











# **Benchtop Autoclave FM-BA-B100**

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## 1. Safety Measures

Symbol	Meaning
	CAUTION
	Warning: dangerous voltage
	WEEE MARKING
	MANUFACTURER
	DATE OF MANUFACTURE
	SERIAL NUMBER
	CONSULT INSTRUCTIONS FOR USE
	Earthing

### Attention

1. The Steam Sterilizer must be placed on the horizontal working base.
2. Must use distilled water to last the operation life of the Steam Sterilizer.
3. There shall be no clog to the air-cooling window on the outer surface of the Steam Sterilizer.

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4. The object apparatus to be sterilized shall be placed on the device plate with enough clearance retained in favor of the air circulation inside the sterilizing room.
5. Empty the water inside the cooling water collecting tank frequently. Usually, the cooling water collecting tank shall be emptied once the water storing tank is emptied.
6. The door handle must be buttoned up before working.
7. Don't open the door of the Steam Sterilizer before seeing the "0" kPa displayed on the pressure indicator.
8. Not be too close to the door of the Steam Sterilizer in case of scald when opening the door.
9. Shut off the power before discharging/installing the sealing ring, and the work shall be carried out after further sufficient cooling in case of scald.
10. Don't drag or drop the Steam Sterilizer during the relocation period of the steam sterilizer.
11. The protecting ground shall be reliable.
12. Equipment must be used away from the magnetic field.
13. The device's end of life must be for processing scrapped by the local environmental protection laws and regulations.
14. For example, if a power failure occurs during the working, need to disinfect the equipment, must be open the door 2 minutes later.
15. The equipment must be far away from flammable items.
16. The equipment must be reliable grounding.
17. The User Must use the attached plug, do not change it.
18. This product is not suitable for leak proofing. not resistant to high-temperature products, the sterilizer's max temperature is 138.0°C.
19. This product is not suitable for liquid sterilizing.

## 2. Introduction

**Benchtop Autoclave FM-BA-B100** is a class B benchtop autoclave, comprising 3 pulsating-vacuum, offers 23 L of capacity and vacuum up to 0.09 MPa. Features B&D test and vacuum test procedures to test the penetrability with double lock door system for safety during operation. Designed with 304 stainless steel chamber, it has jet type of steam generator, ensures the efficient sterilizing. Equipped with imported & advanced 16-bit microprocessor, LCD display, and advanced self-test system, this autoclave has alarm system for waste water tank. With Optional built-in mini-printer or USB connector, it can also record the sterilizing process data.

## 3. Features

- ✓ Class B benchtop autoclave, comprising 3 pulsating-vacuum
- ✓ B&D test and vacuum test procedures to test the penetrability
- ✓ Double lock door system for safety during operation
- ✓ 304 stainless steel chamber with jet type of steam generator
- ✓ Imported & advanced 16-bit microprocessor, easy to operate
- ✓ LCD display and advanced self-test system
- ✓ Alarm system for waste water tank, avoids waste water entrance into sterilizing circulation
- ✓ Optional inbuilt mini-printer or USB connector for recording the sterilizing process
- ✓ Suitable to sterilizing wrap, unwrap, solid, porous, hollow device
- ✓ High-efficient, convenient and easy-to-use

## 4. Specifications

Model No.	FM-BA-B100
Capacity	23 L
Temperature Range	134 °C /121 °C
Type	Class B benchtop autoclave
Recording Accuracy	±0.5°C
Sensor accuracy	0.01°C
Display accuracy	±0.5°C
Vacuum	up to 0.09 MPa
Residual Humidity	<0.2 RH
Pulsating vacuum	3
Test procedures	B&D test and vacuum test procedures
Controller	16-bit microprocessor
Alarm system	Yes, for Waste water tank
Display	LCD
Door lock	Double lock door system
Printer	Built-in mini printer (optional)
Interface	USB
Chamber material	304 stainless steel
Insulation	2.5 mm
Steam-generator	Jet type
Power supply	AC220V/110V, 50/60 Hz
Power	2000 W
Internal dimension	Φ249×450 mm
External dimension (W×D×H)	445×640×395 mm
Packaging dimension (W×D×H)	740×550×500 mm
Gross weight	53 kg

## 5. Applications

Benchtop autoclave is used for sterilization of surgical, dental and eye instruments, glassware medicine, culture medium and biological dressing, food, etc. across dental clinics, hospitals, school lab, scientific research institutions and laboratory.

## 6. Instrument Introduction

### Structure



1. Air Filter
2. Safety valve
3. Air outlet
4. Power socket
5. Fuse
6. Distilled water outlet
7. Used water outlet
8. Filter of chamber
9. Switch
10. Distilled water inlet

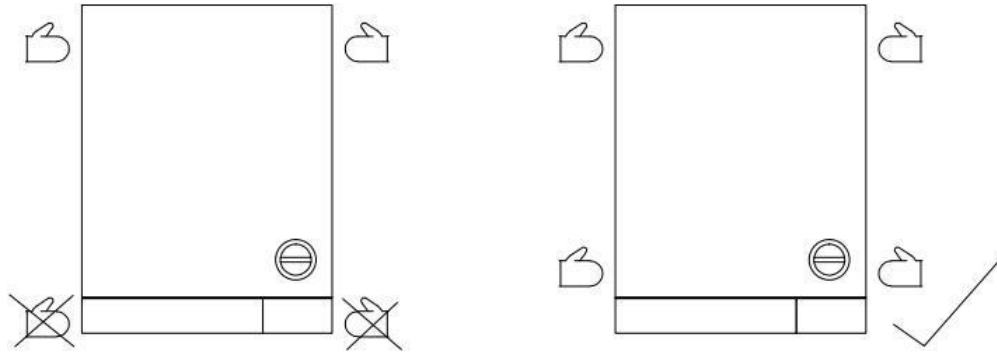
## 7. Installation

### 1. Remove the packing

Dismantle the thin film, open the packing and get the equipment from the packing.

#### ⚠ Hauling precautions:

- Forbid lift-up door
- Forbid lifting the legs of the machine
- Forbid Rollover or upside down
- Hauling sketch map is as follows:



2. The air-cooling window attached to the exterior surface of the Steam Sterilizer shall be non-clogged by dust or articles, and the Steam Sterilizer shall work in the proper air-flowing environment, and no dangerous flammable and explosive gas.

#### Equipment normal working conditions:

Environment temperature: +5~ +40°C

Relative humidity: ≤85%

Barometric pressure: 70kPa ~106kPa

Minimum brightness: 215±1x,

3. The Steam Sterilizer shall be installed on the horizontal working base. Put the machine on the table, refer to specifications, the table must be able to bear the weight of the machine. The clearance between the outside of the Steam Sterilizer and the around articles shall be 10cm as retained, and the top surface shall be 20cm retained. Used to exhaust or drain.
4. The 2 front feet of the Steam Sterilizer can be adjusted to the height, please ensure the front of the machine is slightly higher than the back.
5. The machine will be hot during working time, keep it away from any combustible materials!

⚠ The equipment must be far away from flammable items



### 6. After placing the Equipment

Check whether the power supply conforms with the requirements: 230 ~50 hz, voltage fluctuation range  $\pm 10\%$ , power supply  $\geq 2300$  VA.

To ensure the safety of the person and equipment, there must be a ground wire, the equipment casing and the ground wire of the control cables must be connected to external ground wire reliably.

- ⚠ Must use the attached plug, do not change it.
- ⚠ The equipment must be reliable grounding.
- ⚠ Must use distilled water

### **Attention!**

Through poor conditions of the electrical MAINS, short voltage drops can appear when starting the EQUIPMENT. This can influence other equipment (e.g. the Blinking of a lamp). If the MAINS-IMPEDANCE  $Z_{max} 0.114\Omega$ , such disturbances are not expected.

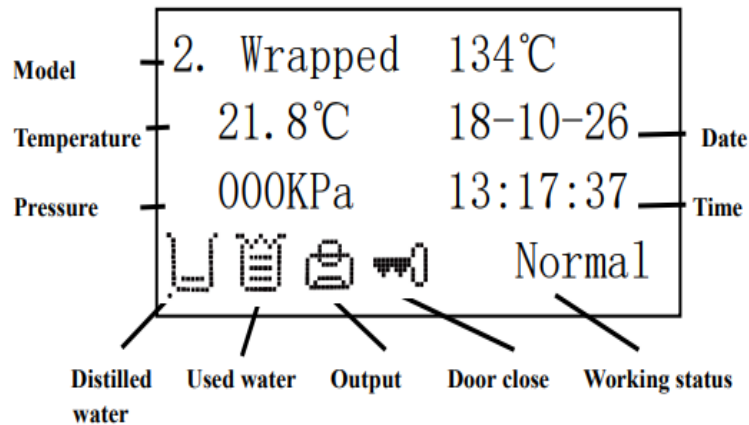
### **PREPARATION BEFORE OPERATION**

Before operation, please connect well to the power source. Connect the power source hole under the back left side of the Steam Sterilizer and the power socket by the attached plug. Press the green switch right corner of the front side, when the indicator light is on, it means that Steam Sterilizer gets through with the electric power, and the process then is in initialization status and shows "LD" on the screen. Currently the Steam Sterilizer is not heating.

## 8. Operations

### 8.1 Display screen

Real-time displaying the sterilizing status like system pressure and temperature.



### 8.2 SETTING Function keys

Used to choose the model and advanced settings status.

### 8.3 ▲ SELECT key:

When in the program selection menu or the Advanced Settings menu, the up arrow is used to indicate movement and parameter data increase.

### 8.4 ▼ SELECT key:

When in the program selection menu or the Advanced Settings menu, the Down arrow is used to indicate movement and parameter data decrease.

**8.5 START/STOP confirmation key:** Used to start the program; the working time is pressed out; the program is confirmed and returned when the program is selected and set.

### 8.6 Sterilizing status settings

#### 1. Choose the program

After turning on the power, the machine will display the Load. Press "SETTING" to enter the program menu, use "▲""▼" to choose the program, and press 'START' to confirm it, after closing the door, the machine will display "🚪", then press the "START" button to start working.

Model  
▶ 1. Unrapp 134°C  
2. Wrapp 134°C  
3. Cotton 121°C

## 2. Advanced Setting:

Adjust the Printing ON/OFF, press "SETTING" 3s to enter the advanced setting on Language, Time, Output... use "▲""▼" to select what you want, press START to choose the select, use "▲""▼" to confirm the setting. press SETTING again to quit.

Setup  
▶ Language ENGLISH  
TIME  
Output Printer

## 3. Advance Setup




**Do not operate for non-professionals!**


**Vacuum test:** select the vacuum degree test after starting. **BD test:** after starting, the program chooses b&d test.

**Helix test:** select helix test after starting.

Open the left side of the machine and you can see the test interface, and no professional forbids the operation.

## 8.7 Fill & drain water

When you install the Steam Sterilizer for the first time, after turning on the switch, The machine will display a lack of distilled water . Then you need to use the measuring cup to fill distilled water from the top inlet around 1500-2000 ml (3-4 cups) for the first time. When the machine needs to be filled with water next time, do not fill the water too well. If the distilled water tank was full do not fill more water.

When the machine displaying the used water is full ,  kindly drain wastewater by pipe after the current sterilizing is finished.

Kindly clean the filter inside the chamber, or it will affect the pressure release during the sterilization. Kindly clean the filter at the same time as you drain the used water.

**Note:** Be sure to fill with distilled water.

1. Before filling the distilled water, you must turn on the switch of power!
2. Fill the distilled water only after the sterilizing work is finished!

### 8.8 Function description

Vacuum sterilizer is divided into the following processes: the preheating process; the vacuum step-up process; the sterilization process; the exhaust drying process; the pressure balance process; ; and the pressure balance process.

#### 1. Preheating process:

Select the program first, then close the door, press the start button to enter the preheating process, electrify the heated steam generator heater to reach 100 °C, and electrify heated the chamber wall heater to set the temperature to 50°C.

#### 2. vacuum process:

Chamber wall temperature to 50 °C, when the steam generator temperature reaches 100 °C, into the vacuum heating process, open the vacuum selection valve, and exhaust valve (normally on) and start the vacuum pump, 300 seconds later Close the vacuum selection valve, exhaust valve (normally on) and the vacuum pump to stop pumping the vacuum. Pot inlet valve intermittent pumping power, as a steam generator to generate steam. If the system is set up with one pre-vacuum, the pressure rises to +50 kPa until the pot stops pumping, open the drain valve to drain the exhaust 0.0kPa to close the drain valve, intermittent steam generator pump water to generate steam, when the pot the temperature reaches the set value, the end of the vacuum and transferred to the sterilized itinerary. If the system is set three times pre-vacuum, then when the pressure inside the chamber rises to +50kPa, end the first pulse. Start the pump again and begin the second pre-vacuum process.

#### 3. Sterilization process:

This trip is an insulation packing process, when the pot temperature drops to the set sterilization temperature of +0.5 °C, the pump starts pumping water to the steam generator, the pot temperature rises to the set sterilization temperature of +0.9 °C, open the exhaust valve, allowing the pot temperature is kept between the set sterilization temperature +0.3 °C to the set sterilization temperature +0.9 °C.

**4. Exhaust drying process:**

When the sterilization time, is reduced to zero, into the exhaust stroke dry, open the drain valve to drain the pressure reduced to +0.0 then the vacuum pump starts. When the drying time is only 3 minutes, open the intake valve to vacuum drying.

**5. Pressure equilibrium process:**

When the drying time is reduced to zero, turn off the exhaust, dry the intake valve open, so that the pressure achieves an external balance, open the automatic doors, and complete sterilization.

**6. The sterilization program is as follows:**

	1	2	3	4	5
	134°C UNWRAPPED	134°C WRAPPED	121°C COTTON	121°C PLASTIC	134°C PRION
Sterilizing temperature	134°C	134°C	121°C	121°C	134°C
Sterilizing pressure	210	210	110	110	210
Vacuum times	1	3	3	1	3
Sterilizing time	4	4	20	20	25
Drying time	12	18	20	18	18

7. Emergency exit, Long press the start key for 5s, The Machine will out of sterilization procedures, meanwhile "EC" alarm.

8. After sterilization, use a handheld we provide accessories to take devices.

9. Must use a handheld to take things, to prevent burn.

## 9. Maintenance

- ⚠ Shut off the power before service or components' replacement, and the service or replacement work shall be done by the technician.

Working environment minimum brightness to 215 + 15 lx,

9.1 Clean the top water tank with disinfectant or alcohol once a week.

9.2 Disinfect and clean the interior surface of the Steam Sterilizer chamber monthly.

### 9.3 Replace the fuse.

Fuse Type: 250V,15A

Check the parameters of the new fuse are correct.

- 1) Before changing the fuse, turn off the power, and must pull out the plug.
- 2) Revolve the fuse base counterclockwise with a screwdriver to bring out the melting fuse to be replaced.
- 3) Replace the new fuse and reset the fuse base on the original position, then use the screwdriver to fasten the base clockwise.
- 4) Check the correctness of the data of the new fuse replaced.

### 9.4 Clean the sealing ring periodically

The operator shall clean the sealing ring periodically to avoid the influence of the seal caused by the dust/dirt left due to the long period of use. Use the smooth cloth with distilled water to wipe the surface of the sealing ring or sealing cap gently. The user shall discharge the sealing ring for further cleaning or replacement if the air-leaking problem cannot be resolved after the above process (The user shall discharge the sealing ring periodically for cleaning and inspection as recommended by the supplier).

### 9.5 The replacement of the sealing ring Tool:

One flat screwdriver (No sharp edge at the head)

- 1) One hand catches the lip of the sealing ring, and the other hand inserts the screwdriver into the clearance between the sealing ring and the door to raise up the sealing ring.
- 2) After raising up part of the ring, you can use your hand to draw the whole ring out. Wash its groove after drawing out the ring and pay attention to see whether it's spoiled or not in consideration of the necessity of replacement.
- 3) Put back the ring to the original door groove after cleaning. Most Importantly, the inset work must be done equably to the groove During the installation, the four equal points of the ring must be inserted to the groove first, later for the same work for the remaining segments of the ring. After finishing, press the sealing ring equally with the force of the hand.
- 4) **Note:** The inner circle of the ring may be raised up when inserting the ring into the groove. Please press it to the groove by using the screwdriver carefully. Shut off the power and cool the Steam Sterilizer sufficiently before inserting the ring to avoid scald.

### 9.6 Check the safety valve

To prevent the safety valve in the blocking state, under normal use, allow the steam pressure released through it once a month.

1. Operation sterilizing procedure
  2. When the pressure in the sterilizer reaches 100 kpa, Pull rings on the safety valve, and make the safety valve open about 2S, if steam leaks, the safety valve work is normal. If not, the safety valve needs effective inspection or replacement
- ⚠ Pull rings on the safety valve will steam jet, It is best to use tools such as a screwdriver when pulling. Do not use your finger directly, Operators also need to keep away from it, to prevent burns!

### Replace the safety valve:

- ⚠ This operation is limited to the professionals
- 1) Loosen the set screws of the safety valve, and take the safety valve down from the panel
  - 2) Replace with a qualified safety valve (must be provided by manufacturers).
  - 3) Test a sterilization process
- ⚠ The machine maintenance and replacement of electrical components must cut off power supply first. And only the manufacturer or professional person designated by the manufacturer can operate.

## 10. Troubleshooting

During the working time, if there is any problem, the Steam Sterilizer will automatically alarm, then release pressure, stop heating and display the error code, It would ensure the safety of the operator:

- ⚠ After the alarm, the door can be opened only when the pressure is " 0" KPa. There will be residual steam and hot water. Please stay away from the sterilizer to prevent scalding.
- ⚠ You need to keep pressing the start button 8S to quit the alarm. In case of any emergency, please check the warning code of the table to solve the problem.

### Error code and resolving measures

NO	Code display	Alarm Tone	Malfunction content	Resolving Measures
1	E1	long "du"	Fault of temperature sensor inside the chamber.	Inspect if anything affected the sensor or wire not connecting well or if the sensor was broken.
2	E2	long "du"	Pressure over 240 Kpa.	Inspect the pressure sensor or vacuum pump working.
3	E3	long "du"	Fault of temperature sensor outside the chamber.	Inspect the temperature sensor outside of the chamber.
4	E4	long "du"	The super high inner temperature when pressure rises.	Inspect the inside temperature sensor or pressure sensor.
5	E5	long "du"	Pressure releasing slowly.	Inspect the filter inside the chamber. keep it clean and no jam.
6	E6	long "du"	The problem of the door switch or doorbeing opened when working.	Inspect the door switch or if the door handle revolved to theright MAX position.
7	E7	long "du"	Fault of temperature sensor on steam generator.	Inspecting the temperature sensor on the steam generator.
8	E8	long "du"	Fail on pressure rising.	Inspect water flowing road and steam leaking.
9	EH	long "du"	Steam generator not heating.	Inspect the connecting wire or resistance of the steam generator.
10	EF	long "du"	Pressure not over than 0 Kpa.	Inspect the water pump/steam generator.

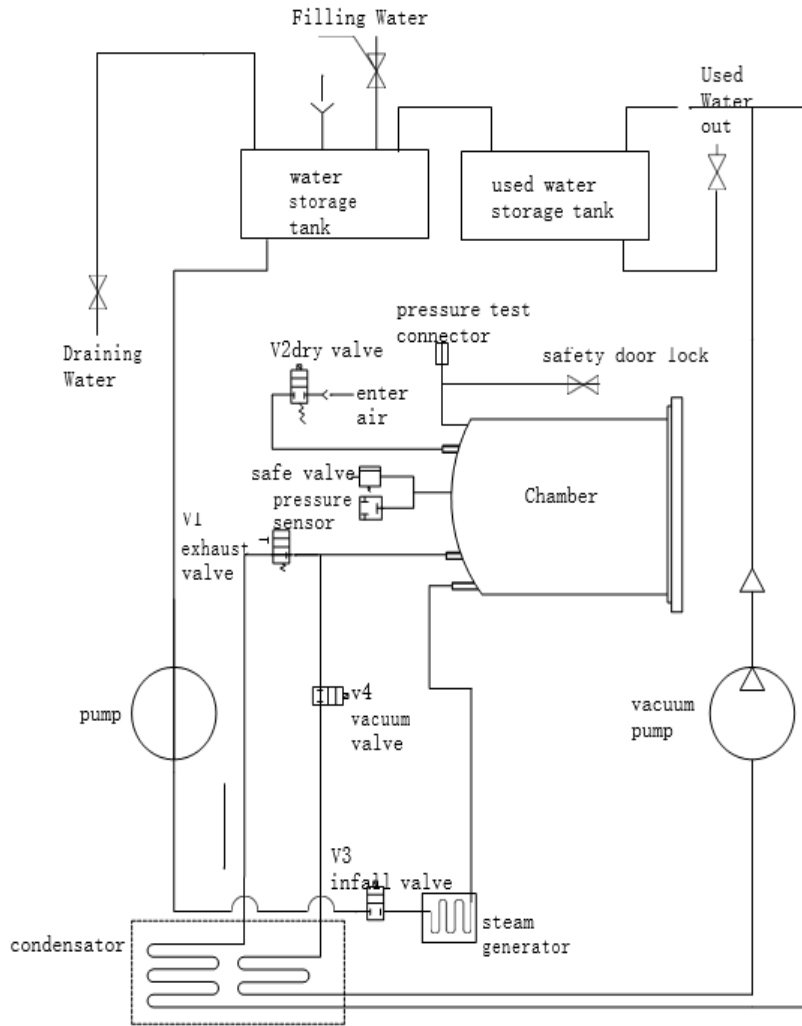


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11	EL	long "du"	Pressure not over 20 Kpa.	Inspect if the electric valve causing a steam leak or replace the water pump.
12	Eo	long "du"	Pressure not over 65 Kpa.	Inspect if the water pump is working weakly. Or replace it.
13	E9	long "du"	Fail to keep pressure and temperature.	Inspect the steam leaking.
14	EC	long "du"	The process was interrupted artificially.	A long press of the start key can unlock the alarm.

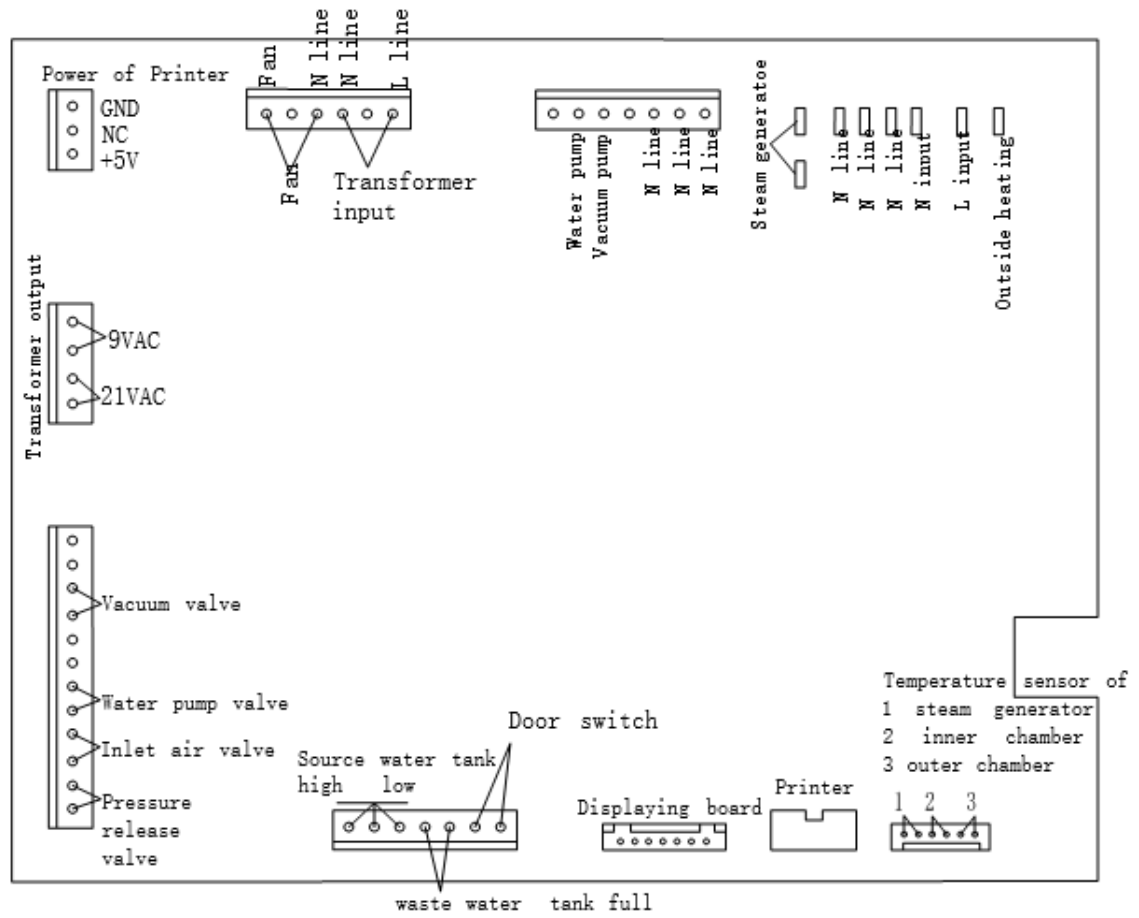
## 11.Circuit Diagram

### Steam Loop (Work Description)



# Benchtop Autoclave FM-BA-B100

## Circuit diagram of sterilizer



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