STE Steam Sterilizer

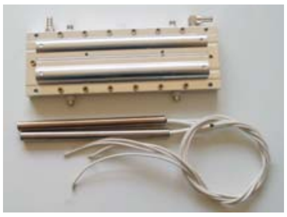
Technical Manual

TYPE D

CONTENT

1.PARTS

Water pump



Steam generator

Outer temperature sensor

Inner temperature sensor

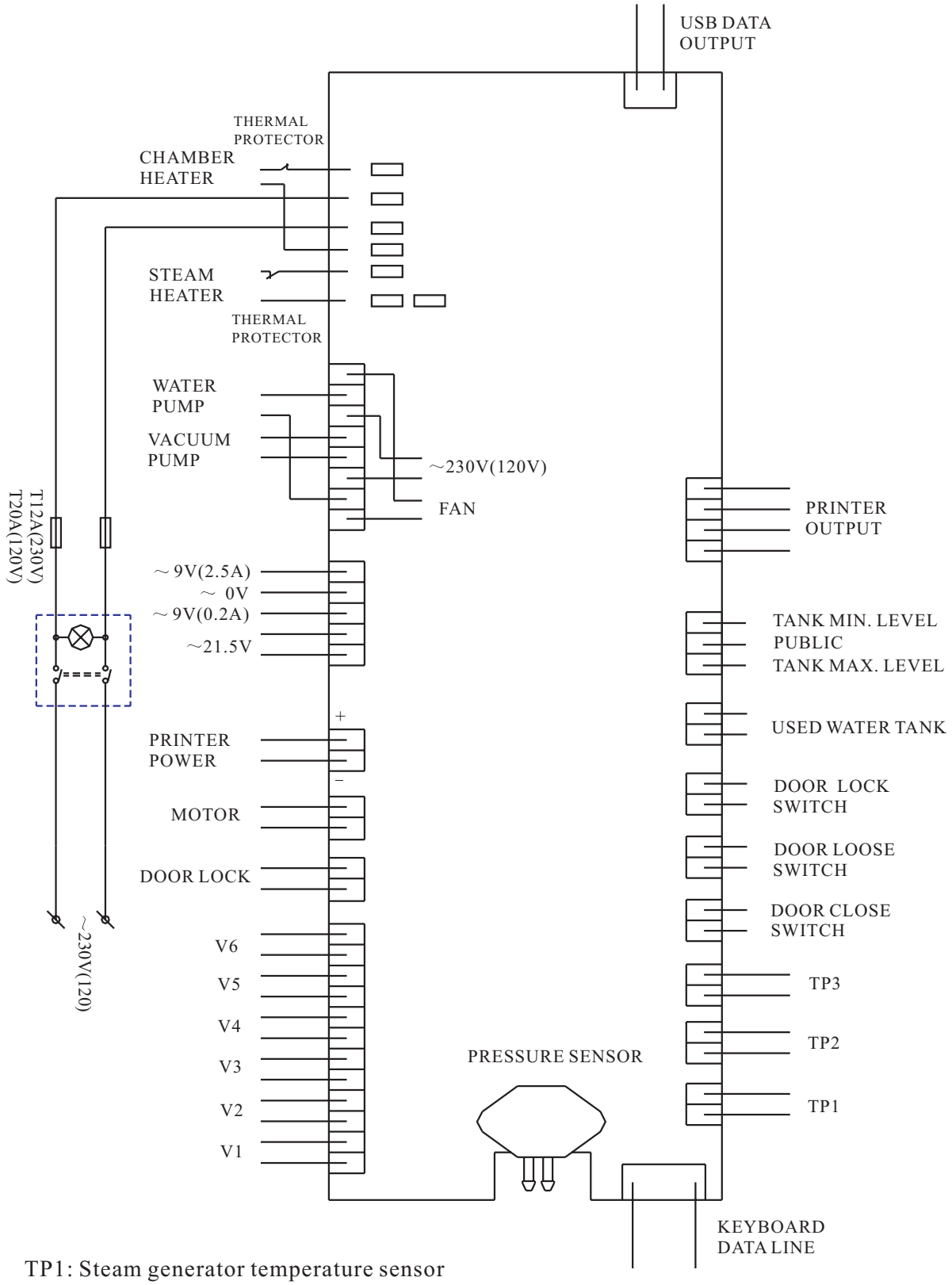
Vacuum pump

Steam generator thermal protector

Chamber thermal protector

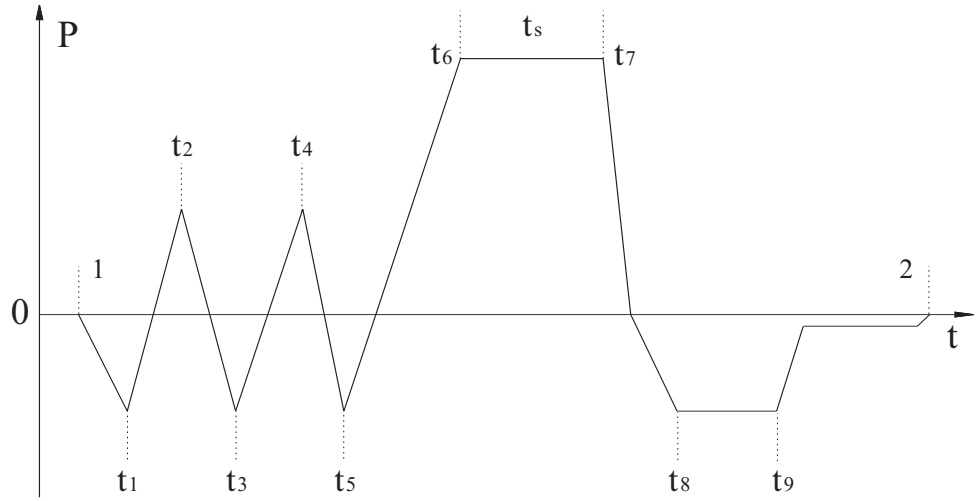
Transformer

2.ELECTRICAL DRAWING



TP1: Steam generator temperature sensor
TP2: Inner temperature sensor of chamber
TP3: Temperature sensor of chamber wall
V1: Air release valve
V2: Air filter valve
V3: Water pump valve
V4: Water release valve
V5: Vacuum pump valve
V6: Auxiliary valve

3.Working principle



0-1 Preheat state，
steam generator and chamber heater work, the indicator will be flash when they work.

1-t5 pulse vacuum state,
After press START button, electrify the air release valve(V1),electrify V5, electrify vacuum pump, the indicator will be light when it work. After reach the pressure or 4 minutes later ,the vacuum pump stop and off V5 , then the water pump work.
The V3 will be electrified every the water pump work when the pressure is below zero. Then the pressure rise. After reach a certain pressure, stop the water pump, off the V1 o release the pressure， after reach the pressure that near 0, the vacuum pump work again.

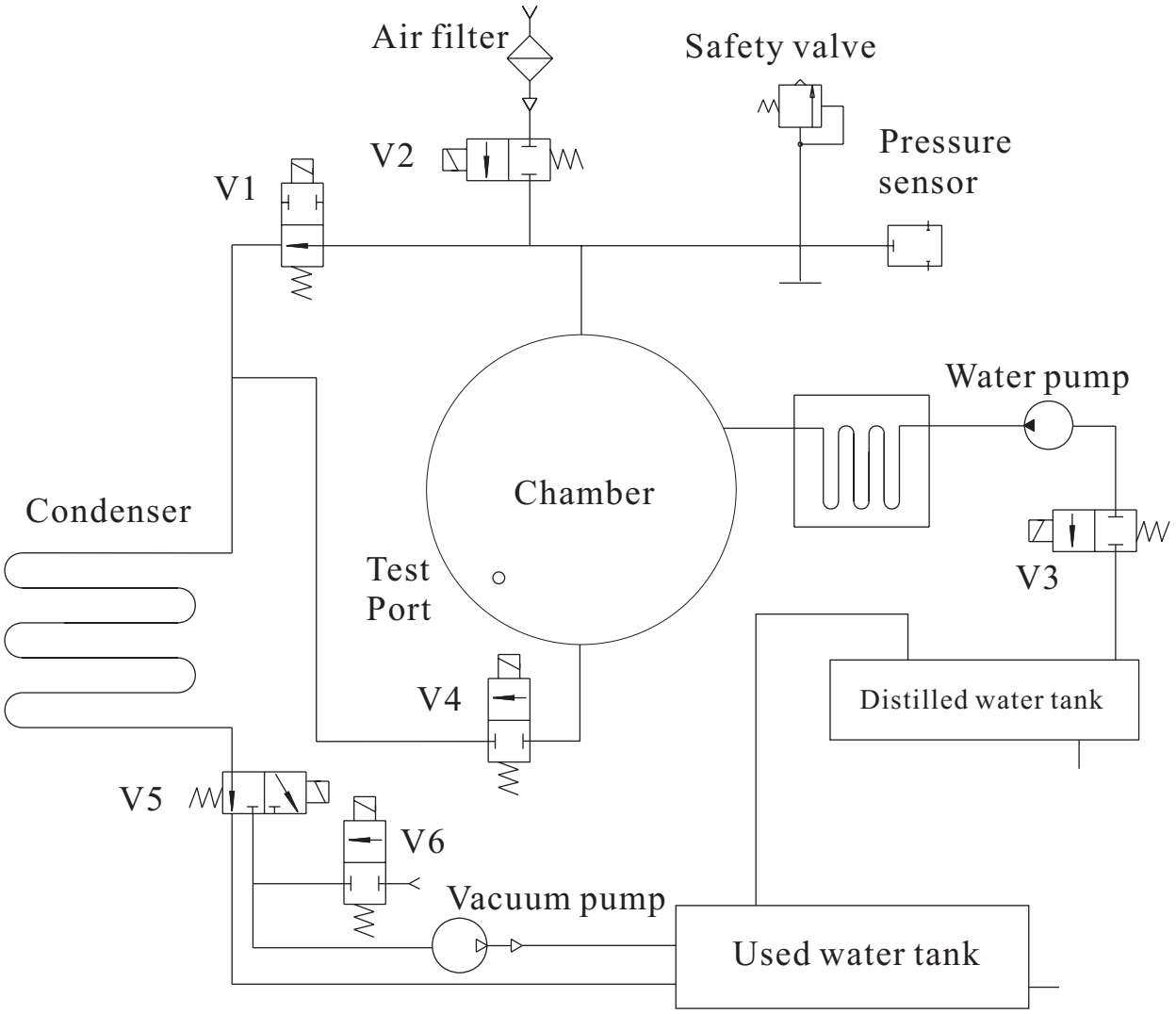
t5-t6 raise pressure state,
electrify the air release valve(V1) and the water pump work.

t6-t7 holding time state,
after reach the sterilization temperature and pressure, stop water pump. During this period, the water pump will work when the pressure or temperature drop a certain value, and the V1 will be electrify to release the pressure when the pressure or temperature over the set value.

t7-2 drying state
After finish the holding time the V1 be off to release the pressure, after reach the pressure that near 0, the vacuum pump work for a certain time, and then electrify the V2, until finish the cycle.

During the holding time, the normal temperature is 121~124℃(in 121℃ program),and134~137℃ (in 134℃ program). The normal pressure is 1.05bar~1.40bar(in 121℃ program),and 2.05bar~2.35bar (in 134℃ program). If the temperature and pressure are not in the range, you should check the the machine.

HYDRAULIC DRAWING



V1: Air release valve
V2: Air filter valve
V3: Pump valve
V4: Water release valve
V5: Vacuum pump valve
V6: Auxiliary valve

4.Malfunction

Please mark down the alarm code and phenomena when it appears alarm. If there is emergency or serious thing you may power off. And open the door when the pressure inside the chamber is less than 0.05 bar. In the others situation you'd better holding the START button to stop the program manually. That the system will stop the current program and drain the water inside the chamber.

4.1 Phenomena

（1.）There is no action after power on.

Solution：

Power	Make sure the light of power switch is on. If it is not, make sure the power plug contact the socket well.
Main fuse	If the power socket is ok ,Check the main fuse.
Transformer	Check the output of the transformer, the couple of green wire is 21～24V,the other is blue-black -gray 15- 0- 15V。

E1

Alarm condition: Steam generator overheats, or temperature sensor doesn't work.

Case 1: Overheating of steam generator:

Solution: Shut off the power, open the door and wait for 10 minutes. And then power on，you may use it again if the alarm disappear.

Case 2: Shut off the power. Then power on, if it alarm right away. The cable between the sensor of steam generator and mainboard is disconnected, or the sensor had been destroyed.

Solution: Shut down the power, check if the cable of steam generator sensor is connected well. If it connect well you shall replace sensor.

Case 3: The controlled temperature by thermal protector of steam generator is too high.

Solution: Please try to turn the thermal protector anti-clockwise with a small angle, less than 5 degree, and then try to run the cycle again.

E2

Alarm condition: the inner chamber overheats, or temperature sensor doesn't work.

Case 1: Overheating of inner chamber

Solution: Shut off the power, open the door and wait for 10 minutes. And then power on, you may use it again if the alarm disappear.

Case 2: Shut off the power. Then power on, if it alarm right away. The cable between the inner sensor and mainboard is disconnected, or the sensor had been destroyed.

Solution: Shut down the power, check if the cable of inner sensor is connected well. If it connect well you shall replace sensor.

E3

Alarm condition: the chamber wall overheats, or temperature sensor doesn't work.

Case 1: Overheating of chamber wall

Solution: Shut off the power, open the door and wait for 10 minutes. And then power on, you may use it again if the alarm disappear.

Case 2: Shut off the power. Then power on, if it alarm right away. The cable between the chamber wall sensor and mainboard is disconnected, or the sensor had been destroyed.
Solution:Shut off the power, check if the cable of chamber sensor is connected well. If it connect well you shall replace sensor.

E4

Alarm condition: It spent too long time to reach the holding state, normally over 1 hour after starting a cycle, it will appear E4.

Case 1: Before appear E4, the temperature had never reached to 135℃, and the pressure is over 225kpa, and release steam frequently.
Solution: Please check the altitude set, normally adjust to "+1" (Please refer the instructions manual)

Case 2: Before appear E4, the pressure is lower than 10kpa, and temperature is around 100℃ or less than.
Solution: Please check the air release valve, if it is working normally.

Case 3: When appear E4, the temperature is below 50℃. There is no steam inside the chamber. Touch the top inside the chamber, feel the temperature is not too high.
Solution: Check the chamber heater whether it works. Does the cable connected well? Does the chamber wall temperature protector work?

Case 4: When appear E4 the temperature is below 100℃.There is no steam inside the chamber. Restart the machine. Waiting for 15 minutes. Check the indicator light of steam generator indicator light on the mainboard. The light is blinking. Or it haven't enter the pre vacuum state if it is class B.
Solution: Check the steam generator works. Check the cable of the heater. Check the cable on the steam generator protector. Check the steam generator protector works. Check the heater of steam generator.

Case 5: When appear E4, the temperature is below 100℃. There is no steam inside the chamber. Restart the machine. Wait for 15 minutes. Check the indicator light of steam generator indicator light on the mainboard. The light does not blink or for a long interval. Or the pre vacuum state had finished if it is class B.
Solution： Check the water pump, check the cable of water pump. Check the water pump valve V3.

Case 6:When appear E4, the temperature is higher than 100℃. The pressure is higher than 0.2bar.
Solution: Check the heater of steam generator. Check if there is a big leakage on the steam generator. Check the water release valve V4 and air release valve V1, if they can be closed completely. You may observe the tube before the valve when the program is running and the pressure is higher than 0.2bar.
If the valve have not been closed completely you will find the steam or water flow to condenser continuously.
Check if there is a big leakage on the steam generator. Or in the other place

Case 7： There is a big leakage. Found some steam or steam leak when the sterilizer works.
Solution： Replace the part.

E5

Alarm condition: Fail to release the pressure

Please check if the air release valve seize up

Solution: Please do not force opening the door under the state of high pressure.

Shut down the power, if the steam pressure is not released, it means the air release valve is blocked. Turn on the power, waiting for its cooling until the pressure value is zero, or pull the safety valve to release the pressure. Then open the door, replace the air release valve V1.

E6

Alarm condition: The door was opened after start.

Solution: Check the door close switch. It does not work.

E7

Alarm condition: Door lock is not released

Solutions: Check the door loose switch.

Check the door solenoid lock.

E9

Alarm condition: Holding temperature is failed

Case 1: Adjust the parameter refer the instructions manual if in a high altitude place.

Case 2: Check the heater of steam generator. One of the heaters does not work.

Case 3: Check if there is a big leakage on the steam generator. Or in the other place

Case 4: Check the water release valve V4 and air release valve V1, if they can be closed completely. You may observe the tube before the valve when the program is running. If the valve have not been closed completely you will find the steam or water flow to condenser continuously.

E11

Alarm condition: Steam generator preheating failure.

Solution: Check the steam generator. Check the cable of the heater.

Check the steam generator thermal protector.

Check the heater of steam generator.

E12

Alarm condition: Chamber heater preheating failure.

Solution: Check the chamber heater. Check the cable of the heater.

Check the chamber thermal protector.

Check the resistance of heater.

E13

Alarm condition: The machine fails to vacuum when running cycle. It only appear at the phase of vacuuming. The pressure can not reach -50kPa.

The principle of vacuum phase: the vacuum pump is working, and the air flow is from chamber to air release valve (V1) to condenser to vacuum pump valve (V5) to vacuum pump and in the end to used water tank.
Case 1: The vacuum pump does not work.
Solution: Check the cable of the vacuum pump. Check the connector of the vacuum pump on the mainboard.

Case 2:The vacuum pump valve does not work.
Solution: Check the cable of the valve. If it works you will hear a sound of click.
Or something enter the valve and block the valve. You may pull out the pipe to feel the air flow when the vacuum pump works. You will feel be absorbed on the side of the valve if the it is not blocked.

Case 3: There is a big leakage somewhere.
Solution: You will hear a sound of leaking if there is a big leakage somewhere. Replace it or tighten it.

Case 4: The air release valve V1 is blocked. The air release valve is a normal open valve. Normally when the vacuum pump is working, you may see the air flow from the chamber to condenser by air rel ease valve.
Solution: Replace the valve.

Case 5: The pressure sensor is damaged. After finish the vacuum phase, if you open the door and feel suction, but the pressure show 0.
Solution: Replace the mainboard.

E20

Alarm condition: The cycle is interrupted by manual
Solution: Shut off the power and restart the power.

The LCD is black
Solution: Check the cable connected to the mainboard.

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

The keyboard does not work
Solution: 1. Check the cable connected to the LCD.
2. Replace the keyboard.
3. Replace the LCD.

Vacuum test is failed

Vacuum test is for checking the leakage rate of chamber.
The following are the ways to check autoclave if vacuum test was failed.
1. Please check if the test was running under cold state of chamber.
Solution: Cool down and run the test again.
2. If vacuum test was actually failed under cold state, please check as following

a. Please check the tightness of door, clean the door seal, and ensure there are not any impurities remaining. If the seal has any breakage, please replace it. If it is no effect, please try to adjust the door.
Solution: Replace the vacuum pump valve.

b. Please check the air release valveV1, when the test comes to the phase of keeping vacuum state, the air release valve will be power on and the valve is closed. Observe the pip form air release valve to condenser. If the water drop inside the pipe flow to the valve it means the valve does not seal well.
Solution: Replace the air release valve.

c. Check the safety valve. When the test comes to the phase of keeping vacuum state observe if the safety valve is leaking.
Solution: Replace the safety valve.

d. check the air filter valve V2, When the test comes to the phase of keeping vacuum state. Put your finger on the port of air filter, to feel if there's any air is absorbed.
Solution: Replace the air filter valve.

e. If there's any release in some other places, when you running a sterilization cycle, sounds of leakage can be heard if there is pressure in chamber.
Solution: Adjust the door seal or replace the parts.

Lots of water remains inside the chamber after cycle finish

1. The filter on the internal bottom of chamber was blocked
Solution: Take it out, and clean or replace it.

2. The filter screen inside the pipe before the water release valve.
Solution: Replace the filter screen.

3. The water release valve is blocked or does not work.
Solution: replace the water release valve.

4.2 Function Of The Parts

（1.）Steam generator

The steam generator is composed of body, temperature sensor, thermal protector.

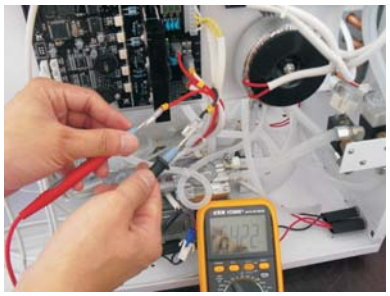
Leak

You will find that it is wet around the steam generator. If it is serious the pressure will not rise. The seal ring is destroyed or the screw is loose.

Can not heat

The heater does not work.

Pull out the No.6 and one of the No.7 cable. Measure the resistance of the heater. The resistance should be about 75Ω （12/16/18L）、78Ω （8L）between the No.6 and No.7.



The thermal protector does not work. It will break the power of the heater.

Check if it is broken between the two pins. Short circuit is normal.

Sensor problem

The temperature sensor short circuit or break. Measure the resistance of the senor (No.1). The normal resistance is1000～1700Ω.

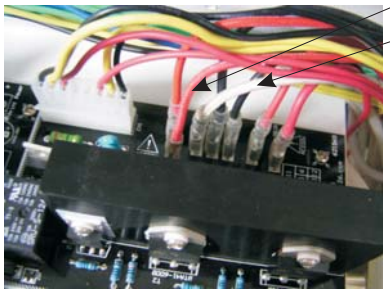
Replace the steam generantor

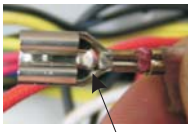
1.Pull out the connector of No.6 and No.7.

2.Pull out the connector of TP1;

3.Screw off the 4 bolts of the bracket of steam generator

4.Screw off the 2 bolts of the bracket of thermal protector.

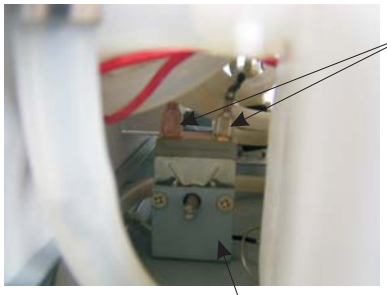




5.Dismantle the tube connected to the water pump and chamber.

6.Then you may pull out the steam generator and replace it.

Bracket of steam generator

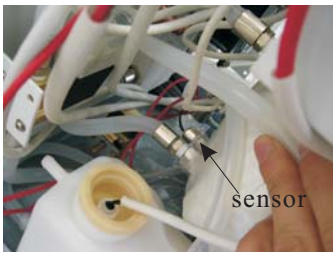


Bracket of thermal protector

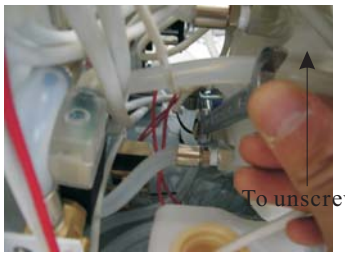
Caution：You must press the clip of the connector when you pull out the wire No.6 and No.7.

（2.）Inner temperature sensor

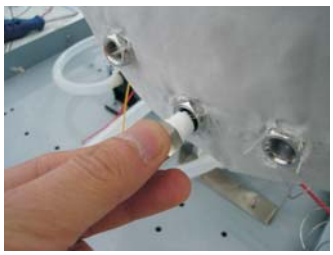
If the sensor does not work it will appear alarm E1 。You may measure the resistor . The normal resistance is 1000～1700Ω 。



1.Open the cover of the machine.



2. Turn the senor anticlockwise by spanner 12#.



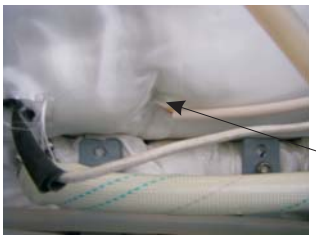
3. Replace a new one.
You must screw it tightly.

（3.）Outer temperatue sensor

If the sensor does not work it will appear alarm E3 。You may measure the resistor . The normal resistance is 1000～1550Ω 。

Replace the outer temperature sensor

1. To find the position of the sensor and cut the heat insulation.
2.Unfasten the brass wires.
3. Replace the sensor.



（4.）Chamber thermal protector

The protector will act when the chamber heater overheat. It will cut the circuit of the chamber heater. This protector need to be recovered by manual. After the chamber is cooled down you may press the reversion button to recover the protector.

Replace the chamber thermal protector

1.To find the position of the sensor and cut the heat insulation.
2.Pull out the connector。
3.screw off the nut and replace the protector。

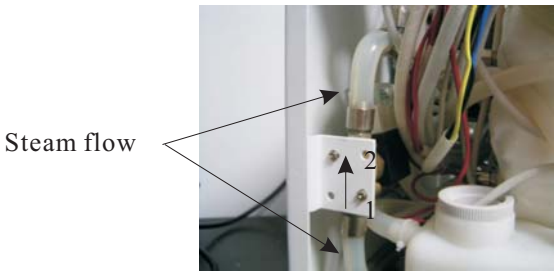
（5.）Water release valve

Water release valve is a normal close valve.

Problem1: The valve can not close completely you will see the steam and water flow by the pipe.

Problem2: The valve can not open during the period of releasing the pressure. There is much water left after the cycle.

Check the solenoid coil if it can work. Check the circuit of water valve by multimeter. Check if the circuit is break. Or you may measure the solenoid coil directly as picture. The resistance is about 80Ω.



（6.）Air release valve

Air release valve is a normal open valve.

Problem1: The pressure can not be released after power off if the valve does not work.

Problem2: The valve can not close completely after it is electrified. The pressure will not rise during the period of raising pressure. And you will see the steam and water flow by the pipe.

Check the solenoid coil if it can work. Check the circuit of water valve by multimeter. Check if the circuit is break. Or you may measure the solenoid coil directly as picture. The resistor is about 80Ω.

（7.）Vacuum pump valve

Vacuum pump valve is three way two position valve.

Problem : The air leak from used water tank by the valve when vacuum pump is working. And the pressure can not decrease.

Check the solenoid coil if it can work. Check the circuit of vacuum pump from mainboard to valve by multimeter.

Check if the circuit is break. Or you may measure the solenoid coil directly as above picture.

The resistor is about 80Ω.

Caution: Make sure the direction of the valve is right when install the valve.
There is an arrow or a number (1 to 2) on the valve.
The arrow of water release valve should be upward. Or the number is down.

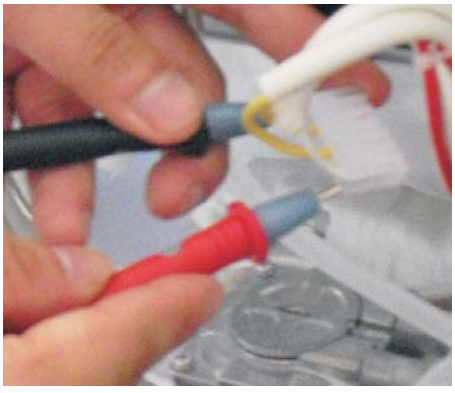
（8.）Vacuum pump

Check the vacuum pump works or not. Pull out the connector from the mainboard.

Measure the resistance of the vacuum pump.

The value should be 200k ohm~400ohm.

It depends on different type of the vacuum pump.



（9.）Water pump

If the water pump does not work the water can not jet into the seam generator, and can not generate the steam ,and the pressure can not rise.

Check the water pump works or not. Pull out the connector from the mainboard.

Measure the resistance of the vacuum pump.

The resistance should be less than 1k ohm.

（10.）Door switch

If the door switch does not work, the door close icon on screen will not appear

Replace door switch

1.Open the cover of the machine, pull out the cable of the LCD from the mainboard.

2.Dismantle the control panel you will see the switch.

3.Screw off the nets to replace the door switch.

（11.）LCD

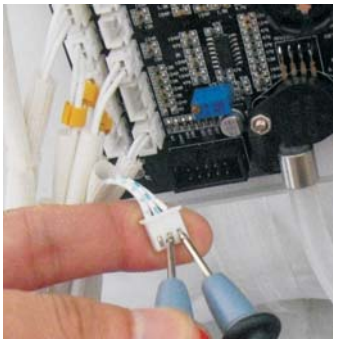
Replace the LCD

1.Open the cover of the machine，pull out the cable of LCD from the mainboard.

2.Dismantle the control panel and remove the LCD.

（12.）Water level sensor of the distilled water tank

If the water level sensor works. The two pins shall be short circuit if the distilled water tank is lack of water. As the picture.



（13.）Water level sensor of the used water tank

If the water level sensor works. The two pins shall be short circuit if the tank is full.