Haier

Small Steam Sterilizer Operation Manual

Certificate of Quality

Inspector:

Haier Biomedical
Makes Life Better

Contents

Safety precautions

Dear customers,

Thank you for choosing Haier small steam sterilizer. Please study the contents of this manual to familiarize the operation of the unit. Observing and following the instruction marked with the signs below prevent personal injury and damage to articles.

Thank you for paying attention.

▮ Safety label

Caution   High-temperature   Electric shock   Grounding

Caution: A high attention is required. Failure to follow the instruction may lead to an incomplete sterilization, minor personal injury or an equipment damage.

Warning: Serious personal injury and equipment damage can be caused by users and maintenance personnel.

Danger: Regulation must be strictly followed for personnel safety.

Grounding: Equipment must be securely and reliably grounded.

High temperature: Attention is required due to a high temperature.

Electric shock: An electric hazardous condition exists. Attention is required.

▮ Safety warning

Under all conditions marked with ⚠, it is necessary to refer to the documentation, so as to clarify the nature of potential risks and any countermeasures that must be taken.

⚠ Warning — Failure to following the instructions in the warning signs may lead to casualty accidents.

⚠ Caution — Failure to follow the instructions in the caution signs may lead to casualties, damage to properties.

🚫 Conduct or operation that must be forbidden

❗ Conduct or operation that must be observed

❗ Operators or maintenance personnel must be trained to get familiar with the equipment before any usage and service.

❗ Please use a dedicated power source of 220 V and 16 A to power the unit. The power outlet must have a reliable ground connection.

❗ Please use a power outlet meeting the requirement of the voltage and amperage mentioned in the name name plate to operate the unit. Plug in the power plug into the power socket firmly.

🚫 Do not plug in or remove a power plug from a power outlet with wet hands.

🚫 Do not damage, modify, pull, excessively bend or twist the power cord, or put any heavy object on it.

🚫 Do not place the sterilizer on an unstable workbench, such as a wobbly table, an oblique plane or a vibrating position.

🚫 Do not block or cover the door, vent or cooling window of the sterilizer.

Do not place anything on the sterilizer.

When detecting a peculiar smell or abnormal noise of the sterilizer during operation, please turn off the unit immediately and contact our service department.

If a sterilizer is not in usage for some time, please disconnect the power to the equipment.

This equipment shall not be placed in a place near any heat source.

The equipment shall not be used in an environment with electromagnetic interference. Any interference in the power grid would result in a white screen; the corresponding user may arrange a voltage stabilizer, which can solve the above problem.

The sterilizer package (or product) must be accompanied by a chemical indicator (tube).

A sterilizer should not be used to sterilize sealed containers filled with liquid or any objects that are rated for high temperature and pressure.

Any service parts repair a sterilizer must be approved by the manufacturer.

An actual sterilization time is determined by an operator based on the verification of a sterilization process.

Unpackaged items should be used immediately after sterilization. Or they must be stored, transported or out in application in a clean environment.

Using an equipment at conditions not specified by the manufacturer may cause potential damages to the protection system of the equipment.

Please always keep the operation manual with the equipment including any updates. Should the equipment be moved to another site, the manual should accompany the equipment as well.

This equipment is a pressure vessel of class I. It is designed, manufactured, and accepted under the codes of the Pressure Vessel. It also conforms to the codes specified in the Supervision Regulation on the Safety Technology for Stationary Pressure Vessel.

Never use the equipment to sterilize any sealed containers and vessels fill liquid. The high temperature in the sterilization process may cause the containers and vessels to burst, posting a potential risk to operators and damage to the equipment.

Chloride ion is an important factor that causes corrosion in stainless steel. If a sterilizer is used to sterilize any items containing chloride ions, the inner wall of the sterilizing chamber must be washed with clean water everyday to avoid corrosion on stainless steel surface as a result of the deposited chloride ions. Tis will extend the life of the equipment.

The sterilizer is designed for sterilization of only medical devices and articles with high temperature and humidity ratings, rather than oils and powders such as Vaseline.

When a symbol is observed on any parts of the equipment, please refer to the manual and relevant documentations o understand the potential hazards and take proper actions accordingly.

The symbol ⚠ indicates the temperature in the surrounding area is high. Please pay attention to it.

Basic EMC performance is as follows. The control system shall control the set sterilization temperature within the range of 0 C to 4 C for a duration of a minimum of 15 minutes and 3 minutes.

EMC requirements:

a) The equipment conforms to the emission and immunity requirements specified in GB/T18268.1;

b) The equipment is designed and tested as Class A equipment defined in GB4842. At a home environment, the equipment may cause radio interference.   Protective measures may be necessary.

c) It is recommended to evaluate the electromagnetic environment before using the equipment.

d) Do not use the equipment in the surroundings of strong radiation sources such as unshielded video sources to avoid disturbance of normal operation of the equipment.

Circuit diagram

Main control board

Screen

Printer

Rocker switch

Switching Mode Power Supply DC 24V

Interposition circuit breaker

wave filter

battle line
null line
earth wire

PT100

PT100
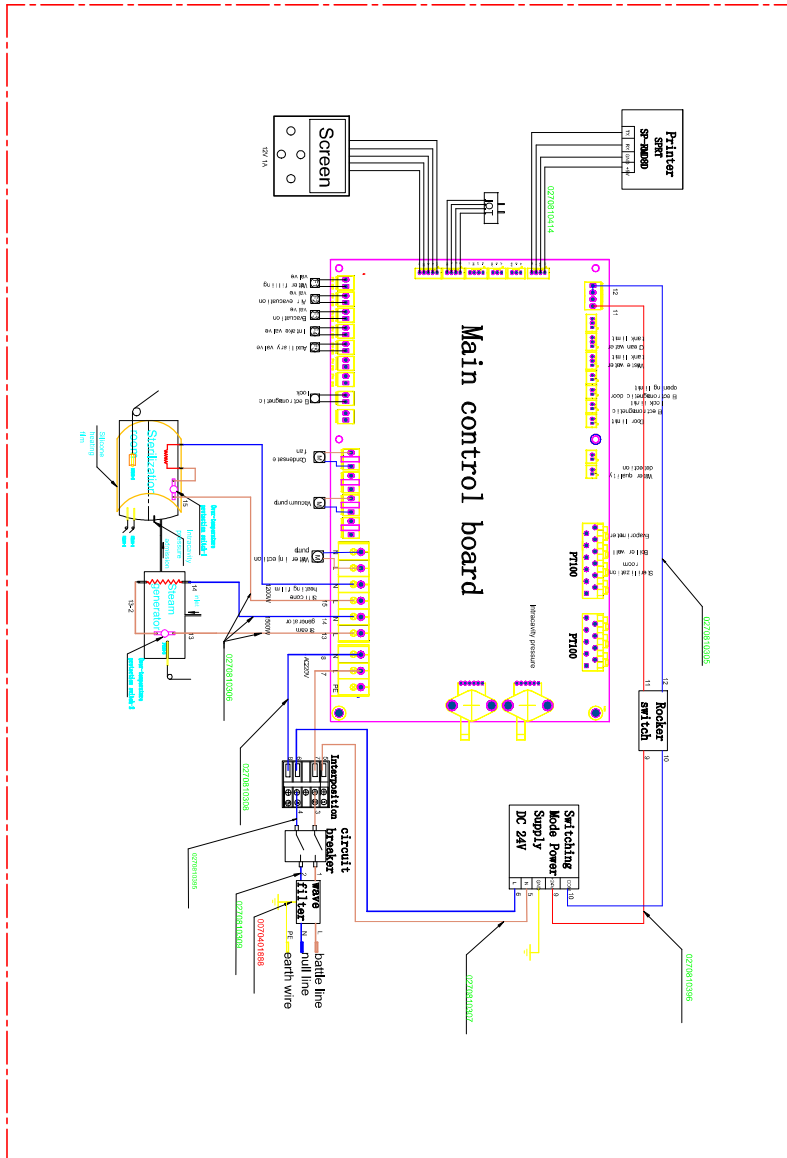
Overview

Scope of application

This equipment is designed for damp heat sterilization of medical devices and sanitary materials.

⚠ Caution | This equipment shall not be used for sterilization of items not suitable for damp heat sterilization.

Sterilization principle and categories of killed microorganisms

The pressure steam sterilizer uses saturated steam as the sterilization medium to conduct heat sterilization. As one of the most extensive and reliable physical sterilization methods, heat can damage the cytoderm and cell membrane, as well as the nucleic acid, thus killing the microorganisms; while damp heat mainly kills the microorganisms by solidifying their protein. The pressure steam sterilizer is designed based on the principle of killing microorganisms by damp heat. The advantage of this method is that steam has a strong sterilization effect, which can increase the water content of bacterial proteins and make them easily solidify by heat and accelerate the death process of microorganisms. It can kill all microorganisms on items, including all pathogenic microorganisms (such as bacterial spores) and non-pathogenic ones.

Sterilization factor and intensity: Sterilization factor is saturated hot water vapor, with the intensity of:

1. 121°C pulse vacuum program, with the sterilization time ≥ 20min.
2. 134°C pulse vacuum program, with the sterilization time ≥ 4min.

Product information and technical parameters

Model	HRTM-18	HRTM-23
Volume (L)	18	23
Exterior dimensions (W x D x H) (mm)	490x600x455	490x690x455
Sterilization chamber dimensions (Diameter x Depth) (mm)	φ（247±5）*（350±5）	φ（247±5）*（450±5）
Voltage	AC220-240V	
Power	2.8 kW	3.2 kW
Sterilization temperature	121°C/134°C	
Sterilization cycle classification:	Type B	
Water source	Deionized water	
Software release version	V1	
Production date	See the barcode on the equipment	
Designed service life	The designed life of the main equipment is 8 years; for details, please refer to the related materials of the pressure vessel (this designed life is estimated under the agreed standard operating conditions, which is independent of the failure rate in the actual use of the equipment; however, improper use would also accelerate the damage of the equipment).	

Basic profile

■ Equipment principle

• The unit's operation is highly automated by On-board microprocessor control;

• High-power SCR output, constant-temperature sterilization, high precision, stability and reliability;

• LCD display, with touch button and one-button operation function, as well as strong human-machine dialogue function, simple operation, intuitive display; the satisfactory adaptability enables it to realize high control accuracy under different ambient temperature, heating power, and voltage fluctuation conditions;

• The sterilizer is provided with an external steam evaporator. It provides saturated steam to the chamber to perform an effective sterilization process in a short period of time. The sterilizer also performs effective drying for the sterilized items by pulse vacuum and external heating film.
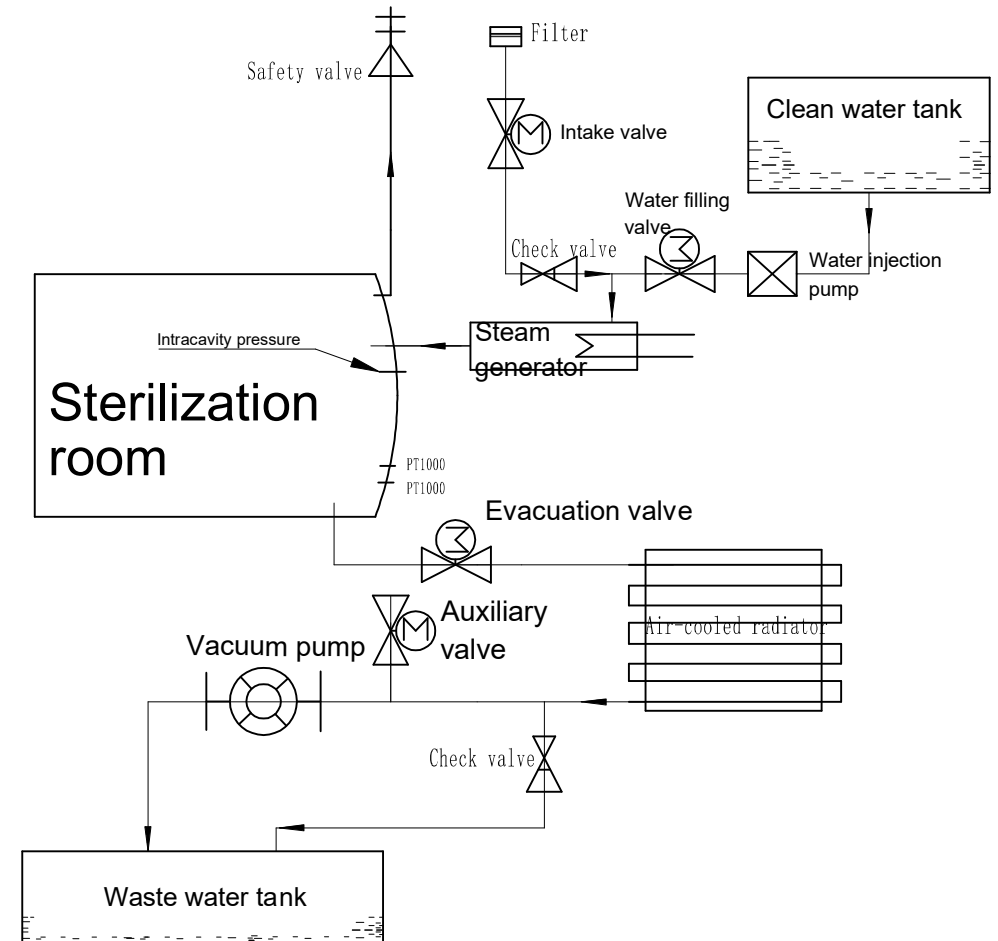
■ Structure and composition of the sterilizer

The product comprises four major parts: main body, sealing door, tubing system and control system.

Principle and wiring diagram

■ Schematic diagram

Regular maintenance and emergency repair

| ⚠Warning | These maintenance instructions are provided for professional use. Unless you are a professional, make sure to refer to the instructions before repairing when the equipment fails. All maintenance methods to our knowledge are provided in the maintenance instructions for the professional's reference. |

■ Lifting and handling

(1) Turn off power.

(2) Before moving the sterilizer, make sure that it is disconnected from the power supply and depressurized to zero.

(3) The sterilizer shall be drained off, and lifted and handled by several persons.

■ Fault analysis table

S/N	Fault code	Alarm name	Handling method
1	E01	Shortage/overflow of water in the tank	Fill/drain water
2	E02	Quit midway	Call the after-sales department
3	E03	Cavity overpressure	Call the after-sales department
4	E04	Door opening during sterilization	Call the after-sales department
5	E05	Cavity wall overtemperature	Call the after-sales department
6	E06	Heating up timeout	Call the after-sales department
7	E07	Sterilization low-temperature	Call the after-sales department
8	E08	Sterilization overtemperature	Call the after-sales department
9	E09	Vacuuming timeout	Call the after-sales department
10	E10	Too low or too high liquid level in the water storage tank	Fill/drain water
11	E11	High liquid level in the condensate water tank	Drain water
12	E12	Printer not connectedor lack of paper	Change the printer paper
13	E13	Door lock system fault	Close the door tightly

■ Operating environment requirements

The sterilizer shall be placed in a clean, dry, lucifugal, and ventilated room with a small temperature difference.

1. Room temperature: 5°C~40°C.

2. Maximum relative humidity: 85%.

3. Allowable voltage fluctuation range: ±10%

4. No dust and pollutants in the room.

■ Safety device introduction

1. Door safety interlocking device The system can only operate its heating system only when its door is closed.　If the sterilizer is pressurized, the safety device can prevent the door from opening.

2. Steam generator overtemperature protector.

3. Automatic relief valve If the chamber pressure exceeds the set pressure, the safety valve will open to relieve the chamber pressure.

4. Circuit safety device: Overcurrent protection.

5. Alarm system When an abnormality of sterilizer's temperature, pressure, and door system, the unit will send out an alarm.

■ Packing list

No	Item	Quantity
1	Device tray	3
1	Device tray rack	1
3	Device tray holder	1
4	Liner door adjustment wrench	1
5	Instructions	1
6	Certificate of warranty	1
7	Pluggable power cord	1

Installation and commissioning

■ Preparations before use

1.Remove the packing materials and tapes

Remove all the packing materials and tapes used for transportation.

If the sterilizer needs to be handled before unpacking, a clamping truck or forklift may be used to lift it from the bottom of the pallet, but only the sides of the packing box can be clamped. If the sterilizer needs to be handled after unpacking, it shall not be lifted by holding the door or supporting feet and nor be placed with one side or upside down.

■ Installation

1. Placement of the sterilizer

(1) There shall be a space of at least 20 cm on the top of the sterilizer, 10 cm respectively on both sides and in the rear, and 50cm in front so that the door can be fully opened.

(2) The sterilizer must be installed in a ventilated environment, with radiator shutters on both sides and at the back unblocked.

(3) The sterilizer shall be placed on a horizontal workbench.

(4) The sterilizer shall not be placed in a place with radiation.

(5) The sterilizer shall not be placed in a place with splashed water.

(6) The sterilizer shall not be placed in a place with any heat source.

(7) The workbench for placing the sterilizer shall have a bearing capacity of no less than 80kg.

2. Wiring:

The wire and socket shall be selected according to the power of the sterilizer. Meanwhile, the local installation and safety rules and regulations must be observed. In an area with unstable voltage, a voltage stabilizer suitable for the load shall be used to ensure the normal input voltage of 220V±10%, and the power of the stabilizer shall be above 4000W.

3. Installation of power supply:

(1) Insert the power cord into the socket (16A).

(2) The sterilizer shall be reliably grounded.

(3) If the power socket is equipped with a grounding wire, please inspect whether the grounding is satis factory before use.

(4) If there is no grounding wire, it shall be connected by an engineering technician.

| ⚠Warning | Do not ground the sterilizer through gas pipes, water supply pipes, telephone lines or lightning conductors as electric shock may be caused. |

| ⚠Warning | After installation, the power plug must be accessible to facilitate unplugging of the power cord in an emergency. Do not block the air vent of the freezer with any article. |

4. Preparation of water source:

Water quality:

• Electrical conductivity: lower than 15μ S/cm.

• Bleach content lower than 2mg/l and hardness lower than 0.02mml/l.

• PH value: 5-7.

Equipment Maintenance

■ Maintenance

• Operations described in this section must be followed to ensure the good working order of the sterilizer and minimize fault   times.
• Before maintenance, check to make sure the equipment is powered off, and there is no pressure inside the sterilizing chamber. After completing the sterilization program, cool the sterilizer naturally for more than 1 hour to avoid scald injury. Insert the drain pipe into the drain port to drain all the water, and then clean the sterilizer.

Maintenance frequency	Operation
Daily	Clean the sealing ring with fresh water
	Wipe the sterilizer cover with a towel
Weekly	Clean the water storage tank with fresh water
	Clean the cavity of the sterilizer with fresh water
Monthly	Open the relief valve for ventilation
Every 3-6 months (depending on the frequency of use)	Replace the bacterial filter
Annual	Replace the door seal

| ⚠Warning | For opening the safety valve, the sterilization pressure shall reach 100kPa; when the lifting ring of the safety valve is pulled, there would be steam, so attention shall be paid to prevent scald; if the safety valve fails, please contact the after-sales personnel immediately, and do not repair it without permission, so as to avoid potential safety hazards. |

| ⚠Warning | If the internal pipes are damaged or broken, there would be abnormal exhaust and drainage, and an alarm would be sent. Please contact the after-sales personnel in time, and be sure not to perform maintenance without permission. |

| ⚠Warning | Before replacing any parts, please call the after-sales service department, and make sure to use the parts of appropriate specifications, so as to avoid any impact on the normal use. |

■ Transportation

• Product packaging and transportation requirements: Subject to the regulations of GB/T 191.
• Ambient temperature: -40~+70°C.
• Atmospheric pressure: 500~1,060KPa.

Device information

1. Model: Specific model of the product: such as HRTM-18;

2. Name: Small Steam Sterilizer;

3. Serial number: On the Super Admin interface, the serial number can be scanned and imported into the system by a barcode scanner; the serial number is the combination of 20 digits and letters;

4. Display screen version: the current software version of the display screen;

5. Information of the supplier/agent/service provider: After entering the Super Admin interface, such information can be displayed here;

6. Main control board version: the current software version of the main control board;

7. Firmware upgrade: After a USB flash disk is inserted, the program of the main control board can be upgraded.

Commissioning procedures

1. Preparation for sterilization

(1) Open the door of the sterilizer. For the initial use, remove all packing materials inside the sterilizer. Also remove packaging materials for the instrument tray and tray rack. Place them in the sterilizer.

(2) Connect the power of the sterilizer.

(3) Turn on the power. The sterilizer will automatically check the water level in the water storage tank. Fill in water into the tank. It also initiates the system. The display will indicate the current pressure, temperature and time.

Caution During the initial power up, the sterilizer will trigger an alarm to alert with the water shortage icon. Please add water into the tank. When the water level passes the minimum level required, the alarm is turned off. When the water level reaches the maximum level, the sterilizer will sound with a prompt tone to alert the filling process be stopped.

(4) Filling water into the water storage tank: Remove the water tank cover on the top of the sterilizer and fill the water tank with distilled water meeting the requirements. When the water reaches the highest level, the sterilizer will give a prompt tone, suggesting that you shall stop filling water.

⚠ **Caution** Do not move the equipment after filling the water to the system.   If the equipment needs to be moved, please drain the water in the tank. The water should be drained from the drain port using a piece of drain tube.

⚠ **Warning** When the monitoring icons for the water tank and waste water tank turn red, please add water to the water storage tank and also drain the waste water tank. The system can not operate at the alerted conditions.

2. Preparation of devices

For best sterilization process, please follow the process described below:

(1) Place devices of different materials on different device trays or separate them completely.

(2) Make sure that the devices are not stacked.

(3) Arrange cutting devices (such as scissors and scalpels) properly to prevent them from contacting each other during sterilization. It is best to wrap them with gauze or sterile bags to better separate and protect them.

(4) Place container-type devices (such as glass bottles, test tubes, and cups) on the tray upside down or sideways to prevent water retention inside.

(5) The devices placed shall not exceed the loading limit of the sterilizer.

(6) Do not stack the device trays together, or directly place them on the surface of the inner cavity of the sterilizer. Place the trays on a tray rack, one for each layer according to the structure of the tray.

(7) Place and remove the trays with a tray holder.

(8) Individually package the devices by sterilization bags, and if multiple devices must be paced together, ensure that they are made of the same material.

(9) The packaging materials shall be able to ensure the sterile state of the devices within the validity period after sterilization.

⚠ Warning | Make sure to pack and seal the cotton batting dressing products or easily decomposed items before sterilization, or place them into special device cases; otherwise, the internal tubes of the sterilizer would be blocked, thus affecting the service life of the sterilizer.

3. Selection of sterilization program

Press the program menu selection interface: Press the key "Up" or "Down" to select the program.

4. Running of the program

After selecting the program, place the devices to be sterilized on the device trays, and put them into the cavity of the sterilizer.

(1) After placing the device trays properly, close the door.

(2) Start the sterilization program.

• Press the start-stop button, and the sterilizer will automatically start a sterilization cycle.

• The sterilization time is 30~75min.

⚠ Caution | If the sterilizer cannot be started after the start-stop button is pressed, please check whether the door lock icon on the LCD screen flickers, for the start-stop button can only be activated when the sterilizer door is closed properly and the corresponding icon does not flicker.

(3) End of sterilization cycle

• After the end of a sterilization cycle, the sterilizer will give a prompt sound, the printer can print the sterilization process parameters, and the operator can sign the name on the signature column.

• If the sterilization process completes normally, namely, there is no alarm or abnormal temperature and pressure during sterilization, the LCD screen will display the completion of the operation and give a buzzer sound, indicating a normal end.

⚠ Caution | When the pressure rises to above -5 KPa, there will be a buzzer sound, and the door of the sterilizer can be opened; then the trays can be taken out with a tray holder. Place and remove the devices on trays with a tray holder to avoid scalding.

4. Press the "Up" or "Down" key to move the cursor, and press "Set" to enter the specific content.

5. Time setting: Press the "Up" or "Down" key to highlight "Time setting", press "Set" to select the year, press the "Up" or "Down" key to adjust the year, and then press "Set" to save the year; later, perform month adjustment, and following the same operations for month, day, hour, minute, and second adjustment.

6. Sterilization count: Do not change the automatic count mode of the system.

7. Pressure unit: When the dialog box is highlighted, click "Set", press the "Up" or "Down" key to select the pressure unit, and press "Set" to confirm.

8. Temperature unit: When the dialog box is highlighted, click "Set", press the "Up" or "Down" key to select the temperature unit, and press "Set" to confirm.

9. Current environmental pressure: Adjust by 1 °C by pressing the "Up" or "Down" key once, and press "Set" for confirmation after adjustment.

10. Preheat setting: When the dialog box is highlighted, click "Set", press the "Up" or "Down" key to select enable or disable, and press "Set" to confirm.

• Press the "Set" + "Start-stop" keys simultaneously to return to the main interface.

11. Press the "Up" or "Down" key to have "Data export" selected; when it is highlighted, click "Set" to enter the data export interface. Press the "Up" or "Down" key to move the cursor and select alarm record, event record or operation data; insert a USB flash disk, press "Set", and the screen will display the message "downloading"; if the USB flash disk is not inserted, press "Set", and the screen will display the message "please insert the USB flash disk"; press and hold the "Set" key for 3 seconds to return to the upper level.

2. Press the "Up" or "Down" key to have "Parameter setting" selected; when it is highlighted, click "Set" for parameter setting; press the "Up" or "Down" key for adjustment by 1min each time, and press "Set" for confirmation after adjustment; press and hold the "Set" key for 3 seconds to return to the upper level.
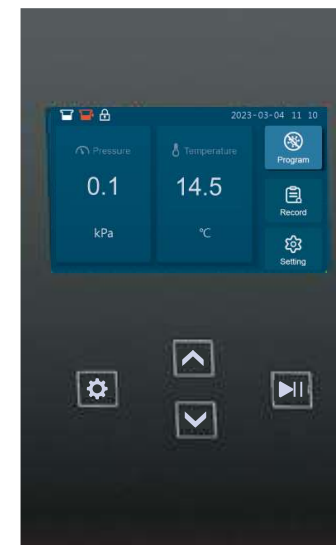

Parameter setting interface

3. Press the "Up" or "Down" key to have "Basic settings" selected, when it is highlighted, click "Set" to visit the basic settings interface.

Program operation

■ Function keys

1. Setting: Select items and set and confirm parameters; when pressed for 3 seconds, the system will return.
2. Start-stop: Start the sterilization program; when pressed for 3 seconds, the program will be suspended.
3. Up: Select and adjust parameters upward.
4. Down: Select and adjust parameters downward.

Status icons

On the status bar, the icons from left to right are: Storage tank level monitoring, condensate tank level monitoring, printer status, door status, and time display.

1、 Storage tank level monitoring: Red indicates low water level, and white indicates normal；

2、 Condensate tank level monitoring: Red indicates low water level, and white indicates normal；

3、 Printer status: Red indicates that the printer is not connected or lack paper, and white indicates normal；

4、 Door status: White indicates that the door is locked, and red indicates that the door is not closed or not tightly closed；
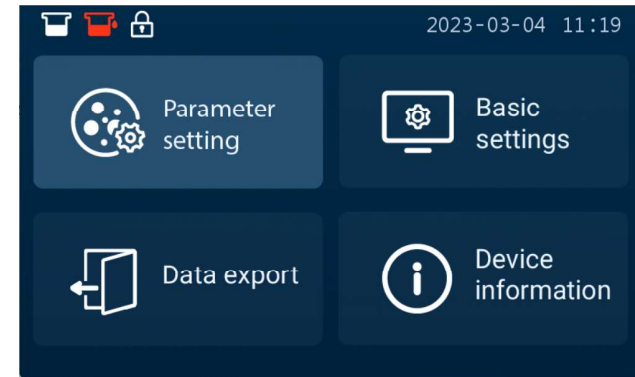
Parameter setting and function introduction

1. Press the "Up" or "Down" key on the home page to have the "Program" selected; when it is highlighted, click "Set" to enter the program interface; press the "Up" or "Down" key to select the corresponding regular program; when it is highlighted, click "Start-stop" for operation, and the interface is displayed below. After the end of the operation, the printer will automatically print the sterilization records, and store them in the memory. Press and hold the "Start-stop" for 3 seconds to manually stop the sterilization program, and then the pop-up window will give an alarm of quit and the sterilization program suspends; press and hold the "Set" key for 3 seconds, and a level 1 password permission pops up; enter the correct password, and the system returns to the main interface.

2. Press the "Up" or "Down" key to select the "Custom program addition" menu; when it is highlighted, click "Set" to enter the custom program addition interface, and select the corresponding items for customization by pressing the "Up" or "Down" key; when a selected item is highlighted, click "Set" to enter the custom parameter adjustment interface, and adjust the parameter by pressing the "Up" or "Down" key.

• Pulsing times: 0-9 (customizable), adjust by 1 by pressing the "Up" or "Down" key once, and press "Set" for confirmation after adjustment;

• Sterilization temperature: 115-134 (customizable), adjust by 1°C by pressing the "Up" or "Down" key once, and press "Set" for confirmation after adjustment.

• Sterilization time: 0-999min (customizable), adjust by 1min by pressing the "Up" or "Down" key once; long press for adjustment by 10min each time, and press "Set" for confirmation after adjustment.

• Drying time: 0-999min (customizable), adjust by 1min by pressing the "Up" or "Down" key once; long press for adjustment by 10min each time, and press "Set" for confirmation after adjustment. After setting, press and hold the "Set" key for 3 seconds to return to the upper level, and press "Start-stop" to start the custom program.
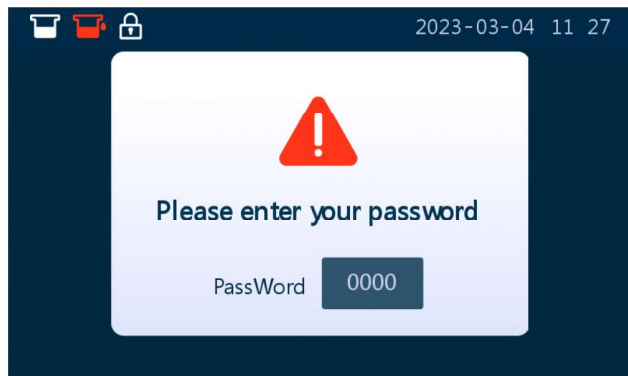
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Setting interface

Setting interface

1. Press the "Up" or "Down" key on the home page to have "Set" selected; when it is highlighted, click "Set" to enter the "Set" interface; press the "Up" or "Down" key to select parameter setting, basic settings, data export, or equipment information; when it is highlighted, click "Set" to enter.

Parameter setting interface

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1. Faults 10-12 are displayed in the status bar on the homepage, and other alarms suggest the alarm content as shown in the figure below.

2. When the system gives an alarm, press and hold the "Set" key for 3 seconds, the alarm state can be canceled. All alarms require Level 1 permission to cancel, and the default password is 1111.

3. Press the "Up" or "Down" key to select the "Event record" option; when it is highlighted, click "Set" to enter the alarm record interface.

4. When the sterilization program is interrupted by a fault alarm, please make sure there is no pressure in the sterilizing chamber before subsequent operation.

■ Event record content

1. Event record: It displays the name of the sterilization program, as well as the time, temperature and pressure parameters within the cycle.

2. Press the "Up" or "Down" key to select the "Event record" option; when it is highlighted, click "Set" to view the event record, and click it again to turn the page; on the printing interface, namely the last page, through clicking "Set", the record can be printed. Press and hold the "Set" key for 3 seconds to return to the upper level.

Program interface

Operation for exposed devices (main interface during program running)
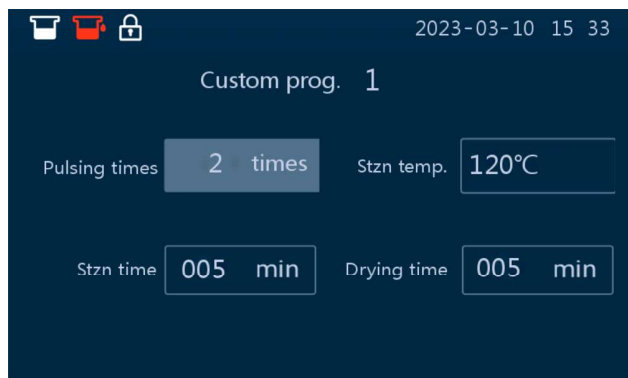
Custom program interface

Pressure display range：-101---300KPA。

■ Record interface

1. Press the "Up" or "Down" key on the home page to have the "Record" menu selected; when it is highlighted, click "Set" to enter the record interface; press the "Up" or "Down" key to select the alarm record or event record; when it is highlighted, click "Set" to enter.
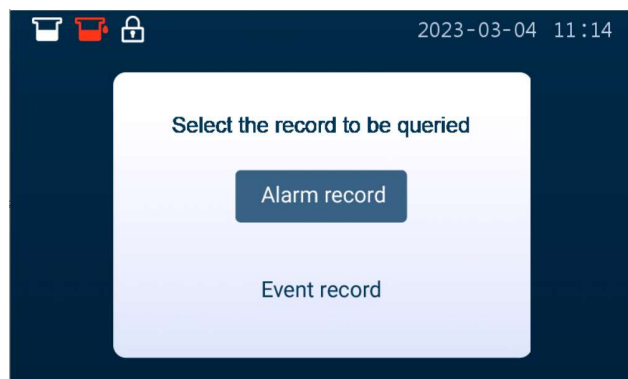
2. Press the "Up" or "Down" key to select the "Alarm record" option; when it is highlighted, click "Set" to enter the interface and view the alarm record.

Alarm record

■ Operation steps

Alarm record interface

Alarm content

	Alarm code	Alarm name
1	E01	Shortage/overflow of water in the tank
2	E02	Quit midway
3	E03	Cavity overpressure
4	E04	Door opening during sterilization
5	E05	Cavity wall overtemperature
6	E06	Heating up timeout
7	E07	Sterilization low-temperature
8	E08	Sterilization overtemperature
9	E09	Vacuuming timeout
10	E10	Too low or too high liquid level in the water storage tank
11	E11	High liquid level in the condensate water tank
12	E12	Printer not connected or lack of paper
13	E13	Door lock system fault