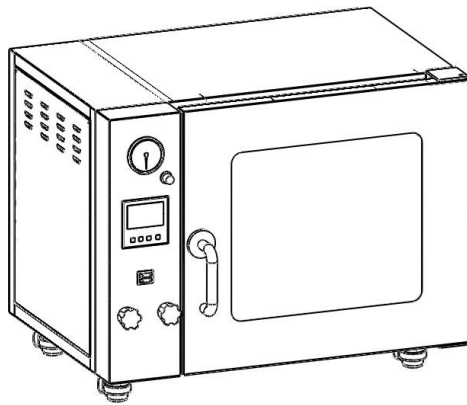


# Vacuum Ovens

## Nahita

# Operation Manual



# Contents

- 1. Safety instructions**
- 2. Application**
- 3. Structure**
- 4. Working condition**
- 5. Technical parameters**
- 6. Device operation**
- 7. Display instructions**
- 8. Wiring**
- 9. Points for attention**
- 10. Maintenance**
- 11. Problem solution**

# 1. Safety instructions

## Avoid dangerous situations!

1. Device must be connected with the ground.
2. When the oven is smoking vacuum or heating, do not allow to touch the door and window, must stand at more than one-meter distance from door.
3. Shall not dry inflammable, explosive, volatile and corrosive substances.
4. When need not to smoke air continuously, should shut off the vacuum valve firstly, then close the vacuum motor power switch, in order to prevent the vacuum pump oil flow backward to chamber.
5. If the oven is broken, must be repaired by professional maintenance person.
6. If need to repair electrical parts, must be repaired by electrical engineer.

## Warnings to prevent serious property damage or loss of life

1. Must fully read and understand operation manual, before operating the device.
2. When replace the fuse and electric parts, must pull the plug.
3. When the oven is not used for long time, must pull the plug.

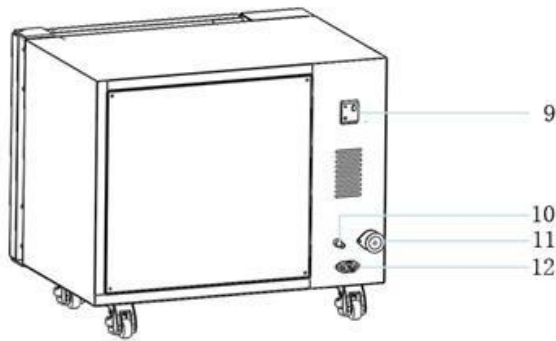
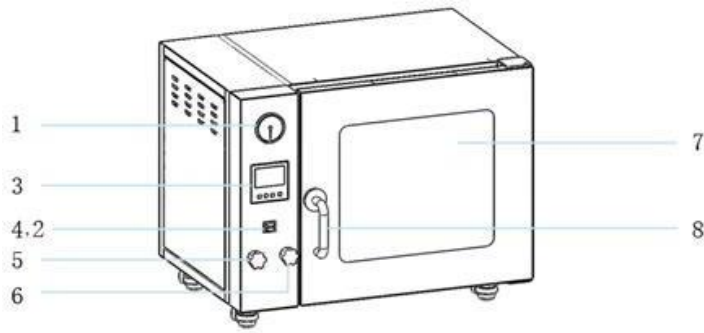
# 2. Application

It is suitable for drying and heating articles in vacuum conditions, in the laboratories of industrial and mining enterprises, colleges and universities and R&D institutions etc. Make vacuum heating for articles in vacuum dry chamber has the following advantages:

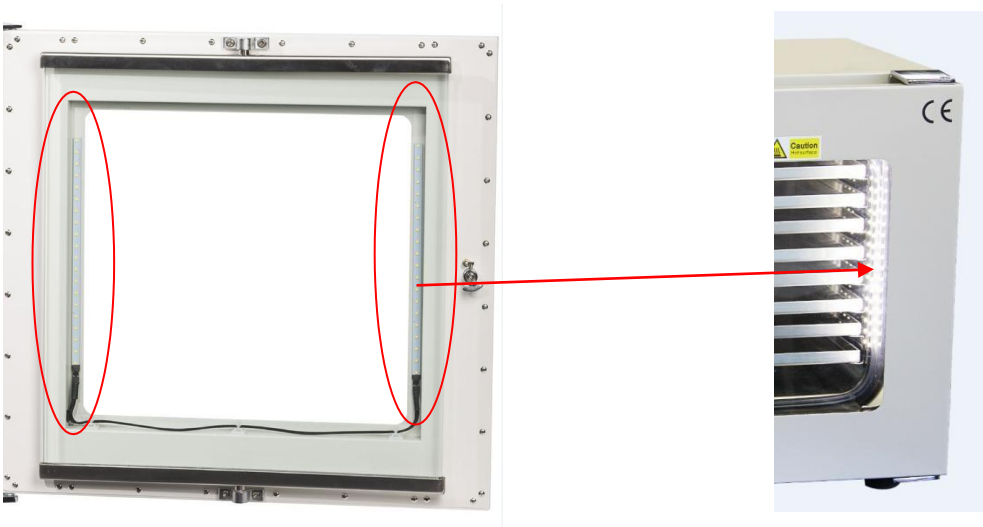
- (1) Can reduce the drying temperature, shorten the drying time.
- (2) Avoid some articles oxide when heated, dust particle damage and the heating air kills the biological cells.

# 3. Structure

The shape of vacuum oven is horizontal type. The box body is made of high-quality steel plate with pressing and welding processing. The surface of box adopts plastic spraying treatment. Thermal insulation of the chamber is achieved with an alumina silica wool filling. The box door is made of double toughened glass, which could regulate the open and close, degree of tightness of box door. The formed high-temperature resistance silicone rubber sealing washer used between working chamber and glass door for ensuring sealing between the box door and chamber, which improved the vacuum degree greatly.



- |                          |                      |                               |
|--------------------------|----------------------|-------------------------------|
| 1. Vacuum gauge          | 2. LED light switch  | 3. PID temperature controller |
| 4. Power switch          | 5. Vacuum valve      | 6. Inert gas inlet valve      |
| 7. Observation window    | 8. Door handle       | 9. Leakage protection switch  |
| 10. Inert gas inlet hole | 11. Vacuum pump hole | 12. Power socket              |



LED lights can be used only when temperature is lower than 100 °C.

#### 4. Working condition

- (1). Environment temperature: +5 - 40°C
- (2). Relative humidity: ≤85%
- (3). Atmospheric pressure: 86 - 106 kPa

- (4). Around without intense shaking, clearance is more than 50 cm.
- (5). There are not direct sunlight and heat radiation.
- (6). There is not a strong airflow blowing straight body.
- (7). There is not high concentration of dust and corrosive materials.

## 5. Technical parameters

| Code        |                   | JBN001  | JBN002      |
|-------------|-------------------|---|-------------|
| Power       | Voltage           | 220V  |             |
|             | Power             | 500W  | 1600W       |
| Material    | Case              | Steel with epoxy powder coating                   |             |
|             | Chamber           | Stainless Steel                                   |             |
| Temperature | Heating method    | 4-sided   |             |
|             | Controller        | Low proportional gain, PID control, LCD display   |             |
|             | Temp. range       | RT to 250°C (lower than 100°C when LED lights on) |             |
|             | Temp. resolution  | 0.1°C   |             |
|             | Temp. fluctuation | ±1°C  |             |
|             | Timer range       | 1-9999 minutes                                    |             |
| Vacuum      | Max. vacuum       | ≤133Pa (1mmHg)                                    |             |
|             | Vacuum gauge      | 0 to -0.1MPa (760 mmHg to 10 mmHg)                |             |
|             | Door gasket       | Silicone  |             |
| Safety      |                   | Circuit breaker, overheat protector               |             |
| Size        | Capacity          | 25L   | 53L         |
|             | Chamber size      | 300x300x275                                       | 415x370x345 |
|             | Product size      | 580x450x450                                       | 720x525x535 |
| Shelf       | Max no.           | 4   | 5           |
|             | Included          | 1   | 2           |
|             | Adjustable        | YES   | YES         |

## 6. Device operation

### (1). Installation

Put the vacuum oven at the place in the room with good air conditions and without vibrations.

There should no inflammable, explosive, and corrosive air in the surroundings of instrument.

## (2). Debugging

Close the vacuum oven door and screw the handle. Close the return-air valve and open vacuum valve, connect the airway at side of box body with vacuum pump by vacuum rubber pipe, switch ON the power of vacuum pump, begin to exhaust air. When the indicating value of vacuum meter reaches to required value, close the vacuum valve and switch OFF vacuum pump. At this time, it has vacuum condition in the box. If there is no heating function, the debugging of vacuum oven is end.

## (3). Usage

1. Put the articles need to be dried in the oven, close the oven door, and screw the handle, close the return-air valve, and open the vacuum valve, connect the airway at rear of oven body with vacuum pump through vacuum rubber, switch ON the power of vacuum pump, it begins to exhaust air. When the indicating value of vacuum meter reaches to the required vacuum degree, close the vacuum valve, and then switch OFF the vacuum pump, at this time, the oven is in vacuum condition.

2. Switch ON the oven power, the indicating light is on, which means it works normal. The display will indicate the temperature in working chamber, then adjust the controller to the required temperature (set point), the electric resistance begins to heat, the green light on the controller is on.

3. If you require a temperature not too high, for example 60°C, you could adopt two steps setting style; set 50°C at the first time, when the overshoot temperature fall after rise, set 60°C at the second time, in this way, you could reduce or stop the overshoot temperature.

4. Different articles with different humidity required different drying times. If longer drying time is required and the vacuum degree is reduced, exhaust air and make vacuum condition again switching ON the vacuum pump and then open the vacuum valve.

5. After finish drying, turn OFF the power firstly, open the return-air valve, make the air in the oven not in vacuum condition, open the oven door and take the articles out. (In vacuum conditions, the rubber ring and glass door absorbed tightly, not easy to open the oven door, after some time, open it easily).

6. In vacuum condition, the set point temperature should not be lower than 50°C. If it is lower than 50°C, the value measured by standard thermometer is different with the display value of meter, that is normal. The temperature control and precision will not be affected when the temperature is higher than 50°C.

## 7. Display instructions

### 1. Product code

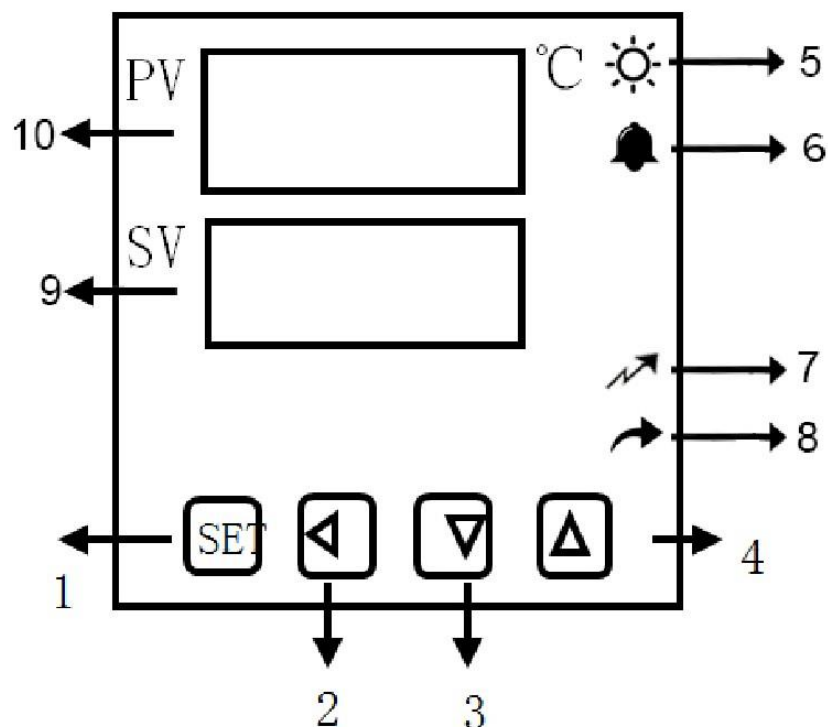
DF

- (1) Panel size (mm)  
D:72\*72 G:48\*48 E:48\*96 A:96\*96 W:80\*160
- (2) 7 degrees of intelligence
- (3) Output mode selection
  - 4: Relay output
  - 5: Solid state relay output
  - 6: Phase shift trigger pulse output
  - 7: Zero-crossing trigger SCR output
  - 8: Zero-crossing trigger pulse signal output
  - 9: 0-10mA 4-20mA continuous current output
  - 10: Phase shift continuous output
  - 11: 0-5V, 0-12V, ON/OFF output
- (4) Alarm selection
  - 0: no alarm
  - 1: relay alarm
  - 2: buzzer alarm
- (5) Model input type selection
  - 1: K.E.S.B and other thermocouple input
  - 2: CU50, PT100
  - 3: 0-10mA, 0-5V, linear voltage output

## 2. Main technical parameters

- 1) Power: 220VAC±10%
- 2) Environmental temperature: 0 - 50°C
- 3) Relative Humidity: < 85%
- 4) Range of temperature: RT - 250°C
- 5) Range of time: 1 - 9999 minutes
- 6) Temperature fluctuation: ±1°C

## 3. Control panel



1. Function key (SET)
2. Shift key - Press and hold for 5 seconds to perform self-tuning
3. Minus key - Sound attenuation
4. Plus key - See heat preservation time
5. Heating symbol
6. Alarm symbol
7. Set: self-adjusting symbol
8. Running symbol
9. Set value display window
10. Measured value display window



#### 4. Operation and using


(1) Power up and switch on, the upper row of meter indicates Inp-LLL, while lower row indicates (Pt).

(2) Press the SET function key for 1 second to enter the first menu, the upper row displays  $\square\square$ , which is the required set temperature, and then press the SET function key, the upper row displays  $\square\square$ , which is the required time setting, and then press the SET function key to save.

(3) Press the SET function key for 5 seconds to enter the setting parameters required by the second menu (according to Table 1), and then press the SET function key for 5 seconds to save the setting value.

##### 4.1 Self-tuning function

Press  $\triangleleft$  for 5 seconds, appears set symbol , and self-adjusting begins; when self-adjusting ends,  off, oven got a group of PID parameters overcoming excessive

temperature. During self-adjusting, press  $\triangleleft$  for 5 seconds and  off, then self-adjusting ends. The meter will be controlled following the original PID parameters.

If the temperature rise is slow, use a parameter that is several tens of degrees higher than the self-tuning parameter to control the required time speed.

##### 4.2 Time function

Press  $\triangle$  key and then the total power up time shows in minutes. In case of power failure, the previous timer is invalid. When the caller calls, start the timer from zero again.

##### 4.3 Time setting up function

According to the first menu in Table 1, the upper row of panel displays  $\square\square$  and the lower row sets the time.

When the time needed by the meter is up, lower row shows off and output function ends. If you want to resume control time setting up, you should select power off first, then restart. If long-term heat preservation is required, the time is set to "0"

4.4 If it displays LLL, it means that the sensor is short-circuited, or the temperature is less than  $-20^{\circ}\text{C}$ ; if it displays HHH, it means that the sensor is open, or the temperature is greater than the measurement range.

Note: When using the vacuum oven, if the sensor is placed inside the oven, and it is self-adjustment at 140°C. The reference number is for example: I=392+200=592.P=848.D=637. The period  $\tau$  is set to 40 seconds.

If the sensor is placed outside the box, it will be self-tuning at 160°C. The reference number is for example: I=350+300=650.P=1060.D=1007. The period  $\tau$  is set to 60 seconds.

When using the vacuum oven, after self- adjustment, the PID parameters remain unchanged, and the period  $\tau$  is set to 5-10 seconds.

#### 4.5. Internal parameters settings

Table 1

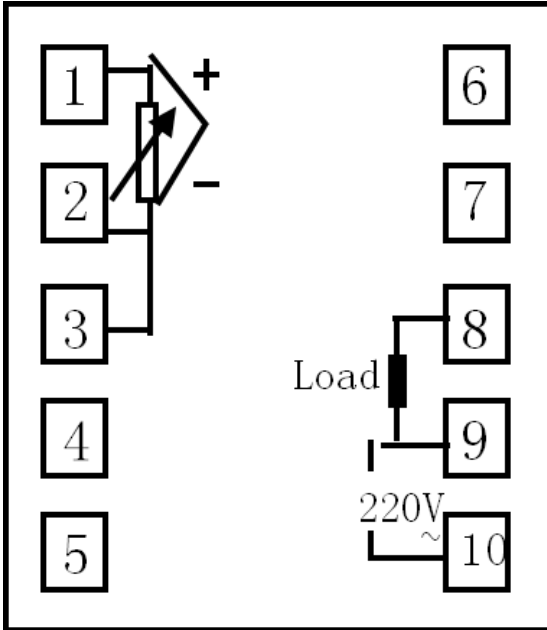
| First menu    | Prompt   | Name                   | Setting range | Description   | Factory default |
|---------------|--|------------------------|---------------|---|-----------------|
| Press "SET"   | SD   | Master Control setting | Full range    |   | Random          |
| Press "SET"   | $\tau$   | Timing setting         | 0-9999        | Timing when temperature reach the set value                           | 0               |
| Second menu   | Press "SET" key for 5 seconds to enter. After value setting press "SET" key for 5 seconds to log out and save. |                        |               |   |                 |
| Serial number | Prompt   | Name                   | Setting range | Description   | Factory default |
| 1             | SHF  | Upper limit alarm      | 100           | When measured value is greater than set value, alarm and output.      | 10              |
| 2             | P  | Proportional belt      | 0-999         | Heating rate  | 500             |
| 3             | I  | Integral               | 0-999         | Integral time   | 150             |
| 4             | D  | Differential           | 0-999         | Differential time   | 250             |
| 5             | $\tau$   | Period                 | 0-120         | Output time (by second), and the period is the differential 1/13      | 20              |
| 6             | ScI  | Sensor correction      |               | Sensor translation correction   | 0               |
| 7             | ScD  | Slope correction       |               | Correction degree x 400/set value = value to be entered               | 0               |
| 8             | HY   | Hysteresis             | 1-20          |   | 1               |
| 9             | AE   | Self-tuning selection  | 0<br>1<br>2   | 0. Step control<br>1. PID working<br>2. Self-tuning working           | 1               |
| 10            | LOCK   | Electric lock          | 0<br>1<br>2   | 0: No lock<br>1: First menu locked<br>2: First and second menu locked | 0               |

While the upper row display LLLL, it means sensor cutting out or the temperature is below measured lower limit value.

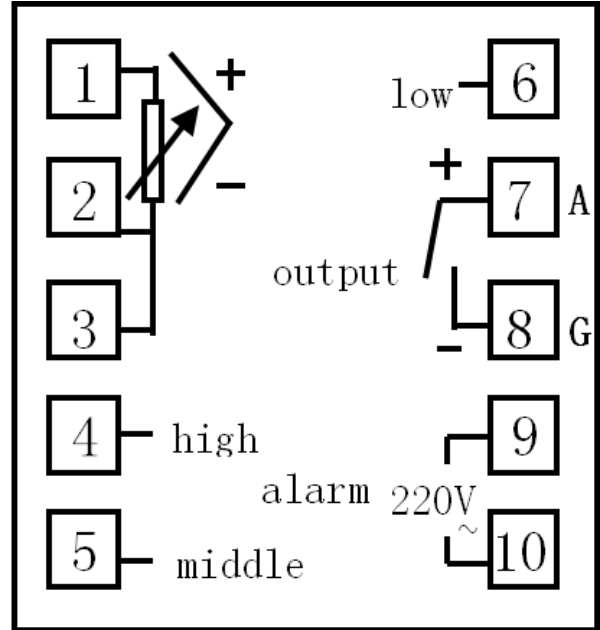
While the upper row display HHHH, it means sensor cutting out or the temperature is above measured upper limit value.

## 8. Wiring

72\*72 DFD

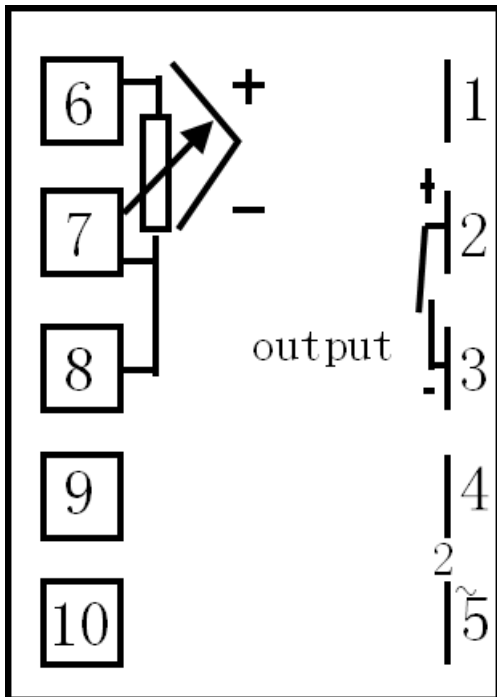


SCR output



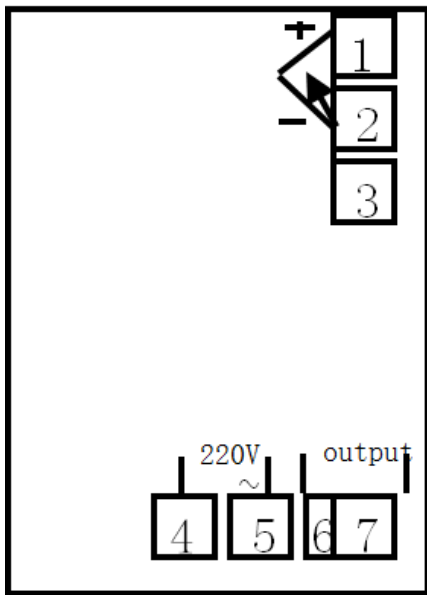
Relay output ,Voltage output ,  
Zero crossing trigger

48\*48 DFG

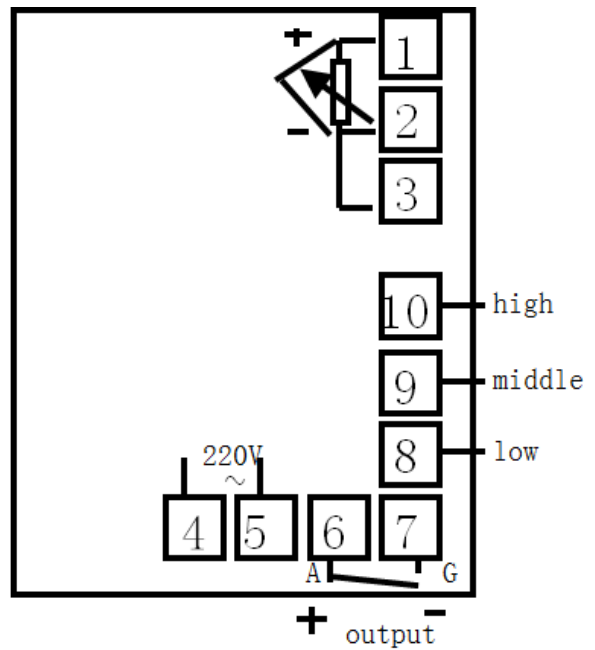


Relay output , voltage output

96\*96 DFA

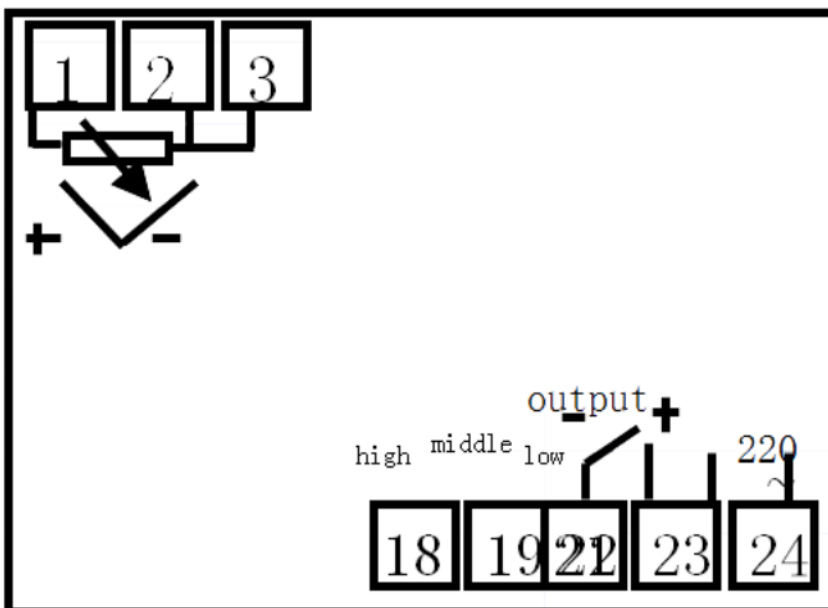


SCR output



Relay output ,Voltage output ,  
Zero crossing trigger

80\*160 DFW



G A

## 9. Points for attention

1. The vacuum dry box must be grounding effectively for ensuring safety.
2. When the vacuum dry box doesn't need to connect with air exhausting, close the vacuum valve firstly, then close the power off vacuum pump, at the same time, open air press valve of vacuum pump, otherwise the pump oil will flow backward to the box.
3. Don't place inflammable substances inside the working chamber.
4. A filter can be installed between the stove and the vacuum pump to prevent humid air from entering the pump.

## 10. Maintenance

1. The oven should be kept clean. Use soft cloth to wipe the door. Avoid using chemical solvent.
2. If device will not be used for a long time, coat the electroplates parts with corrosion resistant oil, put it in a dry room and cover it with a protective plastic.

## 11. Problem solution

| Problem   | Reasons  | Treatment                                 |
|---|--|---|
| No power supply   | The socket has no power supply                   | Check the line and change the socket      |
|   | The socket isn't plug well or the wire is broken | Change the plug and connect the wire well |
|   | Fuse is open circuit                             | Change the fuse                           |
|   | The power is not switch ON                       | Switch ON the power                       |
| The temperature in the chamber isn't rising                                     | The setting temperature is low                   | Adjust the setting temperature            |
|   | The electric heater is wrong                     | Change the heating resistance             |
|   | The temperature controller is wrong              | Change the temperature controller         |
|   | The temperature sensor loosened                  | Screw the connecting nut                  |
| The error between the setting temperature and temperature in the chamber is big | Damage of sensor or controller                   | Change sensor or controller               |
| Temperature is out of control   | Temperature sensor is not properly positioned    | Fix the sensor well                       |
|   | The temperature controller is wrong              | Change the temperature controller         |

