This brochure can be applicable to the following models:

Monitor:
LMD-XH320T/LMD-XH550T/S3180P

Trolley:
TV-500/TV-300

Endoscope Camera System:
UX5/UX5-TEC

Endoscope Light Source:
HB500R/HB500

4K 3D Video Endoscope:
M 31030A/M 31000A/G 31030A/G 31000A

Camera Head:
CH5-SR100/CH5-SR110/CH5-SW100/CH5-SW110

Rigid Endoscope:
G 01030A/G 01000A/G 00530A/G 00500A/G 10530A/
G 10500A/M 01030A/M 01000A

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Location: Moldova
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www.mindray.com

P/N: ENG-UX5 Series 4K&NIR/4K&3D Endoscope Camera System-210285X12P-20241205

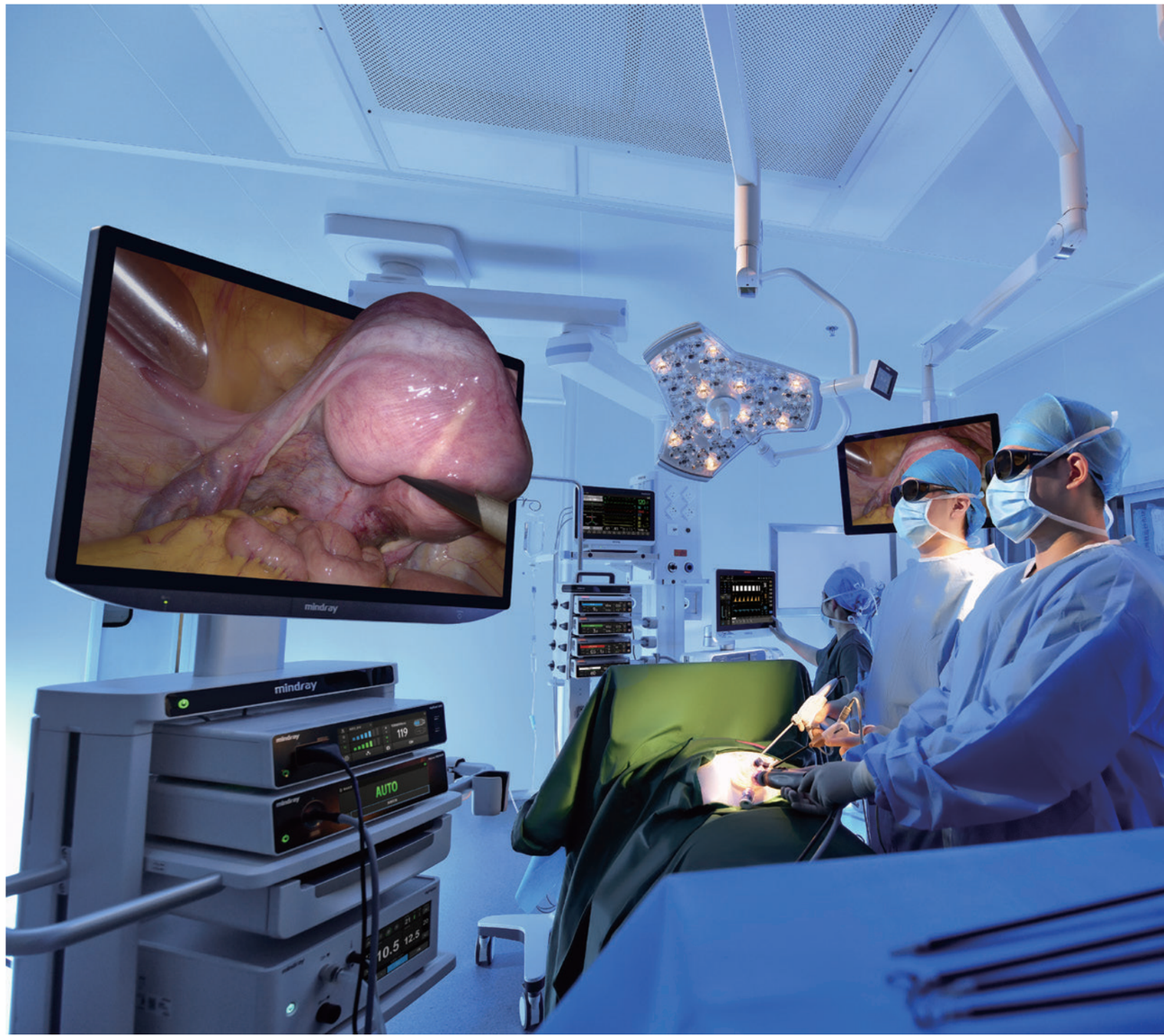
mindray
healthcare within reach

mindray

UX5 Series *4K&NIR/4K&3D*

Endoscope Camera System

Vision beyond Imagination



Full-chain Independent R&D

The advancement of minimally invasive technology has significantly generates the demand for precision surgeries. This has led to increased requirements for the resolution, real-time navigation, and accurate restoration of 3D structures within the cavity.

Based on full-chain independent R&D, Mindray's new generation UX Series Endoscope Camera System has been innovatively integrated with 4K fluorescence and 3D technologies. It provides a comprehensive enhancement in imaging performance and operational experience, enabling clinical breakthroughs in complex surgical procedures.

With various configuration options suitable for multiple departments, it is a truly "all in one imaging platform" for the operating room.

4K Monitor
Options of 32 inch and 55 inch
Options of 2D and 3D
• Recommend: LMD-XH320T/LMD-XH550T

Master Control Trolley
One-touch to start the entire set of equipment on the trolley
• Recommend: TV-500

Endoscope Camera System
Integrated with 4K Fluorescence and 3D Technologies
• Recommend: UX5

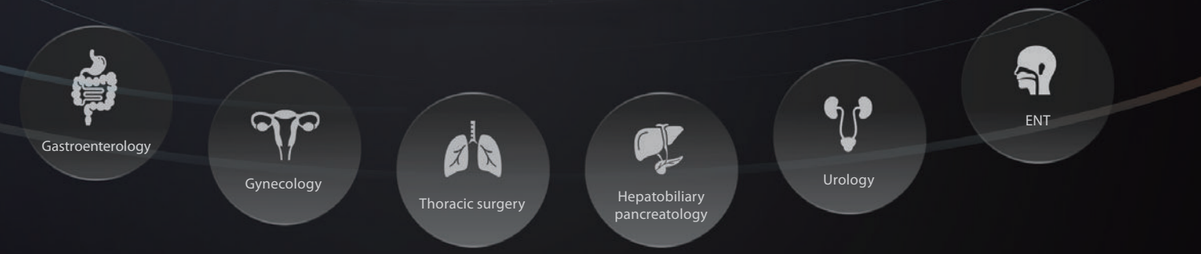
Endoscope Light Source
White Light/Fluorescence
• Recommend: HB500R

4K 3D Video Endoscope
Selectable viewing angles of 0° and 30°
• Recommend: M 31030A

Camera Head
Multiple focal lengths available
White light camera head weight: 190 g
Fluorescence camera head weight: 240 g
• Recommend: CH5-SR100/CH5-SR110

Rigid Endoscope
Selectable diameters of 10 mm, 5 mm and 3 mm
• Recommend: G 01030A

Medical Digital Video Recorder
Access to hospital PACS system
Available to record dual-channel simultaneously
• Recommend: UR-NEXT4KHC

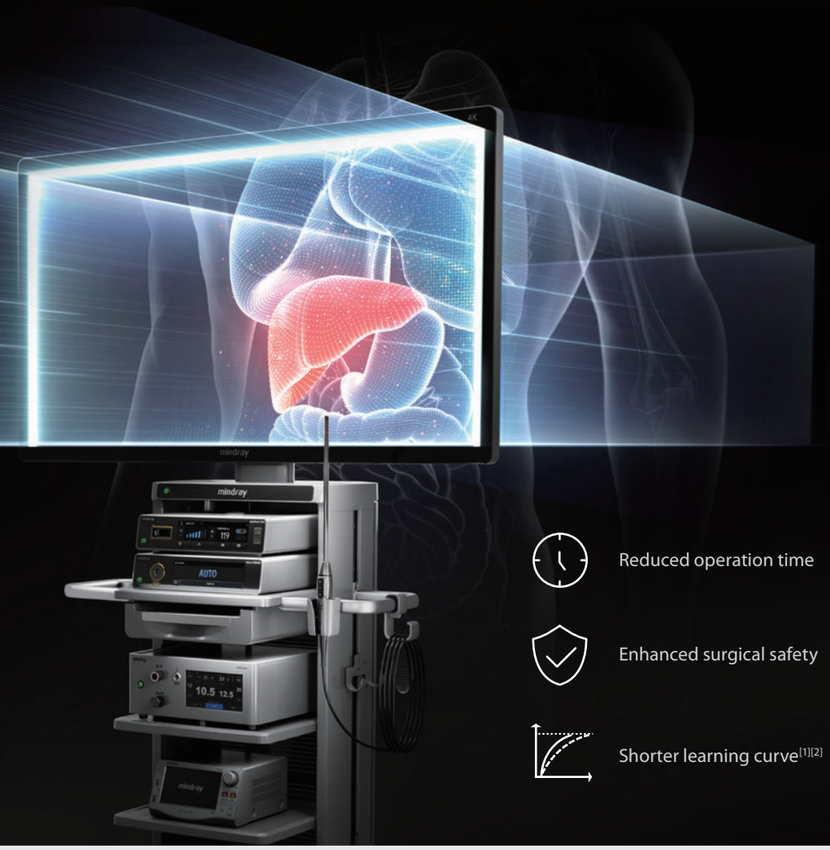


3D Intelligent Bionics,
Natural Space Perception

Dual Chips True 4K
Dual-4K 3D imaging reproduces the structure in the cavity, making the surgery safer and more efficient.

5.6 mm Large Pupil Distance
Enhanced depth of 3D vision can discern small depth differences for more precise surgical positioning.

Anti-fog Optimization
Intelligent fog recognition with Anti-fog algorithm ensures a continuously clear view.



- Reduced operation time
- Enhanced surgical safety
- Shorter learning curve[1][2]

AutoRotate Correction
Built-in high-precision attitude sensor secures real-time perception of the endoscope movement
AutoRotate Correction of the endoscope enables all-around view observation

Enhanced Anti-Fog
The Chip-on-Tip design achieves active heating and defogging, dramatically reducing the frequency of intraoperative lens wipes

Focus-Free Design
The large depth of field eliminates the need to focus, while presenting clear image for a smoother surgical process

Autoclave Available
A new breakthrough in sterilization processes with a high reliability
The whole Video Endoscope supports Autoclave/Low Temperature Plasma/EO Sterilization

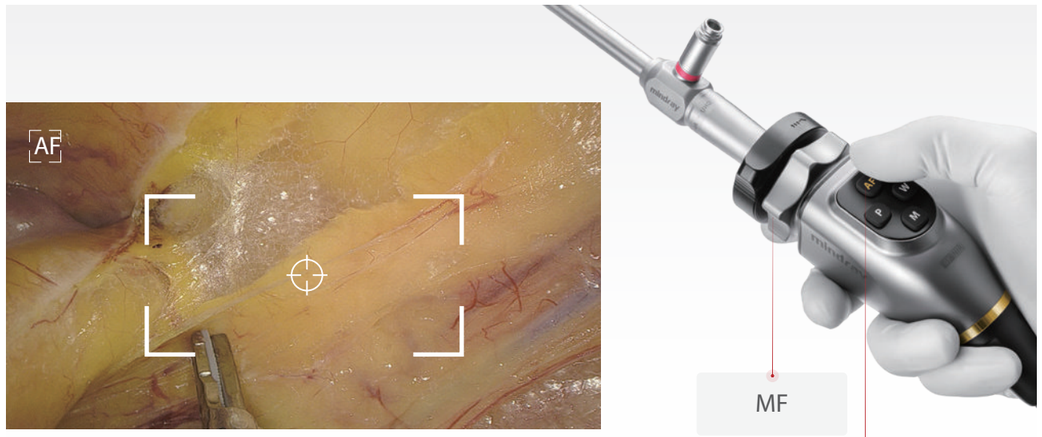
Weighs only 420 g
Titanium alloy handle, sturdy yet lightweight, allowing for easy maneuverability

[1] Arezzo A et al. The use of 3D laparoscopic imaging systems in surgery: EAES consensus development conference 2018.

[2] Velayutham V, Fuks D, Nomi T, Kawaguchi Y, Gayet B. 3D visualization reduces operating time when compared to high-definition 2D in laparoscopic liver resection: a case-matched study. Surg Endosc. 2016 Jan;30(1):147-53. doi: 10.1007/s00464-015-4174-1. Epub 2015 Mar 25. PMID: 25805241.

Smart View Exceptional Image Quality

Integrated auto and manual focus

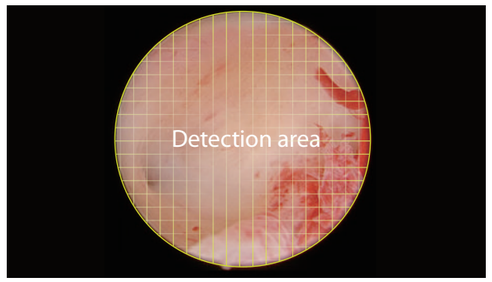


AutoFocus and high quality image achieved with one touch

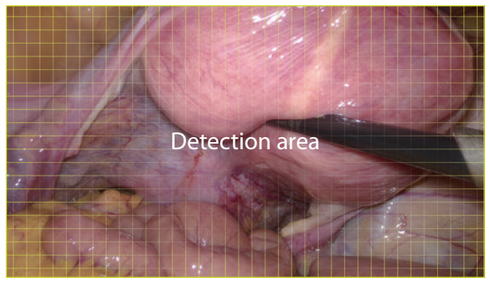
Automatic scene recognition

Smart exposure: Determine different detection areas according to different scenes, and accurately match the exposure parameters without the need to manually switch department modes.

Automatic dimming: The camera system can automatically adjust the intensity of the light source in real time based on the current exposure requirements, ensuring optimal brightness at all times.



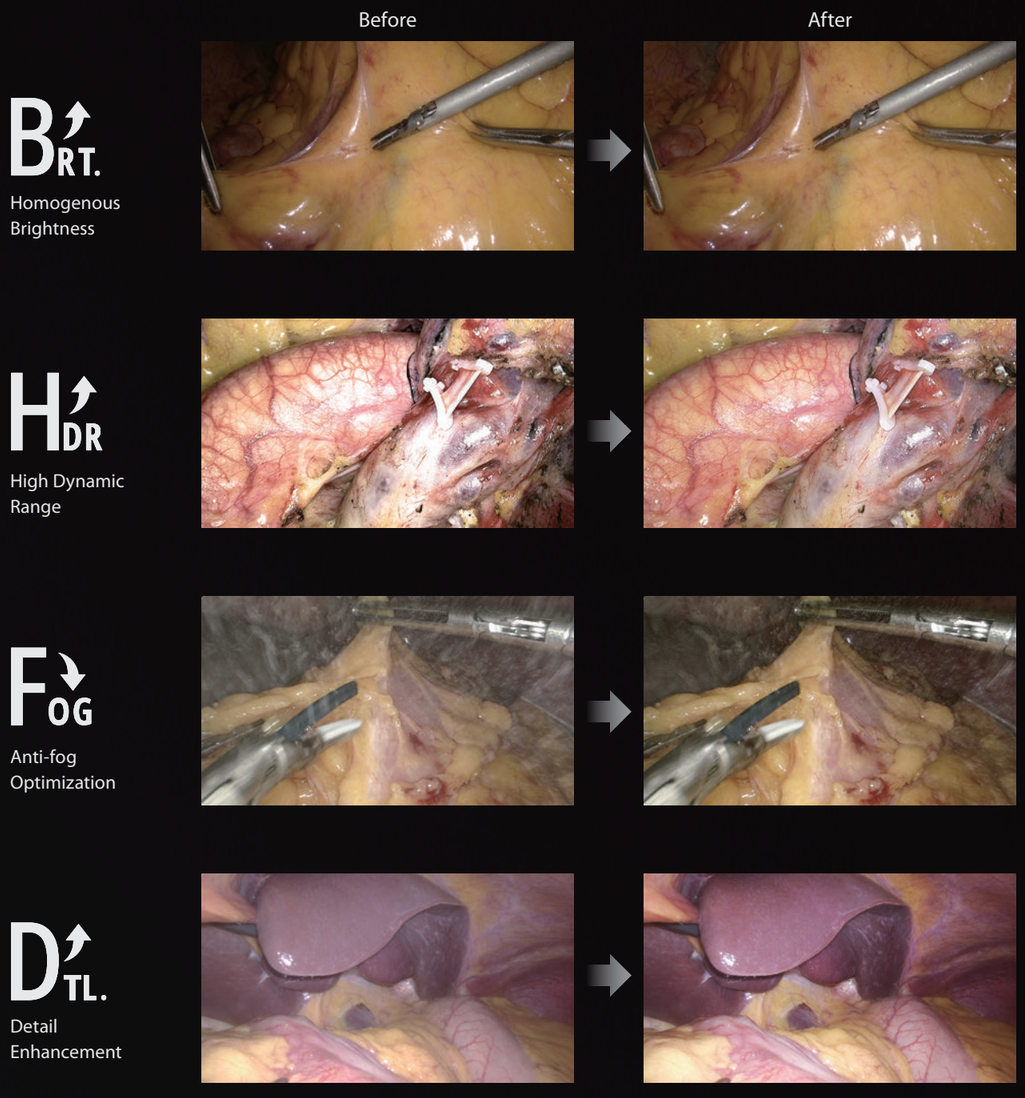
Small diameter scope scene (e.g. hysteroscope)



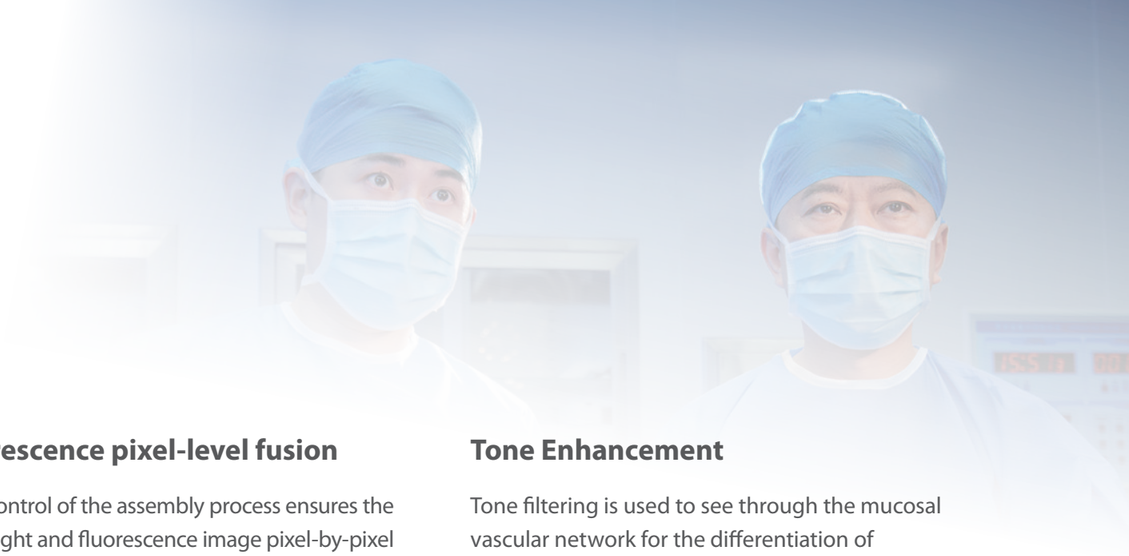
Laparoscope scenario

eImage Intelligent Image Algorithm, Even in Extreme Circumstances

A variety of post-processing image algorithms make up for any uneven lighting, local overexposure, thick fog and other inherent physical defects in specific situations, to deliver clear, structured, and layered images, even in extreme circumstances.



Sensitive Perception, Precise Navigation



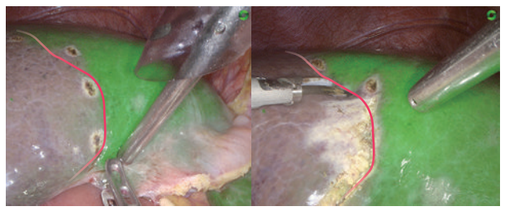
eFluo The fluorescence technology significantly boosts detection sensitivity and fluorescence imaging stability, leading to more precise navigation

Ultra-high fluorescence sensitivity

Dual optimization of the excitation and imaging pathways achieves fluorescence signal capture sensitivity as low as nmol levels, which helps the clinical detection of low-dose micro-metastases and offers greater penetration capability at equivalent doses.

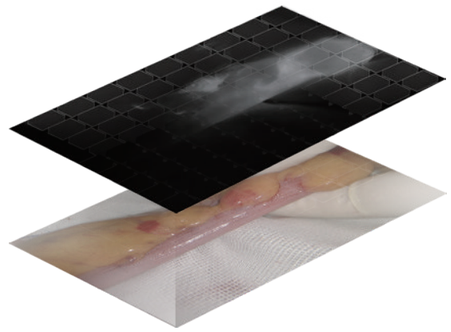
eFlo stabilization algorithm

Accurately reproduces the distribution of the contrast agent, effectively avoiding signal attenuation caused by distance and angle variations. This significantly enhances fluorescence stability, ensuring consistent boundary delineation.



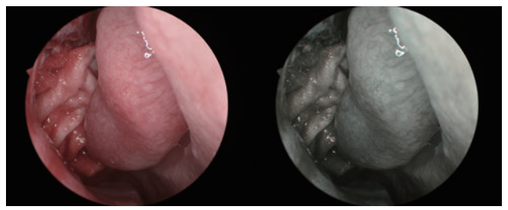
Fluorescence pixel-level fusion

Strict control of the assembly process ensures the white light and fluorescence image pixel-by-pixel alignment and fusion. The fluorescence image with white light texture details can also help with the entire fluorescence-guided surgical process.



Tone Enhancement

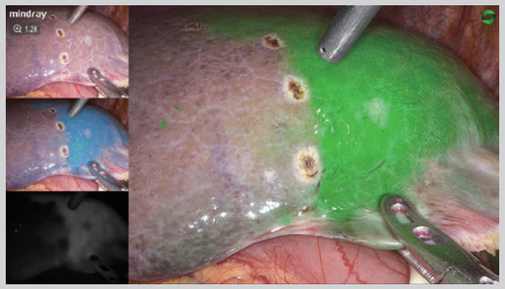
Tone filtering is used to see through the mucosal vascular network for the differentiation of anomalous vessels to assist in clinical diagnosis.



Clinical Cases

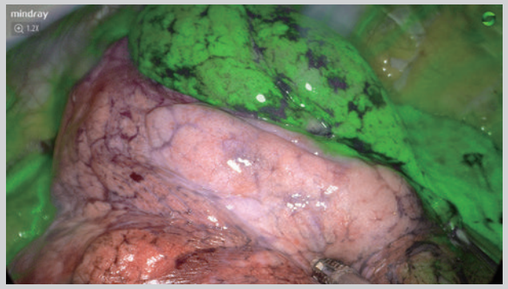
Evaluation of colorectal anastomotic blood supply

Laparoscopic liver watershed resection



SLN mapping in endometrial cancer

Anatomic subpulmonary lobe resection

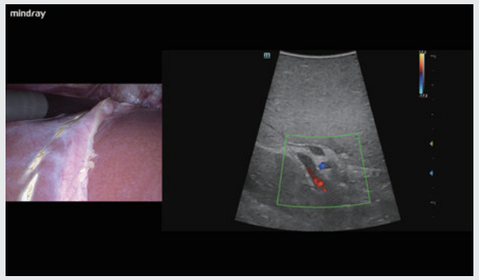


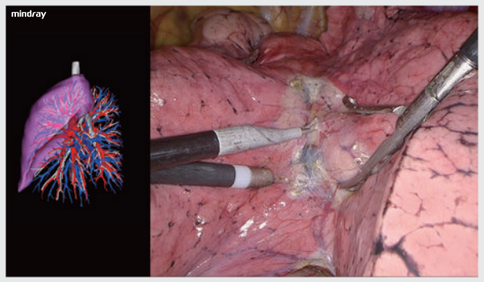
MIS Ecosystem
Unlimited Possibilities

Multimodal Image Fusion

The real-time display of ultrasound images on the endoscope screen helps the surgeon localize the hidden lesion. Simultaneous recording of ultrasound and endoscope images on the same screen makes teaching and sharing more efficient.

The endoscope can display a 3D reconstruction of the organs' structure, together with the surgical view on the same screen, to assist the surgeon with real-time correction needed during the procedure.





Vital Sign Data Sharing

The patient's vital signs data can be customized and displayed on the endoscope screen, allowing the surgeon to evaluate them timely during surgery.

Digital OR, Upgraded Management

The UX5 Endoscope Camera System can be integrated into the Mindray digital operating room for centralized information management, enhancing the overall quality and efficiency of surgical procedures.

Future-proof UX5 Endoscope Camera System, Unstoppable Innovation and Exploration Journey

Flexible endoscope, pendulum camera head, multispectral fluorescence, quantitative fluorescence...

Opening up possibilities for more cutting-edge applications.

WEB

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2024 V2.0

SURGICAL IMAGING SOLUTION

The leader in integrated medical imaging display solutions in China

Global leader in medical display and human-machine interface (HMI) products

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20 Year

R&D and manufacturing experience

95 %

Strategic partners - world-class medical device manufacturers

100 +

Countries and regions to which our products are exported

8000 +

End customers - hospitals in China

Shenzhen Beacon Display Technology Co., Ltd. is a national high-tech enterprise committed to intelligent medical imaging display and HMI technology innovation and application research, offering a wide range of products involving intelligent displays, HMIs, solutions and small and peripheral equipment. Beacon is a subsidiary of Zhejiang Jingxin Pharmaceutical Co., Ltd. (stock code 002020).

We are a strategic partner of many world-class medical device manufacturers such as GE, Philips, Siemens, Canon, United Imaging, and Mindray. Our medical imaging displays have a share of over 50% in the Chinese end market, with more than 8,000 hospital customers. Our products are exported to more than 100 countries.

According to the Chinese Medical Display Market Research and Future Forecast Report (2019), Beacon's medical displays rank first in China in terms of production and sales volume, and top three globally in terms of sales volume.

GLOBAL LAYOUT

COOPERATIVE CLIENTS (Listed in no particular order)

PENTAX MEDICAL · OLYMPUS · mindray · SonoScape · UNITED 联影 IMAGING

Carestream · stryker · FUJIFILM · COMEN · varian A Siemens Healthineers Company

美润达 CARING MEDICAL · 海泰新光 NOVELBEAM TECHNOLOGY · SHINVA · AOHUA 澳华内镜 · WEGO 威高

神州医疗 · HUGER 成运医疗 · OptoMedic · Healnoc 华诺康

UX4/UX410/UX420/UX430/UX450/UX460/ UX470

UX5/UX510/UX520/UX530/UX550/UX560/ UX570/UX5–SIM/UX5–NOR/UX5–TEC

UX7/UX7-TEC/UX7-NOR/ UX7-SIM

Endoscope Camera System

Operator's Manual

■ Release time: 2024-11

■ Revision: 1.0

(9) External control extension connector: connects an external video recorder, and supports starting/stopping recording and taking screenshots.

(10) USB connector 3: connects a USB drive for system software upgrade, supporting USB 2.0 protocol.

(11) MSB (Mindray Serial Bus) connector: connects to a light source, controlling the brightness of the light source.

(12) Network connector 1: supports software upgrade.

(13) Network connector 2: reserved.

(14) CAN (Controller Area Network) connector 1: connects external devices other than light source.

(15) CAN connector 2: connects external devices other than light source.

(16) 3G/12G SDI (Serial Digital Interface) out: connects a high definition/4K video device for high definition/4K video output, such as monitor.

2.9.3 Endoscope Camera Head

This system is compatible with the following models of camera head:

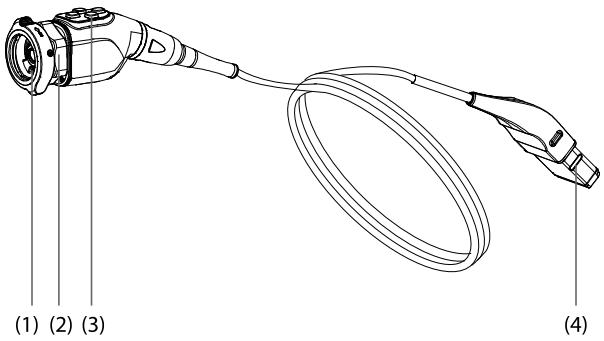
Model	Standard Cable Length	Function
CH5-SW100	4.5m	Supports white light imaging.
CH5-SW110	3m	Supports white light imaging.
CH5-SR100	4.5m	Supports white light and fluorescence imaging.
CH5-SR110	3m	Supports white light and fluorescence imaging.

2.9.3.1 Working Principle of Endoscope Camera Head

The camera head is used together with the CCU to receive 400 nm to 880 nm visible and near-infrared light, supporting visible and near-infrared light imaging.

It provides dual progressive scan CMOS (including a 1/1.8-inch native 4K BSI CMOS) for white light and fluorescence imaging, supporting 4K output display. By using the camera head, you can observe fluorescent images outside the body cavity of patients.

2.9.3.2 Front View of the Camera Head



(1) Endoscope coupler: connects and secures the endoscope.

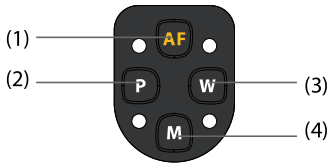
(2) Focusing ring: rotate the ring to focus the camera head.

(3) Camera head buttons: four functional buttons.

(4) CCU connector: connects the CCU.

2.9.3.3 Camera Head Buttons

There are four buttons on the camera head, and three of them can be set to perform different functions. After the camera head is connected to the CCU, the button functions are displayed on the monitor. After a button is pressed, the function prompt disappears. More descriptions are shown below:



(1) AF: press to perform autofocus.

(2) P: short press to take photos and long press to record videos by default. This button can also be set to other functions. For details, refer to ***5.5.2 Setting Button Functions***.

(3) W: short press to zoom the image and long press to perform white balance by default. This button can also be set to other functions. For details, refer to ***5.5.2 Setting Button Functions***.

4.5 Check Before Operation

It is required to check and ensure that the equipment works properly. After turning on the equipment, check the following items:

- The system does not emit abnormal noise, smell, or excessive heat.
- Put a hand near the ventilation outlet and check that there is air flowing out.
- The touchscreen displays and functions correctly.
- Aim the tip of the endoscope to an object and check that the image quality displayed on the monitor is normal.

CAUTION

- **Do not put the system in use before the system is checked and works normally.**
- **In case of any failure, stop and remove equipment from use. Otherwise, injury to the patient or operator or damage to the equipment might result.**

4.6 Setting Interconnected Light Source

After the CCU is correctly connected to the Mindray light source, if the light source is in auto mode, the CCU can automatically adjust the light brightness based on the current surgical field of view to ensure a clear surgical field of view and balanced light brightness.

You can turn on or off the light source by pressing the camera head button. For details about how to set the functions of camera head buttons, refer to ***5.5 Setting Camera Head Functions***.

4.7 Selecting User Configuration

Through the user configuration function, you can save some customized parameters in the setup menu. For details about the list of customized parameters, refer to ***C Default Settings***.

Select the drop-down list in the user configuration area on the main screen to select a saved user configuration.

To update the current user configuration, or delete a saved user configuration, refer to ***5.2 Setting User Configuration***.

4.8 Performing White Balance

The white balance function is used to calibrate the color of the image displayed on the monitor.

It has be to performed:

- before starting the surgery;

- after the light source is changed; and,
- when the color of the image is anomalous.

To perform white balance, follow the procedure below:

1. Ensure that the connected light source is emitting light. If **Smart Light** is enabled, skip this step. For details about how to set **Smart Light**, refer to ***5.7.2.2 Setting Switches of Interconnection Functions***.
2. Point the camera head or endoscope to a white gauze or any white object, and make sure your sight is filled with white. Do not shake the camera head or the endoscope in the process.
3. Adjust the brightness to an appropriate level and avoid overexposure.
4. Long press the W button on the camera head to start white balance. You can also press the white balance button on the main screen to start the function.
5. Check the prompt message on the monitor. If white balance is indicated to be failed, repeat the procedure.

When the white balance is successfully performed, the displayed image color becomes natural. If the white balance is not performed, the white balance parameters set last time are used by default.

The long-press function of W button on the camera head is set to **White Balance** by default. The long-press function of P or M button can also be customized to **White Balance**. For details about how to customize the button function, refer to ***5.5 Setting Camera Head Functions***.

4.9 Adjusting Image Brightness

Select the brightness increase button + or brightness decrease button − on the main screen to adjust the image brightness. The brightness slider in the middle indicates the current brightness level. You can also drag the slider to the left or right to adjust the brightness.

In addition, if the short-press function of P, W, or M button on the camera head is set to **WL Brightness**, you can short press the button to adjust the brightness. For details about how to set the functions of camera head buttons, refer to ***5.5 Setting Camera Head Functions***.

4.10 Adjusting Fluorescence Intensity

After the CCU is correctly connected to the Mindray light source (HB500R/HB500R-TEC), you can select the fluorescence increase button + or fluorescence decrease button − on the main screen to adjust the fluorescence intensity. The fluorescence slider in the middle indicates the current fluorescence intensity. You can also drag the slider to the left or right to adjust the fluorescence intensity.

In addition, if the short-press function of P, W, or M button on the camera head is set to **Fluor Intensity**, you can short press the button to adjust the fluorescence intensity. For details about how to set the functions of camera head buttons, refer to ***5.5 Setting Camera Head Functions***.

4.11 Adjusting Image Focus

Camera heads compatible with the CCU does not support detachable lenses. The focal length of the camera heads is 25 mm ± 20%.

You can press the AF button on the camera head to perform autofocus, or rotate the focusing ring to perform manual focus.

4.12 Zoom In/Out

In the setup menu, select **Image Zoom** to zoom in/out on the displayed image. For detailed setting method, refer to ***5.3.1 Adjusting Image View***.

In addition, if the function of P, W, or M button on the camera head is set to **Image Zoom**, you can press the button to adjust the image magnification. For details about how to set the functions of camera head buttons, refer to ***5.5 Setting Camera Head Functions***.

4.13 Switching Display Modes

The system provides the following display modes:

- WhiteLight: displays the visible light image.
- Overlay: detected near-infrared light (NIR) signal is overlaid on white light image in green.
- Monochromatic: displays the NIR signal without white light.
- Intensity Map: detected NIR signal is overlaid on white light image in pseudo color.
- WL-Quad Screen: the monitor displays in split-screen mode, by default with WhiteLight image on the right, Monochromatic image on the top left, Intensity Map image on the middle left, and Overlay image on the bottom left.
- OL-Quad Screen: the monitor displays in split-screen mode, by default with Overlay image on the right, WhiteLight image on the top left, Intensity Map image on the middle left, and Monochromatic image on the bottom left.
- Mono-Quad Screen: the monitor displays in split-screen mode, by default with Monochromatic image on the right, WhiteLight image on the top left, Intensity Map image on the middle left, and Overlay image on the bottom left.
- IS-Quad Screen: the monitor displays in split-screen mode, by default with Intensity Map image on the right, WhiteLight image on the top left, Monochromatic image on the middle left, and Overlay image on the bottom left.

When different camera head or 3D video endoscope is connected to the CCU, the supported display modes are as follows:

CCU Model	Camera Head or 3D Video Endoscope	Display Mode
UX4 series	Fluorescence camera head	All modes
	White light camera head 3D video endoscope	**WhiteLight** only
UX5 series	Fluorescence camera head	All modes
	White light camera head 3D video endoscope	**WhiteLight** only
UX7 series	Fluorescence camera head G series 3D video endoscope	All modes
	White light camera head M series 3D video endoscope	**WhiteLight** only

You can customize the short-press function of P, W, or M button on the camera head to **Mode Cycle**, and short press the button to switch the display mode. For details about how to set the functions of camera head buttons, refer to ***5.5 Setting Camera Head Functions***.

In addition, you can switch modes on the **Display Mode** page. For detailed setting method, refer to ***5.3.3 Setting External Input Source***.

4.14 Taking Photos or Recording Videos

During surgery, you can press the buttons on the touchscreen or press the camera head buttons to take photos or record videos. The images and videos can be stored in the USB drives or an external video recorder. The specification of images and videos are as follows:

Item	Storage Format	Performance
Image	.jpeg	Highest storage resolution: 4K
Video	MP4	Frame rate: 60 fps Bit width: 10bit or 8bit Encoding standard: H.265

After startup, set the storage location and video quality by referring to ***5.6 Setting Recording Function***.

After setting, when you take photos or videos for the first time, a new file directory will be generated under the storage location, and images and videos recorded during this surgery will be saved to this file directory.

The name of a file directory shows the time of the corresponding surgery, and the name of a video screenshot indicates the name of the corresponding video. The name formats of file directory, video and image are as follows:

Item	Example of Name	Format Meaning
File directory	20230510_1202	year month day_hour minute
Video	Section01_0510_120212.mp4	Section No._month day_hour minute second.mp4
Image (not video screenshot)	Section00_120745.jpeg	Section00_hour minute second.jpeg
Image (video screenshot)	Section01_000402.jpeg	Section No._hour minute second.jpeg

When recording is stopped and "Saving Video" is displayed in the lower left corner of the monitor, do not disconnect the USB drives or the external video recorder.

4.15 Connecting the Wireless Network

You can add wireless networks for the system. The CCU can interconnect with external devices supporting open communication protocols via wireless networks to send, receive, and display device parameters or status. For detailed setting method, refer to ***5.7.2.3 Setting Wireless Network***.

If connecting the current wireless network fails, the CCU automatically connects other wireless networks in the order when they were added.

CAUTION

- **The maximum distance of distinct vision between the equipment and a wireless interconnected device is 30 m.**
- **Wireless network designing, deploying, debugging, and maintenance should be executed by Mindray service personnel or authorized technicians.**
- **Always set the wireless network according to local wireless regulations.**
- **Use the 5 GHz band as much as possible since the 2.4 GHz band has more interference.**
- **Private AP/wireless routers are not allowed, which will cause data loss.**
- **Data communication must be performed within a closed network provided by a hospital for all network functions. The hospital is responsible for ensuring the security of the network.**
- **Adopt WPA2-PSK and WPA2-Enterprise authentication and encryption as far as possible. Failure to use them may cause device malfunction or patient information leakage. You are advised to use WPA2-Enterprise and long-password encryption.**
- **Keep network authentication information (such as password) safe, protecting the network from being accessed by unauthorized users.**

5.4 Setting Image Mode

Select the Setup button on the main screen to access the setup menu. Select the **Image** tab. On this tab, you can perform image optimization, adjust image color, set fluorescent image, and set specialist image.

5.4.1 Performing Image Optimization

To perform image optimization, follow the procedure below:

1. In the setup menu, select **Image** → **Image Opt.**.
2. Switch on or switch off **Detail Enhancement**, **Color Enhancement**, **Homogenous Brightness** and **Anti-fog**.
3. When connecting a camera head, switch on or switch off **HDR.**

NOTE

- **After Anti-fog is switched on, the equipment applies algorithms to implement image defogging.**

5.4.2 Adjusting Image Color

To adjust the image color, follow the procedure below:

1. In the setup menu, select **Image** → **Color Setup**.
2. Set **Color Style**. For detailed introduction of the options, refer to ***2.7 Differences Among Models***.
3. Select the + or - icon to set **Saturation**, **Red Gain**, or **Blue Gain**. Or select **Reset** to restore the factory defaults.

5.4.3 Setting Fluorescent Image

When connecting a fluorescence camera head or G series 3D video endoscope, you can set fluorescent image. Follow the procedure below:

1. In the setup menu, select **Image** → **Fluorescence**.
2. Set **Fluorescence Sensitivity**.
   - Select **Level 1**, **Level 2** or **Level 3(Autofluorescence)**.
   - Select **Level 0**, high-sensitivity processing is not performed.

5.4.4 Setting Image Parameters for Special Departments

To set image parameters for special clinical departments, follow the procedure below:

1. In the setup menu, select **Image** → **Specialty**.
2. When connecting a camera head, switch on or switch off **De-grid Optimization** and **Anti-laser Optimization** under **Special Function**.

3. Switch on or switch off **Tone Enhancement**. After switching on it:
   - Set **Tone Enhancement Mode** to **Mode R** or **Mode G** as needed. After setting, the system enhances the image color contrast by color inversion.
   - Set **Display Mode** to **Full Screen** or **Dual Split** as needed.

5.5 Setting Camera Head Functions

Select the Setup button on the main screen to access the setup menu. Select the **Camera Head** tab. On this tab, you can set functions of the P, W, and M buttons to performing white balance, taking photos, recording, or controlling the brightness of light.

5.5.1 Introduction to Short-press/Long-press Functions

The following table lists the short-press functions that you can set for the buttons:

Short-Press Function	Description
Capture	Short press the button to capture the image displayed on the monitor.
Mode Cycle	Short press the camera head button to cycle through display modes.
Image Zoom	Short press the button to zoom in or out of the image displayed on the monitor.
WL Brightness	Short press the button to increase or decrease the image brightness.
Fluor Intensity	Short press the button to increase or decrease the fluorescence intensity.
3D/2D Switching (with 3D video endoscope)	Short press the button to cycle through 3D view modes.
External Source	Short press the button to display the external input source on the monitor.
Interconnection	Short press the button to display parameters of interconnected devices on the monitor.
Tone Enhancement	Short press the button to cycle through the tone enhancement modes.
Counter	Short press the button to start/stop timing or reset the timer. The recorded time is displayed on the monitor.
Smoke Evacuation	Short press the button to turn on or off the smoke exhaust function of the interconnected insufflator.
Anti-fog	Short press the button to turn on or off the image defogging function.

5.7.2.4 Setting Multicast Parameters

Multicast helps device discovery between CCU and interconnected devices. Devices in the same multicast group can be mutually discovered.

To set multicast parameters, follow the procedure below:

1. In the setup menu, select **System** → **Device Connect**.
2. Select **Setup** on the right side of **Network** and enter the password to access the **Network Type** screen.
3. Select **Device Found**. This following table describes the default values and functions of options on this tab.

Menu Item	Default Setting	Description
Multicast TTL	1	/
Multicast Address	225.0.0.8	
Main Server Add.	/	
Main Server IP	/	
Connect Status	/	Shows whether the master server is properly connected.

5.7.3 Setting Output Format

To set the video output format, follow the procedure below:

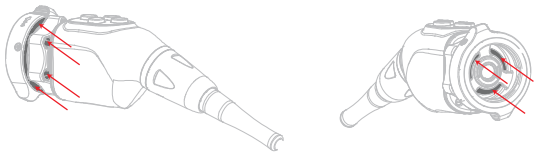
1. In the setup menu, select **System** → **Output Format**.
2. Set **HDMI 1**, **HDMI 2**, **SDI** and **DVI**. For detailed introduction of the connectors, refer to ***2.9.2 Back View of the CCU***.
   - Set **Resolution** to select 4K or HD format for the video output from the corresponding connector.
   - Set **Display** to select 2D or 3D mode for the video output from the corresponding connector.
   - Set **Color Gamut** to select video gamut parameter for the corresponding connector.
3. Select **Output Frequency** to set the video output frequency to 50Hz or 60Hz.
4. Set **Resolution** to select detailed resolution for 4K format.
5. When connecting a 3D video endoscope, view **3D Format**. Its default value is **Line By Line**.

7.4.3 Cleaning the Camera Head

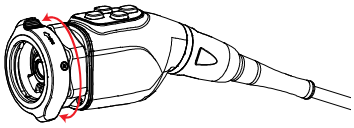
7.4.3.1 Washing

To wash the camera head, follow the procedure below:

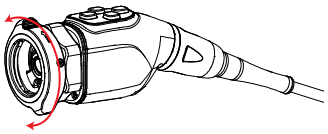
1. Fully immerse the camera head as well as its cable and connector in enzyme-containing cleanser. For requirements about immersing time, temperature, and concentration, refer to the instructions for use of the cleanser.
2. Use a syringe with a volume of at least 10 ml to aspirate the enzyme-containing cleanser and thoroughly wash the equipment parts with complex structures, such as screw threads and gaps, as shown in the following figure. Repeat this step 3 times.



3. While immersing the camera head, use a lint-free cloth or soft cleaning brush to clean all accessible surfaces for 1 to 2 minute until no residue remains.
4. In the cleanser solution, rotate the focusing ring of the camera head 3 times, as shown in the following figure:



5. In the cleanser solution, rotate the endoscope coupler of the camera head 3 times, as shown in the following figure:



7.4.3.2 Rinsing

After preliminary cleaning, follow the procedure below to rinse the camera head:

1. Thoroughly rinse the camera head with running water.
2. Wipe all accessible surfaces of the camera head with a lint-free cloth under the running water. Repeat this step 3 times.

3. Under the running water, rotate the focusing ring and endoscope coupler of the camera head 3 times by referring to the figures in ***7.4.3.1 Washing***.

4. Flush the equipment parts with complex structures, such as screw threads and gaps, with a syringe with a volume of at least 10 ml. Repeat this step 3 times.

NOTE

- **For rinsing, use purified water.**
- **Do not use water for rinsing repeatedly.**

7.4.3.3 Drying

Dry the outer surfaces of the camera head with a disinfected lint-free cloth, and dry the equipment parts with complex structures by using an air gun.

7.4.4 Disinfecting the Camera Head

Disinfect the camera head as required in the local or your hospital's servicing schedule. Use the disinfectants in accordance with the instructions of use provided by their manufacturers. Use only the disinfectants recommended in this chapter for disinfection.

The following table lists the recommended disinfectants for the camera head:

Product Name	Disinfection Method
Ethanol, 75%	Wiping
Glutaraldehyde, 2% - 2.5%	Immersing

NOTE

- **In case the high-level disinfection required by your hospital or local regulations needs to be achieve, select the glutaraldehyde immersion disinfection method.**
- **Do not disinfect the camera head with ultraviolet light, long time exposure to which may cause damage to the imaging element of the camera head.**

7.4.4.1 Rinsing After Disinfection

After immersing the camera head in glutaraldehyde for disinfection, follow the procedure below to rinse the camera head:

1. After disinfection, immerse the camera head in a sterile container filled with rinsing water.

2. In the container, wipe the outer surfaces of the camera head with a sterile lint-free cloth.

3. Under the running water, rotate the focusing ring and endoscope coupler of the camera head 3 times by referring to the figures in ***7.4.3.1 Washing***.

4. Repeat step 1 to step 3 three times. Change the rinsing water each time.
5. Take out the camera head and place it in another sterile container.
6. Dry the outer surfaces of the camera head with a disinfected lint-free cloth, and dry the equipment parts with complex structures by using an air gun.

NOTE

- **After cleaning and disinfection, check the equipment surface for stains. Repeat the cleaning and disinfection procedure if necessary.**

7.4.5 Sterilizing the Camera Head

Sterilize the camera head as required in the local or your hospital's servicing schedule. The camera head can withstand ethylene oxide (EO) sterilization and low temperature plasma sterilization.

WARNING

- **Use one of the recommended methods consistently on the same equipment. Using different sterilization methods may change equipment appearance.**

7.4.5.1 Packaging

Place the camera head in a proper container and double wrap the container with sterile sheet, preventing equipment contamination during storage and transportation.

Recommended specifications of the sterile sheet are as follows:

Dimension	Gram Weight	Materials
1.2m x 1.2m	45g	100% polypropylene, 5-layer SMMMS laminates

7.4.5.2 EO Sterilization

To sterilize the camera head, follow this procedure:

1. Clean and disinfect the camera head and its cable as instructed in the previous sections.
2. Place the packaged container into the sterilizer.
3. Sterilize the equipment following the instructions for use of the sterilizer. You are advised to apply the following EO sterilization parameters that have been tested:

EO Concentration	Temperature	Relative Humidity	Sterilization Time
About 760 mg/L	55°C	40% - 85%	60min

A.6 Input/Output Interfaces

Interface	Quantity	Description
USB connector	3	USB connector 1 and 2: supporting USB 3.0 protocol USB connector 3: supporting USB 2.0 protocol Fixed time synchronization pulse specified by the USB protocol
Network connector	2	RJ45 standard interface Network connector 1: reserved, supporting 1000BASE-TX protocol Network connector 2: supporting 100BASE-TX protocol Calibration protocol of TCP/IP
CAN connector	2	PS/2 interfaces, supporting CAN protocol
SDI connector	1	Used for 4K or 1080P HD video output, supporting 3G SDI and 12 G SDI protocols
HDMI connector	3	HDMI out 1 and 2: used for 4K video output HDMI in 3: used for video input
DVI connector	1	Used for 1080P HD video output, supporting DVI protocol
Power socket	1	Connecting the AC Mains
MSB connector	1	Supporting serial communication protocol
External control extension connector	1	Supporting level control; connecting external video recorders

A.7 Monitor Specifications

Interface type	12G-SDI or HDMI2.0 4K monitors selectable Compatible with DVI and 3G-SDI HD monitors
Resolution	3840*2160 or 4096*2160 pixels
Refresh rate	50/60 Hz

C.2 Image Setup

Menu/Tab	Parameter	Default Setting	Saved in User Configuration
Image Opt.	Detail Enhancement	Close	Yes
	Color Enhancement	OFF	Yes
	Homogenous Brightness	OFF	Yes
	Anti-fog	OFF	Yes
	HDR	OFF	Yes
Color Setup	Color Style	Standard	Yes
	Saturation	0	Yes
	Red Gain	0	Yes
	Blue Gain	0	Yes
Fluorescence	Fluorescence Sensitivity	Level 1	Yes
Specialty	De-grid Optimization	OFF	Yes
	Anti-laser Optimization	OFF	Yes
	Tone Enhancement	OFF	No
	Tone Enhancement Mode	Mode R	Yes
	Display Mode	Full Screen	Yes

C.3 Camera Head Button Setup

Menu/Tab	Parameter	Default Setting	Saved in User Configuration
P Key	Short Press	Capture	Yes
	Long Press	REC	Yes
W Key	Short Press	Camera head: Image Zoom 3D video endoscope: 3D/2D Switching	Yes
	Long Press	White Balance	Yes

Menu/Tab	Parameter	Default Setting	Saved in User Configuration
M Key	Short Press	Fluorescence camera head: Mode Cycle White light camera head: Tone Enhancement 3D video endoscope: No Function*	Yes
	Long Press	External Source	Yes
*: When a G series 3D video endoscope is connected to the UX7 series CCU, the default setting is **Mode Cycle**.			

C.4 REC Setup

Menu/Tab	Parameter	Default Setting	Saved in User Configuration
REC Setup	Storage Location	Internal Recorder	No
	Video Segment	8GB	No
	Video Quality	HD SQ	No
	Record Color Depth	8 bit	No
	Video Recording	2D	No
Photo Setting	Time Of Preview	2s	Yes

C.5 System Setup

Menu/Tab	Parameter	Default Setting	Saved in User Configuration
General Setup	Image Zoom Threshold	2.0X	Yes
	Counter	OFF	No
	Logo	ON	No
	Screen Lock Function	ON	No
	Language&Date&Time	/	No
	Version	/	No

HB500R/HB500R-TEC/HB500/HB500-TEC

Endoscope Light Source

Operator's Manual

CE 0123

CE

■ Release time: 2023-10

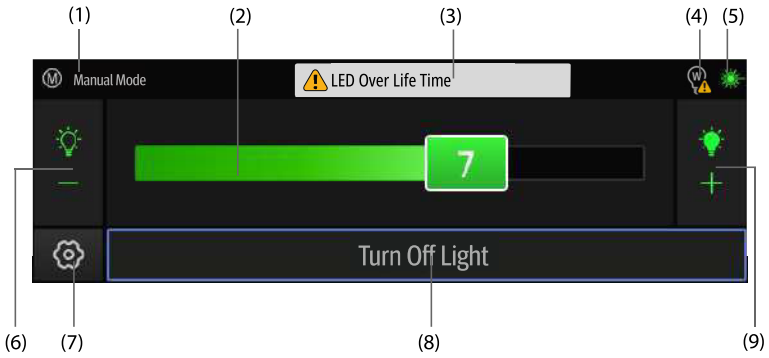
■ Revision: 2.0

NOTE

- **Dry the equipment immediately in case of rain or water spray.**

3.7.1 Operation Screen Introduction

The following figure shows the operating screen of the equipment:



(1) Mode area: indicates the current mode. Select this area to switch between the manual mode and auto mode.

(2) Brightness indication area: indicates the current brightness of light. Move the slider to adjust the brightness of light. If the equipment is in the auto mode, "AUTO" is displayed in this area.

(3) Error message area: displays error messages.

(4) Bulb status symbol: indicates the service life status of the bulb. For detailed introduction of the symbols, refer to ***3.7.2 On-screen Symbols***.

(5) Laser diode (LD) status symbol: indicates the status of LD output. This symbol is dimmed when the LD is off. For detailed introduction of the symbols, refer to ***3.7.2 On-screen Symbols***.

(6) 

Brightness decrease button — : select to decrease the brightness of light (the illumination intensity of the light source).

(7) Setup button  : select to display the setup menu.

(8) Light control button: select to turn on/off the light output.

CAUTION

- **Do not put the system in use before the system is checked and works normally.**
- **Do not use an optical observer (such as an amplifier) to or directly look at the light outlet of the light source.**
- **If you need to connect or disconnect a light cable when the light source is on, make sure that the light source is not emitting light. Otherwise, eye injury may result.**
- **When no light cable is connected, the equipment generates a prompt and does not emit light by default. However, do not look directly at the light outlet in case the light cable detection fails.**
- **In case of any failure, stop and remove equipment from use. Otherwise, injury to the patient or operator or damage to the equipment might result.**

4.6 Switching Between Manual and Auto Modes

Select the Mode area on the main screen to switch between manual and auto modes.

- In manual mode, you can adjust the brightness of light on the main screen. For detailed operations, refer to ***4.8 Adjusting the Brightness of Light***.
- After the light source is connected to a Mindray UX5 series CCU, you can switch to the auto mode. In Auto mode, the CCU can automatically adjust the brightness of light.

4.7 Turning On the Light

The light source does not emit light after startup. You can select the Light control button on the main screen to turn on the light.

When a Mindray UX5 series CCU is interconnected, you can turn on the light by using a camera head button or the CCU touchscreen. For detailed setting method, refer to the operator manual of the CCU.

For HB500R/HB500R-TEC, after you select the Light control button, white light is emitted by default. Further, if a Mindray UX5 series CCU is interconnected, when you enable the IR display mode, the light source emits LD. You can also turn on LD on the touchscreen. For detailed operations, refer to ***4.9.1 Changing Function Setup***.

WARNING

- **To reduce the impact of laser on the human body, turn on the LD only when the endoscope enters the human body and the fluorescence observation is**

necessary. Turn the LD off immediately after the fluorescence observation is completed.

NOTE

- **After a compatible CCU is interconnected, if you press the white balance button, the light source begins emitting light automatically and quickly adjusts the brightness to a proper level. If you press any other camera head button, the light source begins emitting light as well, but in slower way to minimize damage to the operator's eyes. Once the endoscope is withdrawn from the patient, the light will automatically dim. For detailed setting method, refer to the operator's manual of the CCU.**

4.8 Adjusting the Brightness of Light

In manual mode, you can press the Brightness decrease button — or Brightness increase button + on the main screen to decrease or increase the brightness of light, meeting the brightness requirements of different clinical operations. You can also move the slider in the Brightness indication area to the left or right to adjust the brightness.

NOTE

- **Always adjust the equipment to the minimum brightness necessary for the observation, to avoid the risk of burns.**
- **Do not use strong light for a long time.**

4.9 Changing Settings

4.9.1 Changing Function Setup

Select the Setup button on the main screen to access the setup menu. The **Light Source** tab is displayed. In this tab, you can set **Upper Limit**. For HB500R/HB500R-TEC, you can also switch on or switch off **NIR**.

NOTE

- **If the white light is not turned on, the switch of NIR is unavailable.**

4.9.2 Changing System Settings

Select the Setup button on the main screen to access the setup menu. Select the **System** tab. In this tab, you can set general system information.

General system information includes lock screen function, system language, system time, and version information. To set these information, follow the operations below.

4.9.2.1 Setting Lock Screen Function

To set the lock screen function, follow the procedure below:

1. In the Setup menu, select **System** → **General Setup**.
2. Switch on or switch off **Screen Lock Function**.
   - Select **ON** to enable the lock screen function. When this function is enabled, the touchscreen will be locked automatically if no operation is detected in one minute.
   - The lock screen function will not be enabled if **OFF** is selected.

4.9.2.2 Setting System Language

To set the system language, follow the procedure below:

1. In the Setup menu, select **System** → **General Setup**.
2. Set **Language**. Select the current language and all the languages the system currently provide are displayed. Select the target language.
3. Restart the system for the settings to take effect.

4.9.2.3 Setting System Time

To set the system time, follow the procedure below:

1. In the Setup menu, select **System** → **General Setup**.
2. Set **System Date** and **System Time**. Select the Edit button to set the current date and time.

NOTE

- **Before using the system, check that the system time is consistent with your local time.**

4.9.2.4 Checking Version Information

To check the software version of the system, follow the procedure below:

1. In the Setup menu, select **System** → **General Setup**.
2. The software version is displayed on the right of **Version**.

4.10 Error Messages

CAUTION

- **Use the equipment only in environment that meets the specific requirements. Otherwise, the equipment may not meet the performance specifications or unexpected consequences, e.g. damage to the equipment, could result. If the performance of the equipment is degraded due to aging or environmental conditions, contact the service personnel.**

A.3 Power Supply Specifications

Working power supply	100-240VAC (±10%), 50/60 Hz (±3 Hz)
Input power	260VA

A.4 Physical Specifications

Dimension	Depth: 380 ± 5 mm Width: 350 ± 5 mm Height: 80 ± 5 mm (excluding the rubber feet)
Weight	≤ 10 kg

A.5 Hardware Specifications

Display type (CCU)	Touchscreen
Display size (CCU)	7.8 inches
Device interfaces	Power socket: 1, connecting the AC Mains
	MSB connector: 1, supporting serial communication protocol
	USB connector: 1, supporting USB 2.0 protocol. Fixed time synchronization pulse specified by the USB protocol
	Network connector: 1, RJ45 interface, supporting 100BASE-TX protocol. Calibration protocol of TCP/IP
	Light cable connector: 1, connecting the light cable
Bulb type	HB500R/HB500R-TEC: LED, which outputs white light, and semiconductor lasers (class 3R), which output near-infrared light HB500/HB500-TEC: LED, which outputs white light

Service life of bulb	LED: over 60000 hours Semiconductor lasers: over 15000 hours
Bulb specification	LED: 3.5 V, 27 A Semiconductor lasers: 4 V, 8.5 A
Diameter of light outlet	Φ7.2 ± 0.5 mm

A.6 Performance Specifications

Maximum central illumination	≥ 3000000 Lux
Color temperature	3000K - 7000K
Color rendering index	≥90, in the white light mode
Maximum noise	≤ 55 dBA
Defibrillation recovery time	1s

A.7 Laser Performance (for HB500R/HB500R-TEC)

Laser wavelength	780nm ± 10nm ; Full width at half maximum (FWHM): 5 nm ± 5nm
Beam divergence angle	70° ± 10°
Classification	3R
Test value of laser output safety sign	≤ 50 mW

A.8 Operating Environment

Hardware configuration	CPU: 500 MHz RAM: 2 Gb Flash: 4 GB
Software environment	LINUX

NOTE: The above is the minimum requirements of operating environment.

User Manual（用户手册）

S5580P

55” 4K Surgical Medical Display

55” 4K 手术医用显示器

6 Technical specification

Monitor characteristics：	
Panel	55”, TFT, color, LCD panel, anti-glare, hard coating
Active area（H x V）	1209.6±0.1 (H) x 680.4±0.1 (V) mm
Pixel pitch	0.315(H) x 0.315(V) mm
Resolution	3840 x 2160
Refresh rate	60 Hz
Color depth	10 bit
Contrast ratio (Typ. of panel)	1450:1
Viewing angle（CR > 10）	Horizontal: 178°
	Vertical: 178°
Luminance (Typ. of panel)	700cd/m^2
Backlight Type	WLED
Lifetime of backlight (Min.)	50000 hours
Response time (Typ.)	Ton:10ms, Toff:8ms
Power supply：	
Line voltage	AC100～240V
Current consumption	3.5 ~ 1.5 A
Power consumption (Max.)	<260W
Power consumption (Standby)	< 30W
Control and connection：	
Front	Power indicator Touch keypad
Bottom right	Control key
Back	DVI-IN *1/OUT *1 12G-SDI IN *1/OUT *1 3G-SDI IN *1/OUT *1 HDMI *1 RS232 *1 Ground stud*1 AC socket*1 Power switch*1
Mechanical characteristics：	
Housing components	metal
Ventilation openings	Natural heat dissipation
Protection level	Front IP45, Back IP20

Safety regulations：		
Safety standards		CCC：GB4943-2011、GB17625.1-2012、GB9254.1-2008 CE： EN60601-1、EN60601-1-2
Protection class		Protection class I
Dimension:		
Without packing(D x W x T)		1297.60±1.30 mm x 768.40±1.00 mm x 87.20±0.55 mm
With packing (D x W x H)		1394±5 mm x 300±5 mm x 980±5 mm
Weight		
Monitor	Net weight	44kg ± 2.0 kg
	Gross weight	75kg ± 2.0 kg
Climatic conditions：		
Operating temperature		0°C ~40°C(proposal 20°C ~ 30°C)
Operating humidity		15% ~ 85% Relative humidity, no condensation
Operating pressure		700hPa ~1060 hPa
Transport and storage temperature		-20°C ~ +50°C
Transport and storage humidity		10% ~ 90% Relative humidity, no condensation
Storage / transport atmospheric pressure range		700hPa ~1060 hPa

HS-50F, HS-50V, HS-50H, HS-50S, HS-30S

Insufflator

Operator's Manual

CE 0123

- Release time: 2024-12
- Revision: 13.0

of the host power supply wire is disconnected accidentally, test data will be lost.

4.1.6 Connecting the Insufflator Tube

WARNING

- **The tube sets and joints are not sterile. Please clean and sterilize the tube sets according to local laws and regulations and infection control requirements.**
- **In order to prevent cross infection caused by the backflow of body fluid (such as blood) when the exhaust valve is opened, a bacteria filter must be used between the insufflator main machine and the insufflator tube. Please use eligible bacteria filter in accordance with the laws and regulations. Even if the exhaust valve is closed, Mindray also strongly suggests using the bacteria filter.**
- **Take the filter out of the package, and check if there is any damage. If any damage or anomaly is found, do not use the filter.**
- **Repeated uses of unsterilized bacteria filter might cause cross infection, so a reusable bacteria filter shall be sterilized before each use. If a disposable bacteria filter is used, be sure to insert a new one before each use.**
- **Do not try to adjust the tube sets by cutting, adhering, or connecting multiple tube sets.**
- **If a tube is damaged, please replace a new one.**
- **The residual water drops on/inside the tube sets will damage internal sensors (such as causing short circuit) or lead to electric shock. Please dry the tube sets thoroughly before use.**
- **Do not bend the insufflator tube.**
- **Please use insufflator tubes that conform to biological compatibility.**

NOTE

- **For one insufflator, between the insufflator tube and the heating insufflator tube, only one of them can be chosen for connection. The insufflator can identify the connected heating insufflator tube.**
- **Be sure to use the bacteria filter inside the package, or purchase disposable filters that Mindray recommends: model 800-51800 of VADI brand (with a filtering aperture of 0.2um); please contact Mindray for details.**

4.1.6.1 Connecting the Insufflator Tube

1. Connect the sterilized tube to the sterilized Luer-lock.

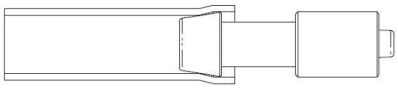


Figure 4-7 The tube connects with Luer-lock

2. Please install the filter between the insufflator tube and the insufflator's CO_2 gas injection interface. As shown in Figure 4-8.

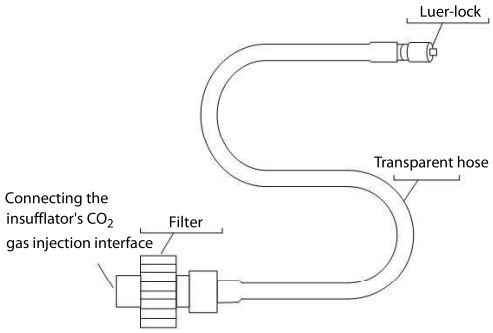


Figure 4-8 Installed insufflator tube (using filter)

3. Connect the installed tube to the CO_2 gas injection interface of the product. Guarantee that the interface is well inserted. As shown in Figure 4-9.

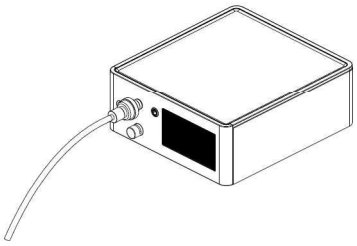


Figure 4-9 The insufflator tube connects with the insufflator (using filter)

WARNING

- **The Luer-lock can only be used to connect the tube. Never use the Luer-lock to connect other accessories.**

4.1.6.2 Connecting the Heating Insufflator Tube (only for HS-50F/HS-50H models)

1. Connect the sterilized tube to the sterilized Luer-lock. As shown in Figure 4-7.
2. Please install the filter between the insufflator tube and the insufflator's CO_2 gas injection interface. As shown in Figure 4-10.
3. Connect the installed tube to the CO_2 gas injection interface of the product. Guarantee that the interface is well inserted.
4. Connect the heating joint to the heating interface on the front panel of the product.

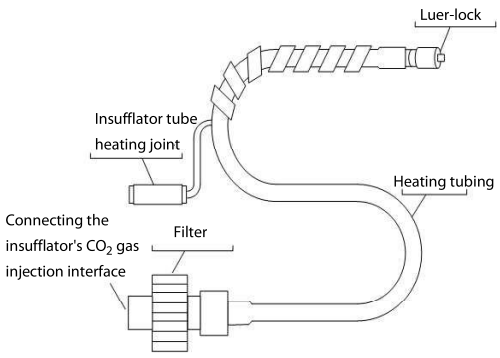


Figure 4-10 Installed heating insufflator tube (using filter)

4.1.7 Connecting the Suction Tube (only for HS-50F/HS-50V models)

1. Connect the Luer-lock, transparent hose, adapter tube, and slim tube. As shown in Figure 4-11.

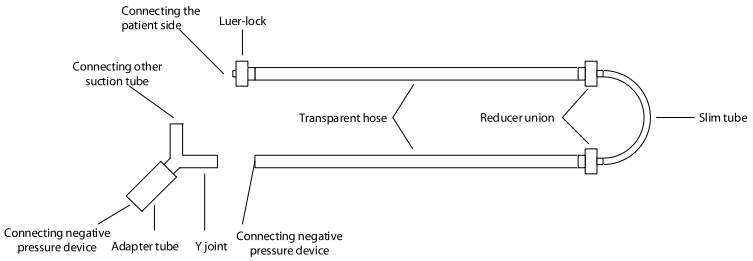


Figure 4-11 Installation of the suction tube

2. Connect the Luer-lock of the sterilized suction tube to the joint of the trocar near the part where smoke generates.

3. Clip the slim tube into the groove of the smoke exhaust valve on the insufflator's front panel. To prevent the tube from collapsing, clip the middle of the Φ5 slim tube into the pinch valve and avoid twisting the suction tube. As shown in Figure 4-12.

4. Install the transparent hose into the suction bottle of the suction device. To connect multiple suction tubes in a negative-pressure suction device, connect the transparent hose and adapter tube to the Y joint as shown in Figure 4-11. (The adapter tube should be connected to the straight end of the Y joint.) In this way, the adapter tube can be connected to the negative-pressure suction device, and the other end of the Y joint can be connected to other suction tubes. See Figure 4-11.

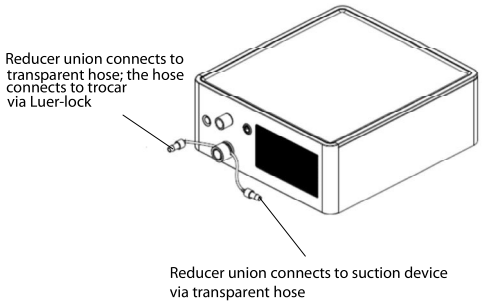


Figure 4-12 Connection diagram of the suction tube

NOTE

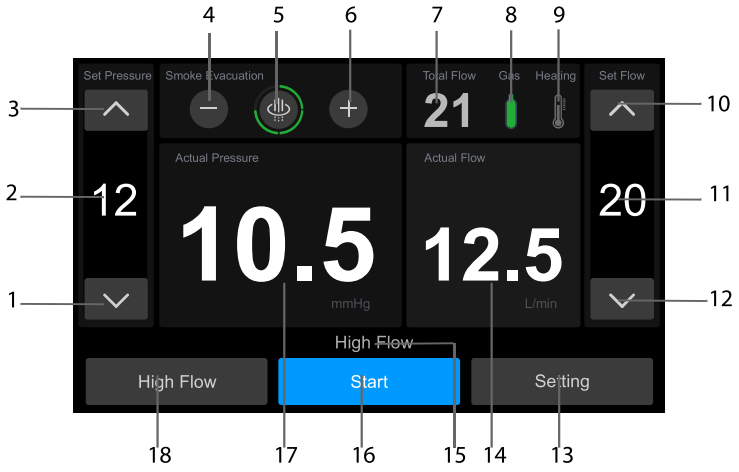
- **It is suggested to adjust the pressure range of the suction device within 0.04MPa-0.06MPa. If the negative pressure is too high, the exhaust will be**

- **After startup, test whether individual parts are working normally, such as functions of smoke exhaust, heating, and setting pressure and flow.**

4.2 Use

4.2.1 Using the Touchscreen

The insufflator is configured with a touchscreen on which you can operate and set the equipment. Below is an introduction of content displayed on the touchscreen:



(1)	Decrease CO_2 pressure
(2)	CO_2 pressure setting
(3)	Increase CO_2 pressure
(4)	Decrease smoke exhausting rate
(5)	Smoke exhausting indicator
(6)	Increase smoke exhausting rate
(7)	Total gas consumption (press to clear the value)
(8)	Gas source indicator
(9)	Heating indicator
(10)	Increase CO_2 flow

(11)	CO_2 flow setting
(12)	Decrease CO_2 flow
(13)	Enters the **Setup** menu
(14)	Actual CO_2 flow
(15)	Message area
(16)	Start/stop insufflation
(17)	Actual CO_2 pressure
(18)	Current work mode (press to select the work mode)

4.2.2 Operating Modes

The equipment provides the following operating mode:

Operating mode	Description
High Flow	Designed for laparoscopies performed on normal weight adult patients.
Pediatric	Designed for laparoscopies performed on children.
Bariatric	Designed for laparoscopies performed on obese adult patients.
RetroPeritonenum	Designed for laparoscopies performed in retroperitoneum.
Custom	You can customize the operating mode as necessary.

4.2.3 Use in Surgery

After startup self-inspection and inspection process pass, the insufflator can be put to use.

1. Based on the type of the targeted patient, choose required operating mode.
2. Adjust and set the flow and pressure. Each mode has its default upper limit and lower limit for flow and pressure, and adjustment cannot be made when it reaches the limits.
3. Tap the **[Start]** button and the insufflator starts to inflate; if you choose veress needle for first inflation, remember to take down the needle before starting the surgery officially, to avoid insufficient inflation during surgery to maintain pneumoperitoneum.

7 Accessories

WARNING

- **Use accessories specified in this chapter. Using other accessories may cause damage to the device or not meet the claimed specifications.**
- **Single use accessories are not designed to be reused. Reuse may cause a risk of contamination and affect the measurement accuracy.**

CAUTION

- **The accessories may not meet the performance specifications if stored or used outside the specified temperature and humidity ranges. If accessory performance is degraded due to aging or environmental conditions, contact your service personnel.**
- **Check the accessories and their packages for any sign of damage. Do not use them if any damage is detected.**
- **Use the accessories before the expiry date if their expiry date is indicated.**

7.1 Insufflator Accessories

No.	Accessory
1.	Reusable Insufflator Tube (2.9m)
2.	Reusable Insufflator Tube (4.5m)
3.	Heating Insufflator Tube (2.9m)
4.	Heating Insufflator Tube (4.5m)

7.2 Other Devices Also Compatible

The following medical devices are also compatible with the insufflator. To purchase these devices contact Mindray.

No.	Device
1.	Disposable Bacteria Filter, Large Size
2.	Foot Switch
3.	CO2 Reducing Valve (452C-150 GB)
4.	CO2 Reducing Valve (452C-150 CGA320)
5.	CO2 Reducing Valve (452C-150 DIN477)
6.	CO2 Reducing Valve (452C-150 CGA940)
7.	CO2 Reducing Valve (452C-150 ISO5145)
8.	CO2 Reducing Valve (452C-150 BS341)
9.	Reusable Suction Tube (2.9m)
10.	Reusable Suction Tube (4.5m)
11.	Central Gas Supply Pipe (German)
12.	Central Gas Supply Pipe (DISS)
13.	Central Gas Supply Pipe (Japan)
14.	Central Gas Supply Pipe (French)
15.	Central Gas Supply Pipe (British)
16.	Central Gas Supply Pipe (SYS)
17.	Central Gas Supply Pipe (Ohmeda)
18.	CO2 Low Pressure Tube (GB)
19.	CO2 Low Pressure Tube (DISS)
20.	CO2 High Pressure Tube (GB)
21.	CO_2 High Pressure Tube (CGA320)
22.	CO2 High Pressure Tube (DIN477)
23.	CO2 High Pressure Tube (CGA940)
24.	CO2 High Pressure Tube (ISO5145)
25.	CO2 High Pressure Tube (BS341)
26.	Straight Connector

A Product Specifications

A.1 Basic Parameters and Performance

Gas pressure adjustment	1 mmHg ~ 30 mmHg	
Accuracy of preset gas pressure	±2 mmHg	
Accuracy of displayed pressure	±2 mmHg	
Overpressure prompt	Prompts when gas pressure difference is 5 mmHg (allowable difference ±2 mmHg)	
Overpressure release	20s	
Underpressure supplement	10s	
Accuracy of set flow	≤10 L/min, allowable difference ±2 L/min	
	>10 L/min, allowable difference ±20%	
Accuracy of displayed flow	≤10 L/min, allowable difference ±2 L/min	
	>10 L/min, allowable difference ±20%	
Accuracy of displayed gas consumption	Allowable difference ±20%	
Smoke exhaust flow	Maximum smoke exhaust flow ≥10 L/min at negative suction pressure of 0.04-0.06MPa	
Flow adjustment range	HS-50F	0.1-50 L/min
	HS-50V	0.1-50 L/min
	HS-50H	0.1-50 L/min
	HS-50S	0.1-50 L/min
	HS-30S	0.1-30 L/min
Heating	≤38°C under typical conditions (ambient temperature: 24°C±2°C; pressure: 12 mmHg; flow: 20 L/min)	
Gas source monitoring	Prompt of low gas pressure Prompt of gas exhaust	