max. height of 5 mm.



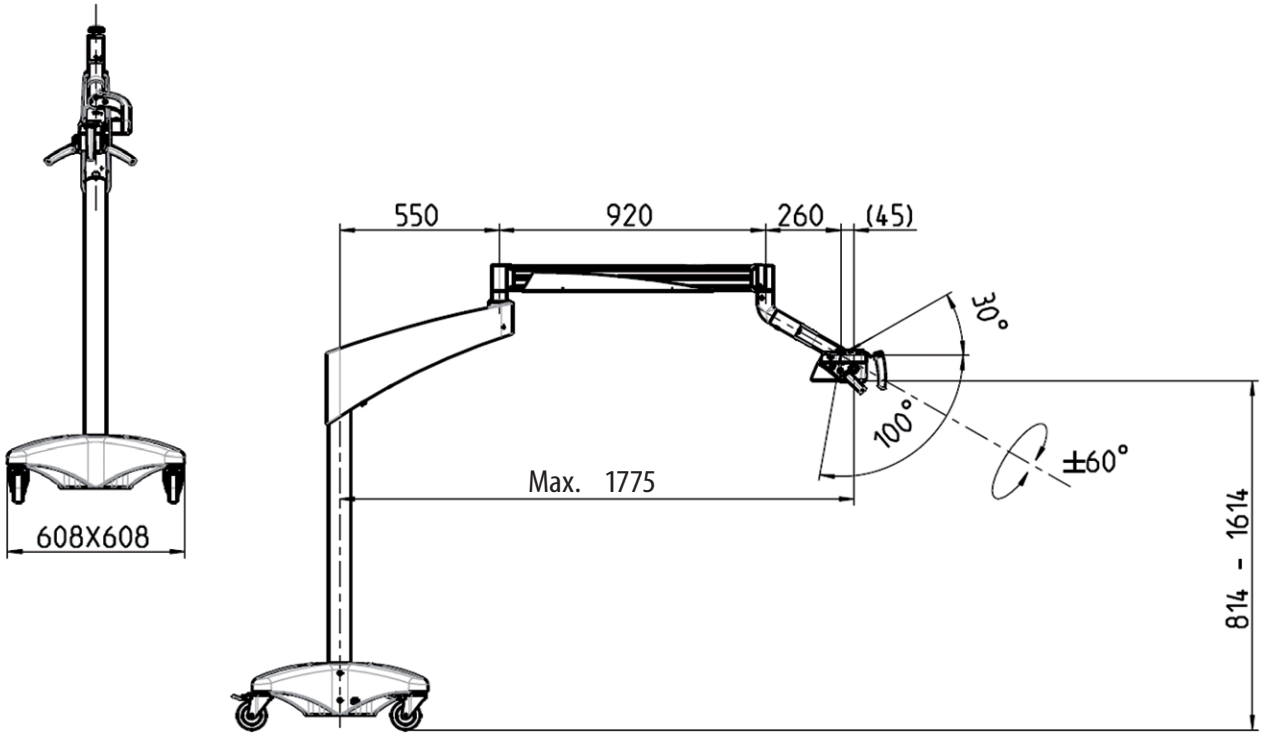
- ▶ Place the wedge (arrow) in front of the threshold.
- ▶ Move the surgical microscope across the threshold in transport position, pushing it by the handgrip.

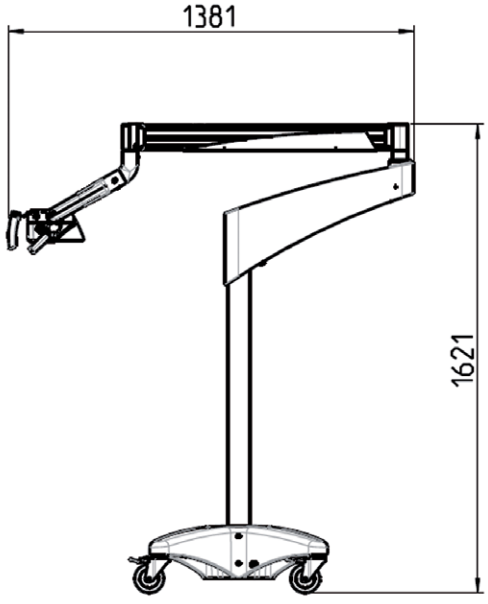
13.13 Working range

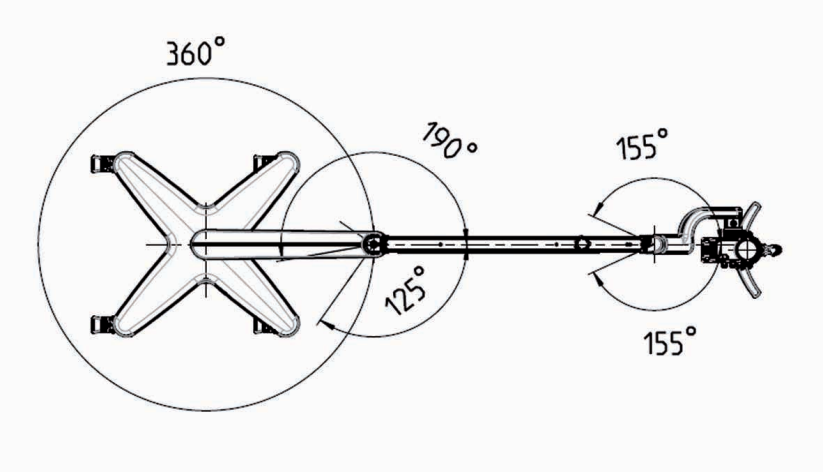
	M320 F12 long swing arm (standard)	M320 short swing arm	M320 W12	M320 C12
Max. extension range (Fully stretched for the inclined version)	1775 mm	1455 mm	1775 mm	1775 mm
Travel range (up/down)	800 mm	300 mm	800 mm	800 mm
Base	608×608 mm		NA	Diameter 247 mm
Transportation height, min.	1621 mm		NA	NA
Balancing Range (Load on the optics carrier)	Min 1.1 kg to max 4 kg	Min 1.5 kg to max 4 kg	Min 1.1 kg to max 4 kg	Min 1.1 kg to max 4 kg
Brake system	Fine adjustable brakes for all axes with detachable brake knob.			
Rotation ranges	For column 360° Swing arm +190°/–125° Microscope carrier on swing arm ±155° Lateral microscope carrier movement ±60°	For column 360° Swing arm +150°/–150° Extension arm on swing arm ±150° Microscope carrier on extension arm ±155° Lateral microscope carrier movement ±60°	For column 180° Swing arm +190°/–125° Microscope carrier on swing arm ±155° Lateral microscope carrier movement ±60°	For column 180° Swing arm +190°/–125° Microscope carrier on swing arm ±155° Lateral microscope carrier movement ±60°
Total weight of the system with maximum load	116 kg	110 kg	35 kg	48 kg

M320 FP12	M320 TC12	M320 TP12	M320 LW12	M320 UN12-D 4K (Japan Only)
1775 mm	1455 mm	1455 mm	1455 mm	1775 mm
800 mm	300 mm	300 mm	300 mm	800 mm
Diameter 247 mm	250×250 mm	250×250 mm	NA	NA
NA	NA	NA	NA	NA
Min 1.1 kg to max 4 kg	Min 1.5 kg to max 4 kg	Min 1.5 kg to max 4 kg	Min 1.5 kg to max 4 kg	Min 1.1 kg to max 4 kg
Fine adjustable brakes for all axes with detachable brake knob.				
For column 360° Swing arm +190°/–125° Microscope carrier on swing arm ±155° Lateral microscope carrier movement ±60°	For column 180° Swing arm +150°/–150° Extension arm on swing arm ±150° Microscope carrier on extension arm ±155° Lateral microscope carrier movement ±60°	For column 180° Swing arm +150°/–150° Extension arm on swing arm ±150° Microscope carrier on extension arm ±155° Lateral microscope carrier movement ±60°	For column 180° Swing arm +150°/–150° Extension arm on swing arm ±150° Microscope carrier on extension arm ±150° Lateral microscope carrier movement ±60°	Swing arm +190°/–125° Swing arm microscope carrier ±155° Lateral microscope carrier movement ±60°
46 kg	41 kg	38 kg	30 kg	48 kg

13.14 Dimensions F12 (in mm)







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