ZEISS TIVATO 700

Surgical microscope

Instructions for Use



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1 Notes on the instructions for use

1.1 Device name

The ZEISS TIVATO 700 is referred to as "the device" in the present Instructions for Use.

1.2 Area of application

These Instructions for Use apply to ZEISS TIVATO 700 software version 1.6 and the following identification label:

- Reference number: 6643

1.3 Purpose and storage of the documentation

These instructions for use explain the safety features, functions and performance parameters of the device. They contain instructions on the safe use of the device and identify measures for its care and maintenance.

Correct operation of the device is imperative for its safe and successful functioning.

- ▶ Read these instructions for use before setting up and using the device the first time.
- ▶ Keep the instructions for use accessible for all users at all times.
- ▶ Pass the instructions for use to future owners of the device.

1.4 Questions and comments

- ▶ If you have any questions or comments concerning these instructions for use or the device itself, contact ZEISS Service.

You can find the ZEISS contact partner for your country on the following website: www.zeiss.com/med

1.5 Conventions in this document

Certain types of information are specially marked in this document for better recognition.

1.5.1 Conventions in all text areas

- This is a list.
  - This is a second level list.

This is a cross-reference: Conventions in this document [▶ 11].

This is **highlighted text**.

This is `software code` or `program text`.

Names of software dialogs, fields or menus, and software messages are marked by quotation marks:

- "View" menu.
- "Do you want to save the settings?"

The steps in menu and file paths are separated by slashes:

- "File / Save as"
- "My documents / Documents"

Keys, buttons, knobs, levers, and other operating controls are marked by square brackets:

- [START] key
- [Next] button

1.5.2 Conventions in a course of action

⚠ WARNING!

This is warning information about hazards that can cause death or severe injuries if not avoided.

The warning message names the possible consequences.

▶ This is a measure with which hazards can be prevented.

⚠ CAUTION!

This is warning information about hazards that can cause injuries if not avoided.

The warning message names the possible consequences.

▶ This is a measure with which hazards can be prevented.

NOTE

This is warning information about hazards that can cause property damages if not avoided.

The warning message names the possible consequences.

▶ This is a measure with which hazards can be prevented.

☑ This is a requirement that must be met before the start of a sequence of actions.

1. This is a command.
2. **CAUTION! This is a warning message about hazards that can occur during a single action.** This is a command.

   ⇨ This is the result of a sequence of actions.

1.6 Other applicable documents

Document type	Document title	Document number
Instructions for Use	INFRARED 800 for the ZEISS TIVATO 700 (option)	G-30-2034
Instructions for Use	14-function foot control panel, wired (FCP) or wireless (FCP WL) (option).	G-30-1706
Instructions for Use	180° Tiltable Tubes with f=170 and f=200 (option)	G-30-1600
Instructions for Use	Foldable Tube f170/f260 (option)	G-30-1776
Briefing report	Briefing report for newly installed systems	G-30-1714
Conformance statement	DICOM conformance statement	EN_30_200 _0084I
Release Notes	Release notes for ZEISS TIVATO 700	RN-30-9066
Product overview	ZEISS Video Accessories	G-30-1888

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2 Safety notes

2.1 Target group

These Instructions for Use are intended for physicians, medical and technical staff, and nurses who are responsible for preparing, operating or maintaining the device following training.

It is the duty of the equipment owner/operator to train and instruct all operating personnel.

2.2 Area of use

2.2.1 Intended use

The ZEISS TIVATO 700 is a surgical microscope intended to illuminate and magnify the surgical area and to support visualization in surgical procedures.

⚠ CAUTION!

Injury to patient's eye!

The device must not be used for ophthalmological procedures.

▶ Make sure that no LED or xenon light enters the patient's eyes.

2.2.2 Indications

Information on the intended medical indications for use, contraindications and the target patient group has been set out in the following table.

Intended medical indications for use	
Medical discipline:	■ ENT surgery ■ Spine surgery ■ P&R surgery ■ Neurosurgery (cranial and spinal applications) ■ Microdentistry
Indication:	The ZEISS TIVATO 700 is a surgical microscope intended to illuminate and magnify the surgical area and to support visualization in surgical procedures.
Contraindication:	Provided that the ZEISS TIVATO 700 is used within its indication of use, there are no known contraindications.
Patient target group:	No constraints

Intended medical indications for use	
Age:	No constraints
Gender:	All

2.2.3 Normal use

The complete system comprises a surgical microscope with a floor stand containing the electronics, the light source, a graphic touch-screen and, optionally, a video display. The stand supports the operation of an optical microscope system.

ZEISS TIVATO 700 is suited for cranial and spinal applications in neurosurgery as well as ENT applications in the area of the auditory nerve and the base of the skull. Further fields of application include P&R procedures and oral and maxillofacial surgery. ZEISS TIVATO 700 is also ideally suited for multidisciplinary use in microsurgery. ZEISS TIVATO 700 is equipped for the connection of navigation systems and for data communication with external network systems. Optional fluorescence modules enable enhanced visualization of tumors and healthy tissue and improved vascular visualization.

ZEISS TIVATO 700 is intended for use in hospitals, clinics or other medical institutions. The user can trigger these functions using the keys on the hand grips and an optional foot control panel. These functions are set by default or are controlled by the optional central control unit in the stand and the interactive graphic touchscreen. The latter enables the user to configure all required settings.

The ZEISS TIVATO 700 may be operated only by physicians, nurses and other medically trained OR staff who have received appropriate training and observe the instructions for use. The instructions for use also contain instructions for cleaning, disinfection, changing spare parts, maintenance and disposal.

The installation conditions and the use of the system must meet microsurgical requirements:

- Low vibration
- Dust-free environment
- Level, horizontal positioning
- Avoidance of extreme mechanical stress
- EMC-specific environment based on a professional healthcare facility (use of RF surgical devices in combination with the microscope)

2.2.4 Risk of burn injuries caused by high illumination intensity

In case of misuse of the xenon or LED light source, an excessive illumination intensity may cause third-degree burns. A long surgical procedure increases the risk of injury, in particular if a standard procedure takes considerably longer than usual. Various factors contribute to the risk of burn injuries:

General

The device is equipped with a powerful xenon or LED light source. If used improperly, this light source can lead to an excessively high illumination intensity resulting in third-degree burns.
Never leave a device unattended when its light source is switched on!

Device-related factors:

- If a high magnification is selected, the diameter of the field of view decreases and the light intensity at the surgeon's eye is reduced whereas the light intensity in the surgical field remains the same. This effect is increased by the use of certain accessories, e.g. eyepieces with higher magnification or the foldable tube f170/f260 with tube magnification (PROMAG function). When working at maximum magnification, you should therefore pay particular attention to the set light intensity to prevent burns, especially of the surrounding tissue.
- If the stereo bridge is used, the light intensity at the surgeon's eye is reduced whereas the light intensity in the surgical field remains the same. When working with the stereo bridge, you should therefore pay particular attention to the set light intensity to prevent burns, especially of the surrounding tissue.

Surgery-related factors:

- The size of the luminous field influences the risk of injury in the following respect: With a large luminous field diameter, areas of the skin are illuminated which are not monitored as strictly by the surgeon and which are not moistened sufficiently. These areas are particularly at risk of injury. These injuries can be prevented by adjusting the illuminated-field diameter to the smallest size required for the relevant operation.
- If the luminous field is reduced in size, the intensity increases because the light is focused more. So, if possible, the intensity should be lowered as soon as the size of the illuminated field is reduced.
- A long surgical procedure increases the risk of injury, in particular if a standard procedure takes considerably longer than usual.
- Injuries in the peripheral area can be prevented by covering this area with moist, sterile gauze. The gauze must be moistened at regular intervals to prevent it from heating up or drying out. The risk is increased if dry drapes are used to cover such areas.
- It should also be considered that some areas of the body may be more sensitive than others.
- Certain preparations of the surgical field, the administration of vasoconstrictive medications and surgical incision drapes may also result in a higher risk of injury (surgical drapes may heat up to varying degrees depending on their color and moisture content).

Patient-related factors:

- The general condition of a patient's health may contribute to the risk of injury.
- The skin type may also play a major role in this respect.
- Certain medications also affect the sensitivity to light.
- The interaction of heat and antimicrobial substances in incision foils may lead to an increase in the patient's reaction to these substances.

Recommendations

- The initial illumination intensity should be preset to a low value.
- If used, drapes should also be remoistened at regular intervals in order to prevent heat from accumulating underneath the drape.
- The risk of burns can be reduced by constantly irrigating the illuminated surgical field and by keeping it moist.
- Using the buttons on the hand grip or foot control panel, the surgeon can then set the illumination intensity to the value required for the procedure. Please note that the intensity increases with decreasing luminous field size if the spot function is used. For this reason, the intensity should be set only after the size of the illuminated field has been changed.
- The device is equipped with "Automatic Light Field Limitation" (function: SmartLink Auto Brightness). This function should not be deactivated.
- The magnification factor usually is increased during surgery. This darkens the image so that the illumination intensity must be increased. This loss in image brightness is automatically compensated if the zoom-dependent brightness control is activated (function: SmartLink Auto Brightness).
- Never leave a device unattended when its light source is switched on.
- Switch off the light when the microscope is not being used, and ensure it is not directed at unprotected bare skin.

2.3 Responsibilities and duties of the operator

Operating personnel

Only personnel who have undergone training and instruction are allowed to use this instrument.

- ▶ Never leave the device unattended when it is located above the patient.
- ▶ Make sure that the operating personnel are appropriately trained and instructed.
- ▶ Make sure that the operating personnel have read and understood the Instructions for Use.
- ▶ Keep the Instructions for Use available at all times for the operating personnel.
- ▶ To facilitate access for the entire operating personnel: If necessary, request further copies of the instructions for use from ZEISS.
- ▶ Define the required skills for handling the device and provide information on who is authorized for which activities.
- ▶ Define rules for reporting errors and damage, and make sure that people are informed of these. Notification of the manufacturer and authorities [▷ 23]
- ▶ Provide the necessary protective clothing.
- ▶ Regularly check compliance with the national laws and regulations concerning accident prevention and occupational health.

Safety inspections

- ▶ To prevent a decrease in device safety due to aging and wear: ensure that safety inspections in compliance with IEC 62353 are performed on time and to the prescribed extent. Observe the applicable national regulations.

The safety inspections may only be performed by the manufacturer or qualified personnel.

- ▶ Comply with the specified time limits (see Maintenance).
- ▶ Perform the inspections to the prescribed extent.

The device should, as a minimum, undergo the following checks and safety inspections:

- Check the presence of the instructions for use
- Visually inspect the device and its accessories for damage, as well as legibility of markings and labels
- Leakage current test
- PE conductor check

- Function and wear test of the brakes
- Functional check of all switches, buttons, connectors and control lamps on the device

Maintenance and inspection

▶ To ensure that the device is safe to operate and reaches its expected service life: observe the maintenance and inspection intervals specified in these Instructions for Use (see: Maintenance).

Changes to the product

▶ WARNING: This device must not be modified without the manufacturer's permission. If the device is modified, suitable inspections and tests must be performed to ensure that the device can still be used safely.

Accessories and additional equipment

▶ If you want to connect accessories or additional equipment to the device: Contact your ZEISS representative [▷ 11].

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

Furthermore, any configurations must comply with the normative requirements for medical systems (within the European Union: see IEC 60601-1).

If you connect additional devices to medical electrical systems, you are considered to be a system configurer and are thus responsible for ensuring that the system complies with the normative requirements for systems.

Local laws take precedence over the above normative requirements.

Dangers arising from connection to a network

Before connecting the device to a network, observe the following safety measures to prevent injury or damage:

▶ The user (or IT manager) is responsible for ensuring that no computer viruses are transmitted to the device via the network connection.

▶ Make sure that there are no defects in the network which could lead to a hazardous voltage on the network connector.

▶ Ensure a data transmission rate of 1 Gbit/s and the conformity of your network configuration with internet protocol IPv4 so that patient data can be exported to your network reliably, safely and error-free.

Network modifications

The following subsequent changes to the network may result in new risks:

- Changes to the network configuration
- Connecting additional devices to the network
- Disconnecting devices from the network
- Updating devices connected to the network
- Upgrading devices connected to the network

▶ Analyze and eliminate any new risk factors arising through such changes to the network.

2.3.1 Requirements for the network connection

The following requirements apply to the network in which the ZEISS TIVATO 700 is integrated:

LAN

Name	Value
Ethernet protocol IPv4	TCP/IP
Gigabit Ethernet	1000BASE-T, IEEE 802.3 Paragraph 40
Assignment of IP addresses	Static IP or DHCP (configurable within the device)
LAN connection to the navigation system	
Latency	< 3 ms
Data transmission rate	> 1 Mbit/s
Video recording for release in the network	
Data transmission rate	> 40 Mbit/s
Live streaming of camera image	
Data transmission rate	> 40 Mbit/s

WLAN

Name	Value
Security standard	WPA2/PSK
WLAN standard	802.11a/b/g/n
Ethernet protocol IPv4	TCP/IP
Assignment of IP addresses	Static IP or DHCP (configurable within the device)
Video recording for release in the network	

Name	Value
Data transmission rate	> 40 Mbit/s
Live streaming of camera image	
Data transmission rate	> 40 Mbit/s

WLAN hotspot

Name	Value
Security standard	WPA2/PSK
WLAN standard	802.11a/b/g/n
Ethernet protocol IPv4	TCP/IP
Assignment of IP addresses	DHCP
Live streaming of camera image	
Data transmission rate	> 40 Mbit/s

Network configuration

Name	Value
Assignment of IP addresses	Static IP or DHCP (configurable within the device)
Shared network drive	SMB protocol (Server Message Block), also known as CIFS (Common Internet File System)
Streaming client (via LAN, WLAN, WLAN hotspot)	
Log	RTSP (RTP via UDP)
2D video codec:	■ Video compression: H.264/MPEG-4 AVC / Baseline Profile / Level 4.2 ■ HD resolution: 1920x1080p25/30

2.3.2 Messages to manufacturer and authorities

If a serious incident occurs in connection with this medical device affecting the operator or another person, the operator (or person responsible) must report this serious incident to the manufacturer or seller of the medical product. In the European Union, the operator must report this serious incident to the responsible authorities in the applicable country.

2.4 Measures and duties of the operator

The device and Sony monitor are switched offElectrical safety

- ▶ Always switch off the device before connecting it to or disconnecting it from the power supply, for cleaning its surface, or if it will not be used for a prolonged period of time.
- ▶ Only connect the device to a power supply that complies with the values specified on the rating plate.
- ▶ Do not use multiple sockets.
- ▶ Do not use extension cords.
- ▶ Do not touch the device if your body is electrostatically charged and the device is not grounded.
- ▶ Connect the device via the potential equalization connection (compliant with IEC 60601-1) to other active devices with the same ground potential or connect it to a protective ground connection.
- ▶ Please note the information on electromagnetic compatibility (EMC).
- ▶ Never open the device.
  The device contains freely accessible live components. If you remove the housing, you are exposed to the risk of an electric shock.

Ambient conditions

- ▶ Make sure that the installation conditions and the operation of the device comply with the surgical requirements:
  - ⇨ Low vibration
  - ⇨ Clean environment
  - ⇨ Avoid extreme mechanical loads
- ▶ Do not operate the supplied devices, provided that they are energetically operated,
  - ⇨ in explosion-risk areas,
  - ⇨ at a distance of less than 25 cm from flammable anesthetics or volatile solvents such as alcohol, benzine or similar substances.
- ▶ Do not store or use this device in damp areas. Do not expose the device to water splashes, dripping water or sprayed water.
- ▶ Ensure that no liquids can enter the device.

Symbols and labels

- ▶ Observe the symbols and labels attached to the device.

Transport

- ▶ Transport the device over long distances only in its transport position.
- ▶ Transport the device over long distances (e.g. relocation, return for repair) only in its original packaging or special return packaging.
- ▶ Contact your dealer or ZEISS Service.

Supervision

- ▶ Never leave the device unattended when it is located above the patient.

2.5 Electromagnetic compatibility

The device is subject to special precautionary measures regarding electromagnetic compatibility (EMC). The following factors can cause EMC disturbances:

- Portable and mobile HF communication equipment in the vicinity of the device.
- Other devices set up in the vicinity or stacked together with the device.
- Accessories, cables and spare parts not specified in the Instructions for Use and not sold by ZEISS as spare parts.

You can prevent EMC disturbances by using the following precautionary measures:

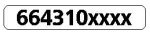
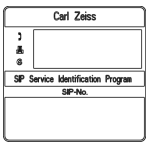
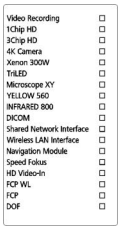
- ▶ Comply with the Instructions for Use.
- ▶ The device must be installed and initially commissioned in accordance with the EMC notes in the Technical specifications section.
- ▶ Only use accessories, transformers, cables and spare parts specified in the Instructions for Use or approved by ZEISS for this device.
- ▶ If you are using radio communication equipment or components for radio transmission: Keep a distance of 30 cm to all components of the device.
- ▶ If you are installing the device near or stacking it with other devices: Check the device is operating correctly in this configuration.

Empty page, for your notes

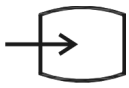
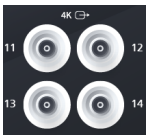
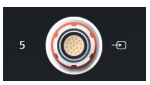
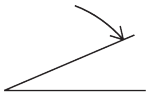
3 Description of the device

3.1 Marking on the device

Symbol	Name	Explanation
	Warning label	General warning sign!
	Warning label	Warning: risk of hand injuries!
	Warning label	Hot surface warning!
	Warning label	Maximum load capacity 7 kg!
	Warning label	Warning label, LED radiation, Risk group 2 ■ Warning of (visible) optical radiation emitted by this device. ■ Do not look into the source of the operating light.
	Mandatory label	Observe the instructions for use and the accompanying documents
	Approval label with performance data	Provides information on: ■ Manufacturer: Carl Zeiss Meditec AG ■ Manufacturer's address ■ Device name ■ Reference and serial number ■ Date of manufacture ■ Rated voltage ■ Connected load ■ Line frequency range ■ Designation of origin for industrial products ■ WEEE label

Symbol	Name	Explanation
		■ CSA label ■ CE mark ■ Maximum laden mass
	Manufacturer	Carl Zeiss Meditec AG Goeschwitzer Strasse 51 - 52, 07745 Jena, Germany
	WEEE label	Do not dispose of electrical or electronic devices along with normal domestic waste.
	Catalog number	-
	Serial number	-
	Date of manufacture	-
	UDI data matrix	UDI label ■ Machine-readable label (data matrix) ■ UDI Device Identifier (UDI-DI) ■ UDI Production Identifier (UDI-PI)
	MD labeling (Medical Device)	-
	Serial number	-
	Service Identification Program (SIP label)	Provides information on: ■ Manufacturer ■ Manufacturer's contact information ■ SIP number of the device
	Identification label, device options	Identifies installed device options.

Symbol	Name	Explanation
	Foot control panel, wireless	-
	Indicator	Pairs the device with the wireless foot control panel (FCP WL).
	Transport position	Transport position: ■ Observe the instructions for use and the accompanying documents ■ Pushing position ■ General Warning
	Drape position	Identifies the seal for the drape vacuum system
	Brand / Logo	ZEISS logo
ZEISS TIVATO 700	Device name	-
	Open	Open, right/left co-observation port
	Zoom	Adjust zoom magnification manually
	Focus	Focus / Working distance
	Illumination diameter	Illumination diameter / Luminous field diaphragm
Varioscope	Brand name	-
	Non-ionizing electromagnetic radiation & Rx Only	-
	Non-ionizing electromagnetic radiation	-
Rx only	Rx Only	Only for USA: "Prescription use only"

Symbol	Name	Explanation
	RFID symbol	RFID scanner or reading device
	Standby / ON	-
USB-C	USB-C port	-
USB-A	USB-A port	-
	Video output (optional)	Number 1: HD-SDI / 3G-SDI output Number 2, 3: HD-SDI / 3G-SDI output Number 4: HDMI output
	Video output (4K option)	Number 11-14: 4K 3G-SDI output Number 4: 4K HDMI output
	Video input (optional)	Number 5: HDMI input
	Video output (optional)	Number 1: HD-SDI / 3G-SDI output
	Video output (optional and 4K option)	Number 11-14: 4K 3G-SDI output
	Video output (optional)	Number 2, 3: HD-SDI / 3G-SDI output
	Video output (4K option)	Number 4: HDMI output Number 4: 4K HDMI output
	Video input (optional)	Number 5: HDMI input
NAV	Navigation (optional)	Port for navigation system (ODUMAC)
LAN	Network connection LAN	-
	Foot control panel, 14 functions	-

Symbol	Name	Explanation
	Remote port	-
F1	Fuse display F1	-
	Potential equalization	-
	Lamp cover	Manual lamp replacement (removal of light source cover)
	Lamp exchange	Manual lamp replacement (replacement of lamp container)
	Light 1	-
	Light 2	-
Carl Zeiss Meditec AG SN ... TOxxxx HLQ 300 Future 304949-9901-000	Identification label, HLQ 300 Future	-
Carl Zeiss Meditec AG SN ... Lampe 300W+ Xenon 304949-9002-000	Identification label, lamp 300 W+ xenon	-
ITOS FO 180 RGB MODULE 15-34 BVDC 1320 A 304977-8071-00 OSRAM GmbH Steinerstr. Parl 62 86167 Augsburg, Germany	Identification label, ITOS FO 180 RGB MODULE SGS: NRTL classification	-
Carl Zeiss Meditec AG Goeschwitzer Strasse 51-52 07745 Jena, Germany INFRARED 800 REF 7012 SN 701210xxxx YYYY-MM-DD (01)04049539070128 (11)YYMMDD(21)701210XXXX CE 0297	Approval label for INFRARED 800 (optional)	-

3.2 Labeling on packaging

Symbol	Symbol	Explanation
$\sum_1$	Packaging unit	Number of packaging units
-20°C +60°C	Permissible temperature	The product may only be transported and stored within a temperature range of min. -20°C to max. +60°C.

Symbol	Symbol	Explanation
	Fragile	Handle with care
	Indication of direction "top"	Indicates the correct upright position of the package.
	Center of gravity	Indicates the package's center of gravity.
	Do not stack	Stacking of the packages is not permitted. No load should be placed on the package.
	Keep dry	Protect the packaging and packaged contents from wetness.
	Permissible relative air humidity	The product may only be transported and stored at an humidity of min. 10% and max. 90% RH.
	Permissible atmospheric pressure	The product may only be transported and stored at an atmospheric pressure of min. 500 hPa and max. 1060 hPa.
		Min. 1.2 m forklift length
		Shockwatch
		Tiltwatch

Table 1: Symbols for transportation and storage

3.3 Structure of the device

3.3.1 Device overview

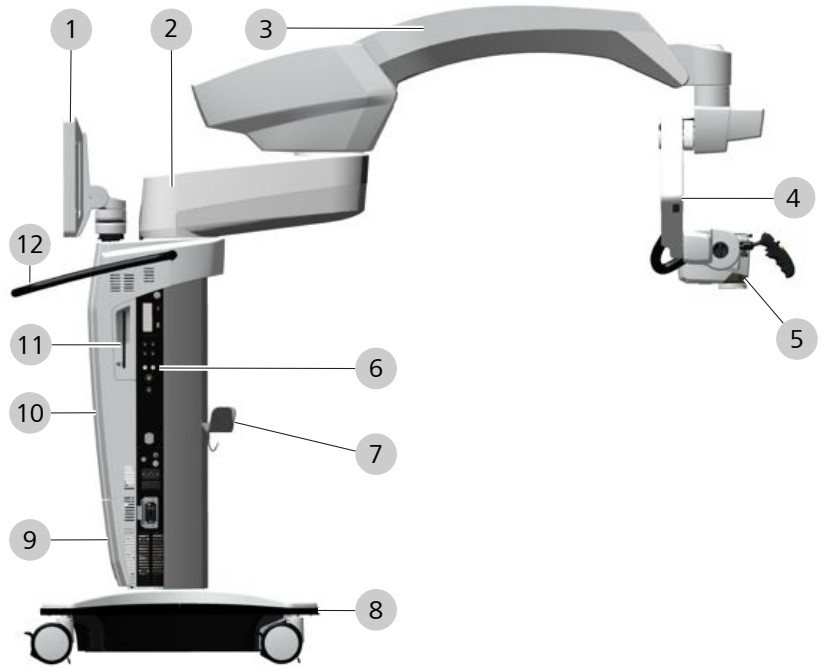


Figure 1: Structure of the device

1	Monitor (touchscreen)	2	Swivel arm
3	Suspension arm	4	Microscope suspension
5	Microscope	6	Connector panel
7	Cable holder, optional for foot control panel	8	Stand base
9	Cover for light source	10	Console
11	Charging station (optional) for a 10.5" iPad Pro or 10.5" iPad Air 3	12	Transport handle

3.3.2 Surgical microscope overview

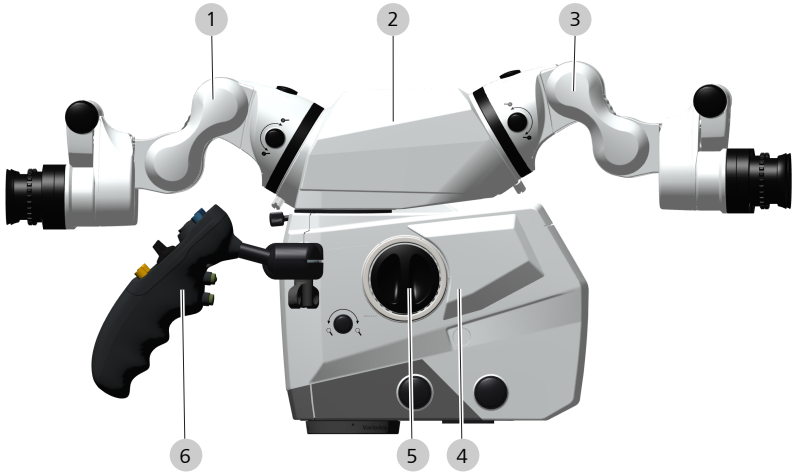


Figure 2: Overview of surgical microscope

1	Foldable tube for surgeon	2	Stereo bridge (optional)
3	Foldable tube for assistant (optional)	4	Navigation system antenna (optional)
5	Lateral stereo co-observation port	6	Hand grip

3.3.2.1 Configuration options

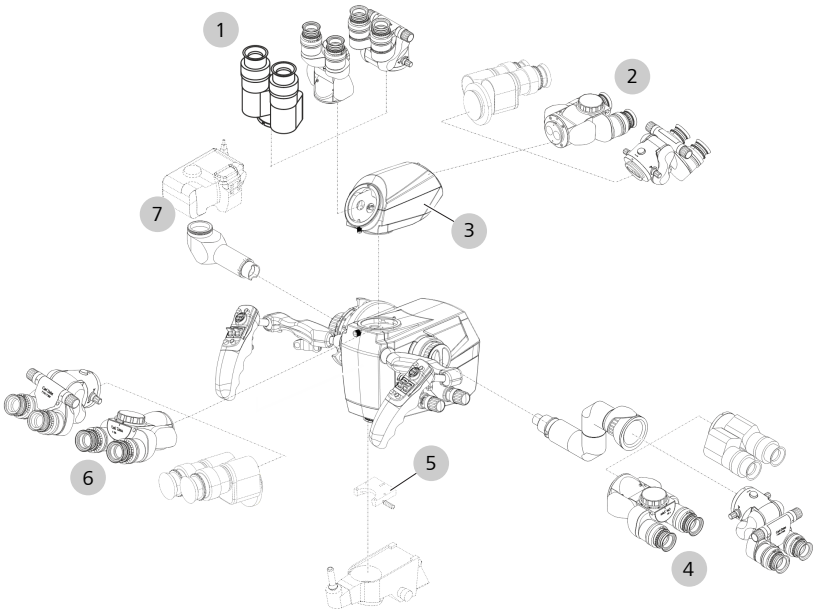


Figure 3: Configuration options

1	Binocular tubes for surgery	2	Binocular tubes for face-to-face viewing
3	Stereo bridge	4	Stereo co-observation module with tubes

5	Dovetail mount for connecting a laser micromanipulator	6	Binocular tubes for surgery
7	Photo adapter for DSLR		

3.3.2.2 Overview of binocular tubes

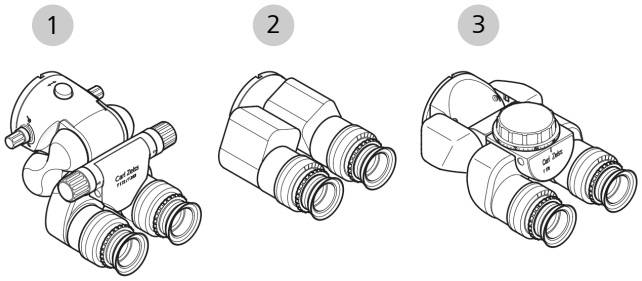


Figure 4: Binocular tubes

1	Foldable tube, focal length f = 170/260 mm	2	Straight tube, focal length f = 170 mm
3	180° tiltable tube, focal length f = 170 mm		

3.3.2.3 Widefield eyepiece (10x or 12.5x)

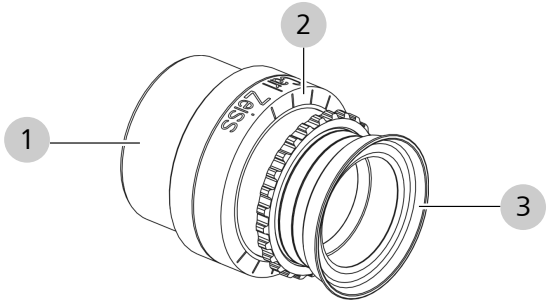


Figure 5: Widefield eyepiece (10x or 12.5x)

1	Magnetic coupling	2	Diopter scale
3	Eyecup		

3.3.2.4 Stereo co-observation module

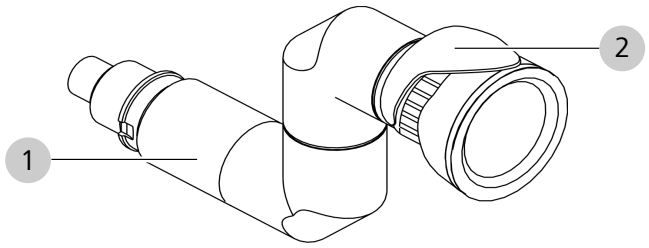


Figure 6: Stereo co-observation module

1	Stereo coobservation module with 2 pivot joints
2	Locking lever

3.3.3 14-function foot control panel

The 14-function foot control panel is used to operate the device hands free.

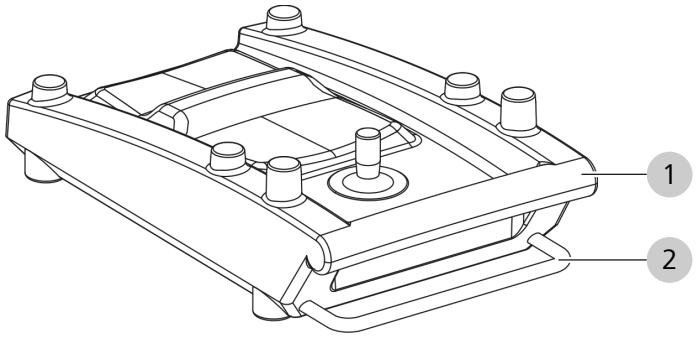


Figure 7: 14-function foot control panel

1	Bracket	2	Storage bracket

The 14-function foot control panel is available in wireless (FCP WL) and wired versions (FCP).

3.3.4 Stand base

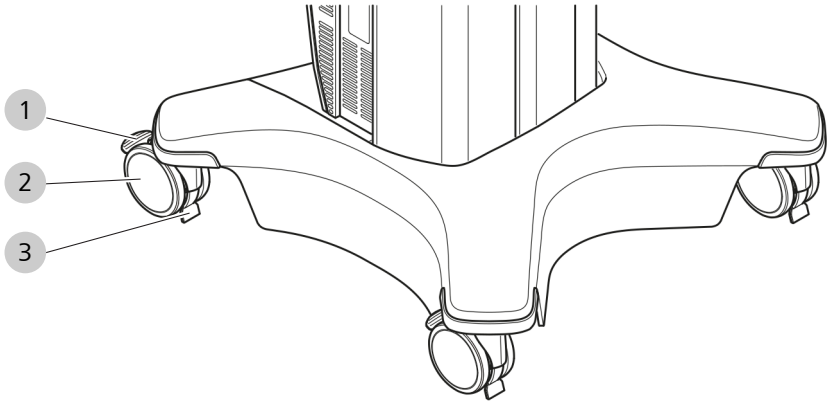


Figure 8: Stand base

1	Locking tab	2	Steerable casters
3	Cable deflector		

3.3.5 Overview of connector panel

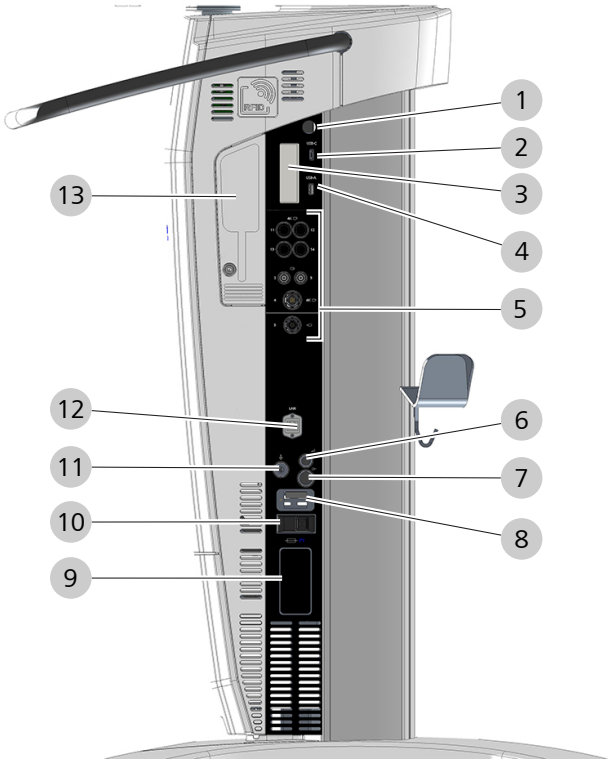


Figure 9: Overview of connector panel

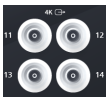
1	Powering the system up/ down	2	USB-C port (2.0)
3	Shelf for external USB storage device	4	USB-A port (2.0)

5	Video connector panel, see Overview of video connector panel [▶ 38]	6	14-function foot control panel port
7	Remote connector (AUX)	8	Power input socket
9	Port for navigation system (ODUMAC)	10	Miniature circuit breaker
11	IEC 60601-1 standard potential equalization connector	12	Ethernet port (LAN) (optional)
13	Charging station (optional) for a 10.5" iPad Pro or 10.5" iPad Air 3		

3.3.6 Overview of video connector panel



Figure 10: Overview of video connector panel

Pos.	Symbol	Name	Explanation
1		SDI video output (optional)	Figure 1: Live camera image output signal: HD-SDI 1920x1080 50/60i or 3G-SDI 1920x1080 50/60p 1x BNC
		SDI video output (4K option)	Figures 11-14: Live camera image output signal: QuadSDI 3840x2160 50/60p 4x BNC

Pos.	Symbol	Name	Explanation
2		SDI video output (optional)	Figures 2 and 3: Copy of system monitor or live full screen / Endo / PIP output signal: HD-SDI 1920x1080 50/60i or 3G-SDI 1920x1080 50/60p 2x BNC
3		HDMI video output	Figure 4: Copy of system monitor or live full screen / Endo / PIP output signal: HDMI 1920x1080 50/60p 1x ODU socket (black)
		HDMI video output (4K option)	Figure 4: Copy of system monitor or live full screen / Endo / PIP Output signal: 4K UHD HDMI 3840x2160 50/60p or HDMI 1920x1080 50/60p 1x ODU socket (black)
4		Video input: HDMI / DVI (optional)	Figure 5: Video input for external video source input signal: HDMI 1920x1080 50/60p or 1280x720 50/60p 1x Lemo socket (orange) format: 16:9
5	NAV	Navigation port (optional)	Port for navigation system (ODUMAC)

3.4 Control elements and displays

3.4.1 Screen keyboard

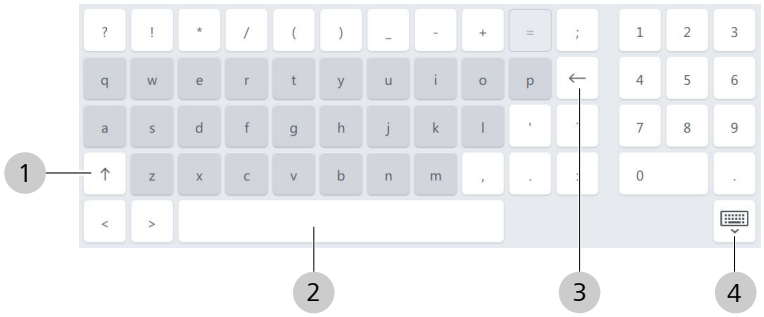


Figure 11: Screen keyboard key assignment

Item	Name	Explanation
1	Shift key	Switches between upper-case and lower-case letters.
2	Space key	-
3	Delete key	Deletes the character to the left of the cursor.
4	Close	Ends the input and closes the screen keyboard.

3.4.2 Display: Editing

A rotating editing symbol appears during editing. A load symbol is displayed while larger amounts of data are being saved, imported or exported.

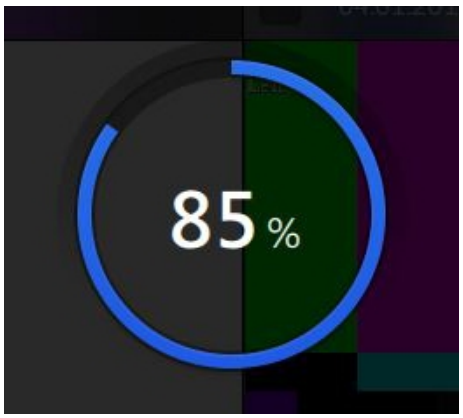


Figure 12: Progress display

During longer editing periods, the percentage display flashes inside the circle symbol.

3.4.3 Online help

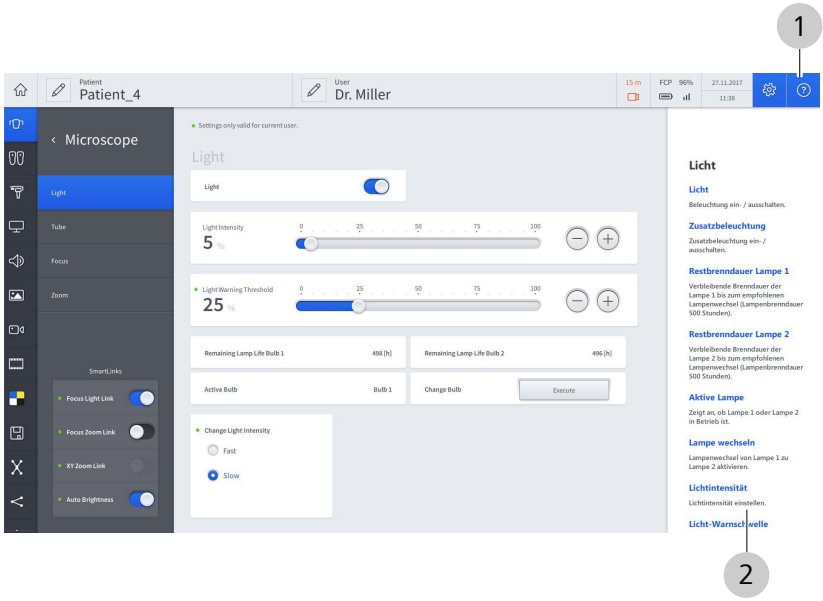


Figure 13: Call-up and display of context help

Position	Symbol	Name	Explanation
1	?	Button [Online help]	Tapping on the ? button opens the Help window on the right side.
2		Help menu	If the entire help text is not displayed, scroll down on the touchscreen.

The content of the Help window adapts to the respective opened menu. To close the Help window, tap on the [Online help] button again.

3.4.4 Surgical microscope control elements



Figure 14: Surgical microscope control elements

Position	Symbol	Name	Explanation
1		Securing screw	Fastens a tube or the stereo bridge.
2		Manual setting of the luminous field diameter	Turn CCW: smaller Turn CW: larger
3		Adjust focus/ working distance manually	Turn CCW: smaller Turn CW: larger
4		Adjust zoom magnification manually	Turn CCW: smaller Turn CW: larger
5		Hand grip clamping	Opens / closes the hand grip clamping for positioning the hand grips.

3.4.5 Foldable tube control elements

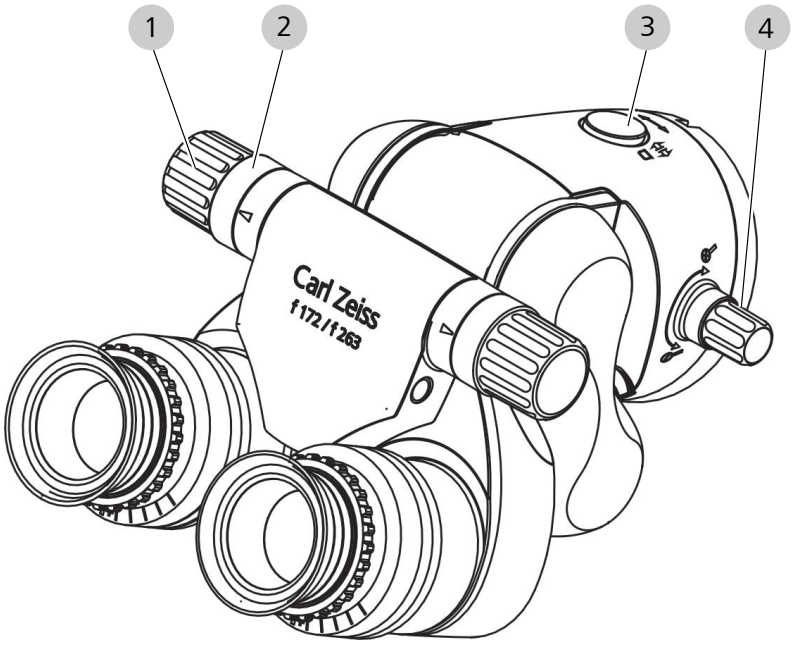


Figure 15: Operating elements of foldable tube

Position	Symbol	Name	Explanation
1		Pupillary distance (PD) adjustment knob on right and left side	Sets the eye distance (inter-pupillary distance)
2		Scale for pupillary distance (PD) adjustment knob on right and left side	Display of eye distance (inter-pupillary distance)
3		Locking device for rotation function	After pressing the locking button, you can turn the tube to the left or right.
4		Adjustment wheel for integrated magnification changer	Used to change to a higher or lower magnification.

3.4.6 Tiltable tube control elements

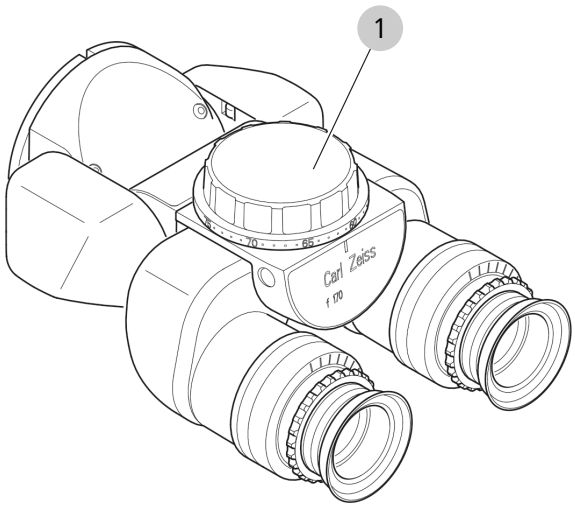


Figure 16: Tiltable tube control elements

Item	Symbol	Name	Explanation
1		Adjustment wheel for eye distance	Sets the eye distance (inter-pupillary distance)

3.4.7 Controls for widefield eyepieces

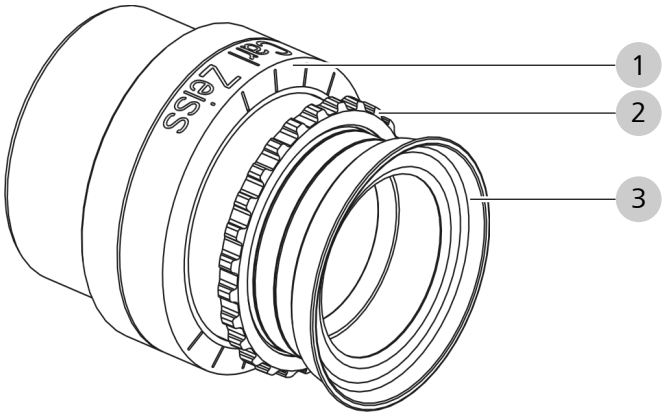


Figure 17: Control elements on the widefield eyepiece

Pos.	Name	Explanation
1	Diopter scale	Adjustable from -8 dpt. to +5 dpt.
2	Diopter setting ring	For adjusting the diopter setting.
3	Adjustable eyecup	Can be unscrewed to prevent the entry of scattered light.

3.4.8 Controls of handgrips

Both hand grips are of the same design. You can configure the left and the right hand grip with the same functions or with different functions.

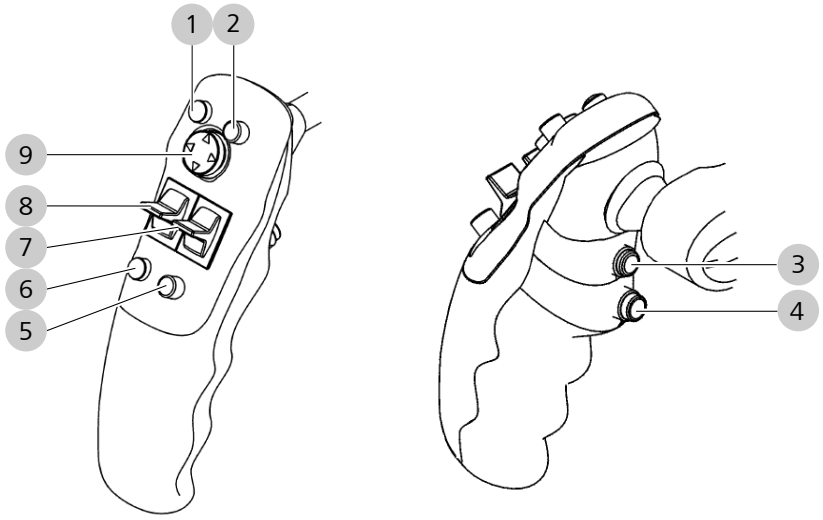
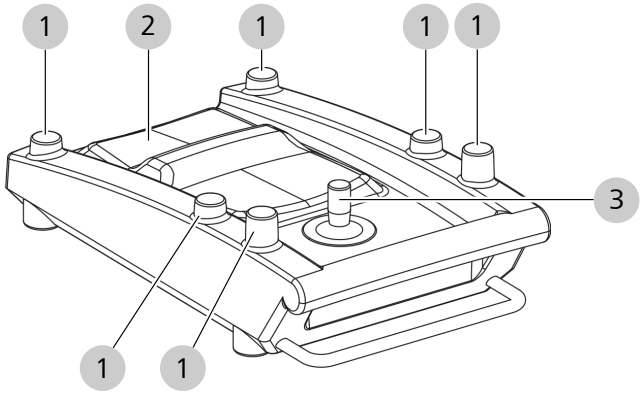


Figure 18: Button assignment of hand grips

Pos.	Name	Explanation
1	Button **A**, configurable	Factory setting: trigger photo
2	Button **B**, configurable	Factory settings: SpeedFokus
3	Brake release button (**SB**)	Brake release button for selected rotary axes (factory setting: stand axes)
4	Brake release button (**AB**)	Brake release button for all stand and microscope axes
5	Button **D**, configurable	Factory setting: increase illumination intensity
6	Button **C**, configurable	Factory setting: reduce illumination intensity
7	Rocker switch **G / H**	Zoom + / Zoom - (factory setting)
8	Rocker switch **E / F**	Focus + / Focus - (factory setting)
9	Joystick	Motorized XY fine adjustment Depending on the current operating mode, the joystick of the right hand grip may have certain special functions (see separate description in the corresponding chapters). Messages displayed on the touchscreen can be acknowledged by pressing the center of the joystick button on the **left** hand grip.

3.4.9 14-function foot control panel



Position	Name	Explanation
1	Buttons	Control device functions (freely configurable).
2	Rocker switches	Control zoom and focus (horizontal and vertical configuration possible).
3	Joystick	Motorized XY fine adjustment (optional) (XY = adjusts the field of view in the vertical and horizontal axes).

3.5 Software description

3.5.1 General

All menus shown in these Instructions for Use are in English. The name and explanation of each function is specified in the respective language in the following lists.

Optional applications (licenses)

Various applications are available for the device which can be activated after obtaining a license. All licenses must be ordered separately.

Display and operation

Only activated applications are displayed on the touchscreen and can be configured and operated.

User-specific settings

User-specific settings are marked by a green dot placed in front of their designation.
These changes in settings are adopted only for the current user.

Please note the following: In order not to obstruct intraoperative changes of users, do not have the focus and zoom start values set user-specifically.Changes of the focus and zoom start values only become effective after the device is restarted.

3.5.2 Interactive buttons

All interactive buttons and their functions are described in the following table.

Symbol	Button	Explanation
	Main menu (Home)	Touchscreen with live image, status bar and main menu bar.
	Configuration menu	All configurations and settings are accessible via this menu.
	Switch	Function switched on.
	Switch	Function switched off.
	Button	Triggers a function.
	Slide control	Continuously adjustable The values displayed (SI units) are rounded. They are intended to improve the display and do not represent a measurement function.
	+/- buttons	Adjustable in steps.
	Record button	Takes a photograph of what is currently being displayed on the monitor and saves it.
	Video On button	Indicates that a video recording is in progress.
	Video Stop button	Stops the video recording.
	Action button	Executes the assigned function, e.g. starts the playback of a video recording.
	Fast forward button	Used to fast forward video playback (normal recording).
	Jump forward/ back one video frame	Used to move the infrared video recording forward/back one video frame.
	Video Stop button	Interrupts the video playback.
	Fluorescence settings	Select the fluorescence module.

Symbol	Button	Explanation
	Selection field	Selection between functions (blue: selected).
	Functions	Selection of various functions (blue: selected).
	Loudspeaker on button	Switches the loudspeaker on.
	Loudspeaker off button	Switches the loudspeaker off.
	PIN lock deactivated	Unlocks the settings for the hand grips and the FCP.
	PIN lock activated	Locks the settings for the hand grips and the FCP.
	Selection menu	Selection of various system languages.
	Functions	Create new user or patient.
	Functions	Edit patient / user profile.
	Functions	Filter patient data / filtering direction.
	Functions	Search for patient record.
	Functions	Import / export data.
	Functions	Hide keyboard.
	Functions	Delete

Table 2: Interactive buttons

3.5.3 User interface

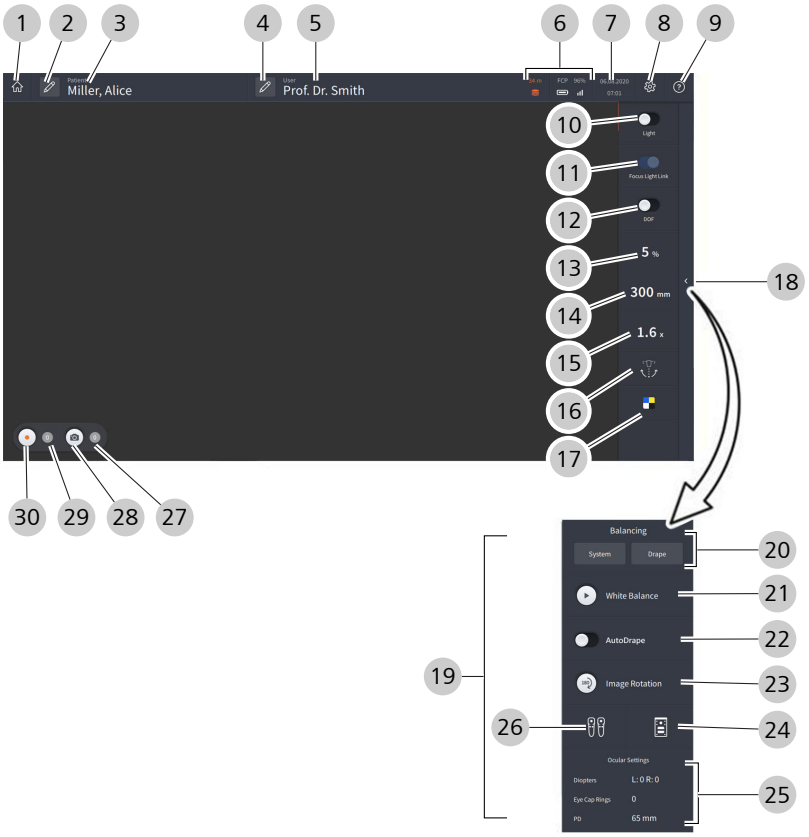


Figure 19: User interface layout

Pos.	Name	Explanation
1	Main menu (Home)	Opens the main menu with live image, status bar and main menu bar.
2	Edit Patient icon	Opens the window for editing the patient data.
3	Patient	Displays the current patient name. Tapping on the button opens the patient directory.
4	edit a user	Opens the window for editing the user data.
5	User	Displays the current user name. Tapping on the button opens the user directory.
6	Status Information	Displays current status information. Tapping on the button opens an overview.
7	Date, time	Displays the date and time.
8	Setup menu	Opens the configuration menu.
9	Help	Opens the help window on the right-hand edge of the screen.

Pos.	Name	Explanation
10	Light	Switches the illumination on and off.
11	Focus Light Link	Limits the maximum light intensity for the selected working distance.
12	DOF	Activates the depth of field (DOF) Increased DOF on: High depth of field – less light – lower image resolution. Increased DOF off: Low depth of field – more light – high image resolution.
13	Light Intensity	Displays the light intensity. The light intensity can be adjusted by tapping the button.
14	Focus speed, focus start value and focus lock	Displays the configured value for the working distance. By tapping on the button you can set the speed of the motorized fine focus adjustment and activate the focus start value, and the focus lock if using laser micromanipulators.
15	Zoom speed	Displays the configured start value for the zoom factor. The button can be tapped to adjust the speed of the zoom.
16	Movement mode XY adjustment (OPMI)	The button can be tapped to adjust the XY speed.
17	Fluorescence setting	The button can be tapped to select the activated fluorescence module, YELLOW 560 or IR 800 (INFRARED 800).
18	Arrow button	Opens and closes the additional menu.
19	Additional menu	Displays additional adjustment options for the device.
20	Balancing	The [System] button can be tapped to balance the device. Fine balancing with a drape can be performed by tapping the [Drape] button.
21	White Balance	Starts the white balance.
22	Image Rotation	The camera image is rotated 180° per click.
23	AutoDrape	Starts the drape suction automatically if the RFID label of the ZEISS SMARTDRAPE has been read in.

Pos.	Name	Explanation
24	Foot control panel	Tapping the button displays the button assignments for the foot control panel; the button assignments can be configured.
25	Ocular Settings	Displays the user-specific eyepiece settings.
26	Hand Grips	Tapping the button displays the button assignments for the hand grips; the button assignments can be configured.
27	Number of photos	Displays the number of captured photos.
28	Image capture	Takes a photograph.
29	Number of videos	Displays the number of videos taken.
30	Video recording	Starts and stops the video recording.

All control elements, the status bar and the main menu bar can be hidden by tapping on the live image (full screen mode).

Only the video runtime is displayed during a recording in full screen mode. The values displayed (SI units) are rounded. They serve to enhance the display and do not represent a measurement function.

If you tap on the monitor again, all control elements, the status bar and the main menu bar will reappear.

3.5.4 Status information

Main menu - Status information

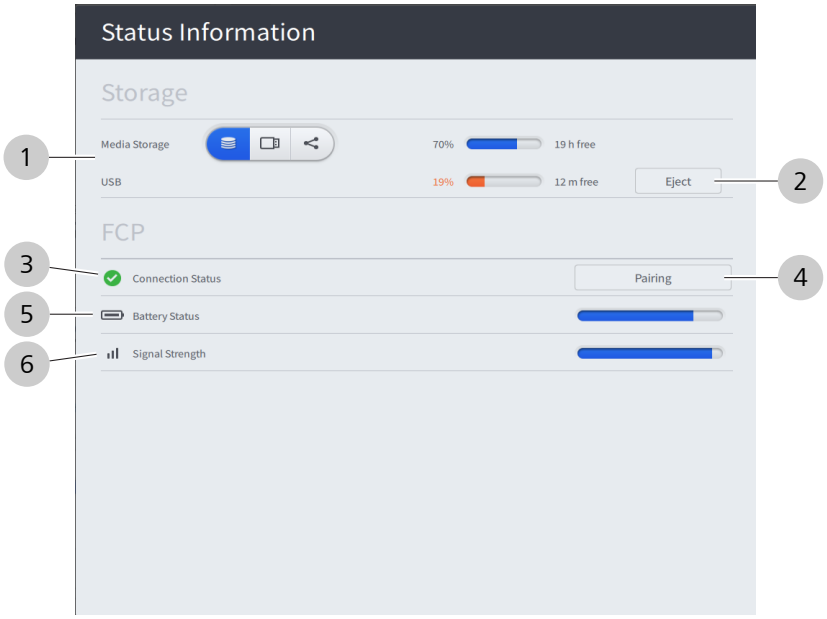


Figure 20: Overview of status information

Pos.	Symbol	Name	Explanation
1		Media storage selector switch	Switches between the internal hard drive and a connected USB medium as the storage space for patient data (it is also possible to use network storage as the storage space).
			Displays the available space on the internal hard disk or the connected USB medium.
2	Eject	Remove Hardware	Removes the hardware (e.g. USB medium).
3		Connection status	Displays the status of the connection to the foot control panel (FCP). ■ Green: Wireless FCP is connected. ■ Red: Wireless FCP is not connected.
4	-	Pairing	Pair FCP with device.
5		Battery Status	Displays the charging status of the battery in the FCP.
6		Signal Strength	Displays the signal strength of the FCP.

3.5.5 Patient data

Main menu – Patient

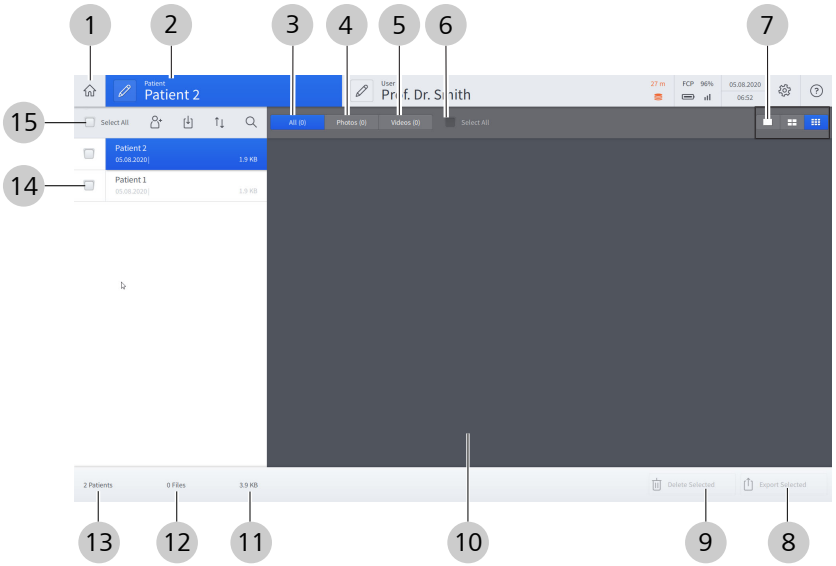


Figure 21: "Patient data" menu overview

Pos.	Name	Explanation
1	Main menu (Home)	Opens the main menu with live image, status bar and main menu bar.
2	Patient	Displays the current patient name. Tap the button to return to the main menu.
3	All	Displays all of the respective patient's recorded images, videos and data in the preview window.
4	Photos	Filters the preview window for photos; all of the respective patient's recorded photos are displayed.
5	Videos	Filters the preview window for videos; all of the respective patient's recorded videos are displayed.
6	Select All	Selects the entire contents of the respective preview window. This function is used to export or delete all patient data, for example. If there is a large quantity of patient data, the selection can take some time.
7	Preview window display	Determines the size of the images in the preview window (large, medium, small).
8	Export Selected	Exports all selected patient files.
9	Delete Selected	Deletes all selected patient files.
10	Preview window	Displays all patient files as thumbnails.

Pos.	Name	Explanation
11	Storage volume	Displays the total storage volume of all patient files.
12	Number of files	Displays the total number of all patient files.
13	Number of patients	Displays the total number of all patients.
14	Patient Directory	Displays all patients.
15	Edit patient directory	Offers five options for working with the patient directory: ■ Select All Patients ■ Add New Patient ■ Import Patient Files (USB, network or DICOM) ■ Sort Patients (date, name, size) ■ Find Patient

3.5.6 Import patient data from the DICOM Worklist

Main menu - Patient - Import - DICOM

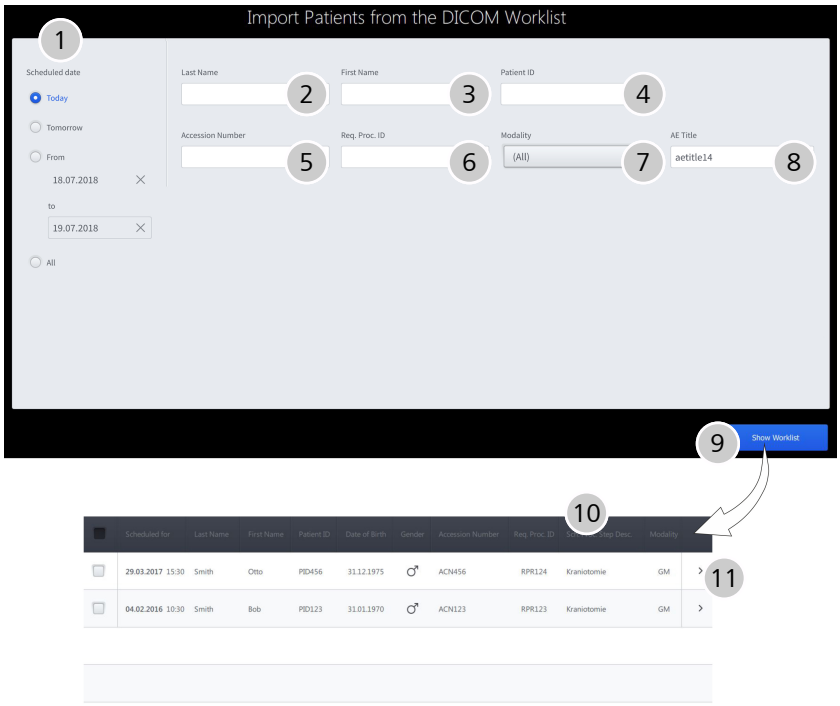


Figure 22: Input mask and "DICOM Worklist" display window

Item	Name	Explanation
1	Scheduled date	Period of time (selectable) for which the DICOM Worklist is to be called up.
2	Last Name	Patient's last name.

Item	Name	Explanation
3	First Name	Patient’s first name.
4	Patient ID	Primary hospital identification number for the patient.
5	Accession Number	Department-specific case number which identifies the order for the “imaging service request”.
6	Req. Proc. ID	Requested Procedure ID: identification number that identifies the requested procedure in the "Imaging Service Request".
7	Modality	Device type with which the scheduled procedure step is to be performed.
8	MWL AE Title	AE title of the device with which the scheduled procedure step is to be performed.
9	Show Worklist	Opens the DICOM Worklist.
10	Sch. Proc. Step Desc.	Scheduled Procedure Step Description: description specified by the hospital or classification of the scheduled procedure step.
11	Arrow button	Displays more details about the patient.
-	Req. Proc. Desc.	Requested Procedure Description: administrative description specified by the hospital or classification of the requested procedure.
-	Req. Proc. Code	Requested Procedure Code: code value that describes the requested procedure according to a specific coding scheme.
-	Ref. Phys. Name	Referring Physician's Name: name of the referring physician who requested the procedure.
-	Sch. Proc. Step Start	Scheduled Procedure Step Start: scheduled start time for the procedure step.
-	Sch. Protocol Code	Scheduled Protocol Code: code value that describes the scheduled protocol according to a specific coding scheme.

3.5.7 Video recording playback

Main menu - Patient - Select patient - Select video

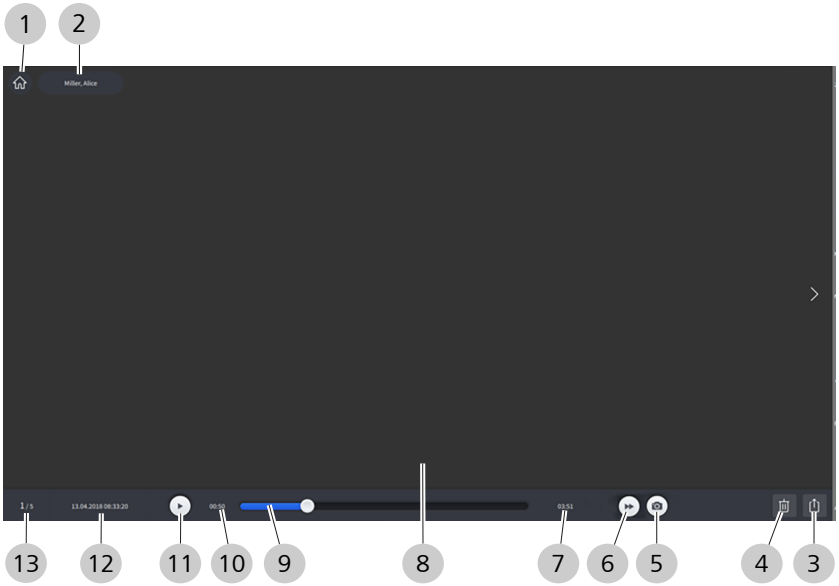


Figure 23: "Play video recording" menu

Pos.	Name	Explanation
1	Main menu (Home)	Navigation to the main menu with live image, status bar and main menu bar.
2	Patient	Displays the name of the current patient; tapping on the button opens the patient data.
3	Export	Exports the patient files.
4	Delete	Deletes the video
5	Image capture	Records and saves the current display as a photo.
6	Fast forward	Used to fast forward video playback (normal recording).
7	Total duration	Displays the total duration of the video.
8	Preview window	Displays the recorded video.
9	“Video playback” slide control	The gray slide control keeps moving throughout the entire length of the video recording. Slide the gray slide control to jump to an area of interest in the video recording.
10	Current time	Displays the current video time.
11	Start / Pause	Plays the video. Video playback can be paused by tapping the button again.

Pos.	Name	Explanation
12	Date / Time	Displays the date and time of the recording.
13	Quantity	Displays the number of media items.

3.5.8 SmartLinks

Main menu - Configuration menu - Microscope - SmartLinks
In the "Settings Microscope" menu, four SmartLinks are available for your selection:

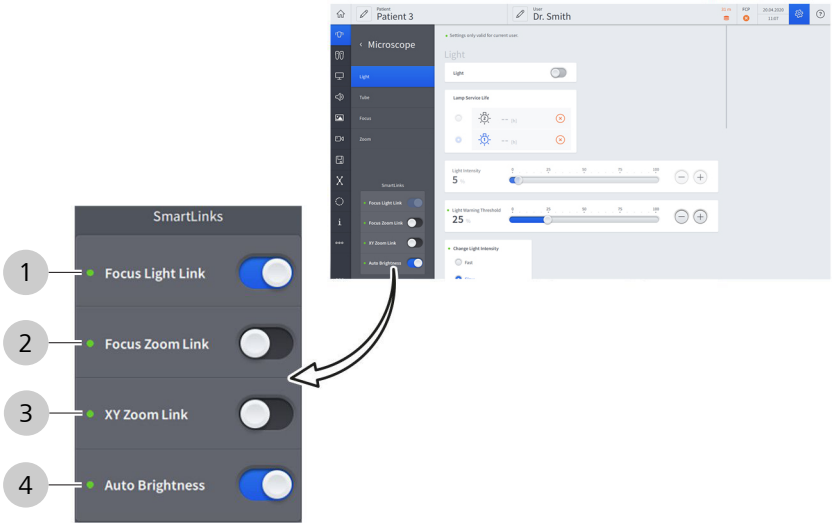


Figure 24: SmartLinks

Pos.	Name	Explanation
1	Focus Light Link	Limits the maximum light intensity for the selected working distance.
2	Focus Zoom Link	Automatically adapts the focusing speed to the magnification. The preselected focusing speed is automatically reduced when a higher magnification is used.
3	XY Zoom Link	Automatically adapts the XY travel speed to the magnification. The preselected travel speed is automatically reduced when a higher magnification is used.
4	Auto Brightness	Regulates the light intensity for constant brightness in the eyepiece depending on the working distance, magnification and depth of field (DOF). Automatically adapts the luminous field diameter.

3.5.9 Light

Main menu - Configuration menu - Microscope - Light
This menu is for configuring the microscope illumination settings.

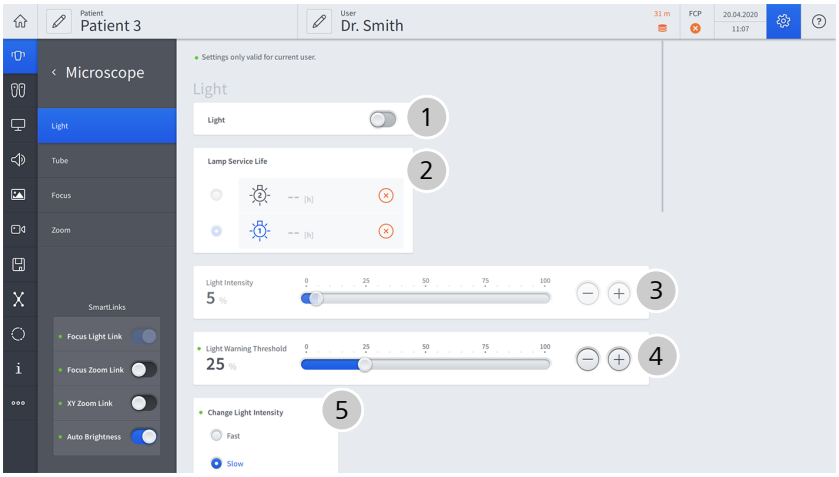


Figure 25: "Settings Microscope" menu, "Light" submenu

Pos.	Name	Explanation
1	Light	Switches the illumination on / off.
2	Lamp Service Life	Xenon lamp option: indicates which lamp is in operation. Displays the remaining operating time for each lamp until the next recommended bulb change (total lamp operating time = 500 hours). If switching to a different lamp, select the desired lamp.
3	Light Intensity	Slide switch for setting the light intensity.
4	Light Warning Threshold	Slide switch for setting the light warning threshold (factory setting: 25 %). Display on monitor.
5	Change Light Intensity	Options for selecting the speed of the light intensity change (fast or slow).

3.5.10 Tube

Main menu - Configuration menu - Microscope - Tube
Select the tubes and eyepieces used by the surgeon. The total magnification is calculated with these stored values and displayed on the monitor.

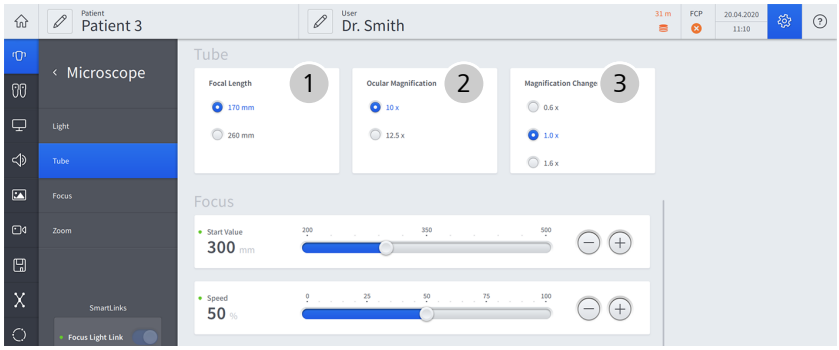


Figure 26: "Settings Microscope" menu, "Tube" submenu

Position	Name	Explanation
1	Focal Length	Selection window - Focal length of tube used: ■ 170 mm for tiltable tube and foldable tube ■ 260 mm for foldable tube with magnification
2	Eyepiece magnification	Selection window - Magnification of the eyepieces used: ■ 10x ■ 12.5x
3	Magnification changer	Selection window - Magnification of the optional 3-position magnification changer: ■ 0.6x ■ 1.0x ■ 1.6x

3.5.11 Focus

Main menu – Settings menu – Microscope – Focus
This menu is for configuring the microscope focus settings.

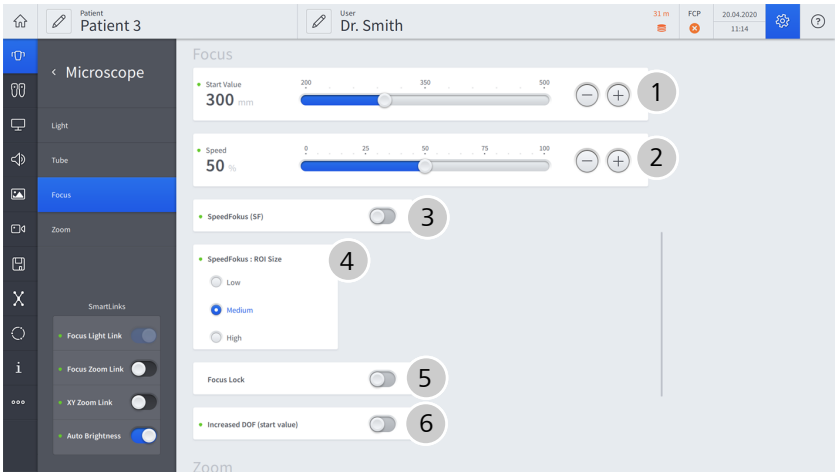


Figure 27: "Settings Microscope" menu, "Focus" submenu

Pos.	Name	Explanation
1	Start Value	Configures the working distance the microscope starts at when turned on.
2	Speed	Sets the speed of the motorized fine focusing.
3	SpeedFokus (SF)	SpeedFokus (SF) on: SpeedFokus is automatically activated each time the brakes are applied and after XY fine adjustment is performed using the joystick. SpeedFokus can also be triggered via a configurable button on the hand grip or the foot control panel. SpeedFokus (SF) off: SpeedFokus is triggered via a configurable button on the hand grip or the foot control panel.
4	SpeedFokus : ROI Size	Low: The focusing algorithm is optimized for a small ROI (region of interest). Medium: The focusing algorithm is optimized for a medium-sized ROI. High: The focusing algorithm is optimized for a large ROI.

Pos.	Name	Explanation
5	Focus Lock	For the application of an optional laser micromanipulator with a fixed working distance. Focus Lock on: SpeedFokus is inoperative. Focus rocker switch on hand grip/foot control panel out of operation. Focus Lock off: SpeedFokus is functioning. Focus rocker switch on hand grip/foot control panel active.
6	Increased DOF (start value)	Activates the depth of field (DOF) Increased DOF on: High depth of field – less light – lower image resolution. Increased DOF off: Low depth of field – more light – high image resolution.

3.5.12 Zoom

Main menu - Configuration menu - Microscope - Zoom
This menu is for configuring the microscope zoom settings.

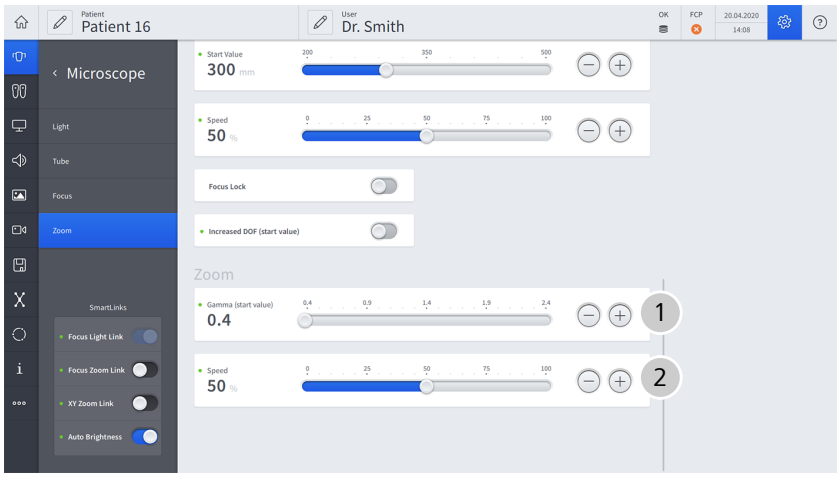


Figure 28: "Settings Microscope" menu, "Zoom" submenu

Position	Name	Explanation
1	Gamma (start value)	Set the zoom factor (0.4 ... 2.4) at which the zoom system is to start after the device is switched on.
2	Speed	Set the zoom speed.

3.5.13 Handgrips

Main menu - Configuration menu ⚙ Operation 🙌 - Hand Grips 🙌
In this menu, you can configure the control elements of the hand grips.

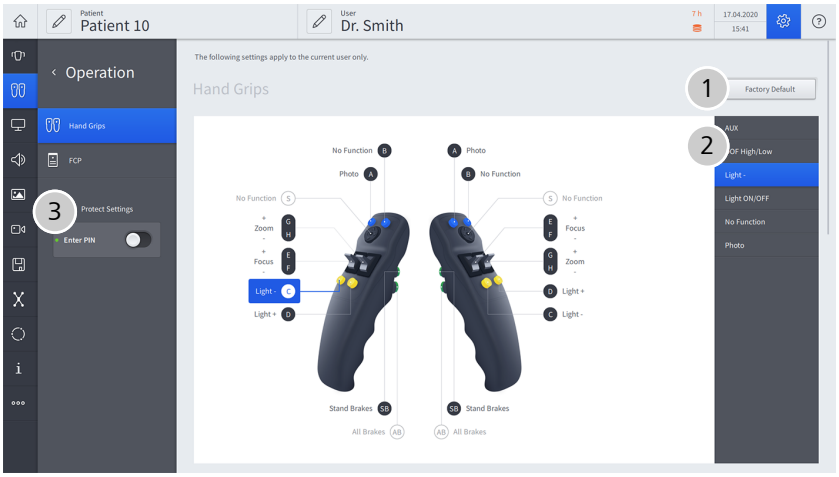


Figure 29: "Settings Microscope" menu, "Hand Grips" submenu

Pos.	Name	Explanation
1	Factory Default	Tapping this button resets the programming of all hand grip functions to their factory settings.
2	Selection window, right side	Appears after a hand grip button is tapped. Displays all available functions for each hand grip button.
3	Enter PIN	By activating this button, you can protect your button assignment for the handgrips with a four-digit PIN. This function is only available to users who have been set up with a user profile.
A	Button [A], configurable	Tapping on hand grip button [A] opens a selection window on the right side where the available functions can be selected.
B	Button [B], configurable	Tapping on hand grip button [B] opens a selection window on the right side where the available functions can be selected.
C	Button [C], configurable	Tapping on hand grip button [C] opens a selection window on the right side where the available functions can be selected.
D	Button [D], configurable	Tapping on hand grip button [D] opens a selection window on the right side where the available functions can be selected.

Pos.	Name	Explanation
S	XY Joystick	For motorized XY fine adjustment: The XY joystick of the right hand grip can have certain special functions, depending on the option activated. Messages displayed on the touchscreen can be acknowledged by pressing the center position of the joystick button on the left hand grip.
E	Rocker switch [E] for focus-zoom	Tapping on button [E] opens a selection window on the right side for selecting the direction (+/-) or changing the zoom/focus functions.
F	Rocker switch [F] for focus-zoom	Tapping on button [F] opens a selection window on the right side for selecting the direction (+/-) or changing the zoom/focus functions.
G	Rocker switch [G] for zoom-focus	Tapping on button [G] opens a selection window on the right side for selecting the direction (+/-) or changing the zoom/focus functions.
H	Rocker switch [H] for zoom-focus	Tapping on button [H] opens a selection window on the right side for selecting the direction (+/-) or changing the zoom/focus functions.
SB	SB Stand Brakes (Selected Brakes)	Tapping on the [SB] hand grip button opens a selection window on the right side where certain brake and movement functions can be selected.
AB	AB All Brakes (all stand and microscope axes)	Pressing and holding the [AB] button on the hand grips allows the entire system to move freely. Releasing the [AB] button locks the system in place and protects it against vibrations.

3.5.14 Foot control panel

Main menu - Configuration menu ⚙ Operation 🦶 - Foot Control Panel 📋
In this menu, you configure the control elements of the foot control panel (FCP).

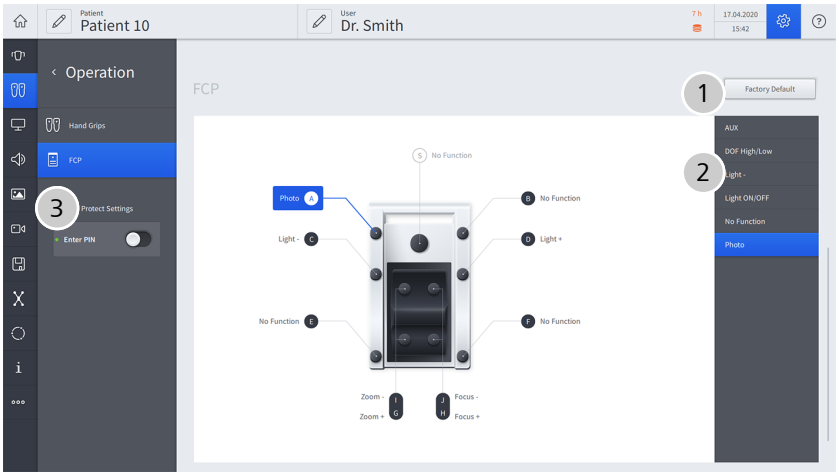


Figure 30: "Settings Microscope" menu, "Foot Control Panel" submenu

Pos.	Name	Explanation
1	Factory Default	All hand grip buttons can be reset to their factory settings by tapping this button.
2	Selection window	Appears after a foot control panel button is tapped: Displays all available functions for each foot control panel button.
3	Enter PIN	By activating this button, you can protect your button assignment for the foot control panel with a four-digit PIN. This function is only available to users who have been set up with a user profile.
S	XY Joystick	Motorized XY fine adjustment. Adjusts the field of view in the vertical and horizontal axes.
A	Button [A], configurable	Tapping on foot control panel button [A] opens a selection window on the right side where the available functions can be selected.
B	Button [B], configurable	Tapping on foot control panel button [B] opens a selection window on the right side where the available functions can be selected.
C	Button [C], configurable	Tapping on foot control panel button [C] opens a selection window on the right side where the available functions can be selected.

Pos.	Name	Explanation
D	Button [D], configurable	Tapping on foot control panel button [D] opens a selection window on the right side where the available functions can be selected.
E	Button [E], configurable	Tapping on foot control panel button [E] opens a selection window on the right side where the available functions can be selected.
F	Button [F], configurable	Tapping on foot control panel button [F] opens a selection window on the right side where the available functions can be selected.
G	Rocker switch [G] for zoom-focus	Tapping on foot control panel button [G] opens a selection window on the right side for selecting the direction or changing the zoom/focus functions.
H	Rocker switch [H] for zoom-focus	Tapping on foot control panel button [H] opens a selection window on the right side for selecting the direction or changing the zoom/focus functions.
i	Rocker switch [I] for focus-zoom	Tapping on foot control panel button [I] opens a selection window on the right side for selecting the direction or changing the zoom/focus functions.
j	Rocker switch [J] for focus-zoom	Tapping on foot control panel button [J] opens a selection window on the right side for selecting the direction or changing the zoom/focus functions.

3.5.15 Stand

Main menu - Configuration menu ⚙ - Stand
This menu is for configuring the movement mode.

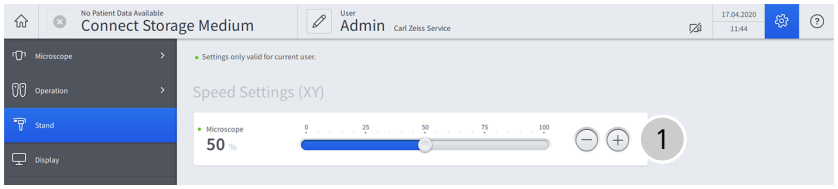


Figure 31: "Stand settings" menu

Pos.	Name	Explanation
1	Speed Settings (XY)	Preselect speed.

3.5.16 Displays

Main menu - Configuration menu ⚙ - Display 🖵
This menu is for configuring the video output settings.

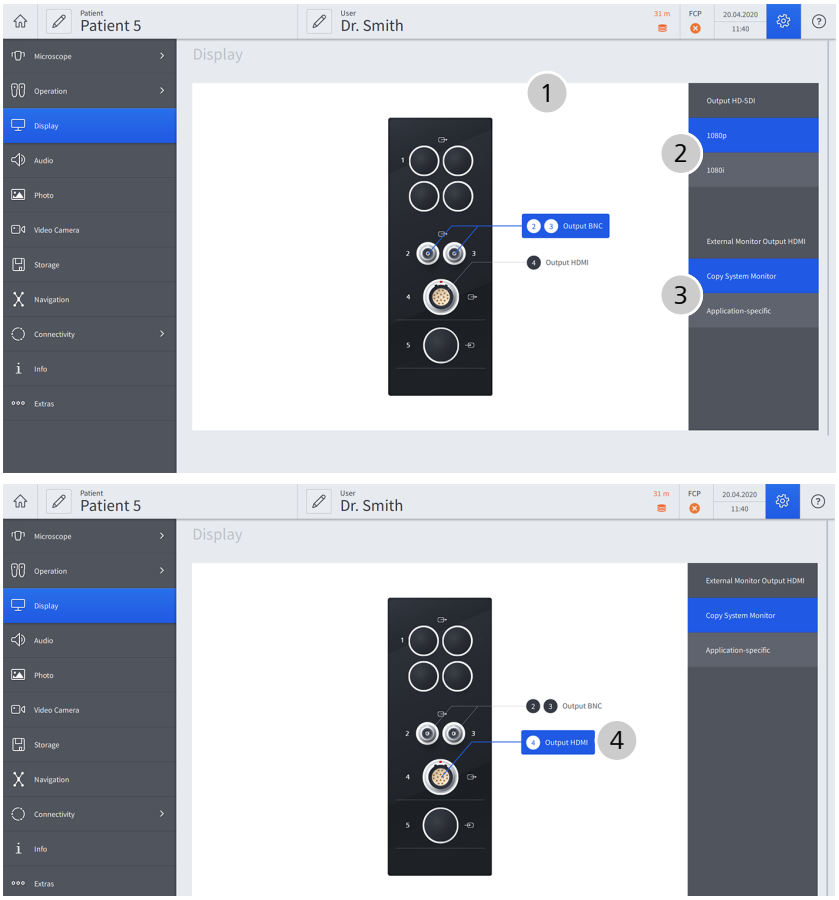


Figure 32: "Settings Display" menu

Pos.	Name	Explanation
1	Video connector panel	Layout and connection assignment of video inputs and outputs.
2	Output HD-SDI	Tapping on the [Output BNC] button opens a selection window on the right side for selecting the HD-SDI output: ■ 1080p ■ 1080i Video outputs: 1, 2, 3
3	External Monitor Output HDMI	Tapping on the [Output BNC] button or the [Output HDMI] button opens a selection window on the right side for configuring the HDMI external monitor output: ■ Copy System Monitor ■ Application-specific live full screen / Endo / PIP

Pos.	Name	Explanation
		Video outputs: 2, 3, 4
4	External Monitor Output Resolution	Tapping on the [Output HDMI] button opens a selection window on the right side for selecting the resolution of the external monitor: ■ HD ■ UHD Video output: 4

3.5.17 Audio

Main menu - Configuration menu - Audio
This menu is for configuring the audio settings.

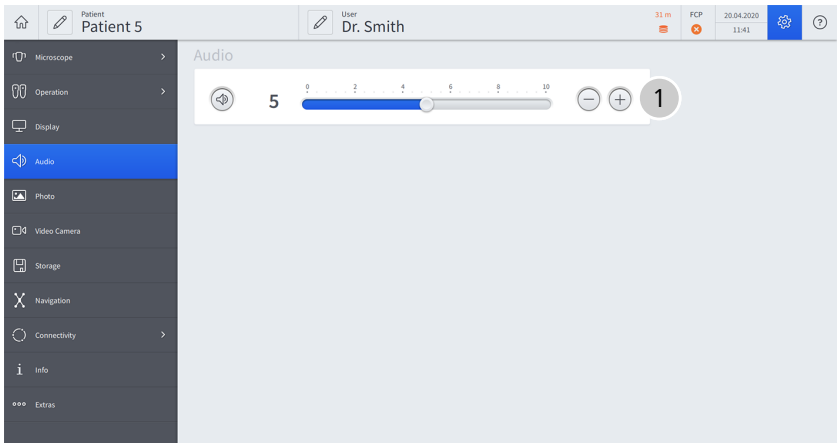


Figure 33: "Settings Audio" menu

Item	Name	Explanation
1	Audio	Switch the sound on/off. Adjust the volume.

3.5.18 Photo

Main menu - Configuration menu ⚙ - Photo 🖼
This menu is for configuring the photo settings.

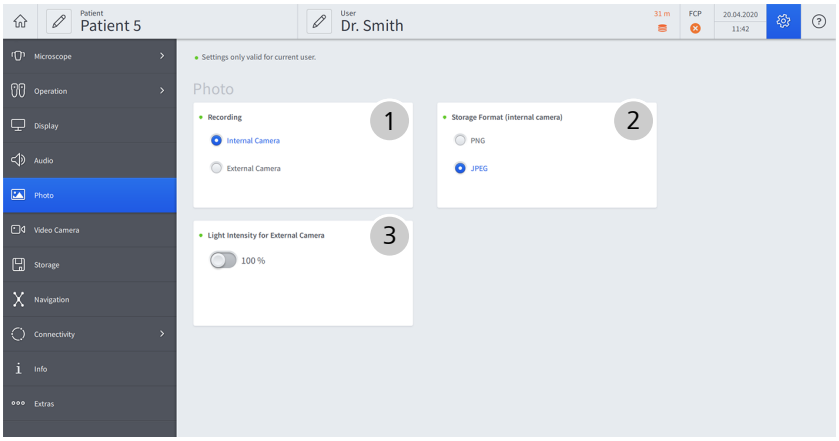


Figure 34: "Settings Photo" menu

Position	Name	Explanation
1	Recording	Selection: ■ Photos with internal video camera ■ Photos with external photo camera (DSLR, option)
2	Storage Format (internal camera)	Storage format for captured photos: ■ PNG format ■ JPEG format
3	Light Intensity for External Camera	Use of maximum light output for photos captured with an external photo camera (flash function).

3.5.19 Video camera

Main menu - Configuration menu ⚙ - Video Camera
In this “White Light” menu, you configure the settings of the video camera. You can optionally configure the video settings for YELLOW 560.

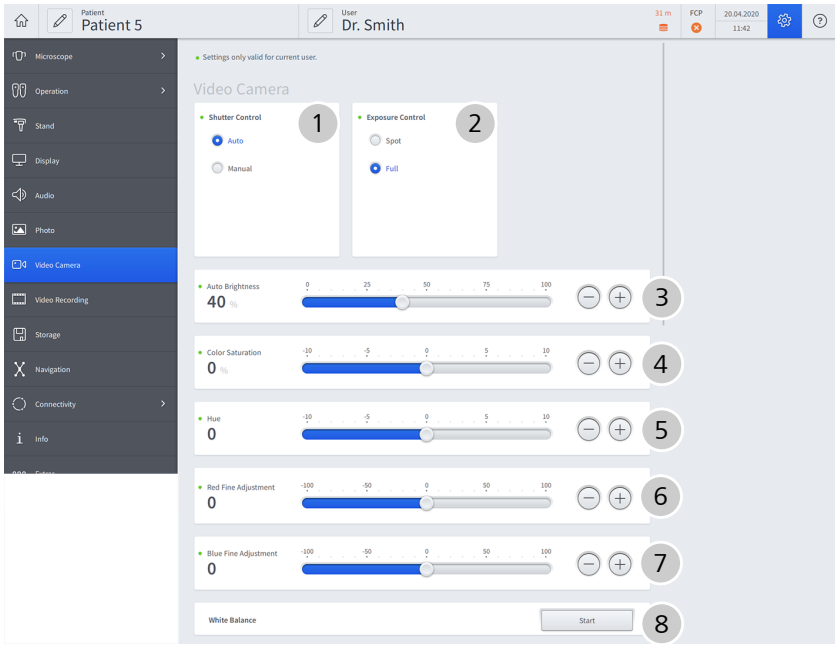


Figure 35: "Settings Video Camera" menu

Pos.	Name	Explanation
1	Shutter Control	Selection in the shutter control: ■ Auto: Automatic control of the exposure time ■ Manual: Manual control of the exposure time - the "Manual Shutter" field appears
2	Exposure Control	This field appears only if the shutter control was set to “Auto”. Selection of exposure control: ■ Spot: Exposure control for camera spot ■ Full: Exposure control for entire camera area
3	Auto Brightness	Set the brightness level of the automatic brightness control. This field appears only if the shutter control was set to "Auto".
4	Color Saturation	Set the color saturation.
5	Hue	Set the hue.

Pos.	Name	Explanation
6	Red Fine Adjustment	Set the red value.
7	Blue Fine Adjustment	Set the blue value.
8	White Balance	Start white balance.

3.5.20 Video recording

Main menu - Configuration menu ⚙ - Video Recording 🎞
This menu is for configuring the video recording settings.

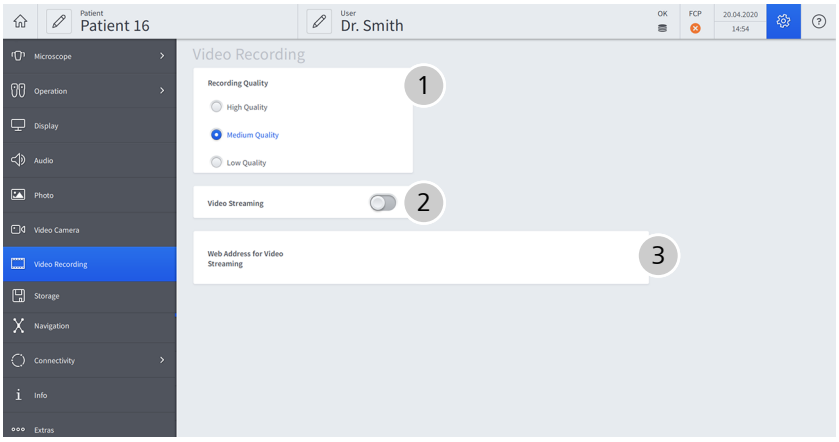


Figure 36: "Settings Video Recording" menu

Position	Name	Explanation
1	Recording Quality	Resolution: 1920 x 1080. Selection of the bit rate. ■ High Quality: High bit rate ■ Medium Quality: Medium bit rate ■ Low Quality: Low bit rate
2	Video Streaming	Switches video streaming on/off. Video streaming enables the prompt reception of video images via a network. The set recording quality also is used for video streaming.
3	Web Address for Video Streaming	Display of different RTSP (Real Time Streaming Protocol) addresses for the connection to video streaming.

3.5.21 Fluorescence

Main menu - Configuration menu - Fluorescence
(option) Fluorescence settings for YELLOW 560 and INFRARED 800.

Only approved fluorescence options will appear and be configurable on the touchscreen.

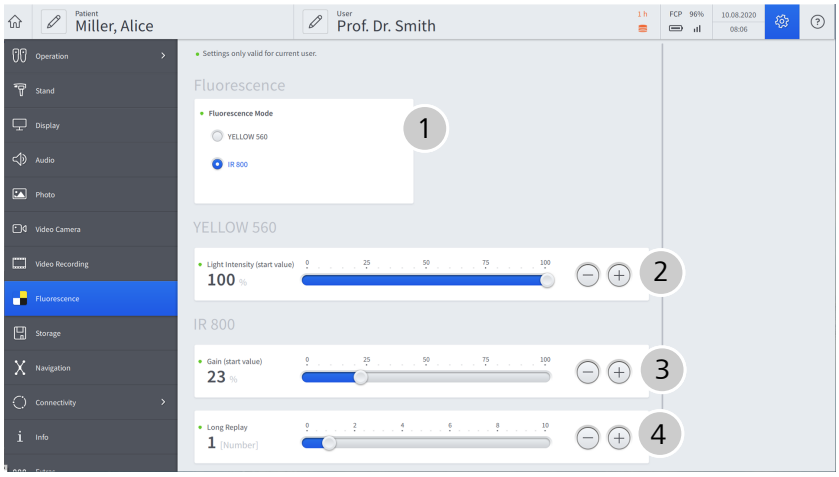


Figure 37: "Settings Fluorescence" menu

Pos.	Name	Explanation
1	Fluorescence Mode	Activates the fluorescence mode: ■ YELLOW 560 ■ IR 800
2	Light Intensity (start value)	Preselects the light intensity for YELLOW 560.
3	Gain (start value)	Sets the gain start value for IR 800 with a manual camera gain.
4	Long Replay	Sets the number of retries for the captured IR 800 video recording.

3.5.22 Storage

Main menu - Configuration menu ⚙ - Storage
You can use this menu to select the storage medium to which the patient data is to be saved.

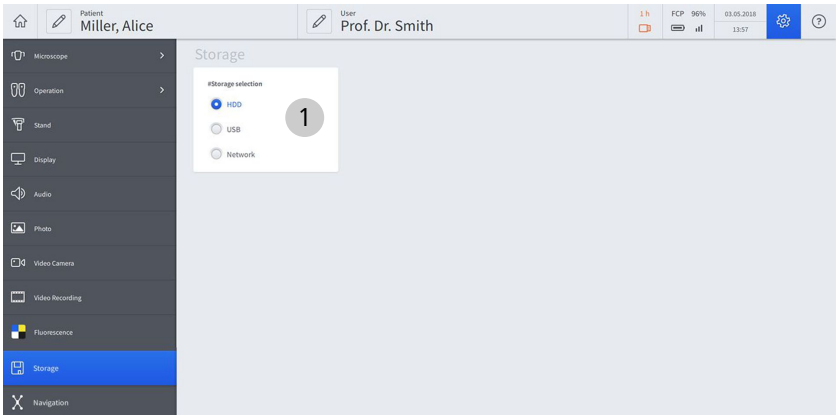


Figure 38: "Settings Storage" menu

Pos.	Name	Explanation
1	Storage Selection	Selection of storage medium for patient data: ■ HDD: Integrated hard disk (option) ■ USB: Storage on the connected USB storage device. ■ Network: Storage in the configured network (optional shared network module).

3.5.23 Navigation

Main menu - Configuration menu ⚙ - Navigation
In this menu, you can configure the interface via which the navigation system will be controlled.

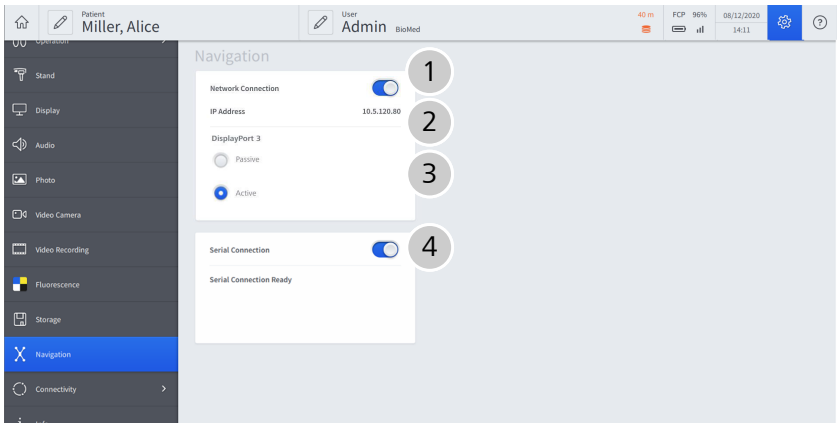


Figure 39: "Settings Navigation" menu

Pos.	Name	Explanation
1	Network Connection	Switches the network connection on/off (Navigation Advanced).
2	IP Address	Display of the IP address of the network connection.
3	IP Address Passive/ Active	Activates the navigation function. This is only displayed if a navigation device is connected.
4	Serial Connection (option)	Switches the serial connection on/off. This option is available for devices with an ODUMAC connector (Navigation Standard).

3.5.24 Computer name

Main menu – Settings menu – Connectivity – Computer Name

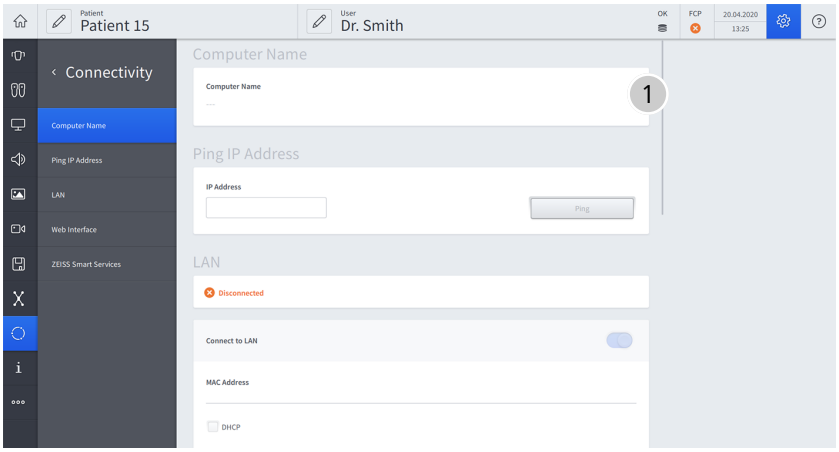


Figure 40: "Settings Connectivity" menu, submenu: "Computer Name"

Item	Name	Description
1	Computer name	Displays the name of the computer.

3.5.25 Ping IP Address

Main menu – Settings menu – Connectivity - Ping IP Address

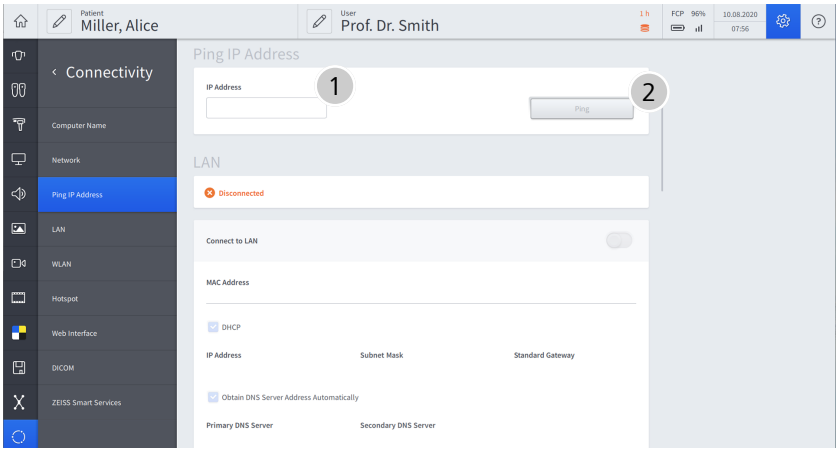


Figure 41: "Settings Connectivity" menu, submenu: "Ping IP Address"

Item	Name	Description
1	IP address	Enter IP address for ping test.
2	Ping	Start ping test.

3.5.26 LAN

Main menu – Settings menu – Connectivity – LAN

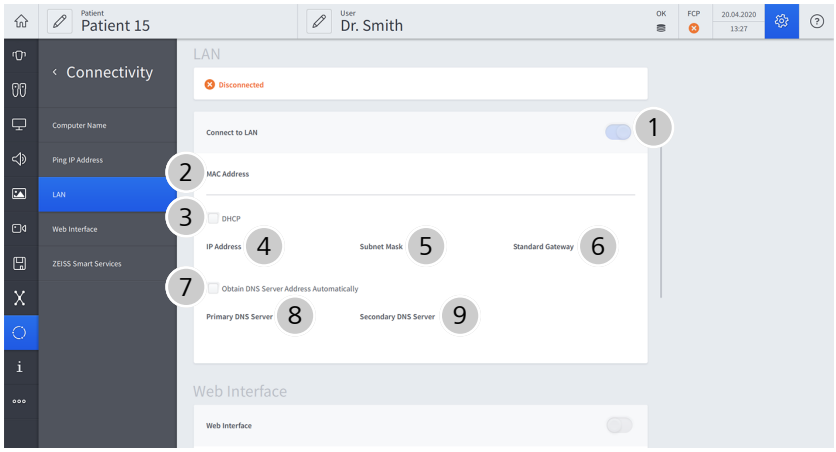


Figure 42: "Settings Connectivity" menu, submenu: "LAN"

Item	Name	Description
1	Connect to LAN	Button for switching the LAN connection on / off
2	MAC Address	MAC address display.
3	DHCP	Assign a network connection via DHCP.
4	IP Address	Specify IP address for LAN connection. **Attention:** Do not use any IP addresses from the following address ranges: ■ 192.168.173.xxx (used for the hotspot) ■ 192.168.100.xxx (used for an internal network connection)
5	Subnet Mask	Enter the subnet mask.
6	Standard Gateway	Enter standard gateway.
7	Use DNS Server Address Automatically	The DNS server address is automatically activated with DHCP.
8	Primary DNS server	Enter primary DNS server.
9	Secondary DNS Server	Enter secondary DNS server.

3.5.27 Web interface

Main menu – Configuration menu. ⚙ – Connectivity ◌ – Web Interface

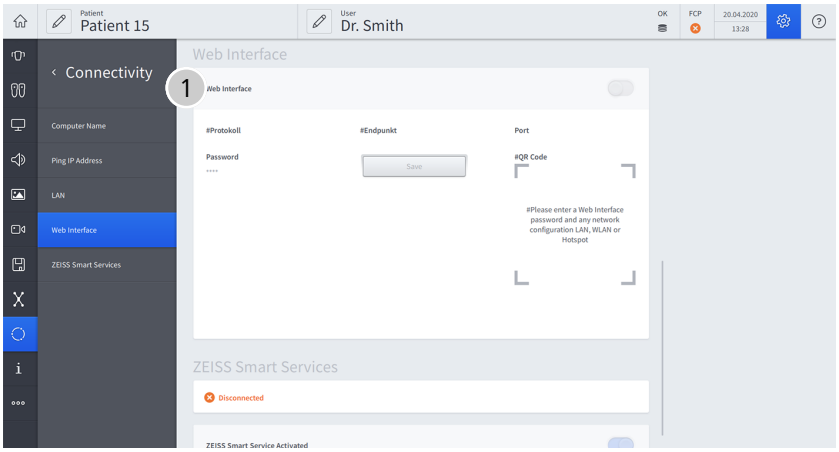


Figure 43: "Settings Connectivity" menu, "Web Interface" submenu

Item	Name	Description
1	Password	Higher password level required.

3.5.28 ZEISS Smart Services

Main menu – Settings menu ⚙ – Connectivity ◌ – ZEISS Smart Services

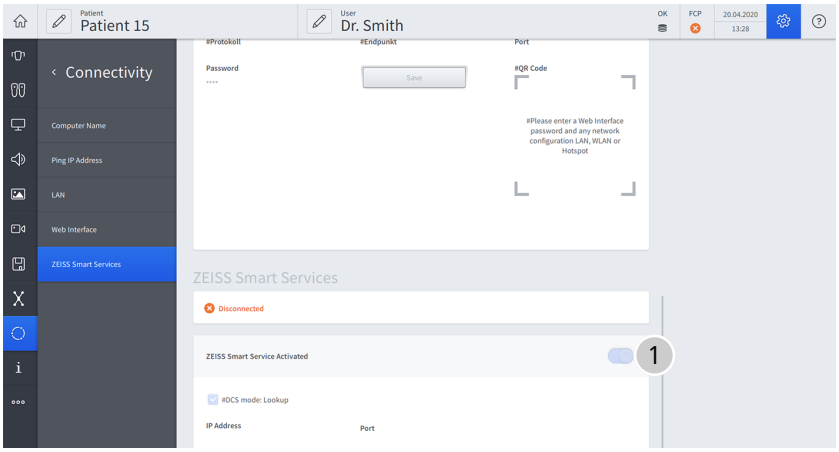


Figure 44: "Settings Connectivity" menu, submenu: "ZEISS Smart Services"

Pos.	Name	Description
1	Activate/deactivate ZEISS Smart Service	Higher password level required.

3.5.29 Info

Main menu - Settings menu ⚙ - Info
This menu displays a variety of information regarding the system (serial numbers, software versions, license information).

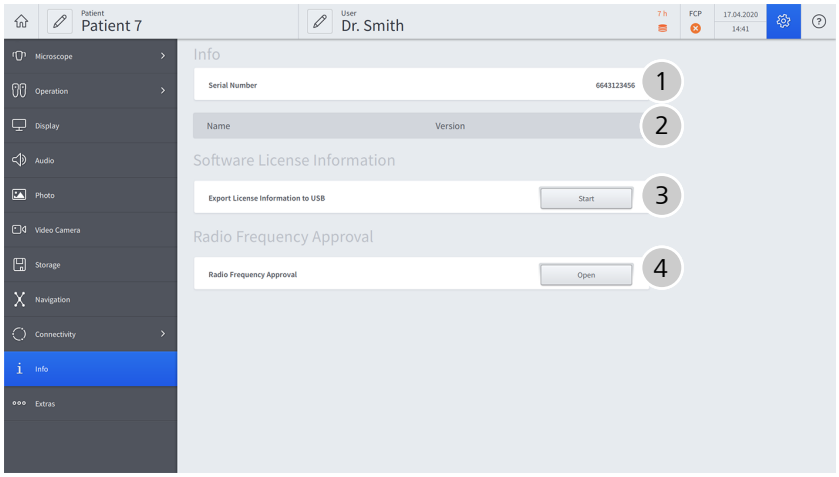


Figure 45: "Settings Info" menu

Pos.	Name	Explanation
1	Serial number	Displays serial number of device.
2	Name / Version	Displays the name and installed version.
3	Software License Information	License information can be exported to a USB storage device by tapping the [Start] button.
4	Radio Frequency Approval	Tapping the [Open] button displays all radio frequency approvals available on the device.

3.5.30 Extras

Main menu - Configuration menu ⚙ - Extras **o o o**
In this menu, you can switch the remote control mode on/off, import licenses and export log files and backups to the internal hard disk.

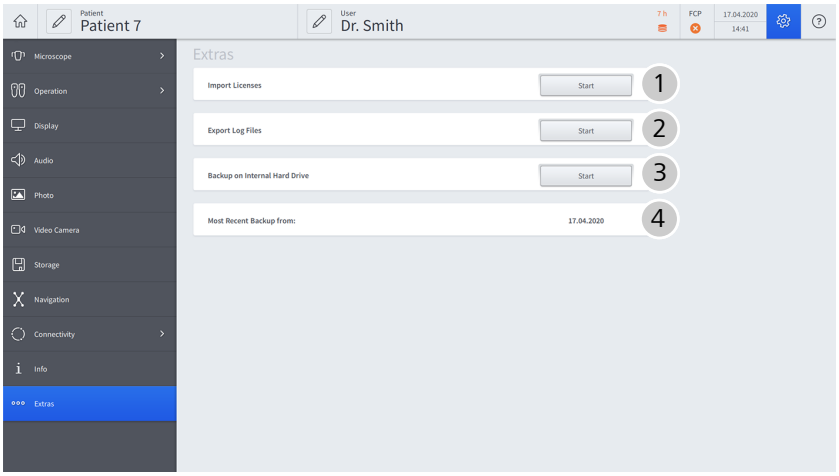


Figure 46: "Settings Extras" menu

Pos.	Name	Explanation
1	Import Licenses	Import additional licenses.
2	Export Log Files	When you press this button, the log files (error messages) are exported to a connected USB storage device.
3	Backup on Internal Hard Drive	Available system backups.
4	Most Recent Backup from:	Point of time of last backup.

⚠ CAUTION!

Risk of injury caused by moving parts!

ZEISS Smart Services generates a very high system load and can lead to delayed movements of the device. When ZEISS Smart Services is started, persons located nearby can be injured by moving parts.

- ▶ Start ZEISS Smart Services only if no patient is located nearby or currently being treated.
- ▶ Start ZEISS Smart Services only if the device is located outside of the sterile OR area.
- ▶ Do not leave the device unattended while ZEISS Smart Services is activated.
- ▶ Reboot the device after operating ZEISS Smart Services before using it for clinical applications.

3.5.31 Password-protected settings and configurations

The following settings and configurations can be performed only by authorized users who have the password required for this purpose.

On activation of the rights for IT system administration, an input window is opened where the password must be entered.
You will find the password inside a sealed red envelope supplied with the device.
When you log in for the first time, you must change the initial password to a personalized password.

The IT system rights administrator can change the system language used by changing the IT settings of the device, see Settings [▶ 90].

3.5.31.1 Computer Name (password protected)

Main menu – Settings menu – Connectivity – Computer Name

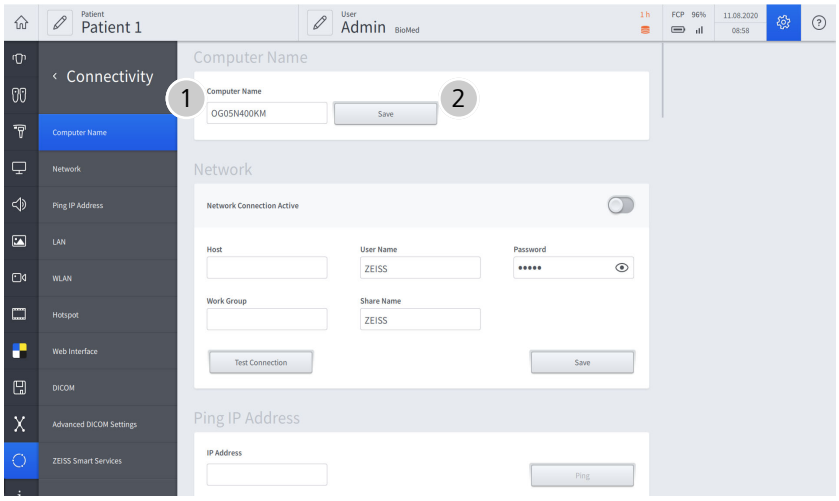


Figure 47: "Settings Connectivity" menu, submenu: "Computer Name"

Item	Name	Description
1	Computer Name	Change the computer name (recommended). The change takes effect after a restart.
2	Apply	Confirm entry.

3.5.31.2 Network (password protected)

Main menu – Configuration menu. – Connectivity – Network

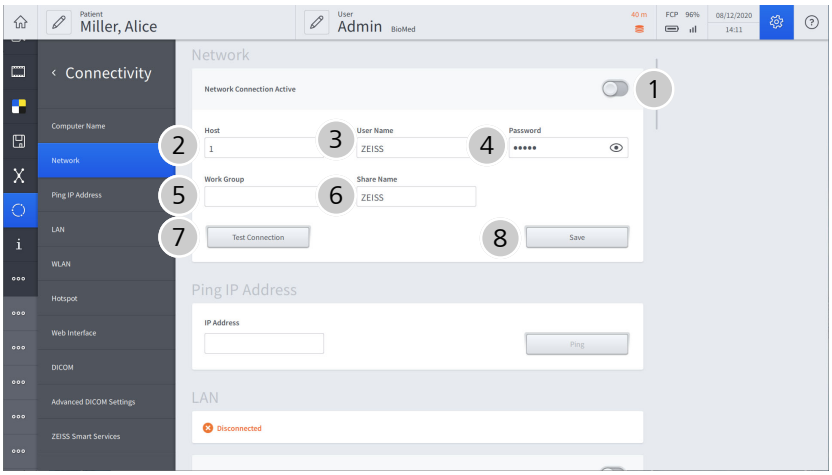


Figure 48: "Connectivity settings" menu, submenu: "Network"

Item	Name	Description
1	Network Connection Active	Activate network connection.
2	Host	Enter host name.
3	User Name	Enter user name.
4	Password	Enter the password.
5	Work Group	Enter work group.
6	Share Name	Enter Share Name
7	Test Connection	Test the network connection
8	Apply	Confirm entry.

3.5.31.3 Ping IP Address (password protected)

Main menu – Settings menu – Connectivity - Ping IP Address

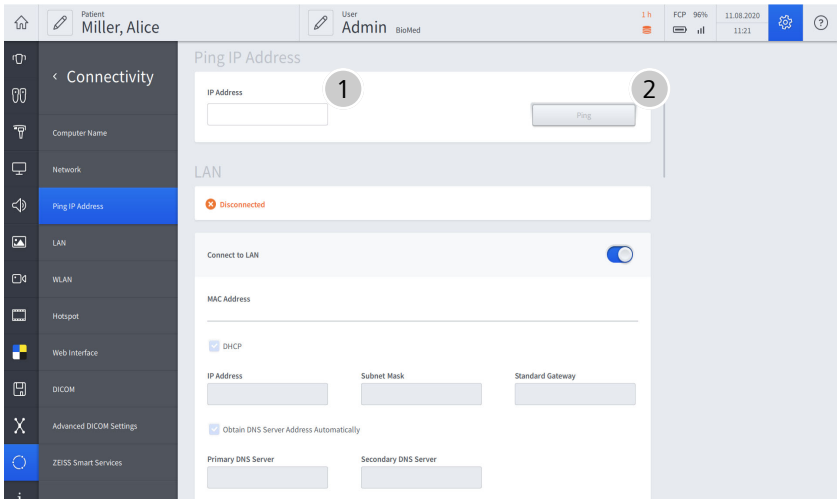


Figure 49: "Settings Connectivity" menu, submenu: "Ping IP Address"

Item	Name	Description
1	IP Address	Enter IP address for ping test.
2	Ping	Start ping test.

3.5.31.4 LAN (password protected)

Main menu – Settings menu. – Connectivity – LAN

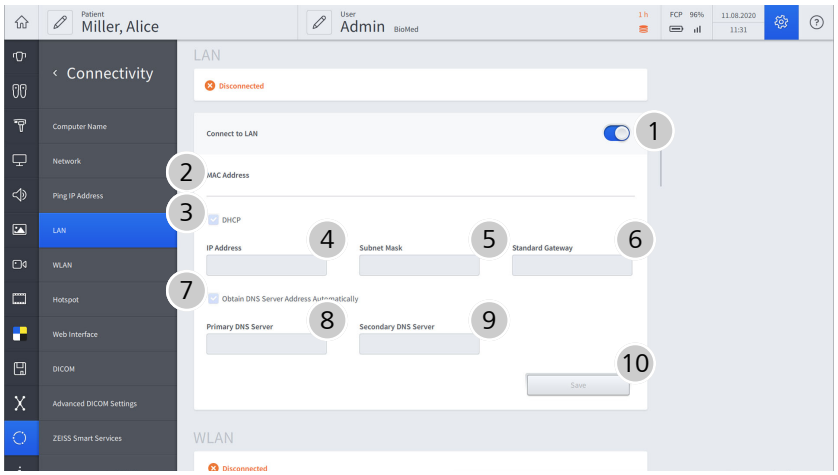


Figure 50: "Settings Connectivity" menu, submenu: "LAN"

Item	Name	Description
1	Connect to LAN	Button for switching the LAN connection on / off.
2	MAC Address	MAC address display.
3	DHCP	Assign a network connection via DHCP.

Item	Name	Description
4	IP Address	Specify IP address for LAN connection. **Attention:** Do not use any IP addresses from the following address ranges: ■ 192.168.173.xxx (used for the hotspot) ■ 192.168.100.xxx (used for an internal network connection)
5	Subnet Mask	Enter the subnet mask.
6	Standard Gateway	Enter standard gateway.
7	Use DNS Server Address Automati-cally	The DNS server address is automatically activated with DHCP.
8	Primary DNS Server	Enter primary DNS server.
9	Secondary DNS Server	Enter secondary DNS server.
10	Apply	Confirm entry.

3.5.31.5 WLAN (password protected)

Main menu – Configuration menu. ⚙ – Connectivity ◌ – WLAN

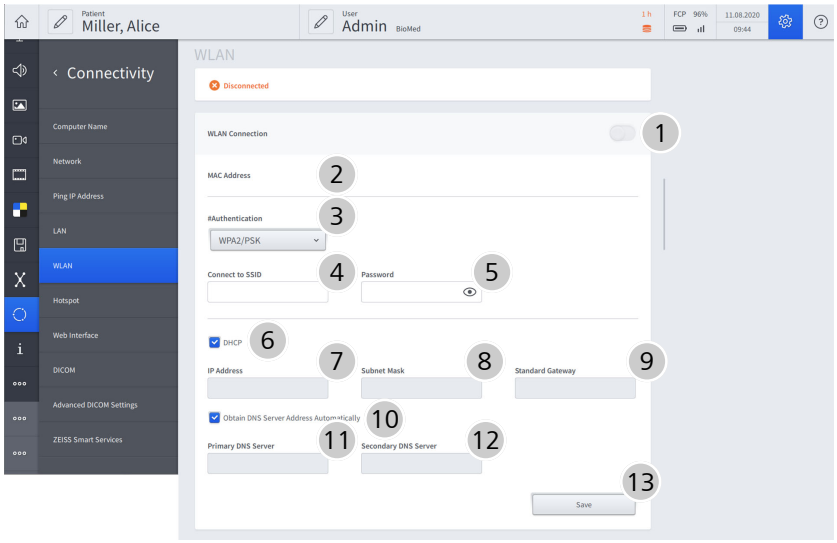


Figure 51: "Settings Connectivity" menu, submenu: "WLAN"

Item	Name	Description
1	WLAN Connection	Switch WLAN connection on/off
2	MAC Address	MAC address display.
3	Authentication	Choose authentication method. With WPA2/PEAP you can also import certificates in the format (.cer, .der or .pem) from a USB drive.

Item	Name	Description
4	Connect to SSID	Enter SSID (Service Set Identifier).
5	User name/ password	Enter password. With WPA2/PEAP, also enter your user name.
6	DHCP	Assign a network connection via DHCP.
7	IP Address	Specify IP address for LAN connection. **Attention:** Do not use any IP addresses from the following address ranges: ■ 192.168.173.xxx (used for the hotspot) ■ 192.168.100.xxx (used for an internal network connection)
8	Subnet Mask	Enter the subnet mask.
9	Standard Gateway	Enter standard gateway.
10	Use DNS Server Address Automati-cally	The DNS server address is automatically activated with DHCP.
11	Primary DNS Server	Enter primary DNS server.
12	Secondary DNS Server	Enter secondary DNS server.
13	Apply	Confirm entry.

3.5.31.6 Hotspot (password protected)

Main menu – Configuration menu. ⚙ – Connectivity ◌ – Hotspot

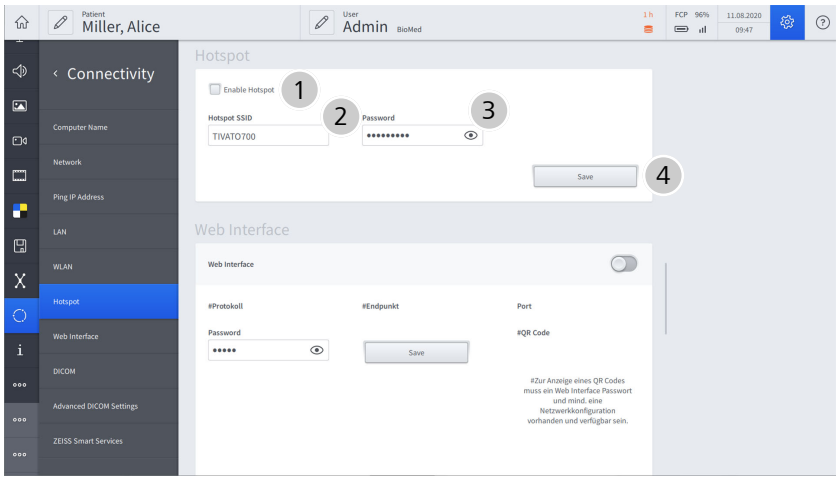


Figure 52: "Connectivity settings" menu, submenu: "Hotspot"

Item	Name	Description
1	Enable Hotspot	Switch hotspot on and off; WLAN connection must first be activated.
2	Hotspot SSID	Enter SSID (Service Set Identifier).
3	Password	Enter the password.
4	Apply	Confirm entry.

3.5.31.7 Web Interface (password protected)

Main menu – Configuration menu. ⚙ – Connectivity ◌ – Web Interface

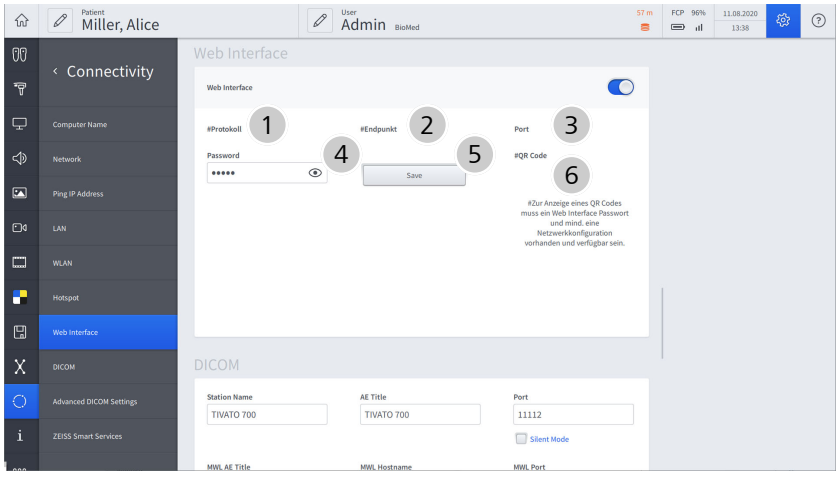


Figure 53: "Connectivity settings" menu, submenu: "Web Interface"

Item	Name	Description
1	Log	Displays the connection log.
2	Endpoint	Displays the pathname.

Item	Name	Description
3	Port	Displays the connection port.
4	Password	Enter the password.
5	Apply	Confirm entry.
6	QR Code	QR code for transferring the connection parameters.

3.5.31.8 DICOM

Main menu – Configuration menu. – Connectivity – DICOM

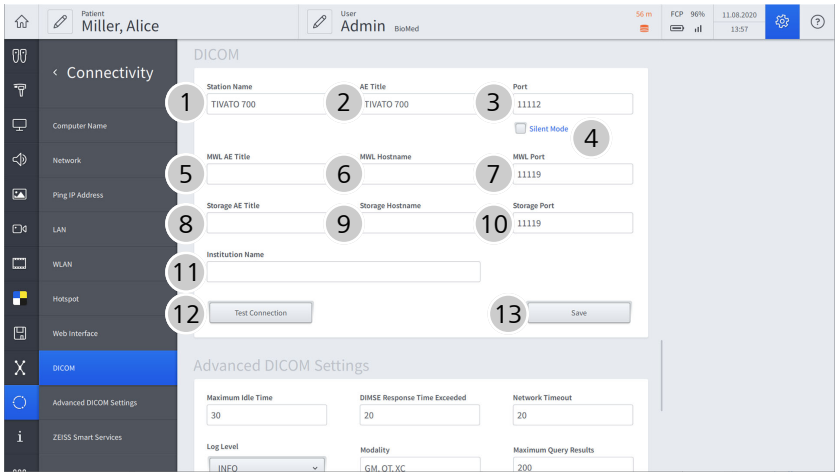


Figure 54: "Connectivity settings" menu, submenu: "DICOM"

Item	Name	Description
1	Station Name	Enter recognizable device names.
2	AE Title	Enter DICOM names of the AE (Application Entity).
3	Port	Port which is used for the connection with DICOM (pre-set)
4	Silent Mode	Block incoming DICOM connections. Note: When option activated, PACS does not respond to DICOM C-ECHO.
5	MWL AE Title	Enter work list names.
6	MWL Hostname	Enter host name.
7	MWL Port	Standard value is preset
8	Storage AE title	Enter AE title of DICOM storage.
9	Storage Hostname	Enter DICOM Storage hostname.
10	Storage Port	Standard value is preset
11	Institution Name	Enter name of clinic/institution.

Item	Name	Description
12	Test Connection	Test DICOM connection.
13	Apply	Apply settings.

3.5.31.9 Advanced DICOM settings

Main menu – Configuration menu. ⚙ – Connectivity ◌ – Advanced DICOM Settings

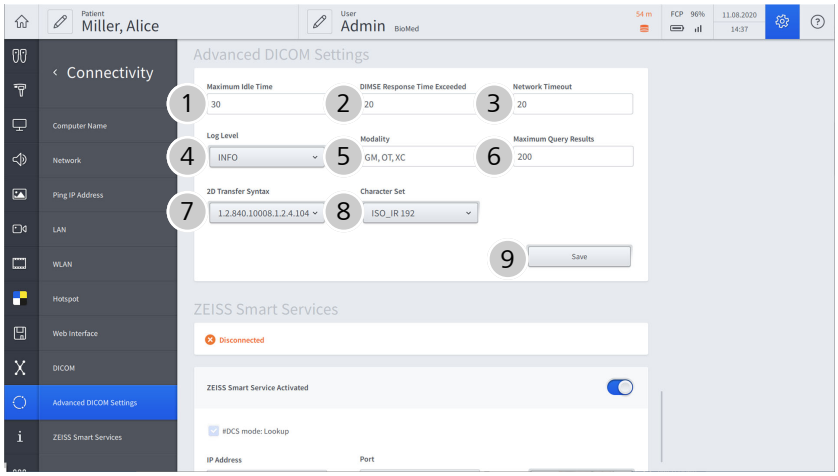


Figure 55: "Connectivity settings" menu, submenu: "Advanced DICOM Settings"

Item	Name	Description
1	Maximum Idle Time	Maximum period of time in which the DICOM connection may remain unused without being disconnected
2	DIMSE Response Time Exceeded	Maximum period of time in which (with active DICOM connection) no DIMSE response from DICOM must be received
3	Network Timeout	Maximum period of time until a DICOM connection is established
4	Log Level	Setting the log level for the used components of the DICOM network
5	Modality	List of modality codes / modality types that may be selected as modality
6	Maximum Query Results	Maximum number of results for a query
7	2D Transfer Syntax	MPEG transfer syntax for 2D video files
8	Character Set	Character set which is used for the DICOM connection
9	[Save] button	Apply settings.

3.5.31.10 ZEISS Smart Services (password protected)

Main menu – Settings menu – Connectivity – ZEISS Smart Services

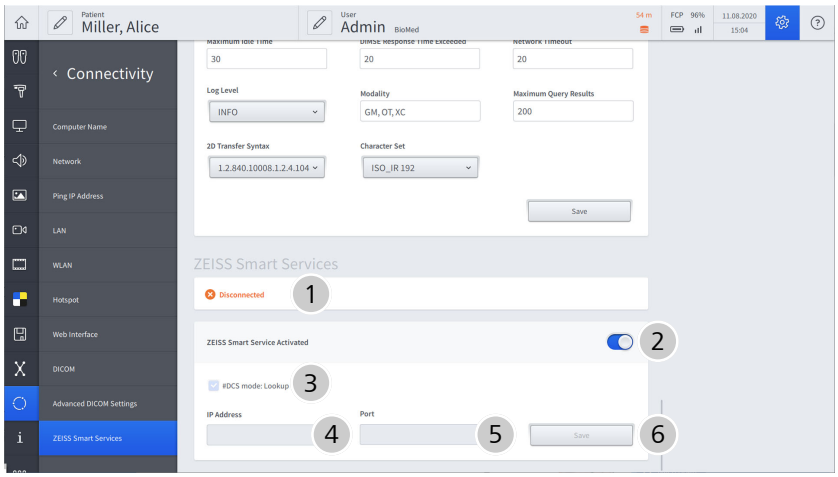


Figure 56: "Settings Connectivity" menu, submenu: "ZEISS Smart Services"

Item	Name	Description
1	Connection status	Status of the readiness for connection for ZEISS Smart Services. **Note:** The connection status must also be verified via the SCU components connected in the network.
2	ZEISS Smart Service Activated	Activate ZEISS Smart Services.
3	DCS mode: Lookup	Find SCU server automatically.
4	IP Address	Enter IP address of the SCU server.
5	Port	Enter port for communication with the SCU server.
6	[Save] button	Apply settings.

3.5.31.11 Service PC

3.5.31.11.1 Overview

Main menu - Configuration menu ⚙ - Service PC - Overview

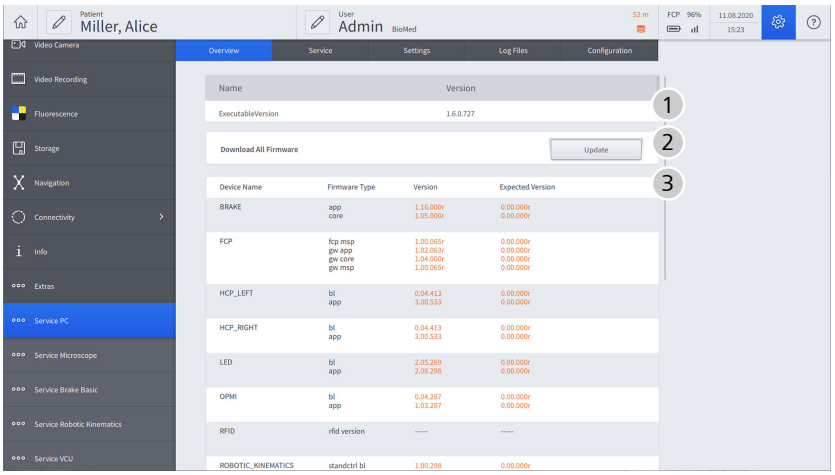


Figure 57: "Settings Service PC" menu, "Overview" tab

Pos.	Name	Explanation
1	Executed Version	Displays the executed version.
2	Update	Incremental firmware download. Firmware downloaded to the device will only be executed if the version does not match.
3	Overview	Display of the firmware versions installed on the device. Versions deviating from these are highlighted in red.

3.5.31.11.2 Service

Main menu - Configuration menu ⚙ - Service PC - Service

In this menu, you can export users, import users and view the date of the last maintenance call.

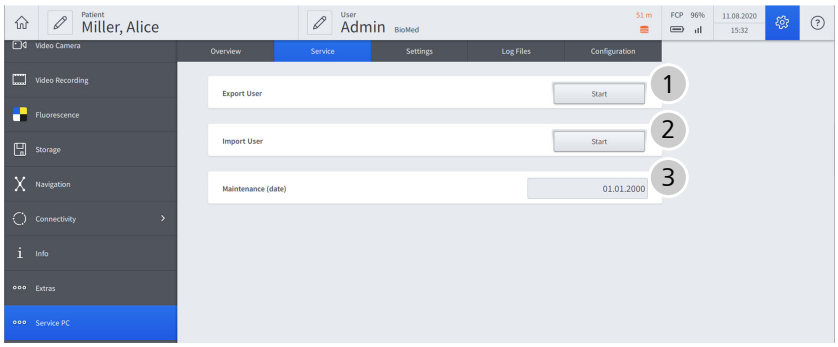


Figure 58: "Settings Service PC" menu, "Service" tab

Position	Name	Explanation
1	Export User	Export the existing user profile.
2	Import User	Import the existing user profile.
3	Maintenance (date)	Date of last maintenance call.

3.5.31.11.3 Settings

Main menu - Configuration menu ⚙ - Service PC - Settings

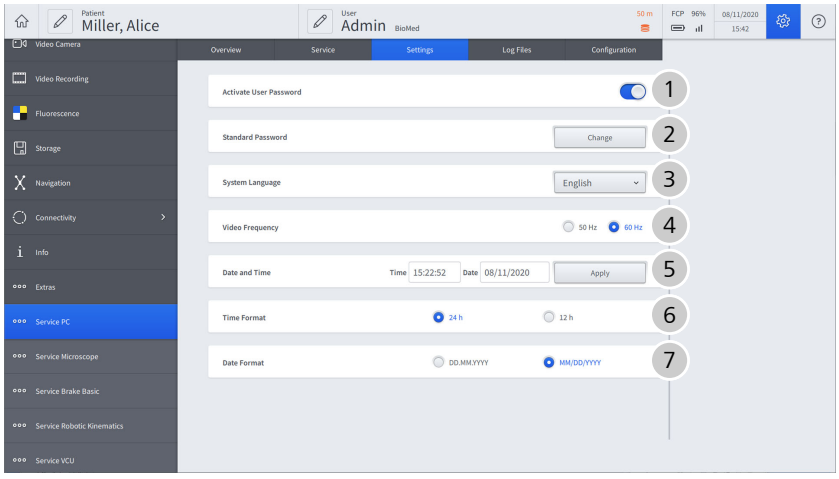


Figure 59: "Settings Service PC" menu, "Settings" tab

Pos.	Name	Explanation
1	Activate User Password	Protect your user profile with a password.
2	Standard Password	Change the standard password for your user profile.
3	System Language	Select system language.
4	Video Frequency	Select: 50 Hz or 60 Hz

Pos.	Name	Explanation
5	Date and Time	Set and [Accept].
6	Time Format	Select: 24h or 12h.
7	Date Format	Select: DD.MM.YYYY or MM/DD/YYYY.

3.5.31.11.4 Log Files

Main menu - Configuration menu ⚙ - Service PC - Log Files

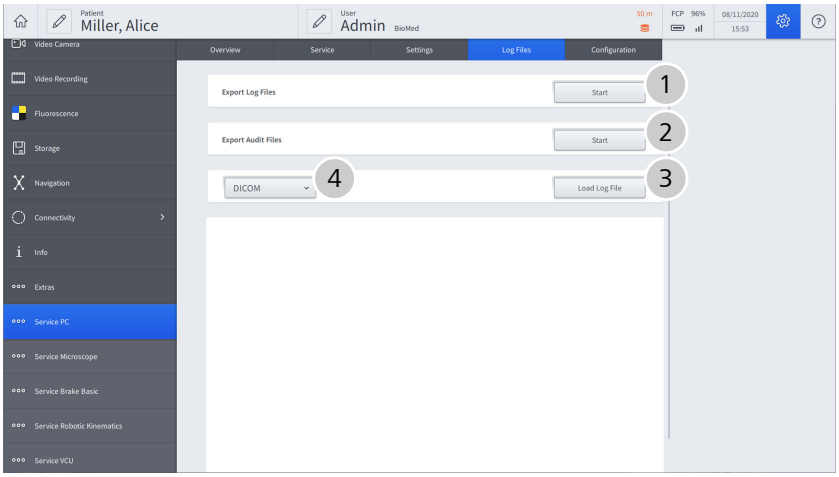


Figure 60: "Settings Service PC" menu, "Log Files" tab

Pos.	Name	Explanation
1	Export Log Files	Export log files to a USB storage device.
2	Export Audit Files	Export audit files to a USB storage medium.
3	Load Log File	Load log file from selected destination.
4	DICOM	Load log files from DICOM.

3.5.31.11.5 Configuration

Main menu - Configuration menu ⚙ - Service PC - Configuration

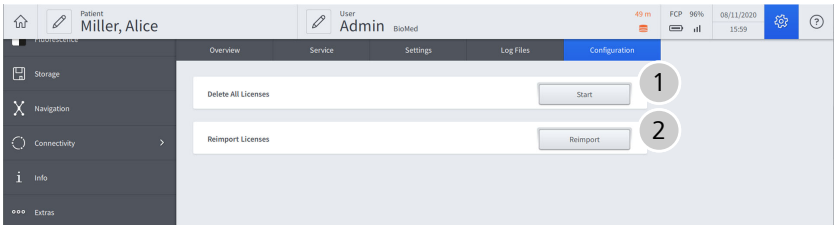


Figure 61: "Settings Service PC" menu, "Configuration" tab

Position	Name	Explanation
1	Delete All Licenses	Delete all licenses installed on the device.
2	Reimport Licenses	Reimport previously imported licenses.

3.5.31.12 Service Microscope

Main menu - Configuration menu ⚙ - Service Microscope

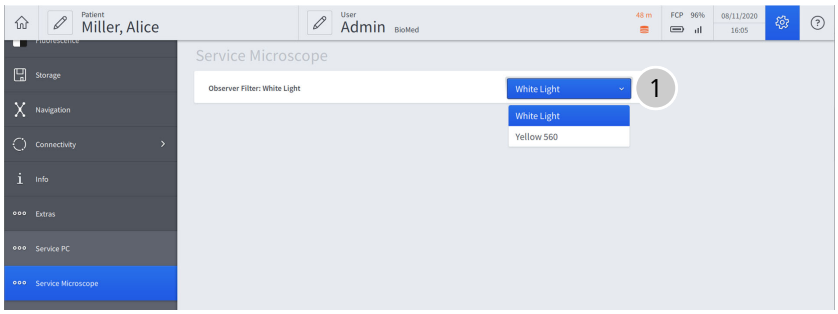


Figure 62: "Settings Service Microscope" menu

Position	Name	Explanation
1	Observer Filter: White Light	Configure the observer filter: ■ for white light ■ for Yellow 560

3.5.31.13 Service Light HLQ

Main menu - Configuration menu ⚙ - Service Light HLQ

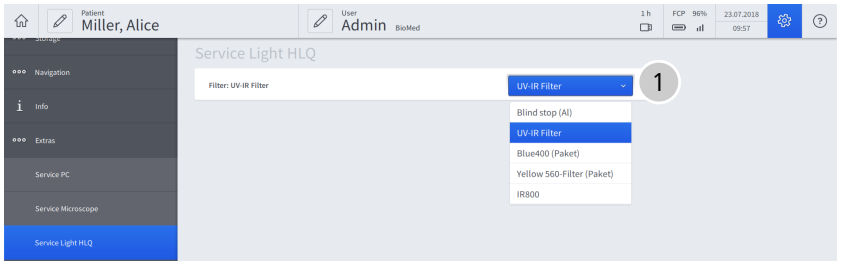


Figure 63: "Settings Service Light HLQ" menu

Position	Name	Explanation
1	Filter: UV-R Filter	Configure fluorescence filter: ■ Blind stop (Al) ■ UV-IR Filter ■ Blue400 (Paket) ■ Yellow 560-Filter (Paket) ■ IR800

3.5.31.14 Service Brake Basic

Main menu – Settings menu ⚙ – Service Brake Basic

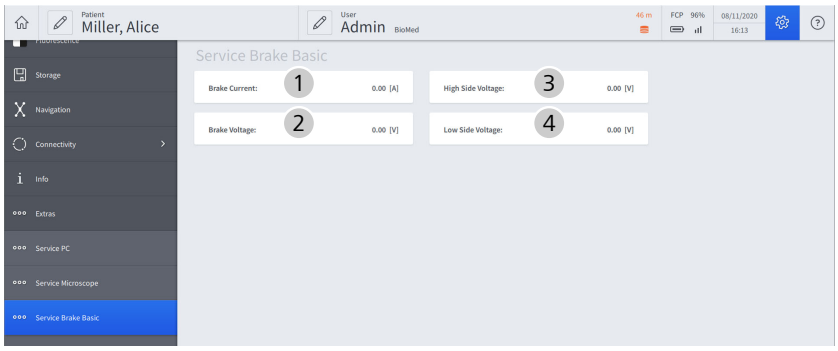


Figure 64: "Settings Service Brake Basic" menu

Pos.	Name	Explanation
1	Brake Current:	Display of brake current.
2	Brake Voltage:	Display of brake voltage.
3	High Side Voltage:	Display of voltage on high voltage side.
4	Low Side Voltage:	Display of voltage on low voltage side.

3.5.31.15 Service Robotic Kinematics

Main menu - Configuration menu ⚙ - Service Robotic Kinematics

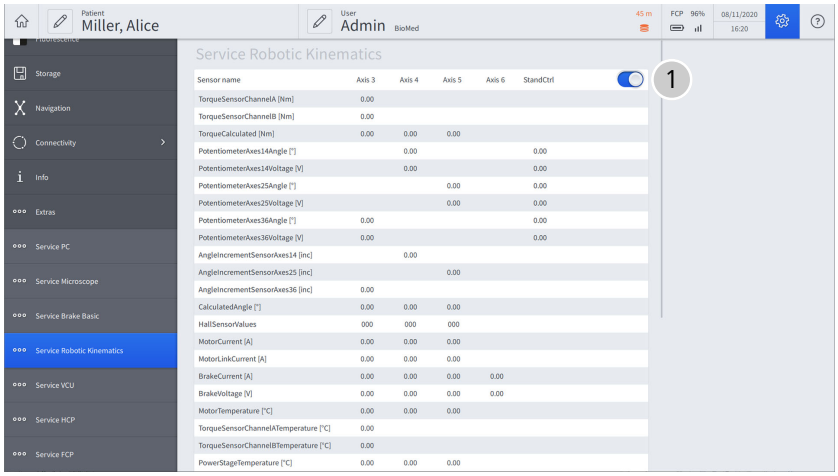


Figure 65: "Settings Service Robotic Kinematics" menu

Position	Name	Explanation
1	Sensor name	Show / Hide current status of motion sensors.

3.5.31.16 Service Drape

Main menu - Configuration menu ⚙ - Service Drape

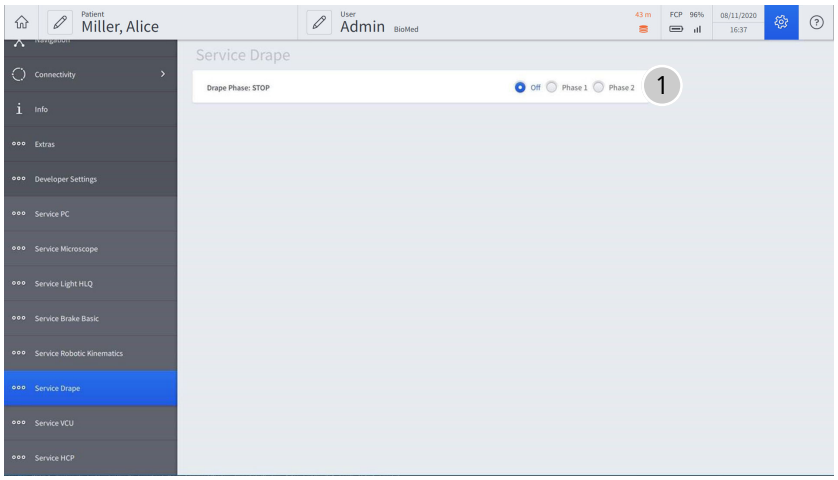


Figure 66: "Settings Service Drape" menu

Position	Name	Explanation
1	Drape Phase: STOP	Set drape phase: ■ Off ■ Phase 1 ■ Phase 2

3.5.31.17 Service VCU

Main menu – Settings menu ⚙ – Service VCU

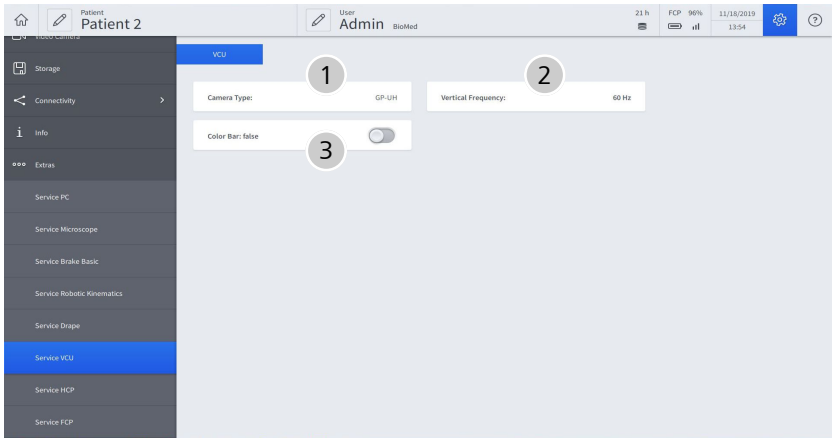


Figure 67: "Settings Service VCU" menu

Pos.	Name	Explanation
1	Camera Type:	Read out camera type
2	Vertical Frequency:	Read out vertical frequency
3	Color Bar: false	Activate/deactivate color bar

3.5.31.18 Service HCP

Main menu - Configuration menu ⚙ - Service HCP

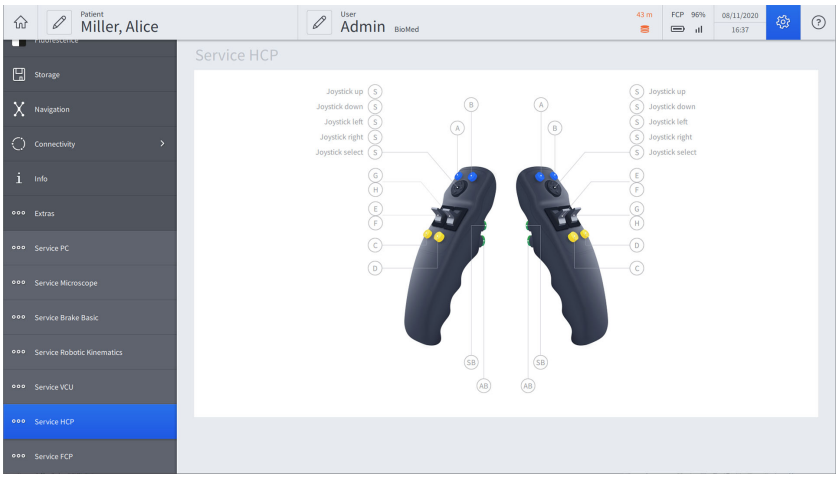


Figure 68: "Settings Service HCP" menu

Item	Name	Explanation
1	Service HCP	Read out button assignment of handgrips

3.5.31.19 Service FCP

Main menu - Configuration menu ⚙ - Service FCP

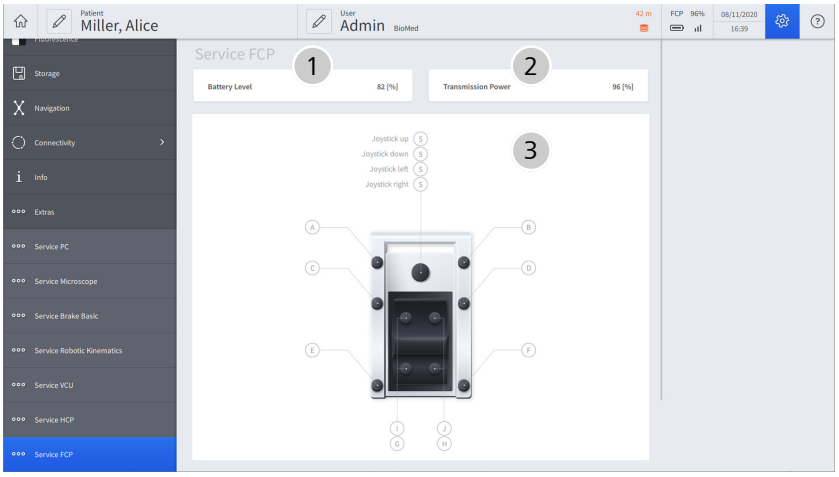


Figure 69: "Settings Service FCP" menu

Item	Name	Explanation
1	Battery Level	Read out battery charge level
2	Transmission Power	Read out transmission power
3	Service FCP	Read out button assignment of foot control panel

3.6 Data management

- Data storage in a shared network (option)

  The ZEISS TIVATO 700 can be connected to the clinic network via a LAN connection (and optionally via WLAN, see below). A correspondingly configured server directory enables fast and easy data transfer of images and videos to this network drive for central data storage and fast accessing of this data from every PC/laptop connected to the network for editing and processing (e.g. with a video editor). This option prevents e.g. time-consuming data transfer using USB media.

- Wireless WLAN data transfer (option)

  An optional WLAN module with a WiFi hotspot function simplifies the management of images and videos recorded with the ZEISS TIVATO 700 enormously. With this option, a wireless connection to the clinic network or server directory can be configured instead of a LAN connection for time-saving data transfer. A WiFi hotspot for connections to mobile devices (e.g. tablets or smartphones) can be additionally activated and used, thus enabling users to access the patient data directory in the ZEISS TIVATO 700 and download the desired images and video clips quickly and easily. All network, WLAN and WiFi connections are password-protected.

4 Installation

4.1 Requirements

Installation requires special knowledge and skills.
An installation by persons not authorized by ZEISS can lead to the injury of patients and operators, as well as to property damage.

Action

- ▶ Have the installation and initial startup performed only by persons authorized by ZEISS.

⚠ CAUTION!

Risk of injury caused by uncontrolled device movements.

The device may make uncontrolled swinging movements if the suspension arm and the surgical microscope are not in the transport position.

- ▶ Place the device in the transport position before moving it.

4.2 Connecting the device to the power supply and switching it on

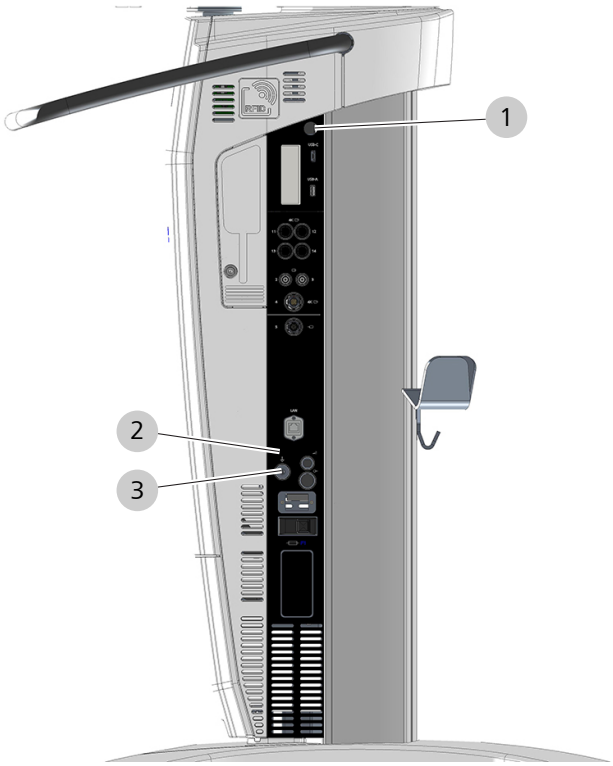


Figure 70: Connecting the device to the power supply and switching it on

1	"Device Power On/Off" operating button	2	Potential equalization connector
3	Power input socket		

⚠ CAUTION!

Risk of injury caused by electrical voltage.

Coming into contact with live components may result in electric shock.

- ▶ Only connect the power cord to an electric grid with a correctly connected ground conductor (IEC 60601-1).

Action

1. Plug the power cord included in the scope of supply into the power input socket.
2. Plug the power cord into the power outlet.
   - ⇨ The "Device Power On/Off" operating button is illuminated white.
3. Press the "Device Power On/Off" button once.
   Do not touch or move the device while it is powering on, as this could hinder the initialization of the device features.
   - ⇨ The "Device Power On/Off" operating button is illuminated green.
   - ⇨ The operating system is booted.
   - ⇨ The device displays the start screen and is ready for operation.

4.3 Initial device login

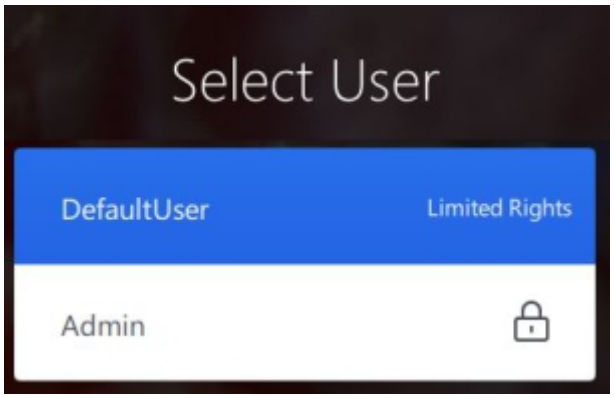
When you use the device for the first time, only the selections “DefaultUser” and “Admin” appear in the “Select User” selection window on the login screen. The “DefaultUser” user group has only limited rights. In order to be able to use the device to a full extent, you must create a new user during initial startup of the device.

Prerequisite

☑ The device is connected to the power supply, switched on and booted.

Action

1. Tap on the “DefaultUser” field in the “Select User” selection window.



   ⇨ The start screen opens.

   ⇨ In the status bar at the top of the screen, the “DefaultUser” appears in the “User” field.

2. Tap on the [DefaultUser] button.

   ⇨ The “Select User” selection window opens again.

   ⇨ The [Add User] button appears in the “Select User” selection window.

3. Tap the [Add User] button and create a new user.

Result

✓ The next time you start the device, the user you have created will appear in the “Users” selection window. Now you can add new users, remove users, edit user data etc.

4.4 Connecting the wired foot control panel



Figure 71: Connection sockets for foot control panel

1	Connection socket for foot control panel

Action

1. Connect the foot control panel cable to the corresponding port on the device.
2. To check the foot control panel's preconfigured button assignment, open the "Extended operation" menu on the right edge of the monitor screen.
3. Tap the [Foot Control Panel]  button in the "Extended operation" menu.
   ⇨ The preconfigured button assignment is displayed.
4. To change the button assignment, tap on the [Change settings] button in the display window.
5. Adapt the button assignment as required.

4.5 Pairing the wireless foot control panel with the device

You can use the “Pairing” function to assign the wireless foot control panel (FCP WL) to the device.

⚠ CAUTION!

Malfunction due to incorrect pairing!

If pairing is performed incorrectly or not at all, the foot control panel may be disabled, or activation of a control may trigger functions on a different stand not assigned to the foot control panel.

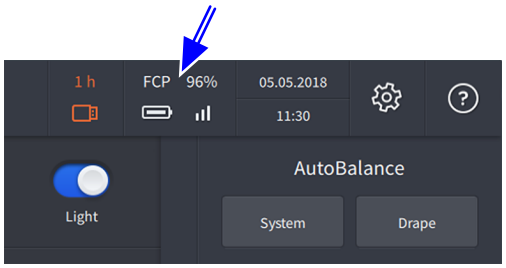
- ▶ Check and label the assignments of the device and the foot control panel.

Prerequisite

☑ The wireless foot control panel is switched on.

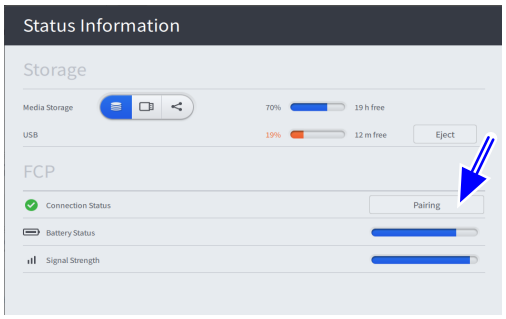
Action

1. Tap the [Status Information] button in the status bar.



⇨ The “Status Information” menu is displayed.

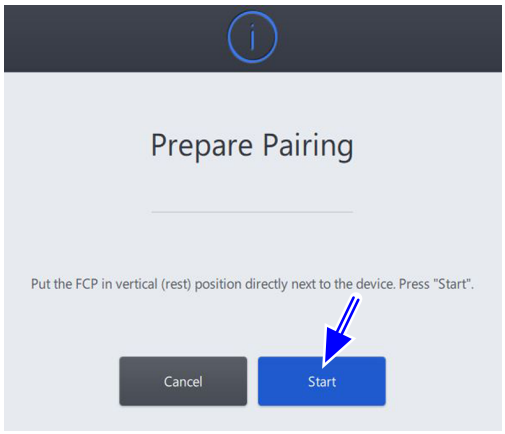
2. Tap on the [Pairing] button.



⇨ The "Prepare Pairing" menu is displayed.

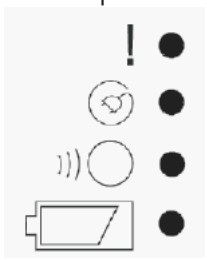
3. Put the foot control panel in a vertical position in the immediate vicinity of the device.

4. Tap on the [Start] button.



   ⇨ The message “Pairing of the device and the foot control panel in progress” appears.

5. Press a button on the foot control panel until the third LED from the top flashes orange. Keep the foot control panel in a vertical position.



   ⇨ Following successful pairing, the message "Pairing was successfully completed" is displayed. Place the foot control panel in a horizontal position and perform a function test. Set the number specified on the stand on the rotary wheel of the foot control panel."

6. Press any two buttons on the foot control panel to perform a function test.

   ⇨ The “Radio Connection Intensity” status display lights up green for approx. 1 second.

7. Use the rotary indicator on the FCP to set the number specified on the stand sticker to display the assignment of the paired foot control panel to this stand.

8. If pairing is unsuccessful, the “Radio Connection Intensity” status display lights up red for approx. 1 second, and one of the following messages appears:
   “Pairing could not be performed successfully. No foot control panel was detected."
   "Pairing could not be performed successfully. Several foot control panels were detected."

9. Repeat the “Pairing” procedure.

4.6 Connecting external video devices and monitors

Approved video cables can be found in product overview G-30-1888.

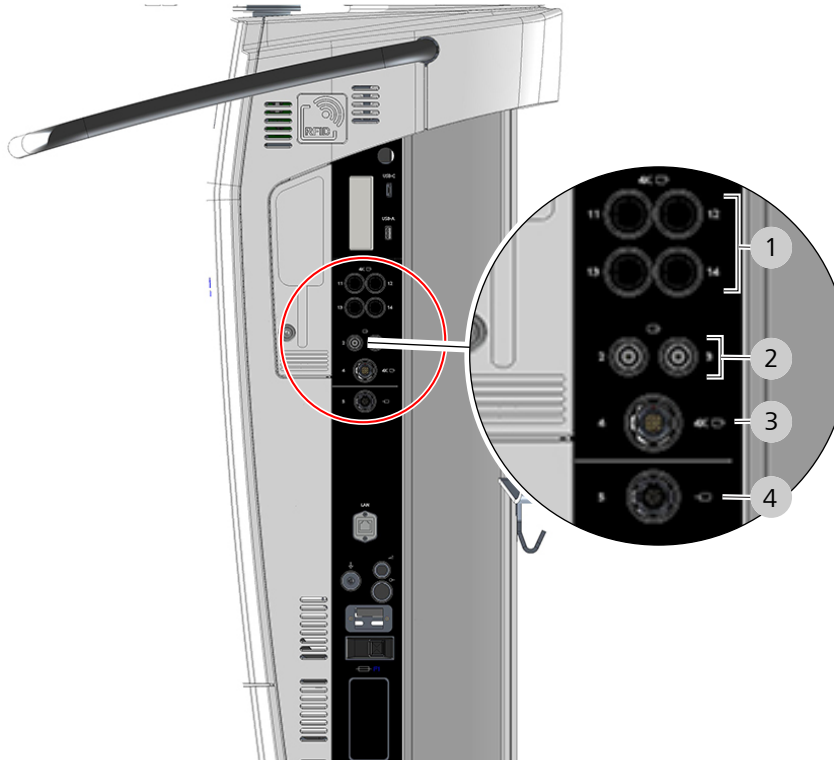


Figure 72: Connecting external video devices and monitors

1	Figure 1: SDI video output (optional) or Figures 11-14: QuadSDI video output (4K option)	2	Figures 2 and 3: SDI video output (optional)
3	Figure 4: HDMI video output or HDMI video output (4K option)	4	Figure 5: Video input: HDMI / DVI (optional)

⚠ CAUTION!

Risk of injury caused by electrical voltage.

Connecting unrecognized, defective or non-permitted accessories to live ports may result in electric shock.

- ▶ Connect only recognized, functioning and permitted accessories to live ports.
- ▶ When configuring your ME system, please make sure to comply with the requirements of IEC 60601-1.
- ▶ You must also comply with the Medical Device Operator Ordinance or other national laws.

Prerequisite

- ☑ The device, video devices and monitor are switched off.
- ☑ All active video ports are equipped with protective dust caps.
- ☑ Devices with HD Video-In license: the video input (Figure 5) is active and equipped with a protective dust cap.
- ☑ Devices without HD Video-In license: the video input (Figure 5) is not obstructed or equipped with a protective dust cap.

Action

1. For the external video device and monitor, please read and observe the documentation from the respective manufacturer.
2. Remove the protective dust caps from the required ports.
3. Connect the external video devices and monitors to the corresponding video inputs and outputs of the device.
4. If required, connect the external video sources (e.g. the endoscope) to the device via the corresponding video input.

4.6.1 Connecting the 4K monitor

You can connect the Sony monitor to the device via the SDI connection sockets or via the HDMI connection sockets.

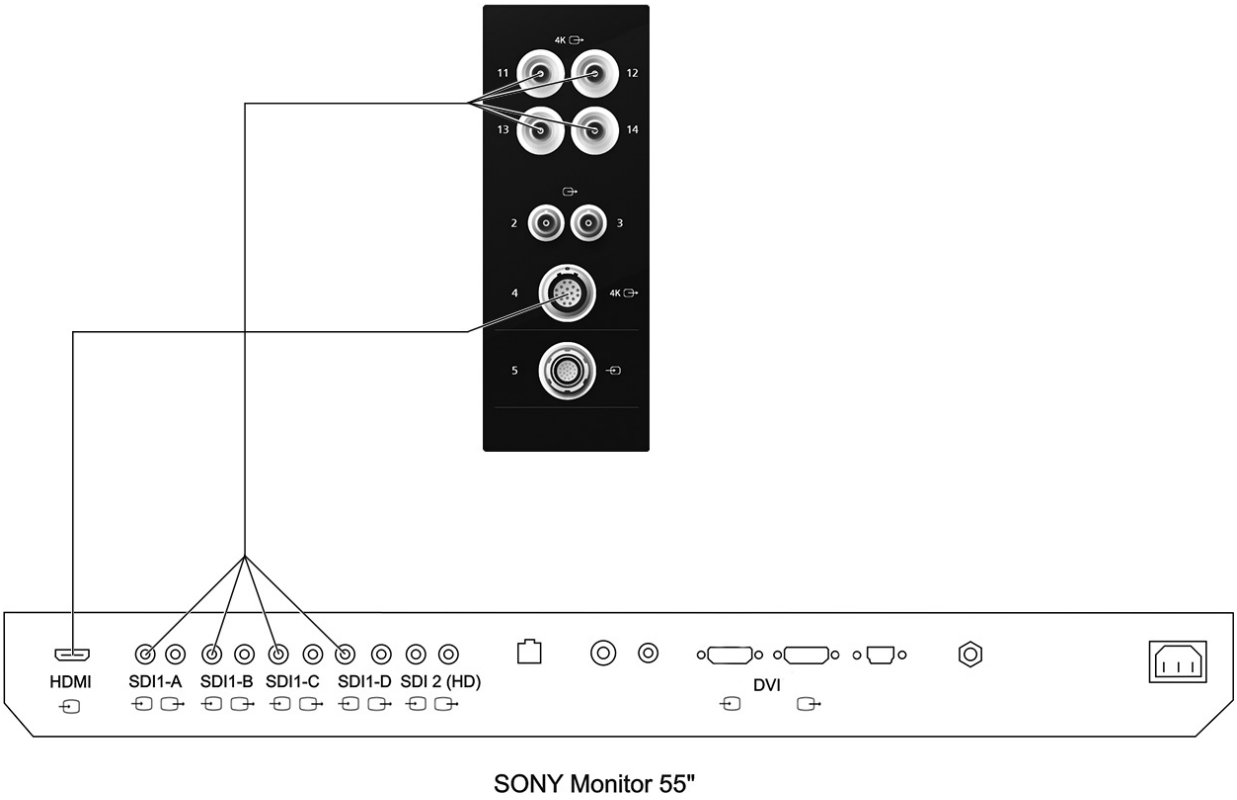


Figure 73: Connection options for the Sony 55" 4K 2D monitor (LMD-X550MD)

Connector ports	Device port	Monitor port	Video cable	Output signals
QuadSDI	11 12 13 14	SDI 1-A SDI 1-B SDI 1-C SDI 1-D	Quad SDI cable, 10 m Order no.: 302584-8785-000	QuadSDI 3840x2160 50/60p (4xBNC)
HDMI	4	HDMI	HDMI cable, 5 m Order no.: 302584-8758-000	HDMI 3840x2160 50/60p (ODU)

Table 3: Connection options for the Sony 55" 4K 2D monitor

Connecting the device to the Sony 55" 4K 2D monitor

Prerequisite

☑ The device and Sony monitor are switched off.

☑ An approved video cable is available.

Action

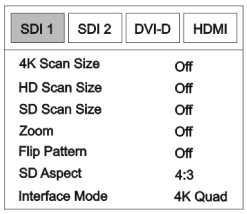
1. Connect the device to the Sony monitor either via the SDI connection sockets or via the HDMI connection sockets.

Setting the ZEISS TIVATO 700

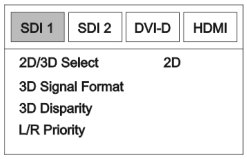
2. Switch the device on.
3. Tap on ⚙ Settings 🖵 → Displays.
4. Activate the "Application-specific" function in the selection window on the right-hand side.

Setting the Sony 55" 4K 2D monitor

5. Switch the Sony monitor on.
6. Press the [PORT A] button at the bottom edge of the Sony monitor.
7. Set the input signal to "SDI1".
8. Select the "Settings" / "Screen Control" menu at the bottom edge of the Sony monitor via the operating buttons.
9. Open the "SDI1" tab and set the following parameters:



10. Set the "Flip Pattern" function optionally to 180° (Face-to-Face).
11. Select the "Settings" / "3D Setting" menu at the bottom edge of the Sony monitor via the operating buttons.
12. Open the "SDI1" tab and set the following parameters:



4.6.2 Connecting the HD monitor

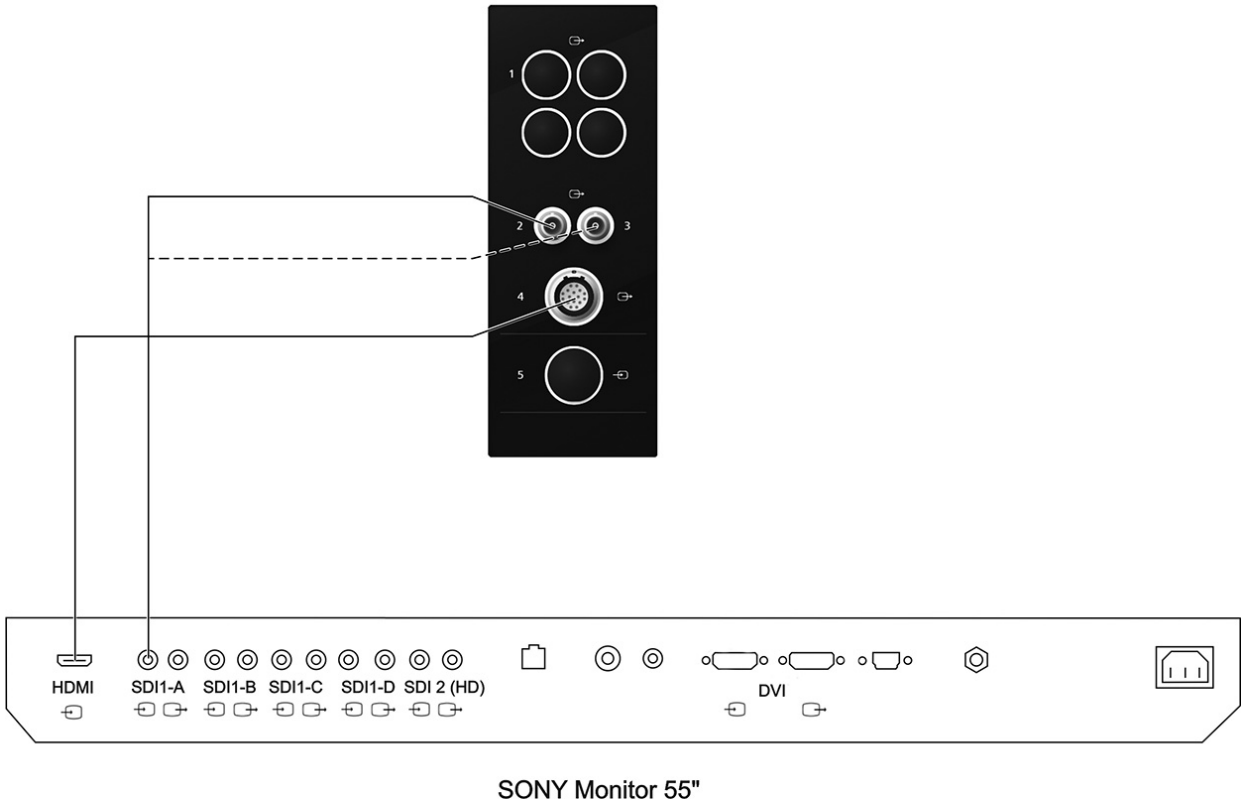


Figure 74: Connection options for Sony 55" HD 2D monitor

Connector ports	Device port	Monitor port	Video cable	Output signals
3G-SDI	2 or 3	SDI 1	SDI cable, 10 m Order no.: 305989-8764-000	3G-SDI or HD-SDI 1920x1080 50/60i/p ("Interlace" or "Progressive", selectable), 2xBNC
HDMI	4	HDMI	HDMI cable, 5 m Order no.: 302584-8758-000	HDMI 1920*1080 50/60p (ODU)

Table 4: Connection options for Sony 55" HD 2D monitor

Connecting the device to the Sony 55" HD 2D monitor

Prerequisite

☑ The device and Sony monitor are switched off.

☑ An approved video cable is available.

Action

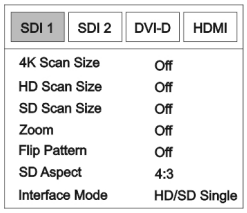
1. Also connect the device to the Sony monitor via the SDI connection socket.

Setting the ZEISS TIVATO 700

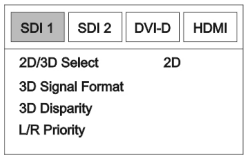
2. Switch the device on.
3. Tap on ⚙ Settings 🖵 → Displays.
4. Activate the "Application-specific" function in the selection window on the right-hand side.

Setting the Sony 55" HD 2D monitor

5. Switch the Sony monitor on.
6. Press the [PORT A] button at the bottom edge of the Sony monitor.
7. Set the input signal to "SDI1".
8. Select the "Settings" / "Screen Control" menu at the bottom edge of the Sony monitor via the operating buttons.
9. Open the "SDI1" tab and set the following parameters:



10. Set the "Flip Pattern" function optionally to 180° (Face-to-Face).
11. Select the "Settings" / "3D Setting" menu at the bottom edge of the Sony monitor via the operating buttons.
12. Open the "SDI1" tab and set the following parameters:



4.7 Connecting USB storage media



1	USB-C port (2.0)	2	Shelf for USB storage medium
3	USB-A port (2.0)		

NOTE

Damage resulting from connecting the device to an external storage device (USB device) or an external network.

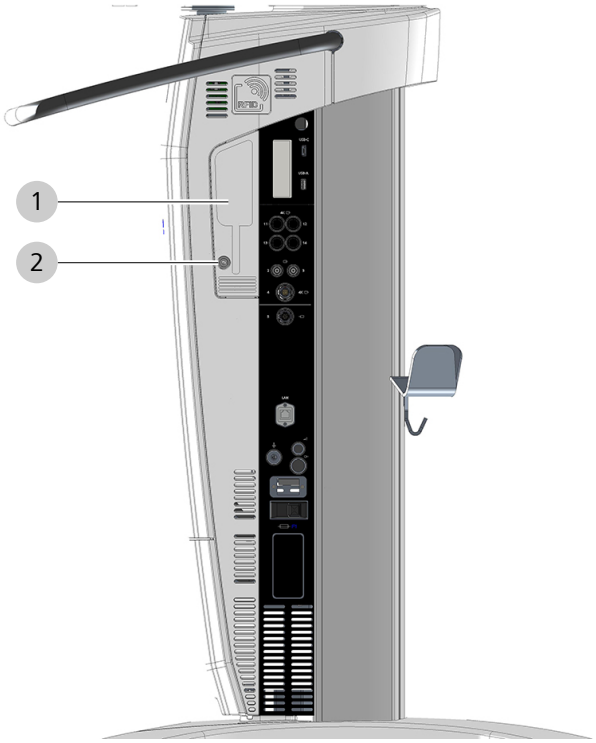
Connecting the device to external storage devices or networks may permit viruses to be transferred to the device or may grant viruses unauthorized access to the system.

- ▶ Use only accessories and media which have been approved for this system by ZEISS.
- ▶ Check to make sure the accessories are free of viruses. The operator is responsible for security.
- ▶ Protect the network by using suitable safeguards (e.g. firewalls) against unauthorized access.

Action

1. Plug the USB storage device into the USB port.
2. Place the USB storage device on the shelf.

4.8 Connecting an iPad to the charging station (option)



1	Charging station (optional) for a 10.5" iPad Pro or 10.5" iPad Air 3	2	Lock for charging station

NOTE

Use of iPad charging station

A temperature increase of up to 14 degrees Celsius above the ambient temperature is possible in the charging station.

- ▶ Observe the iPad manufacturer's instructions for use.
- ▶ Operation of the iPad outside of the ambient temperature range specified by the manufacturer may lead to functional limitations of the iPad or impair the lifetime of the battery.
- ▶ Please note that the surface of the iPad may get hot in case of high ambient temperatures.

Action

1. Plug the tablet into the charging station.
   ⇨ The tablet snaps in place.
   ⇨ The tablet is charged.
2. Lock the tablet with the supplied lock.

4.9 Configuring the network

NOTE

Damage resulting from connecting the device to an external storage device (USB device) or an external network.

Connecting the device to external storage devices or networks may permit viruses to be transferred to the device or may grant viruses unauthorized access to the system.

- ▶ Use only accessories and media which have been approved for this system by ZEISS.
- ▶ Check to make sure the accessories are free of viruses. The operator is responsible for security.
- ▶ Protect the network by using suitable safeguards (e.g. firewalls) against unauthorized access.

You can connect the device to your hospital network in order to export patient data to your network or to a DICOM server, or in order to import patient data from a DICOM worklist.

IT admin system rights

The following settings and configurations can be performed only by authorized users who have the IT Admin password required for this purpose. You will find the IT Admin password inside a sealed red envelope supplied with the device.
When you log in for the first time, you must change the initial password to a personalized password.
If you have forgotten the IT Admin password, contact ZEISS Service. You can find the ZEISS contact partner for your country online on the following page: http://www.zeiss.com/med.

4.9.1 Activating IT admin system rights

Action

1. Tap on the button [User] ⟶ [Admin].
2. Enter the IT Admin password.
   You will find the IT Admin password inside a sealed red envelope supplied with the device.
   When you log in for the first time, you must change the initial password to a personalized password.
3. Tap on the [OK] button  .
   ⇨ The IT Admin system administrator is displayed in the status bar.

4.9.2 Activating the network connection via LAN adapter

The ethernet port on the device has a network isolator as per IEC 60601-1.



1	Network/Ethernet connection (LAN) (optional)

Prerequisite

☑ The device is connected to the respective network via a network cable.

Action

1. Tap on ⚙ Settings ⟶ Connectivity ⟶ LAN.
2. Enter the appropriate information.
3. Tap on the [Apply] button.

Result

✓ The LAN connection is active.

4.9.3 Activate network connection via wireless LAN (option)

As soon as the WLAN adapter has been activated, you can connect the device to your network via WLAN or set up and activate the device as a hotspot [▷ 114].

You only have to enter the IP and DNS address information for your WLAN once, as these values will be saved.

4.9.3.1 WPA2/PSK

Prerequisite

☑ WIFI corresponds to WPA2/PSK

Action

1. Tap on ⚙ Settings ⟶ Scroll down in the Settings menu ⟶ Connectivity ⟶ WLAN.
2. Activate the "Activate WLAN" slide switch.
   ⇨ The WLAN adapter is activated.
   ⇨ Now you can connect the device to your network via WLAN (see description below), or set up and activate the device as a hotspot [▷ 114].
3. When connecting the device to your WLAN for the first time, you must enter all of the required values (steps 4-6).
4. Enter the SSID network name and the password for your WLAN.
5. If your network has a DHCP server, activate the [DHCP] button.
   ⇨ The functions "DHCP" and "Obtain DNS server address automatically" are activated together  .
   ⇨ All required values will be filled in by the DHCP server.
6. If no DHCP server is currently available, enter all of the required IP and DNS address data manually.
7. Tap on the [Apply] button.

Result

✓ The device connects to your WLAN.

* This option is not available in all countries.

4.9.3.2 WPA2/PEAP

Prerequisite

☑ WIFI corresponds to WPA2/PEAP

Action

1. Tap on ⚙ Settings ⟶ Scroll down in the Settings menu ⟶ Connectivity ⟶ WLAN.
2. Activate the "Activate WLAN" slide switch.
   ⇨ The WLAN adapter is activated.
   ⇨ Now you can connect the device to your network via WLAN (see description below), or set up and activate the device as a hotspot [▷ 114].
3. When connecting the device to your WLAN for the first time, you must enter all of the required values (steps 4-6).

4. Enter the SSID network name, your user name and the password for your WLAN. With WPA2/PEAP authentication you will also need a certificate file in one of the following formats: ".cer", ".der" or ".pem". The certificate file, as well as the user name and password, can by synchronized with, or derived from, the RADIUS server used in the network. To do this, please contact your IT administrator.
5. If your network has a DHCP server, activate the [DHCP] button.
   ⇨ The functions "DHCP" and "Obtain DNS server address automatically" are activated together .
   ⇨ All required values will be filled in by the DHCP server.
6. If no DHCP server is currently available, enter all of the required IP and DNS address data manually.
7. Tap on the [Apply] button.

Result

✓ The device connects to your WLAN.

* This option is not available in all countries.

4.9.4 Creating and activating the device as a hotspot

As soon as the WLAN adapter has been activated, you can define and activate the device as a hotspot.

The "IT Admin" user group must activate the hotspot so that the "Default Users" and "Users" user groups can use the device as a hotspot.
When the device is shut down, the hotspot function is switched off again.
After each reboot of the device, the "Default Users" and "Users" user groups can activate the hotspot function on the device [▸ 175].

You only have to set up the device as a hotspot once. The values you have entered will be stored.

Prerequisite

☑ WLAN adapter is activated [▸ 112]

Action

1. Tap on ⚙ Settings ⟶ Scroll down the Settings menu ⟶ Connectivity ⟶ HotSpot.
2. Activate the [Enable Hotspot] slide switch.
   ⇨ If the device has already been set up as a hotspot, it now can be used as a hotspot [▸ 175] by the "Default Users" and "Users" user groups.

3. When setting up the device as a hotspot for the first time, enter the SSID hotspot name and the password for this hotspot. Make sure that you assign a separate SSID hotspot name to each device to ensure that the desired hotspot can be correctly controlled.
4. Tap on the [Apply] button.

Result

✓ Now the device can be used as a hotspot [▶ 175] by the "Default Users" and "Users" user groups.

* This option is not available in all countries.

4.9.5 Network drive (option)

Enables the storage of patient data (still images and videos) in a shared network drive folder.

Prerequisite

☑ The hospital server supports the "Server Message Block (SMB)" and/or "Common Internet File System (CIFS)" protocols

☑ The device is connected to the respective network via LAN or WLAN

Action

1. Tap on ⚙ Settings → Connectivity → Network.
2. Place a check mark in the "Active network connection" box.
3. Enter the host name, user name, password, workgroup and share name.
   You will receive this information from your IT system rights administrator.
4. Tap on the [Apply] button.

Result

✓ The network connection is active.

4.9.6 Configuring the network connection for DICOM (option)

Network and DICOM addresses must be assigned by the IT system rights administrator in charge. Zeiss Service must be aware of all IT and DICOM parameters (PACS/RIS name, AE title, IP address, port number) ahead of the installation.

For detailed information, please refer to the ZEISS DICOM Conformance Statement, EN_30_200_0084I.

Prerequisite

☑ Select the correct PACS.
Be sure to check the connection configuration for a PACS, as data loss otherwise is possible.
Carry out the TCP/IP configuration correctly.
Export to a USB medium is enabled only after user and password authentication.

Action

1. Read and observe the ZEISS DICOM Conformance Statement, EN_30_200_0084I.
2. Tap on ⚙ Settings ⟶ Connectivity ⟶ DICOM.
3. Enter all DICOM data. Preset data can be overwritten.
You will receive this information from your IT system rights administrator.
4. Please pay attention to upper-case and lower-case letters in the AE titles.
5. Tap on the [Apply] button.
   ⇨ The network connection is active.
6. Tap on the [Test Connection] button.

Result

✓ The result of the connection test appears in an info window.

4.10 Changing the computer name of the device

You must delete all licenses on the device before changing its computer name, and then reimport the licenses after changing the device's computer name.

Action

1. Tap on ⚙ Settings ⟶ Service PC ⟶ Configuration.
2. Tap on the [Start] button in the "Delete all licenses" field.
3. Tap on ⚙ Settings ⟶ Connectivity ⟶ Computer Name.
4. Enter the new computer name for the device in the "Change computer name" field (after rebooting).
5. Tap on the [Apply] button.
   ⇨ A system message indicating that the computer name has been changed, licenses have been deleted and must be reimported and a reboot is required appears on the monitor.
6. Confirm the system message displayed on the monitor.
7. Reboot the device and log in as the "IT admin".
8. Tap on ⚙ Settings ⟶ Service PC ⟶ Configuration.
9. Tap on the [Reimport] button in the "Reimport licenses" field.
   ⇨ The licenses from the last backup are restored.
10. If you have backed up the licenses to a USB storage medium, plug the USB storage medium concerned into the device [▸ 109].

11. Tap on ⚙ Settings ⟶ Extras.
12. Tap on the [Start] button in the "Licenses" field.
    ⇨ The device imports all licenses from the USB storage medium.

4.11 Configuring the Service PC

The following settings and configurations may only be carried out by authorized users with IT Admin system rights.

The following settings are available:

- Service
  - Synchronize patient data
  - Export user
  - Import user
- Settings
  - Activate user password
  - Change standard password
  - Setting the system language
  - Change video frequency
  - Set the time
  - Change time format
  - Change date format
- Log files
  - Export log files
  - Export audit files
  - Load DICOM log files

4.11.1 Service

Action

1. Tap on ⚙ Settings ⟶ Service PC ⟶ Service.
2. Tap on the corresponding button [Start] in order to initiate the action.
3. Close the "Settings" menu by tapping on the ⌂ button.

4.11.2 Settings

4.11.2.1 Activating and changing the user password

If you enable the user password function in order to protect patient data, all users must log into the device using the standard password "zeisszeiss". All newly created users are also assigned the standard password. The standard password can be changed by the IT admin. The IT admin is responsible for the standard password and for providing it to all users of the device.

Users can log in to the device as a “Default User”; no password needs to be entered to do this. However, they will then only be able to view the current patient's data.

Action

1. Tap on Settings ⟶ Service PC ⟶ Settings.
2. Tap on the slide switch in the “Activate User Password” field to activate the user password.
   - ⇨ The slide switch will turn blue .
   - ⇨ The user password is activated.
   - ⇨ All users must log in on the device using the standard password that has been issued to them.
   - ⇨ Newly added users are automatically assigned the issued standard password.
3. In the "Standard Password" field, tap on the [Change] button to change the standard password.
4. Enter a new password.
5. Confirm your entry by tapping on the [Done] button.
6. Disclose the new user password to the users of the device.
   - ⇨ All users must log in on the device using the standard password that has been issued to them.
   - ⇨ Newly added users are automatically assigned the issued standard password.

Note: Disabling and re-enabling the user password will cause the passwords of all users to be reset to the standard password.

4.11.2.2 Setting general parameters

Action

1. Tap on Settings ⟶ Service PC ⟶ Settings.

   You can set the following general parameters:
2. **Set System Language:** ⟶ Select the desired system language.
3. **Set Date and Time:** ⟶ After setting, tap on the [Accept] button.
4. **Change Time Format:** ⟶ 24 h or 12 h.

5. **Change Date Format:** ⟶ DD.MM.YYYY or MM/DD/YYYY.
6. Close the "Settings" menu by tapping on the ⌂ button.

4.11.3 Log Files

Action

1. Tap on ⚙ Settings ⟶ Service PC ⟶ Log Files.
2. Tap on the corresponding button [Start] in order to initiate the action.
3. Tap on the button for the file type and select the file type to be loaded.
4. Tap on the [Load log file] button to start the action.
5. Close the "Settings" menu by tapping on the ⌂ button.

4.12 Connecting the navigation system to the device

You can connect the following navigation systems to the device:

- Navigation system via ODUMAC plug (standard navigation):
  - The navigation system is connected directly to the device via a cable with a connector.
- Navigation system via network (advanced navigation):
  - The navigation system is connected to the device via the network.

Once the navigation system has been connected to the device, trained personnel from the manufacturer of the navigation system must perform the calibration and inspection of the navigation functionalities.

⚠ CAUTION!

Damage resulting from incorrectly configured navigation antenna.

The navigation antenna may become maladjusted due to a collision during transport or coarse positioning. An incorrectly configured navigation antenna can result in erroneous interpretations of the navigation data.

- ▶ Check the calibration of the navigation system according to the manufacturer's specifications before every use.
- ▶ Before every intervention using a connected and authenticated navigation system, the function and accuracy of the navigation system must be verified accordingly (e.g. by focusing on a measuring point or comparing the focal point with a navigated instrument).
  Observe the corresponding specifications of the navigation system.

Prerequisite

☑ The navigation antenna has been installed on the microscope (by trained personnel from the navigation system manufacturer)

Action

1. If you use a standard navigation system via ODUMAC connector: Connect the navigation system directly to the device; for this purpose, read and observe the manufacturer's corresponding instructions.
2. If you use an advanced navigation system via network: Connect the navigation system to the device via the network; for this purpose, read and observe the manufacturer's corresponding instructions.
3. To install functionalities of the navigation system in the device, activate the navigation system Activating a connection to the navigation system [▶ 135].

4.13 Mounting the laser micromanipulators

⚠ CAUTION!

Incorrect mounting of a laser micromanipulator

Incorrect mounting of the laser micromanipulator can cause damage to equipment and errors during use. Anyone connecting additional equipment to medical electrical systems is considered a system configurer and as such responsible for compliance of the system with the standards for systems (see IEC 60601-1-1 or section 16 of the 3rd edition of IEC 60601-1, respectively). Local legislation has priority over the requirements of the abovementioned standards.

- ▶ Observe the information and the instructions for use supplied by the manufacturer of the laser micromanipulator. If necessary, contact your ZEISS representative.
- ▶ Before fitting the ZEISS dovetail mount, consult the laser manufacturer to check whether it is compatible. Some laser manufacturers offer their own assembly sets for their laser micromanipulators.

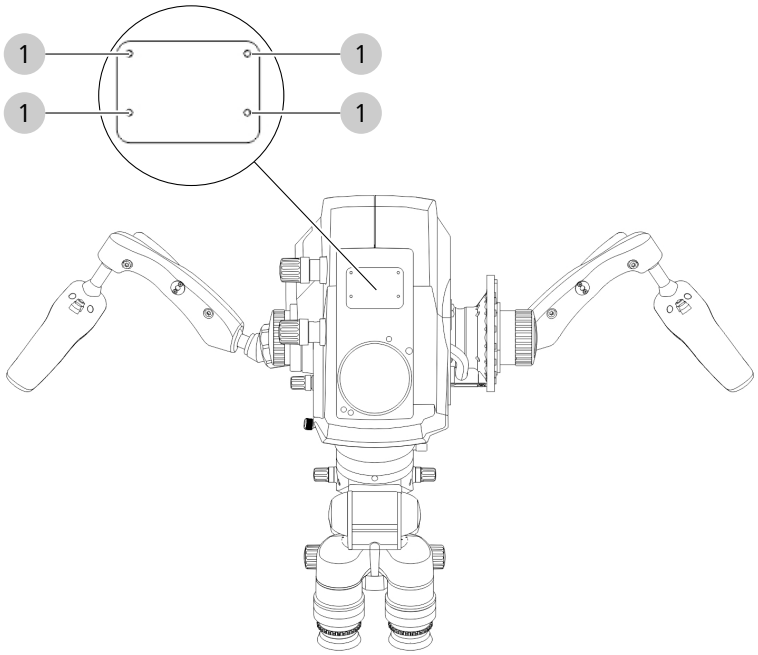


Figure 75: Fitting the dovetail mount on the underside of the surgical microscope

1	Threaded bores (4x) for fastening the dovetail mount for laser micromanipulators

Prerequisite

☑ A dovetail mount including four M3x12 fastening screws (screw material: A2-70) is available (order number: 303360-9903-000)

☑ The laser micromanipulator does not weigh more than 1 kg

☑ The device is switched off

Action

1. Fasten the dovetail mount for laser micromanipulators to the bottom of the surgical microscope using the four (M3x12) screws supplied.
2. Make sure that the maximum permissible screw-in depth of the fastening screws into the Varioskop carrier is 5 mm.
3. Tighten the four screws firmly to a tightening torque of 0.93 Nm.
4. Slide the laser micromanipulator into the dovetail mount.
5. Tighten the knurled screw firmly to secure the laser micromanipulator in the dovetail mount.

Result

✓ You can prepare the device for the use of a laser micromanipulator. [▸ 136]

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5 Daily startup

5.1 Safety during preparation

⚠ CAUTION!

Functional deterioration

The device's functionality can become impaired.

- ▶ Perform a functional test prior to each use of the device.
- ▶ Do not use the device if the function test shows signs of impaired functionality.

⚠ CAUTION!

Risk of infection caused by missing sterile accessories.

The patient can become infected if sterile accessories are not used.

- ▶ Use the device only with suitable sterile accessories.
- ▶ Disinfect, clean and sterilize sterile accessories before each use. This also applies to the first use after delivery. These procedures may only be performed by properly trained personnel.

⚠ CAUTION!

Risk of infection due to unsterile fluorescence target.

The patient may become infected if an unsterile fluorescence target is used.

- ▶ Therefore, perform the fluorescence function test prior to the operation and without a patient.

⚠ CAUTION!

Risk of tripping

Inappropriately laid cables represent an increased risk of tripping.

- ▶ Always route cables in a manner such that they do not obstruct your work.

NOTE

Damage due to covered ventilation slots

Covered ventilation slots may cause material damage due to overheating of the electronics, resulting in functional failure.

- ▶ Do not cover any ventilation slots.

5.2 Setting the position of the handgrips

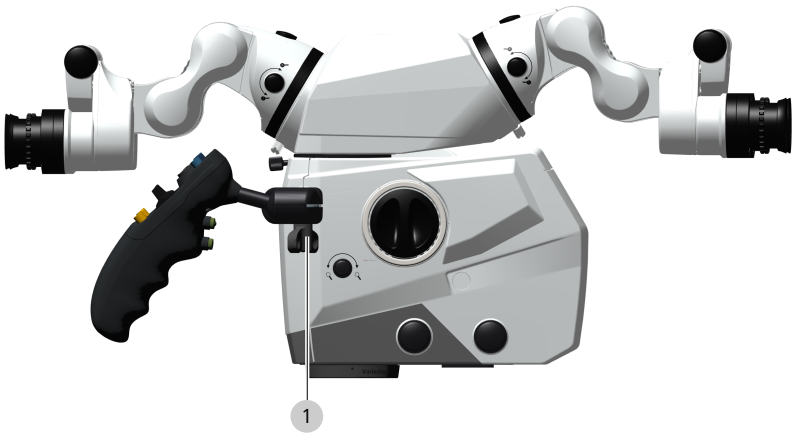


Figure 76: Setting the position of the hand grips

1	Hand grip clamping

Action

1. Open the hand grip clamp and swivel the hand grip into the desired position.
   The hand grip, including the clamp, can be rotated endlessly.
2. Choose a position of the hand grips which is most convenient for the surgical procedure to be performed.
3. Tighten the hand grip clamp by hand.
4. Then check whether the required swiveling ranges of the microscope are sufficient and any collisions with attached accessories can be excluded (lateral co-observer).

5.3 Positioning the device in the OR

5.3.1 Cranial procedures and ENT

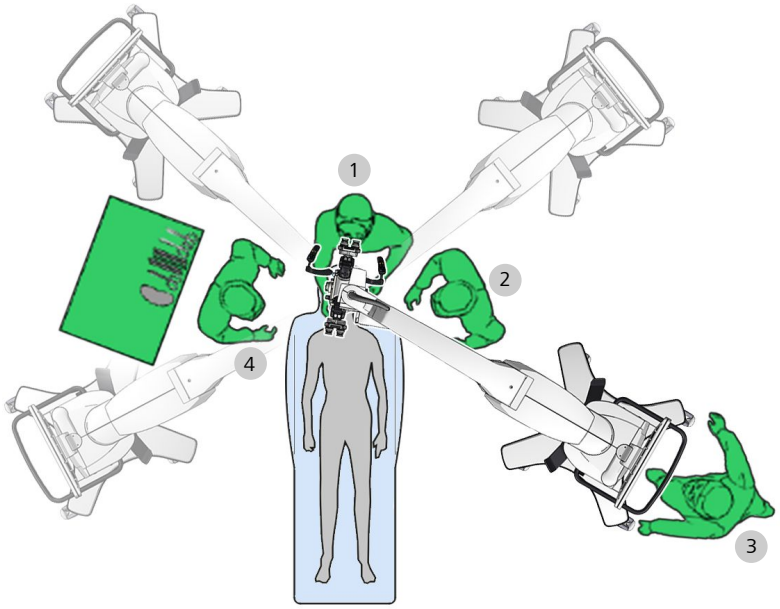


Figure 77: Possible positions for cranial procedures and ENT

1	Surgeon	2	Assistant
3	Non-sterile specialist	4	Sterile specialist

5.3.2 Face-to-face procedures

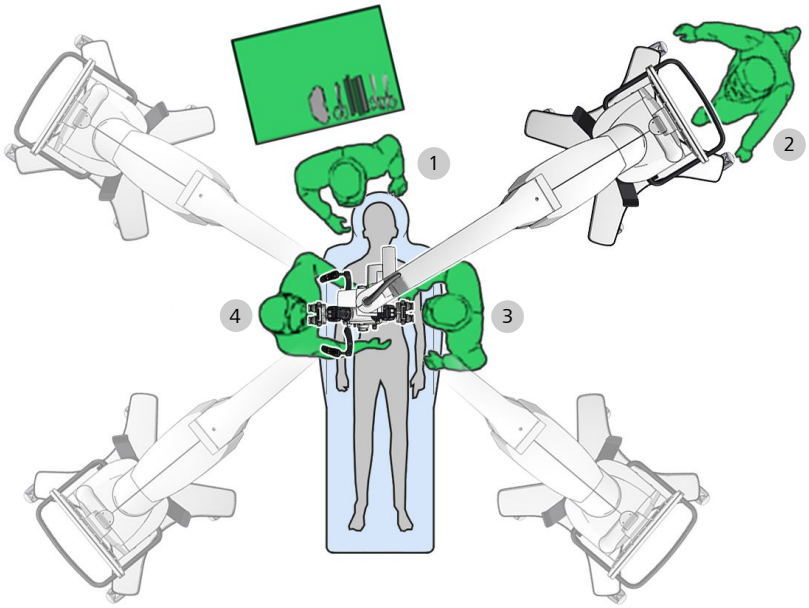


Figure 78: Possible positions for face-to-face procedures, e.g. spine procedures and P&R surgery

1	Sterile specialist	2	Non-sterile specialist
3	Assistant	4	Surgeon

5.3.3 Moving the device

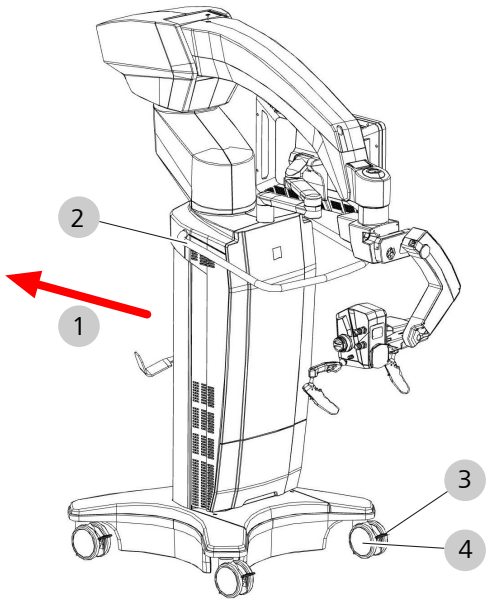


Figure 79: Moving the device

1	Pushing direction 	2	Transport handle
3	Locking mechanism	4	Steerable caster

⚠ CAUTION!

Risk of injury caused by uncontrolled device movements.

The device may make uncontrolled swinging movements if the suspension arm and the surgical microscope are not in the transport position.

- ▶ Place the device in the transport position before moving it.

Action

1. Hold the device in position with the transport handle.
2. Unlock all locking mechanisms.
3. Carefully move the device into a position that is favorable for you.
4. Fix this position with all locking mechanisms.
5. Make sure that the device is standing securely. Push and pull on the transport handle to check.

5.4 Checking the movement freedom of the device

Position the device in such a way that you can push it away from the patient at any time.
Since the connector of the power inlet socket is used as a disconnect device, the disconnect device must remain freely accessible.

5.5 Configuring the device for applications

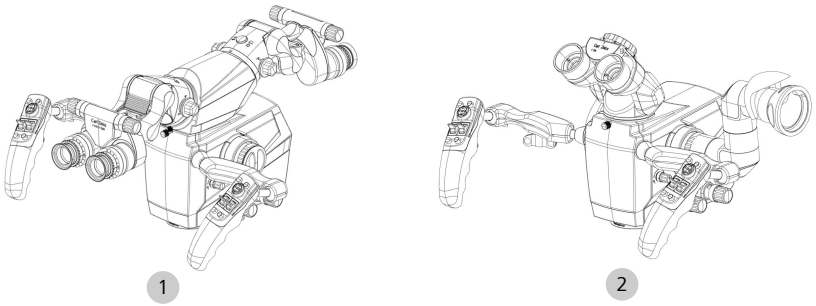


Figure 80: Configuring the device for applications

1	Configuring the device for “face-to-face” co-observation (spine)	2	Configuring the device for “left/right” co-observation (cranial)

For information on mounting the tubes, the stereo bridge and the documentation/co-observation system, refer to the section Attaching tubes and eyepieces [▶ 128].

5.6 Attaching tubes and eyepieces

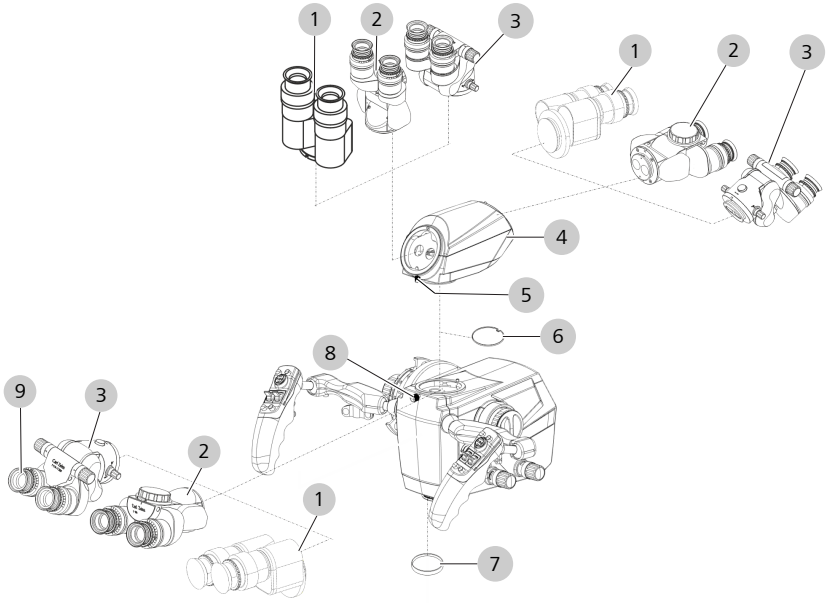


Figure 81: Attaching the tubes and eyepieces

1	Straight tube	2	Tiltable tube
3	Foldable tube	4	Stereo bridge
5	Stereo bridge fastening screw	6	Dust protection cover
7	Transport protection cover	8	Microscope body fastening screw
9	Stereo bridge fastening screw		

⚠ CAUTION!

Risk of injury to eyes caused by high light intensity.

Using the tube to look into the sun or a source of high intensity light can damage the retina of the eye.

- ▶ Never stare directly into the sun or a light source with the eyepieces or the binocular tube.

⚠ CAUTION!

Risk of injury caused by lowering of the surgical microscope or falling parts.

Lowering of the surgical microscope or falling parts may cause injury to the patient.

- ▶ Only use accessories which have been certified.
- ▶ Never change modules or approved accessories during a surgical procedure or over the patient.
- ▶ Always make sure that the maximum permissible load is not exceeded.
- ▶ Balance the completely equipped surgical microscope before each application.

NOTE

Damage caused by widefield eyepieces with magnetic coupling!

The magnets may cause property damage.

- ▶ Please observe the usual rules for the handling of magnets with regard to eyepieces that have been removed from the tube.
- ▶ Do not place the eyepiece near instruments which may be magnetizable.
- ▶ Do not place the eyepiece on sensitive electronic devices such as infusion pumps, pacemakers, measuring devices or magnetic data media such as floppy disks, audio and video tapes or credit cards.
- ▶ Always store the eyepiece in its original packaging when not using it.

5.6.1 Attaching tubes to the microscope body

Action

1. Unscrew the fastening screw on the microscope body several turns.
2. Remove the dust protection cover from the microscope body.
3. Mount the binocular tube (foldable tube or tiltable tube) and hand tighten the fastening screw on the microscope body.
4. Insert widefield eyepieces as far as they will go in the mounts provided on the binocular tube.
5. Remove the transport protection cover from the objective lens.
6. Enter the tube focal length and eyepiece magnification used in the "Settings Microscope / Tube" configuration menu so that the device can calculate the correct total magnification.

5.6.2 Attaching tubes and stereo bridge to microscope

Action

1. Unscrew the fastening screw on the microscope body several turns.
2. Remove the dust protection cover from the microscope body.
3. Mount the stereo bridge on the microscope body and hand tighten the fastening screw on the microscope body.
4. Mount the binocular tube (foldable tube, tiltable tube or straight tube) on the stereo bridge and hand tighten the fastening screw on the stereo bridge.
5. As required: Mount the binocular tube for face-to-face activities on the stereo bridge and hand tighten the fastening screw on the stereo bridge.
6. Insert widefield eyepieces as far as they will go in the mounts provided on the binocular tube.

7. Remove the transport protection cover from the objective lens.
8. Enter the tube focal length and eyepiece magnification used in the "Settings Microscope / Tube" configuration menu so that the device can calculate the correct total magnification.

5.6.3 Attaching the documentation/co-observation equipment

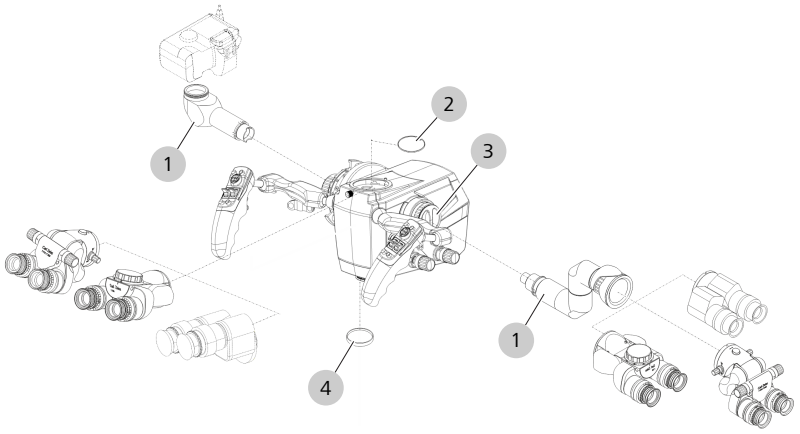


Figure 82: Attaching the documentation/co-observation system

1	Co-observation module, e.g. photo adapter for DSLR or stereo co-observer	2	Dust cover for main tube
3	The dust cover of the opposite co-observation module is not shown here.	4	Transport protection cover

Action

1. Remove the dust cover of the co-observation module.
2. Push the co-observation module or other optical accessory, e.g. the photo adapter for DSLR, into the mount of the image output as far as it will go.
   NOTE! The mount of the image exit port is fitted with guide tabs. The optical accessory can be inserted as far as it will go only if it is aligned to these guide tabs.
3. Screw the knurled ring onto the co-observation module or one of the other optical accessories used and tighten the knurled ring securely.
4. Only when using the co-observation module: Mount the binocular tube (foldable tube, tiltable tube or straight tube) on the co-observation module and hand tighten the fastening screw on the co-observation module.
5. Insert widefield eyepieces as far as they will go in the mounts provided on the binocular tube.
6. Remove the transport protection cover from the objective lens.

5.7 Attaching a ZEISS SMARTDRAPE

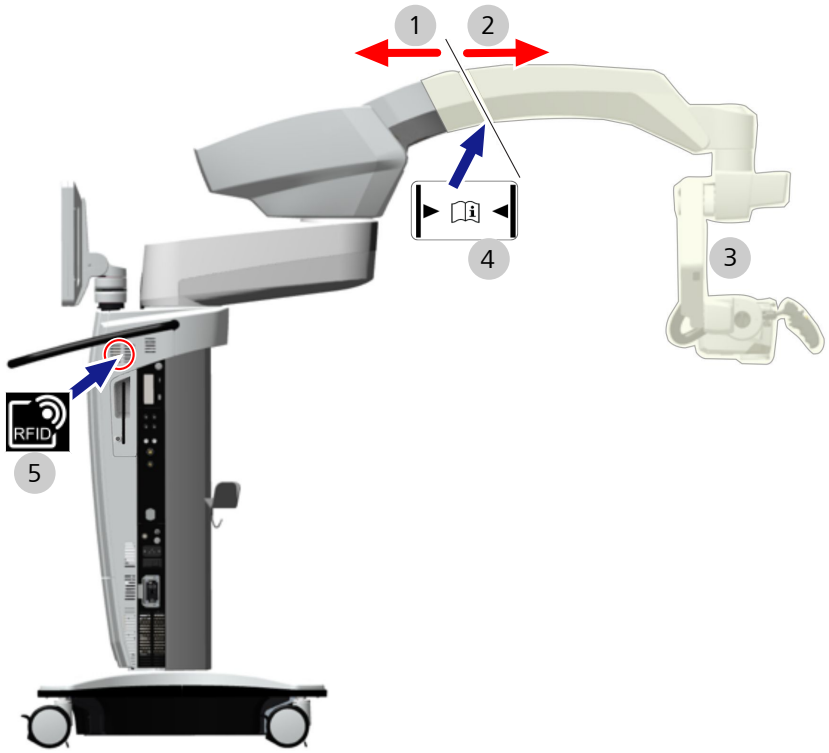


Figure 83: Attaching a ZEISS SMARTDRAPE

1	Non-sterile area	2	Sterile area
3	Effective area of drape vacuum system	4	Marking: Close SMARTDRAPE air-tight here
5	RFID reader		

⚠ CAUTION!

Risk of infection

Risk of infection due to contamination.

- For sterile draping of the device, use disposable sterile covers (ZEISS SMARTDRAPE).

⚠ CAUTION!

Using drapes from other manufacturers may result in deviations of the optical parameters.

The cover glasses on drapes from other manufacturers may impair the optical characteristics of the device. This may result in the transmission of falsified navigation data, for example.

- Only use a ZEISS SMARTDRAPE® with the device.

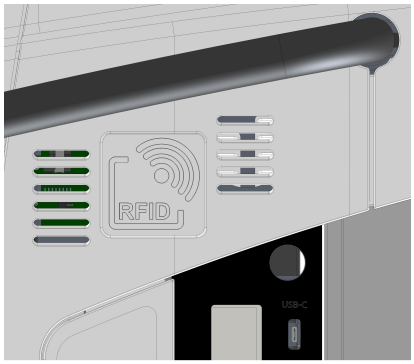
Prerequisite

☑ When using drapes from third-party manufacturers without RFID detection, the "AutoDrape" function (air extraction for easier draping) is not available. The magnetic fastening function cannot be used if the drape does not have a corresponding magnetic holder.

☑ ZEISS SMARTDRAPES (order number 306028-0000-000) are tested for use with navigation systems.

Action

1. Unpack the SMARTDRAPE.
2. Pull the SMARTDRAPE over the surgical microscope.
3. Fasten the drape ring of the SMARTDRAPE to the lens below the surgical microscope.
   ⇨ The drape ring with the magnet engages in the correct position (proper orientation of the beveled cover glass to prevent reflections).
4. Pull the SMARTDRAPE over the horizontal arm until it covers the marking.
   When attaching the SMARTDRAPE, make sure that there is sufficient free space for swiveling, tilting and rotating movements of the surgical microscope.
   Make sure the control elements can be safely operated through the SMARTDRAPE.
5. Seal the SMARTDRAPE airtight at the marking using one of the fastening straps.
6. Remove the RFID label from the SMARTDRAPE.
7. Stick the adhesive label on the RFID reader.



   ⇨ It can take up to 10 seconds to successfully read in the code.
   ⇨ A beep sounds as soon as the code has been successfully read in.
   ⇨ The AudoDrape function is available.
8. Open the additional menu “Extended operation” on the touchscreen.

9. Press the [AutoDrape] button in the additional menu to activate the AutoDrape vacuum pump.
   ⇨ The vacuum system operates at maximum power after approx. 2 minutes.
   ⇨ After approx. 2 minutes, the suction system automatically switches to a reduced power to maintain a vacuum.
10. Remove the RFID label once the operation has ended.

5.8 Balancing the device



Figure 84: Balancing the device

1	Axis 1	2	Axis 2
3	Axis 3	4	Axis 4
5	Axis 5	6	Axis 6

⚠ CAUTION!

Risk of injury caused by lowering of the surgical microscope or falling parts.

Lowering of the surgical microscope or falling parts may cause injury to the patient.

- ▶ Balancing and the subsequent test may not be carried out while the system is positioned above a patient; this may only be done at a safe distance from other people and devices.
- ▶ Check the balance of the device by actuating the brake buttons while holding the microscope securely by both hand grips. Repeat the balancing procedure if necessary.
- ▶ Only use accessories which have been certified.
- ▶ Never change modules or approved accessories during a surgical procedure or over the patient.
- ▶ Always make sure that the maximum permissible load is not exceeded.
- ▶ Balance the completely equipped surgical microscope before each application.

Action

1. To balance the whole device: on the touchscreen, tap the [System] button in the “Extended operation” menu.
   ⇨ Follow the instructions on the touchscreen.
2. Balancing axis 3 (drape): On the touchscreen, tap the [Drape] button in the "Extended operation" menu.
   ⇨ Follow the instructions on the touchscreen.

If the device has been correctly balanced, the surgical microscope should be able to be moved almost effortlessly.

5.9 Adjusting the microscope

Action

1. Position the microscope vertically above a flat object, e.g. a written piece of paper.
2. Bring the eyepieces on the binocular tube to eye distance, so that the two eyepiece images (the object and the periphery of the field of view) merge to produce a single image.
3. Set to the smallest magnification on the microscope.
4. Select as short a working distance as possible (shortest working distance + approx. 25 mm).
5. Adjust the diopter setting ring on the eyepiece to 0 dpt. (diopters).
6. Look through the eyepiece and focus the image sharply.
7. Set the microscope to the highest magnification and correct the fine focusing until the image is defined sharply.
8. Now set to the smallest magnification once again without changing the working distance.

9. Adjust the diopter setting ring on the eyepiece to the maximum positive dpt. value (e.g. +5 dpt.).
10. Look through the eyepiece and slowly turn the diopter setting ring in the minus dpt. direction until the image is once again defined sharply.
11. Repeat the entire procedure for the second eyepiece.
    ⇨ The microscope is now adjusted so that a constantly sharp image is produced throughout the entire magnification range without your having to refocus after changing the magnification value.
12. To refocus, repeat this procedure.
13. Adjust the eyecups so that you can survey the entire field of view.
    Observation using eyeglasses: Screw the eyecups in all the way.
    Observation without eyeglasses: Unscrew the eyecups and adjust them individually.

5.10 Activating a connection to the navigation system

Please note the information provided by the manufacturer of the navigation system. The navigation system to be connected must be calibrated once for the ZEISS TIVATO 700 by the manufacturer in order to be used properly.

⚠ CAUTION!

Damage resulting from incorrectly configured navigation antenna.

The navigation antenna may become maladjusted due to a collision during transport or coarse positioning. An incorrectly configured navigation antenna can result in erroneous interpretations of the navigation data.

- ▶ Check the calibration of the navigation system according to the manufacturer's specifications before every use.
- ▶ Before every intervention using a connected and authenticated navigation system, the function and accuracy of the navigation system must be verified accordingly (e.g. by focusing on a measuring point or comparing the focal point with a navigated instrument).
  Observe the corresponding specifications of the navigation system.

Prerequisite

☑ The navigation system is connected to the device [▶ 119]

Action

1. Tap on ⚙ Settings ⟶ o o o Navigation.
2. Activate the "network connection" (advanced navigation) or "serial connection" (standard navigation) depending on the existing connection.

3. Activate the "Active" field.
4. Activate the navigation function in the navigation software.
5. Confirm the connection dialog on the device to establish a connection between the device and the navigation software.
   ⇨ The "Navigation" function is activated.

5.11 Preparing the device for use of laser micromanipulators

⚠ CAUTION!

Danger due to unintentional change to the focus position.

Due to deactivation of the "Focus Lock" function, the focal planes of the surgical microscope and the laser micromanipulator no longer match and the desired effectiveness of the laser micromanipulator is not achieved.

- ▶ Before each use, check that the focal planes correspond (without a patient present). It is essential that the focal plane of the surgical microscope matches that of the laser micromanipulator.
- ▶ When operating an approved external laser micromanipulator, activate the "Focus Lock" function if it does not have an AF function.
- ▶ Observe the information and the instructions for use supplied by the manufacturer of the laser micromanipulator. If necessary, contact your ZEISS representative.

Prerequisite

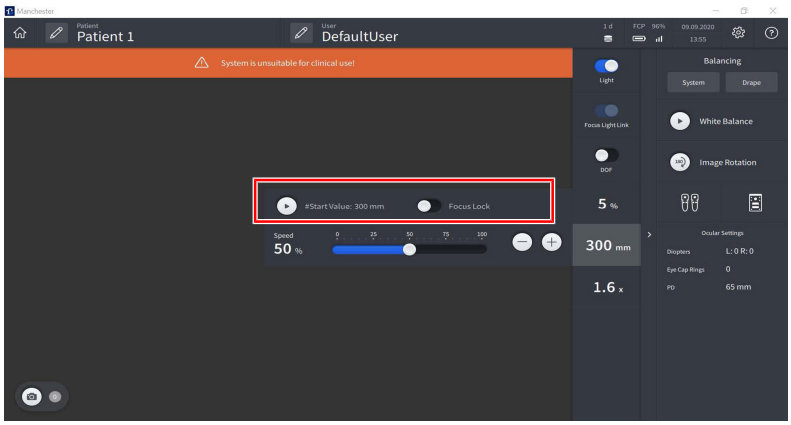
☑ The laser micromanipulator is mounted on the surgical microscope. [▷ 120]

☑ No patient is lying underneath the surgical microscope and the mounted laser micromanipulator.

Action

1. Switch the device on.
2. Setting the working distance (rough focus) via the home screen ⟶ Focus ⟶ Focus start value.
   The focus start value is saved in the user profile and should ideally be suited to the laser micromanipulator in use. See also section Configuring the focus [▷ 145].
3. If necessary, correct the focus adjustment by slightly shifting it (fine focus).
   ⇨ The current focus value is displayed on the monitor.
4. Aim the aiming beam at a suitable object (e.g. a wooden spatula) to check the mutual alignment of the focal planes.
5. Trigger a single pulse.
   ⇨ The center of the burn zone must not deviate from the center of the aiming beam by more than max. 0.5 mm.
6. If necessary, perform minor adjustments to correct the focus.

7. Activate the slide switch in the "Focus Lock" field.



   ⇨ All motorized focus functions, including the "SpeedFokus" function, are deactivated.

   ⇨ The focal planes cannot be motor adjusted.

   ⇨ The "SpeedFokus" function will not be triggered when the brakes are activated.

8. In order to work with the laser micromanipulator, read and observe the manufacturer's documentation.

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6 Operation

6.1 Safety during operation

⚠ CAUTION!

Risk of injury to eyes caused by the light source.

If light enters the patient's eyes during surgery in the facial area, there is a risk of damaging the retina.

- ▶ Make sure that no light enters the patient's eyes during operations in the facial area.
- ▶ Do not use the device to perform ophthalmological interventions on the patient.

⚠ CAUTION!

Risk of burns due to high light intensity.

The interaction of heat and antimicrobial substances in incision foils may lead to an increased reaction of the patient to these substances.

- ▶ Avoid using adhesive foil/incision foil to cover the patient wherever possible.
- ▶ Avoid high light intensity outside of the OR area.
- ▶ Avoid long treatment periods.

⚠ CAUTION!

Risk of burns due to high light intensity.

Using dry drapes to cover the patient increases the risk of 2nd degree burns due to an excessive light intensity.

- ▶ Avoid drying out of the drapes which are used to cover the patient.
- ▶ Make sure that the drapes always remain moist.
- ▶ Avoid high light intensity outside of the OR area.
- ▶ Avoid long treatment periods.

⚠ CAUTION!

Risk of burns due to high light intensity.

Using dry drapes to cover the patient increases the risk of 2nd degree burns due to an excessive light intensity when the device is switched on and left unattended.

- ▶ Never leave the device aimed at the patient while it is switched on.
- ▶ Never leave the device unattended for a longer period of time.

⚠ CAUTION!

Risk of burns due to high light intensity over a longer period of time.

If the application requires a high light intensity over a longer period of time, thermally induced tissue damage can occur in the area of the illuminated surgical field.

- ▶ Avoid excessively long treatment periods with a high light intensity.
- ▶ Reduce the light intensity during long treatment periods.

⚠ CAUTION!

Loss of functionality caused by hardware or software faults.

Loss of functionality can impair surgery.

- ▶ Perform a visual check and functional test prior to each use of the device.
- ▶ Keep a backup xenon lamp or OR illuminator ready at hand.
- ▶ Arrange suitable precautions, irrespective of the application, to be able to complete the operation or application without use of this microscope.
- ▶ Position the device in such a way that you can move it away from the patient at any time by overpowering the brake mechanism.

⚠ CAUTION!

Loss of electrical functions during surgery.

If electrical functionality is lost, some functions will not be available during surgery.

- ▶ Adjust the focus, zoom and luminous field size manually using the corresponding rotary knob on the microscope body.

⚠ CAUTION!

Light source failure caused by aging of the lamp.

As light sources age, their actual illumination intensity decreases. The intensity of the light sources may fluctuate, or the light sources may fail; this will increase the amount of time required to complete the surgery.

- ▶ Before each use, check each light source to make sure it is functioning properly.
- ▶ Xenon lamp option: Replace the lamp if required.
- ▶ Xenon lamp option: Keep a backup lamp or an OR illuminator ready at hand.
- ▶ Xenon lamp option: After installing the replacement lamp, check the brightness of the lamp and adjust it using the monitor.

⚠ CAUTION!

Xenon lamp failure caused by ageing of the lamp.

If the xenon lamp is used beyond its maximum life of 500 service hours, it may fail suddenly and interrupt operation.

- ▶ Please note the remaining service hours displayed on the touch-screen.
- ▶ Once the current xenon lamp has reached 500 service hours, activate the backup xenon lamp.
- ▶ Replace the xenon lamp when its operating time of 500 service hours has expired.

⚠ CAUTION!

LED light source failure caused by ageing of the lamp.

As the light source ages, the actual illumination intensity decreases. The intensity of the light sources may fluctuate, or the light sources may fail; this will increase the amount of time required to complete the surgery.

- ▶ Before each use, check each light source to make sure it is functioning properly.
- ▶ When the designated burn time has been exceeded, a fault signal will light up. Inform ZEISS Service.

⚠ CAUTION!

Risk of injury caused by electrical voltage.

Contact with plug connector contacts may cause electric shock.

- ▶ Never touch the contacts on plug connectors during contact with the patient.

⚠ CAUTION!

Damage resulting from failure of the touchscreen.

It is possible that loss of touchscreen functionality may only be the result of the screen's illumination failing. Touching the screen in this case may unintentionally open menus or change settings.

- ▶ Do not touch the touchscreen if the device is on and the screen is dark.

⚠ CAUTION!

Malfunction of INFRARED 800 recordings due to interfering radiation from the navigation system.

If INFRARED 800 and the navigation system are used simultaneously, the infrared light source of the navigation system may cause interference with the INFRARED 800 recording.

- ▶ Do not aim the infrared light source of the navigation system at the surgical field whenever INFRARED 800 and the navigation system are being used simultaneously.

6.2 Software configuration

6.2.1 Configure microscope

Tap on Settings → Microscope.

Prior to use, check the illumination and make sure that the illumination intensity required for the application is available.

6.2.1.1 Configuring the illumination of the xenon light source

You can assign illumination settings user specifically in the “Settings Microscope / Light” menu.

The settings made in the "Settings Microscope / Light" menu apply only to the current user.

The “Focus Light Link” function can be set via the "SmartLinks" in the "Light" submenu **or** in the main menu bar on the touchscreen.

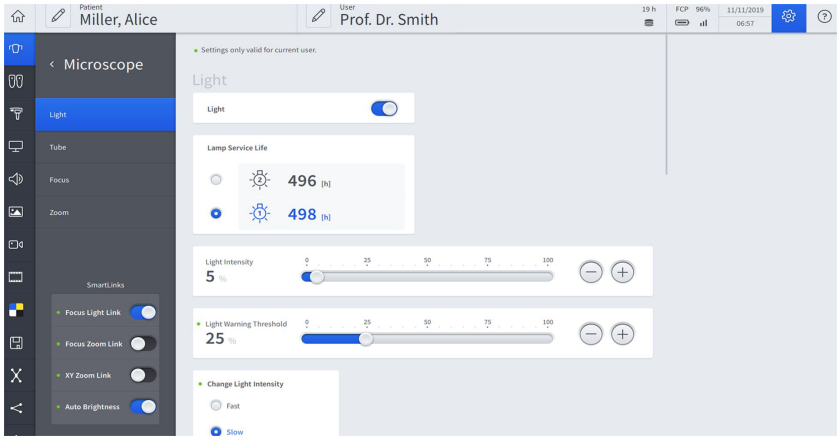


Figure 85: “Settings Microscope” menu, “Light” submenu for the xenon light source

⚠ CAUTION!

Danger resulting from excessive light intensity.

Decreasing the diameter of the field of view increases the light intensity in the surgical field. Excessive light intensity can burn the patient's surrounding tissue. This effect is amplified by using certain accessory parts, e.g. eyepieces with higher magnification, the 3-level magnification changer or the f170/f260 foldable tube with tube magnification (PROMAG function).

- ▶ When working at high magnification levels, pay particular attention to the set light intensity.

⚠ CAUTION!

Xenon lamp failure caused by ageing of the lamp.

If the xenon lamp is used beyond its maximum life of 500 service hours, it may fail suddenly and interrupt operation.

- ▶ Please note the remaining service hours displayed on the touch-screen.
- ▶ Once the current xenon lamp has reached 500 service hours, activate the backup xenon lamp.
- ▶ Replace the xenon lamp when its operating time of 500 service hours has expired.

Action

1. Tap on ⚙ Settings → Microscope → Light.
2. Use the [Light Intensity] slide control to set the required illumination intensity.
3. Set the required warning threshold level on the [Light Warning Threshold] slide control.
   ⇨ The value set is displayed in the “Light” menu.
   If the light warning threshold is exceeded, this is displayed by an orange color in the live menu, in the main menu bar, [Light Intensity] slide control.
4. Select the speed of light intensity change with the [Fast] or [Slow] button in the "Change Light Intensity" menu **or** with the [High] or [Low] button on the hand grip and the foot control panel.
5. Activate or deactivate the [Focus Light Link] switch in the “SmartLinks” menu.
   ⇨ Activated: The maximum adjustable light intensity is limited depending on the working distance used.
6. Activate or deactivate the [Auto Brightness] switch in the "SmartLinks" menu.
   ⇨ Activated: Automatic control of the light intensity for constant image brightness in the eyepiece.
7. Check the remaining lamp operating time of both xenon lamps (the active lamp is “Lamp 1” in the default setting).
8. Once the current xenon lamp has reached 500 service hours, press the [Change Lamp] button to activate the backup xenon lamp.

6.2.1.2 Configuring the illumination of the LED light source

You can assign illumination settings user specifically in the “Settings Microscope / Light” menu.

The settings made in the "Settings Microscope / Light" menu apply only to the current user.

The “Focus Light Link” function can be set via the "SmartLinks" in the "Light" submenu **or** in the main menu bar on the touchscreen.

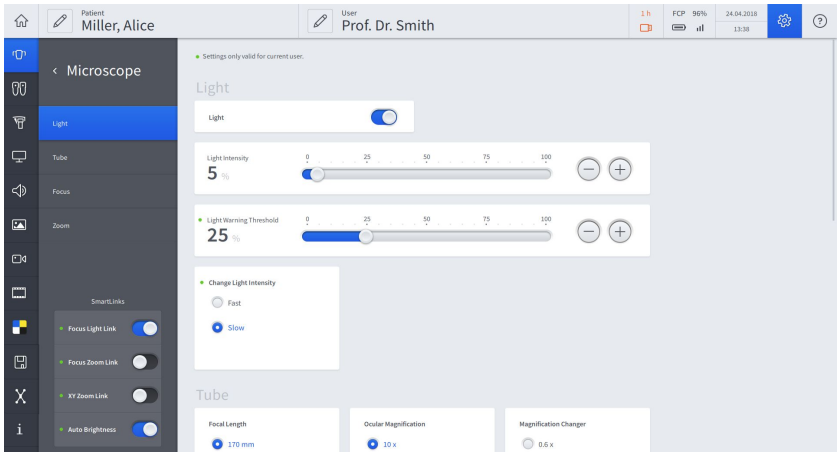


Figure 86: “Settings Microscope” menu, “Light” submenu for the LED light source

⚠ CAUTION!

Danger resulting from excessive light intensity.

Decreasing the diameter of the field of view increases the light intensity in the surgical field. Excessive light intensity can burn the patient's surrounding tissue. This effect is amplified by using certain accessory parts, e.g. eyepieces with higher magnification, the 3-level magnification changer or the f170/f260 foldable tube with tube magnification (PROMAG function).

▶ When working at high magnification levels, pay particular attention to the set light intensity.

Action

1. Tap on ⚙ Settings → Microscope → Light.
2. Use the [Light Intensity] slide control to set the required illumination intensity.
3. Set the required warning threshold level on the [Light Warning Threshold] slide control.
   ⇨ The value set is displayed in the “Light” menu.
   If the light warning threshold is exceeded, this is displayed by an orange color in the live menu, in the main menu bar, Light Intensity slide control.
4. Select the speed of light intensity change with the [Fast] or [Slow] button in the "Change Light Intensity" menu **or** with the [High] or [Low] button on the hand grip and the foot control panel.
5. Activate or deactivate the [Focus Light Link] switch in the “SmartLinks” menu.
   ⇨ Activated: The maximum adjustable light intensity is limited depending on the working distance used.

6. Activate or deactivate the [Auto Brightness] switch in the "SmartLinks" menu.
   ⇨ Activated: Automatic control of the light intensity for constant image brightness in the eyepiece.

6.2.1.3 Configuring the tube

Action

1. Tap on Settings → Microscope → Tube.
2. Tap on the focal length of tube in use: (170 mm for tiltable tube and foldable tube or 260 mm for foldable tube with magnification).
3. Tap on the eyepiece magnification of the eyepieces used: (10x or 12.5x).
4. Tap on the magnification of the optional 3-position magnification changer.

6.2.1.4 Configuring the focus

Action

1. Tap on Settings → Microscope → Focus.
2. Use the [Start Value] slide controller to set the desired start value for the working distance.
   ⇨ This setting is saved as the start value for the user.
   ⇨ This setting is also used as the initial working distance value for working with a laser micromanipulator. See Preparing the device for use of laser micromanipulators [▷ 136].
3. Use the [Speed] slide controller to set the start value for the motorized fine focus.
   ⇨ This setting is saved as the start value for the user.
4. Tap the [SpeedFokus (SF)] button (SpeedFokus) to adjust the focus automatically.
   ⇨ SpeedFokus (SF) on: SpeedFokus is automatically activated each time the brakes are applied and after XY fine adjustment is performed using the joystick. SpeedFokus can also be triggered via a configurable button on the hand grip or the foot control panel.
   ⇨ SpeedFokus (SF): SpeedFokus is triggered via a configurable button on the hand grip or the foot control panel.
   ⇨ SpeedFokus is not available during some specific applications, e.g. when using a micromanipulator (Focus Lock function). A corresponding acoustic signal is then emitted.
5. Select the size of the focus area (ROI – Region of Interest).
   ⇨ Low: The focusing algorithm is optimized for a small ROI.
   ⇨ Medium: The focusing algorithm is optimized for a medium-sized ROI.
   ⇨ High: The focusing algorithm is optimized for a large ROI.

6. Tap on the [Focus Lock] button if you with to use an optional micromanipulator with a fixed working distance.
   ⇨ Focus Lock on: SpeedFokus is deactivated. The focus cannot be adjusted; the focus rocker switch on the hand grip/foot control panel is out of operation.
   ⇨ Focus Lock off: SpeedFokus is in operation. The focus can be adjusted; the focus rocker switch on the hand grip/foot control panel is active.
7. Tap the [Increased DOF] button to activate the depth of field (DOF).
   ⇨ Increased DOF on: High depth of field – less light – lower image resolution
   ⇨ Increased DOF off: Low depth of field – more light – higher image resolution

6.2.1.5 Configuring zoom

Action

1. Tap on Settings → Microscope → Zoom.
2. Set the desired value on the [Start value] slide control.
3. Set the desired value on the [Speed] slide control.

6.2.1.6 Configuring SmartLinks

Action

1. Tap on Settings → Microscope.
   ⇨ Four SmartLinks are available for your selection in the microscope menu:
2. Activate the Focus Light Link function.
   ⇨ This limits the maximum light intensity for the selected working distance (focus).
3. Activate the Focus Zoom Link function.
   ⇨ The focusing speed is automatically adapted to the magnification. The preselected focusing speed is automatically reduced when a higher magnification is used.
4. Activate the XY Zoom Link function.
   ⇨ The motorized XY travel speed is automatically adapted to the magnification. The preselected travel speed is automatically reduced when a higher magnification is used.
5. Activate the Auto Brightness.
   ⇨ This regulates the light intensity for constant image brightness in the eyepiece depending on the working distance and magnification.
6. Close the "Settings" menu by tapping on the ⌂ button.

6.2.2 Configuring the button assignment of the handgrips and foot control panel

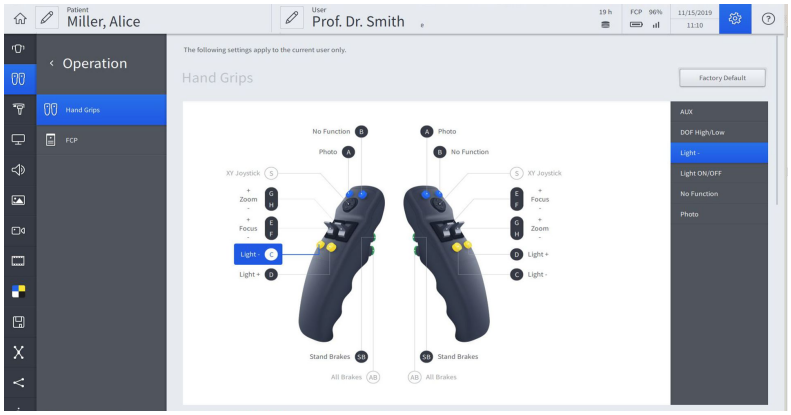
6.2.2.1 Configuring the handgrips

In the “Hand Grips” menu, you can assign user-specific functions to the buttons.

The settings made in the "Hand Grips" menu apply only to the current user.

Action

1. Tap on Settings → Operation → Hand Grips.



2. To assign a function to a button: Tap on the corresponding letter e.g. [A].
   ⇨ A field with the available functions appears in the selection field on the right side.
3. Tap on the function to be assigned to the button.
   ⇨ The function is accepted and displayed next to the button symbol.
4. You can swap the zoom and focus functions of the two rocker switches and change the respective direction (+/-).
5. Tap on the rocker switch symbols [E-F], [G-H].
   ⇨ The available functions appear in the selection field on the right side.
6. Tap on the function to be assigned to the rocker switches.
   ⇨ The function is accepted and displayed next to the button symbol.

6.2.2.2 Configuring the brake release buttons

The brake release buttons are located on the back of the handgrips .

- The lower button [AB] is not configurable. When pressed, it releases all microscope and stand axes for positioning.
- The upper button [SB] (stand brakes) can be used to enable various movement modes, depending on the system configuration.

Action

1. Tap on Settings → Operation → Hand Grips.



2. To assign a function to the [SB] button: Tap on an [SB] button symbol.
   ⇨ The available functions appear in the selection field on the right side.
3. In the selection field, tap on a function that you wish to assign to the button (e.g. SB: release stand brakes).
   ⇨ The function is accepted and displayed next to the button symbol.

HINT: Test the button assignment and the functions of the brake release buttons before every application and without a patient.

6.2.2.3 Configuring the foot control panel (FCP)

In the "FCP" menu, you can assign user-specific functions to the buttons.

Action

1. Tap on Settings → Operation → FCP.
2. To assign a function to a button: Tap on a button symbol, e.g. [A].
   ⇨ The available functions appear in the selection field on the right side.
3. Tap on a function in the selection field to be assigned to the button.
   ⇨ The function is accepted and displayed next to the button symbol.
4. The zoom and focus functions can be swapped or the direction (+/-) can be changed.

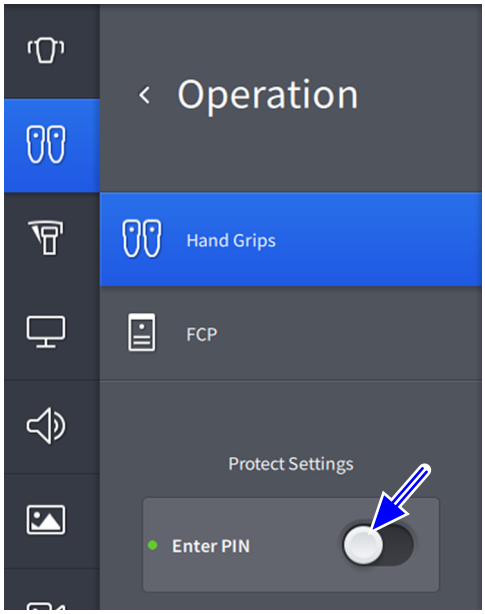
5. Tap on the rocker switch symbols [I-G], [J-H].
   ⇨ The available functions appear in the selection field on the right side.
6. Tap on a function in the selection field to be assigned to the rocker switches.
   ⇨ The function is accepted and displayed next to the button symbol.

6.2.2.4 Protect Settings

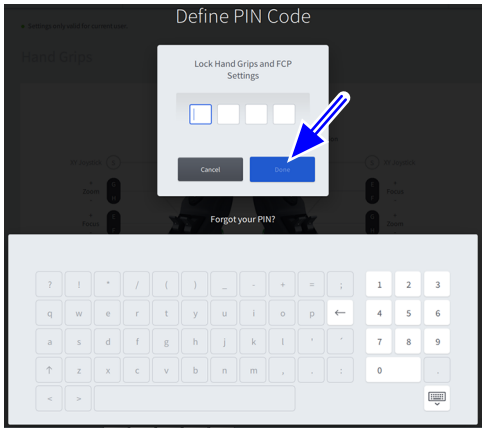
Every user can protect his handgrip and foot control panel configuration from third-party access with a password (PIN). Settings thus protected can be changed again only after unlocking them with the valid PIN.

Action

1. Tap on Settings → Operation.
2. Tap on the [PIN input] button to activate the lock .



3. Enter a 4-digit PIN.



4. To save the PIN number: tap the [Done] button.

   ⇨ The switch in the [PIN input] button lights up blue .
   In the "Operation" menu, this is displayed for all controls at the upper right by the symbol.
   The PIN lock is jointly active for all controls.

6.2.2.5 Unlocking settings

Action

1. To Unlock tap on the [PIN input] button .
2. Enter your PIN.
3. Tap the [Done] button.

   ⇨ The switch in the [PIN input] button lights up gray .
   The PIN lock is jointly deactivated for all controls.
   In the "Operation" menu, this is displayed for all controls at the upper right by the symbol.

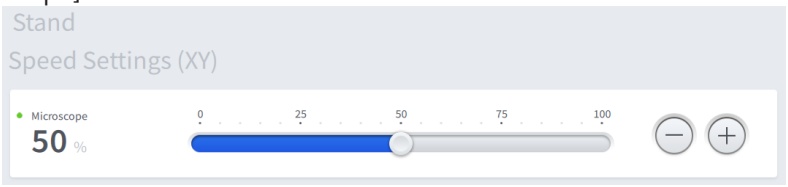
4. Close the "Settings" menu by tapping on the button.

6.2.3 Configuring the stand

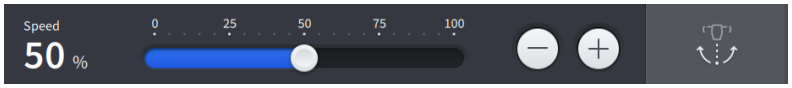
The settings made in the "Stand" menu apply only to the current user.

Action

1. Tap on Settings → Stand.
2. Set the speed for microscope movements with the [Microscope] slide control.



3. Close the "Settings" menu by tapping on the button.
4. Change the speed as required directly with the [Speed] slide control in the main menu bar.



6.2.4 Configuring displays

Display on external monitors

Action

1. Tap on Settings → Displays.
2. In this menu, you define which display is to be displayed with which quality on external monitors.
3. Close the "Settings" menu by tapping on the button.

6.2.5 Configuring Audio

Action

1. Tap on Settings → Audio.
2. Turn the sound on  and set it to the desired volume with the controller or turn the sound off  .
3. Close the “Settings” menu by tapping on the button.

6.2.6 Configuring Photo

The settings made in the "Photo" menu apply only to the current user.

Action

1. Tap on Settings → Photo.
2. Select whether the photos are to be taken with the internal camera or with the external DSLR camera (option) in the "Recording" field.
3. Select the desired format for saving your photos on the device in the "Storage format (internal camera)" field.
4. If you would like to take photos with an external camera, activate the slide switch in the "Light intensity for external camera" field.
   - ⇨ The switch illuminates blue  .
   - ⇨ The light intensity of the illumination is briefly set to the maximum value when the external DSLR camera is triggered (flash function).
5. Close the "Settings" menu by tapping on the button.

6.2.7 Configuring the video camera

All settings in this menu are displayed in the preview image.

The settings made in the "Video Camera" menu apply only to the current user.

Action

1. Tap on Settings → Video Camera.
2. Set the parameters of the video camera as desired.

6.2.7.1 Setting the brightness

You can set the exposure for the video recording via the shutter control and via the direct exposure control:

Action

▶ Select the "Auto" or "Manual" function in the "Shutter Control" field.

⇨ Auto: The video camera controls the exposure time automatically and keeps the set brightness constant. Select the "Spot" or "Full" function in the "Exposure Control" field. Use the [Auto Brightness] controller to set the required exposure time.

⇨ Manual: Set the exposure time manually in the "Manual Shutter" field.

6.2.7.2 Setting the color saturation and hue

You can set the hue and color saturation (chroma) of the integrated camera.

Action

1. Set the desired value with the slide control in the "Color Saturation" field.
   ⇨ Higher values produce more intensive colors.
2. Set the desired value with the "Hue" slide control.
   ⇨ A hue of ±0 usually provides the most natural color impression.

6.2.7.3 Setting the red and blue values

You can set the coloring of the integrated camera via the red level and the blue level.

Action

▶ Set the required values in the "Red Fine Adjustment" and "Blue Fine Adjustment" fields using the corresponding controllers.

⇨ Values of ±0 usually provide the most natural color impression.

6.2.7.4 White Balance

You can perform a white balance for the integrated camera. Here the system adjusts the signal of the integrated camera in such a way that white areas in the surgical field also appear white on the monitor.
A white balance must not be executed during a fluorescence application in order to ensure that the camera parameters are not falsified. Furthermore, the influence of extraneous light must be minimized or avoided (e.g. sunlight incidence through a window or direct illumination from a surgical ceiling light).

Prerequisite

☑ The illumination is switched on at the device

☑ The device is not in the fluorescence mode

☑ The surgical field is shielded from extraneous light

Action

1. Set the light intensity to 40 - 60%.
2. Aim the surgical microscope at a white object.
3. Focus on the white object.
   ⇨ The field of view is sharply discernible.
4. Start the white balance. Tap on the [White Balance] button.
   ⇨ The following prompt is displayed: "Set the light intensity to 40 - 60% and insert a white sheet of paper in the field of view".
5. To start the white balance: Tap on the [Start] button. To cancel the operation: Tap on the [Cancel] button.
   ⇨ The message “Please wait - white balance in progress!” appears. After a successful white balance, the message "White balance completed successfully” appears. If it was not successful, the message “White balance failed” is displayed.
6. Following a successful white balance, tap on the [Done] button.
   ⇨ The white balance settings are saved user-dependently.

6.2.8 Configuring the video recording

Action

1. Tap on ⚙ Settings 🎞 → Video Recording.
2. If you would like to record your video data for video streaming in high definition, tap on "HD Video" in the "Recording Quality" field.
   ⇨ The video files will be recorded in high definition.
   ⇨ The data volume increases in proportion to the length of the recording. Prior to the recording, check whether there is sufficient space on the storage medium.
   ⇨ Recording video data in HD quality is suitable for short operations.
3. If you would like to record your video data for video streaming in medium definition, tap on "Medium Quality" in the "Recording Quality" field.

4. If you would like to record your video data for video streaming in low definition, tap on "Low Quality" in the "Recording Quality" field.
   ⇨ The video files will then be recorded in low definition. The quality of the recorded video data is therefore lower than for recordings performed in HD video quality.
   ⇨ The data volume is much lower.
   ⇨ Recording video data in low resolution quality is suitable for long operations.
5. Switch on "Video Streaming" →  if you would like to live stream video recordings to a streaming client.
   ⇨ The web address of the device which must be entered as the Streaming Client is displayed in the "Web Address for Video Streaming" field.
6. Close the "Settings" menu by tapping on the ⌂ button.

6.2.9 Configuring fluorescence

All of the settings you select in the "Fluorescence" menu apply only to the currently active user.

Action

1. Tap on ⚙ Settings → Fluorescence.
2. Select the desired fluorescence application in the "Fluorescence Mode" field.
   Only activated fluorescence options are displayed.
3. YELLOW 560: "Light Intensity (start value)" → Set the start value with the slide control.
4. IR 800: "Gain (start value)" → Set the desired start value with the slide control.
5. IR 800: "IR 800 Retries" → Set the desired number of retries with the slide control.
   You can set the repetition rate to a value ranging from 0 to 10.
   ⇨ The recordings are played back successively until the repetition rate set by you is reached or the Fluorescence button on the hand grip or foot control panel is pressed.
6. Close the "Settings" menu by tapping on the ⌂ button.

6.2.10 Configuring storage

Action

1. Tap on ⚙ Settings → **o o o** Storage.
2. Select the data storage medium: "HDD", "USB" or Network".
3. Close the “Settings” menu by tapping on the ⌂ button.

6.2.11 Configuring navigation

Action

1. Tap on ⚙ Settings → **o o o** Navigation.
2. Select the connection mode for transferring the navigation data: "UDP Connection" or "Serial Connection".
3. Close the “Settings” menu by tapping on the ⌂ button.

6.3 Managing users

In the “User” menu, you can manage a maximum of 40 users. You can assign a user language and various user-specific settings to each user.

- You can change the names of users. You cannot change the name of the default user.
- You can delete users. You cannot delete the active user or the default user.
- If the desired user is not displayed, scroll down on the touch-screen display.

6.3.1 Adding users

If you are operating the device as a default user, you can only add a new user if the user password function is deactivated, see Activating and changing the user password [▶ 118].

When adding a new user, the default settings are adopted first; user-specific settings (labelled on the touchscreen with a green dot) may be made by the user at any time.

Action

1. Tap the [User] button in the status bar.
2. Tap on the button 👤+.
3. Enter: name, language, interpupillary distance, diopters of the left/right eye, marking rings of the adjustable eyecup for the new user.
   ⇨ The user name can be freely selected. The selection of a user name (entry of personal data) is the responsibility of the user.
4. Tap on the [OK] button  .
5. In order to select the new user as an active user, tap on the desired user name in the "Select user" menu.
   ⇨ The current user is highlighted in blue.
   ⇨ The new user is now highlighted in blue and is shown as an active user in the status list.
6. Close the menu by tapping on the ⌂ button.

6.3.2 Configuration of users

In the status bar of the "Configure User" menu ✎, you can perform the following user profile settings for the current user:

- Editing the user name
- Language selection
- Add comment
- Enter the interpupillary distance
- Enter left eye diopters
- Enter right eye diopters
- Marking ring on the adjustable eyecup

  If the entered values (in the case of interpupillary distance, diopters of left and right eye) are greater than adjustable values, a note on the permissible values appears at the top of the touchscreen.

Action

1. Tap on the [Configure User] button ✎ in the status bar.
2. Tap on the respective field: [user name, language, comment ...].
3. Enter the information for the user profile.
4. Tap on the [Save] button.

   ⇨ The user profile settings are now saved for the current user.

6.3.3 Exporting user settings to a USB storage device

All users (including Default_User) can export their own complete user settings to a USB storage device in order to transfer them to another ZEISS TIVATO 700.

Some configuration information, in particular user settings that can be exported and imported, are saved without being encrypted. The user has the option of deleting the data at any time.

The IT Admin user can select and export all user data records to a USB storage device at once.

Action

1. Select the user to be exported as the active user.
2. Tap on the [Configure User] button ✎ in the status bar.
3. Connect the USB storage device to the USB port.
4. Tap on the [Export] button ⍐ to export the complete user settings to a USB storage device.

6.3.4 Importing user settings from a USB storage device

A logged-in user (including DefaultUser) can import his/her personal user settings from a user record stored on a USB storage device.

Some configuration information, in particular user settings that can be exported and imported, are saved without being encrypted. The user has the option of deleting the data at any time.

Only the IT admin can import complete user data records. Records imported in this way are created as new users.
When a new user is created, it is always checked whether this name already exists. If the newly added user name already exists, a suffix is appended to it (e.g. “Ellen Edwards_2”).

Action

1. Tap on the [Configure User] button in the status bar.
2. Connect the USB storage device to the USB port.
3. Tap on the [Import] button to import the complete user settings from the USB storage device.
   ⇨ The list of user records stored on the USB storage device will appear.
4. Select the user record to be imported.
   ⇨ The selected user record will be imported.
   The selected user will appear as the active user in the status bar.

6.3.5 Change of user

It is not possible to change users during a video recording. Therefore, always terminate any running video recordings before changing users.

Action

1. Tap on the [User] button in the status bar.
   ⇨ The “Select User” menu is displayed. The current user is highlighted in blue.
2. Tap on the new user name.
   ⇨ The new user is displayed. The “Change of user” menu is hidden.

6.3.6 Copy a user

Action

1. Tap on the [User] button in the status bar.
   ⇨ The “Select User” menu is displayed.
   All stored users are displayed. The user list is sorted alphabetically.
2. If a user is not displayed, scroll down the user list.
3. Tap on the [Configure User] button.
4. Mark the box in front of the user name.
   ⇨ The desired user is highlighted in blue.

5. Tap on the [Copy] button at the bottom left to copy the user record.
   ⇨ The copy (with the suffix "_1" appended to the name) is displayed below the copied user.

6.3.7 Delete User

Action

1. Tap on the [User] button in the status bar.
   ⇨ The "Select User" menu is displayed.
2. Tap on the [Configure User] button.
   ⇨ All stored users are displayed. The user list is sorted alphabetically.
3. If the new user is not displayed, scroll down the user list.
4. Mark the box in front of the user name to be deleted.
   To delete multiple users simultaneously, mark the boxes in front of the names of all users to be deleted.
   ⇨ Your selection is confirmed by a symbol.
5. Tap on the [Delete] button to delete the user name(s) you have selected.
   ⇨ The "Delete User" menu is displayed.
6. To delete the user(s): Tap on the [Yes] button.
   ⇨ The user(s) has/have been deleted.
7. Tap on the live image on the touchscreen to close the menu.

6.4 Managing patients

Patients are managed exclusively externally by connecting a USB storage device, via an optional integrated hard disk or via a network connection.

Depending on how it has been configured, the device offers various possibilities for saving patient data. Data that is saved directly onto a USB stick is not encrypted. The user is responsible for keeping the data secure.

You can manage patient data in the "Patient" menu. In the patient menu, you can save, export or delete images, videos or data.

6.4.1 Adding a patient

Prerequisite

☑ A storage device (USB storage device, optional integrated hard disk) is connected or a network connection has been established.

Action

1. Tap on the [Patient] button in the status bar.
   ⇨ The "Patient" menu is displayed.
2. Tap on the [Add Patient] button.
   ⇨ The "Create New Patient" menu is displayed.

3. Tap on the field for which you wish to enter data: [First name, Last name, Gender, Date of birth, Patient ID, Comments ...].
   ⇨ The virtual keyboard is displayed.
4. Enter the desired patient data.
   If the date is entered in the wrong format, a message will appear at the top of the touchscreen: "Wrong format. Use MM/DD/YYYY."
5. Tap on the [Done] button.
   ⇨ The patient data are saved for the current patient.
6. To close the "Patient" menu: Tap on the [Patient] button or on the ⌂ button in the status bar.

6.4.2 Changing patients

It is not possible to change patients during a video recording. Always terminate any running video recordings before changing patients.

Prerequisite

☑ A storage device (USB storage device, optional integrated hard disk) is connected or a network connection has been established.

Action

1. Tap on the [Patient] button in the status bar.
   ⇨ The "Patient" menu is displayed.
2. Tap on the new patient name.
   ⇨ The patient folder is displayed and created as the current patient.
3. To close the "Patient" menu: Tap on the [Patient] button or on the ⌂ button in the status bar.

6.4.3 Editing patient data

In the status bar of the "Edit patient data" menu ✎, you can perform the following settings for the current patient:

- Change first name
- Change last name
- Add comment
- Gender
- Date of birth
- Patient ID

Prerequisite

☑ A storage device (USB storage device, optional integrated hard disk) is connected or a network connection has been established.

Action

1. Tap on the [Edit patient data] button in the status bar.
   ⇨ The "Edit patient data" menu is displayed.
2. Tap on the field for which you wish to enter data: [First name, Last name, Gender, Date of birth, Patient ID, Comments ...].
   ⇨ The virtual keyboard is displayed.
3. Change the required patient data.
4. Tap on the [Done] button.
   ⇨ The patient data are saved for the current patient.

6.4.4 Searching for a patient

Prerequisite

☑ The desired storage device has been selected: integrated hard disk (option), external storage device or connection to a network.

Action

1. Tap on the [Patient] button in the status bar.
   ⇨ The "Patient" menu is displayed.
2. Tap on the [Search] button.
   ⇨ A search window is displayed.
3. Enter your search criteria: patient name, starting letters, etc.
   ⇨ The patient or patient group being searched for is displayed.

6.4.5 Sorting patients

Prerequisite

☑ The desired storage device has been selected: integrated hard disk (option), external storage device or connection to a network.

Action

1. Tap on the [Patient] button in the status bar.
   ⇨ The "Patient" menu is displayed.
2. Tap on the [Filter] button.
   ⇨ The sorting criteria [Date], [Name], [Size] are displayed.
3. Tap on the desired [Button].
   ⇨ The patient list is displayed sorted.
4. Tap on the [Sort] button to display the sorted patient list in ascending or descending order (alphabetical order).
5. To close the "Patient" menu: Tap on the [Patient] button or on the button in the status bar.

6.4.6 Exporting patient data

Prerequisite

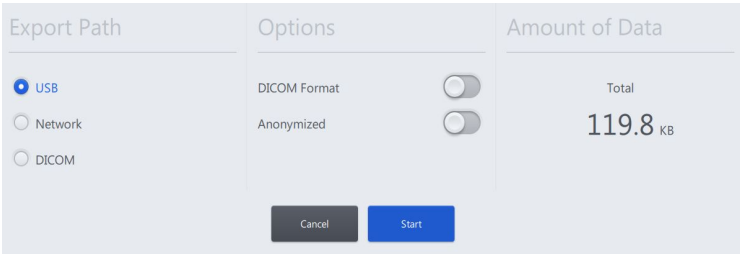
☑ When exporting to a USB storage medium, the target storage medium has enough free space; the USB symbol in the status bar must not be colored orange.

☑ The desired storage device has been selected:
integrated hard disk (option), external USB storage device or connection to a network.

☑ A network connection to a DICOM server has been established.

Action

1. Tap on the [Patient] button in the status bar.
   ⇨ The “Patient” menu is displayed.
2. Tap on the name of the patient whose data you want to export.
3. Tick the checkbox in front of the patient name.
   ⇨ Selecting all of the patient names using the "Select all" button can take some time.
   ⇨ Your selection is confirmed by a  symbol.
   ⇨ In the preview window, all of the patient's data are marked with a  symbol.
4. Deactivate the data you do not want to export.
5. Tap on the [Export Selected] button  .
   ⇨ The “Export Patient Data” menu is displayed.



6. Select the desired export path: "USB", "Network" or "DICOM" button.
7. Select the memory option:
   DICOM format (for USB and network storage only)
   On: Images are stored on a USB medium in DICOM format.
   Off: Images are stored in native format (PNG, JPEG) in the predefined patient data structure.
   Anonymized
   On: No user or patient names are stored in the EXIF image data.
   Off: The EXIF image data include user and patient names.
8. Tap on the [Start] button to export the patient data.

9. A successful export is acknowledged by a short status message.
10. To close the Patient menu: Tap on the "Patient" button or on the ⌂ button in the status bar.

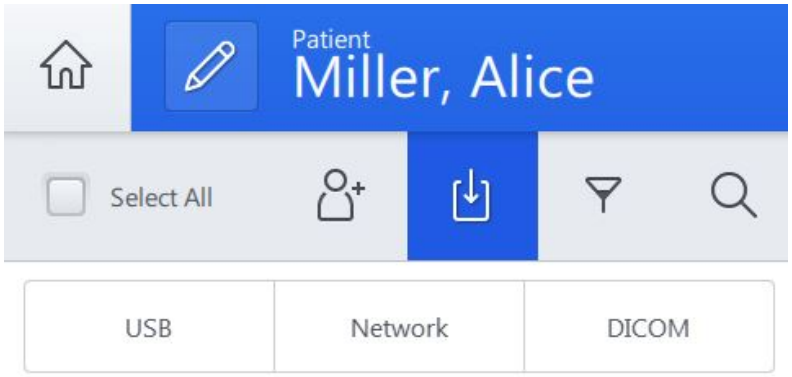
6.4.7 Importing patient data from the USB port or network

Prerequisite

☑ The desired storage device has been selected:
integrated hard disk (option), external USB storage device or connection to a network.

Action

1. Tap on the [Patient] button in the status bar.
   ⇨ The “Patient” menu is displayed.
2. Tap on the [Import] button.
3. Select the medium from which the patients are to be imported: [USB] or [Network] button.



   ⇨ The “Import Patient” menu is displayed.
4. Mark the box in front of the name of the patient whose patient data you want to import.
   Mark the [Select All] box if you want to import all of the displayed patients.
5. Tap on the [Start] button to import the patient data.
   ⇨ A new patient record is always imported, i.e. the data are not added to the existing patient record.
   ⇨ If a new patient record is imported which has the same name as the existing patient record, there will be two patient records with the same name.
   If necessary, change the new patient name (by adding the suffix “_1”).
6. To close the “Patient" menu: Tap on the [Patient] button or on the ⌂ button in the status bar.

6.4.8 Importing patient data from the DICOM Worklist

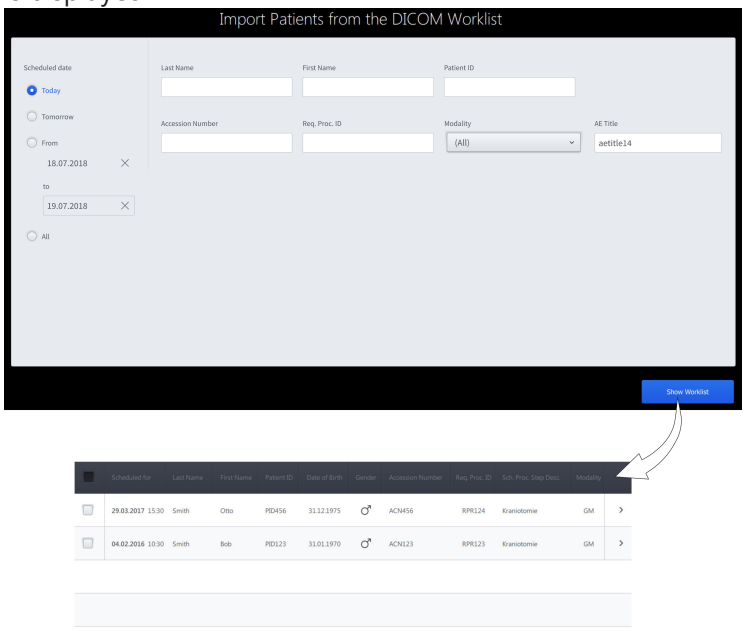
Prerequisite

☑ The desired storage device has been selected:
integrated hard disk (option), external USB storage device or connection to a network.

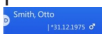
☑ A network connection to a DICOM server has been established.

Action

1. Tap on the [Patient] button in the status bar.
   ⇨ The “Patient” menu is displayed.
2. Tap on the [Import] button.
3. Tap on the [DICOM] button.
   ⇨ The input mask "Import patient data from DICOM Worklist" is displayed.



4. Fill out the offered search criteria.
   The search criteria are interpreted as an "AND conjunction".
   Empty search windows are interpreted as "wild cards" (placeholders for other characters).
   To limit the search, you can e.g. enter the first letters of the patient’s name.
5. Select the scheduled date.
6. Select the [Modality].
7. Tap on the [Show Worklist] button.
   ⇨ All patients of the DICOM Worklist are displayed.
8. If you would like to view further details of individual patients, tap on the corresponding arrow key on the right side of the screen. The arrow keys are briefly shown after the file is opened.
   ⇨ The DICOM Worklist is then displayed with the planned patient records.

9. Push this list to the right to return to the DICOM Worklist.
10. Mark the box in front of the name of the patient whose patient data you want to import.
    Mark the box in the header of the DICOM Worklist if you want to import all of the displayed patients.
11. Tap on the [Import selection] button.
    ⇨ The “Patient” menu is displayed.
    ⇨ The imported patient(s) are marked with a "D" in the patient list.
    
    ⇨ The patient name will now have an information symbol next to it in the status bar.
    
    Tapping this symbol opens a detailed list of patient data.
12. To close the “Patient" menu: Tap on the [Patient] button or on the ⌂ button in the status bar.

6.4.9 Deleting patients

Prerequisite

☑ The desired storage device has been selected:
integrated hard disk (option), external storage device or connection to a network.

Action

1. Tap on the [Patient] button in the status bar.
   ⇨ The “Patient” menu is displayed.
2. Tap on the patient to be deleted.
   To delete multiple patients simultaneously, mark the boxes in front of the names of all patients to be deleted.
   ⇨ Your selection is confirmed by a symbol.
3. Tap on the [Delete] button to delete the selected patient.
   ⇨ The “Delete Patient Data” menu is displayed.
4. To delete the patient(s):
   Place a check mark next to "Remove patient".
   Then tap on the [Yes] button.
   ⇨ The patient or patients is/are then deleted.
5. To close the “Patient" menu: Tap on the [Patient] button or on the ⌂ button in the status bar.

6.5 Video recording (option)

"Video Recording" allows you to record the integrated camera's Live Video during the surgical procedure. The recorded video is assigned to the patient currently selected as active in the process. The following possibilities exist for recording a video:

- Hand grip button: Settings → Operation → Hand Grips → Configure a configurable button for video recording
- [Video] button on the touchscreen: Start

Prerequisite

☑ The desired storage device has been selected: integrated hard disk (option), external storage device or connection to a network.

Action

1. Starting the video recording: Tap the [Video Recording] button or press the button on the hand grip programmed for "Video Recording".
   ⇨ On the touchscreen, the [Video Recording] button changes from to and the time display indicates the runtime of the video recording.
   ⇨ A blue bar with information on the video recording appears in the status line at the bottom of the touchscreen: On the left side: e.g. HD recording; on the right side: storage location, e.g. internal hard drive with specification of storage capacity in percentage.
2. Stopping the video recording: Tap the [Video Recording] button again or press the button on the hand grip programmed for "Video Recording".

TIP:
During a video recording, additional photos can be taken via the [Photo] button. These photos also can serve as markers. During the playback of the video, the marked locations can be called in succession via the [Search Backwards] or [Search Forwards] button in the "Record" menu.

You can change to the Patient Video menu of the current patient by tapping on the [Videos] button on the touchscreen (bottom left).

6.6 Creating photos with the integrated video camera

You can create current photos and assign them to a patient.
The following possibilities exist for creating a photo:

- Hand grip button: → Configurable button is configured for the "Photo" function
- [Photo] button on the touchscreen
- [Photo] button in the Video Player, during playback of a video from the patient data.

Prerequisite

☑ The desired storage device has been selected: integrated hard disk (option), external storage device or connection to a network.

Action

1. Create a photo: Tap the [Photo] button or press the button on the hand grip configured for the “Photo” function.
   ⇨ A thumbnail of the acquired photo is briefly displayed above the [Photo] button. At the same time, an acoustic signal sounds. The photo is saved.

Tip:

You can change to the Patient Photo menu of the current patient by tapping on the [Photos] button (at the bottom left) on the touchscreen.

When playing back a recorded video, you can take a photo of the current video playback position and use it as a marker for this position in the video. During the playback of the video, the marked locations can be called in succession via the [Search Backwards] or [Search Forwards] button in the “Record” menu.

6.7 Patient data, photos and videos

⚠ CAUTION!

Risk of misdiagnosis due to uncalibrated external video monitor!

The external video monitor is neither calibrated nor designed for diagnostic purposes. Use of the video monitor for diagnostic purposes can lead to misdiagnoses.

▶ Do not use the data displayed on the video monitor for diagnostic purposes.

Patients are managed via an (optional) integrated hard disk, by connecting an external USB storage device or via a network connection.
To perform the activities described below, the ZEISS TIVATO 700 must equipped with an (optional) integrated hard disk, a USB storage device must be connected or a network connection must be established.

6.7.1 Opening the patient directory

Action

1. Tap on the [Patient] button in the status bar.
   ⇨ The patient directory opens. The data of the current patients are displayed.

6.7.2 Display of media objects (files)

Three views are available for displaying the files in the patient directory. Tapping one of the icons changes the display view.



Action

1. Preview
   ⇨ Only one file is displayed per page.
2. Large display
   ⇨ Files are displayed in a large format.
3. Small display
   ⇨ Files are displayed in a small format depending on the number of files.

Tip: If necessary, scroll up or down to display files which are outside of the currently visible area.

6.7.3 Viewing patient images

Action

1. Tap the [Photos] button in the “Patient” menu.
   ⇨ All of the patient's photos will be displayed.
   If not all of the photos are displayed, scroll down in the photo list.
2. Tap the photo you want to view in full size.
   ⇨ A full size version of the photo will appear.
   The following information/buttons are displayed:
   ⇨ Opened photo/number of photos
   ⇨ Date and time of recording
   ⇨ Located on the left and right edge of the photo are arrows [<], [>] for moving in reverse or forward.

3. Tap the appropriate arrow [<], [>] to view the previous photo or the next photo or "swipe" horizontally across the touch-screen.
4. To close the menu: Tap the [Patient] button or ⌂ in the status bar.

6.7.4 Viewing patient videos

Action

1. Tap on the [Videos] button in the "Patient" menu .
   ⇨ All videos of the patient are displayed.
   If not all of the videos are displayed, scroll down the video list.
2. Tap on the video you want to view in full size.
   The following information/buttons are displayed in the footer of the video player:
   ⇨ Opened video/number of videos
   ⇨ Date and time of recording
   ⇨ Playback / pause
   ⇨ Fast forward
   ⇨ Take photo of/save current display
   ⇨ Delete
   ⇨ Export
3. Tap on the [Start] button ⓟ to start the playback. Tap on the [Pause] button ⓟ to stop the playback.
4. Tap on the [Fast Forward] button ⓟ to run the video forward at fast speed.
5. Tap on the [Record] button ⓟ to record and save a frame from the sequence. A marker is also set simultaneously. It should provide you with orientation in the video.
   Markers are assigned to the photos in the video.
6. Tap on the [Delete] button 🗑 to remove the current video.
7. Tap on the [Export] button ⎙ to export the current video.
8. Located on the left and right edge of the video are arrows [<], [>] for moving in reverse or forward. Tap on the appropriate arrow [<], [>] to open the previous video or the next video.

6.8 DICOM (option)

Transfer of patient data

The DICOM option enables a standardized exchange of patient data with the PACS system of the clinic.
Please observe the DICOM Conformance Statement applicable to

the ZEISS TIVATO 700: EN_30_200_0084I.
In order to utilize the DICOM functionality, the ZEISS TIVATO 700 must be registered and configured in the hospital network.

NOTE

Do not use images and videos for diagnostic purposes!

The monitor is not calibrated and is not designed for diagnostic purposes.

- The video contents and images displayed on the monitor (cut sequences) must not be used for diagnostic purposes. They may contain deviations with respect to scale, shape, contrast and color.

Patients are managed exclusively externally by connecting a USB storage device or via a network connection. To perform the activities described below, a USB storage device must be connected or a network connection must be established.

6.8.1 Importing patient data from the DICOM Worklist

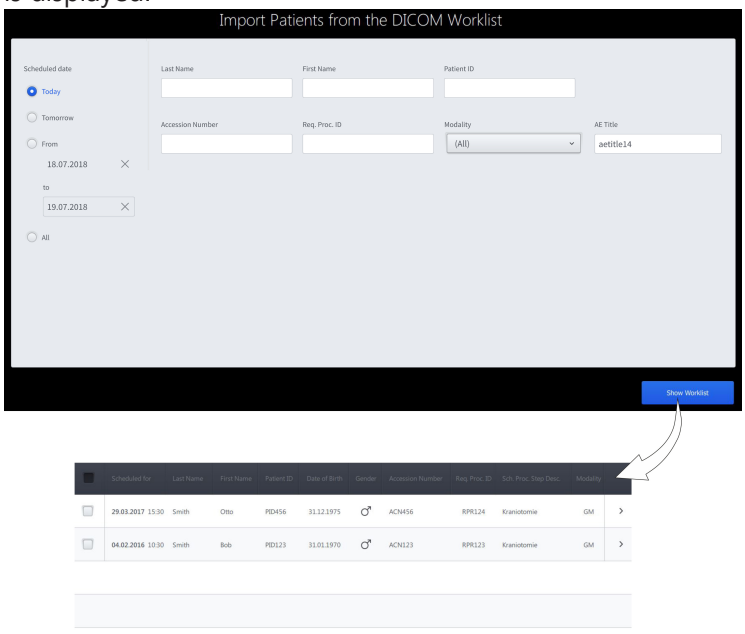
Prerequisite

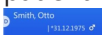
☑ The desired storage device has been selected: integrated hard disk (option), external USB storage device or connection to a network.

☑ A network connection to a DICOM server has been established.

Action

1. Tap on the [Patient] button in the status bar.
   ⇨ The “Patient” menu is displayed.
2. Tap on the [Import] button.
3. Tap on the [DICOM] button.
   ⇨ The input mask "Import patient data from DICOM Worklist" is displayed.



4. Fill out the offered search criteria.
   The search criteria are interpreted as an "AND conjunction".
   Empty search windows are interpreted as "wild cards" (placeholders for other characters).
   To limit the search, you can e.g. enter the first letters of the patient's name.
5. Select the scheduled date.
6. Select the [Modality].
7. Tap on the [Show Worklist] button.
   ⇨ All patients of the DICOM Worklist are displayed.
8. If you would like to view further details of individual patients, tap on the corresponding arrow key on the right side of the screen. The arrow keys are briefly shown after the file is opened.
   ⇨ The DICOM Worklist is then displayed with the planned patient records.
9. Push this list to the right to return to the DICOM Worklist.
10. Mark the box in front of the name of the patient whose patient data you want to import.
    Mark the box in the header of the DICOM Worklist if you want to import all of the displayed patients.
11. Tap on the [Import selection] button.
    ⇨ The "Patient" menu is displayed.
    ⇨ The imported patient(s) are marked with a "D" in the patient list.
    
    ⇨ The patient name will now have an information symbol next to it in the status bar.
    
    Tapping this symbol opens a detailed list of patient data.
12. To close the "Patient" menu: Tap on the [Patient] button or on the button in the status bar.

6.8.2 Exporting patient data to DICOM

Action

1. Tap on the [Patient] button in the status bar.
   ⇨ The "Patient" menu is displayed.
2. Mark all data to be imported.
3. Tap on the [Export Selected] button at the bottom right on the touchscreen.
   ⇨ The "Export Patient Data" menu is displayed.

4. Tap on the [DICOM] selection field in the “Export Path” field.
5. Tap on the [Start] button to export the patient data.
   ⇨ The message "Export in progress" is displayed.

6.9 YELLOW 560 (option)

The descriptions and notes that follow in this section apply both for the YELLOW 560 module and the YELLOW 560 LED module.

Because of regulatory restrictions regarding the contrast medium used with YELLOW 560, the YELLOW 560 option is not registered in all countries, and is therefore not available in every country. Please contact your local ZEISS representative to obtain information regarding the registration status of YELLOW 560 in your country.

Normal use

YELLOW 560 is an optional function for surgical microscopes which is used to view and visually assess the intraoperative blood flow in the cerebral vascular area, including but not limited to the evaluation of cerebral aneurysms and vascular twig occlusions as well as the permeability of very small perforating vessels.

YELLOW 560 also supports real-time visualization of the blood flow and the visual assessment of vessel types before and after arteriovenous malformation (AVM).

YELLOW 560 is designed for excitation in the wavelength range of 460 to 500 nm and observation in the wavelength range of 540 to 690 nm. The surgeon can switch back and forth between white light and blue excitation light for fluorescence at the touch of a button. For optimal viewing of the florescent light, the room or the ambient lighting should be dimmed.

Normal use under standard conditions

⚠ CAUTION!

Risk of misdiagnosis due to uncalibrated external video monitor!

The external video monitor is neither calibrated nor designed for diagnostic purposes. Use of the video monitor for diagnostic purposes can lead to misdiagnoses.

- ▶ Do not use the data displayed on the video monitor for diagnostic purposes.

The YELLOW 560 fluorescence option permits the user to visualize and digitally record fluorescent light and autofluorescent light emitted by tissue.
The visualization of the fluorescence signal is influenced by several different factors:

- the fluorescence medium and its concentration in the tissue
- the illumination intensity of the light source in the defined wavelength range
- the transmission of the optical system
- the total magnification and the aperture setting
- the working distance and the illuminated field diameter

When using the ZEISS TIVATO 700 in connection with a fluorescence medium, the same medical contraindications apply as when using suitable marker substances.

As in almost all procedures, false-positive and false-negative results can also occur in the fluorescence-guided method.

For optimal visualization of the fluorescence signal, the room and surrounding lights should be dimmed.

6.9.1 Configuring YELLOW 560

6.9.1.1 Configuring the fluorescence button on the handgrip or FCP

Action

1. Tap on Settings → Operation → Configure handgrips or FCP →Fluorescence button.
2. Tap on a configurable button.
   ⇨ The available functions appear in the selection field on the right side.
3. Tap on the “Fluorescence” function in the selection field.
   ⇨ The function is accepted and displayed next to the button symbol.

6.9.1.2 Configuring the light intensity for YELLOW 560

In order to achieve a good fluorescence result, ZEISS recommends using the factory setting of 100%.

Action

1. Tap on Settings→ Fluorescence → YELLOW 560.
2. Set the desired start value with the YELLOW 560 [Light Intensity] controller.
   ⇨ The surgical field will be illuminated with this light intensity as soon as YELLOW 560 is activated.

* In China the light intensity cannot be set to 100% in the YELLOW 560 fluorescence mode due to national regulations.

6.9.1.3 Configuring Video Recording for YELLOW 560

Action

1. Tap on ⚙ Settings → 🎥 Video Camera.
2. Scroll down in the "Video Camera" menu to → YELLOW 560.
3. Set the shutter control to “Auto” or “Manual”.
4. If you have set the shutter control to “Auto”, set the desired brightness level on the [Auto Brightness] slide control.
5. If you have set the shutter control to “Manual”, set the desired exposure time in the [Manual Shutter] selection field.
6. Close the "Settings" menu by tapping on the ⌂ button.

6.9.2 Procedure for YELLOW 560 function test

⚠ CAUTION!

Risk of infection due to not sterile fluorescence target.

The patient may become infected if a not sterile fluorescence target is used.

▶ Therefore, perform the fluorescence function test prior to the operation and without a patient.

Action

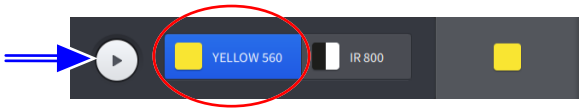
1. Place the target in the center of the illuminated field.
2. Set the focus to 300 mm.
3. Set the zoom to 4.5x.
4. Move the microscope up and down to focus it on the supplied target.
5. Dim the room lighting.
6. Start the YELLOW 560 fluorescence application, see Starting the YELLOW 560 fluorescence application [▷ 174].
7. Check whether the image on the touchscreen corresponds to the supplied sample image in the target.
   NOTE! There may be some slight differences in color and brightness.
8. Stop the YELLOW 560 fluorescence application.

6.9.3 Starting the YELLOW 560 fluorescence application

As soon as the YELLOW 560 fluorescence application is started, the "Navigation" function is automatically deactivated in order to prevent any impairment of the image quality in the eyepiece and on the video image.

Action

1. To start the YELLOW 560 fluorescence application, tap on the handgrip or the FCP button to which you have assigned the “Fluorescence” function.
2. Or, in the main menu bar on the touchscreen, tap on Fluorescence ⟶ YELLOW 560 ⟶ Start the fluorescence application ⟶  .



Result

✓ The YELLOW 560 fluorescence application begins.

✓ The "Navigation" function (if activated) is automatically deactivated.

6.10 Using the device as a hotspot

As soon as the WLAN adapter has been activated, you can use the device as a hotspot.

After each reboot of the device, the hotspot must be switched on again by the "Default Users" or "Users" user group. When the device is shut down, the hotspot function also is switched off.

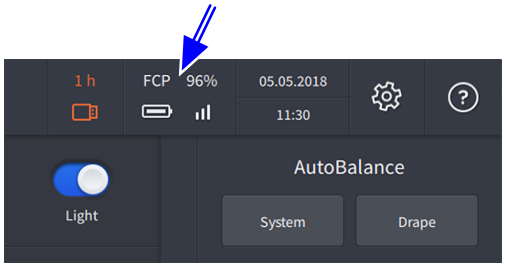
Prerequisite

☑ WLAN adapter is activated [▷ 112]

☑ Device was set up and activated as a hotspot [▷ 114] by the "IT Admin" user group

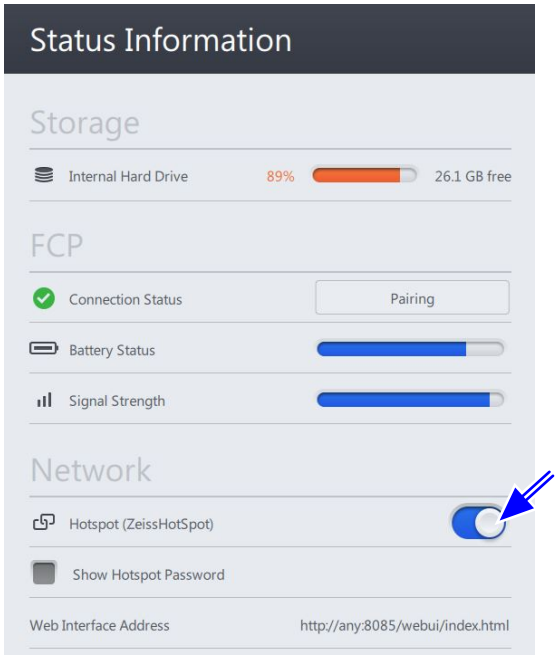
Action

1. Tap on the [Status Information] button in the status bar.



⇨ The “Status Information” menu is displayed.

2. Activate the [Hotspot] slide switch.



Result

✓ The device is available as a hotspot.

✓ The hotspot corresponds to WPA2/PSK.

* This option is not available in all countries.

6.11 Using ZEISS Smart Services

The following settings and configurations may only be carried out by authorized users with IT admin system rights.

6.11.1 Activating ZEISS Smart Services

Prerequisite

☑ You are logged on as Administrator.

Action

1. Tap on [Connectivity] ⟶ [ZEISS Smart Services].
2. Activate the [ZEISS Smart Services] slide switch.
   ⇨ In the "Extras" menu, the "Diagnostic Package" and "Remote Service Access" functions become available.

6.11.2 Send Diagnostic Package

Prerequisite

☑ The device is connected to the network via LAN or WLAN.

☑ The ZEISS Smart Services have been activated.

Action

1. Tap on ⚙ Settings ⟶ Extras.
2. Tap on the [Send Diagnostic Package] button.
   ⇨ A data transfer progress bar is displayed on the monitor.

6.11.3 Allow Remote Service Access

⚠ CAUTION!

Risk of injury due to accidental device travel movements during remote maintenance!

If ZEISS Smart Services is activated, the device can be controlled and possibly moved via remote maintenance.

- ▶ Make sure that the network connection is stable.
- ▶ Make sure that the device is not standing within reach of a patient.
- ▶ Make sure that the device is not standing inside a sterile surgical area.
- ▶ Do not leave the device unattended when ZEISS Smart Services is activated.
- ▶ Reboot the device before using it for clinical applications.

Prerequisite

☑ The device is connected to the network via LAN or WLAN.

☑ The ZEISS Smart Services have been activated.

Action

1. Tap on ⚙ Settings ⟶ Extras.
2. Activate the [Remote Service Access] slide switch.
3. Deactivate the [Remote Service Access] slide switch as soon as the remote service has been completed.

6.12 Switching the device off

Action

1. Press the "Device Power On/Off" operating button.
   ⇨ The device shuts down.
   ⇨ The device is in standby mode if the "Device Power On/Off" operating button is illuminated white.
2. Remove the power plug from the power outlet to safely disconnect the device from the power supply.

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7 Cleaning and disinfection

7.1 Safety during cleaning and disinfection

⚠ WARNING!

Contamination with pathogenic germs!

If the device is cleaned or disinfected using unsuitable methods or cleaning agents, pathogenic germs can accumulate on the device and the device may also be damaged.

- ▶ Make sure that the device is operated only in a sterile manner and with sterile accessories, Attaching a ZEISS SMARTDRAPE [▷ 131].
- ▶ Dispose of sterile accessories in line with the applicable regulations for hospital wastes and/or materials contaminated by bacterial and/or viral infections.
- ▶ Read and follow the Instructions for Use for the accessories used.
- ▶ Make sure that the device is operated, cleaned and disinfected only by personnel who have been instructed in these procedures.
- ▶ When cleaning and disinfecting the device, only use cleaning/disinfection agents that are suitable and approved for the surface in question.

7.2 Contamination of the system

Dust can penetrate into the internal optics of the device or its individual components.

Action

- ▶ Always close all openings that are not in use with the covers provided (e.g. openings for eyepieces, tube outlets or the lateral co-observation outlets).
- ▶ Always store tubes, eyepieces and accessories in dust-free cases when they are not being used.
- ▶ After use, cover the system with the supplied dust cover to protect it from dust.
- ▶ Clean used accessories directly after use.

7.3 Cleaning and disinfecting agent

7.3.1 Cleaning agents

	Unit	Order number
Optics cleaning kit	1 piece	000000-2096-685
Microfiber cleaning cloth	1 piece	000000-1439-266
Optical lens wipes	Available from specialized dealers	

7.4 Cleaning

Clean the device before the first use and after every use.

7.4.1 Cleaning optical surfaces

The multi-layer T* coating of the optical components (e.g. eyepieces, objective lenses) ensures optimal image quality. Image quality is impaired by even slight contamination of the optics or by a fingerprint. Clean the exterior surfaces of the optical components (eyepieces, objective lenses) only when necessary:

Action

- ▶ Do not use any chemical cleaning agents.
- ▶ Use a clean and grease-free brush to remove dust.

TIP: For the regular cleaning of surgical microscope's objective lenses and eyepieces, we recommend the optics cleaning set and Cleaning agents [▷ 180] available from ZEISS.

7.4.2 Cleaning the monitor (touchscreen)

To prevent damage, ensure that no moisture or cleaning agents get inside the monitor.

NOTE

Incorrect use of glass cleaner!

Damage to the monitor.

- ▶ Never spray glass cleaner directly onto the monitor.

Prerequisite

☑ Switch off the device.

Action

- ▶ Clean the monitor with a soft, clean microfiber cloth or with moist optical lens wipes.
- ▶ If necessary, moisten the cloth slightly with water or pure glass cleaner.
- ▶ Wipe the monitor with a moist cloth.

7.4.3 Cleaning mechanical surfaces

All mechanical surfaces of the system can be cleaned by wiping them with a damp cloth.

Action

- ▶ Do not use any aggressive or abrasive cleaning agents.
- ▶ Remove any possible residue using a mixture of 50% ethyl alcohol and 50% distilled water plus a dash of household dishwashing liquid.

7.4.4 Fogging of optical surfaces

We recommend using an anti-fogging agent to prevent fogging of optical surfaces. Anti-fogging agents like the ones offered by opticians for applications with eyeglasses are also suitable for optical surfaces from ZEISS.

Action

- ▶ Observe the Instructions for Use pertaining to the anti-fogging agent concerned.

An anti-fogging agent does not ensure fog-free eyepiece optics. It cleans eyepiece optics and protects them against dirt, grease, dust, lint and fingerprints.

7.5 Disinfection

7.5.1 Disinfecting the mechanical surfaces

The maximum concentrations are:

- For alcohol (tested with isopropyl alcohol): 60%
- For aldehyde (tested with glutaraldehyde): 2%
- For quaternary compounds (tested with DDAC): 0.2 %

To achieve maximum disinfection, disinfectants with an alcohol concentration higher than 70% can be used. There is a chance that long-term use of such disinfectants may cause the device's surfaces to become dull or matte, or may loosen the adhesive labels on the device without causing them to fall off. However, the use of such disinfectants will never impair device performance or endanger patients.

NOTE

Surface damage caused by wrong disinfectants!

Performing disinfection with the wrong disinfectants may result in damage to the surfaces of the device.

- ▶ Use an aldehyde and/or alcohol-based disinfectant. The addition of quaternary compounds is acceptable.
- ▶ In order to prevent surface tensions, you may use only the disinfecting components specified above.

Action

- ▶ Disinfect all of the required surfaces.

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8 Maintenance

8.1 Safety during maintenance

Regularly checking and maintaining the device is necessary to ensure safe and correct operation of the system and a long service life. For example, within the framework of a service and maintenance contract.
Device-specific technical knowledge is required for all maintenance work. It is frequently necessary to open the system for this work. Please contact your local ZEISS Service organization in due time for the performance of these maintenance activities.
You can find the ZEISS contact partner for your country on the Internet at the following website: www.zeiss.com/med

8.2 User maintenance intervals

Component	Activity or test criterion
Electromagnetic compatibility (EMC)	▶ No regular tests or maintenance are/is required in order to maintain electromagnetic compatibility (EMC).
According to country-specific requirements	
Safety check	▶ Checking the device and electrical safety
Prior to each use	
Brakes	▶ Electrical and mechanical function test: ⇨ Release brakes completely; braking force holds microscope securely in balanced state without any change of position.
Xenon light source	▶ Check: ⇨ Operating hours of xenon lamp within permissible range ⇨ Backup xenon lamp available and operational We recommend replacing the xenon lamp after the specified operating hours have been reached (500 hours).
LED light source	The LED light source is maintenance-free.

Component	Activity or test criterion
	The specified lifetime is 40,000 operating hours. In case of premature failure or damage, replacement may be performed only by a service engineer.

8.3 Maintenance schedule for the authorized service

8.3.1 Service maintenance intervals

Time Interval	Activity or test criterion
Every 12 months:	Basic device functions Specific function checks: Microscope, illumination, stand system, visual inspection of device identification, cleaning and inspection of optics, video functionality
Every 4 years:	Extended device functions Extended function checks: Microscope, illumination, stand system, visual inspection of device identification and device safety, cleaning and inspection of optics, video functionality, equipment-specific functional tests and checks of various options

8.3.2 Performance of safety inspections

The safety inspection (Technical safety test) serves to determine and evaluate product safety. The user of this product is obligated to perform and document safety inspections in compliance with IEC 62353.

⚠ CAUTION!

Risk of injury without safety inspection (technical safety test)!

Hazards and product deficiencies will not be detected in time and can have a negative effect on patients, users, or others.

- ▶ Have a safety inspection in compliance with IEC 62353 performed on time and to the prescribed extent. At the same time, be sure to comply with the relevant national regulations.

Prerequisite

☑ Only the manufacturer or qualified persons may perform the safety inspection.

Action

- ▶ Check to make sure the Instructions for Use are available.
- ▶ Check to make sure all marks and inscriptions on the device are legible.
- ▶ Check the leakage current and the protective ground conductors.
- ▶ Check to make sure the casters and locking devices function properly and are not worn-out.
- ▶ Perform a function check of all switches, buttons, sockets and indicator lamps of the system.

8.4 Remote service

ZEISS Smart Services offers a direct data exchange between the device and ZEISS Service for remote maintenance or troubleshooting.

For informationen on the activation and use of ZEISS Smart Services, read Using ZEISS Smart Services [▷ 176].

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9 Troubleshooting

9.1 Localize faults

If a particular event occurs during operation or if the system registers an irregularity, the system shows you this disruption via a notification on the monitor.

Faults are saved in a service file. You can export this log file and transmit it to your ZEISS Service organization.

9.1.1 Fixing faults with messages

Information on a problem occurring during operation is detected automatically and displayed as an error message.

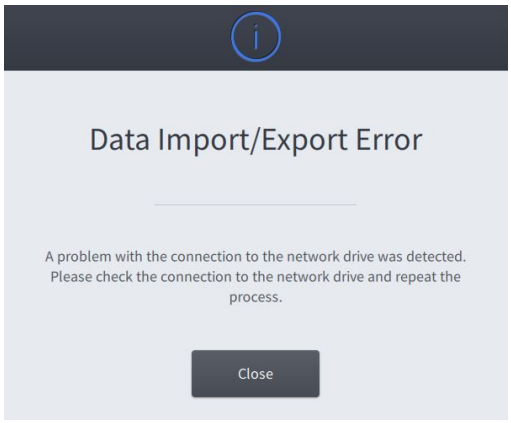


Figure 87: Error message on the monitor

Prerequisite

☑ An error message has appeared on the monitor

Action

1. Read the error message.
2. Tap the "Close" button or press the center of the joystick button on the left hand grip to close the error message.
3. Fix the fault.
4. If the error message appears on the monitor again and the problem persists, export the log file and contact your local ZEISS Service organization.

9.1.2 Export Log Files

Disruptions with notifications are saved in log files on the system. You can export these log files to a USB storage device and send them to ZEISS Service for fault analysis.

Action

1. Connect a USB storage device to the USB port.
2. Tap on Settings → ooo Extras → Export log files → Start.
   ⇨ The log files are then exported to the connected USB storage device.

3. Tap on the "Status Information" field in the status bar.
4. Tap on the [Eject] button in the "USB" field.
5. Remove the USB storage device.
6. Send these log files to your ZEISS Service organization.

9.1.3 Service information

You can find the ZEISS contact partner for your country on the following website: www.zeiss.com/med

9.2 Faults without messages

Fault	Cause	Rectification
No function at all	The power plug is not plugged in.	▶ Connect the power plug.
	The device is not switched on.	▶ Press the "Device Power On/Off" operating button. The operating button is illuminated white.
	Automatic circuit breaker in power switch of stand responds.	▶ Press the "Device Power On/Off" operating button. ▶ Inform ZEISS Service.
No surgical field illumination on the microscope	Xenon lamp option: Lamps 1 and 2 have failed.	▶ Replace both lamp containers.
	Failure of device electronics.	▶ Illuminate the OR field with an additional OR lamp. ▶ Inform ZEISS Service.
	Light source has not been switched on.	▶ Activate the "Light" function in the main menu on the monitor.
The surgical field illumination is too dark.	The set brightness is too low.	▶ Increase the brightness using the preconfigured buttons on the hand grip / foot control panel.
	Xenon lamp option: The lamp is too old / weak.	▶ Perform a lamp change on the monitor or manually.
The surgical field is not evenly illuminated.	The light guide is defective.	▶ Have the light guide replaced by ZEISS Service.
The surgical field illumination is too bright.	The set brightness is too high.	▶ Reduce the brightness using the preconfigured buttons on the hand grip / foot control panel.
The focus cannot be set via the hand grip / foot control panel.	The system control is defective.	▶ Adjust the focus manually using the corresponding rotary knob on the microscope body.

Fault	Cause	Rectification
The focus drive consistently moves to the end position.	The system control is defective.	▶ Adjust the focus manually using the corresponding rotary knob on the microscope body.
	The SMARTDRAPE cover glass on the objective lens is dirty or of poor optical quality.	▶ Clean the SMARTDRAPE cover glass. ▶ Use the ZEISS SMARTDRAPE.
The zoom cannot be set via the hand grip / foot control panel.	The system control is defective.	▶ Adjust the zoom manually using the corresponding rotary knob on the microscope body.
The zoom drive consistently moves to the end position.		▶ Adjust the zoom manually using the corresponding rotary knob on the microscope body.
Poor image quality	The SMARTDRAPE cover glass on the objective lens is dirty or of poor optical quality.	▶ Clean the SMARTDRAPE cover glass. ▶ Use the ZEISS SMARTDRAPE.
The monitor is black.	The system control is defective.	▶ Do not touch the monitor! This is necessary to ensure that you do not execute any unwanted actions. ▶ Switch the device off, wait briefly (for approx. 2 min) and then switch it back on. ▶ If the monitor is still black, contact ZEISS Service.
No video image appears on the external monitor	The external monitor is not connected to the device.	▶ Connect the external monitor to the corresponding video output of the device.
External video source is not displayed	The external video source is not connected to the device.	▶ Connect the external monitor to the corresponding video input of the device.
The brakes of the axes are closed.	The line voltage has failed, the device is no longer being supplied with power.	▶ Pull and push the microscope body and stand arms into the desired position manually.
Malfunction / failure of wireless foot control panel	Batteries are depleted.	▶ Read and follow the Instructions for Use supplied for the foot control panel, G-30-1706.
	The radio link is faulty or has failed.	▶ Read and follow the Instructions for Use supplied for the foot control panel, G-30-1706.
	The foot control panel is not completely paired with the device.	▶ Pair the foot control panel with the device again.

9.3 Basic functions following failure of the system control (Basic Function Mode)

If the system control fails and the line voltage is still present, all filters in the light source and in the microscope will be swiveled out. The Focus Light Link and Auto Brightness functions are not available.

The button assignments on the handgrip and foot control panel remain stored.

NOTE

Illumination malfunction caused by system control failure.

Following failure of the system control, the light intensity is decreased to approx. 50%, and the device automatically switches to Basic Function Mode. The Focus Light Link and Auto Brightness functions are not available.

- ▶ You can increase or further decrease the light intensity in order to complete your surgical procedure.

You can set the following functions in the Basic Function Mode:

Function	Adjustments following failure of the system control
Release all axes	▶ Press the bottom button [AB] on the back of the hand grips.
Release the stand axes	▶ Press the top button [SB] on the back of the hand grips.
Focus +/-	▶ Adjust the focus using the buttons configured for this purpose on the handgrip / foot control panel.
Zoom +/-	▶ Adjust the zoom using the buttons configured for this purpose on the handgrip / foot control panel.
Light +/-	▶ Adjust the brightness using the buttons configured for this purpose on the handgrip / foot control panel.

9.4 Device in the de-energized state

If the line voltage fails and the device no longer is being supplied with power, the brakes of all axes close. You can move the individual axes of the stand manually by overcoming the braking effect.

Action

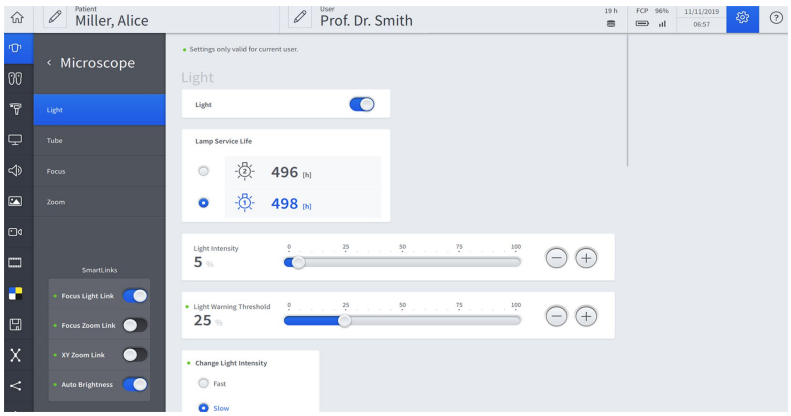
- ▶ To move the microscope, grasp the microscope body (and not the handgrips!) with both hands and pull or push the microscope body into the desired position.
- ▶ To execute movement in individual stand axes, push or press the vertical / horizontal arm and/or the microscope suspension into the desired position.

9.5 Activating the backup xenon lamp via the monitor

If the device detects a faulty xenon lamp or if a xenon lamp fails during operation, an automatic lamp change takes place.
You can also activate the backup xenon lamp on the monitor.

Action

1. Tap on Settings → Microscope → Light.
2. Select the corresponding lamp.



3. Check the brightness level set on the backup xenon lamp.
4. Close the "Settings" menu by tapping on the button.
   ⇨ The live image of the video camera appears on the monitor.

9.6 Activating the backup xenon lamp via the light source

The backup xenon lamp is put into operation via a motor-actuated push lever.

If this motor fails during surgery, the backup xenon lamp can be manually activated on the light source.

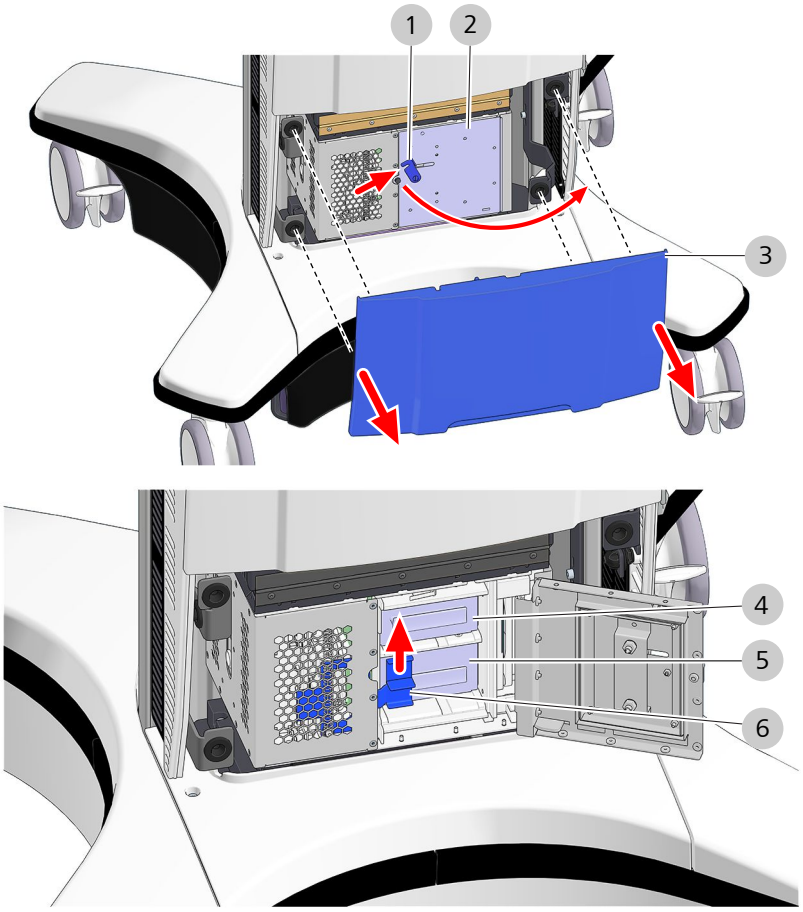


Figure 88: Changing the lamp on the light source

1	Locking bolt	2	Housing door
3	Cover	4	Lamp 2
5	Lamp 1	6	Push lever

Prerequisite

☑ Be aware of any obstacles, and of the position of the microscope, while changing the lamp.

Action

1. Pull the cover off of the device in a horizontal direction.
2. Open the locking bolt of the housing door.
3. Open the housing door.
4. Slide the push lever towards the second lamp (the one not in use) as far as it will go.
5. Close the housing door.

6. Lock the housing door.
7. Attach the cover to the receptacles on the device.
   ⇨ The cover is properly attached if the receptacles engage fully.
8. Following surgery, replace the defective lamp container with a new one.
9. Dispose of the used lamp according to your local directives and laws.

9.7 Changing the lamp container of the xenon light source

⚠ CAUTION!

Risk of injury and burns.

In case of malfunction, the high pressure inside the hot lamp may cause the lamp to burst. Also, the hot surface of the lamp container may also cause burns.

- ▶ Let the lamp container cool off for at least 10 minutes before replacing it.
- ▶ The lamp container may be changed only by properly trained persons.

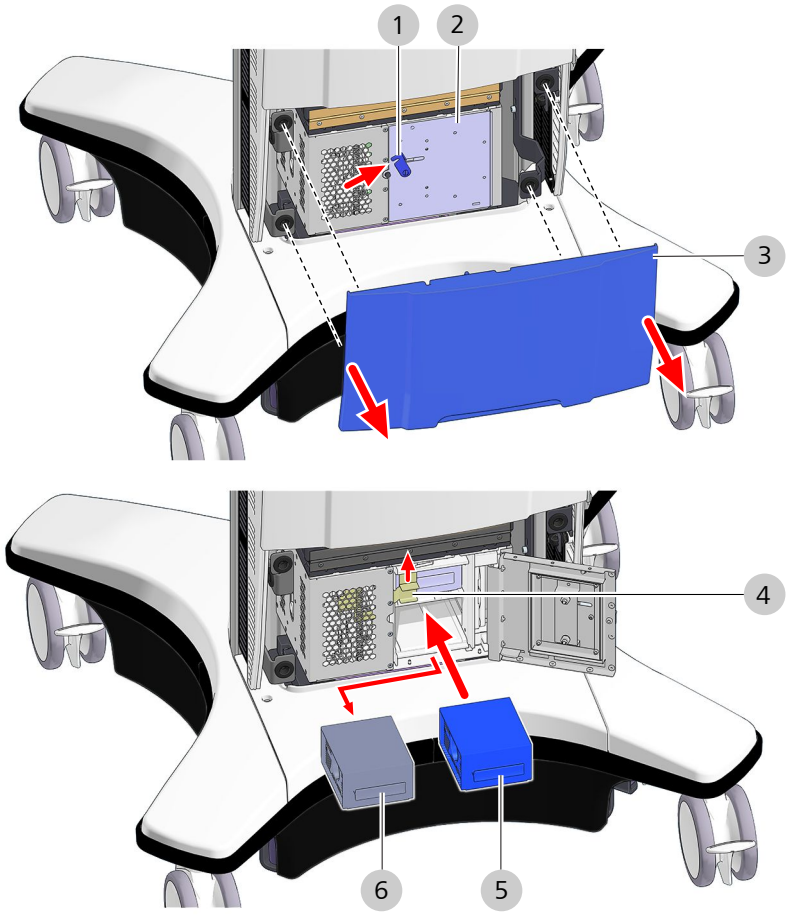


Figure 89: Changing the lamp container of the xenon light source

1	Locking bolt	2	Housing door
3	Cover	4	Push lever
5	New lamp container	6	Old lamp container

Prerequisite

☑ The power cord is disconnected from the power outlet.

☑ Be aware of any obstacles, and of the position of the microscope, while changing the lamp container.

Action

1. Pull the cover off of the device in a horizontal direction.
2. Open the locking bolt of the housing door.
3. Open the housing door.
4. If necessary, adjust the push lever to release the container to be replaced.
5. Pull out the defective lamp container.
6. Slide a new lamp container into the lamp housing as far as it will go.
7. Close the housing door.
8. Lock the housing door.
9. Reattach the cover to the receptacles on the device.
   ⇨ The cover is properly attached if the receptacles engage fully.
10. Plug the power cord into the power outlet.

Following a lamp failure, a message stating that you should keep an extra new lamp container on hand as a replacement appears on the monitor during every device start.

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10 Technical specifications

10.1 Regulatory information

The ZEISS TIVATO 700 fulfills the requirements of the following standards:

- IEC 60601-1
- IEC 60601-1-2
- IEC 62304
- CAN/CSA-C22.2 NO. 60601-1

Classification of the product according to IEC 60601

The ZEISS TIVATO 700 is classified as follows:

- Degree of protection against electric shock: Class 1
- Operating mode: continuous operation

Classification of the product according to IEC 60601-1-2

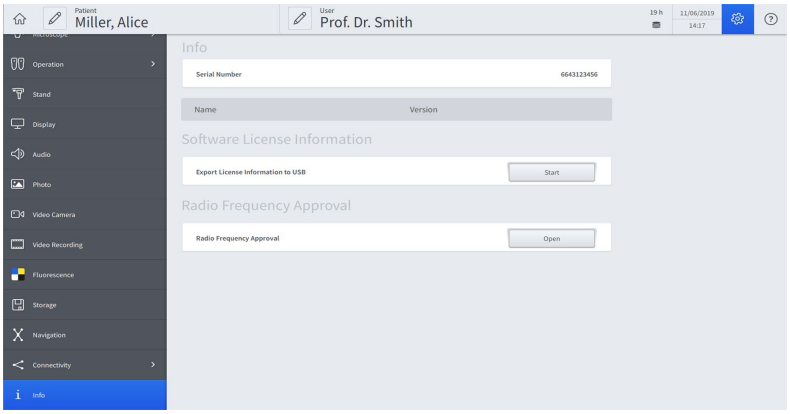
- Electromagnetic compatibility (EMC): Fulfills IEC 60601-1-2, Class A (as per CISPR 11)

10.2 Radio frequency approval

10.2.1 Displaying radio frequency approvals on the monitor

Action

1. Tap on ⚙ Settings → ℹ Info → Radio Frequency Approval → Open.
   ⇨ The markings of the existing radio frequency approval are displayed.



2. Scroll down in the "Radio Frequency Approval" display.
3. Close the "Radio Frequency Approval" display by tapping on the black surface next to the display.

10.2.2 Radio frequency approval labeling

This device contains radio modules and fulfills the requirements of 2014/53/EU.

10.3 Radio modules

10.3.1 FCP WL, FCP Gateway WL and FCP Interface

Designation	Value
Transmit and receive frequencies	2402 MHz to 2480 MHz
Receive power	-82 dBm to 0 dBm
Transmit power	1 mW to max. 2.5 mW (Class 2)
Modulation	FHSS

10.3.2 WLAN module

Intel® Dual Band Wireless - AC 8265

Name	Value
Frequency bands for operation	2.4 GHZ band and 5 GHz band
Operating frequencies	2400–2483.5 MHz 5150–5250 MHz 5250–5350 MHz 5470–5725 MHz 5725–5875 MHz* *Within the jurisdiction of the EU Radio Equipment Directive and in Malaysia, no connection may be made to the ZEISS TIVATO 700 within the 5725–5875 MHz frequency range. Consult the menu of your router to check whether channels 145–174 are activated. If they are, deactivate channels 145–174.
RF output power	The maximum output power may vary according to country depending on local regulations. 20 dBM max. (2400 – 2483.5 MHz) IEEE802.11 b/g/n mode, and Bluetooth 10 dBM max. (2400 - 2483.5 MHz) Bluetooth BLE mode

Name	Value
	23 dBm max. (5150 – 5725 MHz) IEEE802.11 a/n/ac mode 14 dBm max. (5725–5875 MHz**) IEEE802.11 a/n/ac mode ** Please observe the note on operating frequencies.
Modulation type	2.4 GHz: DSSS/OFDM/FHSS 5 GHz: OFDM BT 2.1 (+EDR), 3.0 (+HS), 4.0 (BLE): GFSK

10.3.3 RFID

TWN4 MULTITECH 2 BLE

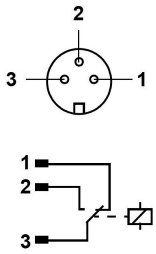
Name	Value
Transmit and receive frequencies	13.56 MHz
Transmission power	67 dBµV/m @3m
Modulation	ASK

10.4 Essential performance features

The device does not have any essential performance features as defined in IEC 60601-1.

10.5 Electrical data

Name	Value
Rated voltage	100–240 V AC
Current consumption	max. 800 VA
Rated frequency	50–60 Hz
Degree of protection (as per EN 60601-1)	I
USB-C port	5 V DC Max. 1 A
USB-A port	5 V DC Max. 1 A
Remote connection	Max. 24 V / 0.5 A, galvanically decoupled as per IEC 60601-1

Name	Value
	Pin assignment: Pin 1: NC Pin 2: NO PIN 3: C 3-pole circular connector type 680
Fuse	Automatic circuit breaker

10.6 Xenon light source

Name	Value
Color temperature	5000 K (±500 K)
Rated power (lamp)	Approx. 300 W
Voltage	100–240 V AC

10.6.1 Additional information

- Illumination technique: Fiber optics
- Main lamp: Xenon short-arc reflector lamp,
- Spare lamp: Xenon short-arc reflector lamp
- Lamp change: Automatic / manual to spare lamp
- Lamp replacement: Manual
- Filter: UV/IR heat protection filter, sieve aperture, controls light intensity

10.7 LED light source

Name	Value
Color temperature	5000 K (±500 K)
Voltage	24 V

10.8 Integrated 1-chip HD camera

Designation	Value
Clarity	1920 x 1080 p
Signal-to-noise ratio	54 dB
Sampling frequency	50 Hz, 59.94 frames/second

10.9 Integrated 3-chip HD camera

Designation	Value
Clarity	1920 x 1080 p
Signal-to-noise ratio	54 dB
Sampling frequency	50 Hz, 59.94 frames/second

10.10 Integrated 4K camera

Designation	Value
Resolution	3840 × 2160 p 1920 × 1080 p
Signal-to-noise ratio	54 dB
Sampling frequency	50 Hz, 59.94 frames/second

10.11 Digital video outputs

Digital video output ports

Name	Value
Output 1 HD-SDI (-0.8 Vp-p/75 ΩPAL)	1920x1080 50/60i
Output 1 3G-SDI (-0.8 Vp-p/75 ΩPAL)	1920x1080 50/60p
Output 2, 3 HD-SDI (-0.8 Vp-p/75 ΩPAL)	1920x1080 50/60i
Output 2, 3 3G-SDI (-0.8 Vp-p/75 ΩPAL)	1920x1080 50/60p
Output 4 HDMI	1920x1080 50/60p 1x ODU socket (black)
Output 4 HDMI UHD 4K	HDMI 2.0 3840x2160 50/60p 1x ODU socket (black)

4K digital video outputs

Name	Value
Outputs 11 - 14 3G-SDI	QuadSDI 3840x2160 50/60p 4x BNC
Output 4 HDMI UHD 4K	HDMI 2.0 3840x2160 50/60p 1x ODU socket (black)

10.12 Digital video inputs

With HD Video-In license (optional)

Name	Value
Input: 5 HDMI / DVI	1920x1080 50/60p
	1280x720 50/60p

10.13 Mechanical data

10.13.1 Device data

Name	Value
Max. additional load on microscope body	Max. 7 kg
Max. dimensions in transport position (WxHxD)	839x1860x1660mm
Total weight of device with max. add. load	Max. 395 kg
Total weight of device incl. wooden transport box	Approx. 595 kg

10.13.2 Weights of accessories

Name	Weight
Stereo co-observation module (000000-1063- 869)	1084 g
Tiltable tube, 180° (303791-0000-000)	860 g
Straight tube, f = 170 mm (303765-0000-000)	528 g
Foldable tube, f = 170/260 mm (303771-9021-000)	940 g
Photo adapter, f = 340 mm (000000-1022-973)	420 g
Photo adapter, T2 Canon EOS (000000-0448-028)	60 g
Push-in widefield eyepieces, 10x (2 pcs) (305542-0000-000)	226 g
Push-in widefield eyepieces, 12.5x (2 pcs) (305543-9901-000)	216 g

Name	Weight
Magnification changer, 3-position (303429-9903-000)	448 g
Rotating adapter (301007-0000-000)	192 g
Dovetail guide (303360-9903-000)	40 g
Stereo bridge 50 (303825-9000-000)	844 g
Micromanipulator	See manufacturer documentation, max. 1 kg.

10.14 Optical data

10.14.1 Surgical microscope

Designation	Value
Varioscope	Approx. 200 to 500 mm (option: approx. 200 to 625 mm)
Zoom system magnification factor	0.4x to 2.4x

10.14.1.1 Additional information

- Magnification adjustment: motorized/manual, adjustable travel speed.
- Focusing: motorized/manual, adjustable travel speed.
- Luminous field adjustment: motorized/manual, automatic adaptation to magnification and focus (Auto Brightness).

10.14.2 Widefield eyepiece (magnification factor 10x)

Name	Value
Focal Length	25 mm
Field of view	21 mm
Distance of the exit pupil from the last lens	24 to 25.5 mm
Diopter adjustment range	+5 to -8 D
Weight	113 g

10.14.3 Widefield eyepiece (magnification factor 12.5x)

Name	Value
Focal Length	20 mm
Field of view	18 mm
Distance of the exit pupil from the last lens	22 to 23.5 mm
Diopter adjustment range	+5 to -8 D
Weight	113 g

10.15 Ambient requirements for operation

Name	Permissible range
Temperature	+10°C to +40°C
Relative humidity	30 to 75%
Atmospheric pressure:	700 to 1060 hPa

10.16 Ambient requirements for transport and storage

Name	Permissible range
Temperature	-20°C to +60°C
Rel. humidity (without condensation)	10 to 90%
Atmospheric pressure:	500 to 1060 hPa

10.17 Operation with intraoperative MRT systems

For operation in the vicinity of an MRT/MRI scanner, the device must be positioned so that all system components (stand, microscope) are located outside of the 5-Gauss line. The operator must take suitable measures to ensure that the device cannot be moved toward the MRT/MRI system across the 5-Gauss line. The device must be switched off during an MR image acquisition. You may use the device only when no MR image acquisition is in progress.

10.18 Dimensional drawing

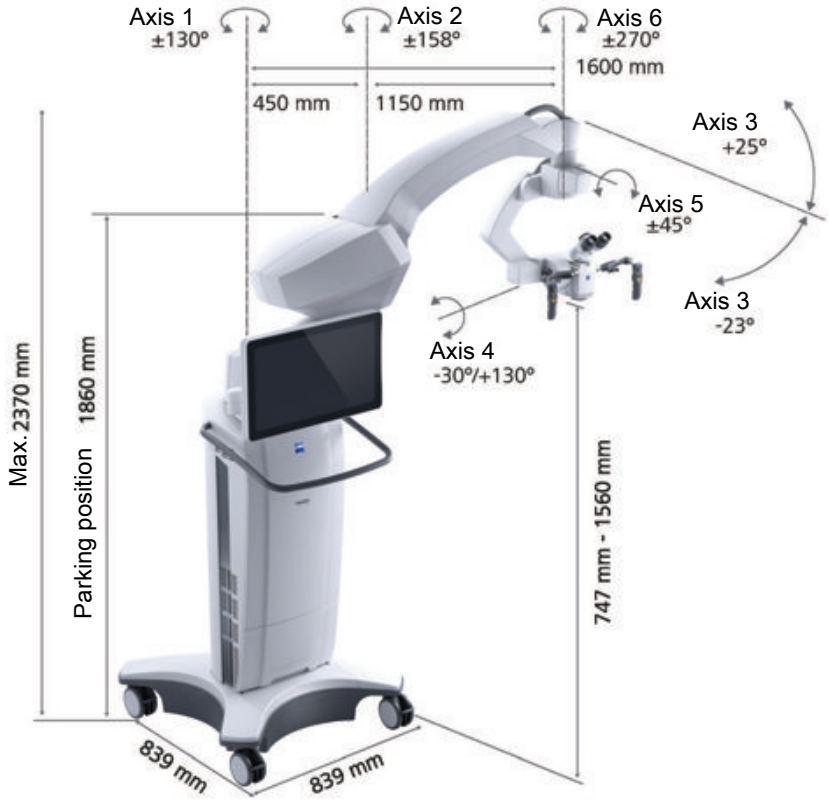


Figure 90: Dimension diagram

10.19 Guidelines and manufacturer's declaration for electromagnetic compatibility

10.19.1 EMC - Electromagnetic compatibility as per IEC 60601-1-2:2007 (3rd Edition)

The device is subject to specific precautions with regard to electromagnetic compatibility (EMC). In order to avoid the occurrence of EMC interference, the device may only be installed, operated and maintained in the manner indicated in these Instructions for Use and only with components supplied by ZEISS.

NOTE

Danger from electromagnetic radiation!

The ZEISS TIVATO 700 may be disturbed by other devices even when these other devices comply with the emission requirements applicable to them according to CISPR.

- Do not use the ZEISS TIVATO 700 when it is located next to or stacked on top of other devices.
- If operation of the device located next to or stacked on top of other devices is required, observe the ZEISS TIVATO 700 to ensure its normal operation in the arrangement in which it is used.

NOTE

Danger from electromagnetic radiation!

Electrical devices can influence each other as a result of their electromagnetic radiation. The use of non-approved components (accessories, transformers of all types, cables) can cause increased emissions or reduce the device's immunity.

- Only use accessories, transformers, cables and spare parts which are specified in these Instructions for Use or which are approved by ZEISS for this device.
- Do not use any portable or mobile RF communication equipment near the device as it is not possible to exclude the possibility that the function of the device will be affected.
- Do not use any mobile phones near the device. They represent a potential risk of improper functioning of medical devices. The malfunctions that may occur depend on a variety of local factors These cannot be predicted or estimated.
- Please follow the EMC guidelines in the following pages.

10.19.1.1 Electromagnetic interference emissions

The ZEISS TIVATO 700 is intended for operation in an electromagnetic environment as specified below. The customer or the user of the ZEISS TIVATO 700 is responsible for ensuring that the device is operated in such an environment.

Interference measurements	**Compliance**	**Electromagnetic environment - guidelines**
RF emissions as per CISPR 11	Group 1	The ZEISS TIVATO 700 uses RF energy only for its internal functions. As a result, RF emissions are very low and unlikely to cause any interference in nearby electronic devices.
RF emissions as per CISPR 11	Class A	The ZEISS TIVATO 700 is suitable for use in facilities other than residential environments that are directly connected to a PUBLIC POWER GRID which also supplies buildings used for residential purposes.
Harmonic emissions as per IEC 61000-3-2	Not applicable	
Voltage fluctuations/flicker according to IEC 61000-3-3	Not applicable	

NOTE
The properties of the ZEISS TIVATO 700 determined by EMISSIONS permit its use in industrial areas and in hospitals (CISPR 11, Class A). If used in a residential area (for which Class B usually is required as per CISPR 11), the ZEISS TIVATO 700 may not provide the necessary protection with regard to radio frequency communication services. The user may have to take corrective measures such as moving or realigning the device.

10.19.1.2 Electromagnetic immunity for all ME equipment and ME systems

The ZEISS TIVATO 700 is intended for operation in an electromagnetic environment as specified below. The customer or the user of the ZEISS TIVATO 700 is responsible for ensuring that the device is operated in such an environment.

Electromagnetic immunity tests	IEC 60601 test level	Compliance level	Electromagnetic environment - guidelines
Electrostatic discharge (ESD) as per IEC 61000-4-2	±6 kV contact discharge ±8 kV air discharge	±6 kV contact discharge ±8 kV air discharge	Floors should be made of wood or concrete or be covered with ceramic tiles. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Fast transient/ burst immunity as per IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±2 kV for power supply lines ±1 kV for input/output lines	The quality of the supply voltage should be that of a typical business or hospital environment.

Surges as per IEC 61000-4-5	±1 kV line-to-line voltage ±2 kV line-to-ground voltage	±1 kV line-to-line voltage ±2 kV line-to-ground voltage	The quality of the supply voltage should be that of a typical business or hospital environment.
Voltage dips, short interruptions and voltage variations as per IEC 61000-4-11	< 5% U_T (> 95% dip in U_T) for 1/2 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (95% dip in U_T) for 5 s	< 5% U_T (> 95%dip in U_T) for 1/2 cycle 40% U_T (60 % dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles < 5% U_T (95% dip in U_T) for 5 s	The quality of the supply voltage should be that of a typical business or hospital environment. If the user of the ZEISS TIVATO 700 requires continued operation even in the event of interruptions in the power supply, we recommend powering the ZEISS TIVATO 700 from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field as per IEC 61000-4-8	3 A/m	3 A/m	Magnetic fields in the supply frequency should correspond to the typical values that are found in business and hospital environments.
Note: U_T is the AC voltage supply before application of the test levels.			

10.19.1.3 Electromagnetic immunity for non-life-supporting devices

The ZEISS TIVATO 700 is intended for operation in the electromagnetic environment specified below. The customer or the user of ZEISS TIVATO 700 is responsible for ensuring that the device is operated in such an environment.

Electromagnetic immunity tests	**IEC 60601 test level**	**Compliance level**	**Electromagnetic environment - guidelines**
Conducted RF disturbances as per IEC 61000-4-6 Radiated RF disturbances according to IEC 61000-4-3	3 $V_{\text{effective value}}$ 150 kHz to 80 MHz 3 V/m 80 MHz to 2.5 GHz	3 V/m 3 V	Portable and mobile radio communication equipment should not be used closer to ZEISS TIVATO 700, including its cables, than the recommended safety distance that is calculated using the equation applicable to the transmission frequency involved. **Recommended safety distance** $d = 1.2 \sqrt{P}$

			$d = 1.2 \sqrt{P}$ for 80 MHz to 800 MHz $d = 2.3 \sqrt{P}$ for 800 MHz to 2.5 GHz where P is the rated output of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). The field strength of stationary transmitters as determined by a site survey[a] should be less than the compliance level in all frequency ranges.[b] Interference may occur in the vicinity of equipment marked with the following symbol. 

Note 1: At 80 MHz and 800 MHz, the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is influenced by absorption and reflection by structures, objects and persons.

[a] Theoretically, field strengths of stationary transmitters such as base stations for mobile telephones and mobile land radio equipment, amateur radio stations, AM and FM radio broadcast and TV broadcast transmitters cannot be predicted accurately. To assess the electromagnetic environment with respect to stationary RF transmitters, consider performing a site study of the electromagnetic phenomena. If the measured field strength in the location where the ZEISS TIVATO 700 is used exceeds the COMPLIANCE LEVELS indicated above, the ZEISS TIVATO 700 should be monitored to verify normal OPERATION. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the ZEISS TIVATO 700.

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

10.19.2 EMC - Electromagnetic compatibility as per IEC 60601-1-2: 2014 (4th Edition)

The device is subject to specific precautions with regard to electromagnetic compatibility (EMC) in Professional Healthcare Facility Environments.
In order to avoid the occurrence of EMC interference, the device may only be installed, operated and maintained in the manner indicated in these Instructions for Use and only with components supplied by ZEISS.

⚠ WARNING!

Functional deterioration!

Do not install or operate the device in direct proximity to other devices with the exception of the combination of the devices described in these Instructions for Use.

- If it cannot be avoided that the ZEISS TIVATO 700 is operated in proximity to other devices, the proper function of the ZEISS TIVATO 700 must be monitored.

⚠ WARNING!

Functional deterioration!

- Only use accessories, transformers, cables and spare parts which are specified in these Instructions for Use or which are approved by ZEISS for this device.

⚠ WARNING!

Deterioration of performance!

- Do not use any portable or mobile HF communication equipment or transmitters (including peripheral devices such as antenna cables or external antennas) in the proximity of the device (minimum distance 30 cm), as it cannot be ruled out that this will impair the function of the device or cause its performance to deteriorate.
- Do not use any mobile phones near the device. They represent a potential risk of improper functioning of medical devices. The malfunctions that may occur depend on a variety of local factors These cannot be predicted or estimated.
- Please follow the EMC guidelines in the following pages.

NOTE

Danger from electromagnetic radiation!

The ZEISS TIVATO 700 may be disturbed by other devices even when these other devices comply with the emission requirements applicable to them according to CISPR.

- ▶ Do not use the ZEISS TIVATO 700 when it is located next to or stacked on top of other devices.
- ▶ If operation of the device located next to or stacked on top of other devices is required, observe the ZEISS TIVATO 700 to ensure its normal operation in the arrangement in which it is used.

10.19.2.1 Electromagnetic disturbance emissions

The ZEISS TIVATO 700 is intended for operation in an electromagnetic environment as specified below. The customer or the user of the ZEISS TIVATO 700 is responsible for ensuring that the device is operated in such an environment.

Interference measurements	**Compliance**
RF emissions as per CISPR 11	Group 1
RF emissions as per CISPR 11	Class A
Harmonic emissions as per IEC 61000-3-2	Not applicable
Emission of voltage fluctuations/flicker as per IEC 61000-3-3	Not applicable

NOTE
The properties of the ZEISS TIVATO 700 determined by EMISSIONS permit its use in industrial areas and in hospitals (CISPR 11, Class A). If used in a residential area (for which Class B usually is required as per CISPR 11), the ZEISS TIVATO 700 may not provide the necessary protection with regard to radio frequency communication services. The user may have to take corrective measures such as moving or realigning the device.

NOTE

The emission properties of the ZEISS TIVATO 700 are suitable for use in industrial areas and hospitals (CISPR 11 Class A). If the ZEISS TIVATO 700 is used in a residential area (for which CISPR 11 Class B is normally required) this equipment may not provide the necessary protection with regard to radio frequency communication services.

10.19.2.2 Electromagnetic immunity for all ME equipment and ME systems

The ZEISS TIVATO 700 is intended for operation in an electromagnetic environment as specified below. The customer or the user of the ZEISS TIVATO 700 is responsible for ensuring that the device is operated in such an environment.		
Electromagnetic immunity tests	IEC 60601 test level	Compliance level
Electrostatic discharge (ESD) as per IEC 61000-4-2	±8 kV contact discharge ±15 kV air discharge	±8 kV contact discharge ±15 kV air discharge
Fast transient/ burst immunity as per IEC 61000-4-4	±2 kV for power lines ±1 kV for input/output lines	±2 kV for power lines ±1 kV for input/output lines
Surges as per IEC 61000-4-5	±1 kV voltage Phase neutral conductor ±2 kV voltage Phase neutral conductor-earth	±1 kV voltage Phase neutral conductor ±2 kV voltage Phase neutral conductor-earth
Power frequency (50/60 Hz) magnetic field as per IEC 61000-4-8	30 A/m	30 A/m
Voltage dips, short interruptions and voltage variations as per IEC 61000-4-11	0 % U_T for 1/2 cycle	0 % U_T for 1/2 cycle
	0 % U_T for 1 cycle	0 % U_T for 1 cycle
	70 % U_T for 25/30 cycles	70 % U_T for 25/30 cycles
	0 % U_T for 250/300 cycles	0 % U_T for 250/300 cycles

10.19.2.3 Electromagnetic immunity for non-life-supporting devices

The ZEISS TIVATO 700 is intended for operation in the electromagnetic environment specified below. The customer or the user of the ZEISS TIVATO 700 is responsible for ensuring that the device is operated in such an environment.		
Electromagnetic immunity tests	**IEC 60601 test level**	**Compliance level**
Conducted RF disturbances as per IEC 61000-4-6	3 V 150 kHz to 80 MHz	3 V
	6 V ISM bands between 150 kHz and 80 MHz	6 V
Radiated RF disturbances according to IEC 61000-4-3	3 V/m 80 MHz – 2.7 GHz	3 V/m

Radiated RF disturbances from near fields of wireless communication devices as per EN 61000-4-3	27 V/m 385 MHz	27 V/m
	28 V/m 450 MHz, 810 MHz – 2.45 GHz	28 V/m
	9 V/m 710 MHz – 780 MHz, 5.24 GHz – 5.785 GHz	9 V/m

10.20 Security Concept

10.20.1 Security Concept

10.20.2 System overview

The device has the following external interfaces, which are critical for cybersecurity:

- WLAN network interface (client and access point)
- LAN network interface
- USB port
- Touchscreen monitor as graphical user interface
- Bluetooth interface
- RS232 interface (optional)
- RFID reader

10.20.3 General principles

Medical device security is a shared responsibility between stakeholders, which include healthcare facilities, patients, service providers and manufacturers of medical devices.

Failure to maintain cybersecurity can result in compromised device functionality, loss of data (medical or personal) availability or integrity, or expose other connected devices or networks to security threats.

10.20.3.1 Identification of general security threats and vulnerabilities

- Malware could repurpose the system’s capabilities if it accesses the underlying operating system.
- Malware could change system capabilities and even render the whole system unusable.
- Malware could expose the device to unauthorized use or alter it.
- Unauthorized access could expose the device to unauthorized use or alter it.

- Unauthorized access could compromise data.
- Operators could be tempted to repurpose the system's computing capabilities.

10.20.3.2 Medical device regulations and guidelines

- The medical device, as well as any subsequent design changes, will be validated and documented taking into consideration the current regulations and guidelines for medical devices.
- To ensure the proper functioning of the device and to avoid any non-compliance with medical device regulations, neither third-party software (e.g. third-party virus scanning software) nor automatic updates (e.g. automatic software updates) may be applied to the system. The same applies for non-validated OS configuration changes.
- An assessment of the impact of cybersecurity threats and vulnerabilities on device functionality and on end users/patients will be performed.
- If threats and vulnerabilities are identified, the likelihood and risk levels will be determined.
- Based on the respective assessments, subsequent actions to maintain the intended system functionality and security will be taken byZEISS as and when necessary.

10.20.4 Data protection

The following patient-related data can be created and stored in the system:

- Patient's first and last name
- Date of birth
- Gender
- Comment
- Recorded images and video
- All of the DICOM tags provided, if the patient data is imported from a worklist server with DICOM modality

Patient data are stored on external USB or network storage devices or (optionally) on a separate internal hard drive. To ensure data protection, not even ZEISS Smart Services will have remote access to any patient data.

With the data protection feature Activating and changing the user password [▶ 118] enabled (required in order to be compliant with the GDPR), users need to provide authentication to activate the role-based access control system. This ensures that only authorized users can access and display patient data. Any user action is protocolled in the audit trail. The default user (emergency user) does not under any circumstances have access to the stored patient data. The use of the emergency user is recorded in the audit trail.

With this system you can create, edit and delete users and patients. Each user has an individual set of parameters that can be customized. They are stored on a dedicated flash drive in the system. User data is password-protected. It is not possible to store parameter changes for the default user (emergency user).

10.20.5 Functions relevant to cybersecurity

10.20.5.1 Limit access to trusted users only

10.20.5.1.1 User authentication

- User authentication can be enabled (optional).
- For privileged users, password authentication is required.
- Default user for emergency cases is always accessible with restricted functionality (access only to active patient).

10.20.5.1.2 Layered authorization model based on the user role

A layered authorization model with different privileges based on the user role is implemented:

- Standard users have standard basic rights.
- "IT Admin" has additional IT system rights to enable/set passwords for standard users, to enable/set up network connections (such as DICOM, Remote Service) and to set the time and date Activating and changing the user password [▷ 118].
- In addition to "IT Admin", "Biomed" has limited service functionalities available.
- The "ZEISS Service" user has additional rights to access service dialogs and settings.
- The "ZEISS Factory" user has full access.

10.20.5.1.3 Appropriate authentication

With activated user authentication, authentication is required for all users (except default users in cases of emergency):

- The password must be entered on a virtual keyboard displayed on the GUI.
- In the ZEISS TIVATO 700 software, user authentication via the network is not possible.
- Brute-force attacks cannot be carried out automatically, and therefore require time and interaction to enter passwords through the virtual keyboard and GUI.
- Passwords are stored encrypted in the system.

10.20.5.1.4 Strong password protection

The user passwords for “IT Admin” and “Biomed” are:

- More than 8 characters long
- Specific to each individual ZEISS TIVATO 700 device

The user passwords for “ZEISS Service” and “ZEISS Factory” are:

- More than 32 characters long or are provided via an encrypted "service key" file
- Become invalid after a maximum of 30 days

10.20.5.1.5 User authentication for software or firmware updates

Software and firmware updates require authentication as a "ZEISS Service" user.

10.20.5.2 External interfaces

Only interfaces which are necessary for the intended use are accessible. All other standard PC interfaces are located inside the device.

10.20.5.2.1 USB drive file system

- Only for data exchange via external storage media
- Controlled via the ZEISS TIVATO 700 device software
- Export/import patient data only
- Export/import settings
- Import licenses
- Export log files
- Autorun functionality not supported by embedded Linux OS
- Keyboards via USB not active by default

10.20.5.2.2 Network-based functionalities and network interface bindings

The purpose of connecting the medical device to a computer/IT network:

- Export patient data (images, video) via network to central archiving system using DICOM (LAN, WLAN)
- Save patient data (images, video) via the network to shared folder for data archiving (LAN, WLAN)
- Import patient data (images, video) via network from shared folder (LAN, WLAN)
- Stream live feed from camera via network to a compatible video streaming client (LAN, WLAN, WLAN hotspot)
- ZEISS Smart Services integrated remote support client – see also the ZEISS Smart Services white paper (LAN, WLAN)
- Web browser access from mobile device to WebUI (LAN, WLAN, WLAN hotspot)

- Interface for IOS apps (LAN or WLAN hotspot)
- Navigation interface (LAN, ZEISS navigation port)

10.20.5.2.3 Network specifications for the respective network interface

LAN

- TCP/IP IPv4 ethernet protocol: HTTPS encrypted
- RTP for video streaming services
- Gigabit ethernet
- Static IP or DHCP (configurable within ZEISS TIVATO 700)
- DICOM protocol (no encryption)
- Remote network share access via SMB
- Navigation LAN: DTLSv1.2 (restricted to AES256-GCM-SHA384 ciphers), authorized by certificate hash value
- ZEISS Smart Services: SSL encrypted
- REST API for IOS apps via HTTP (authentication mandatory)
- WebUI via HTTPS (authentication mandatory)

WLAN

- WPA2/PSK
- IEEE 802.11a/b/g/n
- TCP/IP IPv4 ethernet protocol: HTTPS encrypted
- DICOM protocol (no encryption)
- RTSP for video streaming services
- Static IP or DHCP (configurable within ZEISS TIVATO 700)
- Remote network share access via SMB
- ZEISS Smart Services: SSL encrypted
- REST API for IOS apps via HTTP (authentication mandatory)
- WebUI via HTTPS (authentication mandatory)

WLAN hotspot

- WPA2/PSK
- IEEE 802.11a/b/g/n
- TCP/IP IPv4 ethernet protocol: HTTPS encrypted
- Hotspot by default deactivated, manual activation for use required
- RTSP for video streaming services
- DHCP server
- REST API for IOS apps via HTTP (authentication mandatory)
- WebUI via HTTPS (authentication mandatory)

RS232 interface

- Only available with option “Navigation Standard”
- Supports only a serial communication to one connected navigation system
- Transfer rate: 9600 baud
- Bidirectional communication

Bluetooth interface

- IEEE 802.15.1 (Bluetooth)
- Frequency range: 2400 – 2483.5 MHz
- RF output power: < 4mW, RF
  Channels: 79, Modulation: GFSK
- The pairing procedure only allows one connection to a ZEISS foot control panel

RFID interface

- Reader for drape RFID tags
- Frequency: 13.56 MHz
- Send and receive power: 67 dBµV/m @3m
- Modulation ASK

10.20.5.3 Firewall

- The embedded Linux system is configured such that it does not require a firewall. All services that are not required are deactivated. User access to the underlying operating system via the network interfaces is not possible because all network services controlled by the operating system are deactivated. Only the ZEISS TIVATO 700 device software is able to start and stop services on demand.
- The operating system and the system software are installed on write-protected internal storage.
- Only the ZEISS TIVATO 700 device software is allowed to bind arbitrary in- and outbound ports. The following applications and services are activated and deactivated through the ZEISS TIVATO 700 device software:
  - DHCP client UDP port 68
  - DHCP server (only for access point) UDP port 67
  - DICOM service with configurable port (default TCP port 11112)
  - SMB protocol TCP port 445 (outbound only)
  - Navigation interface TCP port 8123
  - RTSP video streaming TCP port 8554
  - Ping
  - Tracert

  - WebUI TCP port 8085/8443
  - REST API for apps TCP port 8085/8443
  - ZEISS Smart Services:
    Remote support functions
    outbound CP, remote target port 7778
    The following lookup ports will only be used during the automatic, initial setup of the connection between ZEISS TIVATO 700 and the remote support site control unit (SCU). Alternatively, the connection can be configured manually so that the UDP protocol is not required for the remote support functions.
    Inbound ports for device search: UDP 7716 - 7719
    Outbound ports for device search: UDP remote ports 7700 - 7703
- All unnecessary services and applications are deactivated or not installed by default.
- Access to the services is controlled by the ZEISS TIVATO 700 device software and will only be activated on demand.

10.20.5.4 Features that allow security compromises to be detected and qualified

- Audit trail, security logs, error logs and user logs are implemented.
- Audit trail is the only log which contains any personal data.
- Log files (except audit trail) can be exported, encrypted and sent to ZEISS.
- With ZEISS Smart Service, personal data (user data or patient data) cannot be transferred to log files.
- Audit trails containing personal data are protected and can only be accessed and/or exported by the local IT administrator.

10.20.5.5 Protection of embedded Linux operating system in the medical device

- Customized embedded Linux operating system. Does not contain any unnecessary components.
- Closed system (no direct access to the Linux operating system):
  - It is not possible for users, IT administrators or ZEISS Service to gain access to the Linux operating system GUI on which the ZEISS TIVATO 700 software is based.
  - Therefore there is no possibility of installing additional software and/or changing or modifying existing software modules in a way that might introduce viruses or malware to the system or damage it.

  - It is not possible to run any files on the system which might act as malware, since neither the user or the IT administrator have access to the Windows operating system GUI.
  - The ZEISS TIVATO 700 software only grants access via the GUI of the the ZEISS TIVATO 700 system.
  - Application in full-screen mode. No operating system desktop
- Hard disk (SSD) partitions on which the operating system and ZEISS TIVATO 700 software are stored are protected against persistent changes (unauthorized software cannot be installed on the SSD partition).
- The system cannot be booted from an external storage device.
- It is not possible to run any third-party software applications on a connected external USB device which might act as malware, since even ZEISS service engineers do not have access to the operating system.
- The ZEISS TIVATO 700 features a specific HDD design:
  - The embedded Linux operating system and the ZEISS TIVATO 700 software are located on an internal write-protected flash drive so as to prevent the installation of unauthorized third-party software applications. Any changes to this partition caused by a virus will be automatically discarded.
  - All user data are stored on the second SSD partition with no write protection.
  - Patient data are located on a separate internal hard drive (available as an option) that can be replaced in case of a hardware malfunction.

10.20.6 Sicherstellen einer vertrauenswürdigen Systemvorbereitung

- Restrict software or firmware updates to authenticated code.
- Software and firmware updates may only be performed by ZEISS service engineers with specially configured ZEISS software update media.
- The software checks firmware versions for compatibility.
- Use systematic procedures for authorized users to download version-identifiable software and firmware from the manufacturer.
- No software downloads are provided to customers (only to ZEISS service engineers).
- During manufacturing and after each configuration change by a ZEISS service engineer, a backup is performed and stored on an internal backup storage device, and on a USB drive if desired.
- Service engineers can restore any stored backup.

- Import and export functions can be used for backup and for restoring patient data on external storage devices.
- Images from the ZEISS TIVATO 700 software and software updates are checked for viruses.
- To ensure a verified medical device setup and functionality and to maintain medical device conformity, no non-validated changes to the system are allowed:
  - The customized embedded Linux operating system does not support an automatic update function by design for the above-mentioned reason. However, the ZEISS TIVATO 700 system in its hardened configuration offers no target for the exploitation of any system vulnerabilities. None of the ZEISS TIVATO 700 services or system services are represented by default in an uncontrolled manner to the outside of the system.
  - For the same reason, no third-party virus-scanning solutions may be installed or run on the ZEISS TIVATO 700 system. To protect the system against viruses and other malware, all options to execute any files or applications are controlled by the ZEISS TIVATO 700 software. There is no way to run files or applications manually or automatically in the ZEISS TIVATO 700 system. As any changes to the partitions on which the OS and the ZEISS TIVATO 700 software are located are non-persistent, there is no way for any malware to be installed or run on a ZEISS TIVATO 700 system.
- Embedded Linux operating system patches will be delivered and installed only by ZEISS.

10.20.7 Schutz kritischer Gerätefunktionen

The device magnification, focus adjustment, light intensity and manual ZEISS TIVATO 700 movement features are independent of any PC functionality. The mentioned device features can still be used even if the integrated PC is not available or is shut down (basic function mode).

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11 Accessories and components

These Instructions for Use also describe accessories and components that are not necessarily included in the individual delivery scope. A current accessories and components list can be obtained from your ZEISS contact person.

You can find the ZEISS contact partner for your country on the following website: www.zeiss.com/med

Only use accessories and components authorized by ZEISS for this device. Device safety during operation cannot be guaranteed if accessories and components that are not authorized by ZEISS are used.

11.1 Video options

Designation	Order no.
Video recording	40HDREUC
HD Video In	40VIINUC

11.2 Main tube with eyepieces

Designation	Order no.
180° tiltable tube with two eyepieces	20UCTUBF
Foldable tube with two eyepieces	20UCTUBT
Straight tube with two sleeves and two eyepieces	20UCSTRT

11.3 Eyepieces

Designation	Order no.
10x eyepiece, 2 pcs	20EYPO10
12.5x eyepiece, 2 pcs	20EYPO12

11.4 Left/right co-observation

Designation	Order no.
Left/right co-observation with stereo co-observation module, straight tube, two sleeves and two eyepieces	20COLRST
Left/right co-observation with stereo co-observation module, 180° tiltable tube and two eyepieces	20COLRTI
Left/right co-observation with stereo co-observation module, foldable tube and two eyepieces	20COLRFO

11.5 Face-to-face co-observation

Designation	Order no.
Face-to-face co-observation with 180° tiltable tube, rotatable adapter and two eyepieces	20COFFTI
Face-to-face co-observation with foldable tube and two eyepieces	20COFFFO

11.6 Tube for posterior fossa

Designation	Order no.
Straight tube with two sleeves	20UCSTRT

11.7 Magnification changer

Designation	Order no.
Magnification changer	60MAGCH3

11.8 Tube and stereo bridge 50

Designation	Order no.
Stereo bridge 50	20COFFWO
Stereo coobservation tube with two joints	20COLRWO
Rotatable adapter for tube	60ROTATE

11.9 Fluorescence

Designation	Order no.
Fluorescence target INFRARED 800	30IR800T
INFRARED 800 module	30INFCUC
INFRARED 800 complete	30INCPUC
Fluorescence target YELLOW 560	30YE560T
YELLOW 560 module	30YELLUC
YELLOW 560 complete	30YEXCPL
YELLOW 560 LED module	30YLEDUC
YELLOW 560 LED complete	30YELCPL

11.10 Foot control panel

Designation	Order no.
Foot control panel, wireless (FCP WL)*	10HFWLUC
Foot control panel, wired (FCP)*	10HFWRUC

11.11 Sterile covers/drapes

Designation	Order no.
SMARTDRAPE, no. 28 (5 pcs), sterile	306028-0000-000
VisionGuard replacement lenses (20 pcs), sterile	306001-0000-000

11.12 Sterilizable caps

Designation	Order no.
Asepsis caps 12 mm (6 pcs), sterile	60SETKAP
Asepsis caps 22 mm (6 pcs), sterile	
Asepsis caps PD 180° tiltable tube (6 pcs), sterile	

11.13 Country-specific cables

Designation	Order no.
Power cord for Europe, length: 6 m	000000-0594-821
Power cord for USA, length: 6 m	000000-0594-822
Power cord for UK, length: 6 m	000000-0594-823
Power cord for Switzerland, length: 6 m	000000-0584-947
Power cord for Argentina, length: 6 m	000000-0594-906
Power cord for China, length: 6 m	000000-0594-824
Power cord for Brazil, length: 6 m	000000-0594-905
Power cord for Australia, length: 6 m	000000-0616-997
Power cord for the Netherlands, length: 6 m	000000-0603-410

11.14 Lamp container of the xenon light source

Designation	Order no.
Xenon lamp container 300 W	60HLQLAM

11.15 Connectivity and data management

Designation	Order no.
Integrated hard drive	40H1TBUC
Wireless network package*	50WLANUC
Approved network package	50NETWUC
DICOM package	50DICOMP
LAN package	50LANIUC

11.16 Navigation interface

Designation	Order no.
Advanced navigation interface	50NAADUC
Standard navigation interface	50NASTUC

11.17 Positioning functions

Designation	Order no.
Microscope XY movement	10YXCOUC
Additional depth of field	30DOFDUC
Autobalance	10AUTOUC
SpeedFokus	40SPEEUC
Long working distance	10FODIUC

11.18 Video accessories

Designation	Order no.
External Sony 4K monitor*	404K2DMO
Sony 4K mobile monitor cart*	404KCART
Earth leakage guard for mobile cart*	40ELGCAR
NDS 24'' HD monitor*	40ENDS24
NDS 26'' HD monitor*	40ENDS26
HD-SDI video cable 5 m	40CSDI05
HD-SDI video cable 10 m	40CSDI10
HD-SDI video cable 15 m	40CSDI15
4K Quad SDI cable 10 m	40CSD415
UHD ODU video cable 5 m	40C4KODU
Endo in cable, Lemo HDMI, 5 m	40CEHDMI
Endo in cable, Lemo-DVI-D, 5 m	40CEDVID
USB 3.0 memory stick 64 GB	40USBSTI
External mini HDD USB 3.0 1 TB	40USBHDD
Canon DSLR adapter kit	40EOSKIT

Options/accessories marked with an * are not registered in all countries due to regulatory restrictions, and are therefore not available in all countries. Please contact your local ZEISS representative for information regarding the registration status in your country.

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12 Disposal

NOTE

Incorrect disposal contaminates the environment.

A high proportion of electronic scrap at the unsorted municipal waste facility poses a risk to the environment.

- ▶ Do not dispose of the waste as normal municipal waste.
- ▶ Observe the local laws/regulations governing the disposal of electrical and electronic equipment.

- ▶ Keep packing material in the event of a relocation or repair.
- ▶ If you would like to dispose of the original packing material, send it in for recycling via a recognized collection system.

The device contains electronic components with integrated batteries.

- ▶ Dispose of the device and integrated batteries correctly, in accordance with national legislation.



In accordance with applicable EU guidelines and national regulations at the time at which the product was brought onto the market, the product specified on the consignment note is not to be disposed of via the domestic waste disposal system or communal waste disposal facilities.

- ▶ For more information on disposing of the device, contact the ZEISS contact person in your country.

You can find the ZEISS contact partner for your country on the following website: www.zeiss.com/med

- ▶ If you resell the device or its components: Inform the buyer that the device is to be disposed of in accordance with the currently applicable regulations.

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Glossary

Diopter scale

Element of an eyepiece for reading off the set refraction value.

Electromagnetic compatibility (EMC)

EMC (electromagnetic compatibility) designates the normal, desired state in which technical devices do not impede each other as the result of undesired electric or electromagnetic effects (non-interference).

Eyecup

An eyepiece control element used to shield the eyepiece against scattered light during eye-controlled focusing.

FCP

The FCP is a wired foot control panel.

FCP WL

FCP WL is a wireless foot control panel.

FL button

Release button for fluorescence application on the handgrip or FCP

HF

HF (high frequency)

Ref. Phys. Name

Referring Physician's Name, name of the referring physician who requested the procedure.

Req. Proc. Code

Requested Procedure Code, code value that describes the requested procedure according to a specific coding scheme.

Req. Proc. Desc.

Requested Procedure Description, administrative description specified by the hospital or classification of the requested procedure.

Req. Proc. ID

Requested Procedure ID, identification number that identifies the requested procedure in the "Imaging Service Request".

Sch. Proc. Step Desc.

Scheduled Procedure Step Description, description specified by the hospital or classification of the scheduled procedure step.

Sch. Proc. Step Start

Scheduled Procedure Step Start, planned start time for the procedure step.

Sch. Protocol Code

Scheduled Protocol Code, code value that describes the scheduled protocol according to a specific coding scheme.

SIP

SIP (Service Identification Program)

Technical safety test

Technical safety test to determine and assess the system safety.

UDI

Unique Device Identification (UDI) Standardized identification system for medical devices.

UDI Production Identifier (UDI-PI)

Unique Device Identification - Production Identifier

UDI-DI

Unique Device Identification - Device Identifier

WEEE

WEEE (Waste of Electrical and Electronic Equipment)

WL

WL (Wireless)

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Specifications subject to change

CE

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