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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www.mindray.com

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

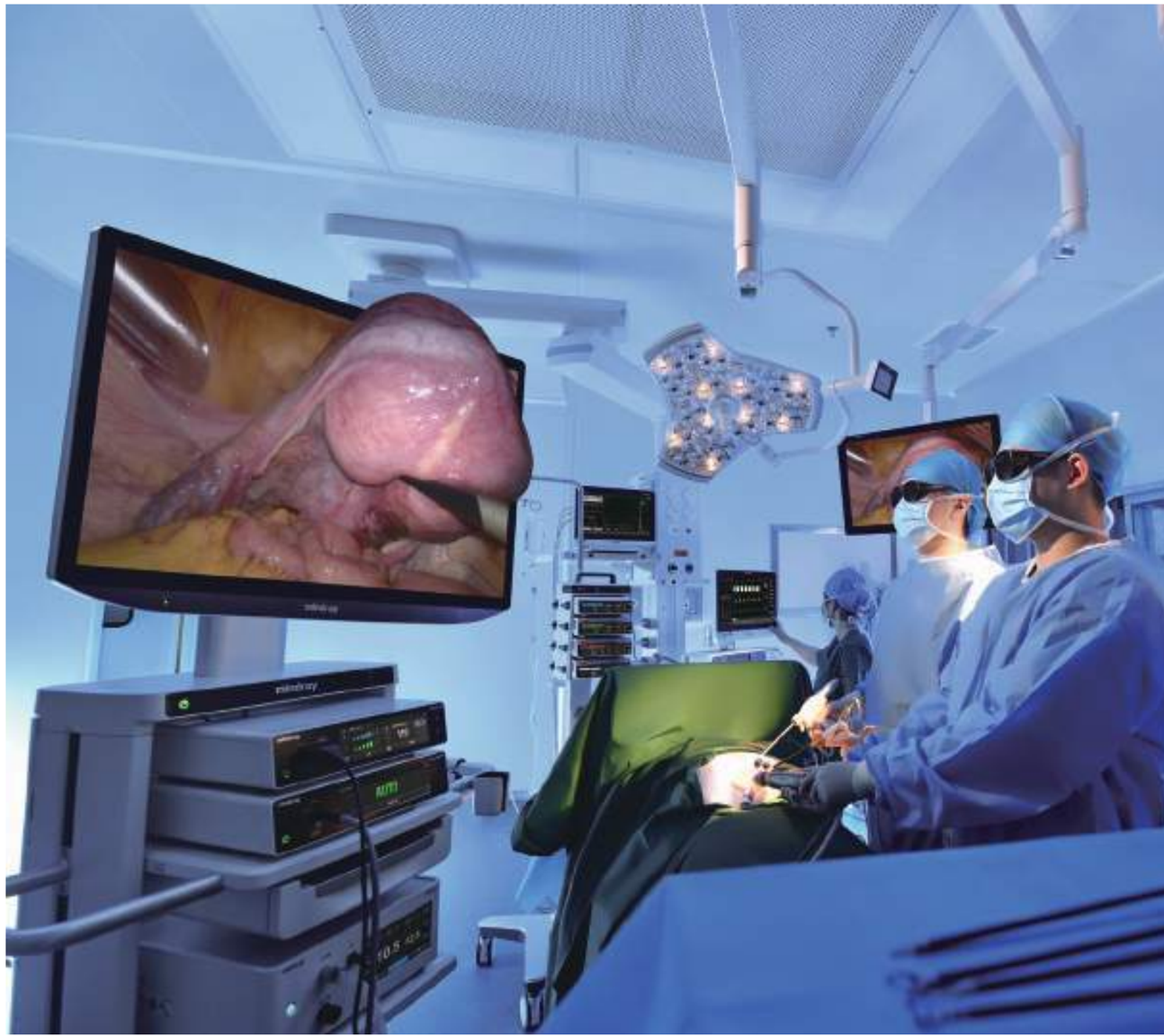
mindray
healthcare within reach

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

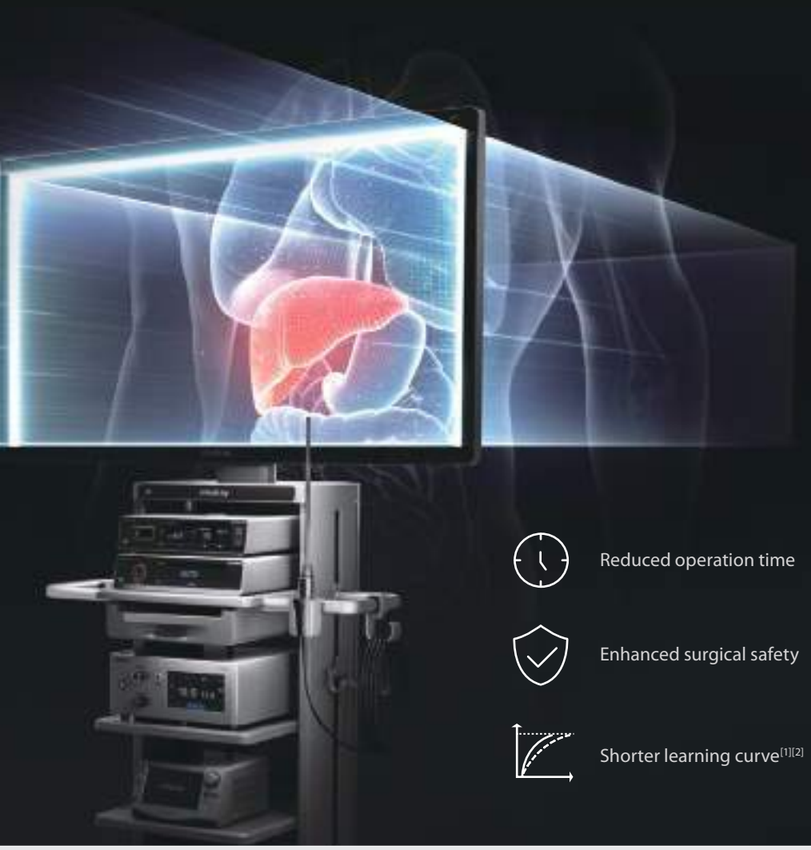
Medical Digital Video Recorder
Access to hospital PACS system
Available to record dual-channel simultaneously
• Recommend: UR-NEXT4KHC

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

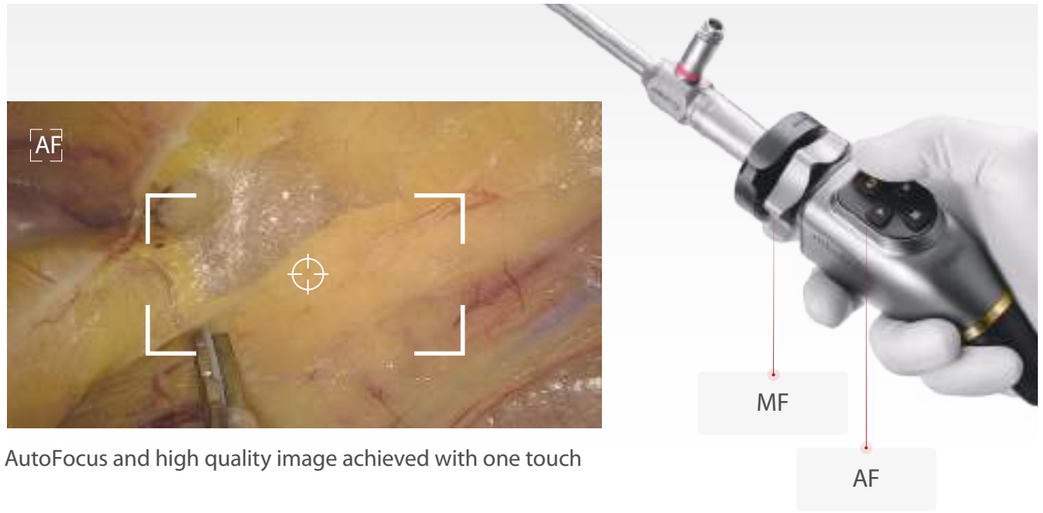
Weighs only 420 g
Titanium alloy handle, sturdy yet lightweight, allowing for easy maneuverability

[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

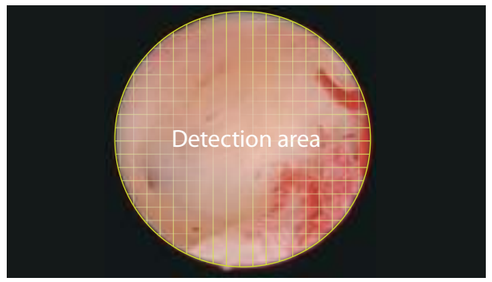


AutoFocus and high quality image achieved with one touch

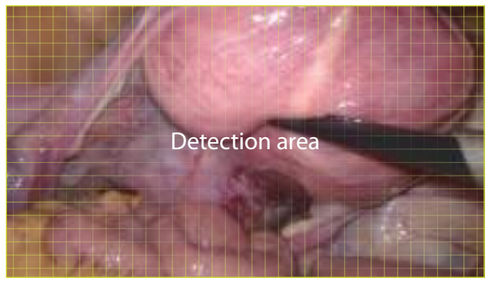
Automatic scene recognition

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.



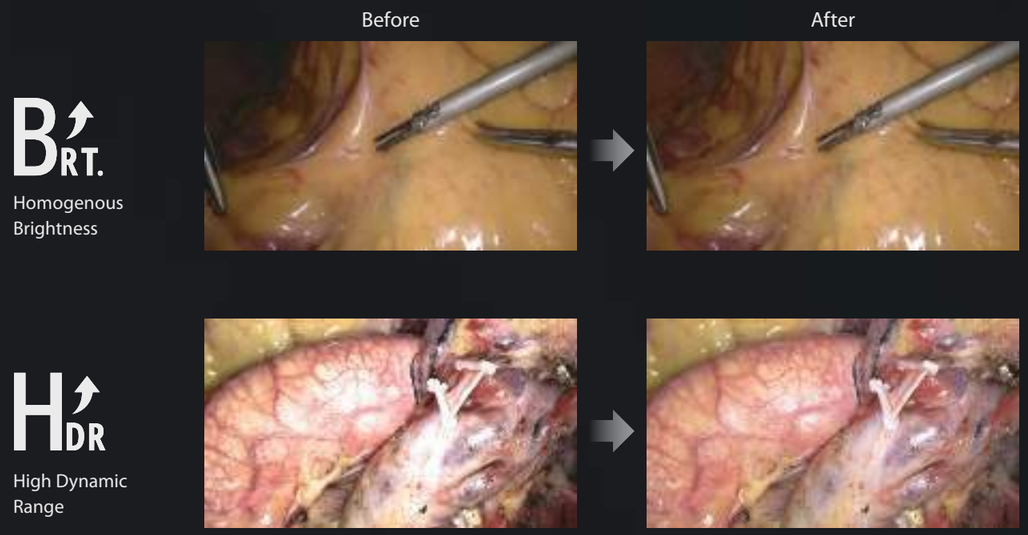
Small diameter scope scene (e.g. hysteroscope)



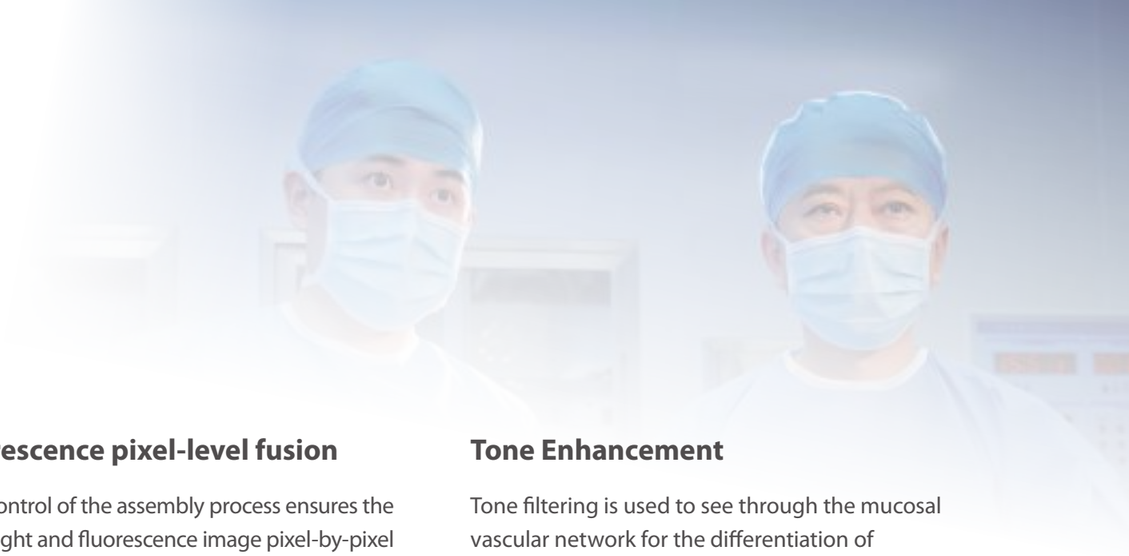
Laparoscope scenario

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.



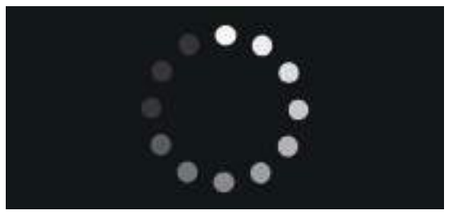
Sensitive Perception, Precise Navigation



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

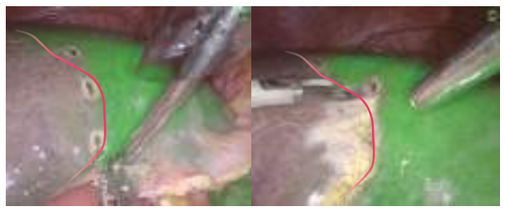
Ultra-high fluorescence sensitivity

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.



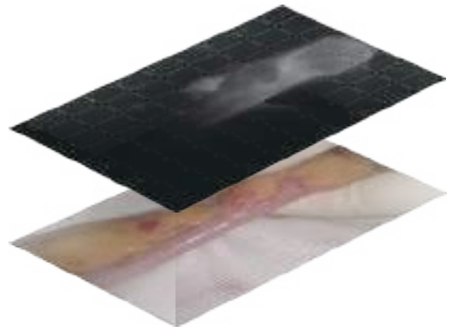
eFlo stabilization algorithm

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.



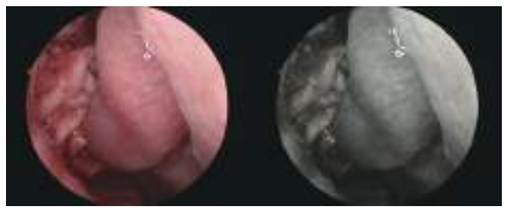
Fluorescence pixel-level fusion

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.



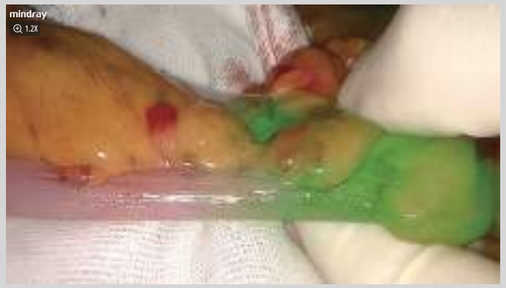
Tone Enhancement

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

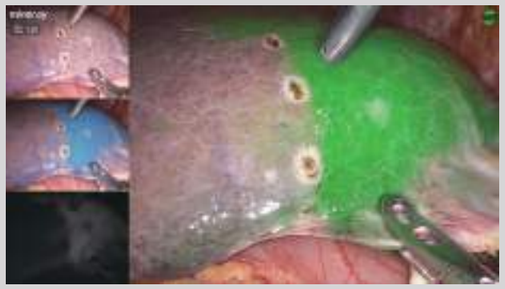


Clinical Cases

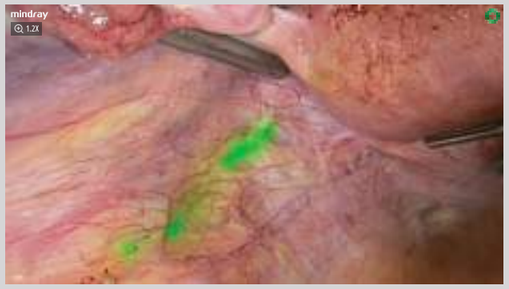
Evaluation of colorectal anastomotic blood supply



Laparoscopic liver watershed resection



SLN mapping in endometrial cancer



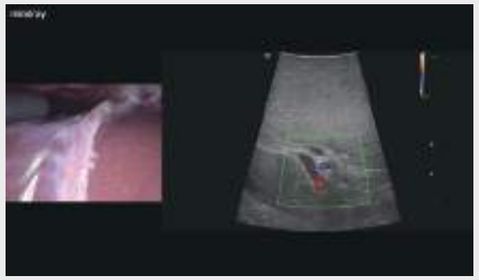
Anatomic subpulmonary lobe resection

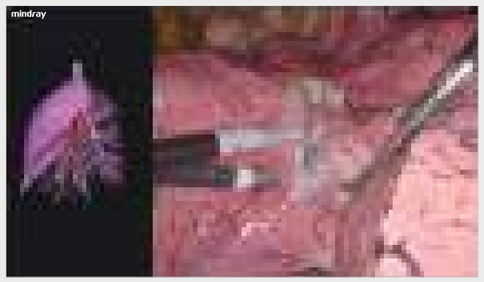
MIS Ecosystem
Unlimited Possibilities

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.

TV-300/TV-300T(220V)/TV-300T(110V)/

TV-500/TV-500T(220V)/TV-500T(110V)

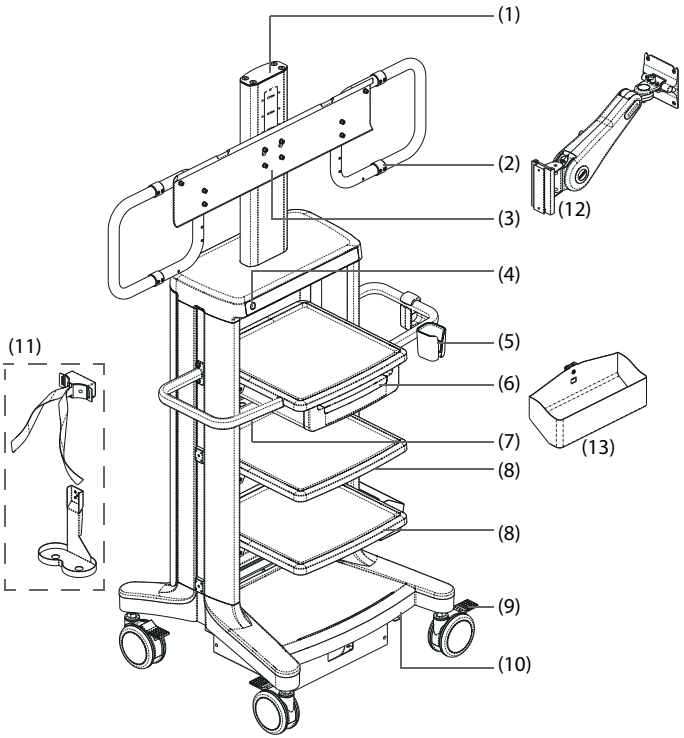
Mobile Trolley

Operator's Manual

■ Release time: 2023-5

■ Revision: 1.0

2.3.1 Front View of the Mobile Trolley



(1) Monitor column: supports a monitor stand. For details about the monitor stands of different sizes for different models, refer to ***3.5 Fixing Position of the Monitor Stand***.

(2) Monitor stand handle: hold to adjust the monitor position, available only for 55-inch monitor stands.

(3) Monitor stand: secures a monitor screen.

(4) Power switch: press to turn on/off all powered medical devices on the trolley.

- Orange: AC power is properly connected to the trolley with isolation transformer, but the power switch is off.
- Green: AC power is properly connected, and the power switch is on.

(5) Camera head holder: holds camera head.

(6) Drawer: stores accessories, including keyboard tray (optional).

(7) Drawer handle: hold to move the trolley.

(8) Shelves: used to place main units, such as insufflator and light source.

(9) Castor brake: apply the castor brake to lock or unlock the castors.

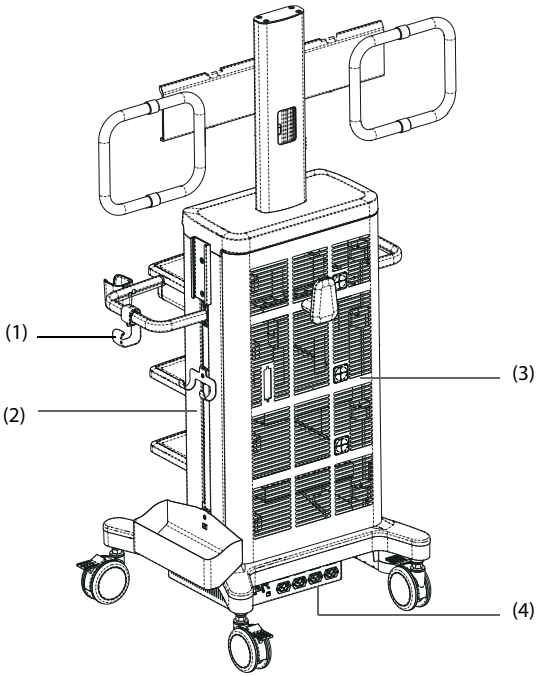
(10) Base plate: an isolation transformer (if configured) is installed under the base plate.

(11) CO2 holder assembly (optional): holds CO2 cylinders, and includes a cylinder strap rack and a cylinder holder.

(12) Monitor arm (optional): secures a side-screen monitor.

(13) Footswitch holder: stores footswitches.

2.3.2 Back View of the Mobile Trolley



(1) Hook: holds light cables and other cables.

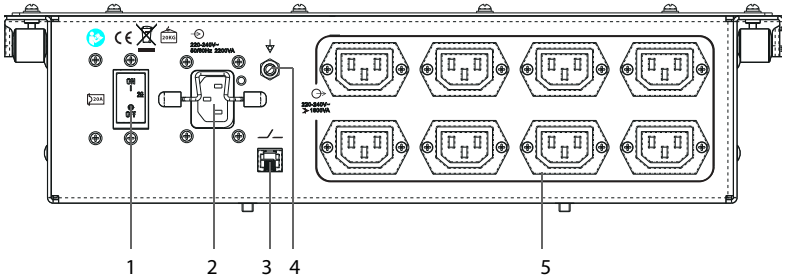
(2) Trolley column: accessories such as the monitor arm and footswitch holder are secured on the slide rail of the trolley column.

(3) Rear door: lock it when moving the trolley.

(4) Isolation transformer: if the trolley is equipped with an isolation transformer, you can connect the power connectors of the mounted devices to the output power sockets of the isolation transformer.

2.3.3 Back View of the Isolation Transformer

Taking TV-300T(220V)/ TV-500T(220V) as an example, the back view of the isolation transformer is as follows:



(1) Circuit breaker: used to protect the circuit. It is turned on in normal status.

(2) Input power socket: connects the AC Mains.

(3) RJ11 connector: used to supply power to the power switch of the trolley.

(4) Equipotential grounding terminal: when using the isolation transformer together with other devices on the trolley, connect their equipotential grounding terminals together to eliminate potential difference.

(5) Output power socket: connects the devices on the trolley.

- **Keep the equipment dry. Do not move the equipment directly from a place of low temperature to a warm one, which may cause condensation or water drops, resulting in a short circuit.**

NOTE

- **Put the equipment in a location where you can easily view and operate the equipment.**
- **Keep this manual in the vicinity of the equipment so that it can be obtained conveniently when needed.**
- **Save the packing case and packaging materials for possible shipment or storage in the future.**

3.3 Unpacking and Checking

Before unpacking, examine the packing case carefully for signs of damage. If any damage is detected, contact the carrier immediately. Open the package and remove the equipment and accessories carefully. Check all materials against the packing list and check for any mechanical damage. Contact Mindray in case of any problems.

3.4 Environmental Requirements

The operating environment of the equipment must meet the requirements specified in this manual.

The environment where the equipment is used should be reasonably free from noises, vibration, dust, as well as corrosive, flammable, and explosive substances.

When the equipment is moved from one place to another, condensation may occur as a result of temperature or humidity difference. In this case, wait until the condensation disappears before using the equipment.

3.5 Fixing Position of the Monitor Stand

The mobile trolley can be configured with one of the following monitor stands:

Model	32-Inch Monitor Stand (Without Pan/Tilt Functions)	32-Inch Monitor Stand (With Pan/Tilt Functions*)	55-Inch Monitor Stand
TV-300	√	√	×
TV-300T(200V)	√	√	×
TV-300T(110V)	√	√	×
TV-500	×	√	√

Model	32-Inch Monitor Stand (Without Pan/Tilt Functions)	32-Inch Monitor Stand (With Pan/Tilt Functions*)	55-Inch Monitor Stand
TV-500T(200V)	×	√	√
TV-500T(110V)	×	√	√
*: The monitor stand provides up to 20° tilting movement and 75° panning movement.			

NOTE

- **√ indicates "configured" while × indicates "not configured".**

You can select the position of the monitor stand as needed. A 32-inch monitor stand can be adjusted to the following 3 heights:

- 1600 mm (center of the monitor)
- 1650 mm (center of the monitor)
- 1700 mm (center of the monitor)

A 55-inch monitor stand can be adjusted to the following 2 heights:

- 1650 mm (center of the monitor)
- 1630 mm (center of the monitor)

3.6 Fixing Position of the Shelves

The mobile trolley has 4 layers of space. The distance between shelves (excluding the thickness of the shelves) is as follows:

- Layer 1: 202 ±5 mm
- Layer 2: 200 ±5 mm
- Layer 3: 200 ±5 mm
- Layer 4: 200 ±5 mm

Document NO.：YF.SMS230302	Model：S3180P	Version：C0

User Manual

S3180P

LCD Monitor

6 Technical specification

Monitor characteristics：	
Panel technology	32”, TFT, color, LCD screen, anti-glare, hard coating
Active area	708.48 (H) x 398.52 (V) mm
Pixel pitch	0.1845(H) x 0.1845(V) mm
Resolution	3840（RGB）x 2160
Refresh rate	60 Hz
Luminance	850 cd/m^2 (Typ.)
Contrast ratio	1500:1 (Typ.)
Viewing angle（CR ≥ 10）	L/R178° (Typ.)
	U/D178° (Typ.)
Backlight	WLED
Lifetime of backlight	30000 hours (Min.)
Response time	$T_{Rising + Falling}$:20ms (Typ.)
Power supply：	
DC IN	24 V，6.5 A (supplied from AC adaptor)
Power consumption	<150 W
Standby	< 0.5 W
Control and connection：	
Front	Power indicator Mechanical keypad
Back	DVI IN *1/OUT *1 3G-SDI IN *1/OUT *1 12G-SDI IN *1/OUT *1 HDMI *1 RS232 *1 USB*1 LAN*1 Ground stud*1 DC socket*1 Power switch*1
Mechanical characteristics：	
Housing components	Plastic、glass
Ventilation openings	Natural heat dissipation
Protection level	IP45（Front）、IP20（back）

UX5/UX5–TEC/UX5–SIM/UX5–NOR

Endoscope Camera System

Operator's Manual

■ Release time: 2024-8

■ Revision: 5.0

(1) Equipotential grounding terminal: when using the equipment together with other devices, connect their equipotential grounding terminals together to eliminate potential difference.

(2) General warning sign

(3) Ventilation outlet: used for heat dissipation.

(4) DVI (Digital Visual Interface) out: connects a high definition video device for high definition video output, such as monitor.

(5) HDMI (High Definition Multimedia Interface) out 1: connects a 4K video device for 4K video output, such as monitor.

(6) HDMI in 3: connects an external video source device for video input, supporting video input with a maximum resolution of 2K. The external input source can only be connected to this interface.

(7) HDMI out 2: connects a 4K video device for 4K video output, such as monitor.

(8) AC (Alternating Current) power input: connects the AC Mains.

(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 2D camera head:

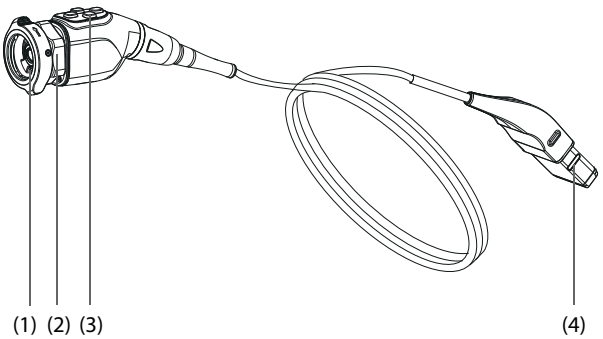
Model	Standard Cable Length	Function
CH5-SW100	4.5m	Supports white light imaging.
CH5-SW110	3m	Supports white light imaging.
CH5-SR100	4.5m	Supports white light and fluorescence imaging.
CH5-SR110	3m	Supports white light and fluorescence imaging.

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.

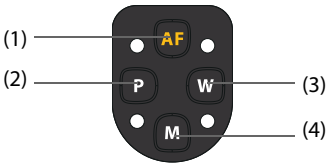
(2) Focusing ring: rotate the ring to focus the camera head.

(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***.

- **Before connecting the equipment to the AC mains, check that the voltage and frequency ratings of the power supply are the same as those indicated on the equipment's label or in this manual.**

3.6.5 Connecting USB Drive

Images and videos can be stored in USB drives connected to the CCU. Before recording, plug USB drives to the USB connector on the front panel. You can connect two USB drives simultaneously. The system detects the status of the USB drives automatically and displays on the touchscreen. Besides, if one USB drive is out of memory, images and videos will be stored to the other USB drive.

Select NTFS, FAT32, or exFAT USB drives from a qualified manufacturer. The CCU supports connecting hard drives with memory greater than or equal to 6 TB. You are advised to choose a USB drive with memory greater than 32 GB. The following are the recommended USB drives:

Video Quality	Recommended Manufacturer
4K quality, HD High Quality	SanDisk Z25 series SSD Samsung T7 series SSD
HD Standard Quality	SanDisk CZ600 series U disk SanDisk CZ880 series U disk

You are advised to format the USB drive before use. For details about formating USB drives, refer to ***5.6.3 Formatting USB Drive***.

You are advised to use the PotPlayer or KMPlayer to play videos stored in the USB drives.

CAUTION

- **Select USB drives from qualified manufacturers. Otherwise file corruption or system failure could result. It is not recommended that you use a card reader instead of an USB drive.**
- **Formatting a USB drive will clear all data stored in it. Make sure a backup of data you need is made.**

3.7 Using the Touchscreen

The equipment is configured with a LCD touchscreen on which you can operate and set the equipment, and view operation information.

NOTE

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

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 ***5.7.4.2 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. Short 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

2D 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.
- Overlay-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.
- Intensity-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 a 2D white light camera head or 3D video endoscope is connected, the default display mode is **WhiteLight** and cannot be changed.

and display device parameters or status. For detailed setting method, refer to ***5.7.4 Setting Wireless Network***.

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

To manually switch the wireless network, select from the system status information area on the top right corner of the screen, and select the desired wireless network.

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.**
- **Do not connect non-medical devices to the network of the main unit.**
- **If wireless network signal is poor, there may be a risk of data loss.**
- **RF interference may result in wireless network disconnection.**
- **Disconnecting from the network may result in data loss and function failure. Check the patient in case of network disconnection and solve the network problem as soon as possible.**
- **Ensure that the IP address setting is correct. Changing the network settings may result in network disconnection. Contact your service personnel if you have any problems on setting the IP address.**

NOTE

- **When the network is reconnected, the wireless connection is restored automatically.**

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

HB500R/HB500R-TEC/HB500/HB500-TEC

Endoscope Light Source

Operator's Manual

CE 0123

CE

■ Release time: 2023-10

■ Revision: 2.0

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**

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.

C Default Settings

This chapter lists default settings of the system.

C.1 Function Setup

Menu/Tab	Parameter	Default Setting
Upper Limit	50%, 75%, 100%	75%
NIR (for HB500R/ HB500R-TEC)	ON, OFF	OFF

C.2 System Setup

Menu/Tab	Parameter	Default Setting
Screen Lock Function	ON, OFF	ON
Language	Simple Chinese, English	English
System Date	/	/
System Time	/	/

LC0005S/LC0003S Light Cable Instructions for Use

Statement

SHENZHEN MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD. (hereinafter called Mindray) owns the intellectual property rights to this product and this manual. Disclosure of the information in this manual in any manner whatsoever without the written permission of Mindray is strictly forbidden.

This manual provides the instructions necessary to operate the product in accordance with its function and intended use. Observance of this manual is a prerequisite for proper performance and correct operation, and ensures patient and operator safety.

Mindray is responsible for the effects on safety, reliability and performance of this product, only if:

(1) this product is used in accordance with the instructions for use.

(2) this product is not damaged by human factors. Human factors refer to unintentional falling, intentional damaging, etc.

In the event that it becomes necessary to return a unit to Mindray, please contact the Mindray Service Department and obtain a Mindray Customer Service Authorization Number. The Mindray Customer Service Authorization Number must appear on the outside of the shipping container. Return shipments will not be accepted if the Mindray Customer Service Authorization Number is not clearly visible. Please provide the model number, serial number, and a brief description of the reason for return. The customer is responsible for freight charges when this product is shipped to Mindray for service (including any relevant customs fees or other freight related charges).

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The issue date of this manual is 2021-5.

Notification of Adverse Events

As a health care provider, you may report the occurrence of certain events to SHENZHEN MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD., and possibly to the competent authority of the Member state in which the user and/or patient is established.

These events, include device-related death and serious injury or illness. In addition, as part of our Quality Assurance Program, SHENZHEN MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD. requests to be notified of device failures or malfunctions. This information is required to ensure that SHENZHEN MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD. provides only the highest quality products.

Important Information

1. It is the customer's responsibility to maintain and manage the product after delivery.
2. The warranty does not cover the following items, even during the warranty period:
   (1) Damage or loss due to misuse or abuse.
   (2) Damage or loss caused by force majeure such as fires, earthquakes, floods, and lightning.
   (3) Damage or loss involving the product purchased from a channel other than Mindray or its authorized agency.
3. This product shall not be modified without permission.
4. In no event shall Mindray be liable for the damage caused by alteration, modification, or repair performed by personnel other than those designated by Mindray.
5. At the end of the service life of the product, please contact Mindray or its agency. Mindary shall not be liable for the result if you do not consult Mindray or its agency about disposal of the product.
6. This manual contains warnings regarding foreseeable potential dangers, but you shall always be alert to dangers other than those indicated as well.
7. Mindray shall not be liable for damage or loss that results from negligence or from ignoring the precautions and operating instructions described in this manual.
8. This manual shall always be kept properly so that it can be obtained conveniently as needed.

I. Intended Use

The light cable is used to transmit light during the endoscopic diagnosis and treatment. In the medical field, it is used with the cold light source of endoscopes.

NOTE

- According to the conclusion of clinical evaluation and residual risk evaluation, for the intended patients, there is no known side effects that can occur during or after the use of the medical device. And there is no need for the operator to make extra preparations. Thus, no residual risk associated with using the medical device should be disclosed due to the risk management report.

II. Specifications

Model	LC0005S	LC0003S
Length of light cable	3000 mm ± 10%	
Diameter of exit optical fiber	Φ4.8 mm ± 0.1mm	Φ3.5 mm ± 0.1mm
Minimum bending radius	50mm	

III. Introduction

1. Connector (to light source)
2. Light source adapter
3. Connector sleeve
4. Anti-bending device
5. Connector (to endoscope)

IV. Safety Precautions

⚠ WARNING

Risk of patient injury

- Ensure that all endoscopic equipment is properly connected and functioning before inserting the endoscope into a patient.
- Use this product only along with the endoscopic device specified by Mindray.

⚠ CAUTION

Risk of patient injury

Light source produces a lot of heat, causing a high temperature at the connector and front end of the endoscope. It may result in the following risk:

- ➢ Scalding the patient (for example, when the small cavity of the lumen is exposed to excessive lighting, or the front end of the endoscope is close to the tissue).
- ➢ Burn of the patient or user's skin.
- ➢ Combustion or burning-out of surgical instruments (such as surgical drapes, and plastic materials).

- It is forbidden to place the endoscopic equipment on the patient's skin, flammable materials, or temperature-sensitive materials.
- Adjust the output power of the light source to make the minimum brightness required to illuminate the target area. Avoid excessive exposure to strong light.

⚠ CAUTION

Risk of user injury

When the light source is on, do not look straight at the endoscopic connector of the light cable because that may cause eye injury.

V. Removal After Use

⚠ CAUTION

Risk of user injury

Touching the light cable connector when its temperature is high may cause scalding.

- Cool the light cable after use.

INSTRUCTION

Risk of product damage

Sudden change in temperature may cause damage to the product.

- Cool the light cable after use.
- It is forbidden to use liquid to cool the light cable.

INSTRUCTION

Risk of product damage

Pulling the cable may damage the product.

- To unplug the light cable from the light source, grasp the plastic shell of the connector.

VI. Cleaning, Disinfection, and Sterilization

Clean, disinfect and sterilize this product regularly based on the local or hospital's regulations related to cleaning, disinfection, and sterilization.

A protective cap is provided together with the product before delivery, as shown in the following figure. Remove the protector before cleaning, disinfection, and sterilization.

1. Cleaning and Disinfection

(1) Disconnect the light cable from the devices, including light source and endoscope.

(2) Use a soft cloth dipped in an appropriate amount of water to remove leftover on the surface of the light cable.

(3) Use a clean soft cloth dipped in an appropriate amount of ethanol (75%) to wipe the surface of the light cable.

(4) Use a dry soft cloth to wipe off detergent on the surface of the light cable, and place the light cable in a ventilated and cool environment to air dry it.

2. Sterilization

The recommended sterilization method is pressure steam sterilization. For loading method of pressure steam sterilization, please refer to the corresponding sterilizer operation instructions.

The procedure is as follows:

(1) Remove the light source adapter from the light cable.

(2) Put the product in a sterilization box, and wrap two layers of sterile sheets to prevent contamination during storage and transportation after sterilization.

(3) Perform pressure steam sterilization as instructed in the manual for using the sterilizer.

The pressure steam sterilization parameters are as follows:

Sterilization process	Temperature	Minimum required time
Pulsation vacuum	132°C - 134°C	4min

⚠ WARNING

Risk of patient/medical staff injury

Improper or inadequate cleaning, disinfection, and sterilization may result in infection of the patient or medical staff or product damage.

- Clean, disinfect, and sterilize the product for the first use and before each use.
- Clean, disinfect and sterilize the product properly according to this manual.

VII. Warranty

If a user or unauthorized person repairs or modifies the product privately, the warranty of the Mindray becomes invalid. The product damage caused by improper use is not covered by the warranty.

VIII. Operating Environment

1. Temperature: 0°C - +35°C
2. Humidity: 30% - 85% RH, non-condensing
3. Atmospheric pressure: 70 kPa - 106 kPa

IX. Storage and Transportation Environment

1. Temperature: -20°C - +60°C
2. Humidity: 30% - 95% RH, non-condensing
3. Atmospheric pressure: 70 kPa - 106 kPa

Put clean and disinfected products in packages capable of isolating the products from bacteria, and store them in a dark, cool, and well-ventilated room.

X. Equipment Symbols

Symbol	Description
MD	Medical Device
	Manufacturer
	Date of manufacture
	TYPE CF APPLIED PART
LOT	Batch code
	Temperature limit
	Humidity limitation
	Atmospheric pressure limitation
CE	The product bears CE mark indicating its conformity with the provisions of the Council Directive 93/42/EEC concerning medical devices and fulfils the essential requirements of Annex I of this directive. Note: The product complies with the Council Directive 2011/65/EU.
	Refer to instruction manual/booklet
EC REP	Authorized representative in the European community
	Comply with the requirements of Directive 2012/19/EU Waste Electrical & Electronic Equipment

Company Contact

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mindray

LC0005S/LC0003S

导光束
使用说明书

Light Cable
Instructions for Use

046-020513-00(3.0)

声明

本说明书详细地介绍了产品的用途、功能和操作使用。使用本产品之前，请认真阅读并理解本说明书中的内容，以保证能够正确地使用本产品，并确保病人和操作者安全。在下列条件都满足的情况下，迈瑞公司将对产品的安全性、可靠性和性能负责：

(1) 按照《使用说明书》使用本产品。

(2) 非人为因素造成的产品损坏。人为因素是指不小心摔落、蓄意破坏等。

确实需要向迈瑞公司退货时，请联系迈瑞公司售后服务部，告知产品型号和系列号，并简述原因。若产品的系列号模糊不可辨认，退货请求将不予接受。

说明书编制日期：2021 年 5 月

重要信息

1. 购买本产品后，客户对产品的维护和管理负全部责任。
2. 即使在保修期内，对下列情况迈瑞将不负责保修：
   (1) 由于操作不当或故意损坏造成的损坏。
   (2) 由于不可抗力如火灾、地震、洪水、闪电等造成的损坏。
   (3) 不是从迈瑞公司或指定的分销商手中购买的迈瑞产品，如果发生损坏，将不予保修。
3. 禁止擅自对本产品做任何改动。
4. 非迈瑞公司指定人员对设备进行的重新改装、改动或维修造成的损坏，迈瑞将不负任何责任。
5. 产品报废处理前请联系迈瑞公司或其代理机构。未向迈瑞公司或其代理机构咨询而对产品进行处理，迈瑞公司不对其所产生的后果负责。
6. 本说明书对可以预见的危险做出了警告。但请在任何时间保持警惕以防出现其他危险。
7. 由于疏忽没有按照说明书中的指引而产生的问题，迈瑞公司将不对此负责。
8. 请妥善保管本说明书，以确保管理和操作人员可以随时查阅。

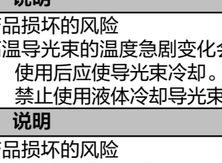
一、预期用途

导光束用于在内窥镜诊断和治疗中传输光线。医学领域中，它与医用内窥镜冷光源配套使用。

二、主要技术参数

型号	LC0005S	LC0003S
导光束长度	3000 mm ± 10%	
出射端光纤直径	Φ4.8 mm，允差 ±0.1mm	Φ3.5 mm，允差 ±0.1mm
最小可弯曲半径	50mm	

三、导光束结构



1. 导光束接头（光源侧）
2. 导光束光源适配套
3. 接头套管
4. 防折弯装置
5. 导光束接头（内窥镜侧）

四、安全注意事项

⚠ 警告

患者受伤的风险

- 将内窥镜插入患者体内之前，应始终正确连接内窥镜设备。
- 本产品仅可与迈瑞指定的内窥镜设备配合使用。

⚠ 小心

患者受伤的风险

光源会产生大量热量，导致内窥镜接头与先端部温度升高。可能会存在以下风险：

- ➢ 患者组织烫伤（例如，管腔较小的腔隙暴露在过强的照明下，或内镜先端部与组织距离过近）。
- ➢ 患者或用户皮肤烧伤。
- ➢ 手术器械燃烧或烧毁（例如，手术铺巾，塑料材料等）。

- 禁止将内窥镜设备放置在患者皮肤、可燃性材料或对温度敏感的材料上。
- 调节光源的输出功率，达到照亮目标区域所需的最低亮度。避免强光的过度暴露。

⚠ 小心

用户受伤的风险

在光源打开的情况下，直视导光束的内镜接头可能导致眼睛损伤。因此，光源打开的情况下，禁止直视导光束的内镜接口。

五、使用后拆卸

⚠ 小心

用户受伤的风险

导光束上的接头温度过高时，触摸接头可能会导致烫伤。

- 使用后应使导光束冷却。

说明

产品损坏的风险

高温导光束的温度急剧变化会损伤产品。

- 使用后应使导光束冷却。
- 禁止使用液体冷却导光束。

说明

产品损坏的风险

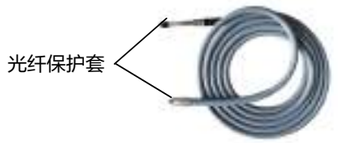
拉拽缆线会损坏产品。

- 从光源上拔下导光束时，应拉动接头的塑料外壳。

六、清洗、消毒和灭菌

请根据当地或医院关于医疗设备清洁消毒的规定定期对本产品进行清洁、消毒和灭菌。

本产品出厂时配送光纤保护套，如下图所示，清洁消毒及灭菌前请先取下保护套。



1. 清洁和消毒

(1) 断开导光束与光源、内窥镜等设备的连接。
(2) 使用一块软布蘸取适量的水除去导光束表面的残留物。
(3) 使用干净的软布蘸取适量乙醇（75%）擦拭导光束表面。
(4) 用干的软布擦去导光束表面的清洁剂，并将导光束置于通风阴凉的环境下风干。

2. 灭菌

推荐使用经验证过的灭菌方法：压力蒸汽灭菌。

压力蒸汽灭菌的装载方法，请参照相应灭菌器的操作说明。

步骤如下：

(1) 卸下导光束光源适配套。
(2) 将产品放置在灭菌盒中，并包裹两层无菌单，以防止灭菌后在存放、运输过程中染菌。
(3) 参照灭菌器的使用说明书执行压力蒸汽灭菌。

压力蒸汽灭菌器灭菌参数如下：

设备类别	温度	所需最短时间
预真空式	132ºC ~ 134ºC	4min

⚠ 警告

患者 / 医务人员受伤的风险

清洗、消毒和灭菌不当或不充分可能导致患者或医务人员感染和产品损坏。

- 首次及此后每次使用产品之前，应该进行清洗、消毒和灭菌。
- 按照本说明书，正确进行产品清洗、消毒和灭菌。

七、保修

如果用户或未经授权的人员私自维修或改造产品，则迈瑞公司的保修将失效。因使用不当导致的产品损坏不在保修范围之内。

八、工作环境

1. 温度：0ºC ~ +35ºC
2. 湿度：30% ~ 85% RH（无凝露）
3. 大气压：70 kPa ~ 106 kPa

九、存储和运输环境

1. 温度：-20ºC ~ +60ºC
2. 湿度：30% ~ 95% RH（无凝露）
3. 大气压：70 kPa ~ 106 kPa

将清洗和消毒处理后的产品置于能隔离细菌的包装中，存放在避光、阴冷、通风良好的室内。

十、符号

符号	说明
	注意！查阅随机文件
	生产日期
	CF 型应用部分
	批次代码
	温度极限
	湿度极限
	大气压力极限
	电子产品环保使用年限（20 年）

售后服务单位

单位名称：深圳迈瑞生物医疗电子股份有限公司
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P/N:ENG-Rigid Endoscope-210285X4P-20230822

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Rigid Endoscope

Small Diameter, Big Vision

Small Diameter, Big Vision

The heatable front end provides effective anti-fogging, which helps deliver smooth surgery.

The Standard 300mm and Lengthened 450mm Type are adaptable for use in various surgeries.

A large depth of field of 3-200mm provides consistently clear views, eliminating the need for repeated refocusing.

The control body has been specially polished to retain grease more easily, allowing for smooth entry and exit of trocars.

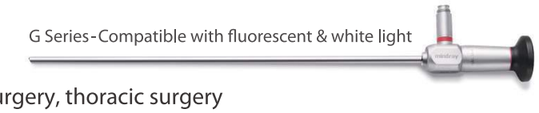
A channel diameter of Φ5.45mm ensures greater luminous flux while smoothly passing through a variety of 5mm-size trocars.

The format size is consistent with that of the Φ10mm endoscope, which enables easy full-screen view.

Rigid Endoscope

Standard 5mm Type

G Series-Compatible with fluorescent & white light

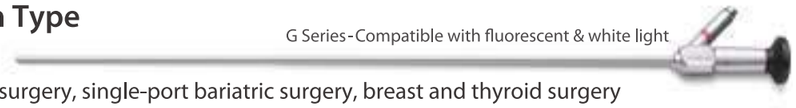


Recommended Surgery: Single-port gynecologic surgery, thoracic surgery

Product	Diameter	Working Length	Field of View	Code
0°	5.45mm	300mm	85°	G 00500A
30°	5.45mm	300mm	85°	G 00530A

Lengthened 5mm Type

G Series-Compatible with fluorescent & white light



Recommended Surgery:
Single-port gynecologic surgery, single-port bariatric surgery, breast and thyroid surgery

Product	Diameter	Working Length	Field of View	Code
0°	5.45mm	450mm	85°	G 10500A
30°	5.45mm	450mm	85°	G 10530A

G Series-Compatible with fluorescent & white light

Standard 10mm Type

M Series-Applicable with white light

Recommended Surgery: General Surgery

Product	Diameter	Working Length	Field of View	Code
0°	10mm	321mm	80°	M 01000A / G 01000A
30°	10mm	321mm	80°	M 01030A / G 01030A

Rigid Endoscope Tray

Product Name	Placed Items	Dimensions (mm)	Code
Small Rigid Endoscope Tray	Standard 5 or 10mm Rigid Endoscope	496×90×44	X TR500944
Long Rigid Endoscope Tray	Lengthened 5mm or 3D Electronic Endoscope	643×158×75	X TR641675

Rigid Endoscope

Operator's Manual

(M 01030A/M 01000A/M 01030PA/M 01000PA/G 01030A/G 01000A/G 01030PA/G 01000PA/M 00530A/G 00530A/M 00500A/G 00500A/M 10530A/G 10530A/M 10500A/G 10500A/M 00530PA/G 00530PA/M 00500PA/G 00500PA/M 10530PA/G 10530PA/M 10500PA/G 10500PA)

CE 0123

■ Release time: 2023-5

■ Revision: 1.0

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

4.7.3 Autoclave Sterilization

NOTE

- **As the sterilizer and its operating conditions may affect sterilization, it is recommended that the sterilization process be reconfirmed and monitored before sterilization in accordance with related international standards (for example, ISO 17665), national standards, or hospital management rules.**

To perform autoclave sterilization, follow the procedure below:

1. Place the packaged container into the sterilizer.
2. Sterilize the equipment following the instructions for use of the sterilizer.

Sterilization parameters of autoclave sterilizer are as follows:

Device	Temperature	Required minimum time
Pre-vacuum	132°C	4min
	134°C	

CAUTION

- **After autoclave sterilization, do not use liquid to forcibly cool the endoscope. Otherwise, the endoscope may be damaged.**

UP700/UP700B/UP700C/UP700D

Ultrasonic Surgical & Electrosurgical Energy Platform

Operator's Manual

CE 1639

- Release time: 2024-4
- Revision: 6.0
- Software Version: 02.xx.xx.xx

■ A transducer (optional)

NOTE

- **Your product may not contain all of these components. For details about the availability of components, contact Mindray.**

2.5.1 UP700 Series Generator

UP700 series generator supplies electrical energy for ultrasonic assembly and bipolar instruments.

2.5.1.1 Front View of the Generator

(1) Ultrasonic socket (applied part): connects a transducer.

(2) Power switch: turns on or off the generator.

(3) Monopolar socket 1 (applied part): connects a monopolar instrument.

(4) Touchscreen: displays equipment status and changes settings.

(5) Return electrode socket: connects a return electrode.

(6) Monopolar socket 2 (applied part): connects a monopolar instrument.

(7) Split return electrode indicator: indicates the connection status of the split return electrode. When the indicator is green, the split return electrode is properly connected.

(8) Non-split return electrode indicator: indicates the connection status of the non-split return electrode. When the indicator is green, the non-split return electrode is properly connected.

(9) Bipolar socket (applied part): connects a bipolar instrument.

2.7 Audio Indicators of the Generator

Audio Indicator	Volume	Remarks
Activation tone for coagulation mode of HF instrument	Lowest volume ≥ 45 dB(A) Highest volume ≥ 65 dB(A) (1m away from the rear of the generator)	The tone persists throughout the duration of activation.
Activation tone for cutting mode of HF instrument		
Activation tone for ultrasonic assembly		
Activation tone for electrode surgical instrument for Seal 7	≥ 45 dB(A) (1m away from the generator)	The tone persists throughout the duration of activation.
Coagulation success tone for electrode surgical instrument for Seal 7		/
Coagulation failure tone for electrode surgical instrument for Seal 7		
Information signals	Not higher than that of the system alarm of low priority	Simultaneously play the following tones: 365Hz±5%, 730Hz±5%, 1095Hz±5%, 1460Hz±5%, 1825Hz±5% Last for 165 ms±5%
System alarm tone	≥ 45 dB(A) (1m away from the generator)	This audio indicator complies with IEC 60601-1-8.
Return electrode alarm tone	≥ 65 dB(A) (1m away from the rear of the generator)	This audio indicator complies with IEC 60601-2-2 and IEC 60601-1-8.

CAUTION

- **The alarm tone is different from the prompt tone.**
- **Make sure that the volume of alarm tones and activation tones are adjusted to a level that can be clearly heard by the surgical team. For detailed setting methods, refer to *4.11 Setting Volume*.**

- Surface of the equipment and peripheral devices have no signs of distortion, damage, or contamination.
- The coating of the blade is not peeled or damaged.
- The parts of surgical instruments that will be put inside the patient have no rough surface, sharp edges, or protrusions.
- No tissue residues are on the surgical instruments. All cords are intact and well routed.
- Connectors or plugs are not loose, distorted, damaged, contaminated, or blocked.
- All instruments and adapters are correctly connected and metal parts on connectors are not exposed
- No irrelevant objects are on top of the equipment and the ventilation outlet is not covered by dust or other objects
- No obstacles are in the movement range of the system or near the ventilation outlet.

CAUTION

- **If using instruments not specified by Mindray, check its compatibility and especially insulation performance. Make sure that the output voltage of the generator does not exceed the rated voltage of the instruments.**

4.4 Starting the System

Press the power switch on the front panel to turn on the generator. After startup, the power indicator changes from orange to green.

4.5 Check Before Operation

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

- During startup, a normal startup tone is heard.
- The system self check passes and no alarm is generated.
- After startup, the indicator lights and the color is correct.
- The touchscreen displays correctly.
- 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.

CAUTION

- **Do not put the system into 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 Using the Touchscreen

The equipment is configured with a LCD touchscreen on which you can operate and set the equipment.

If all HF instruments and ultrasonic assembly are connected, the touchscreen display of the generator is as follows.

(1) Ultrasonic area: Power levels in this area is highlighted if the ultrasonic assembly is connected. For detailed description, refer to *4.7.3 Using Ultrasonic Assembly*.

(2) Bipolar area: Power levels and modes in this area is highlighted if the bipolar instrument is connected. For detailed description, refer to *4.9.1 Operation Area for Common Bipolar Instrument*.

After the test passes, the prompt "Test Complete" appear, and then the operation screen displays. Now the generator is ready for use.

If the test fails, follow the on-screen instructions to deal with the issue. For detailed error messages and solutions, refer to *5.7 Error Messages for Ultrasonic Assembly*.

4.7.2 Operation Area for Ultrasonic Assembly

The operation area for ultrasonic assembly is as follows:

(1) MAX level: indicates the maximum power level. MAX level is 5 and cannot be adjusted. If the MAX mode is activated, the MAX area shows a yellow-green background.

(2) MIN level: indicates the power level of the MIN mode. MIN level can be adjusted from 1 to 5. The default value is 3. If the MIN mode is activated, the MIN area shows a yellow-green background.

(3) Mode Setting button: indicates the current mode that will be activated when you press the MIN button of the ultrasonic assembly. The default mode is MIN.

(4) Footswitch symbol: indicates the status of the footswitch. If the instrument can be activated by footswitch and the footswitch is properly connected, the symbol is displayed as . If the instrument cannot be activated by footswitch, the symbol is displayed as .

(5) Power Level Increase button : press to increase the power level.

(6) Power Level Decrease button : press to decrease the power level.

4.7.3 Using Ultrasonic Assembly

To use the ultrasonic assembly, follow the procedure below:

1. Connect the ultrasonic assembly to the generator.
2. If the connected ultrasonic assembly supports the advanced features, press the Mode Setting button to select the MIN mode or the Enhanced Vessel Sealing (EVS) function:

5 System Alarm

5.1 Overview

This chapter describes the alarm function of the generator and lists error messages related to the ultrasonic assembly and HF instruments.

5.2 Introduction to Alarm Function

The system provides technical alarms only. Alarms are classified into high priority and low priority based on the alarm severity.

The alarm system only provides one alarm preset basing on electrical parameters. The alarm limits and algorithms cannot be changed. There is also a complete set of programs for monitoring operations of the generator and accessories. When an alarm generates, the generator gives alarm tones and displays error messages to alert the operator.

A system log of the generator records error messages and system power-off time. The generator can store 5000 history records in the log, and earlier data are overwritten by later ones if the memory is full.

The alarm system consists of latching alarms and non-latching alarms:

- A latching alarm continues to be displayed when the triggering event no longer exists and disappears after the generator is restarted.
- A non-latching alarm disappears when the triggering event no longer exists.

NOTE

- **The delay inherent in the determination of the alarm condition is less than 1s.**
- **Alarm settings and system log are maintained when the system is power down. The duration of power interruption has no effect on the stored alarm information.**

5.3 Alarm Indicators

When an alarm occurs, the equipment indicates it to you through visual or audible alarm indications. For details, see the following table:

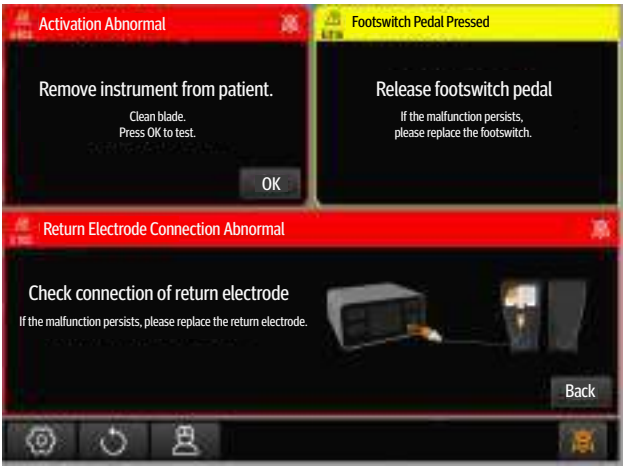
Alarm Priority	Audible Tone Pattern	Alarm Message	Symbol
High	Except return electrode alarms: Repeat pattern of 2 x 5 beep tones	White text and symbol inside a red box	
	Return electrode alarms: Low-pitched 3-beep tones		
Low	2-beep tones	Black text and symbol inside a yellow box	

NOTE

- **When a return electrode alarm occurs, the indicator on the return electrode socket lights up in red.**
- **When multiple error messages occur simultaneously in the same area, the message of the highest priority is displayed preferentially. You can view other error messages by swiping to turn pages.**
- **When multiple alarms of different priority levels occur simultaneously, the system selects the alarm of the highest priority to issue the alarm tone.**

5.4 Alarm Screen

An alarm provides a pop-up window that contains messages or pictures to help you identify the cause of the alarm, as shown in the following figure:



Keep observing error messages and take actions as instructed. If the equipment starts to beep, check the message immediately and take corrective actions.

5.5 Acknowledging Alarms

After an alarm is generated, you can select the Alarm acknowledgment button to acknowledge the alarm and turn off the alarm tone. When the alarm system is acknowledged:

- The alarm sound is silenced.
- The symbol is displayed, without affecting the generation of new alarms.

To set the alarm volume, refer to *4.11 Setting Volume*.

5.6 General Error Messages

Message	Possible Cause	Attemptable Solution	Alarm Priority	Latching or Not
System Malfunction	Communication failed. Or the generator software is faulty.	Restart the generator. If the problem persists, contact Mindray.	High	Yes
Generator Temperature Too High	The ventilation outlet is blocked. Or the room temperature has exceeded the specified range.	Clear the blockage from the ventilation outlet. Restart the generator. If the problem persists, contact Mindray.	High	Yes
Footswitch Pedal Pressed	When the footswitch is connected to the generator, a footswitch pedal has been pressed.	Ensure the footswitch pedals are released. Use a new footswitch. If the problem persists, contact Mindray.	Low	No

5.7 Error Messages for Ultrasonic Assembly

Message	Possible Cause	Attemptable Solution	Alarm Priority	Latching or Not
Ultrasonic Circuit Error	The power of the ultrasonic assembly is too high.	Restart the generator. If the problem persists, contact Mindray.	High	Yes
Ultrasonic Malfunction	Communication failed. Or the generator software is faulty.	Restart the generator. If the problem persists, contact Mindray.	High	Yes

Frequency	30 - 80 kHz (typical value: 55.5 kHz, unless otherwise specified in the instrument's instructions for use)

6.2.2 Selection of Ultrasonic Power Level

The power level of the MIN mode can be adjusted from 1 to 5 and the power level of the MAX mode is fixed to 5. You can select power levels by following suggestions below:

- For vascular tissue: As the power level increases, the cutting efficiency increases. The maximum power level is usually used to cut tissue containing small vessels. Cutting larger vessels by using the MIN mode is less efficient. However, considering the sealing effect and cutting time, you are advised to select the power level 3 to cut and seal vessels in normal cases. To seal large vessels, you can use the EVS function for optimal sealing even though the cutting efficiency is further reduced.
- For tissue such as muscle, liver, and mesentery: As the power level increases, the cutting efficiency increases. You are advised to select the power level 5 to cut for efficient surgical operation.

6.3 Monopolar Cutting Modes

The equipment provides two monopolar cutting modes: Pure Cut and Blend Cut. Their applicability is as follows:

- The Pure Cut mode is applicable to smooth and precise cutting of soft tissue with little or without hemostasis.
- The Blend Cut mode is applicable to slow and dry cutting of soft tissue with significant hemostasis.

NOTE

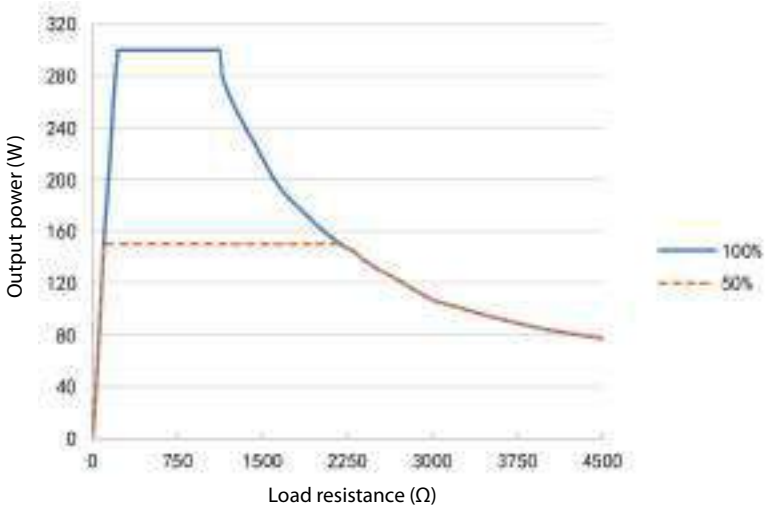
- **Any associated equipment and active accessories used in the Blend Cut mode must be rated to withstand the combination of actual voltage and crest factor.**

6.3.1 Technical Parameters of Monopolar Cutting Modes

Parameter	Pure Cut	Blend Cut
Operating frequency	434 kHz ± 10%	434 kHz ± 10%
Modulation frequency	/	27.7 kHz ± 10%
Duty cycle	100%	50% ± 10%
Rated load	300 Ω	300 Ω
Rated power	300 W ± 15%	200 W ± 15%
Maximum output voltage	1287 V_p	2178 V_p

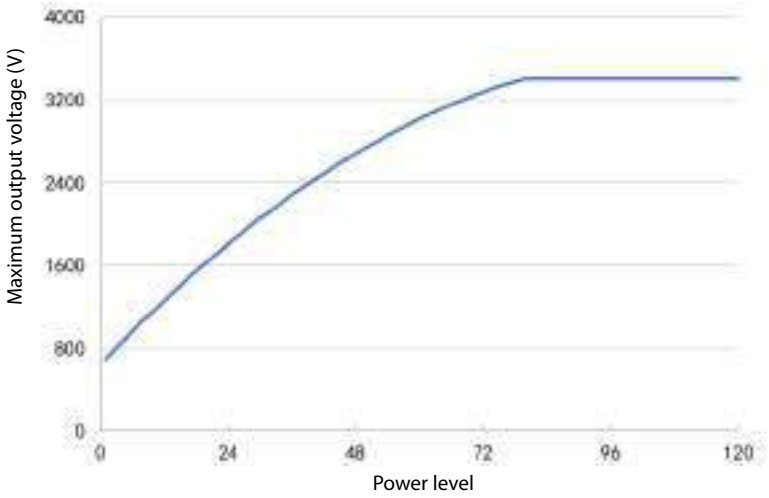
Parameter	Pure Cut	Blend Cut
Maximum output current	1.32A	1.05A
Crest factor (rated load)	1.5 ± 0.3	2.3 ± 0.3
Power ranges and step	--; 1 - 40 W (step: 1 W); 40 - 100 W (step: 5 W); 100 - 300 W (step: 10 W)	--; 1 - 40 W (step: 1 W); 40 - 100 W (step: 5 W); 100 - 200 W (step: 10 W)

6.3.2 Characteristic Diagrams of Pure Cut Mode



6.4.1 Technical Parameters of Monopolar Coagulation Modes

Parameter	Soft Coag	Fulgurate Coag	Spray Coag
Operating frequency	434 kHz ± 10%	434 kHz ± 10%	434 kHz ± 10%
Modulation frequency	/	27.7 kHz ± 10%	21.1 kHz ± 10%
Duty cycle	100%	6.25% ± 10%	4.76% ± 10%
Rated load	100 Ω	500 Ω	500 Ω
Rated power	120 W ± 15%	120 W ± 15%	120 W ± 15%
Maximum output voltage	264 V_p	3448 V_p	3932 V_p
Maximum output current	1.71A	1.05A	1.05A
Crest factor (rated load)	1.5 ± 0.3	5.3 ± 0.3	6.1 ± 0.3
Power ranges and step	--; 1 - 40 W (step: 1 W); 40 - 100 W (step: 5 W); 100 - 120 W (step: 10 W)	--; 1 - 40 W (step: 1 W); 40 - 100 W (step: 5 W); 100 - 120 W (step: 10 W)	--; 1 - 40 W (step: 1 W); 40 - 100 W (step: 5 W); 100 - 120 W (step: 10 W)



6.5 Bipolar Coagulation Modes

The generator provides four bipolar coagulation modes: Precise Coag, Standard Coag, Macro Coag, and Bipolar Soft Coag. The applicability is as follows:

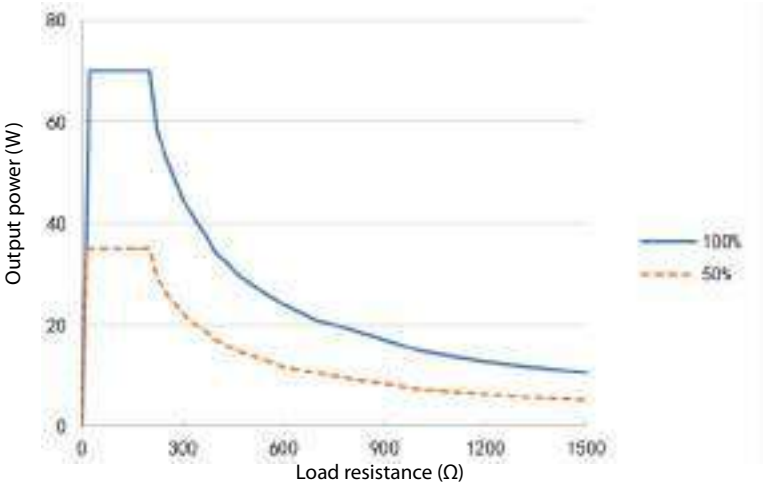
- The Precise Coag mode is applicable to low-voltage and fine coagulation of tissue. Using this mode prevents the generation of sparks and eschars and precisely controls the coagulation effect.
- The Standard Coag mode is applicable to most low-voltage bipolar coagulation of tissue. Using this mode prevents the generation of sparks and eschars and achieves consistent coagulation effect.
- The Macro Coag mode is applicable to bipolar cutting and rapid coagulation. Compared with other bipolar modes, Macro Coag delivers higher voltage and greater power.
- The Bipolar Soft Coag mode is applicable to slow and deep bipolar coagulation with no sparks. Using this mode causes practically no tissue carbonization or adhesions.

6.5.1 Technical Parameters of Bipolar Coagulation Modes

Parameter	Precise Coag	Standard Coag	Macro Coag	Bipolar Soft Coag
Operating frequency	434 kHz ± 10%	434 kHz ± 10%	434 kHz ± 10%	350 kHz ± 10%

Parameter	Precise Coag	Standard Coag	Macro Coag	Bipolar Soft Coag
Duty cycle	100%	100%	100%	100%
Rated load	100 Ω	100 Ω	100 Ω	50 Ω
Rated power	70 W ± 15%	70 W ± 15%	70 W ± 15%	70 W ± 15%
Maximum output voltage	284 V_p	415 V_p	530 V_p	150 V_p
Maximum output current	1.98A	1.98A	1.87A	2.2A
Crest factor (rated load)	1.6 ± 0.3	1.6 ± 0.3	1.8 ± 0.3	1.48 ± 0.3
Power ranges and step	--; 1 - 40 W (step: 1 W); 40 - 70 W (step: 5W)	--; 1 - 40 W (step: 1 W); 40 - 70 W (step: 5W)	--; 1 - 40 W (step: 1 W); 40 - 70 W (step: 5W)	--; 1 - 10 W (step: 1 W); 10 - 70 W (step: 2W)

6.5.2 Characteristic Diagrams of Precise Coag



9.2 Ultrasonic Surgical Instruments

Model				Description
F14/P14 series	**F23/P23 series**	**F36/P36 series**	**F45/P45 series**	
FC-14	FC-23	FC-36	FC-45	Ultrasonic Surgical Instrument
FCH-14	FCH-23	FCH-36	FCH-45	
FOK-14	FOK-23	FOK-36	FOK-45	
FOM-14	FOM-23	FOM-36	FOM-45	
PC-14	PC-23	PC-36	PC-45	
PCH-14	PCH-23	PCH-36	PCH-45	
POK-14	POK-23	POK-36	POK-45	
POM-14	POM-23	POM-36	POM-45	
POS-14	POS-23	POS-36	POS-45	
PCT-14	PCT-23	PCT-36	PCT-45	
FOS-14	FOS-23	FOS-36	FOS-45	
FCT-14	FCT-23	FCT-36	FCT-45	
FO-14	FO-23	FO-36	FO-45	

9.3 Footswitches

Model	Description
FS-U	Footswitch for ultrasonic surgical instrument
FS-D	Double-pedal footswitch for HF instrument
FS-S	Single-pedal footswitch for HF instrument

9.4 Carts

Model	Description
CT-01	Cart (standard)
CT-02	Cart (available for smoke module)
CT-03	Cart (available for smoke module&pump)

C Default Settings

C.1 Default System Settings

Parameter	Items/Options	Default Setting
Brightness	/	7
Activation/Button Volume	/	7
Alarm Volume	Low, Medium, High	Medium

C.2 Default Ultrasonic Assembly Settings

Parameter	Items/Options	Default Setting
Activation Type	Both Hand and Foot, Only Hand, Only Foot	Both Hand and Foot
Advanced Features	STS(Smart Tissue Sensing)	ON
	EVS(Enhanced Vessel Sealing)	ON
	Activation Tone Change	ON

C.3 Default HF Instruments Settings

Parameter	Items/Options	Default Setting
Return Electrode	Neonatal Return Electrode Monitoring	OFF

C.4 Default User Maintenance Settings

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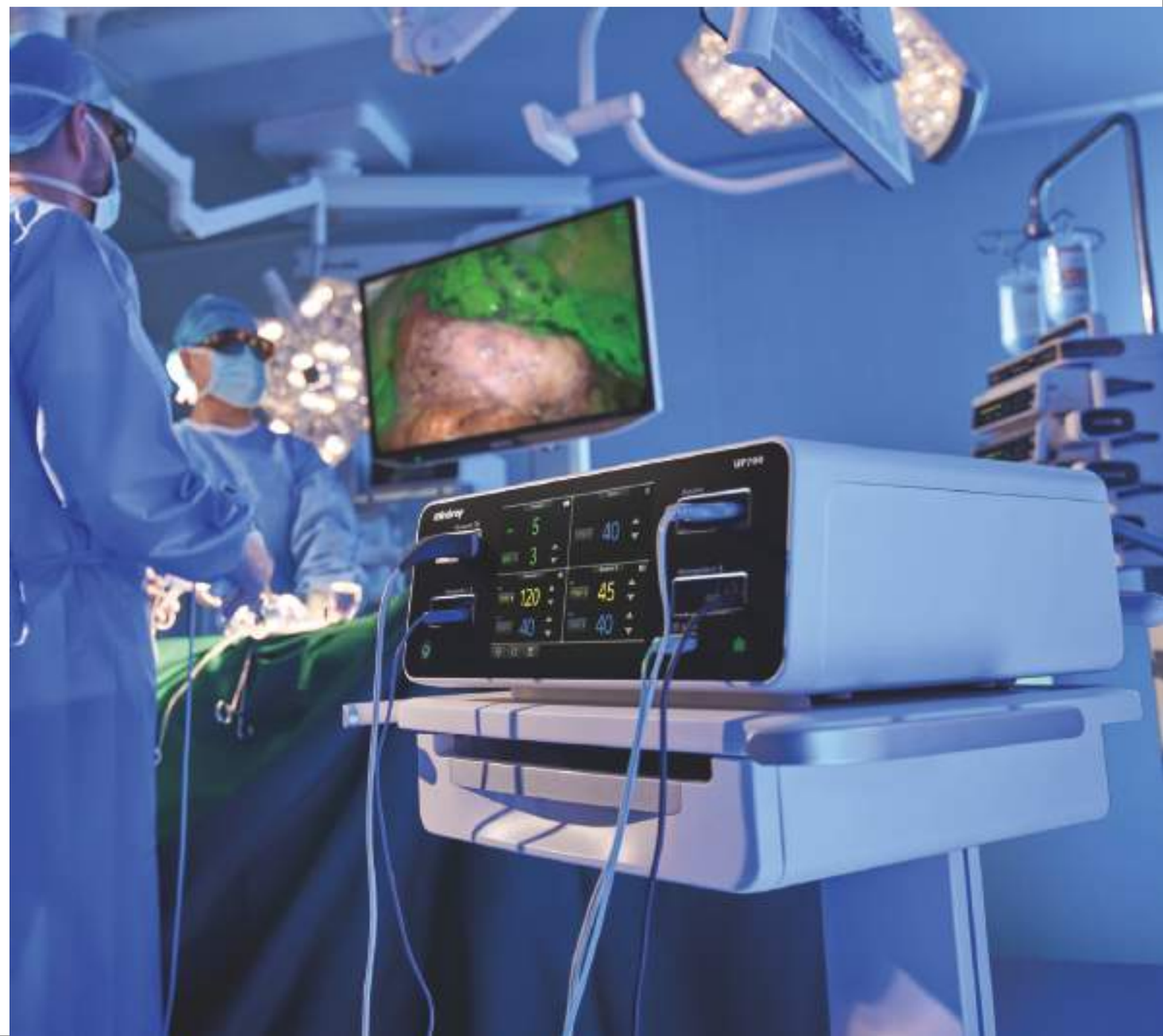
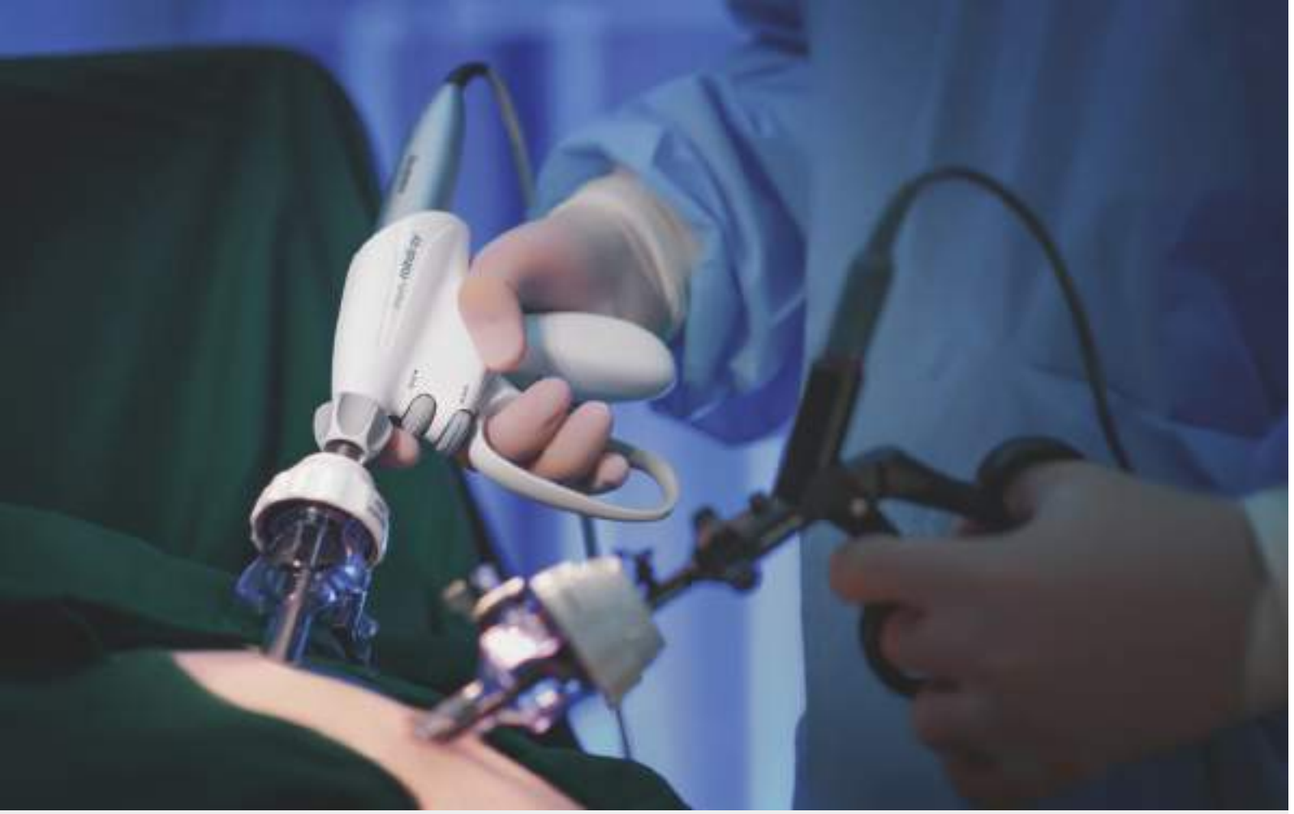
Ultrasonic Surgical & Electrosurgical Energy Platform

Higher Precision, Easier Operation





Energy devices are an integral part of surgery.
How can they provide added value to surgeons and patients?

Tapping into the needs of healthcare, focusing on clinical pain points, and breaking through technology blockades to create Advanced compact, Advanced accurate and Advanced precise surgical equipment.

Advanced Compact

Integrated ultrasonic surgical and HF instruments free up more space in the OR and require less maintenance

One generator for multiple energy devices

Mode switching and power level adjustment in one simple tap

Flat Menu Design

4-Quadrant Interactive UI

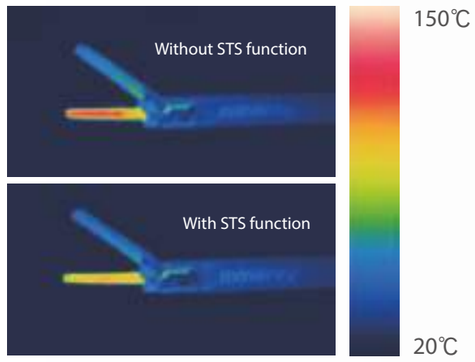
Simplified and Intuitive

Advanced Accurate

Ultrasonic Module

STS™ (Smart Tissue Sensing)

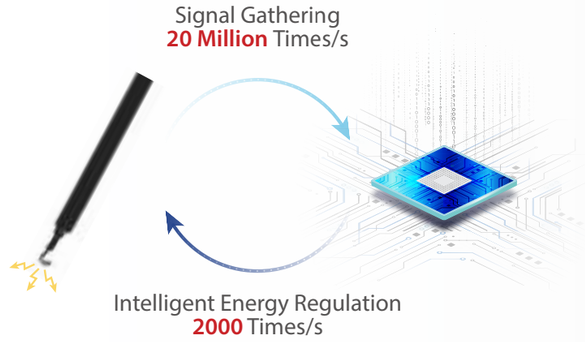
Comparison of Heat Maps of Forceps
(1 second after disconnection)



Automatic reduction of output power after tissue disconnection means less risk of accidental scalding from ultrasonic surgical instrument.

HF Electrosurgical Module

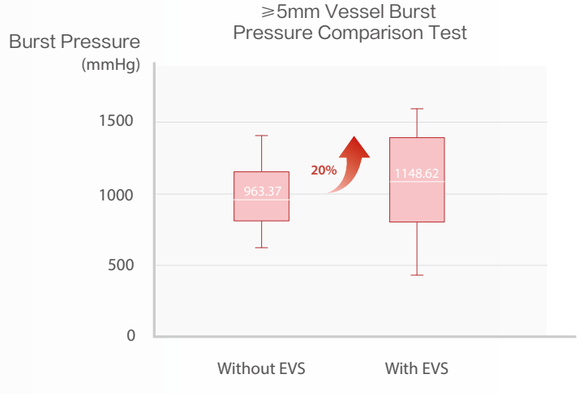
Precise Energy Control Algorithm



Real-time precise energy regulation based on tissue characteristics ensures smooth cutting of different tissues with HF instrument.

EVS™ (Enhanced Vessel Sealing)

Precise output of energy based on the status of the blood vessel, providing firmer and safer 5mm vessel sealing.



Extraordinary Energy Compensation Algorithm

By compensating for transmission loss, the advanced algorithm ensures consistent energy delivery to tissues aligned with your settings, to eliminate attenuation over time.

Advanced Precise

Thin and narrow design more for greater manoeuvrability in tight spaces

20% Thinner
Compared to Original Design

20% Narrower
Compared to Original Design

Rounded edges and corners to avoid scratching the blood vessels. All-round coating to reduce adhesion and wiping during surgery.

Anti-Adhesion Coating

Anti-Scratch Blade Tip

Energy Platform Generator

Different combinations of functions for specific clinical scenarios

UP700

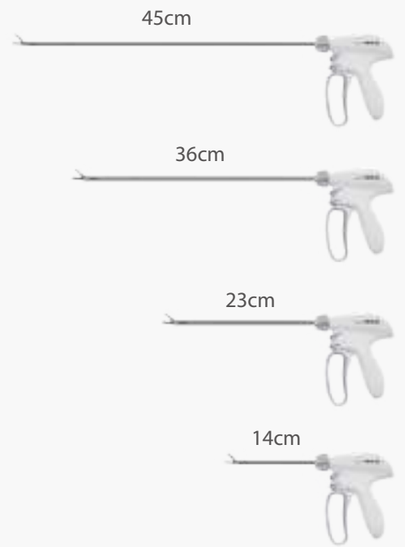
Ultrasonic + Bipolar + Monopolar

UP510

Ultrasonic + Bipolar

Ultrasonic Surgical Instrument

Different lengths for various types of surgery



Trolley

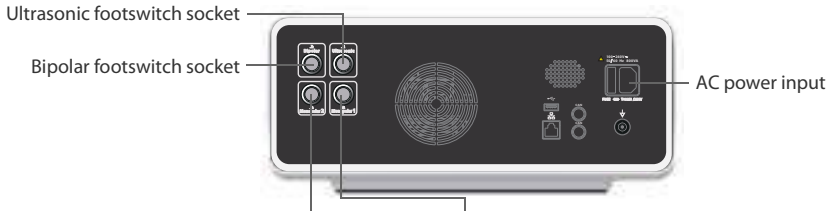
Fixed position structure for generator and self-locking wheel design

Transducer

Supports 100 operations

UP700 Series Generator Quick Start Guide

Product Overview



Note: Multiple instruments can be connected to the generator at the same time, but they cannot be activated simultaneously.

Using the Touchscreen

Using the EVS Function

When using an ultrasonic assembly, you can switch between the EVS function and the MIN mode in the ultrasonic area. **EVS(Enhanced Vessel Sealing)** is switched on by default.

Press the MIN button on the ultrasonic surgical instrument or press the left pedal of footswitch to activate the EVS function.

Enabling Neonatal Return Electrode Monitoring

When using a monopolar instrument, you can switch on **Neonatal Return Electrode Monitoring** in the setup menu.

Then the neonate symbol is displayed in the monopolar area, indicating that the return electrode monitoring for neonate is enabled.

Setting Procedure

Select the Procedure button on the touchscreen to display the **Select Procedure** page.

On the **Select Procedure** page, you can either add a Procedure, or edit or select a saved one.

A maximum of 500 Procedures can be added.

Setting Seal 7 Mode

Connect the electrode surgical instrument for Seal 7 to the generator. The generator automatically identifies the instrument and enter the Seal 7 mode.

The prompt tone will change when the sealing is finished.

Troubleshooting

Symptom	Attemptable Solution
There is no energy output when the instrument is activated.	Set the power level and reactivate the instrument.
	Properly connect the instrument to the generator. Make sure that the relevant instrument tests have been performed according to the on screen prompts.
When the generator is activated, the operation of other devices is interfered.	Keep the generator and cords connected to the generator away from other electronic devices.

Note: If the problem persists, remove the system from use immediately. Contact your service personnel.

Recommended Power Levels

GI Surgery  Monopolar: Blend 40W Monopolar: Fulgurate 40W	**Hepatobiliary Surgery**  Monopolar: Blend 40W Monopolar: Fulgurate 40W Monopolar: Spray 80W (Optional) Bipolar: Standard 50W	**Gynecological Surgery**  Monopolar: Blend 40W Monopolar: Fulgurate 40W Bipolar: Standard 50W	**Thyroid Surgery**  Monopolar: Blend 30W Monopolar: Fulgurate 30W Bipolar: Precise 10W
Breast Surgery  Monopolar: Blend 40W Monopolar: Fulgurate 40W	**Esophageal and Lung Surgery**  Monopolar: Blend 30W Monopolar: Fulgurate 35W	**Spine Surgery**  Monopolar: Blend 40W Monopolar: Fulgurate 40W Bipolar: Standard 12W	**Brain Surgery**  Monopolar: Pure 30W Bipolar: Precise 8W
Arthroscopic Surgery  Monopolar: Blend 25W Monopolar: Fulgurate 25W	**ENT Surgery** 	**Cardiothoracic Surgery** 	
Ophthalmic Surgery  Bipolar: Precise 2W	**ENT (Needle Electrode)** Monopolar: Fulgurate 15W **ENT (Blade Electrode)** Monopolar: Fulgurate 30W	**Cardiothoracic (Heart Surface)** Monopolar: Fulgurate 10W **Cardiothoracic (Vessels)** Monopolar: Blend 30W Monopolar: Fulgurate 25W	**Cardiothoracic (Coronary Artery Bypass)** Monopolar: Fulgurate 20W **Cardiothoracic (Sternum)** Monopolar: Spray 75W

Note: The listed recommended power levels were derived from clinical feedback for reference only. The actual power level applied may vary significantly due to the surgery situation, patient differences, or electrode type. You are advised start with a low power level and increase it cautiously for optimal effect.

To obtain more maintenance information:

046-025723-00(1.0)

www.mindray.com

P/N:ENG-Reusable Laparoscopic Instruments-210285X20P-20241122

mindray

healthcare within reach

mindray

Reusable Laparoscopic Instruments

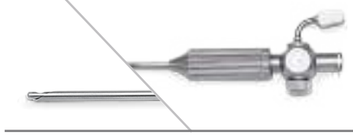
User Friendly & Future Proof

Trocars

Product	Description	Dimension	Code	
	Pyramidal Trocar	ϕ 5X95	221-51155	👍
		ϕ 10X95	221-01155	👍
		ϕ 12X95	221-81155	
		ϕ 5X150	221-53155	👍
		ϕ 10X150	221-03155	👍
		ϕ 12X150	221-83155	👍
	Auto Shield Trocar	ϕ 5X95	221-51255	
		ϕ 10X95	221-01255	
		ϕ 12X95	221-81255	
		ϕ 5X150	221-53255	
		ϕ 10X150	221-03255	
		ϕ 12X150	221-83255	
	Pyramidal Trocar with Screw	ϕ 5X95	221-51165	
		ϕ 10X95	221-01165	
		ϕ 12X95	221-81165	
	Auto Shield Trocar with Screw	ϕ 5X95	221-51265	
		ϕ 10X95	221-01265	
		ϕ 12X95	221-81265	

Trocars

- To avoid blood contamination when inserting the telescope and to reduce times of cleaning the tip of the telescope by controlling the sealing flap opening and closing.

Product	Description	Dimension	Code	
	Veress Needle	ϕ 2X120	221-21127	
		ϕ 2.7X150	221-27157	👍
	Reducer Sleeve	ϕ 10 - ϕ 5	221-01785	
		ϕ 12 - ϕ 5	221-81785	
	Sealing Cap	ϕ 5	221-50925	👍
		ϕ 10	221-00925	👍
		ϕ 12	221-80925	👍
	Reducer	ϕ 10 - ϕ 5	221-00725	👍
		ϕ 12 - ϕ 5	221-80725	👍
	Reducer	ϕ 10 - ϕ 5	221-00715	

The "Relia" Reusable Electrode Surgical Instruments

Safe

Insulated sleeve exposes a shorter metal base to avoid the accidental damage caused by electrical leakage.

Durable

Strictly selected materials plus special production processes greatly extend the product's life.

Ergonomic

One-click to disassemble into three parts for more thorough cleaning and sterilization.

Dissecting and Grasping Forceps

- **Diamond serration clamp teeth**
  Stronger grasping force with less tissue damage
- **Shorter metal base**
  Less unintentional electrical injury
- **No obvious bulge at the opening joint**
  Reduce blood and tissue residues, easy to clean and reduce cross infection

Product	Description	Dimension	Code	
 16mm	KELLY Dissecting and Grasping forceps, Maryland	ϕ 5X360	222-5S3013	👍
		ϕ 5X360, With Ratchet	222-5T3013	
		ϕ 5X430	222-5S4013	
		ϕ 5X430, With Ratchet	222-5T4013	
 22mm	KELLY Dissecting and Grasping forceps, long, Maryland	ϕ 5X360	222-5S3023	👍
		ϕ 5X360, With Ratchet	222-5T3023	
		ϕ 5X430, With Ratchet	222-5T4023	
 16mm	Dissecting and Grasping forceps, right-angled	ϕ 5X360	222-5S3123	👍
		ϕ 5X360, With Ratchet	222-5T3123	
		ϕ 5X430, With Ratchet	222-5T4123	
 23mm	Straight Dissecting and Grasping forceps, atraumatic	ϕ 5X360	222-5S3043	
		ϕ 5X360, With Ratchet	222-5T3043	
 43mm	Dissecting and Grasping forceps, atraumatic	ϕ 10X360	222-0S3103	
		ϕ 10X360, With Ratchet	222-0T3103	
 26mm	Dissecting and Grasping forceps, right-angled	ϕ 10X360	222-0S3133	👍
		ϕ 10X360, With Ratchet	222-0T3133	

Grasping Forceps


No Ratchet


With Ratchet

Product	Description	Dimension	Code	
 18mm	Bowel Grasper, fenestrated, short	ϕ 5X360	222-5S3213	👍
		ϕ 5X360, With Ratchet	222-5T3213	
 24mm	Atraumatic Grasping forceps	ϕ 5X360	222-5S3633	👍
		ϕ 5X360, With Ratchet	222-5T3633	
		ϕ 5X430, With Ratchet	222-5T4633	
 27mm	CROCE-OLMI Grasping forceps, atraumatic, curved	ϕ 5X360	222-5S3453	👍
		ϕ 5X360, With Ratchet	222-5T3453	
		ϕ 5X430, With Ratchet	222-5T4453	
 26mm	Grasping forceps, w specially fine atraumatic serration	ϕ 5X360	222-5S3473	
		ϕ 5X360, With Ratchet	222-5T3473	
		ϕ 5X430	222-5S4473	
		ϕ 5X430, With Ratchet	222-5T4473	
 37mm	Bowel Grasper, fenestrated	ϕ 5X360	222-5S3303	👍
		ϕ 5X360, With Ratchet	222-5T3303	
 18mm	BABCOCK Grasping forceps	ϕ 5X360	222-5S3553	
		ϕ 5X360, With Ratchet	222-5T3553	👍
 14mm	Grasping forceps, 2X4 teeth	ϕ 5X360	222-5S3393	
		ϕ 5X360, With Ratchet	222-5T3393	

Grasping Forceps

No Ratchet

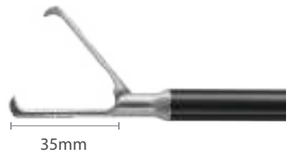
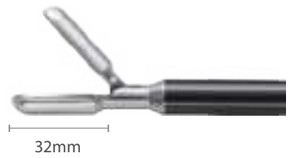
With Ratchet

Product	Description	Dimension	Code
 28mm	Grasping forceps, atraumatic	ϕ 5X360	222-5S3333
		ϕ 5X360, With Ratchet	222-5T3333
 15mm	VANCAILLIE Adhesion Forceps, one jaw fenestrated	ϕ 5X360	222-5S3493
		ϕ 5X360, With Ratchet	222-5T3493
 15mm	MANHES biopsy forceps	ϕ 5X360	222-5S3903
		ϕ 5X360, With Ratchet	222-5T3903
 14mm	MANHES Grasping forceps, "tiger-jaws", 2X4 teeth	ϕ 5X360	222-5S3363
		ϕ 5X360, With Ratchet	222-5T3363
 16mm	Claw forceps, 2X3 teeth, short	ϕ 10X360	222-0S3403
		ϕ 10X360, With Ratchet	222-0T3403
 34mm	SAWALHE Tissue Grasping forceps	ϕ 10X360	222-0S3423
		ϕ 10X360, With Ratchet	222-0T3423
 30mm	BABCOCK Grasping forceps	ϕ 10X360	222-0S3573
		ϕ 10X360, With Ratchet	222-0T3573

Grasping Forceps

No Ratchet

With Ratchet

Product	Description	Dimension	Code	
 35mm	Claw forceps, 2X3 teeth	ϕ 10X360	222-0S3413	
		ϕ 10X360, With Ratchet	222-0T3413	👍
 32mm	Spoon forceps	ϕ 10X360	222-0S4883	
		ϕ 10X360, With Ratchet	222-0T4883	👍
 13mm	VANCAILLIE Oviduct Forceps	ϕ 5X360	222-5S3583	👍
		ϕ 5X360, With Ratchet	222-5T3583	
 18mm	Dissecting and Grasping forceps, “alligator jaws”	ϕ 5X360	222-5S3773	
		ϕ 5X360, With Ratchet	222-5T3773	
 31mm	DeBAKEY Grasping forceps, curved and slender jaws	ϕ 5X360	222-5S3813	
		ϕ 5X360, With Ratchet	222-5T3813	
 19mm	Grasping forceps, atraumatic, spoon-shaped	ϕ 5X360	222-5S3223	
		ϕ 5X360, With Ratchet	222-5T3223	
 14mm	MANHES Dissecting and Grasping forceps, "duckbill"	ϕ 5X360	222-5S3283	
		ϕ 5X360, With Ratchet	222-5T3283	

Monopolar Scissors

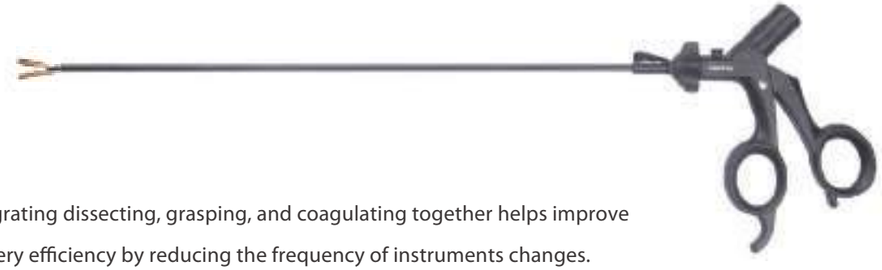
- **Sharp**
  The sharpest blade enables fast cutting.

- **Smooth**
  Involute design of blade line ensures more smooth cutting.

- **Durable**
  The vacuum heat treatment process makes sure that the metal hardness control accuracy reaches HRC1 (Rockwell hardness), increasing the metal life by 3-4 times compared with the traditional method.

Product	Description	Dimension	Code	
 15mm	METZENBAUM Scissors, curved	ϕ 5X360	222-5S3022	👍
		ϕ 5X430	222-5S4022	👍
 20mm	Scissors, spoon-shaped blades, serrated, curved	ϕ 5X360	222-5S3012	
		ϕ 5X430	222-5S4012	
 15mm	Scissors, straight	ϕ 5X360	222-5S3092	
		ϕ 5X430	222-5S4092	

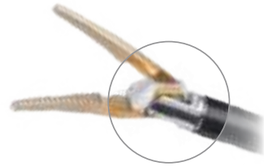
Bipolar Dissecting Forceps



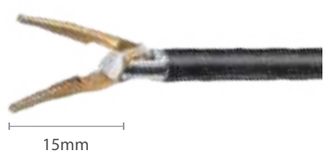
Integrating dissecting, grasping, and coagulating together helps improve surgery efficiency by reducing the frequency of instruments changes.

- **Innovative anti-sticking:**
  Sticking prevention with coated jaw.

- **Strong grasping:**
  Enhanced force with wider opening angle to achieve better grasping.



- **Guaranteed Safety:**
  Advanced insulation design guarantees the safety and reliability of bipolar coagulation.

Product	Description	Dimension	Code	
 15mm	Bipolar Straight Dissecting Forceps	ϕ 5X360	222-5S3011	👍
		ϕ 5X430	222-5S4011	👍
 15mm	Bipolar Curved Maryland Dissecting Forceps	ϕ 5X360	222-5S3021	👍
		ϕ 5X430	222-5S4021	

Monopolar Electrodes

Product	Description	Dimension	Code	
	Hook Tip Coagulation Electrode	ϕ 5X330	222-51110	👍
	Ball Tip Coagulation Electrode	ϕ 5X330	222-51220	
	Spatula Tip Coagulation Electrode	ϕ 5X330	222-51440	👍
	Rod Tip Coagulation Electrode	ϕ 5X330	222-51610	👍

Cables

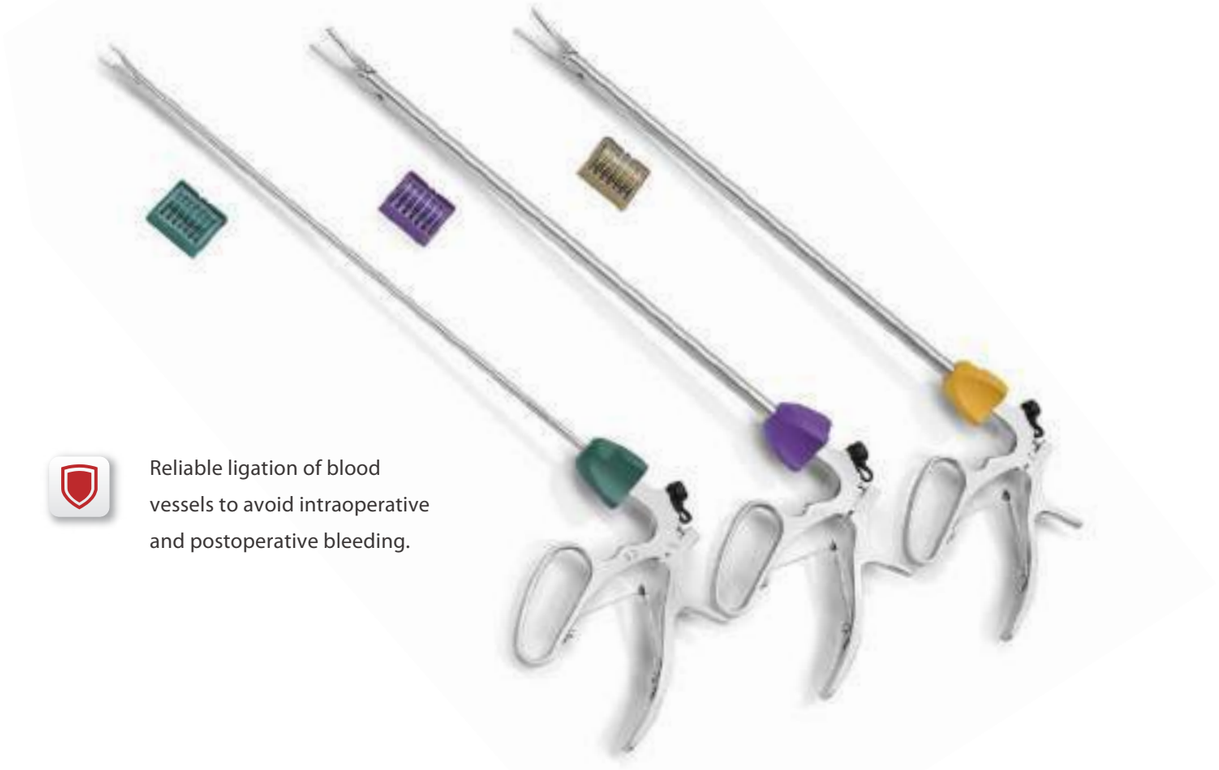
All cables are autoclavable.

Product	Description	Dimension	Code	
	Monopolar cable	3200mm	999-030	👍
	Bipolar Cable	3200mm	999-031	👍

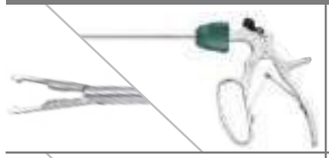
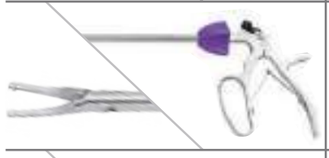
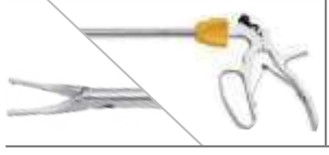
Instrument Trays

Product	Description	Dimension	Code	
	Double-decker Instrument Tray	540X250X100	X TR5425A0	
	Long Double-decker Instrument Tray	600X250X100	X TR6025A0	👍
	Long Three-decker Instrument Tray	600X250X140	X TR6025E4	

Clip Appliers



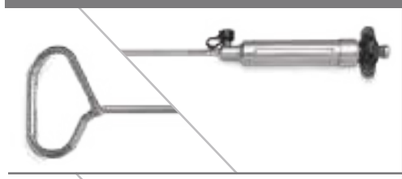
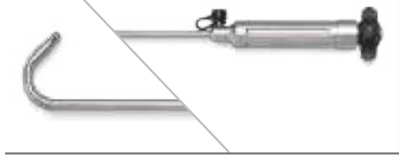
Reliable ligation of blood vessels to avoid intraoperative and postoperative bleeding.

Product	Description	Dimension	Code	
	Endo Applier for Medium Large polymer locking Clip	ϕ 5X330	221-55636	
	Endo Applier for Large polymer locking Clip	ϕ 10X330	221-05646	
	Endo Applier for Extra Large polymer locking Clip	ϕ 10X330	221-05656	

Clip Appliers

Product	Description	Dimension	Code	
	Endo Applier for Small Titanium Clip, Single action	ϕ 5X330	221-55116	
	Endo Applier for Medium Titanium Clip, Single action	ϕ 10X330	221-05126	
	Endo Applier for Medium Large Titanium Clip, Single action	ϕ 10X330	221-05136	
	Endo Applier for Large Titanium Clip, Single action	ϕ 10X330	221-05146	
	Open Surgery Applier for Small Titanium Clip	28 cm	221-00516	
	Open Surgery Applier for Small Titanium Clip	18 cm	221-01516	
	Open Surgery Applier for Medium Titanium Clip	28 cm	221-00526	
	Open Surgery Applier for Medium Titanium Clip	23 cm	221-01526	
	Open Surgery Applier for Medium Large Titanium Clip	28 cm	221-00536	
	Open Surgery Applier for Large Titanium Clip	28 cm	221-00546	

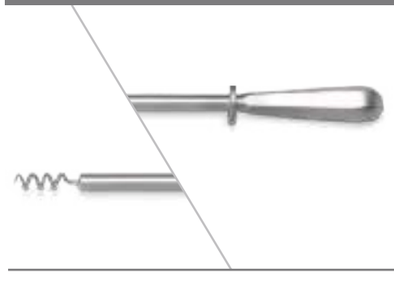
ENDO-Retractors

Product	Description	Dimension	Code	
	ENDO-Retractor	ϕ 5X360	221-53013	
	ENDO-Retractor	ϕ 5X360	221-53023	👍

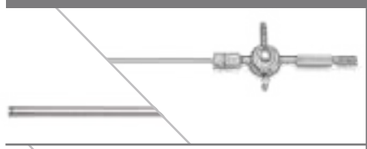
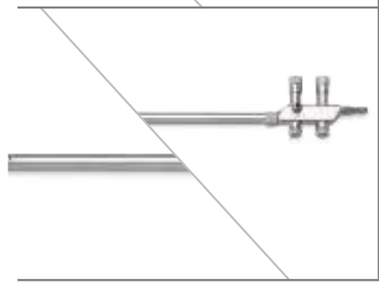
Fans Dissecting Forceps

Product	Description	Dimension	Code	
	3 Finger Retractor	ϕ 5X330	221-55923	
	5 Finger Retractor	ϕ 10X330	221-05923	👍

Myoma Drills

Product	Description	Dimension	Code	
	Myoma Drill	ϕ 5X330	221-53109	👍
		ϕ 5X420	221-54109	
		ϕ 10X330	221-03109	
		ϕ 10X420	221-04109	

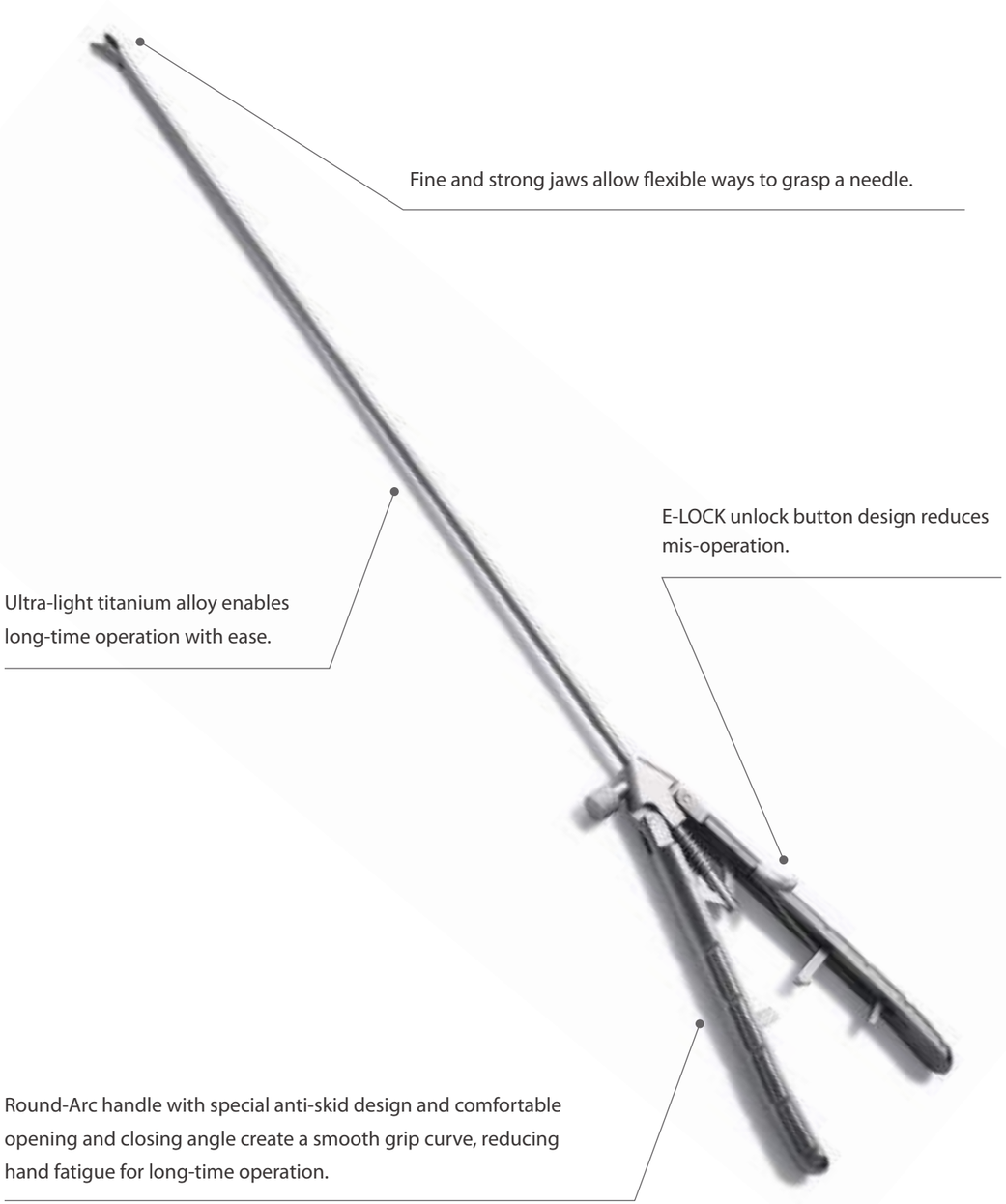
Suction & Irrigation Apparatus

Product	Description	Dimension	Code	
	Suction and irragation	ϕ 5X330	221-53114	
	Suction and irragation	ϕ 5X330	221-53224	👍
		ϕ 10X330	221-03224	

Puncture Injection Needles

Description	Pinhead	Dimension	Code	
Puncture Injection Needle（7#）	0.7mm	ϕ 5X330	221-53015	
Puncture Injection Needle（9#）	0.9mm	ϕ 5X330	221-53025	
Puncture Injection Needle（13#）	1.3mm	ϕ 5X330	221-53035	👍
Puncture Injection Needle（16#）	1.6mm	ϕ 5X330	221-53055	
Puncture Injection Needle（18#）	1.8mm	ϕ 5X330	221-53065	

Needle Holders



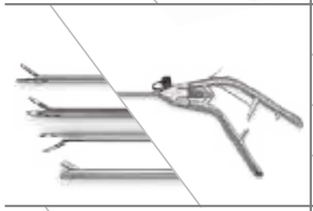
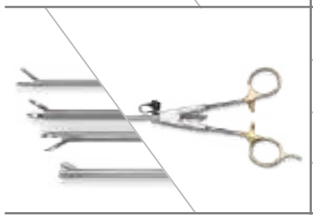
Fine and strong jaws allow flexible ways to grasp a needle.

E-LOCK unlock button design reduces mis-operation.

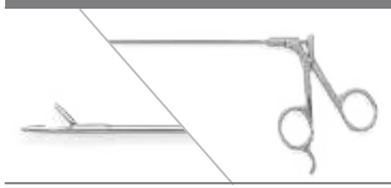
Ultra-light titanium alloy enables long-time operation with ease.

Round-Arc handle with special anti-skid design and comfortable opening and closing angle create a smooth grip curve, reducing hand fatigue for long-time operation.

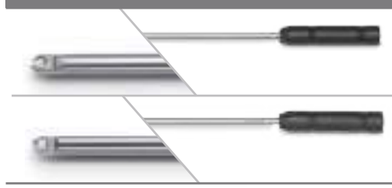
Needle Holders

Product	Description	Dimension	Code	
	V Handle Straight Needle Holder	ϕ 5X330	221-56416	
	V Handle Left Curved Needle Holder	ϕ 5X330	221-56426	👍
	Pistol Handle Straight Needle Holder	ϕ 5X330	221-56516	
	Pistol Handle Left Curved Needle Holder	ϕ 5X330	221-56526	
	Pistol Handle Right Curved Needle Holder	ϕ 5X330	221-56536	
	Pistol Handle Needle Holder with Reposition Function	ϕ 5X330	221-56546	
	O Handle Straight Needle Holder	ϕ 5X330	221-56816	
		ϕ 5X450	221-56876	
	O Handle Left Curved Needle Holder	ϕ 5X330	221-56826	
		ϕ 5X450	221-56886	👍
	O Handle Right Curved Needle Holder	ϕ 5X330	221-56836	
	O Handle Needle Holder with Reposition Function	ϕ 5X330	221-56846	

Suture Fascia Fix Forceps

Product	Description	Dimension	Code	
	Suture Fascia Fix Forceps	ϕ 3X200	221-32013	👍

Knot Pushers

Product	Description	Note	Dimension	Code	
	Knot Pusher	Half Ring	ϕ 4X330	221-43019	👍
		Full Ring	ϕ 4X330	221-43029	

5 mm HICURA Dissection Forceps

Maryland Forceps

Multipurpose curved dissection forceps with cross-cut surface for strong grasping for all laparoscopic applications.

Length of jaws: 17 mm

Article Number	Description
WA69350M	Jaws insert “HICURA”, 5 x 330, Maryland, monopolar
WA69350S	Jaws insert “HICURA”, 5 x 250, Maryland, monopolar
WA69350L	Jaws insert “HICURA”, 5 x 430, Maryland, monopolar
WA69300M	Shaft “HICURA”, 5 x 330, monopolar
WA69300S	Shaft “HICURA”, 5 x 250, monopolar
WA69300L	Shaft “HICURA”, 5 x 430, monopolar
WA69001M	Handle “HICURA”, size M, monopolar
WA69001L	Handle “HICURA”, size L, monopolar

Precision Forceps

For very precise dissection.

Length of jaws: 25 mm

Article Number	Description
WA69354M	Jaws insert “HICURA”, 5 x 330, precision, monopolar
WA69300M	Shaft “HICURA”, 5 x 330, monopolar
WA69001M	Handle “HICURA”, size M, monopolar
WA69001L	Handle “HICURA”, size L, monopolar

Long Maryland Forceps

Longer branch length improves overview and handling.

Length of jaws: 21 mm

Article Number	Description
WA69352M	Jaws insert “HICURA”, 5 x 330, Maryland long, monopolar
WA69352S	Jaws insert “HICURA”, 5 x 250, Maryland long, monopolar
WA69352L	Jaws insert “HICURA”, 5 x 430, Maryland long, monopolar
WA69300M	Shaft “HICURA”, 5 x 330, monopolar
WA69300S	Shaft “HICURA”, 5 x 250, monopolar
WA69300L	Shaft “HICURA”, 5 x 430, monopolar
WA69001M	Handle “HICURA”, size M, monopolar
WA69001L	Handle “HICURA”, size L, monopolar

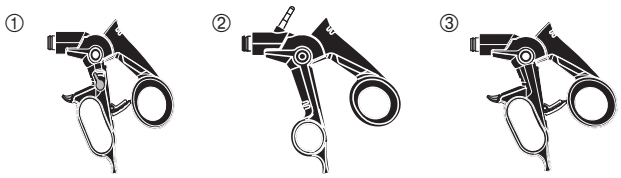
Maryland Straight Forceps

For delicate dissection and needle holder assistance.

Length of jaws: 15 mm

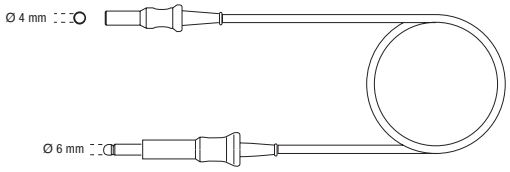
Article Number	Description
WA69356M	Jaws insert “HICURA”, 5 x 330, Maryland straight, monopolar
WA69356S	Jaws insert “HICURA”, 5 x 250, Maryland straight, monopolar
WA69356L	Jaws insert “HICURA”, 5 x 430, Maryland straight, monopolar
WA69300M	Shaft “HICURA”, 5 x 330, monopolar
WA69300S	Shaft “HICURA”, 5 x 250, monopolar
WA69300L	Shaft “HICURA”, 5 x 430, monopolar
WA69001M	Handle “HICURA”, size M, monopolar
WA69001L	Handle “HICURA”, size L, monopolar

HICURA Handles



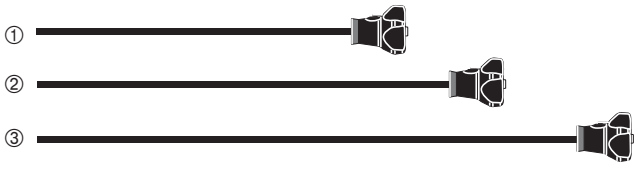
①	**WA69000M**	Handle “HICURA”, deactivatable ratchet, size M
	WA69000L	Handle “HICURA”, deactivatable ratchet, size L
②	**WA69001M**	Handle “HICURA”, monopolar, size M
	WA69001L	Handle “HICURA”, monopolar, size L
③	**WA69003M**	Handle “HICURA”, ratchet, size M
	WA69003L	Handle “HICURA”, ratchet, size L

HF Cables



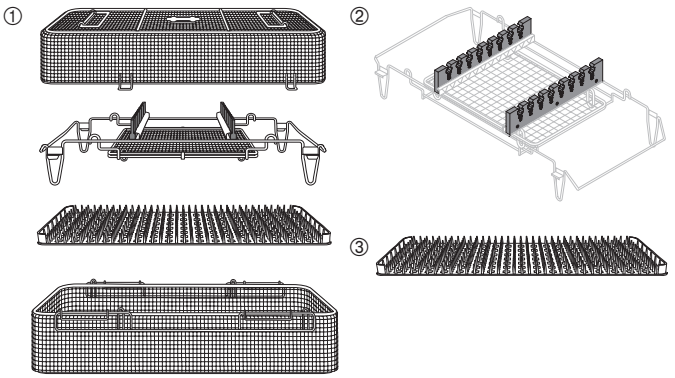
A0358	HF cable, monopolar Compatible HF units: ▪ ESG-400 ▪ ESG-410 ▪ Valleylab (new)
A0355	HF cable, monopolar Compatible HF units: ▪ Valleylab (old)
A0357	HF cable, monopolar Compatible HF units: ▪ ESG-400 ▪ ESG-410 ▪ Erbe T series ▪ Berchtold

HICURA Shafts



①	**WA69300S**	Shaft “HICURA”, 5 x 250, monopolar
②	**WA69300M**	Shaft “HICURA”, 5 x 330, monopolar
③	**WA69300L**	Shaft “HICURA”, 5 x 430, monopolar

Instrument Basket System



①	**WA05956A**	Instrument basket system, for HiQ+, HICURA
②	**WA05957A**	Spare retainer, silicone, set, 2 pcs., for WA05956A
③	**WA05958A**	Spare mat, nubby, silicone, for WA05956A

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

Insufflator

Operator's Manual

CE 0123

■ Release time: 2022-6

■ Revision: 7.0

Intellectual Property Statement

Intellectual property rights for this Operator's Manual and its corresponding product belong to Nanjing Mindray Bio-Medical Electronics Co., Ltd. (hereinafter "Nanjing Mindray").

No part of this Operator's Manual may be copied, revised, or translated without the written consent of Nanjing Mindray.

mindray, 

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Statement

Nanjing Mindray has the right of final interpretation for this Instructor's Manual. Pictures in this manual are only for reference; if any discrepancy is found between the pictures and the actual product, the latter shall govern.

Only when all the following requirements are met is Mindray responsible for the security, reliability and performance of the product:

- The assembly, expansion, readjustment, improvement and repair are all conducted by professionalsrecognized by Mindray;
- All parts that involve replacement, accessories that are for ancillary use, and consumables are originalfrom or recognized by Mindray;
- Related electrical equipment conforms to national standards and requirements of this Instructor'sManual;
- Operations for the product are performed according to this Instructor's Manual.

Warranty and Maintenance Service

The warranty period of the product purchased is subject to the sales contract.

Consumables: refer to disposable consumable materials that need replacement after each use or quick-wear parts that are replaced regularly, which are not within range of the warranty.

The warranty period starts on the "installation date" filled in the attached Device Warranty Card which is the only credential for calculating the period. In order to safeguard your rights and interests, please fill out the warranty card after device installation completes, and gives the second copy of the card (the copy "kept by Mindray") to the installation personnel or send it back to Mindray customer service department.

Please take notice that the following conditions are not covered by the warranty:

- The customer has not filled in and returned Device Warranty Card within 30 days of installation and acceptance.
- The device serial number provided by the customer is incorrect (which our company uses to confirm whether the warranty stands).

Under warranty, the product is entitled to free after-sales service; but note that even within warranty period, Mindray shall implement paid maintenance service and you shall pay maintenance fee and accessories fee due to product maintenance caused by the following reasons:

- Man-made damage;
- Improper use;
- Power grid voltage exceeds product-specified range;
- Inevitable natural disasters;
- Replace or use parts, accessories and consumables not recognized by Mindray, or maintenance are conducted by personnel not authorized by Mindray;
- Other faults not caused by the product itself.

Upon expiration of the warranty, Mindray may continue providing paid maintenance service.

If you fail to pay or delay the payment of the maintenance service fees, Mindray may suspend the maintenance service until you pay off.

Company Contact

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EC-Representative:	Shanghai International Holding Corp. GmbH (Europe)
Address:	Eiffestrasse 80, 20537 Hamburg, Germany
Tel:	0049-40-2513175
Fax:	0049-40-255726

NOTE

- **Targeted readers of this Operator's Manual are the following professionals: people who conduct daily system operations, people who perform system maintenance and troubleshooting, and people who study system operations.**

WARNING

- **This system is only used for operation by professionals, doctors and lab technicians trained by Mindray or Mindray's agents.**

Important Information

1. After purchase of this product, the customer shall take full responsibility for the maintenance and management of the product.
2. Even within quality assurance period, the assurance does not include the following:
   - Damages or losses caused by incorrect or abusive use.
   - Damages or losses caused by force majeure such as fire, earthquake, flood, or lightning.
   - Damages or losses due to noncompliance with usage conditions stipulated by the system, such as insufficient power supply, incorrect installation, or non-compliant environment conditions.
   - Damages or losses due to not using the system in region where you originally buy it.
   - Damages or losses due to not buying the system from Mindray or dealers or agents authorized by Mindray.
3. This system can only be operated by qualified medical staff with professional qualification certificate.
4. It's forbidden to arbitrarily modify softwares and hardwares of this product.
5. Under any circumstances where issues, damages or losses occur due to reinstallation, change or repair conducted by non Mindray-designated personnel, Mindray assumes no liability.
6. For the loss of data stored within the system due to operator's misoperation or abnormal situations, Mindray does not bear any responsibilities.
7. This Operator's Manual contain warnings about predictable potential dangers. Stay strongly vigilant anytime against dangers that are not illustrated. For damages or losses caused by negligence or ignorance of the preventive measures specified in this Operator's Manual, Mindray does not bear any responsibilities.
8. Once the administrator of the system is changed, this Operator's Manual must be turned over.

About This Operator's Manual

Before using the system, users must carefully read this Operator's Manual and thoroughly understand the operating steps, functions, performance, and maintenance steps of the system in detail.

Interface in the Operator's Manual

Because of different system software versions and configurations of optional accessories, the operation interface given in this Operator's Manual might differ from the interface actually displayed on the system. If so, the interface displayed on the purchased machine shall govern.

NOTE

- **Not all models in all sales regions have the functions described in the manual series of this system.**

Appointed Descriptive Approach

None.

Notification of Adverse Events

As a health care provider, you may report the occurrence of certain events to NANJING MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD., and possibly to the competent authority of the Member state in which the user and / or patient is established.

These events, include device-related death and serious injury or illness. In addition, as part of our Quality Assurance Program, NANJING MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD. requests to be notified of device failures or malfunctions. This information is required to ensure that NANJING MINDRAY BIO-MEDICAL ELECTRONICS CO., LTD. provides only the highest quality products.

Contents

1 Safety

1.1 Safety Information

The safety statements presented in this chapter refer to basic safety information that the operator must pay attention to and abide by when using the insufflator. There are additional safety statements in other chapters or sections, which may be the same as or similar to the following, or specific to particular operations.

DANGER

- **Indicates an imminent hazard that, if not avoided, could result in death, serious injury or damage to product/property.**

WARNING

- **Indicates a potential hazard or unsafe practice that, if not avoided, could result in death, serious injury or damage to product/property.**

CAUTION

- **Indicates a potential hazard or unsafe practice that, if not avoided, could result in minor personal injury or product/property damage.**

NOTE

- **Provides application tips or other useful information to ensure that you get the most from your product.**

1.1.1 Dangers

DANGER

- **Never use the system where flammable gases or flammable liquids are present, otherwise an explosion may occur.**
- **Only medical-level CO_2 gas can be used for this machine. Never use other gases. Using gases other than CO_2 may cause fire, poisoning, complications, etc. Using**

non-medical level, polluted CO_2 may cause failure in gas injection pressure adjustment phase, which leads to serious injury for patients. Please use high-pressure tube, reducing valve, or wall tubing connector to connect CO_2 gas cylinder or medical gas pipeline, as described in this Operator's Manual.

- **If endoscopy is conducted improperly, this product cannot be used to normally perform intraperitoneal gas injection.**
- **During inspection, do not unplug the power supply or press the power switch button.**
- **It's forbidden to use this product for intrauterine gas injection, that is, this product cannot be used to dilate uterus.**
- **Do not connect the insufflator to the patient's abdominal cavity when starting up the insufflator. Connect it to the patient only after self-inspection.**

1.1.2 Warnings

WARNING

- **The power plug of the system must be connected to a grounded outlet (3 pin) which conforms to the requirements on the rated power identification plate of the device. Using an adapter or a multi-functional socket may influence grounding and make the current leak beyond the required safe current level.**
- **Mindray suggests connecting jacks on the wall, and not using extension-cord power strip; do not use socket other than the designated ones.**
- **Do not use parts and accessories and peripherals other than the designated ones.**
- **During system operation, ensure that the ground terminal of the system is earthed reliably and the grounding cable is connected when the system is off, otherwise an electric shock will be caused.**
- **Please follow correct electrical connection methods of connecting the power supply to the ground, otherwise a shock hazard will occur. Do not connect the ground wire to any gas pipes or water pipes, for it will cause poor earthing or an explosion hazard will occur.**
- **Before cleaning the machine, be sure to unplug the power cable, or electrical shock and equipment damage may occur.**
- **Do not let any liquid splash on or let flow into the machine, or a shock hazard or device damage will occur. If a liquid is accidentally splashed on the machine, turn off the power at once and contact your service representative.**
- **Do not let live parts (such as various signal input and output ports, etc.) of the system or any other devices contact with a patient. If the system or other equipment fails, patients would be at risk of an electric shock.**
- **Do not bump or shake the equipment.**

- **Do not open the case or panel, or it will cause short circuit or electric shock will occur.**
- **Precautions during transportation: Please hold tightly both sides of the system to move it. If you hold other parts, system damage due to abnormal stresses will occur.**
- **All analog and digital devices connecting with the system must be certified in accordance with the designated IEC standards (such as IEC 60950 Information Technology Equipment Standards and IEC 60601-1 Medical Device Standards). All the configurations shall be in accordance with the valid version of IEC 60601-1 system standards. The person in charge of connecting additional equipment to signal input/output ports shall configure the medical system and take responsibility for the system's compliance with IEC 60601-1 standards. For any questions, please contact the supplier.**
- **Do not turn off the system while the lens body remains in patient's body.**
- **The operators of the equipment must not simultaneously contact patients and live parts of the system or other equipment (such as various signal input and output ports) connected to the system, otherwise a shock hazard to patients may occur.**
- **Do not touch the joint between CO2 cylinder and gas supply valve with bare hands, otherwise low-temperature burn may result.**
- **When product failure occurs during use, stop operation immediately, unplug the power cord and take out the endoscope slowly from the patient's body, and in the meantime contact the manufacturer to assign the designated personnel for repair.**
- **Do not use the insufflator in places where oxygen concentration is high, there is oxide (such as nitrous oxide (N_2O)) or flammable gas in the atmospheric environment, or it is near flammable liquid. Otherwise, it may cause explosion or fire since the insufflator has no anti-explosion capability.**
- **In actual use, locate the patient end of the insufflator to make the associated pipeline higher than gas injection position, so that liquid in the patient end won't flow into the pipeline due to gravity and then flow back to the insufflator.**
- **Please keep the gas cylinder upward at an upright position. Fasten it on the wall or other stable structures to avoid tilt. If the gas cylinder is placed horizontally or obliquely, liquefied CO_2 will flow into the inflation pipeline within the insufflator, making it unable to inject gas normally.**
- **In a laparoscopic surgery, when the insufflator is used together with a laser device, argon coagulator, or other air feeders, the insufflator and the simultaneously used device both become gas supply source. Accordingly, the time it takes to reach the required gas pressure is less than when only the insufflator is used. In this case, note that the intra-abdominal gas pressure shall not be too high. Since other air feeders might not have the intra-abdominal gas pressure detection capability that the insufflator has, aeroembolism cannot be completely avoided, because it's related to the condition of the patient and the**

infection position, about which the physician shall make a professional judgment. If the insufflator gives prompt that intra-abdominal overpressure has occurred, the bibcock or valve of the perforator shall be opened immediately. Then reduce the gas input from other air feeders. If the device continues to be used after the prompt sound arises, it may lead to aeroembolism due to intra-abdominal overpressure.

- **Whether the smoke exhaust function works to release excess gas depends on the capability of the connected suction device/equipment. Please note that the device cannot complete the function of gas suction alone; be sure to connect the device to suction device/equipment using suction tube.**
- **When the safety valve is opened, intra-abdominal gas and/or liquid might flow back and pollute the insufflator. In order to avoid this, it is strongly suggested to use bacteria filters that comply with laws and regulations in the insufflator and the CO_2 gas feed pipe.**
- **If the liquid flows into the insufflator, there will be a liquid ingress prompt. It will lead to startup failure. Then the insufflator needs to be returned for repair.**
- **Please operate the insufflator in accordance with the Operator's Manual. Misuse will not only impair the device performance, making it unable to bring its best efficiency into full play, but also cause device damage and/or complications. Before each use, make sure to inspect the device according to instructions in this Operator's Manual.**
- **The device shall be used under environment provided with laparotomy equipment. And a hospitalization emergency plan shall be prepared so that it can be adopted in case of any problem that endoscopic surgery cannot solve.**
- **Alternate CO_2 gas cylinder shall be prepared so that it can be replaced quickly when CO_2 runs out during use.**
- **Another standby insufflator shall be prepared so that the surgery can be completed when the device malfunctions.**
- **During use, especially when choosing high gas flow, a lot of CO2 gas is needed. If CO_2 concentration in the operating room increases, personnel in the room might be affected. Therefore, be sure to keep indoor ventilation.**
- **This product may only be used in operating environments that are specified by the product. Using under other conditions not only affects normal functions, but also causes device damage.**
- **When using this device, watch out for the patient's parameters, such as intracorporal CO_2, electrocardiogram, and body temperature, to avoid complications.**
- **Intra-abdominal gas pressure shall avoid exceeding 20mmHg for a long time. Otherwise, it might cause weakened respiration and diaphragm shifting; reduced venous blood backflow; reduced cardiac output; acidosis; etc.**
- **Too high flow speed and/or gas pressure might cause excessive suction of CO_2 and/or aeroembolism. The abdominal cavity can be fully dilated with the**

maximum gas pressure of 20mmHg. There is almost no need to use a gas pressure higher than 20mmHg, and blood vessel intravasation rarely occurs under such gas pressure level. It's very rare for situations in which a gas pressure above 20mmHg is needed, and it will increase the amount and speed of blood vessel intravasation. Sufficient respiration helps avoid CO_2 related issues.

- **Special corporeity reactions. Patients with sickle-cell disease or pulmonary valve insufficiency has a higher risk of developing metabolism imbalance due to excessive absorption of CO_2.**
- **Other possible complications include gas embolism, low body temperature, subcutaneous emphysema, shoulder pain, hypercarbia, pneumothorax/ pneumomediastinum, and diaphragm carbonic acid stimulation. Injected CO2 gas directly entering the vascular system (such as through open blood vessel in the abdominal cavity, or improper penetration of veress needle) might cause gas embolism.**
- **If two insufflators are simultaneously used on the same part of a single patient, ensure that these two insufflators are set to the same gas pressure.**
- **Only an insufflator with a flow speed of at least 4-10 litres/minute may be used in the surgery. Insufflators that have a maximum flow speed lower than this parameter may only be used for diagnosis.**
- **In endoscopic surgeries that use gas injection, venous air embolism is very rare, but potential serious complications might occur. The signal is cardiovascular collapse (sudden serious hypotension) and precordium noise. If aeroembolism is observed during the surgery, stop gas injection and keep the patient on left lateral decubitus or at lithotomy position.**
- **Using accessories and cables not listed in this manual may lead to noncompliance with EMC.**
- **This device shall not be near or heaped on other devices during use to avoid affecting EMC.**
- **If the insufflator tube is not connected to the patient, do not supply gas for a long time. Otherwise the decompressor will freeze, causing functions including gas injection to stop working.**
- **Using the system simultaneously with electronic equipment like a high frequency electrotome, a high frequency therapy apparatus, or a defibrillator might cause electric shock to the patient. Do not use under strong electromagnetic conditions.**

1.1.3 Cautions

CAUTION

- **Precautions related to clinical examination technology:**

- **This system can only be operated by medical staff with qualified professional training.**
- **This Manual does not introduce clinical examination technology. Choose the correct examination technology based on knowledge from professional training and clinical experience.**

- **Precautions when moving the system:**
  - **During installation, ensure the system is horizontally installed and placed in a fixed position. Otherwise, the system may move and cause injury.**
  - **Do not sit on the system, for the system may move and fall down due to a loss of balance.**
  - **Before moving the system, ensure the devices around have been firmly affixed. Otherwise these devices may tilt and cause injury.**
- **If the circuit protector is in working condition, it indicates that the system or peripheral equipment has failed; please contact your service representative and do not handle the problem by yourself.**
- **The system and accessories are unsterilized when leaving the factory. After the disinfection and sterilization of accessories, all chemical reagent must be completely removed. Residual chemical reagent may cause product damage and patient injury.**
- **Do not directly plug or unplug the system or its accessories (such as the foot switch and the heating insufflator tube, etc.) when the power is on, otherwise it will cause system damage or electric shock.**
- **During operation, inappropriate shut down may cause data corruption or system failure.**
- **If the grid power is unstable and may affect normal operation of the system, use an uninterruptible power supply.**
- **Do not exert too many vibrations on the machine (for example, when moving the equipment), or damage to components will occur.**
- **Do not use a USB memory device (e.g., a USB flash drive) which contains unsafe data. This may result in system damage.**
- **Always keep the machine dry and do not move it from a cold place to a warmer place quickly, or condensation of water droplets which may result in a short circuit will occur.**

1.1.4 Notes

NOTE

- **Do not use the system in a strong electrical field or magnetic field (such as a transformer), or a negative impact on the system will occur.**

- **Do not use the system near high frequency devices (such as mobile telephones), or a negative impact on system performance will occur and cause equipment failure.**
- **When using or placing the system, ensure that the system is placed horizontally to avoid a loss of balance.**
- **To avoid damage to the system, do not use the system under the following circumstances:**
  - **Under direct sunlight;**
  - **Where temperatures vary greatly;**
  - **In a dusty place;**
  - **Where this system may easy be vibrated;**
  - **Near a heat source;**
  - **In high humidity.**
- **Do not restart immediately after the power is turned off, but after a period of time, or the system may not be started normally.**
- **Avoid applying force on the control panel, or damage to the machine will occur.**
- **Do not use pointed and hard objects to press the touch screen, otherwise the screen will be damaged.**
- **The veress needle and the perforator shall be inspected in accordance with the manual before using.**
- **Using the system in small spaces may cause a rise of the indoor temperature. Therefore, good indoor ventilation is necessary.**
- **If it is necessary to abandon the system or any accessory, please contact your service representative. Do not dispose of the system without consulting the Company. The Company will not be responsible for any damage caused by not following the instructions.**
- **When used over an extended period of time, the system's electrical and mechanical safety performance will decline (such as the occurrence of current leakage, or deformation and wear of mechanical parts), the gas supply ability and accuracy will deteriorate as well. In daily maintenance and within service life period, the equipment must be inspected regularly to ensure normal performance. It is suggested that a maintenance and regular inspection plan be made, or a maintenance and repair agreement be signed with Mindray to inspect the machine's safety performance at regular intervals to prevent the occurrence of any accidents.**
- **Installation, maintenance or upgrading of the equipment can only be conducted by service personnel trained and authorized by Mindray.**
- **A system log of the equipment records information such as error messages. Log export should be performed by professional service personnel.**

- **Do not turn off the system's power supply during startup and shutdown, or a failure of these processes and file information loss will occur.**
- **Please verify that the system date and time settings are consistent with the currently inspected date and time.**
- **Use a pluggable power cord as the point to separate the device from the power grid**

1.2 Equipment Symbols

Symbol	Description	Symbol	Description
 (Blue)	Refer to instruction manual/ booklet		Manufacturer
	Stand-by		Date of manufacture
	TYPE CF APPLIED PART		Caution
	Serial number		CO_2 smoke exhaust and gas outlet valve
	Alternating current		Fuse
	Equipotentiality		Temperature; thermometer
	Input; entrance		Output; exit
	Humidity limitation		Atmospheric pressure limitation
	Temperature limit		Protective earth (ground)
	Foot switch		Dispose of in accordance to your country's requirements

Symbol	Description	Symbol	Description
	Environmentally-friendly use periods of electronic products (20 years)		Non-sterile
	Not made with natural rubber latex		Batch code
IP20	Protected against solid foreign objects of 12,5 mm Ø and greater	**IPX8**	Protected against the effects of continuous immersion in water
	Medical Device		Unique device identifier
	Authorized representative in the European Community		
	The product bears CE mark indicating its conformity with the provisions of the REGULATION (EU) 2017/745 on medical devices and fulfills the general safety and performance requirements of Annex I of this regulation. Note: The product complies with the Council Directive 2011/65/EU.		

NOTE

- **Some symbols listed above may not appear on your equipment.**

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2 System Overview

2.1 Intended Use

The product is used to inflate the abdominal cavity in minimally invasive laparoscopic surgery to form pneumoperitoneum, thus providing space and view for the surgery.

This product may not be used for any other purposes.

2.2 Operator's Manual

This Operator's Manual contain the basic information of safely and effectively using this product. Please carefully read this Operator's Manual and other manuals for all peripheral equipment before using, and operate in accordance with the stipulations.

Please put all relevant operation manuals in safe and easy-to-access places. For any questions or opinions regarding contents of this Operator's Manual, please contact Mindray.

2.3 Contraindications

It is not allowed to use this equipment if the disease the patient suffers from is not suitable for endoscopic surgery.

2.4 Precautions Before Use

If there are regulations on the qualification licensing of endoscopic diagnosis and treatment workers officially established by hospitals or other health care professional associations, only the medical workers who meet the requirements of such regulations can operate the product.

Generally, the user of the product shall be the medical workers who has taken training of endoscopic technique and thoroughly mastered the endoscopic operation technology.

When used over an extended period of time, the safe electrical and mechanical performance of the system will decline. To avoid unnecessary impact on diagnosis, treatment, and normal use of the product, regular inspection and maintenance must be performed. It is suggested to sign a maintenance and repair agreement to prevent the occurrence of accidents. Meanwhile, inspect the product before each use. If any faults are found, contact support engineers in time.

This product needs to match with the peripherals. Using unmatched equipment might cause patient injury and/or equipment damage.

Do not modify the product in any way without authorization. The Company reserves the right to maintain, upgrade, and modify the product.

2.5 Differences Among Various Models

The differences among the models are shown below:

Model	Flow adjustment range (L/min)	Heating function	Smoke exhaust function	Optional foot switch	Optional heating insufflator tube
HS-50F	0.1-50	Yes	Yes	Yes	Yes
HS-50V	0.1-50	No	Yes	Yes	No
HS-50H	0.1-50	Yes	No	No	Yes
HS-50S	0.1-50	No	No	No	No
HS-30S	0.1-30	No	No	No	No

2.6 Cleaning, Sterilization and Storage

This product has not been sterilized before shipping. Before first use, please perform cleaning and sterilization according to laws and regulations or infection control requirements.

After using the device, store it properly.

Partial and/or improper cleaning, sterilization and storage may cause infection control risks and lead to device damage or performance degradation.

3 Functions and Parameters

3.1 Block Diagram of Overall Structure

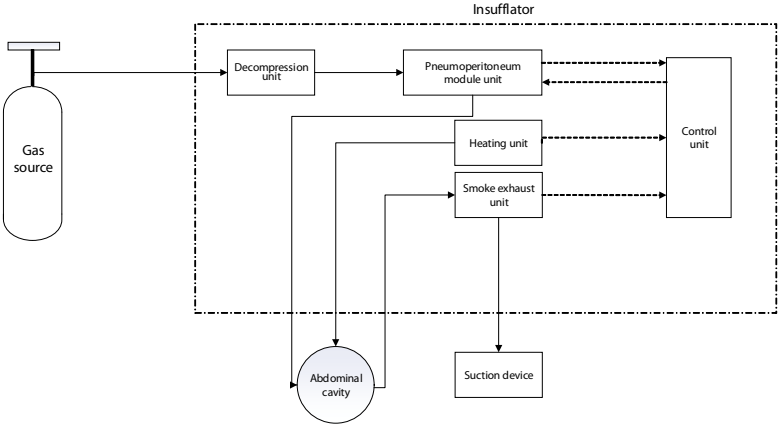

Figure 3-1 Block Diagram of Overall Structure

3.2 Front Panel

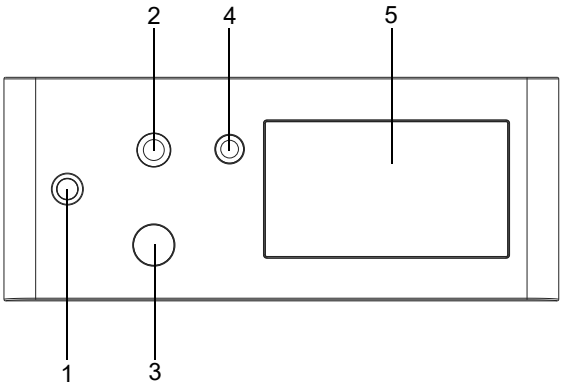

Figure 3-2 Insufflator Main Machine - Front Panel

Description of front panel:

1. Power switch: Turns on the insufflator
2. CO2 gas injection interface: Can output CO2 gas when gas injection is on
3. Smoke exhaust valve (optional): Controls Smoke exhaust rate
4. Insufflator tube heating joint: Heating socket that connects heating insufflator tube
5. Insufflator control screen: 7-inch touchscreen. Displays and controls the status of the insufflator

3.3 Rear Panel

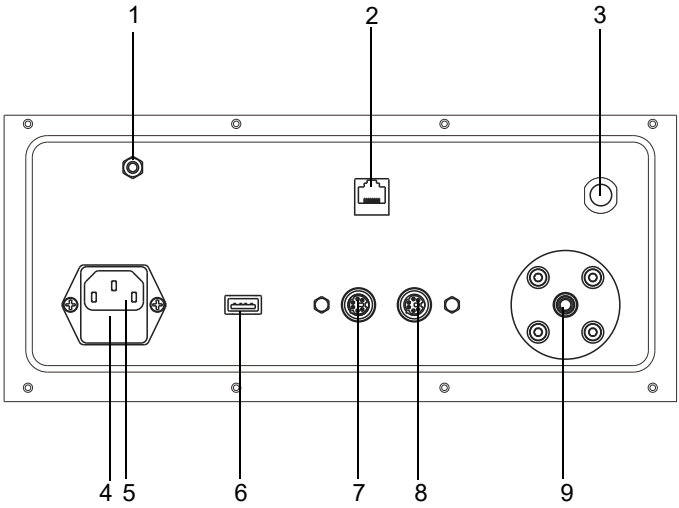

Figure 3-3 Insufflator Main Machine - Rear Panel

Description of rear panel:

1. Equipotential grounding terminal: When using the insufflator together with other devices, connect their equipotential grounding terminals together to eliminate the potential difference between them.
2. Network connector: connects PC only for upgrading software by using .mpkg files
3. Foot switch interface: connects the foot switch.
4. Fuse box: contains the fuse.
5. AC power input: connects the AC mains.
6. USB connector: connects USB drive to export logs and upgrade the device
7. SCI connector: reserved
8. SCI connector: reserved
9. CO_2 gas inlet: connects CO_2 gas source

3.4 Description of system functions

The product is used to inject CO2 into and exhaust smoke from the abdominal cavity in minimally invasive laparoscopic surgery, thus ensuring necessary space and view in the surgery and observation.

The main functions are as follows:

1. Gas injection
   - ◆ When the gas injection function is turned on for the insufflator, CO2 gas sent from eligible gas source can be sent out stably through insufflator tube based on configured gas pressure and flow.
2. Gas pressure and flow monitoring
   - ◆ In the gas injection process, the insufflator always monitors gas pressure and flow, and ensures the pressure and flow remains within the configured range.
3. Gas heating (optional)
   - ◆ Using heating insufflator tube (optional) can keep the output gas at about 37°C.
4. Smoke exhaust (optional)
   - ◆ With the smoke exhaust function, smoke can be exhausted quickly from the abdominal cavity, while still maintaining proper gas pressure.

3.5 Usage environment

The intended usage environment is in an operating room for minimally invasive abdominal surgery, and the normal working power supply and environment conditions are as follows:

1. Environment temperature: 0°C - 40°C;
2. Relative humidity: 30% - 85%;
3. Atmospheric pressure: 700hPa - 1060hPa;
4. Power supply: overall input voltage: AC 100-240V～, allowable error ±10%; frequency: 50/60Hz;
5. Overall input current: 0.75 - 0.35A;
6. Fuse: T3.15AH250V
7. Gas source: CO_2
8. Gas pressure: 0.4~16MPa

3.6 On-screen Symbols

The symbols displayed on the main screen indicate the status of the gas supply, heating and smoke exhausting as follows:

Symbol	Description	Symbol	Description
	Gas source indicator: central gas is used and the gas pressure is normal (green).		Gas source indicator: central gas is used and the gas pressure is low (red).
	Gas source indicator: gas cylinder is used and the CO_2 gas is sufficient (green).		Gas source indicator: gas cylinder is used and the CO_2 gas is insufficient (yellow). Backup CO_2 cylinder is required.
	Gas source indicator: gas cylinder is used and the CO_2 gas pressure is low (red). Replace the CO_2 cylinder immediately.		Heating indicator (green): the gas is being heated.
	Heating indicator (red): the gas is overheated.		Heating indicator (gray): required gas temperature is reached or the heating function does not work.
	Smoke exhausting indicator: no smoke exhausting.		Smoke exhausting indicator: the green part indicates the exhausting rate.

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4 Installation and Use

4.1 Installation

4.1.1 Placement

Before placing the insufflator, please carefully read and comprehend the safety precautions to ensure the safety of operators and equipment.

1. Turn off the system power supply and unplug the power.
2. Disconnect all peripheral equipment, and arrange all cables and pipelines properly to prevent tripping over them.
3. Place the insufflator on a stable and flat workbench. If the insufflator is placed on a trolley, it must be confirmed that the trolley is big enough and can prop up steadily.
4. In actual use, the position of the insufflator's patient end and many associated pipelines shall be higher than the pneumoperitoneum area to prevent the patient's body fluid from accidentally flowing into the pipelines. If the pipelines are lower than the pneumoperitoneum area, the patient's body fluid may flow into the insufflator due to gravity.

CAUTION

- **Provide enough space behind and at the bottom of the machine, or machine failure due to temperature rise inside the machine may occur.**

4.1.2 Connecting CO_2 Gas Cylinder

DANGER

- **Using non-medical CO_2 gas may cause fire, poisoning, complications, etc. Besides, the oil stains, impurities and other substances may permeate into the insufflator, preventing the proper injection of CO_2 gas.**

WARNING

- **Be sure to keep the gas cylinder upward at an upright position. Fasten it on the wall or other places of stable structure to avoid tilt. Only when the**

insufflator and the CO_2 gas cylinder are connected correctly shall the gas supply valve be opened. If the valve is opened before correct connection, the liquid CO_2 may flow into the insufflator, causing related pipelines frozen and thus affecting the normal injection of CO_2 gas; or the CO_2 gas may leak into the air.

- **Do not use grease and oils to lubricate the joint parts of the device/hoses. Otherwise the grease, oils or other impurities may permeate into the insufflator, affecting normal operation and the normal injection of CO_2 gas.**
- **Mindray bears no responsibility for injury or damages caused by improper connection of the gas cylinder.**
- **If obvious gas leak inside the insufflator is found, stop using immediately and contact Mindray.**
- **The maximum input gas pressure supported by this device shall not exceed 16MPa, otherwise the device might not work normally**

CAUTION

- **When connecting American-standard, British-standard, or German-standard gas cylinder, check whether the seal rings at joints of the reducing valve or high pressure tube are in good condition. In case of any loss or deformation, replace the seal rings.**
- **If CO_2 cylinder and the regulator are used, CO_2 supply pressure greater than 0.5 MPa is recommended. For more information, refer to the instructions for use delivered with the cylinder regulator.**

4.1.2.1 Using Reducing Valve and Its Connecting Tube to Connect Steel Cylinder

1. Connect the connecting tube of reducing valve and the adaptive end of the insufflator with the CO_2 gas inlet of the insufflator. Use a force of about 11.8N.m (1.2kgf.m) to fasten it. As shown in Figure 4-1.

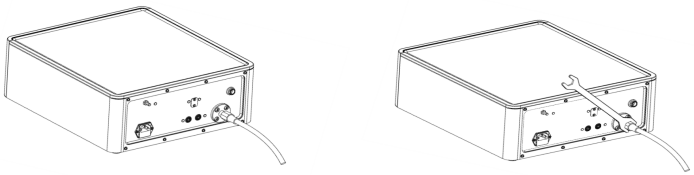


Figure 4-1 Connect the connecting tube of reducing valve and fasten it

2. Connect the steel cylinder joint of the reducing valve to the gas outlet of the steel cylinder. Use a force of about 29.4N.m (3kgf.m) to fasten it. As shown in Figure 4-2.

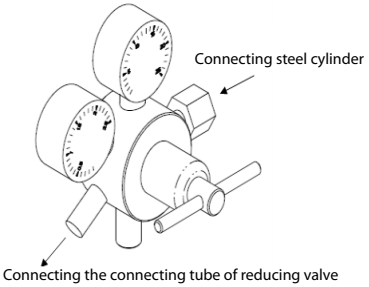


Figure 4-2 Connection of the reducing valve

3. Connect the connecting tube of reducing valve to the low pressure end of the reducing valve.
4. Confirm that the insufflator and the CO_2 gas cylinder are connected correctly, and slowly open the gas cylinder valve. As shown in Figure 4-3.
5. Slowly open the valve of the reducing valve.

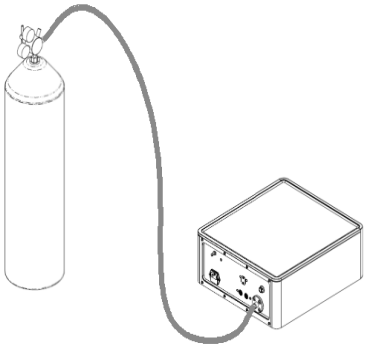


Figure 4-3 The insufflator connects with steel cylinder via the reducing valve

WARNING

- **The pressure to use for the reducing valve shall be suitable. The suggested pressure is 0.5~1MPa to meet the inflation requirements.**

4.1.2.2 Directly Connecting the Insufflator with the CO_2 Steel Cylinder

1. Check whether the high pressure tube used for the direct connection of steel cylinder is damaged, has cracks or other anomalies.

2. Use a wrench to connect the high pressure tube to the CO_2 gas inlet on the insufflator's rear panel, with a force of 11.8N.m (1.2kgf.m) to fasten it. As shown in Figure 4-4.
3. Connect the steel cylinder joint of the high pressure connecting tube to the gas outlet of the steel cylinder. Use a force of about 29.4N.m (3kgf.m) to fasten it.
4. Confirm that the insufflator and the CO_2 gas cylinder are connected correctly, and slowly open the gas cylinder valve.

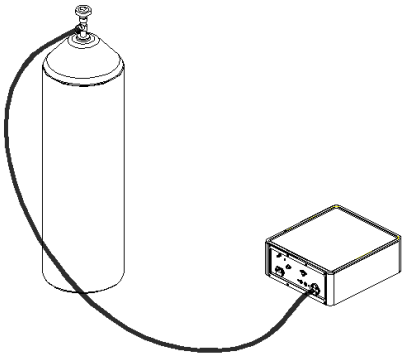


Figure 4-4 The insufflator directly connects with the CO2 steel cylinder

4.1.3 Connecting the Central Gas Supply Pipe Joint

DANGER

- **Using non-medical CO_2 gas may cause fire, poisoning, complications, etc. Besides, the oil stains, impurities and other substances may permeate into the insufflator, preventing the proper injection of CO_2 gas.**

WARNING

- **First connect the gas supply hose to the insufflator, and then connect it to the central gas supply joint, otherwise a serious gas leak might occur.**
- **Do not use grease and oils to lubricate the joint parts of the device/hoses. Otherwise the grease, oils or other impurities may permeate into the insufflator, affecting normal operation and the normal injection of CO_2 gas.**

- **Confirm that the gas pressure for the medical gas pipeline shall be higher than 343.2kPa (3.5 kgf/cm2) and lower than the upper limit stipulated in ISO7396 (1400kPa), to ensure the normal injection of CO_2 gas.**
- **If obvious gas leak inside the insufflator is found, stop using immediately and contact Mindray.**

1. Use a wrench to connect the insufflator joint of the gas supply hose to the CO_2 gas inlet on the insufflator's rear panel, with a force of 11.8N.m (1.2kgf.m) to fasten it. As shown in Figure 4-1.
2. Connect the gas supply hose to the CO_2 central gas supply port.

4.1.4 Connecting the Foot Switch (only for HS-50F/HS-50V models)

WARNING

- **Do not connect any other devices to the foot switch interface.**
- **The joint part of the foot switch is not waterproof. Please keep it away from liquids.**

1. Insert the foot switch plug into the foot switch interface on the insufflator's rear panel as indicated by the arrow, until it fits in.
2. When taking down the foot switch, hold the cusp of the foot switch to pull if out straightly.

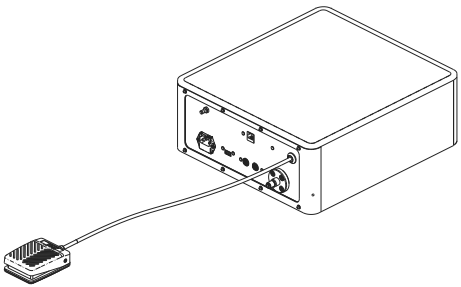


Figure 4-5 Connect with the foot switch

4.1.5 Connection with the Power Grid

WARNING

- **Connect the equipotential wire before inserting the power supply plug into socket. Similarly, to avoid electrical shock, pull the system plug away from the socket before unplugging the equipotential wire.**
- **When other equipment is connected to the system, equipotential cables must be used to connect to each equipotential terminal, or an electrical shock will occur.**
- **When connecting or disconnecting protective grounding wires, turn off the equipment power supply. Or an electrical shock will occur.**
- **If the circuit breaker and fuse of for a socket are the same as that used in this system and are used to control the current of equipment such as a life support system, do not connect the system to such socket. Because once the system operates abnormally, overcurrent is generated, or there is transient current when starting up, the circuit breaker and the fuse of the power supply system will be in protective mode.**

1. Plug the power supply cable into the power socket at the bottom of machine's backside.
2. Plug the power supply cable into a power outlet. Ensure that the grounding terminal is connected with a ground protection wire inside the socket.

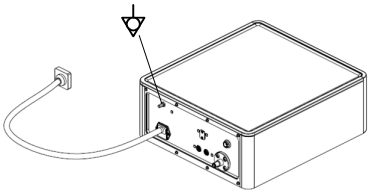


Figure 4-6 Connect with the power grid

⏚ is an equipotential terminal and is used to balance the electric potential of the protective grounding between the system and other electrical equipment. Please refer to the instruction in Figure 4-6 for equipotential terminal of the system.

NOTE

- **Connected cables must maintain proper looseness to prevent the plug from disconnecting with the socket after the system is moved slightly. If the plug**

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

4.1.6 Connecting the Insufflator Tube

WARNING

- **The pipe fittings and joints are not sterile. Please clean and sterilize the pipe fitting 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 repetitive 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 pipe fitting by cutting, adhering, or connecting multiple pipe fittings.**
- **If the pipe fitting is damaged, please replace a new one.**
- **The residual water drops on/inside the pipe fitting will damage internal sensors (such as causing short circuit) or lead to electric shock. Please dry the pipe fitting 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.**
- **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 pipe fitting to the sterilized Luer-lock.

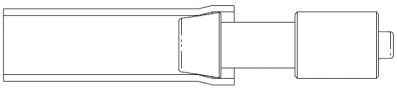


Figure 4-7 The pipe fitting connects with Luer-lock

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

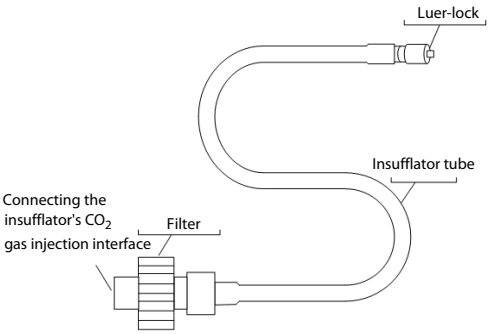


Figure 4-8 Installed insufflator pipe fitting (using filter)

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

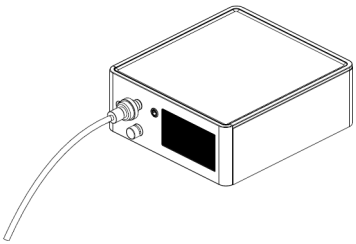


Figure 4-9 The insufflator pipe fitting connects with the insufflator (using filter)

WARNING

- **The Luer-lock can only be used to connect the pipe fitting. 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 pipe fitting 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 pipe fitting to the CO_2 gas injection joint of the product. Guarantee that the interface is well inserted.
4. Connect the heating joint to the insufflator tube heating joint on the front panel of the product.

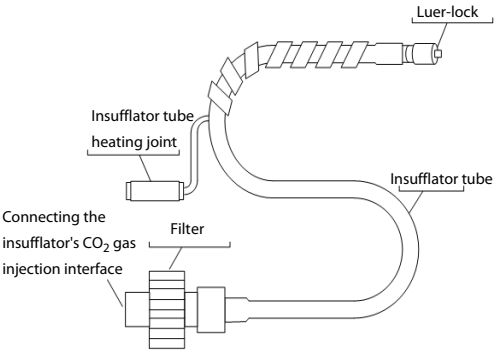


Figure 4-10 Installed heating insufflator pipe fitting (using filter)

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.

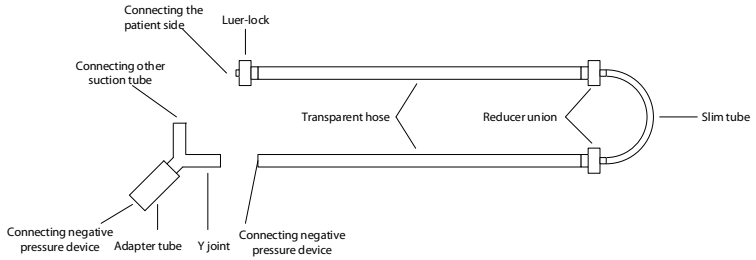


Figure 4-11 Installation of the suction pipe fitting

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

3. Clip the slim tube into the groove of the smoke exhaust control valve on the insufflator's front panel. To prevent the pipe fitting 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.

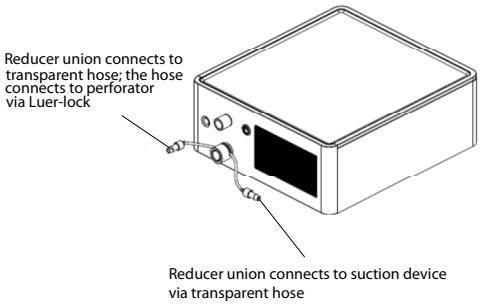


Figure 4-12 Connection diagram of the suction tube

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**

too fast to maintain the abdominal pressure; if the negative pressure is too low, the exhaust will be too slow.

5. The installed insufflator system with smoke exhaust function is as shown in Figure 4-13.

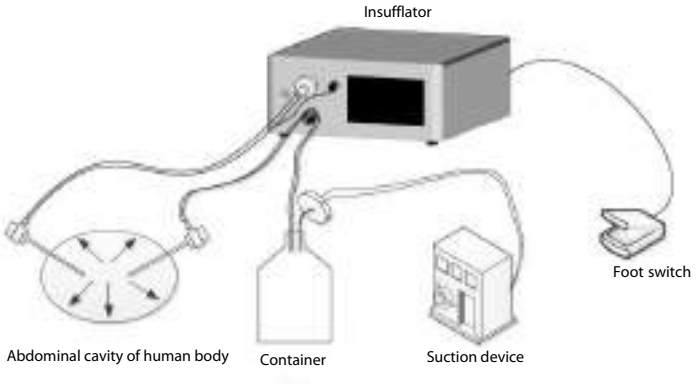


Figure 4-13 Connection method of insufflator with smoke exhaust

WARNING

- **Inspect the suction tube before use to make sure there is no blocking, bending or twisting, and the joint needs to be well connected.**
- **It is suggested to set the suction pump pressure within the range of 0.04MPa-0.06MPa.**
- **Please use Mindray matched suction tube, and do not use suction tube of other sizes.**
- **Please use parts and accessories provided by Mindray, and do not use parts and accessories of other sizes.**

4.1.8 Check Before Startup

WARNING

- **Conduct preventive inspection before each use. Please check the device according to the following instructions, and check other matched devices according to the Operator's Manual. Do not use if there is any minor anomaly,**

and see the measures in "Troubleshooting" to make correction. If the problem still persists after handling, please contact Mindray.

- **This machine has not been sterilized before shipping. Before first use, please perform cleaning and sterilization according to requirements.**
- **Be sure to use insufflator tube and suction tube that Mindray recommends. Using other pipe fittings not only degrades performance, but also might cause incorrect operation.**
- **Please sterilize the insufflator tube and the suction tube before each use.**

4.1.8.1 Inspection Process

1. Check the high pressure hose and the gas supply source (steel cylinder or wall central gas supply joint)
   - ◆ Check whether the high pressure tube has any scratch, crack or other damages.
   - ◆ Check whether the seal rings at joints have any scratch, crack or other damages.
2. Check the insufflator tube and the suction tube
   - ◆ Check whether the pipe fittings and interfaces have any scratch, crack or other damages. Any damaged device shall be discarded and replaced.
   - ◆ Confirm that the pipe fittings and interfaces are dry.
   - ◆ Before taking the filter out of the package, check whether the package is damaged. If the package has already been opened or torn, or if the filter is broken, do not use the filter. Because the interior pipeline of the filter cannot guarantee asepsis. Do not try to sterilize it.
3. Check the foot switch (only for HS-50F/HS-50V models)
   - ◆ Check whether the connected cables or the switch has any crack or other damages.
4. Turn on the gas source switch
5. Turn on the power switch
   - ◆ Press the power switch to turn on the insufflator. Wait until the screen prompts that self-inspection completes.
   - ◆ Set up the working mode. Confirm that the newest gas pressure has been set. And set the flow to minimum.

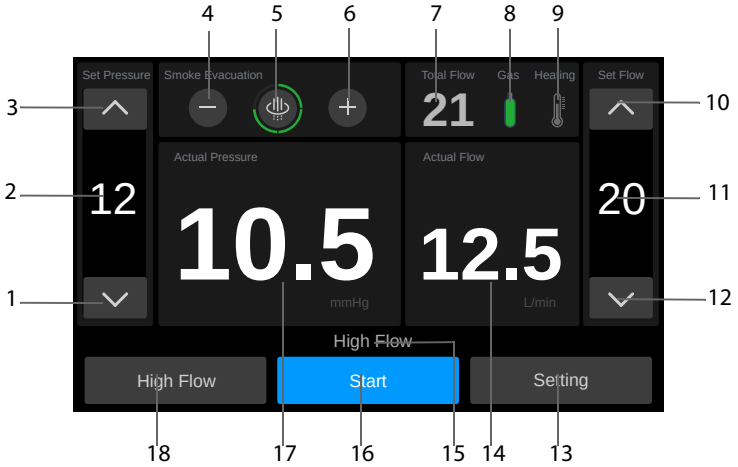
WARNING

- **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 CO_2 exhaust (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 pneumoperitoneum 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.
4. If there is too much smoke in the abdominal cavity, the foot switch can be treaded to exhaust smoke; if smoke exhaust is not needed, get off the switch in time. Do not tread the switch for a long time.

5. If no operation is performed for over 1 minute, the following unlocking bar will be displayed when you tap the screen. Press and slide it to the position on the right. The touchscreen is unlocked, and displays the main screen.

6. After the surgery is completed, tap the **[Stop]** button and the insufflator stops inflating.

DANGER

- **If the pressure is found uncontrolled during the surgery, please turn off the gas source immediately.**
- **Please use the Luer taper that meets the GB_T1962.1-2001 design requirements. The veress needle shall be properly connected with the Luer taper.**

WARNING

- **Tread and hold the foot switch according to the situation of smoke in the abdominal cavity. Do not tread and hold the switch for longer than 3 minutes, to avoid affecting the maintenance of normal pressure of pneumoperitoneum. Please choose suitable smoke exhaust gear based on the smoke situation.**
- **It is forbidden to switch pneumoperitoneum mode during surgery.**
- **Be sure to exhaust the residual gas in the pipeline after surgery.**
- **For security reasons, the smoke exhaust function will lose efficacy when the flow is set to lower than 20L/min or actual pressure is less than 3mmHg, to avoid evacuating all gas in the abdominal cavity and causing injury.**
- **In order to keep pneumoperitoneum, if gas leakage speed is too high, the flow of gas inflation needs to be increased appropriately.**
- **Please ensure the deflation valve in the [Settings] screen is on before use.**
- **If you hear any abnormal noise the machine makes during surgery, the gas source shall be turned off immediately.**
- **The connection of individual parts and accessories of the machine shall be stable.**

4.2.4 Removing the System from Use

After the surgery or if system failure occurs, remove the system from use as indicated below:

1. Turn off the gas supply system. Since there is residual gas inside the pipeline, you need to start pneumoperitoneum inflation again, and wait until the residual gas is excluded from the pipeline before you stop inflation again.
2. Turn the equipment off..

Perform cleaning, disinfection, sterilization, and other maintenance as required by the local or your hospital's regulation.

5 Maintenance, Storage, and Disposal

5.1 General Principle

1. There are accident reports recording the cross infection of patients caused by improper cleaning or sterilization in medical documents. It is strongly suggested that the person in charge of cleaning and sterilization thoroughly understand and abide by the hospital regulations and policies in his/her country and region.
2. Dedicated staff or team in the cleaning and sterilization department shall be assigned to take charge of the cleaning and sterilization of the device. It is strongly suggested to train backup personnel in case the person in charge is out.
3. All personnel in charge of cleaning and sterilization shall know: occupational health and safety rules, regulations and policies of national and local hospitals, stipulations in this Operator's Manual, mechanical knowledge of the device, label descriptions of long-acting sterilizing agent, and other relevant information.

5.2 Precautions

WARNING

- **The insufflator tube and the suction tube need to be cleaned and sterilized immediately after each use, to avoid any infection between the patients or between the patient and the operator. Be sure to clean and sterilize the interior and exterior surface of the pipe fitting.**
- **If the insufflator tube is not thoroughly cleaned, effective sterilization cannot be achieved. The thorough cleaning must be conducted before sterilization to remove the microorganisms or organic matters that may reduce the sterilization efficacy.**
- **The patient's tissue detritus and the chemical agents used for cleaning and sterilizing are hazardous. In the process of cleaning and sterilizing, the appropriate personal protective equipment should be used, such as safety goggles, face shields, waterproof outfits and chemical resistant gloves. And be prepared for infection control.**
- **Rinse thoroughly to remove the disinfectant. And the pipe fitting also needs to be thoroughly rinsed by using the water to remove all the residual disinfectant.**
- **Pay attention to the ventilation condition of the environment where the sterilization occurs. Adequate ventilation helps prevent the accumulation of the harmful steam of the chemical agents.**

- **Please make sure that the device has been cleaned and sterilized before each use.**
- **If the aseptic package has been ripped off or damaged, the expected sterilization effect cannot be achieved. In this case, please replace it with a brand new package for sterilization.**
- **If too many appliances are placed in the package, the sterilization effect cannot be achieved. Be sure to leave enough room when placing the appliances into the aseptic package.**
- **The cleaning and sterilization methods mentioned in this document cannot eliminate the prion of Creutzfeldt-Jakob Disease (CJD). After using this product for a patient who suffers CJD or Variant Creutzfeldt-Jakob Disease (vCJD), please make sure this product is only used for this patient, or /and take appropriate measures to dispose of this product. Please compliance with applicable laws and regulations in the country of residence when it comes to dealing with CJD.**
- **This device is nondurable or it does not have the durability required for the method of eliminating prions proposed in the country of residence. If the cleaning and sterilization methods not mentioned in this document are used, Mindray will not guarantee the efficacy, safety, and durability of this device. Please be sure to confirm the device does not have any anomaly, and use it under the guidance of the doctor in charge. Do not use the device if any anomaly is found.**
- **A repetitive bacteria filter needs to be cleaned, disinfected, sterilized and properly stored according to the relevant laws and regulations after each use and before reuse. The filter needs to be replaced regularly according to its service life.**
- **A disposable bacteria filter is single-use part. Please do not reuse it, and dispose of it as the medical waste.**
- **Before a disposable bacteria is used, please check if the aseptic package is in a good condition or if the filter has any damage first. If any damage is found on the package or filter, please do not use them.**

5.3 Cleaning, Sterilization and Discard

NOTE

- **Various methods of cleaning and sterilization are applicable for the device and its accessories. But some methods do not apply to certain parts and accessories and will cause device damage.**
- **When choosing proper methods of cleaning, disinfection, and sterilization, please refer to this document and suggestions from the infection control department, as well as regulations of national and local hospitals.**

WARNING

- **The power switch shall be turned off and the power cord shall be unplugged before cleaning.**
- **Alcohol cannot be used as the sterilizing agent.**

This product has not been sterilized before shipping. Before first use, please perform cleaning and sterilization according to laws and regulations or infection control requirements.

After using the device, store it properly.

Partial and/or improper cleaning, sterilization and storage may cause infection control risks and lead to device damage or performance degradation.

Cleaning and sterilization methods recommended for this product are as follows:

- When cleaning the insufflator's casing, use wet cloth that has been soaked with clean water to scrub the insufflator's casing surface.
- When disinfecting the insufflator's casing, use wet cloth that has been soaked with recommended disinfectant to scrub the insufflator's casing surface.
- When the exterior of the repetitive filter is dirty, use clean cloth to scrub; the filter cannot be soaked with potion, otherwise it will be damaged.
- The insufflator tube and suction tube can be sterilized with high-temperature and high-pressure steam.

5.3.1 Cleaning, Sterilization, Storage, and Discard of the Insufflator and Foot Switch

NOTE

- **This product cannot be soaked in water. Do not soak it into water or let liquid immerse into the device.**
- **Do not perform high-temperature and high-pressure sterilization or gas sterilization on the machine. Otherwise device damage may occur.**
- **Do not let electric terminals (system joint, foot switch interface, AC power input port, heating insufflator tube power interface) contact liquids. Otherwise poor contact may occur.**
- **In order to avoid damaging the surface, do not use coarse cloth.**
- **After cleaning, please dry the device thoroughly before use.**

- **When choosing proper methods of cleaning, disinfection, and sterilization, please refer to this document and suggestions from the infection control department, as well as regulations of national and local hospitals.**

5.3.1.1 The Selection of Cleanser and Disinfectant

Please use cleansers and disinfectants recommended by the manufacturer. Do not use cleanser repeatedly.

Cleansers and disinfectants recommended for this product are as follows:

Name	Manufacturer	Type	Applied to
Purified water	/	Liquid	Insufflator and foot switch
Ethanol, 70% ~75%	/	Liquid	Insufflator and foot switch
Isopropanol, 70%	/	Liquid	Insufflator
Sodium hypochlorite bleach, 0.5%	/	Liquid	Insufflator and foot switch
Glutaraldehyde, 2%	/	Liquid	Insufflator
1-Propanol, 50%	/	Liquid	Insufflator
Hydrogen peroxide, 3%	/	Liquid	Insufflator
HEALTH ESSENCE Disinfecting Effervescent Tablets	Beijing ChangJiangMai Medical Science Technology Co. Ltd.	Tablets	Insufflator
Dismozon® plus, 0.4%	BODE Chemie GmbH	Powder	Insufflator
mikrozid® AF Wipes	Schülke & Mayr GmbH	Wipes	Insufflator
Terralin®	Schülke & Mayr GmbH	Wipes	Insufflator
Perform® Classic Concentrate OXY, 0.5%	Schülke & Mayr GmbH	Powder	Insufflator
mikrozid® PAA Wipes	Schülke & Mayr GmbH	Wipes	Insufflator
Clinell® Sporicidal Wipes	GAMA Healthcare Ltd	Wipes	Insufflator
Tristel Duo™	Tristel solutions Limited	Liquid	Insufflator
Tristel Jet	Tristel solutions Limited	Liquid	Insufflator
Tristel Fuse For Surfaces, 196ppm	Tristel solutions Limited	Liquid	Insufflator
Descosept® forte	Dr. Schumacher GmbH	Liquid	Insufflator
Descosept® AF	Dr. Schumacher GmbH	Liquid	Insufflator

Name	Manufacturer	Type	Applied to
Ecolab Incidin® OxyWipe S.	Antec International Ltd	Powder	Insufflator
Rely+On™ Virkon® High Level surface Disinfectant, 1%	ANAERON	Wipes	Insufflator
Neutral detergent wipes	RAYNARD Health	Wipes	Insufflator
Premier disinfectant wipes	Whiteley Medical	Wipes	Insufflator
V-wipes	Antec International Ltd	Wipes	Insufflator
Ultraviolet light	/	Radiation	Insufflator and foot switch

5.3.1.2 Steps of Washing and Disinfection

1. Turn off the power switch of the insufflator, and disconnect the AC plug.
2. Use a clean, soft cloth dipped with a proper amount of purified water to remove dust, clay and other dirt on the device.
3. After cleaning, dry the device in a cool and ventilated environment.
4. Wipe the device surface with a cotton ball or a soft cloth dipped with disinfectant.
5. After disinfection, dry the device in a cool and ventilated environment.

5.3.1.3 Storage

WARNING

- **Please do not store the equipment in the tote box. Otherwise, it may have the infection control risk.**
- **The equipment must be ensured to have fully dried out before storage. Otherwise, the residual moisture may cause the infection control risk.**
- **Ensure there is no dust or foreign matter residing in CO_2 gas inlet joint.**

NOTE

- **Do not store the insufflator in places where there is direct sunlight, ultraviolet ray, X-ray, radiation or strong magnetic field. Otherwise it will damage the insufflator.**
- **Do not store the device in high temperature place, high humidity place, or place where there is splash.**
- **Do not operate the cables with force, and please avoid bending, stretching, tangling or extruding the cables.**

- **Do not strike the device using foreign matters or operate rudely, or device function anomaly may occur. Be sure to operate the device with caution.**

1. Take down all power cords, and relax and zigzag them. Do not extrude or bend them when stored. If the device falls onto hard surfaces, it might be damaged.
2. Disconnect from the CO_2 steel cylinder or the central gas supply pipe.
3. Place the device flatwise in clean, dry and stable indoor temperature environment.

5.3.1.4 Discard

When discarding the product, all applicable national and local laws and regulations shall be followed.

Applicable period:

On condition that this insufflator is used in accordance with the Operator's Manual, operating life is 10 years after delivery.

On condition that the foot switch is used in accordance with the Operator's Manual, operating life is 10 years after delivery.

5.3.2 Cleaning, Sterilization, and Discard of the Insufflator Tube and Suction Tube

WARNING

- **When disinfecting the pipe fitting, all the air bubbles in the pipe fitting needs to be eliminated. If there is still any air bubble in the pipe fitting, the disinfection effect cannot be achieved.**
- **All the disinfection procedures should be performed while the pipe fitting is fully soaked in the disinfectant. Otherwise, the disinfectant may not be able to get enough touch with all the surfaces.**
- **The sterilization efficiency depends on a variety of factors, such as the packaging or placement of the sterilization equipment, and how to place the device in the sterilization equipment. Please use the biological or chemical indicator to examine the sterilization effect. Meanwhile, please follow the operation manual of the sterilizer published by the infection control department of the healthcare administration institutions, public organizations or various medical institutions.**
- **After high-temperature and high-pressure sterilization, please have the equipment package cooled down to room temperature first before taking it out of the sterilizer. Otherwise it may cause burn injury.**
- **Please check if each package is opened, cracked or has any other damages. If any damage is found, please use a new package to seal the equipment and resterilize it.**

- **Let the package dry out in the sterilizer by using the drying cycle function of the sterilizer (if any), or opening the sterilizer door for wind drying. The aseptic condition of the package will be affected if it is wet.**
- **Please do not clamp the pipe fitting and the joint when putting the package in.**

NOTE

- **Before each use, be sure to follow the approaches specified in this chapter to conduct cleaning and sterilization in order to use.**
- **After each use, the following cleaning procedures shall be conducted immediately. If the cleaning is delayed, the residual tissue scraps will curdle, making it hard to clean and sterilize the device effectively.**
- **Wash thoroughly, or the residual cleanser might cause contamination or corrosion.**
- **Be sure to wear personal protective equipment to reduce infection risk and tissue stimulation.**
- **Do not use surfactants or disinfectants that contain surfactants. In order to avoid damaging the device, be sure to use clean water or the recommended disinfectants.**
- **The pipe fitting supports sterilization with high-temperature and high-pressure steam.**
- **The temperature in high-temperature and high-pressure sterilization shall not exceed 134°C. Also keep the sterilization time within 20 minutes, or it may cause damage of the pipe fitting or reduction of service life.**
- **In high-temperature and high-pressure sterilization, please finish the complete sterilization cycle according to the device requirements, including vacuum drying. Otherwise it might cause apparatus short circuit and damage.**
- **Sudden change of temperature may damage the pipe fitting or reduce service life.**

5.3.2.1 The Selection of Cleanser

Please use cleansers recommended by the manufacturer. Do not use cleanser repeatedly.

Cleansers recommended for this product are as follows:

Name	Manufacturer	Type
Purified water	/	Liquid

Name	Manufacturer	Type
MetriZyme®	METREX® RESEARCH	Enzymatic cleaner

5.3.2.2 Washing Steps

After each use, the following cleaning procedures shall be conducted immediately. If the cleaning cannot be conducted immediately, please immerse the pipe fitting in distilled water immediately to prevent dirt from drying, but the time should not exceed 24 hours.

1. Disassemble the pipe fitting to its basic structure. As shown in Figure 5-1, Figure 5-2, and Figure 5-3.

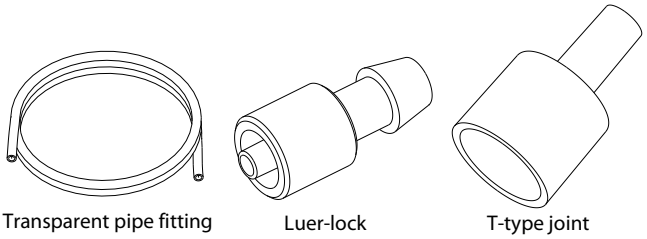


Figure 5-1 Disassembly of the insufflator tube

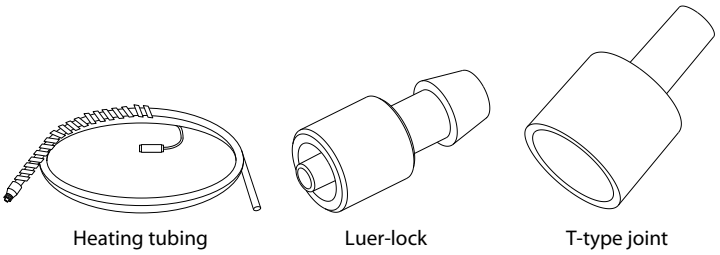


Figure 5-2 Disassembly of the heating insufflator tube

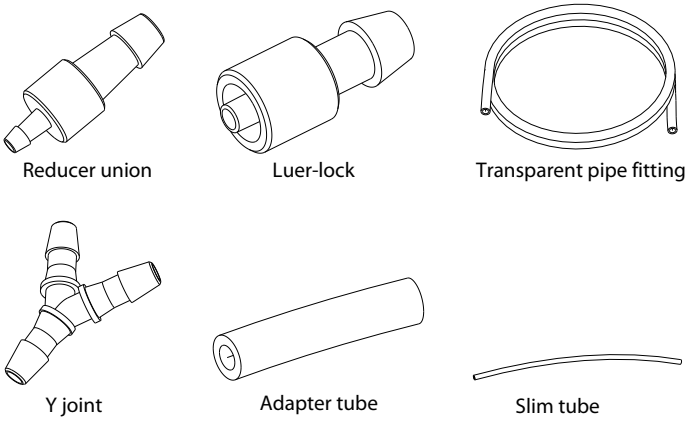


Figure 5-3 Disassembly of the smoke exhaust suction tube

2. Pour new cleanser into the cleaning container at a temperature and a concentration recommended by the manufacturer of the cleanser.
3. Soak the pipe fitting in the container with cleanser. For example, use the 3M multi-enzyme cleaning cleanser, 10mL cleanser/ 2L deionized or distilled water, immersed for 2mins, 25°C.
4. Use clean lint-free cloth to clean the outside surface in the solution.
5. Use an injector to inject the cleanser into the pipe fitting, and thoroughly wash the pipe fitting to clean its inside surface. As shown in Figure 5-4.
6. Soak the pipe fitting with time and temperature recommended by the manufacturer of the cleanser.
7. Take the pipe fitting out of the solution, and put it in clean water.
8. Use clean lint-free cloth to clean the outside surface in the clean water.

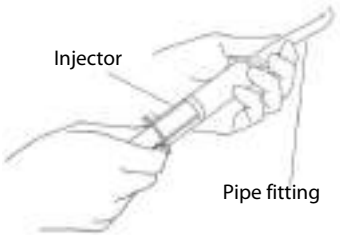


Figure 5-4 Use injector to clean the pipe fitting

9. Take the pipe fitting out of the clean water.
10. Use injector to inject air to eliminate the liquid inside the pipe fitting.
11. Use clean lint-free to wipe the outside surface dry.

5.3.2.3 The Selection of Disinfectant

Please use disinfectants that conforms to the license of the country or region, that meets requirements of medical administrative departments, and that are line with Mindray claims.

When using the disinfectant, its usage time, temperature and concentration shall comply with the disinfectant manufacturer's suggestion on advanced disinfection. If the disinfectant is used repeatedly, its effectiveness shall be checked regularly using test paper recommended by the manufacturer. Do not use disinfectant that has passed its expiration date.

Disinfectants recommended for this product are as follows:

Name	Manufacturer	Type
Ethanol, 70%~75%	/	Liquid
Glutaraldehyde, 2%	/	Liquid

5.3.2.4 Disinfection Operations

1. According to the instructions of the disinfectant manufacturer, adjust the concentration and temperature of the disinfectant.
2. Soak the pipe fitting in the container with disinfectant solution.
3. Use sterile lint-free cloth to clean the outside surface in the disinfectant solution.
4. Install the injector on the pipe fitting, and use the disinfectant solution to thoroughly wash the pipe fitting to clean its interior. As shown in Figure 5-4.
5. Soak the pipe fitting with time and temperature recommended by the manufacturer of the disinfectant.

5.3.2.5 The Selection of Water Used for Washing

Once the pipe fitting is taken out of the disinfectant solution, the insufflator tube shall be thoroughly washed with sterile water. Remove the residual disinfectant. Do not use the washing water repeatedly. If there is no sterile water, please consult related infection control department of the hospital.

5.3.2.6 Washing Steps

1. Take the pipe fitting out of the disinfectant solution, and soak it in the sterile water.
2. Install the injector on the pipe fitting, and use the sterile water to thoroughly wash the pipe fitting.

3. Gently churn the pipe fitting, washing it thoroughly.
4. Take the pipe fitting out of the sterile water.
5. Install the injector on the pipe fitting, and inject air to eliminate water inside the pipe fitting. As shown in Figure 5-4.
6. Use sterile lint-free to wipe the outside surface dry.

5.3.2.7 Requirements for Sterilization

The disassembled parts of the pipe fitting need to be reassembled before sterilization.

The high-temperature and high-pressure sterilization supported for the pipe fitting meets the requirements of WS/T 367-2012 Technical Code of Disinfection for Medical Institutions.

Highest temperature	Sterilization time
134°C	4 min

NOTE

- **The time above refers to the sterilization time, excluding forevacuum time and time for drying and cooling after sterilization.**
- **Maximum temperature at any phase shall not exceed 134℃, otherwise it might cause damage to the pipe fitting or reduction of service life.**

5.3.2.8 Steps of Sterilization

1. Before sterilization, put the pipe fitting inside the sterilization box, and pack it with sterilization pouch or sterilization cloth.
2. According to regulations of the hospital, seal the pipe fitting that needs to be sterilized in a package suitable for high-temperature and high-pressure sterilization. It is recommended to choose dedicated surgical instruments to sterilized the sterilization cloth (pouch).
3. Perform high-temperature and high-pressure sterilization on the package in accordance with the sterilization requirements of the device and the operating manual of the sterilization instrument manufacturer.
4. After high-temperature and high-pressure sterilization, let all components cool to room temperature gradually.

5.3.2.9 Storage After Sterilization

NOTE

- **After cleaning and sterilization, the pipe fitting and contaminated devices need to be stored separately.**

- **Do not store the pipe fitting in sterile package that has crevice, is sealed inappropriately or has water damage. Otherwise the aseptic condition of the package will be impaired.**
- **Storage location must be clean, dry and well ventilated, and the temperature shall stay at ambient temperature. Do not store the pipe fitting in an environment where there is direct sunlight, high temperature, high humidity, X-ray or ultraviolet ray. Otherwise it might damage the pipe fitting or pose infection control risk.**

5.3.2.10 Discard

When discarding the product, all applicable national and local laws and regulations shall be followed.

Applicable period:

On condition that the insufflator tube is used in accordance with the Operator's Manual, it can be used for sterilization 100 times.

On condition that the suction tube is used in accordance with the Operator's Manual, it can be used for sterilization 100 times.

5.3.3 Cleaning, Sterilization, Storage, and Discard of the Repetitive Filter

NOTE

- **If the filter housing or filter cotton is found damaged or has visible foreign matter, please do not use them.**
- **Before each use, be sure to perform cleaning and sterilization.**
- **After each use, the following cleaning procedures shall be conducted immediately. If the cleaning is delayed, the residual tissue scraps will curdle, making it hard to clean and sterilize the device effectively.**
- **Do not use disinfectants or medicines to disinfect the filter, do not soak the filter in potion, and do not use ethylene oxide to sterilize it!**
- **The filter cannot be used if its resistance coefficient is greater than 4cmH2O.**
- **Please use the filter according to doctor's advice.**

5.3.3.1 Cleaning and Sterilization

1. When the exterior of the filter is dirty, use clean cloth to scrub.
2. Before sterilization, the filter shall be packed with sterile cloth.
3. Conduct sterilization on the basis of the following parameters:

Sterilization temperature	Sterilization pressure	Sterilization time
121℃	1 bar	30 min

5.3.3.2 Storage After Sterilization

NOTE

- **After cleaning and sterilization, the filter and contaminated devices need to be stored separately.**
- **Do not store the filter in sterile package that has crevice, is sealed inappropriately or has water damage. Otherwise the aseptic condition of the package will be impaired.**
- **Do not soak the filter in liquid medicine; otherwise, the filter may be damaged.**
- **Do not use ethylene oxide for disinfection.**
- **Storage location must be clean, dry and well ventilated, and the temperature shall stay at ambient temperature. Do not store the filter in an environment where there is direct sunlight, high temperature, high humidity, X-ray or ultraviolet ray. Otherwise it might damage the filter or pose infection control risk.**

5.3.3.3 Discard

When discarding the product, all applicable national and local laws and regulations shall be followed.

Applicable period:

On condition that the filter is used in accordance with the Operator's Manual, it can be used for sterilization 25 times or has a life of one year, whichever comes first.

Storage life: 3 years from manufacture date.

5.4 Maintenance and Modification

The power needs to be shut off to disassemble the machine. This product does not contain any parts repairable by users themselves, and non-professionals cannot repair it.

Do not disassemble, modify the machine or try to repair; otherwise the patient or operator might get injured and/or the device might be damaged.

For certain problems not caused by dysfunction, refer to *6 Troubleshooting* for resolutions. If the problem still can't be solved, please contact Mindray.

5.4.1 Factory Maintenance

This menu is password-protected and only available for service personnel authorized by Mindray.

6 Troubleshooting

WARNING

- **If the insufflator has any obvious damages and cannot work properly, or any abnormal states are found during the self-test, please do not use it; and contact Mindray.**
- **Some problems that are not related with the product malfunction can be resolved by consulting *6.1 Fault Analysis and Clearing*. After troubleshooting according to the stated solution, if the problem still persists, please stop using this device, and send it back to Mindray for repair.**
- **In order to prevent cross infection and ensure the internal parts of the insufflator work properly, once the liquid flows into the gas inlet of the insufflator, the startup self-inspection will fail. The insufflator needs to be sent back to Mindray for repair.**

NOTE

- **Mindray is not responsible for repairing accessories. If any accessory is damaged, please contact Mindray to purchase a new one.**

6.1 Fault Analysis and Clearing

For common minor faults and solutions for the equipment, the operator can troubleshoot them or contact the maintenance staff designated by Mindray.

Symptom	Possible cause	Solution
System power supply can't connect or LCD screen doesn't display	Power cord of the insufflator is not connected.	Connect power cord of the insufflator.
	Power cord is damaged.	Replace the power cord.
	Power distribution panel in the operating room is turned off.	Turn on the power distribution panel.
	Power cord such as that of the trolley is not connected.	Connect the power cord such as that of the trolley.
	Power cord of the trolley is broken off.	Replace a new power cord.
	The power switch of the trolley is off.	Turn on the power switch.
	Fuse is blown.	Press the fuse holder lock to extract the fuse holder, replace the fuse, and then push the holder back to its original position.
	Circuit breaker of the trolley power supply is triggered.	Restore the circuit breaker of the trolley power supply.

Symptom	Possible cause	Solution
Cannot inject gas	The gas injection switch is not pressed.	Press the gas injection switch.
	The gas cylinder valve is closed.	Open the gas cylinder valve.
	The high pressure tube or medical gas pipeline hose is not connected.	Correctly connect the high pressure tube or medical gas pipeline hose.
	The gas cylinder is not upright. (Liquid CO_2 entered the device and froze the pipeline)	Place the gas cylinder at a upright position. Turn on the power switch and wait for 5 minutes or longer before operation.
	Remaining gas in the gas cylinder is not enough.	Replace the gas cylinder.
	The pressure of CO_2 central gas source is insufficient.	Restore the CO_2 central gas supply.
	The insufflator tube is not connected.	Connect the insufflator tube.
	Cannot inject gas. The insufflator tube is bended.	Straighten bended part of the insufflator tube.
	There is a hole in the insufflator tube.	Replace a new insufflator tube.
	The valve of veress needle or perforator is closed.	Open the valve of veress needle or perforator.
	Veress needle or perforator is inserted incorrectly.	Pull the veress needle or perforator out and reinsert it.
	Veress needle or perforator is damaged.	Replace a new veress needle or perforator.
	The gas is injected into narrow cavity.	Pull the veress needle or perforator out and correctly insert it.
	The filter is blocked.	Replace the filter.
Cannot open exhaust valve	Exhaust valve is set to Off.	Allow the exhaust valve to be opened in Settings.
Cannot exhaust smoke	The gas injection switch is not pressed.	Press the gas injection switch.

Symptom	Possible cause	Solution
Cannot exhaust smoke	Smoke exhaust mode is turned off.	Turn on smoke exhaust mode.
	Gas flow is too small.	Set the gas flow to be larger than 20L/min.
	The insufflator tube is not connected.	Connect the insufflator tube.
	The insufflator tube is bended.	Straighten bended part of the insufflator tube.
	The valve of veress needle or perforator is closed.	Open the valve of veress needle or perforator.
	The suction tube is not connected.	Connect the suction tube.
	The suction tube is bended.	Straighten bended part of the suction tube.
	The suction tube is blocked.	Remove foreign matters from inside the suction tube.
	The pinch valve is damaged.	Contact Mindray.
	The suction tube joint is not inserted properly.	Pull out and insert the joint again.
	The suction tube is not inserted into the pinch valve correctly.	Insert the suction tube into the pinch valve correctly.
	Suction device is stopped.	Start suction device.
	Foot switch is not connected.	Connect foot switch.
	Foot switch is damaged.	Replace the foot switch.
	Foot switch has poor contact.	Pull out and insert the foot switch interface again.
	Suction ability of the suction device/equipment is too low.	Check whether the suction device/equipment works normally.
	Gas pressure of the abdominal cavity is less than 3 mmHg.	Increase gas pressure of the abdominal cavity to above 3 mmHg.
	System prompts pipeline is blocked.	Solve the pipeline blocking problem.

Symptom	Possible cause	Solution
Continuous suction	The insufflator tube is bended, making it unable to measure gas pressure.	Straighten bended part of the insufflator tube.
	The suction tube is not inserted into the pinch valve correctly.	Insert the suction tube into the pinch valve correctly.
	Foot switch is damaged.	Replace the foot switch.
	The pinch valve is damaged.	Close the perforator valve that connects the suction tube; and contact Mindray.
Cannot perform heating	Gas injection is not started.	Start gas injection.
	The heating insufflator tube is not connected.	Connect the heating insufflator tube.
	The heating insufflator tube is damaged.	Replace the heating insufflator tube.
	The heating module is damaged.	Contact Mindary or the distributor.
Contamination	Liquid enters the device from the inflation port.	Contact Mindary or the distributor.
Prompt tone of overpressure rings continuously	Excessive gas from other devices are released.	Reduce the gas amount released from other devices.
	Anesthesia of the patient loses efficacy.	Handle it properly.
Prompt tone of pipeline blocking rings continuously	The valve of veress needle or perforator is closed.	Open the valve of veress needle or perforator.
	Veress needle or perforator is inserted incorrectly.	Pull the veress needle or perforator out and reinsert it.
	Veress needle or perforator is damaged.	Replace a new veress needle or perforator.
	The filter is blocked.	Replace a new filter.
	The insufflator tube is bended.	Straighten bended part of the insufflator tube.

Symptom	Possible cause	Solution
Prompt tone of insufficient gas supply rings continuously	Valve of the gas cylinder is closed.	Open the gas cylinder valve.
	Remaining gas in the gas cylinder is not enough.	Replace a new gas cylinder.
	The filter at the gas inlet is blocked.	Replace the filter at the gas inlet.
	The high pressure tube or medical gas pipeline hose is not connected.	Correctly connect the high pressure tube or medical gas pipeline hose.
	The pressure of CO_2 central gas source is too low.	Restore the CO_2 central gas supply.
Self-inspection failure	The internal system of the insufflator is faulty, and the screen prompts nothing listed above.	Turn off the insufflator and open it again. If prompt tone rings continuously, please contact Mindray.
LCD screen prompts gas temperature exceeds standard	The heating insufflator tube is faulty.	Disconnect the heating port of the heating insufflator tube immediately. And discard this heating insufflator tube after surgery.
LCD screen prompts other faults	Peripheral equipment is not connected properly, or there is fault inside the insufflator.	Resolve the faults according to the LCD screen prompts. If the issue can't be solved, turn off the insufflator and open it again. If prompt shows up continuously, please contact Mindray.

6.2 Common Prompts and Their Triggering Conditions

"Audio prompt" in the table below indicates times the buzzer rings;

"Text prompt" indicates text information shown on the display screen.

Text prompt	Triggering condition	Audio prompt
OverPressure	Pressure exceeds the set value, 5mmHg.	Yes
Gas Supply ?	Cylinder supply mode: Pressure is lower than 1MPa. Central gas supply: Pressure is lower than 0.1MPa.	Yes

Text prompt	Triggering condition	Audio prompt
Occlusion	The insufflator tube is bended, or the valve of veress needle or perforator is closed.	Yes
Over Temperature	Temperature of the sensor for the heating insufflator tube exceeds 40°C.	Yes
Contamination	Liquid enters the device from the inflation port.	Yes
Overpressure Relief	Pressure exceeds the set value, 5mmHg.	Yes

6.3 Return for Repair of the Insufflator

NOTE

- **For human injury and device damage caused by non Mindray or Mindray-authorized maintenance staff's trying to repair, Mindray bears no responsibility.**

Before the device is returned for repair, please contact Mindray. When returning for repair, attach instructions regarding device faults or damage and the warranty card.

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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.**

No.	Description
1	Power cord (EU, 2.5 m)
2	Power cord (International, 250 V, 10 A, 2.5 m)
3	Power cord (US, 110 V, 13 A, 2.5 m)
4	Power cord (US, 110 V, 13 A, 2.5 m)
5	Power cord (Brazil, 250 V, 10 A, 3 m)
6	Power cord (UK)
7	Power cord (India, 1.8 m)
8	Power cord (South Africa, 250 V, 16 A, 3 m)
9	Power cord (Australia)
10	Serial port cable
11	Grounding cable

No.	Description
12	FUSE Time-lag 250V 3.15AD5X20
13	Heating insufflator tube (2.9m)
14	Reusable insufflator tube (2.9m)
15	Reusable suction tube (2.9m)
16	Heating insufflator tube (4.5m)
17	Reusable insufflator tube (4.5m)
18	Reusable suction tube (4.5m)
19	Central gas supply pipe (German)
20	Central gas supply pipe (DISS)
21	Central gas supply pipe (Japan)
22	Disposable bacterial filter, large size
23	Reducing valve filter kit, 5um
24	Wrench
25	Foot switch
26	Foot switch extension cord
27	Reusable connector, straight, 22-10
28	CO_2 hight pressure tube (CGA320)
29	CO_2 hight pressure tube (DIN477)
30	CO_2 hight pressure tube (YORK940)
31	CO_2 hight pressure tube (ISO5145)
32	CO_2 hight pressure tube (BS341)
33	Pressure regulator, 452C-150 (CGA320)
34	Pressure regulator, 452C-150 (DIN477)
35	Pressure regulator, 452C-150 (YORK940)
36	Pressure regulator, 452C-150 (ISO5145)
37	Pressure regulator, 452C-150 (BS341)
38	CO_2 low pressure tube (DISS)

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	37°C±2°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	

A.2 Safety Specifications

Protection against electric shock type	Class I equipment
Protection against electrical shock level	Type CF applied part
Liquid inlet protection class	Foot switch IPX8 The insufflator is an ordinary-type device (sealed device that does not protect from liquid inlet)
Cleaning method	Use cleaning equipment recommend by the manufacturer.
Take extra care while using with flammable anesthetic gases mixed with air, oxygen, or nitrous oxide	This equipment cannot be used with flammable anesthetic gases mixed with the air, oxygen, or nitrous oxide.
Working mode	Continuous operation
If the equipment is provided with applied parts that protect from defibrillation charge effects	No applied part for protection from defibrillation charge effects is provided.
Signal output/input section	The equipment is provided with a signal output/input section
Permanently installed equipment or non-permanently installed equipment	Non-permanently installed equipment
GB 4824-2013	Group 1 Class A

A.3 Storage and Operation

Item	Temperature (°C)	Relative humidity (Non - Condensing)	Atmospheric pressure (hPa)
Working	0 - 40	30% - 85%	700 - 1060
Transportation/ Storage	-20 - 55	10% - 95%	700 - 1060

A.4 Power Supply Specifications

Input voltage	AC 100 -240V ± 10%
Rated frequency	50/60 Hz
Maximum current	0.75A-0.35A
Fuse	T3.15AH250V

A.5 Physical Specifications

Dimension	Length (front to back): 380 mm Width (left to right): 350 mm Height (top to bottom): 141 mm (excluding the rubber feet)
Weight	10 kg
Mechanical noise	≤50dBA

A.6 Gas Source Specifications

Gas source	Gas supply with gas cylinder/Central gas supply/Connection using reducing valve
Pressure range	0.4 - 16 MPa
Gas type	CO_2
Gas flow	HS-50F, HS-50V, HS-50H, HS-50S: Max 50 L/min HS-30S: Max 30 L/min

A.7 Equipment Connectors

USB connector	1, complied with USB 2.0 standard Fixed time synchronization pulse specified by the USB protocol
Network connector	1, standard RJ45 interface, supporting wired network 10 M/100 M/, and complied with technical standard IEEE802.3 Calibration protocol of TCP/IP
SCI connector	2, reserved
Foot switch interface	1, used for transmitting analog signal from Mindray specified foot switch, complied with Mindray internal standard
Insufflator tube heating joint	1, used for transmitting analog signal from Mindray specified heating insufflator tube, complied with Mindray internal standard

A.8 Operating Environment

Hardware configuration	RAM: 512 MB Flash: 8 GB
Software environment	LINUX

B EMC

HS-50F, HS-50V, HS-50H, HS-50S and HS-30S insufflators complies with the EMC standard IEC 60601-1-2: 2014.

WARNING

- **Use of accessories, transducers and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation.**
- **The non-ME EQUIPMENT (e.g. ITE) that is a part of an ME SYSTEM may be disrupted by the electromagnetic interference of nearby equipment. It may be necessary to take mitigation measures, such as re-orienting or relocating the non-ME EQUIPMENT or shielding the location.**
- **Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.**
- **Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of The ME EQUIPMENT or ME SYSTEM, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.**
- **This device is intended for use in professional healthcare environment. If it is used in special environment, such as magnetic resonance imaging environment, the equipment/system may be disrupted by the operation of nearby equipment.**

TABLE 1

GUIDANCE AND MINDRAY DECLARATION—ELECTROMAGNETIC EMISSIONS		
The system is intended for use in the electromagnetic environment specified below. The customer or the user of system should assure that it is used in such an environment.		
EMISSIONS TEST	**COMPLIANCE**	**ELECTROMAGNETIC ENVIROMENT – GUIDANCE**
RF emissions CISPR 11	Group 1	The system uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The system is suitable for use in all establishments including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Emissions IEC 61000-3-2	Class A	
Voltage Fluctuations/ Flicker Emissions IEC 61000-3-3	Compliance	

NOTE

- **The system needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided below.**
- **Other devices may interfere with this system even though they meet the requirements of CISPR.**
- **Preventing conducted RF immunity. Due to technological limitations, the conducted RF immunity level are limited to 3Vrms level, conducted RF interference above 3Vrms may cause wrong diagnosis and measurements. We suggest that you position system further from sources of conducted RF noise.**
- **Portable and mobile RF communications equipment can affects system. See tables 1, 2, 3, and 4 below.**

If the system is operated within the electromagnetic environment listed in Table 2 and Table 3, the system will remain safe and will provide the following basic performances:

- Pressure accuracy
- Flow rate accuracy

- Foot switch function
- Heating function

TABLE 2

GUIDANCE AND MINDRAY DECLARATION—ELECTROMAGNETIC IMMUNITY			
The system is intended for use in the electromagnetic environment specified below. The customer or the user of system should assure that it is used in such an environment.			
IMMUNITY TEST	**IEC 60601 TEST LEVEL**	**COMPLIANCE LEVEL**	**ELECTROMAGNETIC ENVIRONMENT-GUIDANCE**
Electrostatic Discharge (ESD) IEC 61000-4-2	±8 kV contact; ±15 kV air	±8 kV contact; ±15kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient / burst IEC 61000-4-4	±2 kV for power supply lines; ±1 kV for input/ output lines	±2 kV for power supply lines; ±1 kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV line(s) to line(s); ±2 kV line(s) to earth	±1 kV line(s) to line(s); ±2 kV line(s) to earth	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, Short interruptions and voltage variation on power supply input voltage IEC 61000-4-11	0 % U_T; 0,5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0 % U_T; 1 cycle 70% U_T for 25/30 cycle at 0° 0 % U_T; 250/300 cycle	0 % U_T; 0,5 cycle At 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315° 0 % U_T; 1 cycle 70% U_T for 25/30 cycle at 0° 0 % U_T; 250/300 cycle	Mains power quality should be that of a typical commercial or hospital environment. If you require continued operation during power mains interruptions, it is recommended that our product be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
NOTE: U_T is the A.C. mains voltage prior to application of the test level.			

TABLE 3

GUIDANCE AND MINDRAY DECLARATION—ELECTROMAGNETIC IMMUNITY			
The system is intended for use in the electromagnetic environment specified below. The customer or the user of system should assure that it is used in such an environment.			
IMMUNITY TEST	**IEC 60601 TEST LEVEL**	**COMPLIANCE LEVEL**	**ELECTROMAGNETIC ENVIRONMENT-GUIDANCE**
Conduced RF IEC 61000-4-6	3 Vrms 0,15 MHz – 80 MHz 6 Vrms in ISM and amateur radio bands between 0,15 MHz and 80 MHz	3 Vrms 0,15 MHz – 80 MHz 6 Vrms in ISM and amateur radio bands between 0,15 MHz and 80 MHz	Portable and mobile RF communications equipment should be used no closer to any part of system, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance d = 1.2 x $\sqrt{P}$ d = 1.2 x $\sqrt{P}$ 80 MHz to 800 MHz d = 2.3 x $\sqrt{P}$ 800 MHz to 2.7GHz Where, *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range[b]. Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RF IEC 61000-4-3	10 V/m 80MHz - 2.7GHz	10 V/m 80MHz - 2.7GHz	
Proximity fields from RF wireless communications equipment IEC 61000-4-3	27 V/m 380–390 MHz	27 V/m	
	28 V/m 430–470 MHz, 800–960 MHz, 1700–1990 MHz, 2400–2570 MHz	28 V/m	
	9 V/m 704–787 MHz, 5100–5800 MHz	9 V/m	

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

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

a: Field strengths from fixed transmitters, such as base stations for radio (cellular /cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy.

To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which system is used exceeds the applicable RF compliance level above, system should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the system.

b: Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

TABLE 4

RECOMMENDED SEPARATION DISTANCES BETWEEN PORTABLE AND MOBILE RF COMMUNICATION DEVICE AND THE SYSTEM

The system is intended for use in an electromagnetic environment in which radiated RF disturbance are controlled. The customer or the user of system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communication equipment (transmitters) and system as recommended below, according to the maximum output power of the communication equipment.

Rated Maximum Output power of Transmitter (W)	**Separation Distance According to Frequency of Transmitter (m)**		
	150kHz -80MHz $d=1.2\sqrt{P}$	80MHz-800MHz $d=0.12\sqrt{P}$	800MHz-2.7GHz $d=2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters at a maximum output power not listed above, the recommended separation distanced in meters (m) can be determined using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

If system image distortion occurs, it may be necessary to position system further from sources of conducted RF noise or to install external power source filter to minimize RF noise to an acceptable level.

Note1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

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

C Units and Symbols

C.1 Units

Abbreviation	In Full
°	angle
A	ampere
°C	centigrade
cm	centimeter
g	gram
h	hour
Hz	hertz
hPa	hectopascal
k	kilo-
kg	kilogram
kPa	kilopascal
L	litre
lp/mm	lines pair per millimeter
lx	Illuminance
m	meter
min	minute
ml	milliliter
mm	millimeter
mmHg	millimeter of mercury
s	second
V	volt
VA	Volt ampere
Ω	ohm
µA	microampere
µV	microvolt
W	watt

C.2 Symbols

Symbol	Explanation
-	minus
%	percent
/	per, divide, or
~	to
^	power
+	plus
=	equal to
<	less than
>	greater than
≤	less than or equal to
≥	greater than or equal to
±	plus or minus
×	multiply
©	copyright

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mindray

HS-50F

50L High Flow Insufflator

Ultimate Experience
Intelligent Control

HS-50F

Main features

High Speed Insufflation

The HS-50F offers an increased maximum flow rate of 50L per minute. In addition, the display mode provides clear visualization of the pressure, flow rate and volume in real time for monitoring the status of the HS-50F.

Gas Heating Functions

Using a heated insufflator tube (optional) can maintain the output gas at approximately 37°C, reducing telescope fogging and minimizing the need for the surgeon to frequently wipe the telescope.

100 times autoclavable, outer diameter-12mm, inner diameter-8mm

Multi-modes available

The equipment provides the following operating mode:

Operating mode	Description	Pressure(mmHg)	Flow(L/min)
High Flow	Designed for laparoscopies performed on normal weight adult patients.	1 - 30	1 - 45
Pediatric	Designed for laparoscopies performed on children.	1 - 15	0.1 - 20
Bariatric	Designed for laparoscopies performed on obese adult patients.	1 - 30	1 - 50
RetroPeritonenum	Designed for laparoscopies performed in retroperitoneum.	1 - 30	1 - 20
Custom	You can customize the operating mode as necessary.	1 - 30	0.1 - 50

Automatic Smoke Evacuation

If there is too much smoke in the abdominal cavity during the surgery, the foot switch can be treaded to exhaust smoke quickly to ensure a clear surgical field.

User-friendly design

HS-50F features 7-inch touch screen with a user-friendly interface, and it provides audible and visible alarm messages to promptly alert the surgeon of high pressure situations and etc., thereby ensuring the safety of the surgery.

With the Auto Leakage Compensation function, if there is a gas leakage, the machine automatically replenishes the gas to maintain stable abdominal pressure.

Specifications

Dimension	Length (front to back): 380 mm Width (left to right): 350 mm Height (top to bottom): 141 mm (excluding the rubber feet)
Weight	10 kg
Mechanical noise	≤ 50dBA
Gas source	Gas supply with gas cylinder / Central gas supply / Connection using reducing valve
Pressure range	0.4-16 Mpa
Gas type	CO_2
Gas flow	Max 50 L/min
Input voltage	AC 100 -240V~
Rated frequency	50/60 Hz
Maximum current	0.75A-0.35A
Fuse	T3.15AH250V

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P/N:ENG-HS-50F-210285X2P-20240723

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Foto POM-36


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