Instructions for Use

Surgical Microscope Cameras

C.MOR HD / C.MOR HD³

Look closer. See further.

HAAG-STREIT GROUP

Table of Contents

1 Manufacturer's Details and Contact Information

Manufacturer of the surgical microscope system is

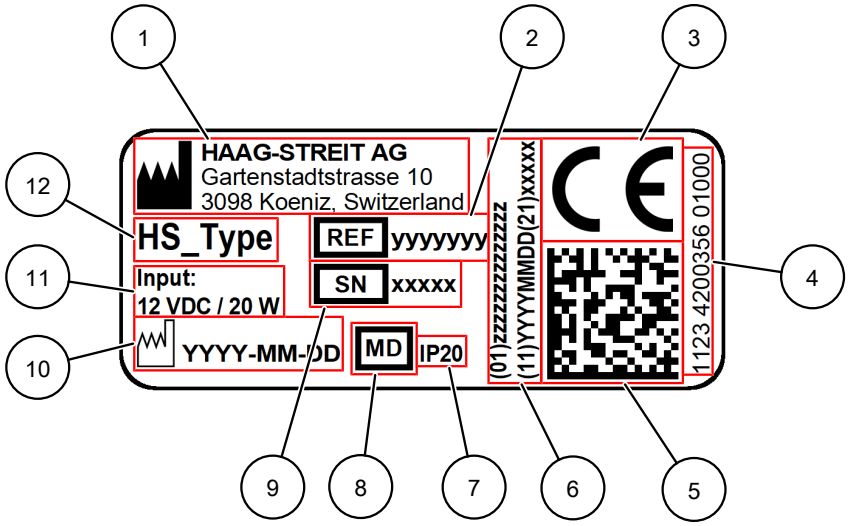
Haag-Streit AG
Gartenstadtstrasse 10
3098 Koeniz
Switzerland

European Community Authorised Representative (EC-REP):

Haag-Streit Deutschland GmbH
Rosengarten 10
22880 Wedel
Germany

If you have any questions, please provide your local sales representative the reference and serial numbers for the relevant components. You can obtain these from the respective components' type plates.

You will find the contact details for your local sales representative in the notes pages of these instructions. A current list of local sales representatives worldwide can be found on the Haag-Streit website (https://www.haag-streit.com/haag-streit-group/contact/haag-streit-distributors/distributors).



Item	Name
1	Manufacturer
2	*Ref*erence Number
3	*CE*-conformity Label
4	Item Number
5	QR-Code (*UDI* information)
6	*UDI* Code: – (01): Global Trade Item Number (*GTIN*) – (11): Date of Manufacture – (21): Serial Number (*SN*)
7	Degree of Protection by Enclosure (*IP-Code*)
8	Medical Device
9	Serial Number (*SN*)
10	Date of Manufacture according to ISO 8601
11	Power Supply Specification

Item	Name
12	Product Name

2 Information for Safety

Residual Risks

The equipment from Haag-Streit has been designed and produced according to state of the art standards and best practices at the time of manufacture. However, some residual risks remain and are indicated on the equipment and in the form of safety messages (WARNING, CAUTION, NOTICE) in this document.

Explanation of Warnings

DANGER

Will lead to serious injury or death.

Follow the instructions to avoid a hazard.

WARNING

May lead to serious injury or death.

Follow the instructions to avoid a hazard.

CAUTION

May lead to light or moderately serious injuries.

Follow the instructions to avoid a hazard.

NOTICE

May lead to material damage and / or operating error.

Follow the instructions to avoid a hazard.

2.1 General Warnings

WARNING

Risk of life threatening electrical shock or uncontrolled system behavior!

The use of accessories, transformers and cables other than those specified (with the exceptions of the transformers and cables supplied by the manufacturer as spare parts for internal components) may increase electromagnetic emissions or reduce the system´s immunity to interference.

a) Only use approved accessories and spare parts.

b) Do not exceed the maximum load capacity of the carrier unit.

c) Do not use additional multiple sockets or extension cables for power connection of the surgical microscope system.

WARNING

Risk of electrical shock and falling parts!

Changes to the surgical microscope system, like connection of additional components or accessories, without sufficient technical knowledge may not be made properly and safely.

a) Changes to the surgical microscope system may only be carried out by qualified personnel.

CAUTION

Risk of limited treatment options!

If defects are not detected, the surgical microscope system may not offer all functions during surgery.

a) Before each use, make sure that all electrical and mechanical connections are firmly seated and free of defects.

b) Regularly check the functionality and quality of the magnified vision.

c) Do not use the system in case of any obvious defects, error states or functional restrictions. Call the Haag-Streit Service.

CAUTION

Risk of unexpected moving parts!

Parts that move unexpectedly can cause injuries.

a) Perform the weight balance of the microscope axis after the attachment of additional accessories or if orientation was changed.

b) Make sure that the carrier unit is still balanced.

3 Legal Information

The part of the surgical microscope system described in these instructions for use supplements the intended use of the surgical microscope system.

3.1 Intended Use

The C.MOR HD and C.MOR HD³ are part of a surgical microscope system and are HD video cameras intended for video documentation.

Monitors, which are connected to C.MOR HD or C.MOR HD³, are exclusively intended to display information that is directly related to the operation. Before use in diagnostic applications, the user must subjectively check key parameters such as color accuracy, gray-level scaling, image size and height to width ratio.

C.MOR HD and C.MOR HD³ can be connected to the surgical microscope system via camera attachments.

3.2 Important Notes

Obligatory Reporting of Serious Incidents

Any serious incident occurring in relation to the product must be reported to Haag-Streit and the competent authority of the member state in which the user and/or the patient is established.

First Installation and Commissioning

The first installation and commissioning of the medical device must be done in accordance with the instructions in the service manual for the medical device. The first installation and commissioning of the medical device must be performed by the authorized local representative or by Haag-Streit directly.

An installation report, stating the full and error free functionality of the medical device, must be signed by both parties after the medical device has been installed and is commissioned.

Liability for Function and Damage

If the device is modified, repaired or serviced improperly, the warranty of Haag-Streit is void. Only personnel authorized by Haag-Streit may modify, repair or service the device.

Liability for Precaution

The user shall always take precaution appropriate to the application to be able to end the surgical procedure without the surgical microscope system.

Accessories

External accessories from 3rd party manufacturers must only be connected to the system after authorization by Haag-Streit. The interfaces and the combination of systems have to be validated.

Maintenance

The device must only be serviced or repaired following the service manual of the surgical microscope system.

Modifications and maintenance must only be performed by persons explicitly authorized by Haag-Streit. For maintenance only original parts from Haag-Streit as well as approved parts from third-party suppliers have to be installed. After maintenance or technical modifications, the device must be readjusted following the service manual of the surgical microscope system.

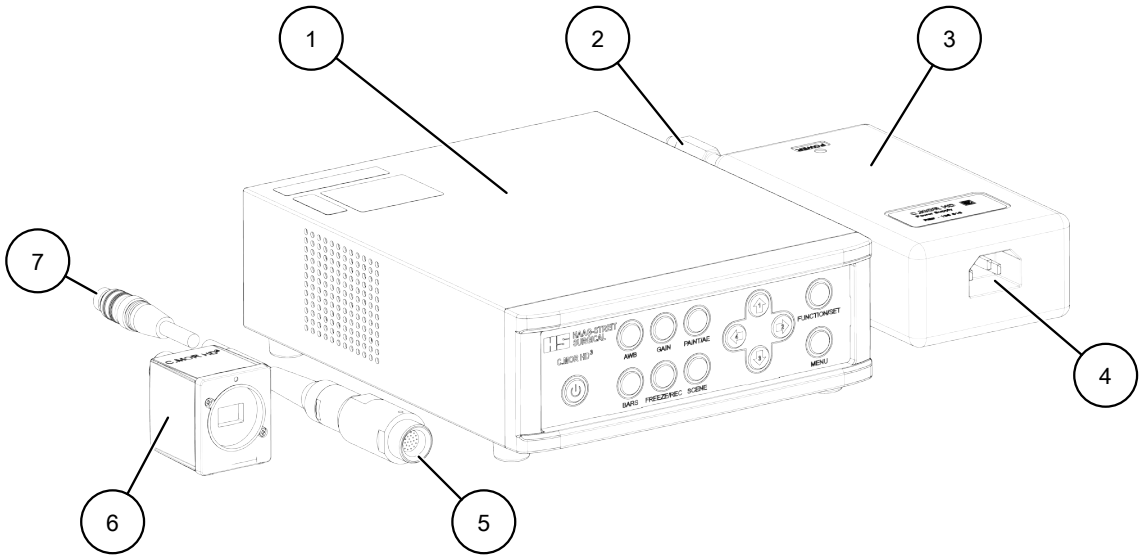
In case of technical inquiries, the device name, the reference number (*REF*), and the serial number (*SN*) need to be indicated.

For installation, dismantling and replacement of components, the actual national laws and directions regarding medical products (e.g. traceability, approval of added components, electrical safety) have to be followed. In case of doubt, please contact Haag-Streit.

4 Overview

4.1 C.MOR HD and C.MOR HD³

4.1.1 Component Overview



Item	Name	Note
1	Camera Control Unit (*CCU*)	For setting up and operating the camera.
2	Hollow Connector 5.5/2.1	For connecting the power supply unit to the CCU.
3	Power Supply Unit	Supplies the CCU with power.
4	*IEC* Socket C13	For connecting the power supply unit to the mains power socket.
5	M23 Round Socket of Camera Cable (26-pin)	For connecting the camera cable to the camera head.
6	Camera Head	Records the image of the microscope to send it to the CCU.
7	M23 Round Plug of Camera Cable (26-pin)	For connecting the camera cable to the CCU.

4.1.2 Camera Head

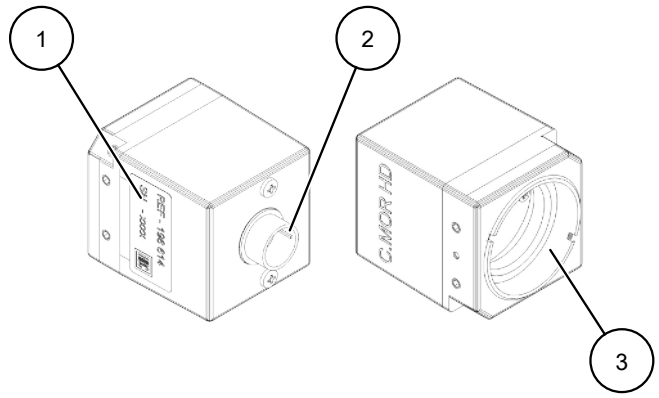


Illustration 1: C.MOR HD

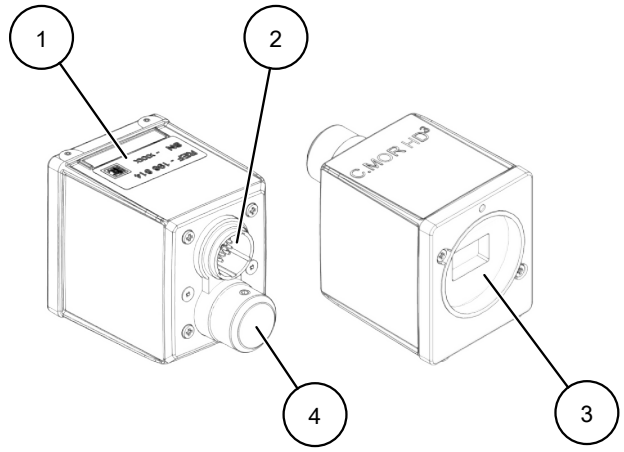
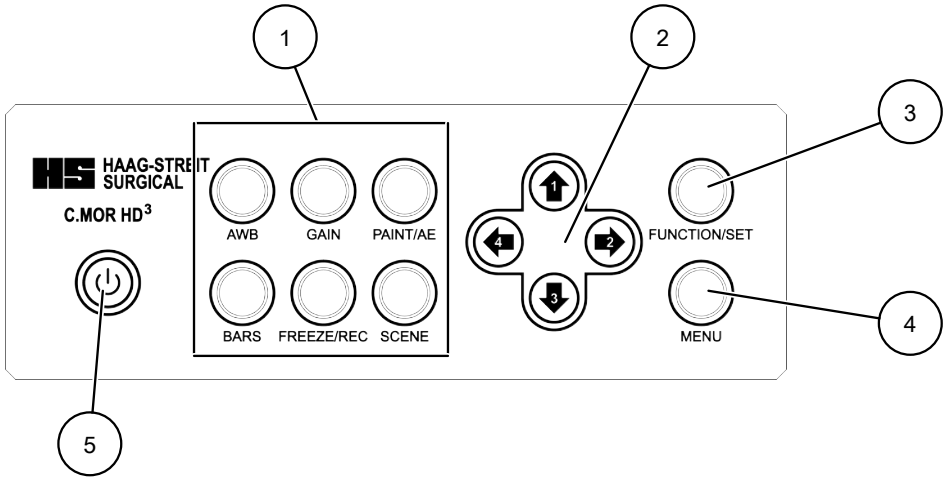


Illustration 2: C.MOR HD³

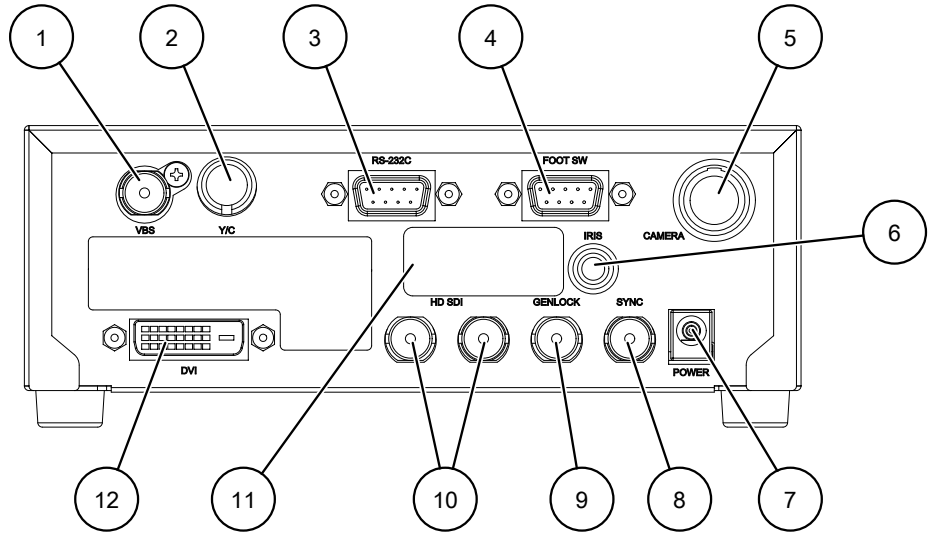
Item	Name	Note
1	Type Plate on Top of the Camera Head	Reference number (*REF*), serial number (*SN*), Health Industry Bar Code (*HIBC*) of the camera head
2	*CCU* Connection	For connecting the camera head to the camera control unit (CCU).
3	⅓″ C-Mount Connection	For connecting the camera head to the camera attachment on the microscope.
4	IRIS Connection	For connecting an automatic aperture lens. Not intended for use with the surgical microscope system.

4.1.3 CCU Front View



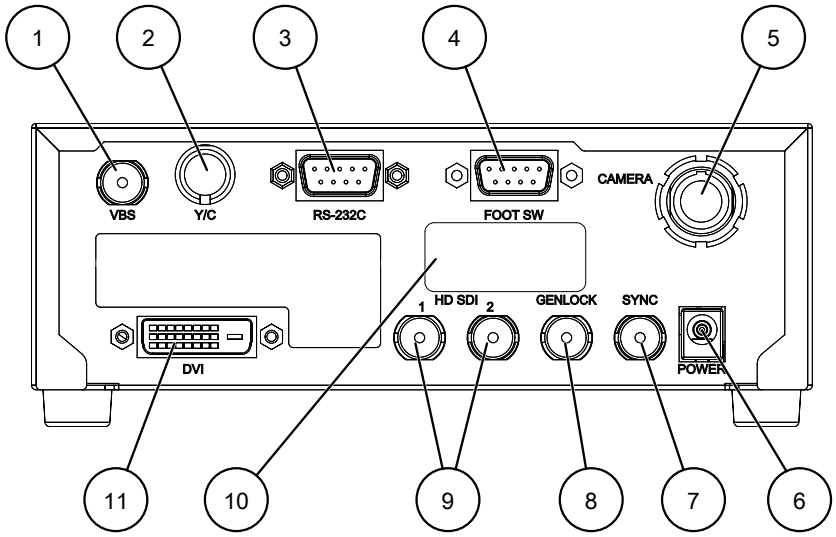
Item	Name	Note
1	Control Elements	For setting the camera functions, see Symbols for Control Elements [▷ 22].
2	Menu Navigation Controls	Buttons for selecting menu items and determining settings, see Symbols for Control Elements [▷ 22].
3	Button [FUNCTION/SET]	Confirms settings and entrys.
4	Button [MENU]	Opens or hides the settings menu.
5	Power Button	Switches the CCU on or off.

4.1.4 C.MOR HD CCU Rear View



Item	Name	Note
1	*VBS*	Output for connecting a VBS compatible monitor via BNC connector. Transmits the image in analog SD quality.
2	*Y/C*	Output for connecting an S-Video compatible monitor via Hosiden connector. Transmits the image in analog SD quality.
3	*RS-232*C	Interface for serial data transmission to monitors, printers or DVD recorders via 9-pin Sub-D connector or for remote control of the CCU.
4	FOOT SW	For connecting a foot switch via 9-pin Sub-D connector.
5	Camera	Input for connecting the camera head via camera cable.
6	IRIS	For connecting an automatic aperture lens. Not intended for use with the surgical microscope system.
7	Power	For connecting the power supply unit.
8	SYNC	Only for the 3D view function. Output for synchronizing when using two sets of cameras and CCUs. Sends synchronization signals to the slave CCU.
9	GENLOCK	Only for the 3D view function. Input for synchronizing when using two sets of cameras and CCUs. Gets the synchronization signal from the master CCU.
10	2x *HD SDI*	Output for connecting up to two HD-SDI compatible monitors via BNC connector. Transmits the image in digital HD quality.
11	Type Plate	Information regarding the manufacturer. Reference number (*REF*), serial number (*SN*) of the *CCU*
12	*DVI*	Output for connecting a DVI compatible monitor via DVI connector. Transmits the image in digital HD quality.

4.1.5 C.MOR HD³ CCU Rear View



Item	Name	Note
1	*VBS*	Output for connecting a VBS compatible monitor via BNC connector. Transmits the image in analog SD quality.
2	*Y/C*	Output for connecting an S-Video compatible monitor via Hosiden connector. Transmits the image in analog SD quality.
3	*RS-232*C	Interface for serial data transmission to monitors, printers or DVD recorders via 9-pin Sub-D connector or for remote control of the CCU.
4	FOOT SW	For connecting a foot switch via 9-pin Sub-D connector.
5	Camera	For connecting the camera head via camera cable.
6	Power	For connecting the power supply unit.
7	SYNC	Output for synchronizing when using two sets of cameras and CCUs. Sends synchronization signals to the slave CCU.
8	GENLOCK	Input for synchronizing when using two sets of cameras and CCUs. Gets the synchronization signal from the master CCU.
9	2x *HD SDI*	Output for connecting up to two HD-SDI compatible monitors via BNC connector. Transmits the image in digital HD quality.
10	Type Plate	Information regarding the manufacturer Reference number (*REF*), serial number (*SN*) of the *CCU*
11	*DVI*	Output for connecting a DVI compatible monitor via DVI connector. Transmits the image in digital HD quality.

4.2 Combinations

	Camera Equipment		
	C.MOR HD	**C.MOR HD³**	**C.MOR HD Adaption**
Carrier unit	**4000011**	**4000012**	**4200033**
FS 2-25	**x**	**x**	**x**

5 Installation to the Surgical Microscope

WARNING

Risk that accessories fall into the surgical area!

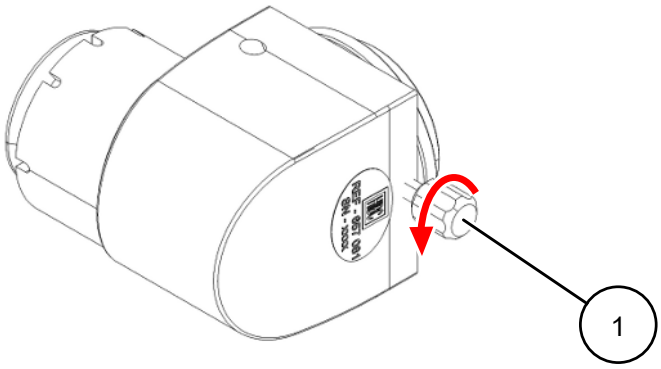
Accessories that can fall into the surgical area can injure the patient.

a) Ensure careful attachment of accessories.

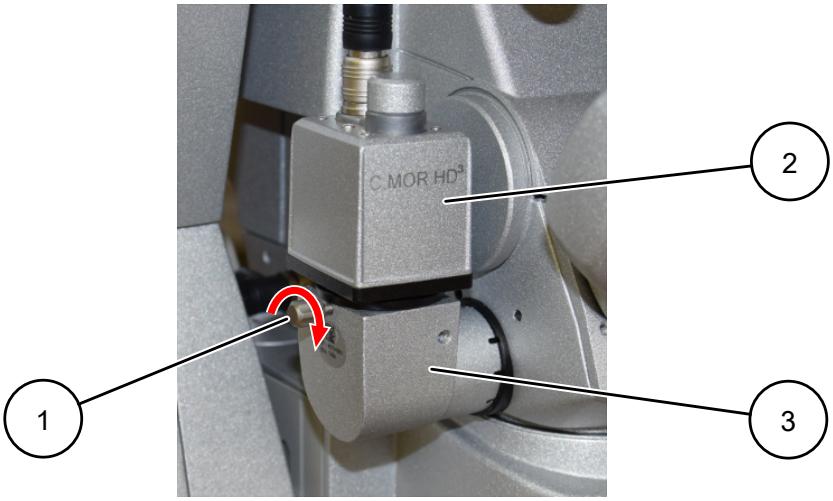
5.1 Connect the Camera Head

✓ For attaching the camera head, a camera attachment with C-mount adapter must be installed to the microscope.

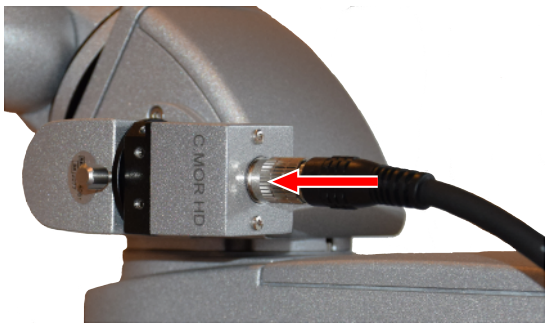
1. Make sure that the screw (1) of the camera attachment is loosened.



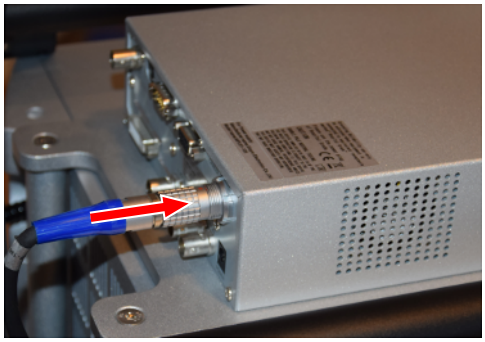
2. Plug the ⅓″ C-mount connection of the camera head (2) onto the C-mount adapter of the camera attachment (3).
3. Tighten the screw (1) of the camera attachment.



4. Connect the female plug of the camera cable to the CCU connection of the camera head. Screw the connector tight.

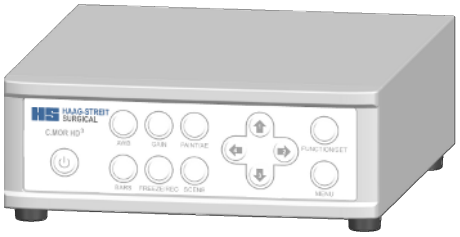


5. Connect the male plug of the camera cable to the “Camera” input of the CCU. Screw the connector tight.



5.2 Connect the CCU

1. Put the *CCU* onto the tray of the carrier unit.



2. Connect the monitor to the CCU.

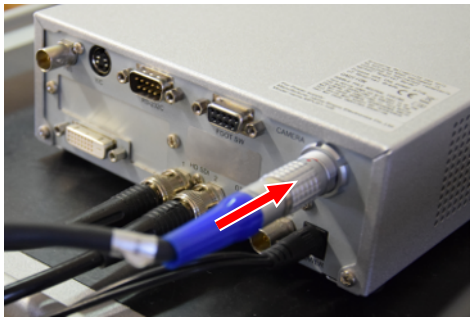
– For using the *VBS* signal (analog SD quality), connect a BNC cable to the “VBS“ output socket.

– For using the S-Video signal (analog SD quality), connect a cable with Hosiden connectors to the “*Y/C*” output socket.

– For using the *HD-SDI* signal (digital HD quality), connect a BNC cable to one of the “HD SDI” output sockets. It is possible to connect two HD monitors to the CCU.

– For using the *DVI* signal (digital HD quality), connect a DVI cable to the “DVI” output connector.

3. Connect the hollow plug of the power supply unit to the “Power” connector of the CCU.



4. Insert the mains plug of the power supply unit into the mains power socket.

5.3 Check the Image Alignment

1. Make sure that the orientation of the camera image matches the orientation of the microscope’s image. The left and right sides of the image should not be mirror-inverted.
2. If necessary, correct the camera orientation on the C-Mount module.
3. To invert the camera image with the help of the menu function, see Invert Camera Image [▷ 27].

6 Before each Operation

6.1 Initial Preparation

1. Check that all electrical and mechanical connections are firmly seated and free of defects.
2. Switch off the CCU with the power button.
3. Pull the mains plug of the power supply unit out of the mains power socket.

6.2 Cleaning and Disinfection

Perform the cleaning, disinfection, and/or sterilization before each use.

The operator must ensure that the preparation is performed within a suitable validated procedure in accordance with the respective national regulations.

The treatment process must at least meet the following requirements:

– Cleaning agent and disinfectant must be approved for the treatment of medical products.
– Cleaning and disinfecting devices and agents must accord to ISO 15883 standard.
– Steam sterilization must be in accordance with ISO 17665 and EN 285 standards if applicable.

Refer to the instructions provided by the manufacturer of the disinfectant regarding recommended concentration and contact time.

After all appropriate items are cleaned, disinfected or sterilized, they should be inspected:

1. Check all items before and after each treatment for mechanical damage.
2. Replace damaged items.
3. Ensure that no visible impurities or contaminations remain on the items.
4. Ensure that glass surfaces are clean and free of streaks.

6.2.1 Cleaning

1. Make sure that no cleaning agent can ingress into the housing of the surgical microscope system.
2. Make sure that no cleaning agent can get onto the glass surfaces or lenses, unless cleaning agents are specifically intended for this purpose.
3. Use slightly soaked wipes with sufficient amount of cleaning agent.
4. Perform disinfection afterwards with disinfectant.

CAUTION

Risk of falling touchscreen!

The touch screen of the C.MON HD may become detached during surgery, if aggressive, non-approved cleaning agents or disinfectants are used.

a) Only use approved cleaning agents or disinfectants. Do not use liquids or gas that contain chloride.
b) See following instructions for proper cleaning agents.

Manual cleaning	
Front lens	**Materials required** – Disposable gloves – Damp cloths – Dry cotton or microfiber cloth – Cleaning agent (glutaraldehyde-based or alcohol-based) – Cleaning agent (pH 6 − 10)
	Process – Use disposable gloves. – Apply the cleaning agent with a damp cloth. – For the cleaning of lenses or glass surfaces use specialized soft tissue or cloth in order to prevent surfaces from being scratched or damaged by the cleaning process by hand. Clean the glass surfaces gently. – Let cleaning agent dry in air. Remove all of the visible cleaning agent residue with a second damp cloth. – Dry the surface with the dry cotton or microfiber cloth. – Perform disinfection afterwards with disinfectant. – Let disinfectant dry out in air.
External surfaces	**Materials required** – Disposable gloves – Cloth (Damp cloth/single-use tissues or wipes, cotton or microfiber cloth) – Cleaning agent (glutaraldehyde-based or alcohol-based) – Cleaning agent (pH 6 − 10)
	Process – Use disposable gloves. – Soak cloth or wipes with a sufficient amount of cleaning agent. – Wipe off the contamination with a cloth soaked in cleaning agent. – Perform disinfection afterwards with disinfectant. – Let disinfectant dry out in air.
Monitors – Displays – Touch screens	**Materials required** – Disposable gloves – Cloth (Damp cloth/single-use tissues or wipes, cotton or microfiber cloth) – Cleaning agent (glutaraldehyde-based or alcohol-based) – Cleaning agent (pH 6 − 10)
	Process – Use disposable gloves. – Soak cloth or wipes with a sufficient amount of cleaning agent. – Wipe off the contamination with a cloth soaked in cleaning agent. – Perform disinfection afterwards with disinfectant. – Let disinfectant dry out in air.

6.2.2 Disinfection

Parts that are intended to be used/touched by the user are colored in black in the "Visual Guide for Cleaning and Disinfection", such as handles, push bars, knobs, oculars and framing of monitors and displays. These black parts in the "Visual Guide for Cleaning and Disinfection" should always be cleaned and disinfected before and after each surgical intervention since they are intended to be touched although they might be covered by a sterile drape.

Disinfect all surfaces with tissue or blood before or after each microsurgical intervention as described in the table.

1. Make sure that no disinfectant can ingress into the housing of the surgical microscope system.
2. Avoid spraying the disinfectant directly onto surfaces.
3. Use slightly soaked wipes with a sufficient amount of disinfectant.
4. Let disinfected surfaces dry out in air.
5. Be aware of the exposure time with the disinfectant.
6. Be aware of the applied concentration of utilized disinfectant.
7. Use **always** a drape.

CAUTION

Risk of falling touchscreen!

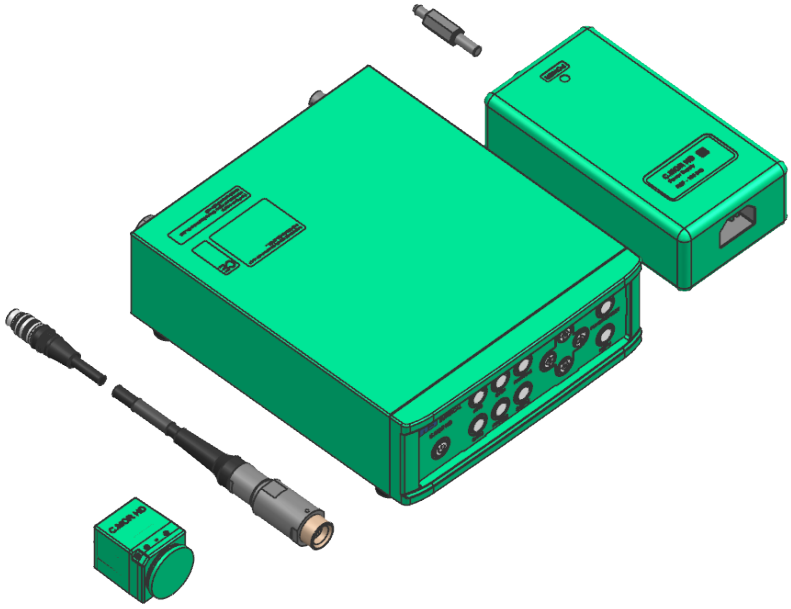
The touch screen of the C.MON HD may become detached during surgery, if aggressive, non-approved cleaning agents or disinfectants are used.

a) Only use approved cleaning agents or disinfectants. Do not use liquids or gas that contain chloride.

b) See following instructions for proper cleaning agents.

Disinfection	
Monitors – Displays – Touch screens	**Materials required** – Disposable gloves – Cloth (Damp cloth/single-use tissues or wipes, cotton or microfiber cloth) – Disinfectant (glutaraldehyde-based or alcohol-based) – Cleaning agent (pH 6 − 10)
	Process – Use disposable gloves. – Soak the cloth with sufficient amount of the disinfectant. – Wipe gently with the cloth into one direction. – Let disinfectant dry out in air.

6.2.3 Visual Guide for Cleaning and Disinfection



Color	Note
Green	Parts that are intended for cleaning and disinfection.
Black	Parts that are intended to be touched by the user. They must be cleaned and disinfected before and after each surgical intervention.
Gray	Parts that are not intended for cleaning and disinfection.

7 Operation of C.MOR HD and C.MOR HD³

NOTICE

Incorrect camera settings may result in poor image quality or no image display.

a) After adjusting the camera settings, make sure that the image reproduction on HD MIOS or the external monitor works.

b) In case of poor image quality, reset the CCU to the default settings (see Menu Settings [▷ 24]).

7.1 Symbols for Control Elements

Button	Function
	Switch the CCU on or off
	Show or Hide the Settings Menu
	Confirm the Entry
	Select the Menu Item
	Adjust the Current Setting
	Perform Auto White Balance
	Set Up the Light Sensitivity
	Adjust Color Filters or Automatic Exposure
	Adjust Image and Monitor Settings with the help of a Color Bar Signal

Button	Function
	Create and Save Still Images
	Open and Select Stored Scene Files.

7.2 Switch the CCU on and off

The camera head is automatically switched on or off with the surgical microscope system.
To switch the CCU on or off:

1. Before turning on the power of the CCU, make sure that all devices (camera head, monitors) are connected correctly.
2. Press the power button.

⇨ If the power button lights up green, the video camera is switched on.

⇨ If the power button is not lit, the video camera is switched off.

7.3 Configure Setup Menu

This chapter only shows the most frequently required menu settings that can be used to improve the camera image under a wide range of environmental conditions.

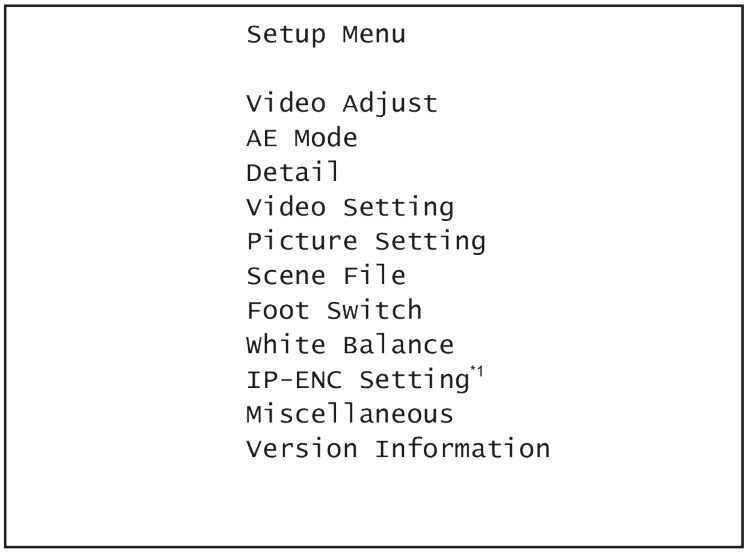
Different types of surgery require different types of illumination. The illumination of the surgical field can be influenced by using different light sources (e.g. endoilluminator, microscope light), different temperatures of light (e.g. halogen filter, daylight filter) or the light intensity.

In addition, the camera image can look different on an external monitor, so that the camera image differs from the microscope's image.

The camera image can be adjusted according to individual preferences, which affects the quality of the image.

An overview of all possible menu settings and their default settings are shown in chapter Menu Settings [▷ 24].

7.3.1 Menu Settings



Menu	Function	Default value	Note
Video Adjust	Pedestal	0	Adjusts the black level. Increasing the value brightens black sections. Normally not used.
	Video Level	0	Adjusts the camera image signal level. Increasing the value produces a brighter image. Normally not used.
	Gain Offset Red	0	Adjusts the red level. Same function as hue adjustment via the button [PAINT/AE]. See Adjust Hue and Automatic Exposure (PAINT/AE) [▶ 32].
	Gain Offset Blue	0	Adjusts the blue level. Same function as hue adjustment via the button [PAINT/AE]. See Adjust Hue and Automatic Exposure (PAINT/AE) [▶ 32].
	White Shading*	OFF	Carries out a white shading correction.
	Auto White Shading*	READY	White shading is adjusted automatically.
	D-Range Expansion*	NORMAL	Carries out a dynamic range expansion. The brightness difference between the darkest and the brightest areas of the image is equalized.
	Flare Control*	17	Adjusts the flare control to reduce aperture spots.

Menu	Function	Default value	Note
AE Mode	Shutter Control	AUTO	Sets the shutter speed mode to automatic or manual.
	Manual Shutter	OFF	Adjusts the shutter speed, if `Shutter Control` is set to `FIX`. Increasing the value reduces the brightness of the image.
	Auto Shutter Limit	1/4000	Sets the upper limit of the shutter speed, if `Shutter Control` or `Gain Control` is set to `AUTO`.
	AE Level	0	If `Shutter Control` or `Gain Control` is set to `AUTO`, it is possible to make the fine adjustment of the shutter speed in relation to the level set here.
	AE Speed	MID	Sets the shutter control speed if the Shutter Control or Gain Control is set to AUTO.
	Peak Ratio	-128	Adjusts a scheme for peak metering or average metering, if `Shutter Control` or `Gain Control` is set to `AUTO`.
	Area Select	NARROW	Adjusts the extent of the measuring area for the automatic sensitivity settings based on the image that is displayed on the monitor (see Adjust Automatic Sensitivity Settings [▶ 29]).
	Gain Control	AUTO	Sets the gain mode to automatic or manual.
	AGC Gain Range	18 dB	Adjusts the maximum of gain, if `Gain Control` is set to `AUTO`.
	Normal Gain	-6 dB	Normal gain setting. Always used regardless of the setting of `Gain Control`. Increasing the value brightens the image.
	High Sensitivity	OFF	Increases the sensitivity when activated. Horizontal resolution will get lower.
	Line Mix	OFF	Increases the sensitivity when activated. Vertical resolution will get lower.
Detail	Detail	OFF	Sets the detail enhancement. When activated, the image is clearer. See Increase Image Details [▶ 30].
	Detail Gain	0	Adjusts the detail enhancement level.
	Boost Frequency	16 MHz	Sets the boost frequency for the detail enhancement.
	Detail Mode*	NORMAL	Adjusts the strength of the detail enhancement.

Menu	Function	Default value	Note
Video setting	Format	50 Hz	Sets the type of the VBS output signal.
	SDI Setting*	1080i	Sets the type of the HDI SDI output signal.
	DVI Setting	1080p	Sets the type of the DVI output signal.
	Gamma	ON	Brightens the dark sections of the image when activated.
	Master Gamma	0	Adjusts the degree of gamma correction. The lower the value, the brighter the dark sections of the image.
	Color Saturation	ON	Sets the color intensity. See Adjust Color Saturation [▶ 30].
	Color Saturation Gain	10	Adjusts the value of the color intensity, if `Color Saturation` is `ON`.
	Genlock Mode*	AUTO	Sets the genlock mode for synchronization when two cameras are used.
	Genlock H Phase	0	Adjusts the horizontal phase for genlock input.
	Genlock V Phase	0	Adjusts the vertical phase for genlock input.
	3D Support*	SLAVE	Sets the function of the CCU when 3D support is used.
Picture Setting	DNR	ON	Activates the noise reduction.
	DNR Level	8	Adjusts the noise reduction strength. Increasing the value reduces more noise but deteriorates resolution.
	H Flip	OFF	Sets the horizontal inversion of the image. See Invert Camera Image [▶ 27].
	V Flip	OFF	Sets the vertical inversion of the image. See Invert Camera Image [▶ 27].
	Digital Zoom	x1.0	Sets the magnification of the electronic zoom.
	Picture Shift H	0	Adjusts the horizontal display position of the screen in 1-pixel units.
	Picture Shift V	0	Adjusts the vertical display position of the screen in 1-pixel units.
	R-DPC*	OFF	Activates the image correction for differential phase contrast.
Scene File	Scene Number	No. 1	Selects and reads a stored scene file. See Open User Profiles (SCENE) [▶ 33].
	Store Scene	READY	Stores the current setting values to the selected scene file. See Configure User Profiles (Scene Files) [▶ 30].
	Initialize Scene	READY	Initializes the selected scene file or all scene files. See Configure User Profiles (Scene Files) [▶ 30].

Menu	Function	Default value	Note
Foot Switch	Foot Switch	NONE	Carries out different operations for foot switches in use. It is possible to use up to 4 foot switches.
White Balance	WB Mode	AWB	Sets the white balance mode. See Choose White Balance Mode [▶ 29] and Perform Automatic White Balance (AWB) [▶ 31].
	Manual Gain Red	-16	Adjusts the red gain.
	Manual Gain Blue	-28	Adjusts the blue gain.
Miscellaneous	Center Marker	OFF	Sets the center marker of the display.
	Beep*	OFF	Activates a beep when operating a button.
	Menu Lock	ON	Sets a lock function for all menu settings. When activated, no settings can be changed, except the menu lock. See Show or Hide Setup Menu [▶ 27].
	Cancel	READY	Restores the last saved menu items.
	Initialize (exp. Scene)	READY	Initializes all settings except those for the scene files.

*Only for C.MOR HD³

7.3.2 Show or Hide Setup Menu

1. Make sure that an external monitor is connected to the CCU (see Installation to the Surgical Microscope [▶ 15]).

2. Press the button [MENU] on the front panel of the CCU to open the `Setup Menu`.
   ⇨ The `Setup Menu` is shown on the monitor.
3. Press the button [MENU] on the CCU to hide the `Setup Menu`.

7.3.3 Invert Camera Image

To change settings in the setup menu, the menu lock must be deactivated:

1. Open the `Setup Menu`.
2. Select the menu item `Miscellaneous`.
3. Set the value of the menu item `Menu Lock` to `OFF`.
   ⇨ The red lock mark in the menu screen disappears.
4. Select the menu item `Picture Setting`.
5. To activate the horizontal image inversion, set the value of the menu item `H Flip` to `ON`.
6. To activate the vertical image inversion, set the value of the menu item `V Flip` to `ON`.
7. To rotate the image by 180°, activate the image inversion around both axes.
8. Confirm the entry by pressing the button [FUNCTION/SET] on the front panel of the CCU.
9. To activate the menu lock, set the value of the menu item `Menu Lock` to `ON`.

7.3.4 Adjust Video Frequency

Using the `Video Setting` submenu, the output signals for *VBS*, *DVI* and *HD SDI* can be adjusted. For the *Y/C* signal, no manual setting is possible.

To change settings in the setup menu, the menu lock must be deactivated:

1. Open the `Setup Menu`.
2. Select the menu item `Miscellaneous`.
3. Set the value of the menu item `Menu Lock` to `OFF`.
   ⇨ The red lock mark in the menu screen disappears.
4. Select the menu item `Video Setting`.

To adjust the frame rate for the VBS output signal:

5. Set `Format` to the desired value:

– `59.94 Hz`: The VBS signal outputs the NTSC format with a frame rate of 59.94 frames per second.
– `50 Hz`: The VBS signal outputs the PAL format with a frame rate of 50 frames per second.

To adjust the HD SDI output signal:

6. Set `SDI Setting` to the desired value:

– `1080p`: progressive image transfer of 1080 image lines, without interlaced scanning
– `1080i`: interlaced image transfer of 1080 image lines

To adjust the DVI output signal:

– Set `DVI Setting` to the desired value:
– `1080p`: progressive image transfer of 1080 image lines, without interlaced scanning
– `1080i`: interlaced image transfer of 1080 image lines

7. Confirm the entry by pressing the button [FUNCTION/SET] on the front panel of the CCU.
8. To activate the menu lock, set the value of the menu item `Menu Lock` to `ON`.

7.3.5 Choose White Balance Mode

In case of incorrect color reproduction, a white balance can be perfomed. The white balance function can be set to automatic or manual. With manual white balance, it is possible to adjust the values for the red and blue gain.

To change settings in the setup menu, the menu lock must be deactivated:

1. Open the `Setup Menu`.
2. Select the menu item `Miscellaneous`.
3. Set the value of the menu item `Menu Lock` to `OFF`.
   ⇨ The red lock mark in the menu screen disappears.
4. Select the menu item `White Balance`.
5. Set `WB Mode` to the desired value:

– `AWB`: The white balance is adjusted automatically. To perform an automatic white balance, see Perform Automatic White Balance (AWB) [▶ 31]. Unlike the auto-tracing white balance, this setting is made only once when the function is triggered.
– `Manual`: The white balance can be set manually. This setting is carried out via `Manual Gain Red` and `Manual Gain Blue` in the same menu. By increasing the red and blue gain values, these colors are displayed more vividly.
– `ATW`: Activates the auto-tracing white balance. In this mode, the color temperature is monitored continuously and thereby white balance is set automatically. This function is recommended when lighting conditions change frequently.

6. Confirm the entry by pressing the button [FUNCTION/SET] on the front panel of the CCU.
7. To activate the menu lock, set the value of the menu item `Menu Lock` to `ON`.

7.3.6 Adjust Automatic Sensitivity Settings

It is possible to carry out the automatic adjustment of the shutter and the light sensitivity (gain) based on the image that is displayed on the monitor.

To use this function, the size of the measuring area must be set, which is to serve as the basis for the automatic setting.

To change settings in the setup menu, the menu lock must be deactivated:

1. Open the `Setup Menu`.
2. Select the menu item `Miscellaneous`.
3. Set the value of the menu item `Menu Lock` to `OFF`.
   ⇨ The red lock mark in the menu screen disappears.
4. Select the menu item `AE mode`.
5. Choose the `Area Select` value for the measuring area that is displayed on the monitor:

– `MID`: About 40% of the screen center is the measuring area.
– `WIDE`: About 60% of the screen center is the measuring area.
– `FULL`: The entire screen is the measuring area.
– `NARROW`: About 10% of the screen center is the measuring area.
– `USER`: Enables user defined setting.

6. Confirm the entry by pressing the button [FUNCTION/SET] on the front panel of the CCU.
7. To activate the menu lock, set the value of the menu item `Menu Lock` to `ON`.

7.3.7 Increase Image Details

It is recommended to activate the detail enhancement of the camera image, so that the image will be clearer and easier to view.

To change settings in the setup menu, the menu lock must be deactivated:

1. Open the `Setup Menu`.
2. Select the menu item `Miscellaneous`.
3. Set the value of the menu item `Menu Lock` to `OFF`.
   ⇨ The red lock mark in the menu screen disappears.
4. Select the menu item `Detail`.
5. Set the value for `Detail` to `ON`.
6. To intensify the detail enhancement, select the menu item `Detail Mode` and set the value from `NORMAL` to `STRONG`.
7. Confirm the entry by pressing the button [FUNCTION/SET] on the front panel of the CCU.
8. To activate the menu lock, set the value of the menu item `Menu Lock` to `ON`.

7.3.8 Adjust Color Saturation

The color intensity can be improved.

To change settings in the setup menu, the menu lock must be deactivated:

1. Open the `Setup Menu`.
2. Select the menu item `Miscellaneous`.
3. Set the value of the menu item `Menu Lock` to `OFF`.
   ⇨ The red lock mark in the menu screen disappears.
4. Open the `Setup Menu`.
5. Select the menu item `Video Setting`.
6. Set the value `Color Saturation` to `ON`.
7. Confirm the entry by pressing the button [FUNCTION/SET] on the front panel of the CCU.
8. To activate the menu lock, set the value of the menu item `Menu Lock` to `ON`.

7.3.9 Configure User Profiles (Scene Files)

Different users have different preferences for the camera adjustment. By saving a scene file, all setting values of the menu are stored so that different users can recall their individual menu settings more quickly.

It is possible to save up to four scene files for quick access to frequently used settings.

To change settings in the setup menu, the menu lock must be deactivated:

1. Open the `Setup Menu`.
2. Select the menu item `Miscellaneous`.
3. Set the value of the menu item `Menu Lock` to `OFF`.
   ⇨ The red lock mark in the menu screen disappears.

Store a scene file

1. Make sure that all settings that are to be saved in this scene file are correctly adjusted.
2. Select the menu item `Scene File`.
3. Select `Store Scene`.
4. Select the number of the scene file which should be saved.
5. Confirm the entry by pressing the button [FUNCTION/SET] on the front panel of the CCU.
   ⇨ All current setting values are saved to the scene file.

Load a scene file

To load a stored scene file, see Open User Profiles (SCENE) [▶ 33].

Initialize a scene file

1. Select the menu item `Scene File`.
2. Select the `Initialize Scene`.
3. Select the number of the scene file which should be initialized or select `All` to initialize all scene files.
4. Confirm the entry by pressing the button [FUNCTION/SET] on the front panel of the CCU.
5. To activate the menu lock, set the value of the menu item `Menu Lock` to `ON`.

7.4 Perform Automatic White Balance (AWB)

Whenever the lighting conditions change, the white balance should be performed. Otherwise, the color reproduction of the camera image will be incorrect.

NOTICE

If the position of the microscope's filter is wrong, the automatic white balance produces a camera image that is wrong in terms of color.

a) Make sure not to use a filter during the automatic white balance performance.

1. Place a white object under the surgical microscope's focus module, e.g., a blank piece of white copy paper.
2. Switch on the illumination that should be used, e.g., the endoilluminator.

3. Press the button [AWB] on the front panel of the CCU.
   ⇨ The button [AWB] lights up green and the operation is displayed on the monitor:

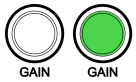
– `AWB BUSY`: The camera is currently performing the automatic white balance.
– `AWB COMPLETED`: The automatic white balance was performed successfully.
– `AWB ERROR`: The automatic white balance was not performed because the illumination is too bright or too dark. Adjust the illumination and perform the automatic white balance again.

7.5 Adjust Light Sensitivity (GAIN)

C.MOR HD and C.MOR HD³ can automatically adjust the brightness of the camera image via gain function. The gain of a camera provides a light amplification. Despite changing lighting conditions, the camera image is displayed with almost constant brightness.

Notice that excessive gain may cause white spots in the video image.

1. Press the button [GAIN] on the front panel of the CCU to switch the automatic gain control on or off.



⇨ If the button [GAIN] lights up green, the automatic gain control is activated.

⇨ If the button [GAIN] is not lit, the automatic gain control is deactivated.

7.6 Adjust Hue and Automatic Exposure (PAINT/AE)

Adjust red and blue component

After the performing of a white balance, the red and the blue component of the camera image can be adjusted manually to obtain the desired hue.

Notice that the settings are only temporary and will be reset if the CCU is switched off.

1. Press the button [PAINT/AE] on the front panel of the CCU to activate the hue adjustment.

⇨ The button [PAINT/AE] lights up green and the hue adjustment is active.

2. Adjust the hue via the control buttons:

– Press the upper control button to increase the red component of the video image.

– Press the right control button to increase the blue component of the video image.

– Press the lower control button to decrease the red component of the video image.

– Press the left control button to decrease the blue component of the video image

3. Confirm the setting by pressing the button [FUNCTION/SET].

Adjust automatic exposure

The *AE* function adjusts the shutter speed and the gain value according to the exposure level. This allows to increase or decrease the brightness of the image.

Notice that the settings are only temporary and will be reset if the CCU is switched off.

To change settings in the setup menu, the menu lock must be deactivated:

1. Open the `Setup Menu`.
2. Select the menu item `Miscellaneous`.
3. Set the value of the menu item `Menu Lock` to `OFF`.

⇨ The red lock mark in the menu screen disappears.

The AE function is only enabled, if the function `Gain Control` is set to `AUTO`:

4. Select the menu item `AE mode`.
5. Set the value `Gain Control` to `AUTO`.

6. If the button [PAINT/AE] lights up green, press the button again to deactivate the hue adjustment.
   ⇨ The button [PAINT/AE] is not lit.
7. Adjust the automatic exposure via the control buttons:

– Press the upper or the right control button to increase the AE level.

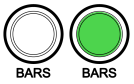
– Press the lower or the left button to decrease the AE level.

8. Confirm the entry by pressing the button [FUNCTION/SET] on the front panel of the CCU.
9. To activate the menu lock, set the value of the menu item `Menu Lock` to `ON`.

7.7 Adjust Image and Monitor Settings (BARS)

C.MOR HD and C.MOR HD³ can output a color bar test pattern, so that image and monitor settings (e.g., contrast, brightness) can be adjusted easier.

1. Press the button [BARS] on the front panel of the CCU to show or hide the color bar test pattern.



   ⇨ If the button [BARS] lights up green, the color bar test pattern is shown.
   ⇨ If the button [BARS] is not lit, the color bar test pattern is hidden.

7.8 Create Freeze Images (FREEZE/REC)

C.MOR HD and HD³ can output freeze images.

1. Select the image section to be captured.
2. Press the button [FREEZE/REC] on the front panel of the CCU to freeze the image.
3. To return to the moving image, press the button [FREEZE/REC] again.

   ⇨ If the button [FREEZE/REC] lights up green, the freeze image function is activated.
   ⇨ If the button [FREEZE/REC] is not lit, the freeze image function is deactivated.

7.9 Open User Profiles (SCENE)

C.MOR HD and C.MOR HD³ can store up to four scene files to access frequently used settings quickly. To save scene files, see Configure User Profiles (Scene Files) [▶ 30].

1. Press the button [SCENE] on the front panel of the CCU.
   ⇨ The button [SCENE] lights up green and the scene selection is active.
2. Select the desired scene file via the control buttons:

– Press the upper control button to load scene file 1.

– Press the right control button to load scene file 2.

– Press the lower control button to load scene file 3.

– Press the left control button to load scene file 4.

8 Troubleshooting

CAUTION

Risk of limited treatment options!

If defects are not detected, the surgical microscope system may not offer all functions during surgery.

a) Before each use, make sure that all electrical and mechanical connections are firmly seated and free of defects.

b) Regularly check the functionality and quality of the magnified vision.

c) Do not use the system in case of any obvious defects, error states or functional restrictions. Call the Haag-Streit Service.

NOTICE

Resettable error reoccurs twice or more

The error may be due to a systematic fault in the medical device and must be attended by Haag-Streit.

Please contact your local representative or Haag-Streit, stating the product name, type and serial number together with a description of the error and the circumstances under which the error occurs.

Error messages	Cause	Remedy
Error message `HEAD ERROR` appears.	The CCU does not detect the camera head.	Check the connection of the camera cable to the camera head and to the CCU.
Error message `AWB ERROR` appears.	Automatic white balance was not performed because the illumination is too bright or too dark.	Adjust the illumination and perform the automatic white balance again.

9 Maintenance

9.1 General

Perform maintenance in accordance with the instructions for use of the surgical microscope system.

We recommend to have the surgical microscope system regularly serviced by your Haag-Streit national representative.

9.2 Maintenance Intervals

Maintenance tasks which are not described in these instructions must be conducted by authorized service technicians.

Maintenance tasks which can be conducted by the user are described in the following table.

User	
Maintenance Interval	**Task**
Before each use	– Installation to the Surgical Microscope [▷ 15] and Before each Operation [▷ 18] – Check that the camera images correspond to the images in the ocular and on the monitor. – Check that the image orientation is correct and not inverted.
Annually	The surgical microscope system must be serviced by the local sales representative of Haag-Streit.

10 Disposable Materials and Spare Parts

WARNING

Risk of life threatening electrical shock or uncontrolled system behavior!

The use of accessories, transformers and cables other than those specified (with the exceptions of the transformers and cables supplied by the manufacturer as spare parts for internal components) may increase electromagnetic emissions or reduce the system´s immunity to interference.

a) Only use approved accessories and spare parts.

b) Do not exceed the maximum load capacity of the carrier unit.

c) Do not use additional multiple sockets or extension cables for power connection of the surgical microscope system.

C.MOR HD	
Name	**REF**
Power pack	4401129
Camera cable, 5 m	4401130
Camera cable, 7 m	4401131

C.MOR HD³	
Name	**REF**
Power pack	4401129
Camera cable, 5 m	4401132
Camera cable, 7 m	4401133

11 Technical Data

Environment Data	
Operating temperature [°C]	+ 10 – + 40
Operating, relative air humidity [%]	10 – 90
Operating, air pressure [hPa]	795 – 1060
Storage and transport, temperature [°C]	- 20 – + 70
Storage and transport, relative air humidity [%]	10 – 90
Storage and transport, air pressure [hPa]	600 – 1060

Conformity	
Classification	CE Regulation (EU) 2017/745 Class I
Safety	EN 60 601-1 Appliance class I equipment
EMC	IEC 60 601-1-2
UMDNS	12-539
GMDN	12539
Degree of protection by enclosure (IP-Code)	IP20

Technical Data	C.MOR HD	C.MOR HD³
REF	4000011	4000012
Mechanical data		
Dimensions CCU		
Height [mm]	58	58
Width [mm]	170	170
Depth [mm]	200	200
Weight [kg]	1.1	1.1
Dimensions Camera Head (without cable)		
Height [mm]	31	40
Width [mm]	31	34
Depth [mm]	36	40
Weight [kg]	0.06	0.1
Connection Type Camera Head	C-mount, ⅓″	C-mount, ⅓″
Electrical data		
Possible operating voltages [V ~]	100 … 240	100 … 240
Possible mains frequencies [Hz]	50/60	50/60
Maximum power consumption [VA]	25	25
Degree of protection by enclosure (IP-Code)	IP20	IP20
Recording system		

Technical Data	C.MOR HD	C.MOR HD³
Type	⅓″, 1-Chip, CMOS	⅓″, 3-Chip, CMOS
Effective pixels	1920 x 1080	1920 x 1080
Scan method	1920 x 1080 50/59.94 progressive	1920 x 1080 50/59.94 progressive
Height – width - ratio	16:9	16:9
Horizontal resolution	900 TV lines	1000 TV lines
Connections		
VBS	PAL/NTSC	PAL/NTSC
Y/C	S-Video	S-Video
RS 232C	not used	not used
FOOT SW	not used	not used
Camera	Connection of the camera head	Connection of the camera head
IRIS	not used	not used
DVI	DVI-D, 1080p/1080i	DVI-D, 1080p/1080i
HD SDI (2x)	1080i 50/59.94	1080i 50/59.94
GENLOCK	Synchronization (Slave)	Synchronization (Slave)
SYNC	Synchronization (Master)	Synchronization (Master)
POWER	Connection of the power pack	Connection of the power pack

12 Disposal

Dispose of the surgical microscope system and its components according to national and regional legislation.

Within the European Union, the surgical microscope system and its components are subject to EU-Directive on Waste of Electrical and Electronic Equipment and may not be disposed together with waste from private households.

The manufacturer shall take the surgical microscope system and its components back for proper recycling or disposal. Please contact your local Haag-Streit sales representative.

13 Appendix

13.1 Specifications on Electromagnetic Compatibility

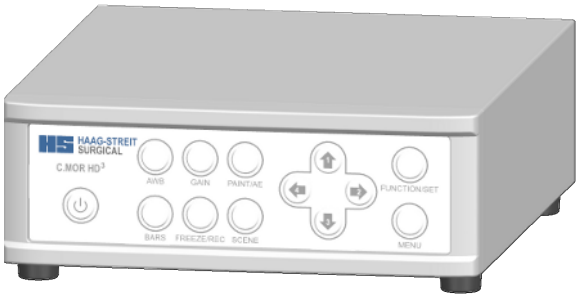
Phenomenon	Test standard	Level
Emissions	CISPR 11	Class A
Harmonic currents	IEC 61000-3-2	Class A, stationary
Voltage fluctuations and flicker	IEC 61000-3-3	
Discharge of static electricity	IEC 61000-4-2	±8 kV contact ±2 kV, ±4 kV, ±8 kV, ±15 kV air
High-frequency electromagnetic fields	IEC 61000-4-3	3 V/m @ 80 MHz ... 2.7 GHz 27 V/m @ 380 MHz ... 390 MHz 28 V/m @ 430 MHz ... 470 MHz 9 V/m @ 704 MHz ... 787 MHz 28 V/m @ 800 MHz ... 960 MHz 28 V/m @ 1.7 GHz ... 1.99 GHz 28 V/m @ 2.4 GHz ... 2.57 GHz 9 V/m @ 5.1 GHz ... 5.8 GHz
Electrical fast transient disturbance/bursts	IEC 61000-4-4	For signal lines: ± 1 kV @ 100 kHz For the supply input: ± 2 kV @ 100 kHz
Surge voltages	IEC 61000-4-5	± 0.5 kV, ± 1 kV line against line for the supply input ± 0.5 kV, ± 1 kV, ± 2 kV line against ground
Conducted disturbances induced by high-frequency fields	IEC 61000-4-6	3 V @ 0.15 MHz ... 80 MHz 6 V @ ISM frequency bands
Magnetic fields with energy-related rated frequencies	IEC 61000-4-8	30 A/m
Voltage drops, voltage interruptions	IEC 61000-4-11	0% 0,5 cycles (0°, 45°, 90°, 135°, 180°, 225°, 270°, 315°) 0% 1 cycle (0°) 70% 500ms (0°) 0% 5s

Glossary

AE

AE is the abbreviation for Automatic Exposure. This function automatically controls the exposure of the camera lens via the aperture value and the shutter speed of the lens.

CCU



abbreviation of camera control unit

CE

CE is the abbreviation for "Communité Européen", the European Community. The abbreviation is used in a special graphic layout to state that the given product is designed and produced according to the European guidelines for product safety and user protection.

DVI

DVI is the abbreviation for Digital Visual Interface, an interface for the transmission of moving images. The transmission can be analog (DVI-A), digital (DVI-D) or a mixture of both (DVI-I). The usual field of application is the connection of monitors to graphics cards of computers. Analog DVI connections are VGA ports.

GMDN

GMDN is the abbreviation for "Global Medical Device Nomenclature", which is the European system defining the nomenclature for medical devices.

GTIN

GTIN is the abbreviation for "Global Trade Item Number", a unique and internationally recognized identification for a product with 14 digits.

HD SDI

The HD SDI is a Serial, Digital Interface, primarily for the transmission of uncompressed and unencrypted High Definition video data via coaxial cable.

HIBC

HIBC is the abbreviation of the term "Health Industry Bar Code". It was introduced to label medical devices and make them forgery-proof and traceable.

IEC

IEC is the abbreviation for International Electrotechnical Commission. IEC connectors are standardized non-locking connectors for connecting power supply cords to electrical appliances of voltage not exceeding 250 V (a.c.).

IP-Code

IP xx, indicates how well a cabinet protects the circuits and switches against ingress of fluids.

REF

REF is the abbreviation of the term "Reference Number". Each product and all spare parts have a unique reference number, by which they can be ordered.

RS-232

RS232 is one of the most widely used standards for serial ports.

SN

SN is the abbreviation of the term "Serial Number". Every product is given a unique serial number, by which the specific technical data can be retrieved.

UDI

UDI is the abbreviation for "Unique Device Identification". The UDI code enables medical device traceability and prevents product diversion and counterfeiting.

UMDNS

UMDNS is the abbreviation for "Universal Medical Device Nomenclature System", which is an international system defining the nomenclature for medical devices.

VBS

VBS ist the abbreviation for Video Blanking Sync. The VBS signal is a video signal for black and white picture transmission, which is composed of the video/picture signal (V), the blanking signal (B) and the synchronization signal (S). The VBS signal is an analog video signal. This transmission technique is also called composite video.

Y/C

Y/C stands for the transmission of an Seperate Video (S-Video) signal. Brightness (Y) and color (C) information are transmitted on separate channels. It allows better quality of the signal than composite video (VBS).

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