Kalstein

Model YR03390

Tabletop Autoclave Class B

Technical Manual

Thank you very much for purchasing our Tabletop Autoclave Class B Model YR03390.

Please read the “Operating Instructions” and “Warranty” before operating this unit to assure proper operation. After reading these documents, be sure to store them securely together with the “Warranty” at a hand place for future reference.

 Warning: Before operating the unit, be sure to read carefully and fully understand important warnings in the operating instructions.

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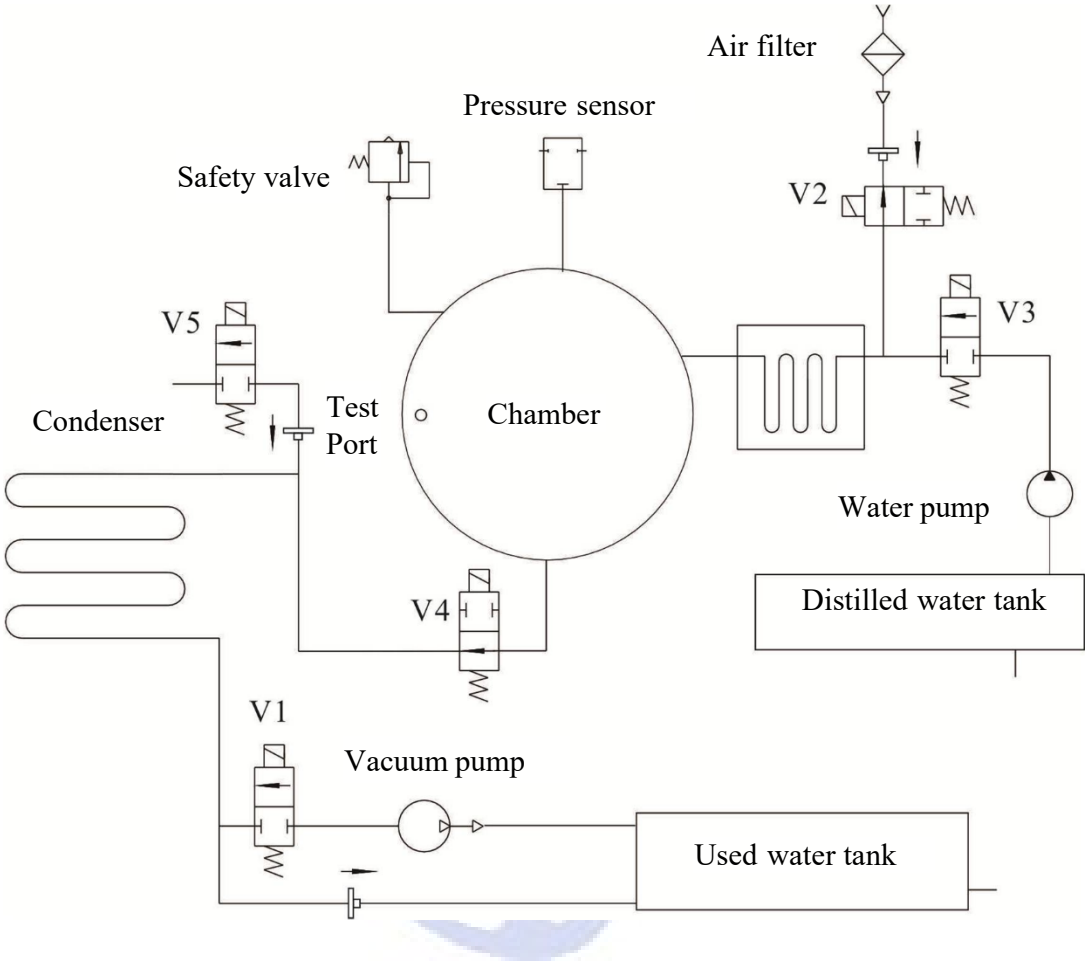
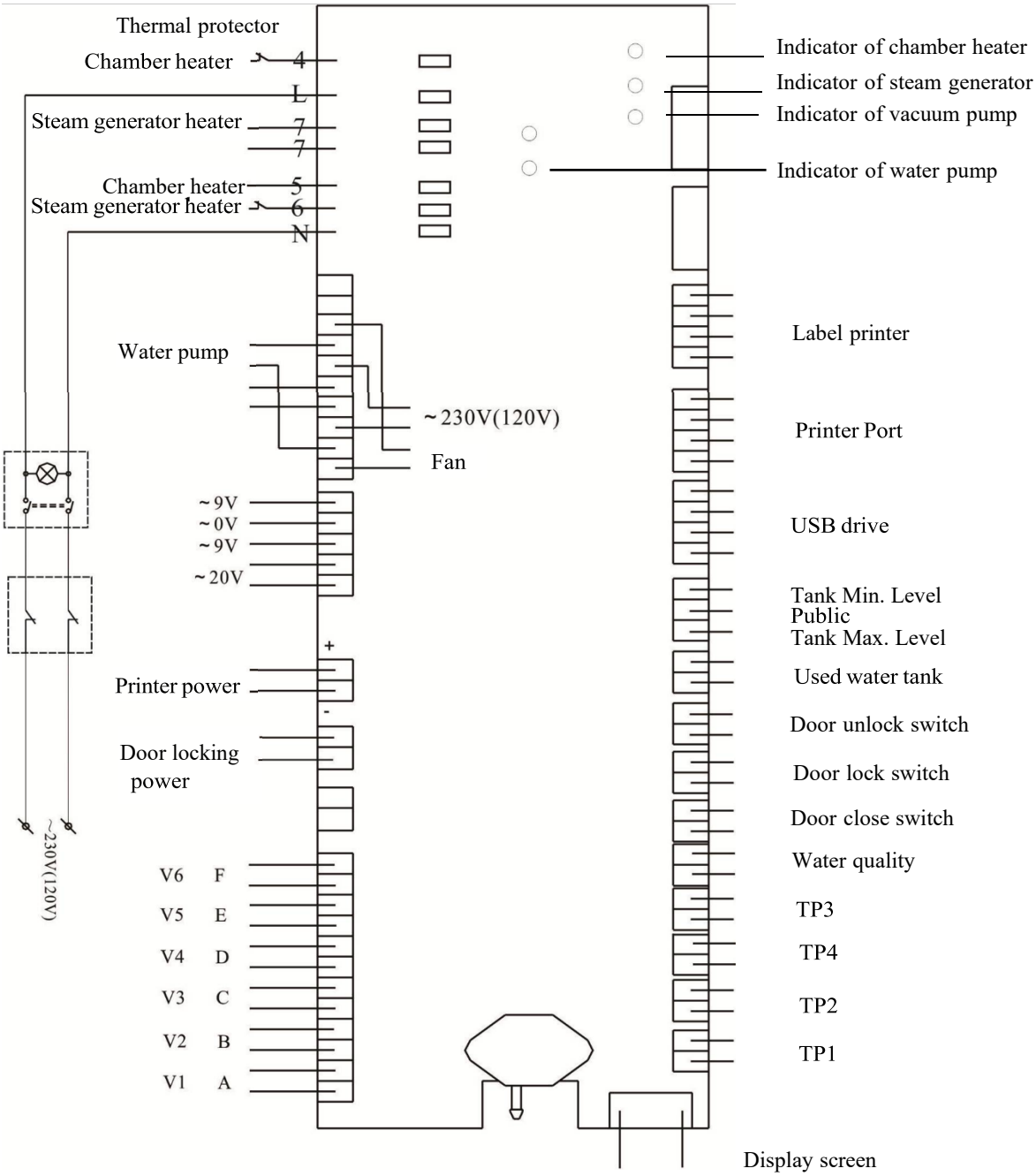
1 Working process

1.1 Hydraulic drawing



V1: Vacuum pump valve (Normally close)
V2: Air filter valve (Normally open)
V3: Pump valve(Normally close)
V4: Water release valve(Normally open)
V5: Vacuum pump start valve(Normally close)

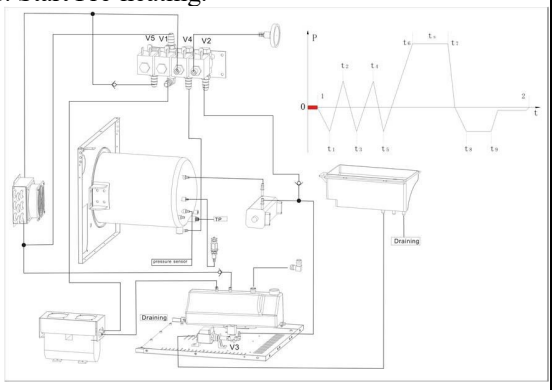
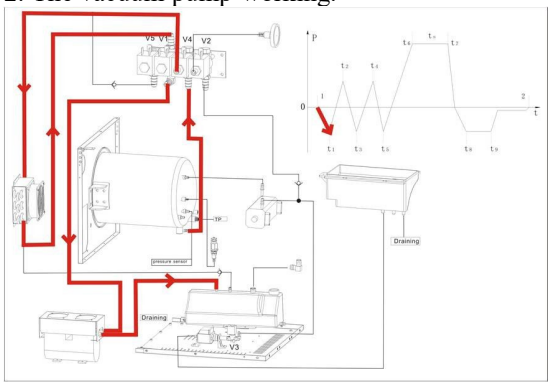
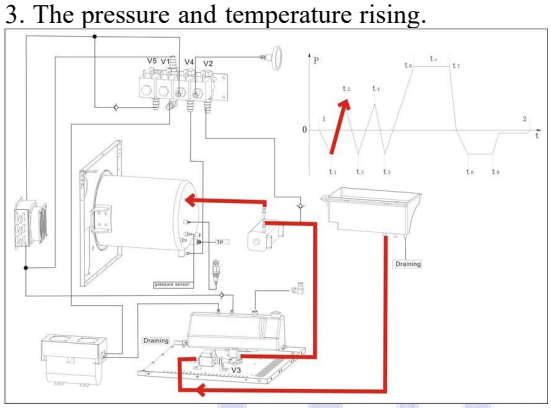
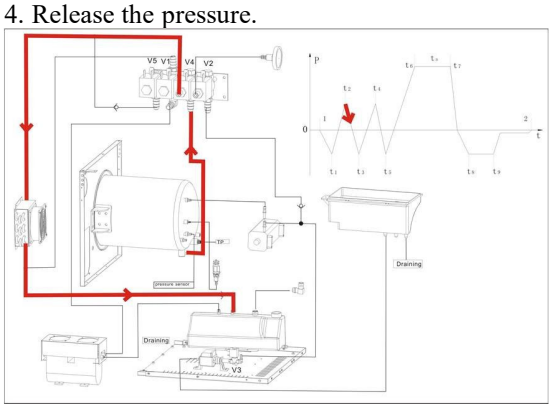
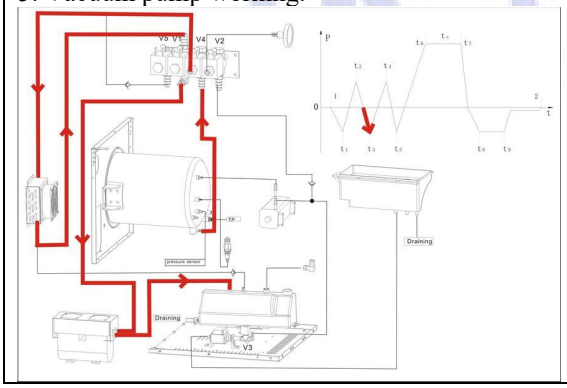
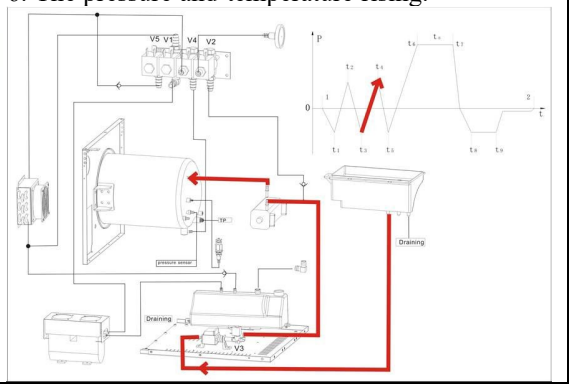
1.2 Electrical drawing

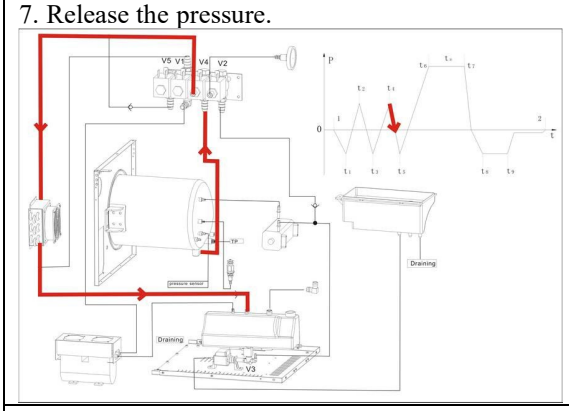
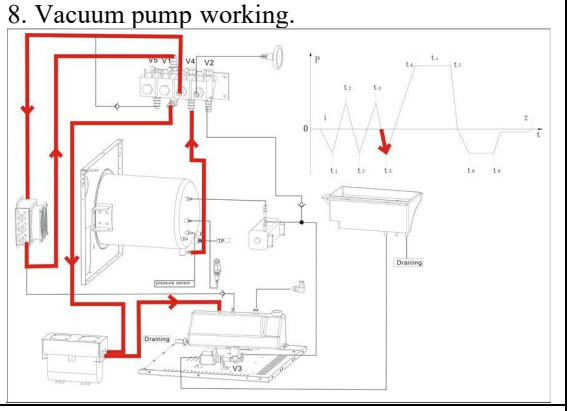
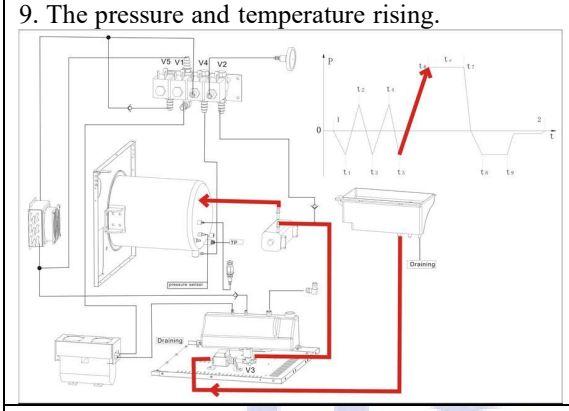
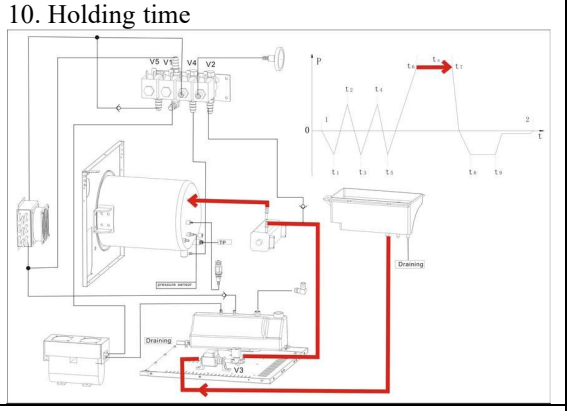
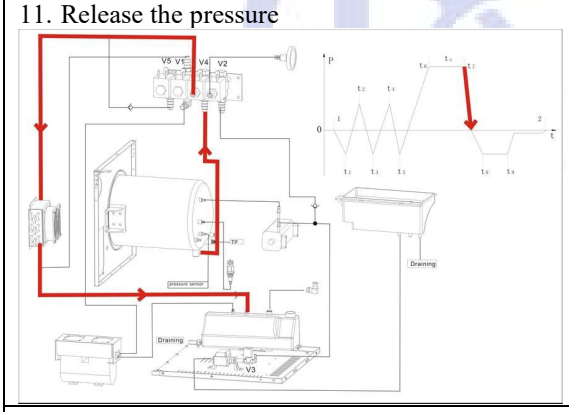
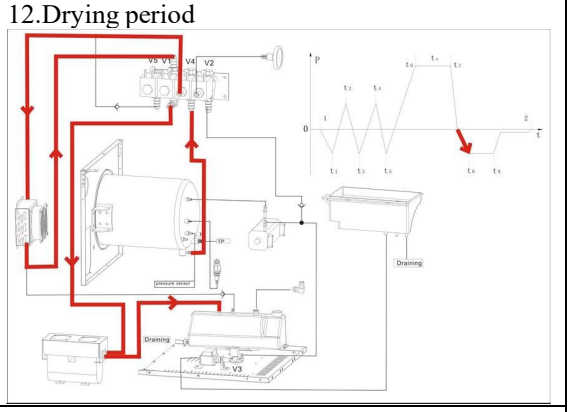
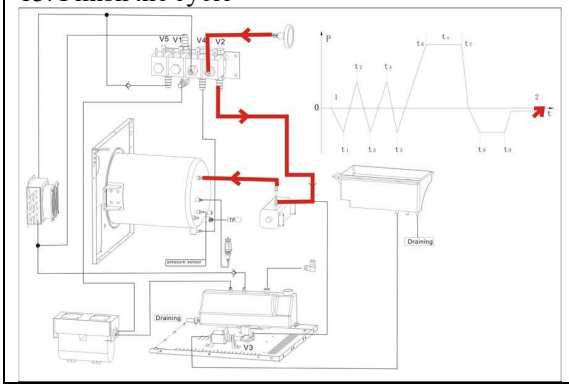


TP1: Steam generator temperature sensor
TP2: Inner temperature sensor
TP3: Temperature sensor of chamber wall
TP4: The second inner temperature sensor

V1: Vacuum pump valve
V2: Air filter valve
V3: Pump valve
V4: Water release valve
V5: Vacuum pump start valve

1.3 Working process

1. Start Pre-heating. 	2. The vacuum pump working. 
3. The pressure and temperature rising. 	4. Release the pressure. 
5. Vacuum pump working. 	6. The pressure and temperature rising. 

7. Release the pressure. 	8. Vacuum pump working. 
9. The pressure and temperature rising. 	10. Holding time 
11. Release the pressure 	12.Drying period 
13. Finish the cycle 	

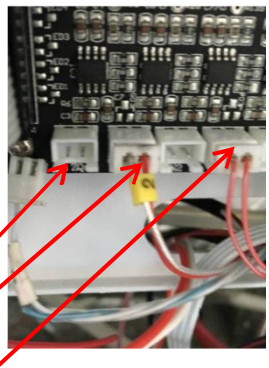
2 Malfunction

Eliminate the error code: Holding the button M for 3 seconds.

2.1 E1,E2,E3

Alarm condition:

E1 the temperature of steam generator is higher 250℃ or the cable is disconnected. E2 the temperature of chamber sensor is higher 140℃ or the cable is disconnected. E3 the temperature of chamber wall is higher 160℃ or the cable is disconnected.

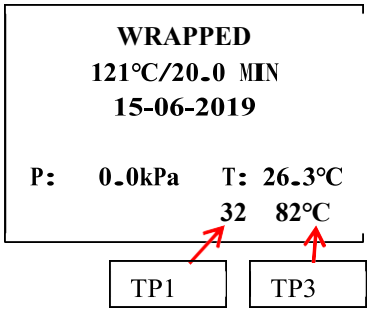


Case 1: The cable of sensor is disconnected，or it doesn't work.
Solution:
1 Check the connector of the cable on the circuit board.
2 Eliminate the error code, then run a cycle again, measure the resistance of cable1(2, 3) within 3 minutes after E1(2,3) shows up., The value of resistance should be 1000 Ω to 1900 Ω. If the value is out of that range, it means the cable is disconnected or the sensor breaks down. Sometimes when the machine starts to work, it alarms. But after measuring the resistance, the value is normal. The sensor need be replaced as well.

Case 2: The sensor doesn't contact well with steam generator
Solution: Check assembling of the sensor. Fix it tightly.

Case 3: Circuit board
Solution: replace the circuit board

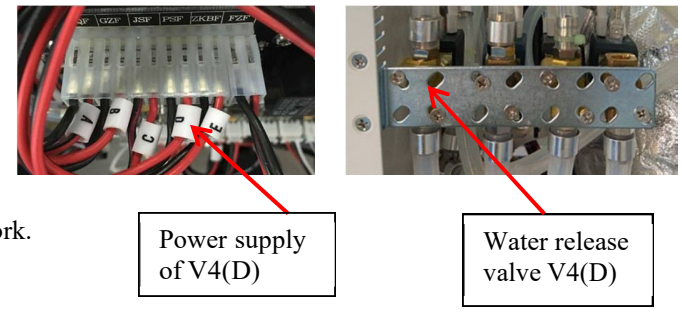
Note: You may observe the temperature of these three sensors by taping the down button.



2.2 E5

Alarm condition: Failure in releasing pressure in 5 minutes
Caution: Please do not try to open the door before the pressure is 0. Wait for the chamber to cool down until the pressure reaches zero. Or pull out the ring of the safety valve to release the pressure.
Case 1: there are too many instruments inside the chamber.
Solution: Make sure it doesn't overload and try it again.

Case 2: V4 blocked.
The V4(D) can't release the pressure.
Solution: Replace the solenoid vale which does not work.

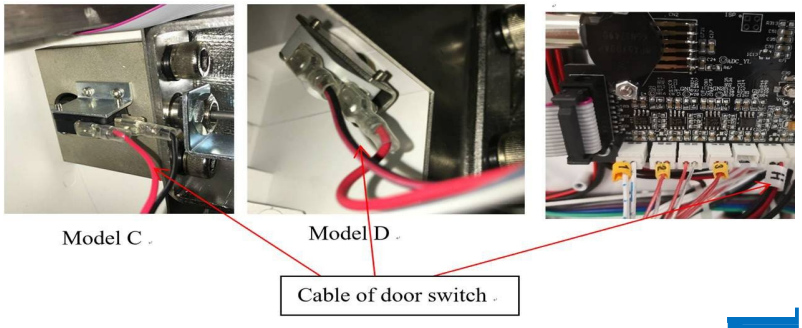


Case 3: Check valve connected to the used water tank doesn't work.
Solution: replace the check valve

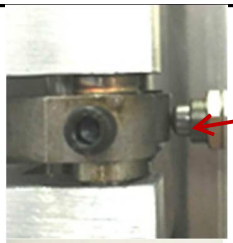
Case 4: The filter inside chamber was blocked.
Solution: Take it out, and clean or replace it.

2.3 E6

Alarm condition:
The door close switch is disconnected during workin g.
Case 1: The cable of door switch is disconnected.
Solution: Check the connector on the circuit board and switch.



Case 2:
1.The piston of door switch does not connect well with the door lock claw.
Solution: Adjust the position of switch (for model series YR03390)



2. The door slide does not connect well with the door close switch.
Solution: Adjust the level of micro witch , bend the level to make the door slide connect well after the door closed. (for model YR-C)

Case 3: Door switch broken
Door is open, door switch signal is open circuit, Door is closed, door switch signal is short circuit.
Solution: Replace the door switch.

2.4 E7

Alarm condition: The pressure is lower 10kPa than the pressure corresponding to the temperature during the holding time.
Case 1: The value of temperature is not right.
Solution: Replace the temperature sensor.

Case 2: The value of pressure sensor is not right.
Solution: Replace the circuit board.

2.5 E8

Alarm condition: The pressure is higher 20kPa than the pressure corresponding to the temperature during the holding time.
Case 1: The value of temperature is not right.
Solution: Replace the temperature sensor.

Case 2: The value of pressure sensor is not right.
Solution: Replace the circuit board.

2.6 E9

Alarm condition: In holding time phase, the inner temperature is lower than the pre-setting temperature (lower than 134℃ for 134℃ program or lower than 121℃ for 121℃ program), That means the steam inside chamber is not enough to hold the requested temperature. There are many possibilities lead to this problem: such as temperature deviation, problem of valve close, steam generator works not properly, leakage etc.
Case 1:The temperature is low and close to the program temperature . And the pressure is higher too much than the pressure corresponding to temperature during the holding time.
For example, the 134 program, the temperature is 134.1 and the pressure is 230kPa.
Solution: Please adjust the temperature deviation, the value should be add 1. Refer to chapter 6.1

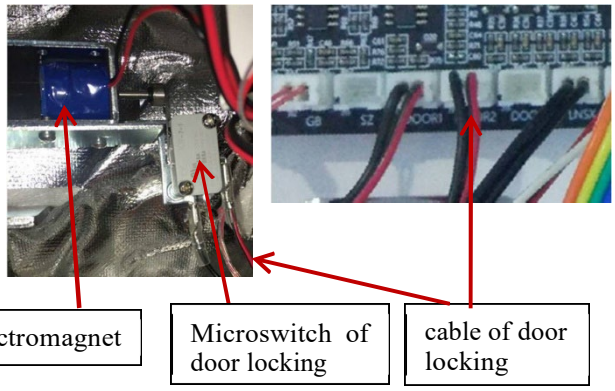
Case 2: valve V4(D) is leaking
Check the water release valve V4(D), if they can be closed completely. Refer to E24 Case 2.

Case 3: there is a leakage at somewhere.
1 leaking from the door.
if there are water or steam coming out from the door.
Solution: Clean or replace the door seal and clean the mating surface of chamber. Check the door if it is tight.
NOTE: when you close the door you have to use a little force, if the door is closed smoothly, the door is loosen.
2 You will find the steam if the others parts is leaking.
Solution: Replace the leaking parts

Case 4: The steam generator doesn't work properly.
Solution: Refer to E24 Case 3.

2.7 E10

Alarm condition: The door locking system doesn't work. The door lock switch give the wrong signal.
That means the signal should be short circuit when the door locked.
The signal should be disconnected when the door lock release.
Case 1: The cable of door locking is disconnected.
Solution: Reconnect the cable.

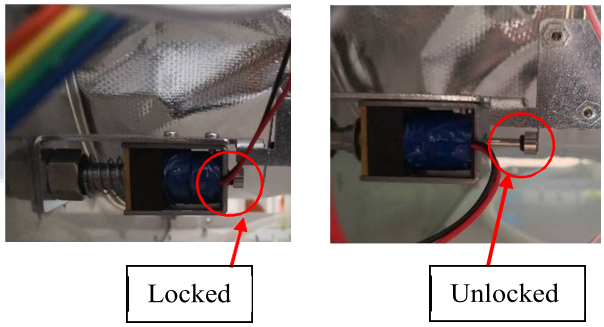


Case 2: Electromagnet broken
Check: Pull out the electromagnet power cable, measure the resistance of electromagnet. The resistance value should be about 35Ω.
Solution: Replace the electromagnet

NOTICE: Make sure the position of the connection on the micro switch is correct.

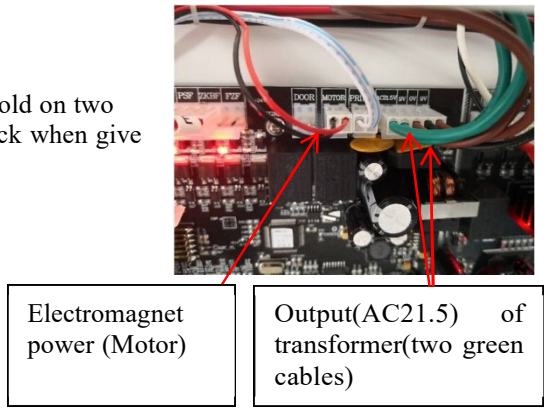
Case 3: Microswitch of door locking is broken
Pull out the cable of door locking, check the signal of this cable.
Locked: signal of door switch-short circuit
Unlocked: signal of door switch-short open circuit
Solution: replace the microswitch of door locking

Case 4: Electromagnet is stuck
Solution: Push and pull the electromagnet pole



Case 5: No power
1 Check the output(AC 21V) of transformer, normally it is about AC 21V.
Replace the transformer if the voltage is lower than 19V.

2 Check the electromagnet. The power of electromagnet is 24VDC. It can hold on two positions. The Pole push out when give a positive power. The pole push back when give a negative power.



2.8 E11

Alarm condition: Failure to preheat the steam generator in 15 minutes.
Please refer to chapter 3.1
Case 1: System Error
Solution: Eliminate the error code, then run a new cycle

Case 2: Thermal protector doesn't work
Solution: Check the thermal protector after the steam generator cools down, if the two pins of the protector are disconnected, replace the thermal protector.

Case 3: Steam generator does not heat.
Solution: Check the steam generator according with the chapter 3.1.

2.9 E12

Alarm condition: Faulure to preheat the chamber in 15 minutes.
Please refer to chapter 3.3
Case 1: System Erroer
Solution: Eliminate the error code, then run a new cycle

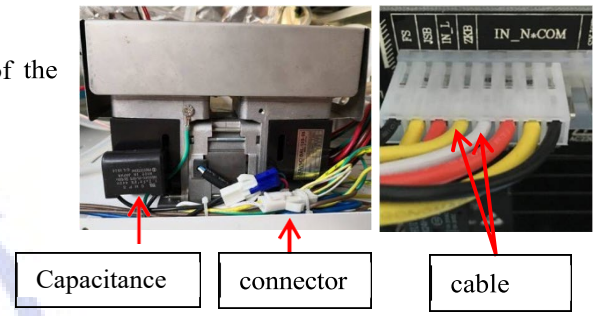
Case 2: Thermal protector doesn't work
Solution: Check the thermal protector after the chamber heater cools down, if the two pins of the protector are disconnected, replace the thermal protector.

Case 3: Chamber heater doesn't heat.
Solution: Check the steam generator according with the chapter 3.3.

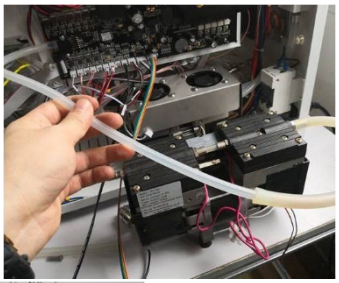
2.10 E13

Alarm condition: The machine fails to vacuum when running cycle. It only appears at the phase of vacuuming. The pressure can't reach lower than -60kPa.
Principle of vacuum phase: the vacuum pump is working, and the air flow is from chamber through water release valve V4(D) to condenser to vacuum pump valve V1(A) to vacuum pump and in the end to used water tank.

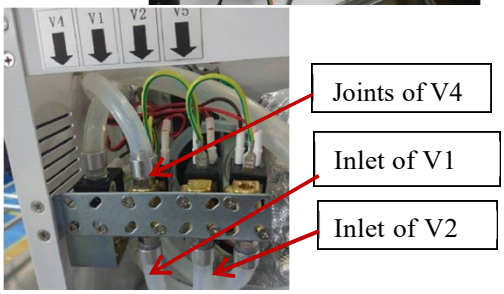
Case 1:The vacuum pump does not work
1 The power cable connector of vacuum pump is disconnected.
Solution: Check the cable of the vacuum pump. Check the connector of the vacuum pump on the circuit board.
Solution: replace the connector or connect the cable directly
2 There is no power(220/110V) when it should work
Solution: replace the circuit board
3 Capacitance broken
Solution: Replace the Capacitance



Case 2: The vacuum pump is weak
Put the finger on the inlet of the vacuum pump, feel the suction. Or connect the inlet of vacuum pump to the pressure sensor(like the picture), then start vacuum test. If pressure can't reach -75 kPa, vacuum pump is weak. Or there is an unusual noise come from vacuum pump, vacuum pump broken.
Solution: Replace the pump

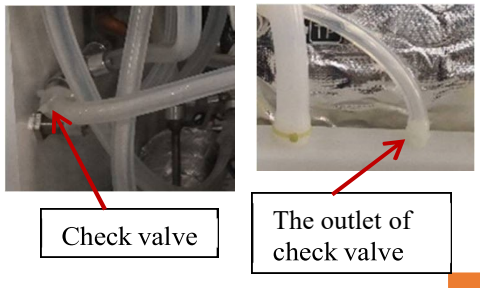


Case 3: The vacuum pump is working.
Solution： 1.The vacuum pump valve V1(A) doesn't open. The inlet of V1 should be felt a suction during the vacuum pump working.

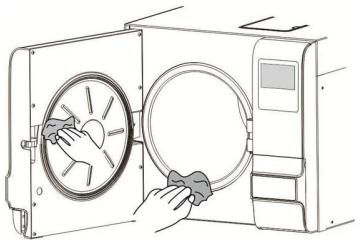


2. The air filter valve V2(B) is leaking.
The inlet of V2 and air filter should not be felt a suction during the vacuum pump working. The joints on all of the solenoid valve as well.

3. Check valve is leaking.
The outlet of check valve should not be felt a suction during the vacuum pump working.



Case 4: V4(D) is blocked
Solution: Replace the blocked valve.



Case 5: There is a big leakage somewhere.
Solution：1. Leaking from the door
There is a sound of leaking from the door, when pressure is under -5Kpa.
Solution: Clean the door seal ring and the surface of chamber.
Tighten the door refer to the instruction manual.
2. The other places are broken, such as tube broken.
Solution: Replace the leaking parts

Case 6: The first vacuum pressure can reach lower than -75kPa, but the second and the third vacuum can not reach -60kPa.
Solution: There are too much instruments inside chamber. Or the filter inside the chamber is block. Or the cooling fan on the back doesn't work.

Case 7: The pressure sensor is damaged. When the E13 appears, you try to open the door, and feel strong force, but the pressure shows 0.
Solution: Replace the circuit board.

2.11 E16

Alarm condition: The pressure can not reach to zero after drying period.
Solution: Check the valve(v2), it was blocked.

2.12 E18 (For the function of fill water tank by water pump)

Alarm condition: The water level isn't higher than the lowest level in 3 minutes or doesn't reach the highest level in10 minutes.
Solution: Check the water pump and the tube.
Check the sensor of water level.

2.13 N20

Alarm condition: The cycle is interrupted manually
Solution: Cancel the alarm by holding the M button for 3 seconds.

2.14 E22

Alarm condition: Vacuum test failure during the 600s.
Solution:

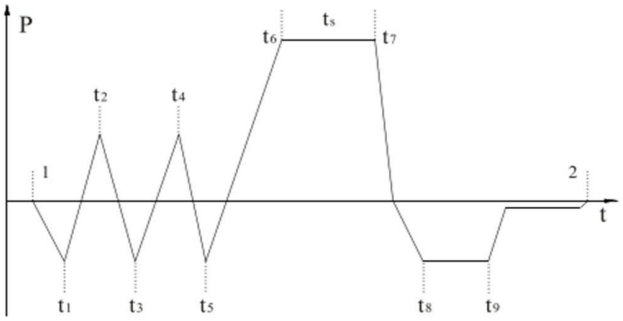
1. Check the door seal. Clean the door sealing surface. Tighten the door if it is loose.
2. Check the weld line on the chamber if you can't find the leakage by the above way. Replace the chamber.
3. The other places are leaking. If you can't find the places that are leaking. You may do by the following way. We check every tube that connect with chamber. We pull out the tube from the chamber. Replace it with the tube that block one side. Then run a vacuum test to check if the leakage is from this tube and the parts connect with this tube. We test the connector on the chamber one by one.

2.15 N23

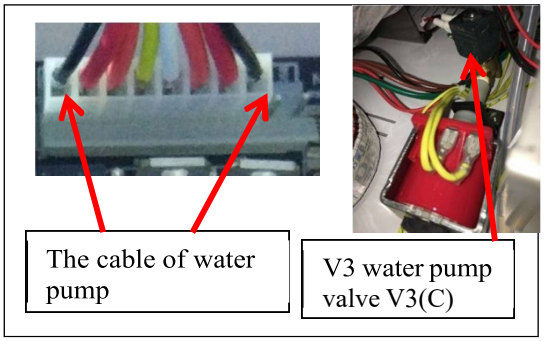
Alarm condition: Result of vacuum test is void. The temperature difference between the max. temperature and the Min. is above 3°C.
Solution: Try again after the chamber cool down

2.16 E24

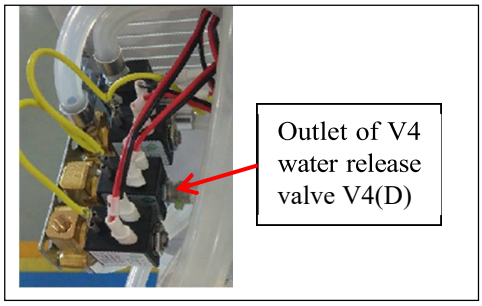
Alarm condition: At the rising pressure phase, It takes over time to reach the next status. from t1 to t2, t3 to t4, t5 to t6.



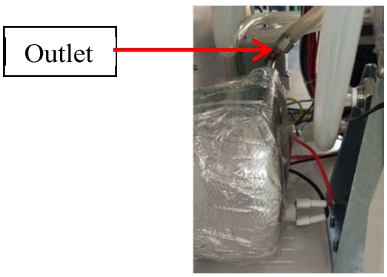
Case 1: There is no steam inside the chamber after E24 appearing.
Solution:
1. The water pump doesn't work. The cable of the water pump disconnected. The water pump doesn't work. Or the distilled tank is blocked.
2. The water pump valve V3(E) doesn't work. Measure the resistance of the valve whether it disconnected. Check the cable of V3 is connected well. Check the LED indicator of the valve on the circuit board. The LED indicator will light and V3 should open when the water pump working.
3.The circuit board doesn't work if the LED indicator is off when water pump working . Replace the circuit board.



Case 2: The temperature is higher than 100℃ and there is water inside the chamber when appearing E24. There is a leakage at somewhere.
Solution:
Check the water release valve V4(D), if they can close completely.
Please observe the tubes connected with the outlet of valves of the valve during the state t1-t2, t3-t4, t5-t6. you will find the steam or water flowing continuously from chamber to the condenser if the valve doesn't close completely.
Check the door sealing . Clean the contact surface. Adjust the door to a little big tighten.
Check the other place that maybe leaking. Such as the other valve, the other tube, the safety valve and etc.



Case 3: The temperature and pressure can't rise.
And you don't find any place leaking. The steam generator doesn't work properly. There is much water with steam pass by outlet tube.
Solution: Replace the steam generator.



Case 4: Overload
Solution: Reduce the load and placed as required.

2.17 N27

Alarm condition: The chamber is hot when a vacuum test program is started. The temperature of inner sensor T1>40℃; the temperature of chamber sensor T3>120℃.
Solution: Try again after the chamber cool down.

2.18 E28

Alarm condition: pressure is over 250 kPa
Caution: Please do not try to open the door before the pressure is 0. Switch off. Wait for the chamber to cool down. Or pull out the ring of the safety valve to release the pressure.
Case 1: The filter inside the chamber is block.

Solution: Clean the filter.

Case 2: V4 didn't work.
The V4(D) opens (power off) to release the pressure.
Solution: Replace the solenoid vale which does not work.

Case 3: Check valve connected to the used water tank is blocked.
Solution: Replace the check valve

Case 4: Circuit board problem
Open the door then turn on the machine, if the pressure is over 250 kPa instead of 0 kPa, it's circuit board problem.
Solution: Replace the circuit board.

2.19 N29

Alarm condition: The power breaks during the cycle running. This code will show in the report.
Solution: Don't need to do anything.

2.20 N30

Alarm condition: Vacuum test failure during the first 300s.
Solution: Refer to the chapter 2.12 E22.

2.21 HELIX is failure

Solution: 1. Check the vacuum pressure is deep enough. Lower than -75kPa will be easier to pass the helix test.
2. Calibrate the temperature with temperature log. You may minus the temperature deviation 1 if there is no temperature log.

2.22 The LCD is dark

Solution:

1. Check the connection of cable on the circuit board and LCD.
2. Check the circuit board works or not. If the mainboard works, press the button will have a sound. Or push the float of distilled water tank to the bottom, there will be an alarm of lack of water. You need replace the LCD or cable if the mainboard works.

2.23 The LCD is blank

Solution: Restart the machine. If it appears again. Replace the LCD.

2.24 The keyboard does not work

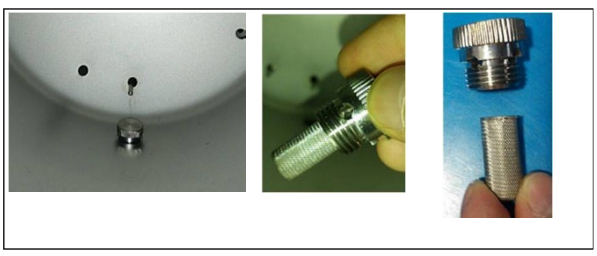
Solution: 1. Check the cable connected to the LCD.
Replace the keyboard.
Caution: Don't make the wrong direction of the cable of the keyboard when you insert the connector.

2.25 Lots of water is left inside the chamber after cycle finish

Case 1: The front of the machine should be higher than the back. So that the water can flow to the outlet.
Solution: Block up the feet of the front.

Case 2. The filter inside chamber was blocked
Solution: Take it out, and clean or replace it.

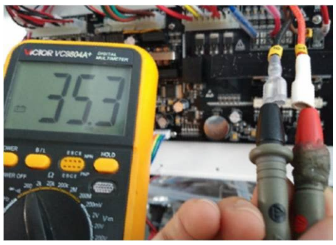
Case 3: The water release valve is blocked or does not work.
Solution: Replace the water release valve V4(D).



3 Function of the Parts

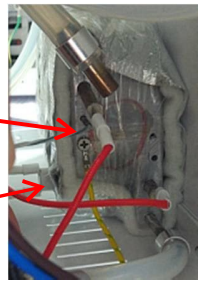
3.1 Steam generator

The steam generator is composed of body, heater, thermal protector, temperature sensor.
Function: Changes the water to steam by pass it.

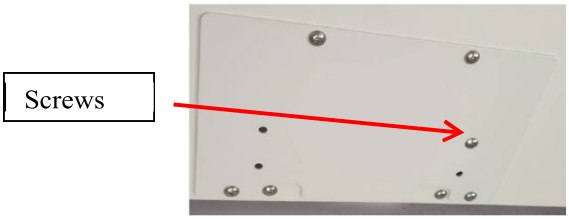


3.1.1 The heater
Pull out the cable of No.6 and No.7 cable. Measure the resistance of the heater.
The resistance is about 30Ω (230V).

3.1.2 The thermal protector
It will break the power of the heater if steam generator is too hot.
It should be short circuit between the two pins normally.



3.1.3 The temperature sensor
The temperature sensor short circuit or break if it doesn't work.
Measure the resistance of the senor (No.1).
The normal resistance is 1000~1900Ω.
The sensor is inserted the hole of the steam generator directly.

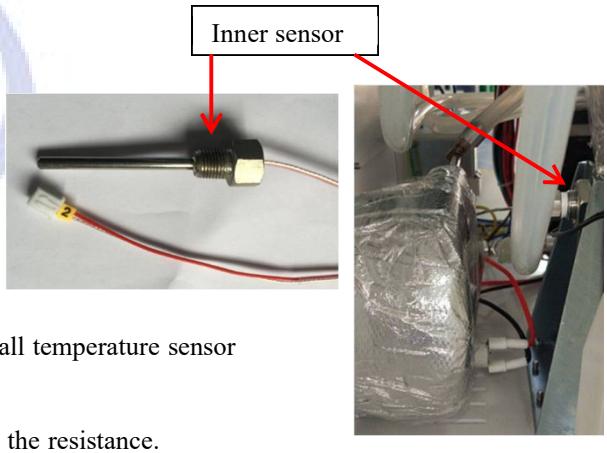


Replace the steam generator
1. Pull out the connector of No.6 and No.7.
2. Pull out the cable No.1 from the circuit board
3. Screw off the screw that fix steam generator on the back.
4. Dismantle the tubes connected to the water pump valve and chamber.
5. Then pull out the steam generator and replace it.

3.2 The inner sensor

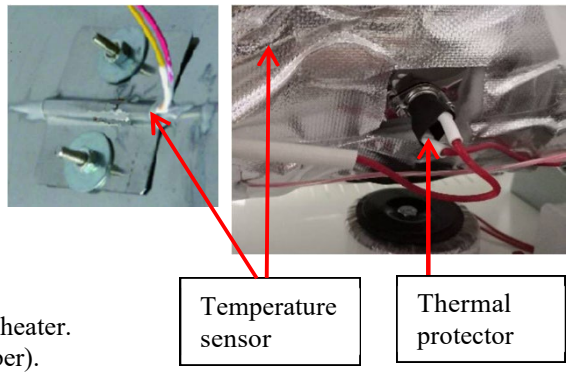
If the sensor does not work it will appear alarm E2.
You may measure the resistor .

The normal resistance is 1000 ~ 1530Ω.



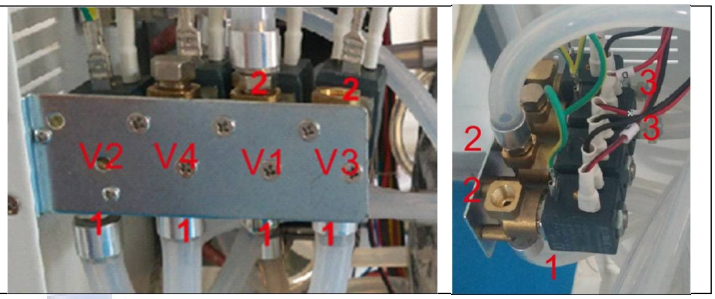
3.3 Chamber heater

Chamber heater is composed of, heater, thermal protector, chamber wall temperature sensor
Function: Keep the temperature of chamber wall.
3.3.1 Chamber wall temperature sensor
If the sensor does not work it will appear alarm E3 .You may measure the resistance.
The normal resistance is 1000~1700Ω .
3.3.2 The thermal protector
It will break the power of the heater if it doesn't work.
It should be short circuit between the two pins normally.
3.3.3 Replace the chamber wall sensor
1. To find the position of the sensor and cut the heat insulation.
2. Unfasten the nut
3. Replace the sensor.
3.3.4 Chamber heater
Pull out the cable of No.4 and No.5
Pull out the No.6 and one of the No.7 cable. Measure the resistance of the heater.
The resistance is about 66-45Ω (230V, depend on the volume of the chamber).



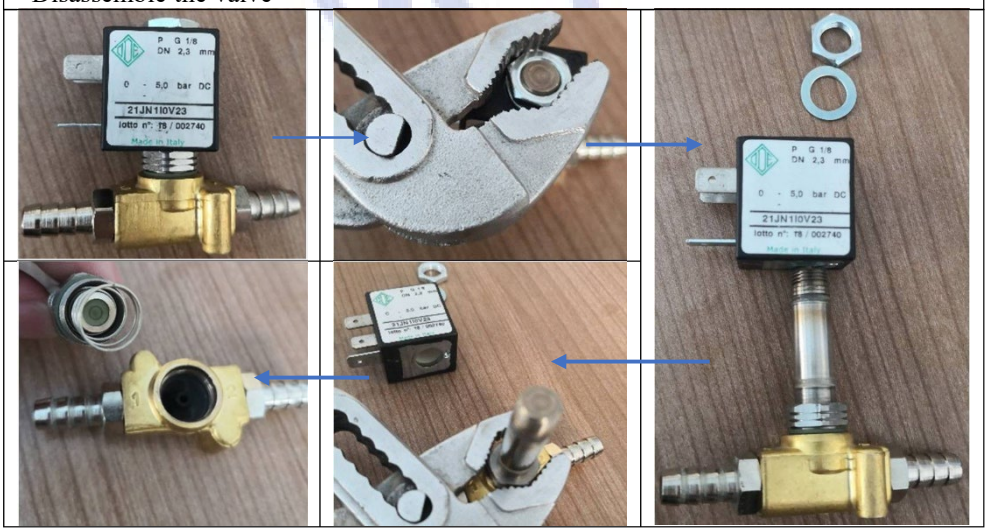
3.4 Solenoid valve

		
Normally open valve (V2)	Normally open valve (V4)	Normally close valve(V1,V3,V5)

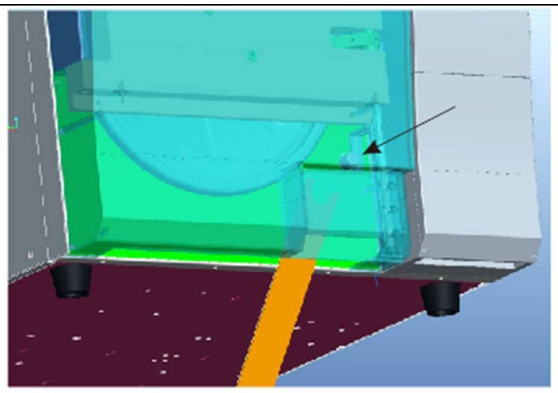
The power of the coil is 24VDC, the resistance of the coil is about 60Ω. We should make sure the direction of the valve when we replace a new valve.	

3.5 Clean the valve

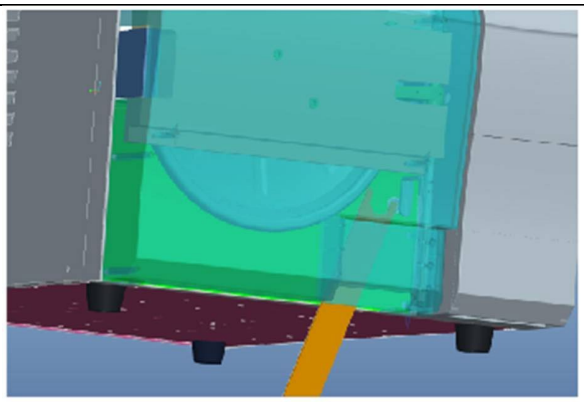
We my disassemble the valve and clean it if there is rubbish inside.

Disassemble the valve


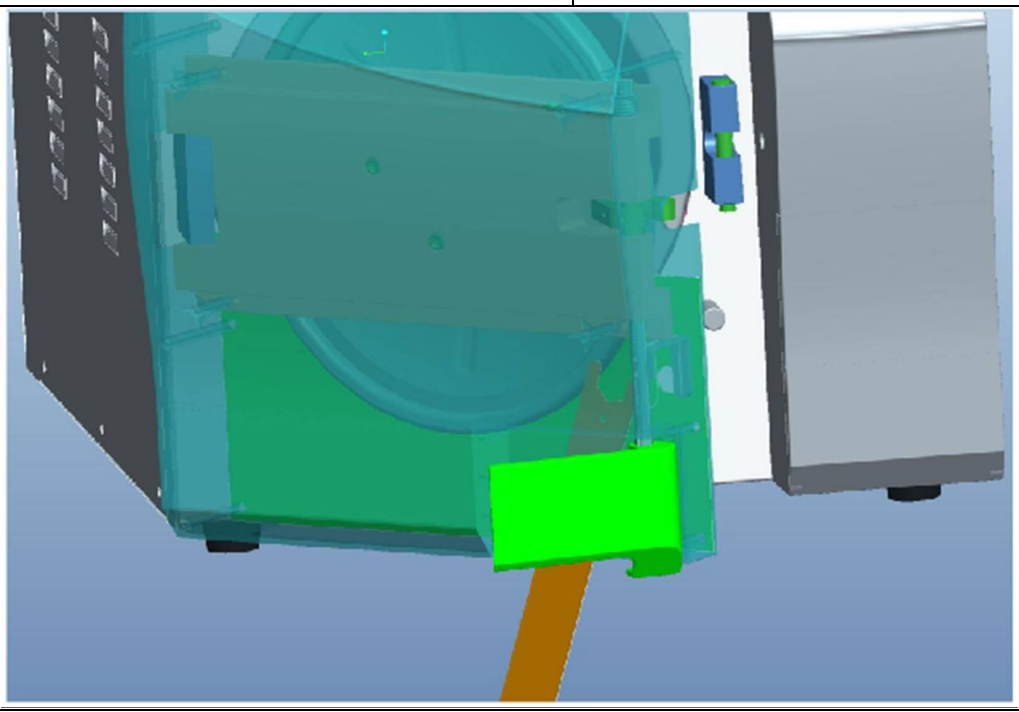
4 How to open the door in the Case of power outage



1.Put the spanner between the metal plate and door.

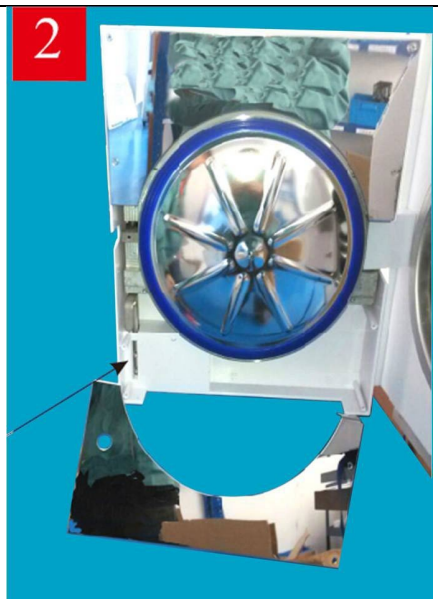


2.Press the button by the spanner and pull the door handle at the same time.

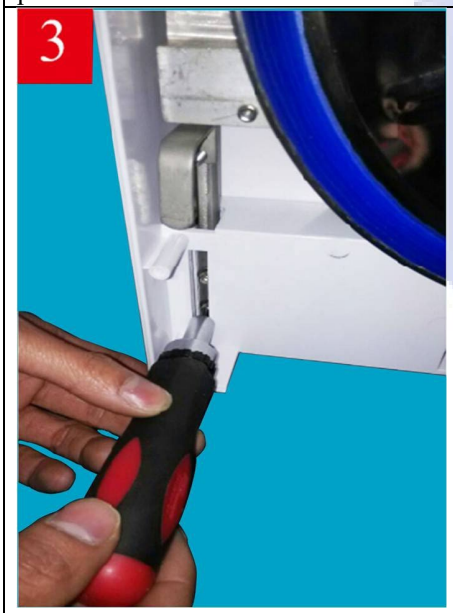


5 How to replace the door handle

1.Remove the bottom part of the mental plate.



2.You will see the crews that fix the door handle.

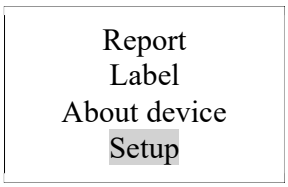


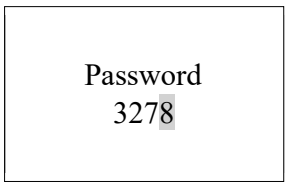
3.Remove the screws.

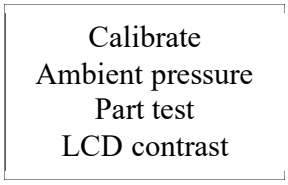
4.Take the door handle from the bottom and repalce it.

6 The setting menu for repairing

Input the password by ⇧⇩ button. Tap Ⓜ button to select the position and enter the setting interface.





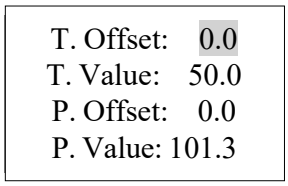


6.1 Calibrate

In this menu, we can set the deviation of temperature and pressure.

6.1.1 T. Offset is for temperature deviation.
The range is -10 - +10

Tap ⇧⇩ button to adjust the value. Tap ⏎ button to save the changes and go back the last menu.



6.1.2 P. Offset is for the pressure deviation.
The range is -10 - +10.

Tap ⇧⇩ button to adjust the value. Tap ⏎ button to save the changes and go back the last menu.

6.2 Ambient pressure

To set the ambient pressure in this menu.

6.2.1 Make sure the pressure inside the chamber is the same with outside.

6.2.2 Tap the⏎ button.

6.3 Parts test

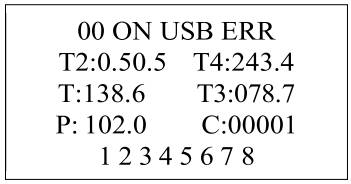
It is used for repairing. The parts will be electrified in turn.

6.3.1 The first line "xx on" means the no.xx parts is electrified.

The code of parts: 00-05 represent v1-v6; 06 means door switch; 07 means door lock switch; 08 means door unlock switch;09 means fan;10 means water pump; 11 means vacuum pump;12 means chamber heater; 13 means steam generator.

Tap Ⓜ button to stop the test.

USB OK/ERR is for testing the function of USB (NOT FINISH)



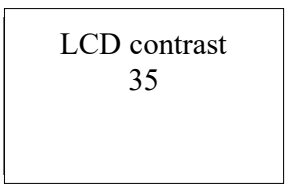
6.3.2 T1means the temperature of steam generator; T2 means the temperature of inner chamber; T3 means the temperature of chamber wall; T4 means the temperature of the second inner chamber; P means the pressure; C means cycle number.

6.3.3 The last line " 1 2 3 4 5 6 7 8"

1 flashing means the door closed; 2 lighting means the door unlocked; 3 lighting means the door locked.; 4 lighting means the used water tank is full; 5 flashing means the distilled water tank is lack of water 6 flashing means the distilled water tank is full.

6.4 LCD contrast

In this menu you may adjust the contrast of LCD. The range is 20-48. 35 is defined value.



6.5 Filling time

(Suit for the function of water pump filling)
You may set the water pump working time after you start the pump(Holding the down button.)

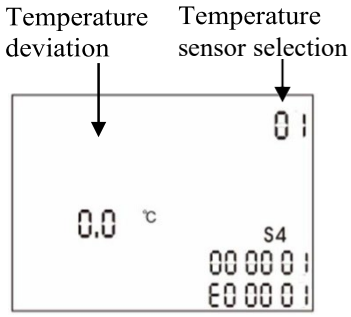
Ambient pressure Part test LCD contrast Filling time	Filling time 01:45

6.6 S4 setting (suit for 8-C/12-C/ 16-C)

Holding the button when switch on. Release the button until S1 appears on the screen.
Tap button to select the S1,S2,S3,S4.

6.6.1 Temperature deviation

Tap button to select the S4.
Tap , S4 stop flashing，the number of temperature start flashing.
Tap , adjust the value, the range is +4.0~-4.0.
Tap to save and exit.

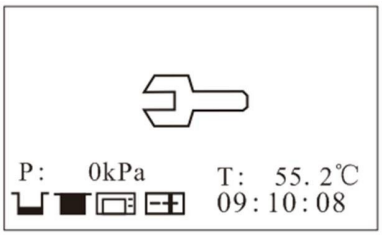


6.6.2 Temperature sensor selection

Tap button to change to the item of select temperature sensor.
Tap change the value.

01 use the temperature TP1.
02 use the temperature TP1 and TP4 in the same time.（suit for the model with 2 temperature sensors）

7 Maintenance procedure



This is a request periodic maintenance for steam sterilizer after the maintenance icon appears. Regular maintenance helps to reduce malfunctions.

1. Inspect the tightness of the door.
2. Check silicone tube.

Open the both side of metal cover, check whether there's silicone tube being hardening, and loose, especially check the tube connected with steam generator and chamber. It's better to replace this tube regularly.

3. Check all tube and parts connect well.
4. Run the vacuum test. The rate of pressure rise should be lower than 0.1kPa/min.
5. Run 134 wrapped program, check if there is somewhere leaking.
6. Temperature calibration.(If necessary)

Put the temperature log inside the chamber, connect printer and USB, run 134 wrapped program.
After this program is finished, compare value of test device with the test report output from the machine, then set temperature deviation.

7. Run Helix test program. After Helix test, check the result.
8. Put the metal plate back. Reset the date and counter of maintenance.

Finish.