



Vertical Autoclave

FM-VA-B300

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1. Safety Measures




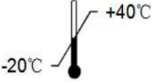









Alarm: To ensure the safe use of the device, read the users' manual carefully before using, each operating step should follow the manual informed as below, or the dis-operation would cause damage and danger.

The manual introduces the operation steps. Read the "**MANUAL**" carefully before the operation to ensure safety.

1.1 Explanation of Symbols

Some symbols and codes are used on the sterilizer's shell in this manual or on the outer carton instead of the text description. The explanation is as follows:

Symbols	Instruction
	Fragile items (the transport package containing fragile items, handling with care)
	Keep Up (the transport package should be straight up during transport)
	Avoid wet (the transport packages should be kept dry)
	Temperature limit (the temperature range during the transport package should be maintained)
	Alternating current.
	Protective grounding/ (Protection conductor terminal)
	Disconnect (the main power supply) / cut (power)
	Switch on (main power) / connect (power)
	Caution, shock hazard / (electricity danger)
	Caution scalds.
	Be careful, Dangerous / (NOTE! See random file)
PT/TT	Pressure/temperature test.

1.2 Safety Instructions

- 1) Read this manual carefully and understand the requirements of all warnings and cautions before using. The users **MUST** check the safety performance of the sterilizer and check if the sterilizer is in good working condition before using it.
- 2) The sterilizer should be used according to the scope of application, use method, and precautions specified in the manual. Otherwise, the unit might be damaged or the sterilization may fail.
- 3) There are some safety protection features equipped with the unit to prevent operators from injury and protect equipment from damage. The operators should understand each step before starting to use it.
- 4) Requirements for the operator: The operator must be trained to be aware of the equipment's performance characteristics, working principles, and on-site operation, and have a certain knowledge of the sterilization process. Before the operation, this manual must have been carefully read and understood.
- 5) **Requirements for the maintenance person:** The maintenance person should have corresponding qualifications, professional repair capabilities and familiar experience.
- 6) This equipment is classified as a type I pressure vessel. During the use, the relevant provisions of the National Pressure Vessel Regulations should be observed. The responsible person should be identified to ensure the safe and correct use of the equipment.
- 7) In the process of designing and manufacturing, we have fully considered the safe use of the product, but the operator still has to check and observe the working status constantly while the equipment is running.
- 8) The connection between the user's network power supply and the power supply should meet the relevant requirements of the national electrical safety standards.
- 9) The voltage fluctuation exceeds 10%, the equipment cannot work properly.
- 10) The sterilizer complies with "Electromagnetic Compatibility Requirements of Measurement and Controlling for Laboratory Use Electrical Equipment, Part 1: General Requirements."
- 11) Ensure an EMC environment for the normal running of the equipment. The sterilizer meets the design and test of Class A equipment. Don't use this sterilizer next to a strong radiation source (e.g: unshielded RF) as it may affect normal working. It is suggested that the user evaluate the electromagnetic environment primarily to ensure the sterilizer working normally.
- 12) In accordance with the relevant provisions of national and industrial laws and regulations, this equipment is designed and manufactured in accordance with the relevant requirements, and this equipment meets the relevant safety requirements.
- 13) The replacement of the door gasket is determined according to the frequency of use, the rate of natural aging, and the conditions of cleaning, disinfection, and sterilization. If no damage occurs, the door seals can continue to be used, or they should be replaced in time.
- 14) The equipment should be used within the specified service life, the overdue use may bring certain safety risks. Due to the aging of the equipment and accessories, there might be some safety risks and hidden dangers at the tail of the service life.

- 15) Therefore, the equipment safety should be checked every time before use, and the broken spares should be replaced if necessary.
- 16) The disposal of the accessories of this equipment and equipment itself after the service life shall be conducted by the relevant regulations of the national and regional environmental protection, and it shall be avoided to pollute the environment or create safety hazards.
- 17) The quality of the water source should meet the requirements. The Safety valves should be regularly tested according to the relevant national regulations.
- 18) The user **“MUST”** disconnect the device before installing a fuse or performing electrical repairs. The fuse for replacement should be with a suitable current value. The model, specifications, and current values should comply with the specifications of this manual.
- 19) Confirm the device circuit switch status before operating on it. If a malfunction happens, the device's main power switch should be immediately disconnected.
- 20) To ensure safety and avoid electric shock, ensure that the equipment is properly grounded. Do not modify the ground interconnection wire inside or outside the equipment or remove the wiring of the grounding protection terminal. Or the protection function of the equipment fails and causes a shock hazard.
- 21) The user's **“MUST”** pay attention and stay away from the area with a hot-proof mark, and the exhaust port of the device to avoid burns.

1.3 Safety Features

1) Over-heat protection

If there is no water or water shortage during the cycles, it will cut off the power directly, and disconnect the power supply in the meantime. Don't open the cover till the pressure inside is zero, then add the water and close the cover, and screw the tightened bolts accordingly. Then turn on the power switch, till the high level indicating the lamp is on, and the sterilizing can proceed.

2) Over-voltage protection

If the power supply voltage is >AC280V, the over-voltage indicator lights will be on and the sterilizer will automatically cut off the power. Turn off the power and check the power network is normal (AC220V) before restarting.

2. Introduction

Vertical Autoclave FM-VA-B300 is a microcomputer-controlled sterilizer that generates high-pressure steam for efficient sterilization. It is crafted with high-quality stainless steel for corrosion resistance and easy maintenance. This offers boiling disinfection at low temperatures or rapid cooling pressure sterilization at higher temperatures for thorough sterilization. Our vertical autoclave includes a counter-pressure mechanism to preserve sample integrity.

3. Features

- ✓ Built-in printer
- ✓ Utilizes F0 cycle
- ✓ Inbuilt steam generation
- ✓ Integrated dry-burn protection
- ✓ Includes current overload safety system

4. Specifications

Model No.	FM-VA-B300
Capacity	100 L
Chamber Dimensions	Ø 440 × 650 mm
Working Temperature	134°C
Maximum Working Pressure	0.22 Mpa
Temperature Range	105 to 134°C
Timer Range	0 to 99min
Safety Features	Safety interlock protection, Automatic heating power cut-off
Power Consumption	4.5 KW
Power Supply	AC220V 50HZ
Dimensions	580 × 560 × 1060 mm
Packaging Dimensions	640 × 640 × 1170 mm
Net Weight	73 Kg
Gross Weight	95 Kg

5. Applications

Vertical Autoclave FM-VA-B300 is used for the sterilization of food packaging, utensils, and instruments, and is ideal for microbial decontamination and sterility testing in food research laboratories, pharmaceutical labs, clinical settings, and microbiological research facilities.

6. Instrument Introduction

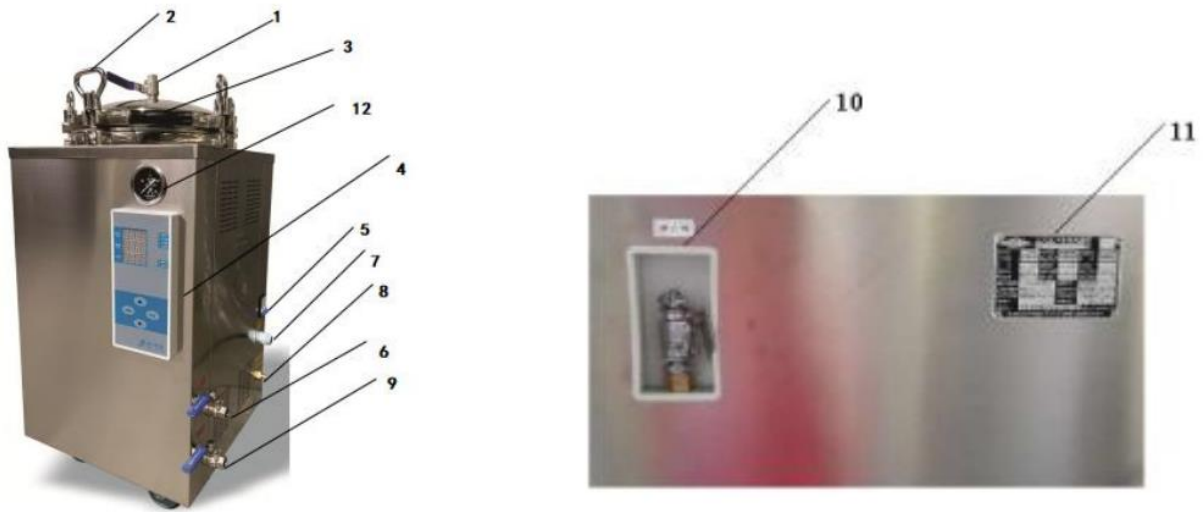


Figure-1

1. Water inlet tap
2. Ring head bolt
3. Control board
4. Breaker switch
5. Air inlet
6. Power cord

7. Exhaust port
8. Water outlet
9. Safety valve
10. Nameplate
11. Pressure range

7. Installation

7.1 The Preparation Before Operations

1) Equipment Placement

- The equipment should be placed on a flat surface.
- The equipment should be kept at a certain distance from the wall, 30 cm from the left wall, 20 cm from the back wall, and 80 cm from the right wall.
- DO NOT place the steam vent of the safety valve too close to the power outlet, and DO NOT be blocked by anything.

2) Power Connection

- **Power requirements:** Single-phase AC 220V \pm 10%, 50Hz.
- The equipment “**MUST**” be reliably grounded. If the outlet does not have a ground end, the equipment must be grounded with a separate grounding conductor before connecting the power.

Warning:

- The power cord must be connected to the power switch for only use. Do not twist or pull the power cord, which might cause damage and looseness to the wires, and bring fire hazard or electric shock.
- The equipment must be grounded reliably. Do not connect the ground wire to plastic pipes, gas pipes, water pipes, etc.

7.2 The Preparation Before Using

- 1) Check if the power supply parameters are consistent with product requirements.
- 2) After piling the items, place them on a sieve plate sequentially, and leave some appropriate gaps between the packages.

7.3 Normal Working Conditions

- 1) **Ambient temperature:** +5°C~+40°C
- 2) **Relative humidity:** \leq 8
- 3) **Atmospheric pressure:** 70kPa~106 kPa
- 4) **Power supply:** AC220V \pm 22V,50Hz \pm 1Hz (All the grounding wires should meet the requirements).
- 5) **Water resource pressure:** 0.15 ~0. 2 5MPa
- 6) **Air pressure:** 0.24 MPa

7.4 Storage Conditions

- 1) **Ambient temperature:** -10~50°C
- 2) **Relative humidity:** 10%~90%
- 3) **Atmospheric pressure range:** 50~106kpa
- 4) The sterilizer is equipped with a safety valve, which would automatically release when the pressure exceeds 0.25mpa, and the power supply would directly be cut off while the temperature exceeds 140°C. Also with over-current loading protection, safe and reliable.

8. Working Principle

This product is designed for two kinds; **disinfection and sterilization**: Direct heating produces pressured steam. Then the pressure steam acts on the microorganisms to destroy their structure and then achieve sterilization purposes. For the rapid cooling and sterilization procedure, first need to inject 6 liters of tap water into the chamber, and then heat it for about 25 minutes to proceed with the sterilization at meanwhile the temperature inside is maintained. The sterilization time is 35-40 minutes. After the completion, 0.24MPa-compressed air is manually injected into the chamber, and then the drain valve is 1/2 opened for drainage, for those soft packages are counter-pressured and cooled. Quickly cooling for 3 minutes, manually turn off the entering of the compressed air and tap water, the temperature of the objects in the chamber can be lowered to 30 to 40 °C.

9. Operations

9.1 Operation Instructions

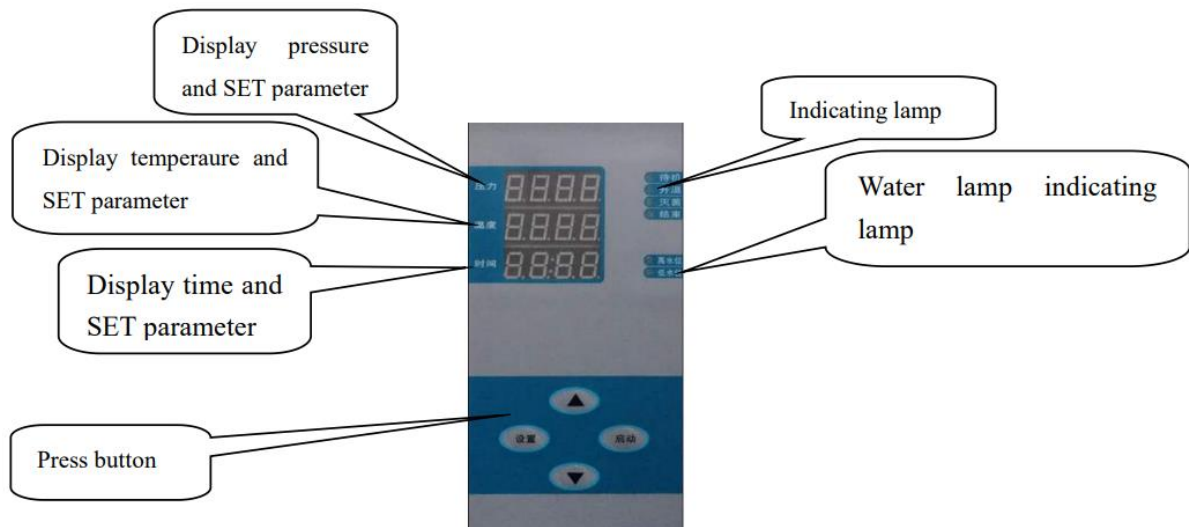


Figure-2

9.2 Operation and Display

1) Button

- **“SET”**: Sterilizing temperature/sterilizing time/parameter setting or inquiry. For setting the Sterilizing temperature (115 to 134 °C) /sterilizing time (0 to 99), for checking the parameter.
- **“▲”**: Increase (+)
To increase the parameter, and reset during working.
- **“▼”**: Decrease (-)
To decrease the parameter, and reset during working.
- **“START”**: To start the cycle.

2) Display Instruction

- **Nixie tube (upper)**: Display pressure (Kpa)
- **Nixie tube (middle)**: Display temperature (°C)
- **Nixie tube (down)**: Display time (min)
- **Cycle**: Indicating each step of the sterilizing, including, stand-by lamp, heating lamp, sterilizing lamp, and end lamp.
- **Water level**: Indicating present water level, including high-level and low level lamps. If the water level is between high and low, then the low-level lamp will flash.

3) Other Instruction

- **Break switch**: The lower side of the sterilizer, which is used during the equipment is under standby status.
- **Drain knob**: The lower part of the sterilizer, which is used for the discharge of water from the container.

9.3 Parameter Setting

In the standby state (i.e, the standby indicator is on), press the SET button, the 2nd nixie tube flashes to set the sterilization temperature, press “▲”, “▼” to modify the parameter, and then press SET again, the 3rd nixie tube flashes to set the sterilization time. Press “▲”, “▼” to modify the parameter. Press the SET button again, and the 1st nixie tube flashes, which shows whether the steam is exhausted at the end of sterilization, press “▲” or “▼” to modify whether to exhaust or not, then press the Set button to save the set parameters.

Parameter	Minimum	Maximum	Default	Marks
Sterilizing temperature	105°C	134°C	132°C	
Sterilizing time	0	5999mins	30mins	
Exhausting	0	1	1	0-no exhausting, 1-exhausting

In the standby state, continuously press the five times ▼ button to set the parameter, the following table shows the info will be displayed, the content with black on is invalid, the pressure window will show numbers, and the temperature window will show the setting figures, press START button, the item number would scroll.

Item	Parameter	Minimum	Maximum	Default	Marks
1.	The time of water inlet in the chamber.	0	999	75 Sec	
2.	Drainage temperature.	100	110	103°C	
3.	Drainage time.	0	5	1 sec	
4.	Drainage cycle.	0	180	60 sec	
5.	The second of exhausting cold air.	0	500	120 sec	
6.	The interval of exhausting cold air.	0	600	120 sec	
7.	Dry option after sterilizing the end.	0	1	1	0-no drying, 1-drying
8.	Exhausting option after the sterilizing end.	0	1	1	0-no exhausting, 1-exhausting
9.	Print type.	0	1	0	0-single time, 1-continuous
10.	Language option.	0	1	0	1-English
11.	Print with LOGO.	0	1	1	0-No print, 1-Print LOGO
12.	Drying type.	0	1	1	0-direct dry, 1-open to dry
13.	The temperature of the exhausting valve.	90	105	102°C	
14.	The interval time of the printing.	1	600	10 sec	
15.	Time exceeding for temperature and pressure raising.	10	600	90 min	

Vertical Autoclave FM-VA-B300

16.	Time exceeding of pressure releasing.	1	20	10 mins	
17.	Exceeding time for water inlet.	1	100	10	
18.	The way of exhausting.	0	2	0	0-no exhausting, 1- slow exhausting, 2-fast exhausting
19.	Retain.	0	0	0	
20.	Pressure compensation.	-20.0	20.0	0KPa	
21.	Temperature compensation.	-20.0	20.0	0°C	
22.	If with a Pressure sensor.	0	1	1	0-no, 1-yes
23.	Type.	0	5	0	0-vertical mechanical type

Long time press the “**START**” button for emergency stop.

9.4 Instructions for the sterilizing procedure

- 1) **Working procedures:** Adding water → stacking → sealing → starting → heating (automatic replacement of cold air) → sterilization → sterilization end → back pressure, cooling → end.
- 2) **Add water:** Open the sterilizer cover, take out the baskets, and inject clean water into the sterilization chamber. The water level should exceed the top of the water level indicators, during the sterilization process, the water will gradually evaporate and the water level will decrease, so the water should be added according.
- 3) **Stacking:** The items to be sterilized are placed on the sieve plate of the basket sequentially, and appropriate space must be left between the bags.
- 4) **Sealing:** Put the baskets into the chamber, then close it, and screw the tightened bolts between relative positions one by one, don't be too much tight or the gaskets might be damaged.
- 5) **Start:** Press the “**Start**” button, the sterilizer enters the “**HEAT**” state, it will automatically discharge cold air during the process.
- 6) **Sterilizing end:** If the sterilization time is reduced to "0", it would alarm 30 seconds to tell the end, the automatic exhaust function is blocked.
- 7) **Count pressure and cooling:** After the sterilization is finished, the buzzer sounds, turn off the power switch, manually open the inlet valve, open the intake valve (=0.24Mpa compressed air), and then open the drain valve at 1/2 position for drainage. Manually close the inlet valve and intake valve after 3 minutes of rapid cooling. The cover can be opened when the gauge pointer returns to zero.
- 8) **End:** Count pressure and cooling are finished, the pressure gauge is back to zero, then the container cover is opened.

ATTENTION: PAY ATTENTION TO THE DRAINAGE PIPE, WHICH SHOULD BE FIXED IN POSITION, TO PREVENT THE SCALDING.

9.5 Alarm

- 1) In case of safety valve failure, the pressure exceeds 0.25MPa and it does not release the steam, and the pressure continues to rise, “**MUST**” cut off the power on time.
- 2) The warning mark on the product is affixed to the top of the power switch on the back side of the product.
- 3) Don't use it if the following three conditions cannot be satisfied, or we cannot guarantee the quality and are out of responsibility for the hazard may cause.
 - **Power:** single-phase AC220V, 50Hz grounding is reliable.
 - **Water source:** 0.15 to 0.25 Mpa.
 - **Compressed air:** 0.24 Mpa constant voltage. A pressure reducer and a water separator should be installed to leave the equipment about 1 meter away.
- 4) Wrap the raw tape around the threads of each pipe joint.
- 5) Secure the valve with a spanner wrench and secure the pipe joint to the valve with another adjustable wrench. Insert the equipped plastic tube into the joint.

10. Maintenance

Alarm: The operator should observe the relevant provision of The Regulation on Safety Inspection of Special Equipment and Inspection Procedure For Pressure Vessel In use.

- 1) The operator should read carefully this manual before using it, should have the operation knowledge and intensify the sense of responsibility, and strictly operate the unit according to the steps of the manual said the is required to do the maintenance below, to ensure the unit is in good condition and normally running, to prevent the accident from happening.
- 2) Ensure there is enough water in the container, keep the water at a high level and the corresponding lamp is always on. **NOTE:** Over much water would affect the drying of the textile.
- 3) Before the heating, **"MUST"** strictly follow the provision to eliminate the cold air from the container, or the sterilizing result will be affected.
- 4) Every day after sterilizing, drain the water from the container. Dry the sterilizer and scrub the water stain frequently to ensure the sterilizing result and prolong the service life.
- 5) If there is much water incrustation that cannot be cleaned, the following solution is suggested: add 0.75 kg of caustic soda and 0.25kg of kerosene into 10 L clean water and mix them. Pour the solution into the container and let it soak for 10-12 hours, then the water incrustation can be cleared and then finally rinse with clean water.
- 6) If the indication of the pressure gauge is not accurate or the pointer cannot return to the "0" position, it should be stopped immediately and sent to a professional institution for inspection. After the inspection is passed or the new pressure is replaced the unit can be used again.
- 7) The pressure gauge should be calibrated regularly and checked at least twice a year by the local technical supervision bureau to maintain the sensitivity and correctness of the to avoid safety accidents.
- 8) The equipment is a kind of pressure vessel, must avoid impact during working, and is forbidden to use overpressure. If the pressure displayed exceeds the maximum allowable value but the safety valve doesn't open to release, the unit should immediately pause to use.
- 9) The safety valve might have failed, check and exchange it. Don't start to use the unit again until the safety valve is qualified. The safety valve should have to be verified every year at the local Technical Supervision Bureau.
- 10) The gasket is wearing part, which should be checked frequently. If the feature is changed or deformed or aging hardening, the spares should be changed immediately.
- 11) Once the value of pressure and temperature is preset, it is not necessary to reset it each time. However, it is necessary to observe whether the value has changed frequently, especially after the sterilizer is moved, it should pay attention to the change of this value. If there is any change, it should be reset.

- 12) The replaced fuse should comply with the provision as the manual said, the model and the specification should be the same as the old one.
- 13) Ensure the safety grounding of the unit, Ensure the power socket grounding well. Keep clean of the unit.
- 14) No special requirement for the transportation and storage. If its long time no use, it should be stored in a shady, dry, and ventilated place, and the necessary dustproof work.
- 15) Under normal use and maintenance, the recommended service life of the unit is 7 years.

11. Troubleshooting

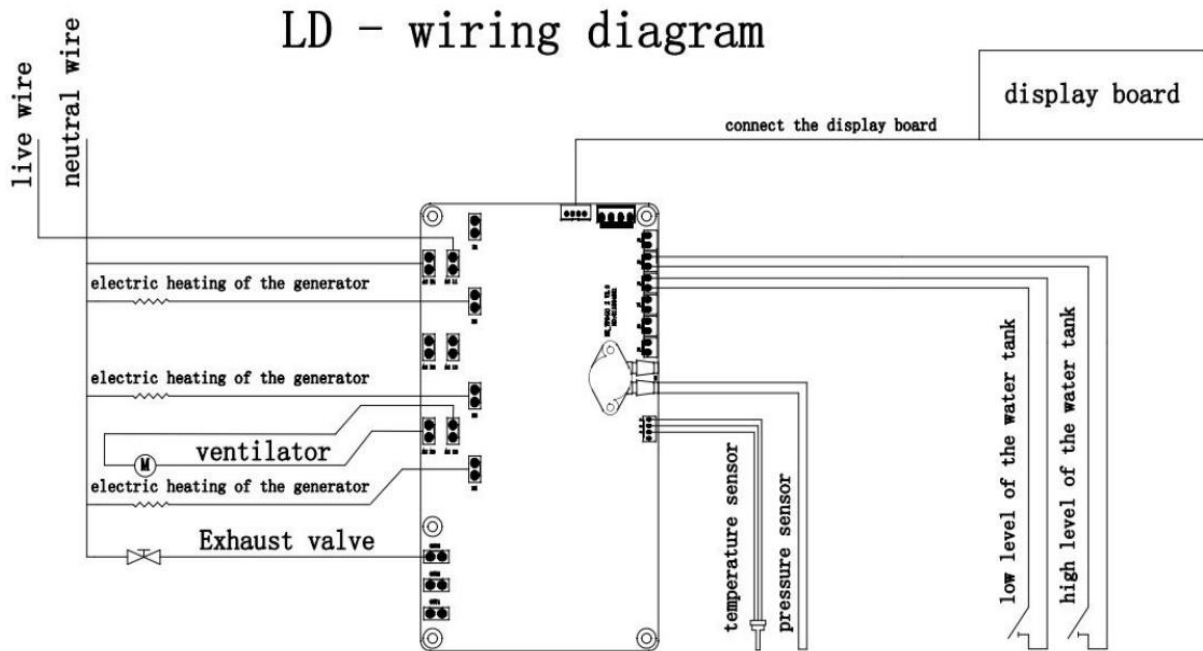
The problem might be met during the cycle.

Problem

- 1) During the sterilization cycle, the operating parameters can be queried.
- 2) If resetting is required during sterilization, press and hold the “▲” key or “▼” key to reset, then the program is back to the “**Ready**” state.
- 3) If the current is overloaded, the overload protection power switch will automatically cut off the power supply. Solve the problem and then turn it on to proceed with the sterilizing again.

Malfunction	Reason
1	The sensor in the chamber is broken.
2	The pressure sensor in the chamber is broken.

12. Circuit Diagram



Fison Instruments Ltd 272 Bath Street Glasgow G2 4JR UK
Email: info@fison.com | Website: www.fison.com