Labotronics



Ethylene Oxide Sterilizer

LB-10ETOS

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1. Safety Measures

Contraindications and precautions

1.1 Contraindications

- Ethylene oxide is toxic to the human body.
- Excessive inhalation can cause dizziness, headache, nausea, and vomiting.
- Ethylene oxide gas is flammable and explosive.
- When the concentration in the air exceeds 3%, it will burn and explode when exposed to open flames and static electricity.
- Therefore, when the sterilizer is operated, ensure that it is airtight and does not leak.
- Ventilation devices should be installed in the sterilizer installation room.

1.2 Matters needing attention

- The sterilizer should be installed in a well-ventilated special room with a room temperature of 10℃or higher, with a water source, power supply, and sewer.
- Smoking and opening flames are strictly prohibited.
- The gas should not be stored in the basement. Once the ethylene oxide gas leaks, it is not easy to diffuse and discharge.
- The room where the ethylene oxide sterilant gas tank is placed should have corresponding safety protection equipment and fire extinguishing agents (such as water mist, alcohol-resistant foam, dry powder, and carbon dioxide).
- The power supply is a dedicated circuit and has a reliable ground wire.
- The sterilizer should be placed steadily, connect the water inlet with the water source, connect the drain with the discharge equipment, and pay attention to sealing.

1.3 Handling of Emergencies

Handling in case of fire

1) **When the sterilant container leaks and causes a fire**
   - Evacuate people quickly, wear protective equipment, and use water spray, alcohol-resistant foam, dry powder, and carbon dioxide fire extinguishers to extinguish open flames.
   - If the leak cannot be stopped in time, you can let it burn.
   - If possible, move the ethylene oxide sterilant container from the fire scene to an open place.
2) **When the sterilizer catches fire**
   - If the fire originates from the sterilizer equipment, first cut off the power supply to the sterilizer before attempting to extinguish the fire to prevent further damage.
   - If the scene of a serious fire cannot be controlled, the crowd should be evacuated immediately.

1.4 Human body contact with ethylene oxide

1) **Acute inhalation**

Symptoms of poisoning: Respiratory tract irritation, dizziness, weakness, dizziness, vomiting, and symptoms of nerve poisoning.

First aid method: Quickly move to an area with fresh air, keep the airway clear, and seek medical attention immediately.

2) **Eye contact Ethylene**
   Symptoms of poisoning: Severe eye irritation and potential damage.
   First aid method: Immediately lift the eyelids and rinse thoroughly with plenty of running water or saline for at least 15 minutes, then seek medical attention immediately.
3) **Skin contact**
   Symptoms of Poisoning: Liquid ethylene oxide causes skin irritation, dermatitis, and blisters.
   First Aid Method: Remove contaminated clothing immediately, rinse the skinthoroughly with plenty of running water for at least 20 minutes, and seek medical attention immediately.
4) **Ingestion**
   Symptoms of Poisoning: Causes severe irritation and burns to the mucous membranesof the digestive tract.
   First Aid Method: Immediately notify a doctor or poison control center. If the person is conscious, induce vomiting after drinking water. Do not induce vomiting or give anything by mouth to an unconscious person.

1.5 Handling of items before sterilization

Preparation before sterilization

- Items requiring sterilization must undergo a thorough cleaning.
- Note that they should not be cleaned with saline.
- Ensure that sterilized items are free from water droplets or excessive moisture to prevent dilution and hydrolysis of ethylene oxide.
- Packaging materials suitable for ethylene oxide sterilization include paper, composite dialysis paper, cloth, non-woven fabrics, ventilated rigid containers, and polyethylene, among others.
- Packaging materials unsuitable for ethylene oxide sterilization include metal foil, Polyvinyl chloride, cellophane, nylon, polyester, polyvinylidene chloride, and impermeable polypropylene.
- Changes made to packaging materials should be verified to ensure the effectiveness of sterilization for the items.

1.6 Packaging requirements for sterilized items

1) **Preparation of items**
   - Choose a medical sterilization bag of suitable length, width, and size based on the size and shape of the items to be sterilized.
   - Avoid choosing bags that are too large to prevent folding, damage, and usability issues, or too small, which can lead to damage under negative pressure and result in sterilization failure.
   - Clean and dry items at room temperature before sterilization to prevent moisture that could dilute ethylene oxide and impact its effectiveness.

- Ensure there are no water droplets or excessive moisture on sterilized items to avoid dilution and hydrolysis of ethylene oxide, which could affect sterilization efficacy.
- Store clean items and packaging materials in a storage room with a relative humidity maintained between 40% and 60% to minimize contamination risks and maintain sterilization effectiveness.

2) Packaging of sterilized items

- Articles to be sterilized are typically packaged using paper and plastic, usually in single-layer configuration.
- For double-layer packaging, ensure the paper and plastic layers are oriented in the same direction, and do not fold the inner layer.
- The sealing width of the paper-plastic packaging bag should be at least 6mm to ensureproper sealing.
- Leave a blanking width outside the sealing of at least 1.5cm to maintain the integrity of the seal.
- Place equipment items in the paper-plastic packaging with approximately 2cm of spacearound them to facilitate effective sterilization
- Sharp equipment, such as scissors, should be provided with a protective cover within thepackaging to prevent damage.
- Remove as much air as possible from inside the packaging.
- Include a chemical indicator card.
- Clearly label the package with the name of the item, sterilization date, expiration date, and signature on the outside.

3) Placement of sterilized items

- Check packaged items to ensure they meet standards before consumption.
- Place items to be sterilized on the loading basket; ensure there are gaps vertically and horizontally, and they do not touch the cabinet walls.
- Ensure the sterilization chamber does not exceed 80% of its total volume.
- Occupying approximately 3/4 of the inner space of the ethylene oxide sterilization cabinet is appropriate.
- Follow principles of separating heavy and light objects: place heavy objects on the bottom layer and light objects on the upper layer.
- Load objects vertically without pressing or folding them.

Equipment identification description

Logo	Description
	Warnings and caution
	High voltage danger
	Ground wire
	Alternating current
	Risk of burns due to high temperature
	Direct current

2. Introduction

Ethylene Oxide Sterilizer LB-10ETOS is a table-top high-performance unit offers 50±3°C of sterilization temperature under -60 kPa working pressure for 23 L capacity. Features electric heating mode with automatic ventilation and full-automatic control system. Ergonomic design with ABS housing and 304 stainless-steel sterilization room, has LCD display for operating status. With sophisticated sensors and alarm system, this unit can store up to 500 pots of sterilization record.

3. Features

1. A table-top high-performance EO sterilizer based on gas diffusion
2. 50±3°C of sterilization temperature under -60 kPa working pressure
3. Electric heating mode with automatic ventilation ensures uniformity
4. Fully-automatic control system with one-click operation function
5. ABS housing and 304 stainless-steel sterilization room
6. LCD display for operating status monitoring and parameters settings
7. Sophisticated sensors for enhanced and accurate function
8. Storage capacity for up to 500 ports of sterilization record
9. Advanced alarm system for safe and reliable operation

4. Specifications

Model No.	LB-10ETOS
Type	Benchtop
Capacity	23 L
Heating mode	Electric heating
Sterilization temperature	50±3°C
Working pressure	-60 kPa
Highest anti-stress value	-140 kPa
Sterilization humidity	45 to 80%
Sterilization cycle	0 to 99 hr (Adjustable)
Ventilation cycle	Automatic, 5 cycles/15 min
Vacuum system	Oil-free vacuum pump
Alarm system	High temperature and ultra-low pressure
Heating system	Explosion-proof
Display	3.5-inch LCD display
Exterior Material	ABS plastic
Interior material	304 stainless steels
Door	304 stainless steel aluminum doors
Power supply	AC 220 V, 50 Hz
Power	3.3 kW
Exterior dimension (L×W×H)	730×510×410 mm
Chamber dimension (Φ×D)	246×450 mm
Packaging dimension (L×W×H)	820×570×520 mm
Net weight	56 kg
Gross weight	69 kg

5. Applications

Ethylene Oxide Sterilizer is used to sterilize medical equipment, veterinary supplies and bulk grain, to control diseases in honeycombs and honeybee equipment and across food and pharmaceutical industries to prevent spoilage.

6. Instrument Introduction

Introduction to operation buttons

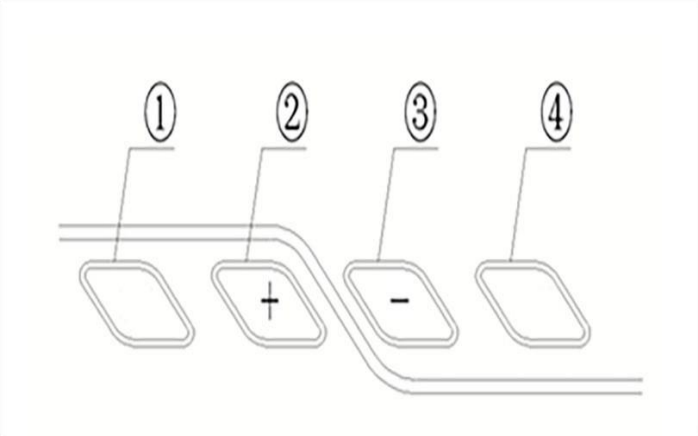


Figure-1

1. Confirm the selected content or shift the value option.
2. +Shift left or add operation to the value.
3. -shift right or subtract the value.
4. Return to the previous level of the selected content;

7. Installation

7.1 Appearance and Installation

7.1.1 Overview of the appearance of ethylene oxide sterilizer

The appearance of the sterilizer is shown in the figures below as the main component names and functions are shown in the table below:

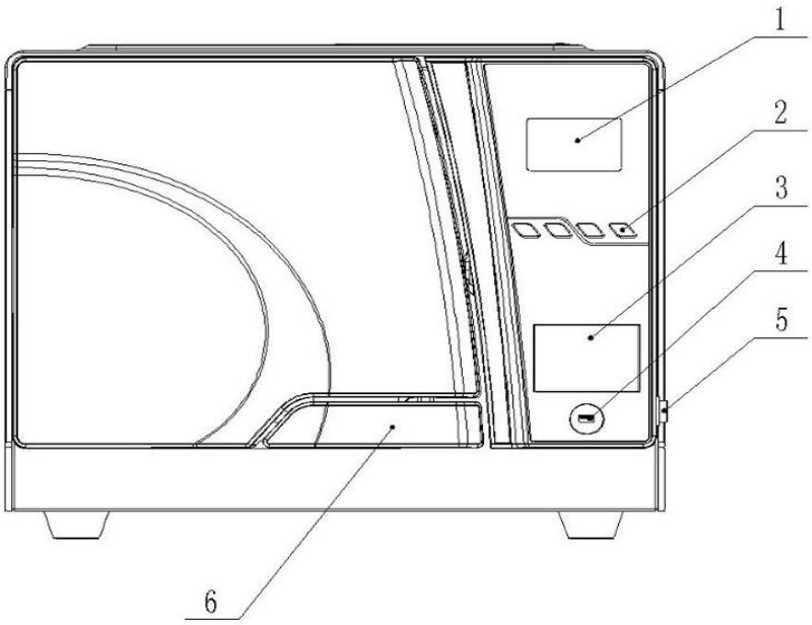


Figure-2

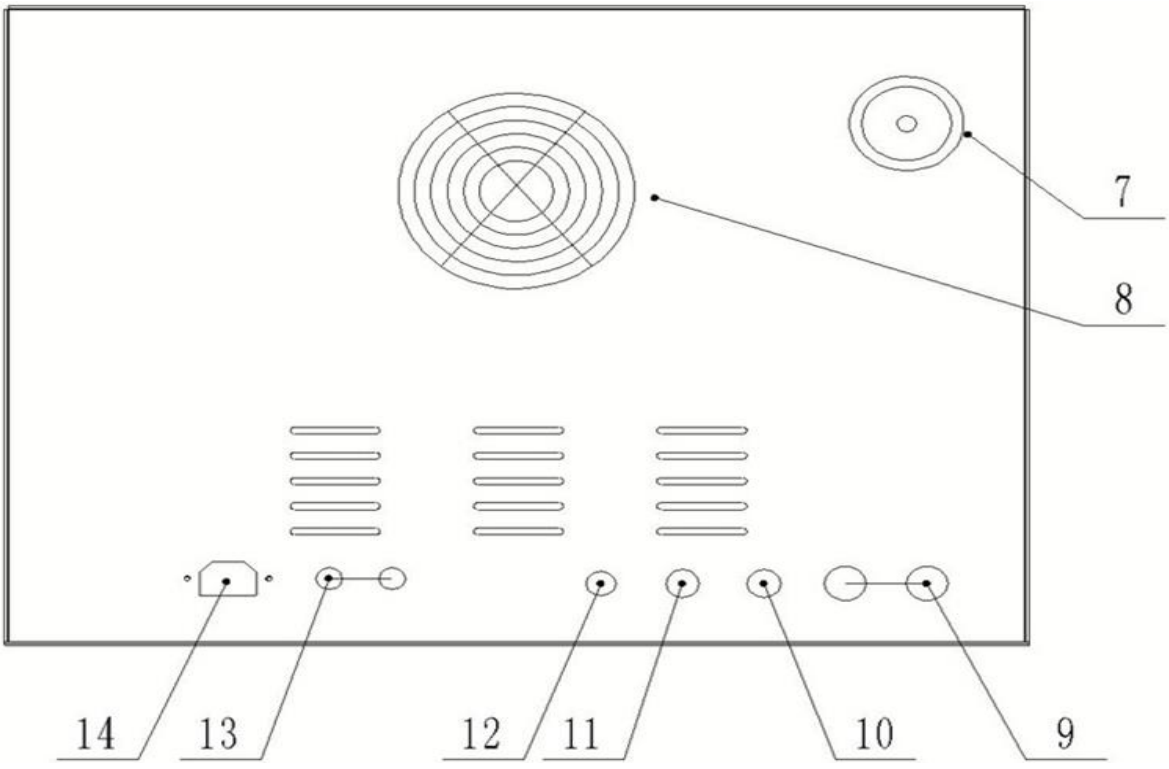


Figure-3



Figure-4

Item	Name	Function
1	Display screen	Display the working process and process parameters of the sterilizer.
2	Operation buttons	Operate and control the sterilizer
3	printer	Print some process information in theworking process of the sterilizer
4	USB interface	Sterilizer program upgrade entrance,sterilization history data transmission interface, and U disk can be inserted.
5	Switch button	Control the startup and shutdown of thesterilizer
6	Switch doorhandle	Open or close the door of the sterilizer
7	air filter	Purifying air
8	Cooling fan	Increase the air circulation inside the sterilizer to dissipate heat from thesterilizer
9	Exhaust port	Drain the filtered water generated during the operation of the vacuumpump
10	Decomposition tank drain	Drain the water in the decompositiontank
11	Pure water tank drain	Drain the water from the pure water tank
12	Decomposition tank water inlet	Add water to the decomposition tank
13	Fuse set	Overcurrent protection for the sterilizer

14	Power cord socket	Sterilizer equipment power supply interface
15	Radiator cap	Pure water tank cover
16	The water tank cover switch button	Press the button down and pull the lid of the water tank upward at the sametime to open.

Warning:

- This equipment must be installed by trained and qualified professional installers.
- Installation by inexperienced or unqualified personnel can result in personal injury or equipment damage.

7.2 Installation requirements

1) **Energy demand**
   - All input and output connections are fixed connections.
   - **Power supply:** 220V/50HZ, 20A (reliable grounding is required)
2) **Environmental requirements**
   - **Ambient temperature:** +5℃～+40℃
   - **Relative humidity:** no more than 85%
   - **Atmospheric pressure:** 70kPa～105kPa
3) **Installation space requirements**
   The sterilizer should be placed in a separate sterilization room to ensure safe operation.
   - The distance between the left, right, and rear ends of the sterilizer and the wall should be atleast 0.5 meters to allow for maintenance.
   - The distance between the front end of the sterilizer and the wall should be at least 1.5 times the total length of the equipment.
4) **Room ventilation requirements**
   The room where the ethylene oxide sterilizer is installed should be well-ventilated and equipped with an appropriate exhaust fan and ventilation system to ensure 10 air exchanges per hour.
5) The installation environment is illustrated in the schematic diagram shown in the figure below.



Figure-5

7.3 Install equipment

7.3.1 Unboxing

1) Before unpacking, check the outer packing box for any damage.
2) Open the outer packing box in a flat-open area.
3) Check whether the equipment, accessories, and accompanying documents are complete according to the packing list.
4) Remove the connection between the equipment and the base of the packing box.
5) Move the equipment from the base of the packing box to a level ground.

7.3.2 Fixed Equipment

Move the equipment to the installation position and ensure it is stable. The four-foot pads of the equipment should be evenly balanced.

7.3.3 Pipeline connection

1) Connection of water source and water inlet of sterilizer.
   - An overhaul valve should be installed between the water source and the equipment to facilitate future maintenance of the sterilizer.
   - Ensure the remnant discharge portand the discharge pipeline are firmly and reliably connected.
   - The installation diagram is shown in the figure below:

2) Check the water source status of the water storage tank.

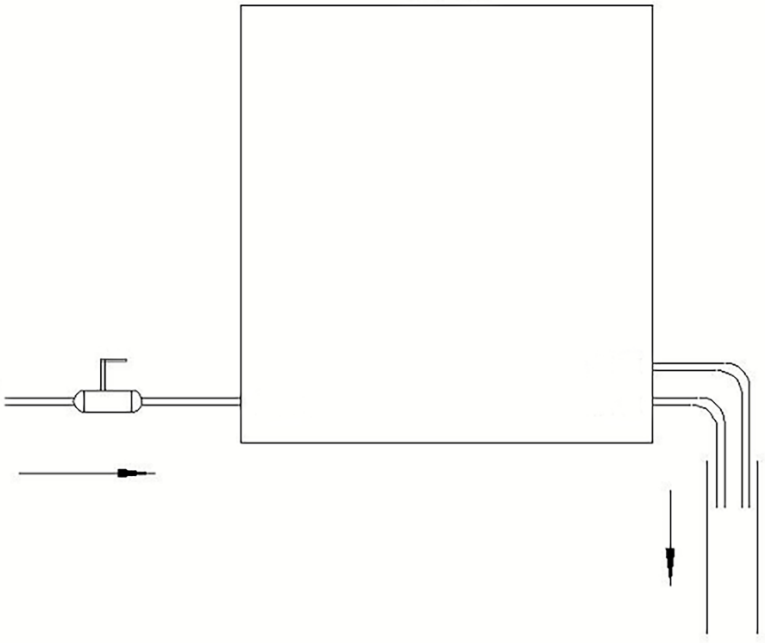


Figure-6

3) When the water level in the storage tank is insufficient, the alarm message "**The water levelis too low**" will be displayed during the equipment's self-check, and the buzzer will emit a"didi" sound. In this case, add water to the storage tank to ensure the effectiveness of the sterilization process.

7.3.4 The filling procedure is as follows:

- The water-filling position is at the top of the sterilizer. Press the water-filling coverswitch and open it.
- Use a measuring cup to pour distilled water into the storage tank. The alarm soundwill disappear when the water level exceeds the minimum required by the sterilizer.
- Continue adding water until the high-water level is reached (indicated by a high-water level warning sound).
- When the tank is full, stop filling, and securely close and tighten the filling cap.



Figure-7

7.3.5 Electrical Installation

- Install a power switch box on the wall behind or on either side of the device.
- This boxmust include a main air switch circuit breaker and an overcurrent protection device to manage the power supply and protect against over-current.
- The power switch box should be located close to the equipment and easily accessible to the operator. It mustbe dedicated to the ethylene oxide sterilizer.
- To ensure safety for both personnel and equipment, ensure the equipment's ground wire is securely connected to the ground wire in the power switch box.
- Connect the equipment wire to the 220V power supply, and carefully check the reliability of the power supply wiring.

Note: The ground wire of the equipment must be reliably grounded.

8. Operations

8.1 Training

Ethylene oxide

1) Ethylene Oxide (EO) is a small molecule with a three-membered ring structure that is unstable, highly penetrative, and chemically active. It is a colorless, transparent liquid at4°C, with a density of 0.884 g/mL, a boiling point of 10.8°C, and an aromatic ether odor.
2) Ethylene oxide is miscible with water in any proportion and dissolves in organic solventsand greases.
3) It is both flammable and explosive; when its concentration in the air rangesfrom 3% to 80%, it can form explosive mixtures and may ignite or explode upon contactwith an open flame.
4) Ethylene oxide is chemically reactive and can undergo a reaction when in contact with a catalyst.
5) This reaction is accelerated by increased temperature, pressure, and water volume, leading to the formation of a yellow, viscous substance that can block pipelines and impair the sterilization process.
6) Ethylene oxide can be harmful to humans through direct contact or inhalation.
7) The gas can irritate the respiratory tract. Protective measures should be used during sterilization.
8) If ethylene oxide liquid meets your skin or eyes, immediately rinse with running water and seek medical attention.

8.2 Equipment operator training

1) After the installation of the ethylene oxide sterilizer is completed, maintenance personnel on the performance, operation methods, sterilant characteristics, and safety of the equipment.
2) Only trained qualifiedpersonnel can operate and maintain the equipment.
3) The user of the ethylene oxide sterilizer shall conduct regular training for the use and maintenance personnel of the equipment and keep records of their studies and test results.

8.3 Introduction to the operation screen

8.3.1 Equipment self-inspection

After starting up, the equipment will perform a self-check to check whether the various parameters of the sterilization process are normal, as shown in figure.

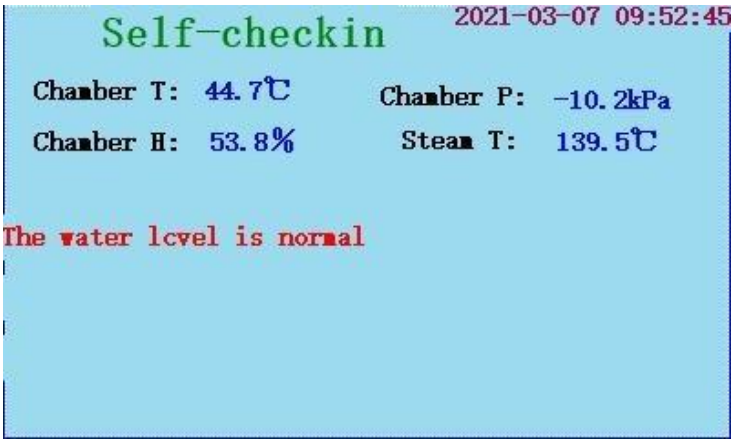


Figure-8

8.3.2 Main page

The main page displays key information and operation buttons for the system. Users can usethe buttons at the bottom of the screen to navigate to the relevant operation pages. The mainpage is illustrated in the figure.



Figure-9

8.3.3 Sterilization Operation

Select "**Sterilization Run"** and click the "**Confirm**" button to access the standard sterilizationmode working screen, as shown in the figure. Click the "**Confirm**" button again to display the sterilization running status. To stop the sterilization operation, press and hold the "**OK**"button for 5 seconds.



Figure-10

8.3.4 Parameter setting interface

The parameter setting screen is shown in the figure. The "**system parameter**" settings should be adjusted only by professional technicians. This menu is specifically designed for technicians to modify certain process parameters of the equipment. Non-professionals should operate this menu only under the guidance of a qualified technician. Details of this operation will not be covered here.



Figure-11

8.3.5 Sterilization parameters

Different sterilization items require different sterilization times, which can be set in the "sterilization parameters" menu. While the sterilization time parameters can be customized, other parameters are optimized during factory testing. The company is not responsible for any adverse consequences resulting from modifications to these parameters.



Figure-12

8.3.6 Time setting

The display time of the sterilizer is regulated by the internal clock chip of the controller. Over time, this internal clock chip may deviate from the standard time. For applications requiring precise time accuracy, you should manually check and adjust the time using the "time setting" menu. Adjustments can be made by selecting the time option and using the "+" and "-" buttons.

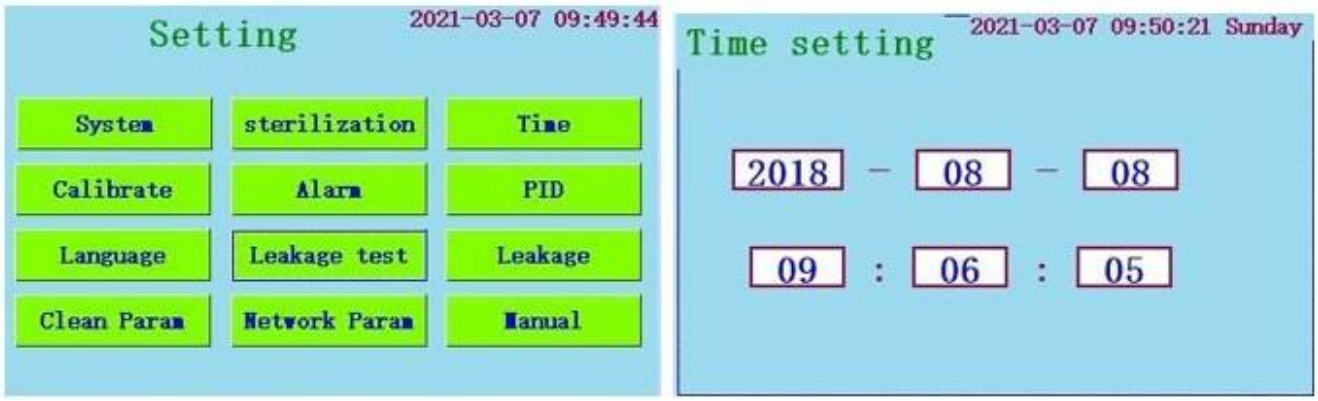


Figure-13

8.3.7 Leak test

If the equipment has not been used for an extended period or after one month of operation, it is recommended to perform a leak test to ensure the equipment's leak-tightness. This helps ensure safer operation.

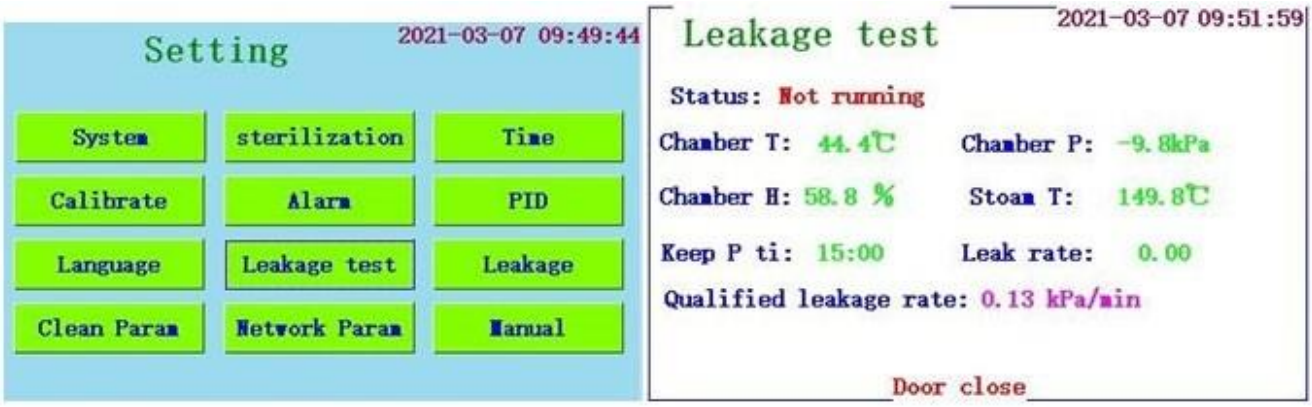


Figure-14

8.3.1 Manual Operation

When the sterilization chamber is under negative pressure, the door cannot be opened. In this situation, use the "manual operation" mode and select "**intake valve**" followed by "**confirm**" to open the valve. This allows outside air to enter the chamber, balancing the pressure inside and outside. Once the pressures are equalized, you can manually open the door of the sterilization chamber.



Figure-15

8.3.2 Historical data

1) The historical data menu records and saves critical information from each stage of the sterilizer's operation, including sterilization time, number of sterilization cycles, temperature, pressure, and humidity. This data aids in analyzing and researching the sterilizer's performance. The screen is shown in the figure.

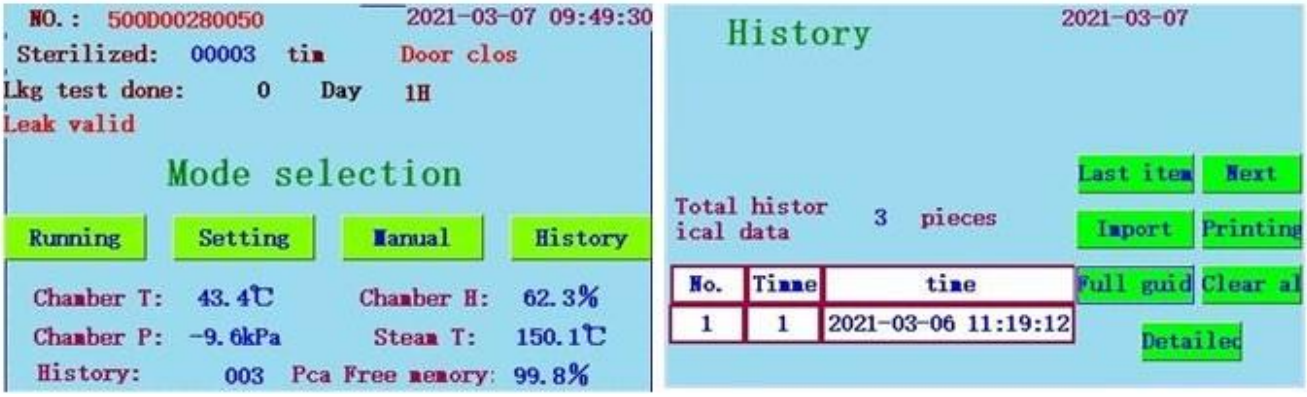


Figure-16

2) Use the "**Confirm**," "**Previous**," and "**Next**" buttons to select the desired cooking times.The "**Confirm**" and "**Import U Disk**" buttons will import the sterilization records of theselected pots to the U disk. The "**Confirm**" and "**Full Guide U Disk**" buttons will import the sterilization records of all pots to the U disk. The data is saved in CSV file format. The "**Confirm**" and "**Detailed View**" buttons allow you to view the sterilization processrecord for the selected pot. The "**Confirm**" and "**Print**" buttons enable you to print thesterilization records for the selected pot. The "**Confirm**" and "**Clear All**" buttons will delete all sterilization data for the pots.

8.4 How to use

1) Check whether the connections of the water-adding and draining pipelines are firm.
2) Check whether there is pure water in the pure water tank.
3) Open the door of the sterilization cabinet and observe whether the sterilization room is clean. It is forbidden to carry foreign objects for sterilization.
4) The fully opened state of the door is about 100 degrees. When there is obvious resistance in the process of opening the door, do not continue to open it with force to avoid damage to the door.
5) Put the ethylene oxide aerosol canister into the storage position of the dosing canin the sterilization room and place the dosing can according to the instructions ofthe aerosol can.
6) Check whether the drain connector is in the closed state, if it is in the open state,users need to manually tighten the knob to make it in the closed state.
7) Pack the sterilized items in a medical packaging bag (guarantee the sterilized item's shelf life for 2 years) and put an EO indicator card in the bag for checkingafter sterilization.
8) Seal the packaging bag and place it loosely on the carrier. Sterilized items occupy 80% of the space in the sterilization chamber.
9) Check if there are any omissions in the above operations and close the door after confirming that it is correct.
10) Turn on the power switch after turning on the power, enter the operation interface, and select "**Sterilization Operation**".
11) Then enter the "standard sterilization mode", click the "**confirm**" button at the bottom of the screen again, and the equipment will begin to sterilize.
12) After sterilization, the printer prints thedata for each stage of the entire sterilization process.

13) Open the sterilizer door and take out the sterilized items for natural analysis; takeout the aerosol cans in the sterilization chamber, check whether the aerosol cansare effectively punctured, and put the discarded aerosol cans for proper disposal.
14) Wait a few minutes to allow the air in the sterilization chamber to convection withthe outside air, and then close the sterilization chamber door.
15) After all the work iscompleted, turn off the power, turn off the water source, and complete the entiresterilization process.
16) According to the special needs of the items to be sterilized, the machine can set the corresponding parameters arbitrarily, but this setting needs to be approved by professional and technical personnel before it can be set.

⚠ **Note**:

- After the sterilization of the sterilizer is completed, if the operator does not open the door to fetch the material within 15 minutes, the vacuum system will automatically operate. Pump the sterilization chamber to set negative pressure.
- If users need to openthe door to take things, users need to select the "manual operation" mode, open the "**intake valve**" to balance the pressure inside and outside the sterilization chamber, and then open the door to take things
- After the equipment is filled with ethylene oxide, it is strictly forbidden to open the sterilization chamber door, which is likely to cause leakage accidents.

8.5 Power-off memory function

This machine has a power-off memory function, and the sterilizer is unexpectedly shut down due to power-off or other conditions during the sterilization process. After powering on, the device will automatically remember the working status when it is turned off. The sterilizer will prompt users to continue the last run, the "Confirm" "Yes" button to continue the last run program; "Confirm" "No" button, the system entersthe main page.

8. Maintenance

8.1 Daily Maintenance

Sterilizer cleaning

1) Kindly disconnect the power supply of the sterilizer before cleaning.
2) Use a clean, soft cloth to wipe the surface of the equipment and do not use strengthening agents or detergents.
3) Do not allow water or cleaning solutions to penetrate the sterilization room and display screen.
4) When cleaning the interior of the sterilization chamber, please do not use abrasive materials or abrasive tools to clean the door of the sterilization chamber. When sealing, the sterilization chamber door is pressed tightly on the sealing ring.
5) Theflatness of the sterilization chamber door will affect the sealing effect. Do not use rough cleaning tools such as wire brushes to clean the sterilization chamber door.

Replace the printing paper

Follow the steps below to replace the printing paper:

1) Open the printer box cover on the control panel.
2) Put the new printing paper into the printer box, paying attention to the glossy side of the paper facing up.
3) Pull the leading end of the printing paper out of the printer about 50mm, close the printer's box cover, press the test button on the upper right side of the printer, and observe whether the printing paper feeds smoothly.
4) Reposition the printing paper; if the paper feeds smoothly, the printingpaper is placed in the correct position. The paper replacement is complete.

9. Troubleshooting

9.1 Faults and Troubleshooting methods

Item	Failure phenomenon	cause
1.	The display does not light upafter turning on the power.	1) There is no electricity.
		2) The fuse is burned out.
		3) The power plug is connected.
2.	The printer does not print.	1) No printing paper.
		2) The printing paper is loaded.
		3) The printer power is not
		4) Printer communication line
		5) Printer failure
3.	Print overlap.	1) The printing paper is not
		2) The printer cover is not
		3) No standard printing paper
		4) The printer paper roll is not
		5) Printer failure
4.	The door cannot be opened after sterilization.	There is negative pressure on the door.

9.2 Alarm and Troubleshooting Methods

Item	Information	Reason/ Explanation
1.	Unqualified water	Unqualified water quality after adding pure water.
2.	The temperature of the inner tank is too high.	Temperature sensor failure or loosewiring.
		The inner tank high-temperature alarmtemperature value is set too low.
		Control system failure.
3.	Vacuum time out	Vacuum pump failure.
		Sterilizer leak.
		The sterilizer door is not closed.
4.	Inner pressure is too high	Pressure sensor failure.
		Control system failure.
		The inner tank high-pressure alarmpressure value is set too low
5.	The steam generator temperature is too high	The steam generator temperature is toohigh, and the alarm value is set to too low
		Steam generator heating failure
6.	The sterilization temperature is too low	Heating failure
		The sterilization temperature is too low, and the alarm value is set too high
7.		Humidification failure

	Sterilization humidity is too low	Sterilization humidity is too low alarm value is set too high
8.	The water level is too low	No pure water
		Detect water sensor failure
9.	The leak rate is too high	Sterilizer leak
		The sterilizer door is not closed
10.	The door is not closed	Detect door sensor failure