Labotronics


# Drying Cabinet

# LB-10DC

# Index

## 1. Safety Measures

- Samples should not be kept too close to each other to avoid affecting air convection inside the chamber. Ensure the equipment is correctly grounded to ensure safety.
- Do not get water onto the observation windows when the temperature is rising to avoid glass cracks.
- This drying oven is not an explosion-proof instrument.
- Do not put volatile and inflammable objects into the oven to avoid an explosion.
- Based on different needs, the user can unblock the air outlet at the upper back of the oven to escalate drying.
- When the oven is working, samples should be kept away from the air outlet at a 10cm distance in order not to be affected by airflow.

## 2. Introduction

**Drying Cabinet LB-10DC** is a microprocessor controlled unit for expediting the drying process. The ideally assembled steel platforms progress the heating process. The product is characterized with the thermostatic configuration.

## 3. Features

1. Digital LCD screen for visual monitoring of data
2. Multiple positioning on shelves
3. Temperature regulation
4. PID controlled system

## 4. Specifications

| **Model No.** | **LB-10DC** |
|---|---|
| **Temperature range** | 5 °C ~ 250 °C |
| **Temperature fluctuation** | ± 1 % |
| **Working space dimensions** | 350 × 350 × 350 mm |
| **Power consumption** | 1.2 kW |
| **Power supply** | 220 V |
| **Dimensions** | 530 × 640 × 550 mm |
| **Weight** | 37.5 kgs |

## 5. Applications

Used for drying, baking, wax melting, disinfection and sterilization in biochemical, chemical, pharmaceutical, medical units, industrial and mining enterprises, colleges and universities, scientific research, etc.

## 6. Instrument Introduction

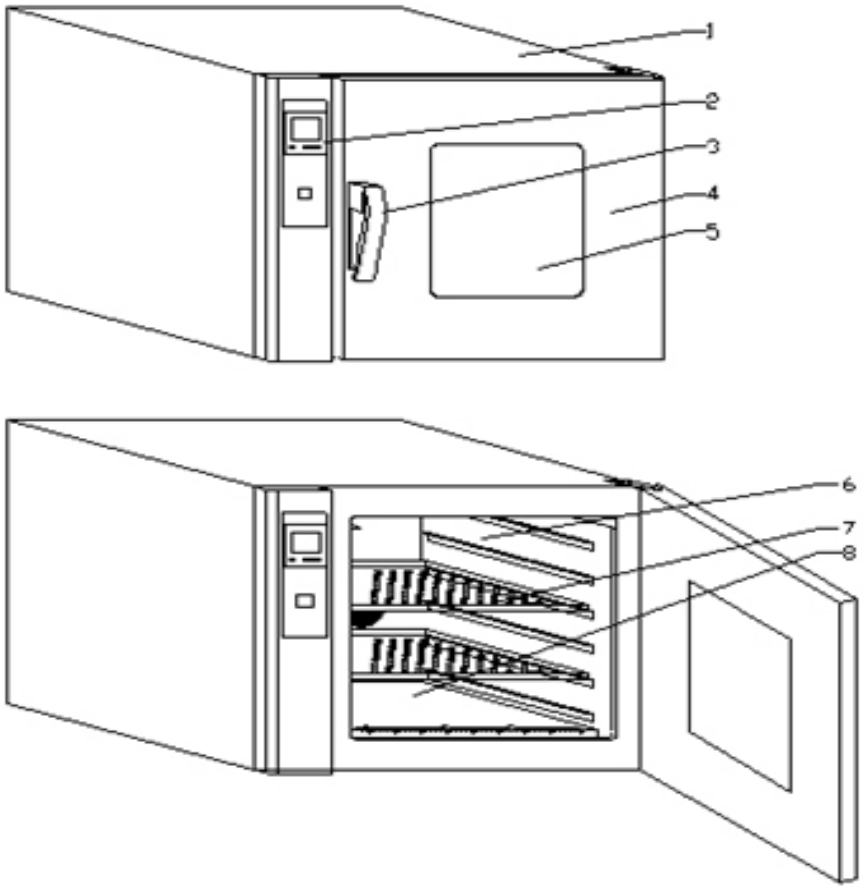



**Figure-1 Instrument structure**

1) Body
2) Controller
3) Handle
4) External door
5) Observation Window
6) Interior Chamber
7) Shelf
8) Airflow Board

**Working principle and structure:**
There is a temperature sensor inside the chamber, which detects the actual temperature and converts it into an electrical signal. The microprocessor receives the signal and controls the heater accordingly to reach the needed temperature.
There are heaters at the bottom of the working chamber and ducted forced air convection devices at the back. The temperature controller maintains and controls temperature. When the oven is working, air goes through the heater and is circulated by the fan, which ensures temperature uniformity. With features of the arc corner design, adjustable shelf distance, and a built-in temperature sensor.

There is fiberglass that serves as insulation between the working chamber and the external shell. The shell is made of steel plate with a spraying-finished surface. The interior chamber is made of a stainless-steel plate, with a built-in heating chamber and air duct. Double tempered glass observation windows. There is a heat-resistant silicone door seal between the working chamber and the external door, which enhances tightness and leak proofness meanwhile enhancing heat insulation. It adopts LCD display and temperature control system with a PID microprocessor. It has features of a timer and high-temperature accuracy.

# 7. Operations

## 7.1 Control Panel


**Figure-2**

1) **Wind Fast:** Show the percentage of fan output.
2) **Appointment time indicator light:** It will be on when the appointment is turned on.
3) **Time:** Fixed value timing.
4) Key lock.
5) Heating power.
6) Measure the temperature.
7) Set the temperature.
8) **Alarm indicator light:** Flash when it is down or abnormal.
9) The operation is bright.
10) **Stop Bright:** It is on during downtime.
11) Water indicator light (standby).
12) Lighting indicator light (standby).
13) Heating indicator light.
14) Refrigeration indicator light (standby).
15) Water level indicator light flashes when there is a shortage of water (standby).
16) **Fan indicator light:** Turn on when the fan is output.

| Symbol | Function |
|---|---|
| °C Symbol | When the temperature unit is Celsius°C Bright |
| °F Symbol | Fahrenheit°F Bright |

| | |
|---|---|
|  | Set |
|  | Metal bolt |
|  | Shift key |
|  | Reduce the key |

## 7.2 The order of call-out of each function

### 7.2.1 Power-on work of the controller

After the controller is powered on, the monitor Fully lit up, and then the upper limit of the range and the lower limit of the range are displayed. After another 2 seconds, the measurement value is displayed in the upper row, and the set value is displayed in the lower row and enters the standard display mode.

### 7.2.2 Temperature, Time, Wind Speed Settings

Press the **SET** key, SV flashes, set the temperature, press ▲ or ▼ key, and make the display the desired temperature value. Press the function key again, and the time flashes (unit is minute), set the timing time (if the timing time is not required, the value is 0), press ▲ or ▼ display the required time value, and press the function key again, show F(fan), press ▲ OR ▼ key, so that the display is the required value, then press the function key, the controller returns to standard mode.

## 7.3 Detailed description of each function

### 7.3.1 PV temperature measurement value; SV Temperature setting value

If " ⊡⊡⊡⊡ " is displayed, the sensor is open, or the input signal exceeds the measurement upper limit. If" ⊡⊡⊡⊡ "is displayed, the sensor is short-circuited, or the input signal is lower than the lower limit of the measuring range. When the input signal of the controller is not within the measuring range, the buzzer buzzes. Press any key to mute the buzzer.

### 7.3.2 Timer function

When time is set to 0, the timing function of the controller is cancelled and the controller keeps running. When time is not set to 0, the controller provides the timing function. When the running time of the controller arrives, the lower row displays **END**, the buzzer chirps, the controller stops working and presses any key to silence, and at the same time the push-down key and ▼ Key 4 seconds, can be restarted.

### 7.4 Self-toting function of the controller

Long press the key for 4 seconds and then release, the instrument starts the self-setting function and the running light flashes. When the temperature runs back and forth several times, the lamp becomes steady, and the instrument self-setting ends (set the setting time to 0, cancel the timing, and set the timing time again after the end of the self-setting).

### 7.5 Temperature control parameter setting

In the standard state, long press the **SET** key, the LCD screen will display LK, adjust LK=18,click the **SET** key to enter the temperature setting.

**5 groups of PID:**

Related parameters: Segmentation point F1~F4, PID1~PID5

Set the value <= F1, execute PID1

Set value [F1~F2], execute PID2

Set value [Fahrenheit~F3], execute PID3

Set value [Fahrenheit3~Fahrenheit4], execute PID4

Set value > F4, execute PID5

**Multiple corrections**:

Related parameters PK1 to PK8 are modified in more points.

Modified method, the measured value of the temperature point is directly input to the corresponding PK position.

If a pair of corrected points is no longer needed, the PK is adjusted to the minimum value, which is -1999.

| Prompt | Name | Set the range | Explain | Initial value |
|---|---|---|---|---|
| **Ot** | Appointment to start up | 0-9999 minutes | If the time is equal to ot, it will start automatically and start running. | 0 |
| **rH** | Upper range settings | 0-400℃ 0.0-400.0 | By adjusting rH, the measuring range of the instrument can be 0 - rH (℃). | By user Demand |
| **AL** | Floor Alarm setting | 0 - full range 0.0 - full range | When the temperature exceeds SP-At the AL value, the alarm light is on. Alarm output. | 6.0 |
| **PK1** | Target value 1 | -1999-9999 | Actual measured value1 (Input the mercury thermometer value is the actual measured value) | 0 |

| | | | | |
|---|---|---|---|---|
| **PK2** | Target value 2 | -1999-9999 | Actual measured value2 (Input the mercury thermometer value is the actual measured value) | -1999 |
| **PK3** | Target value 3 | -1999-9999 | Actual measured value3 (Input the mercury thermometer value is the actual measured value) | -1999 |
| **PK4** | Target value 4 | -1999-9999 | Actual measured value4 (Input the mercury thermometer value is the actual measured value) | -1999 |
| **PK5** | Goal 5 | -1999-9999 | Actual measured value5 (the input mercury thermometer value is the actual measured value) | -1999 |
| **PK6** | Target value 6 | -1999-9999 | Actual measured value6 (Input mercury thermometer value is the actual measured value) | -1999 |
| **PK7** | Target value 7 | -1999-9999 | Actual measured value7 (the input mercury thermometer value is the actual measured value) | -1999 |
| **PK8** | Target value 8 | -1999-9999 | Actual measured value8 (Input mercury thermometer value is the actual measured value) | -1999 |
| **F1** | Split point 1 | -20.0-400.0 | Temperature split point1: Set the temperature≤FF1 Use the first set of PID1 Control | 50.0 |

| | | | | |
|---|---|---|---|---|
| **F2** | Split point 2 | -20.0-400.0 | Temperature split point2: Set the temperature≤FF2 Use the second group PID2 Control | 100.0 |
| **F3** | Split point 3 | -20.0-400.0 | Temperature segmentation point3: Set the temperature≤FF3Use the third group PID3 Control | |
| **F4** | Split point 4 | -20.0-400.0 | Temperature split point4: Set the temperature≤FF4 Use the second group PID4 Control; Set the temperature≥FF4 Use the second group PID5 Control; | 200.0 |
| **P1** | Proportional belt | 0 - full range 0.0 - full range | Proportional action section, the larger the P, the smaller the proportion, and the lower the system gain, P=0 is the bit control, and the insensitive area is 0.4. | 25.0 |
| **I1** | Integral time (Pre-adjustment time) | 10-3600 Second | Integral action time constant, the larger the I, the weaker the integral effect. | 240 |
| **D1** | Differential time (Pre-adjustment time) | 0-3600 Second | Differential action time constant, the larger d, the stronger the differential action, and it can overcome the overtune. | 180 |
| **Ar1** | Overshine suppression | 0- 200% | The smaller the value of Ar, the stronger the controller's ability to suppress temperature overtop. | 100 |
| **T1** | Heating cycle | 1 to 100 second | Relay output≮20s, SSR and SCR switch≮2s, only on the heating side | 5 |

| | | | | |
|---|---|---|---|---|
| **P2** | Proportional belt | 0 - full range 0.0 - full range | Proportional action section, the larger the P, the smaller the proportion, and the lower the system gain, P=0 is the bit control, and the insensitive area is 0.4. | 25.0 |
| **I2** | Integral time (Re-adjust the time | 10-3600 Second | Integral action time constant, the larger the I, the weaker the integral effect. | 240 |
| **Dimension2** | Differential time (Pre-adjustment time) | 0-3600 Second | Differential action time constant, the larger d, the stronger the differential action, and it can overcome the overtune. | 180 |
| **Ar2** | Overshine suppression | 0-200% | The smaller the value of Ar, the stronger the controller's ability to suppress temperature overtop. | 100 |
| **T2** | Heating cycle | 1 to 100 seconds | Relay output≮20s, SSR and SCR switch≮2s, only on the heating side | 5 |
| **P3** | Proportional belt | 0 - full-range 0.0 - full range | Proportional action section, the larger the P, the smaller the proportion, and the lower the system gain, P=0 is the bit control, and the insensitive area is 0.4. | 25.0 |
| **I3** | Integral time (Re-adjust the time | 10-3600 Second | Integral action time constant, the larger the I, the weaker the integral effect. | 240 |
| **D3** | Differential time (Pre-adjustment time) | 0-3600 Second | Differential action time constant, the larger d, the stronger the differential action, and it can overcome the overtune. | 180 |
| **Ar3** | Overshing suppression | 0-200% | The smaller the value of Ar, the stronger the controller's ability to | 100 |

| | | | | |
|---|---|---|---|---|
| | | | suppress temperature overtop. | |
| **T3** | Heating cycle | 1 to 100 seconds | Relay output≮20s, SSR and SCR switch≮2s, only on the heating side | 5 |
| **P4** | Proportional belt | 0 - full range 0.0 - full range | Proportional action section, the larger the P, the smaller the proportion, and the lower the system gain, P=0 is the bit control, and the insensitive area is 0.4. | 25.0 |
| **I4** | Integral time (Re-adjust the time | 10-3600 Second | Integral action time constant, the larger the I, the weaker the integral effect. | 240 |
| **D4** | Differential time (Pre-adjustment time) | 0-3600 Second | Differential action time constant, the larger d, the stronger the differential action, and it can overcome the overtune. | 180 |
| **Ar4** | Overshine suppression | 0-200% | The smaller the value of Ar, the stronger the controller's ability to suppress temperature overtop. | 100 |
| **T4** | Heating cycle | 1 to 100 seconds | Relay output≮20s, SSR and SCR switch≮2s, only on the heating side | 5 |
| **P5** | Proportional belt | 0 - full-range 0.0 - full range | Proportional action section, the larger the P, the smaller the proportion, and the lower the system gain, P=0 is the bit control, and the insensitive area is 0.4. | 25.0 |
| **I5** | Integral time (Re-adjust the time | 10-3600 Second | Integral action time constant, the larger the I, the weaker the integral effect. | 240 |

| | | | | |
|---|---|---|---|---|
| **D5** | Differential time (Pre-adjustment time) | 0-3600 Second | Differential action time constant, the larger d, the stronger the differential action, and it can overcome the overtune. | 180 |
| **Ar5** | Overshing suppression | 0-200% | The smaller the value of Ar, the stronger the controller's ability to suppress temperature overtop. | 100 |
| **T5** | Heating cycle | 1 to 100 seconds | Relay output≮20s, SSR and SCR switch≮2s, only on the heating side | 5 |
| **Dp** | Decimal point Set up | 0; 1 | DP=0 display resolution is 1℃; DP=1 display resolution is 0.1℃, | 1 |
| **CE** | Time-based unit | 0-1 | 0 is a unit of minutes; 1 is a unit of time. | 0 |
| **CT** | Refrigeration control Delay | 0-3600 Second | The delay required to start the compressor twice adjacently, Ct=0 cancels the compressor function. | 0 |
| **CH** | Refrigeration control upper deviation setting | 0~full range 0.0 to a full range | When the temperature exceeds the CH value and meets the compressor refrigeration control delay, the refrigeration light is on, the refrigeration contact is turned on, and the compressor is started. That is, SP+CH > set value | 0.5 |
| **CL** | Refrigeration control is biased Poor setting | 0 - full range 0.0 to the full range | When the compressor is turned on, measure the temperature. ≤When the temperature + CH-CL value is set, the refrigeration contact is disconnected and the compressor is turned off. | 0.3 |

| | | | | |
|---|---|---|---|---|
| **Drt** | Open the door for testing | 0.0-50.0 | If the temperature drops within 10s, the drt is regarded as the door opening detection. If the value is set to 0, this function is not available. (refrigeration without this function, no parameters) | 1 |
| **uF2** | Automatic refrigeration by hand | 0-1 | 0, automatic refrigeration; 1, manual refrigeration | 0 |
| **Nct** | Refrigerate Spot | 0.0-99.9 | 1, when the measured value is less than the nct value, turn on the compressor; When the set value is greater than the nct value, shut down the compressor | 40 |

Long press the set key for 5 seconds, and LK=168 will appear to enter: see the following table:

| Prompt | Name | Set the range | Explain | Initial value |
|---|---|---|---|---|
| ERt | Temperature filtering | 0-9 | Filter coefficient | 0.2 |
| RL | Lower range setting | -50.0-400.0 | Minimum temperature range setting | 0.0 |
| Tm | Timing mode | | Refer Table 1 | 4 |
| CN | Sensor input type | 0-6 | Do not operate | 1 |
| Bm | | | | standby |
| Co | Compressor selection | 0-4 | 0: Refrigeration start-stop type;<br>1: Refrigeration balanced type. The program control is generally set to 1;<br>2：start-stop mode when the set value is less than Eu, do not start the compressor | 2 |

| | | | | |
|---|---|---|---|---|
| | | | when the set value is greater than Eu;<br>3: When the set value is less than Eu, the compressor is normally turned on, and when the set value is greater than Eu, the compressor is not started.<br>4: The compressor is normally on when the set value is less than Eu, and the compressor is in start-stop mode when the set value is greater than Eu. | |
| EU | Refrigeration balanced selection | 0-1 | If C0=1, 0: does not start the compressor.<br>1: Start the compressor. | 0 |
| CF | Celsius Fahrenheit choice | 0-1 | 0: Celsius 1: Fahrenheit | 0 |
| Tc | Refrigeration shutdown zone | 0-100 | PID heating when the measured temperature is less than or equal to the set temperature -tc value (valid only when the compressor is normally open) | 1.0 |
| FuL | The lower limit of fan speed | 0-100 | The lower limit of fan speed | 40 |
| FuH | The upper limit of fan speed | 0-100 | The upper limit of fan speed | 60 |
| tF | Automatic extreme adjustment fan | 0.0-50.0 | The set temperature is greater than Fn+tF or the set temperature is greater than Fn-tF as a fast fan, and for other values, it is a slow fan, which can adjust the speed from 0-100. | 2.0 |

**Form 2: Tm**

| | Time to reach the set value | Power-up and zero ST | Key to start |
|---|---|---|---|
| 0 | Deny | Deny | Deny |
| 1 | Deny | Deny | Yes |
| 2 | Deny | Yes | Deny |
| 3 | Deny | Yes | Yes |
| 4 | Yes | Deny | Deny |
| 5 | Yes | Deny | Yes |
| 6 | Yes | Yes | Deny |

## 7.6 Print control parameter setting

In the standard state, press and hold the **SET** key, the upper row of the LCD screen shows LK, adjust LK=16 Click the **SET** key to enter the temperature setting.

| | | | | |
|---|---|---|---|---|
| **UT** | USB flash drive storage interval | 0-9999 | Set the storage interval of the U disk (how long the U disk is saved once); Set 0 to not save. | 0-9999Minute (0) |
| **Pt** | Print interval | 0-9999 | Set the printing interval (how often to print once); Set 0 to not print. | 0-9999 Minute (0) |
| **Pn** | Printer type | 0-1 | 0: printer;<br>1: Printer | 0 |
| **PL** | Printing Type | 0-1 | 0: Digital printing;1:Curve printing | 0 |
| **Yr** | Year | 0-9999 | Year setting | 0 |
| **Mon** | Month | 0-9999 | Month setting | 0 |
| **Day** | Date | 0-9999 | Date setting | 0 |
| HR | Hour | 0-9999 | Hour setting | 0 |
| **Min** | Minute | 0-9999 | Minute setting | 0 |
| **On** | Update the settings | 0-1 | 0 Do not update Settings; 1 Update Settings | 0 |

## 7.7 Communication parameter setting

In the standard state, long press the **SET** key, and the LCD screen will display LK, adjust LK=36, and tap the **SET** key to enter the parameter setting.

| | | | | |
|---|---|---|---|---|
| **dId** | Equipment Number | 0-9999 | Equipment Number | 0 |
| **Ad** | Correspondence address | 0-99 | Correspondence address | 3 |

| | | | | |
|---|---|---|---|---|
| **bA** | Potter Strain | 0-5 | 0: 1200; 1:2400; 2:4800; 3:9600; 4:19200; 5:38400 | 3 |
| **FO** | Communication format | 0-2 | 0: No verification (NONE) Connect the printer;1: Strange Check (ODD);2: Inspection;(EVEN upper computer) | 0 |

## 8. Maintenance

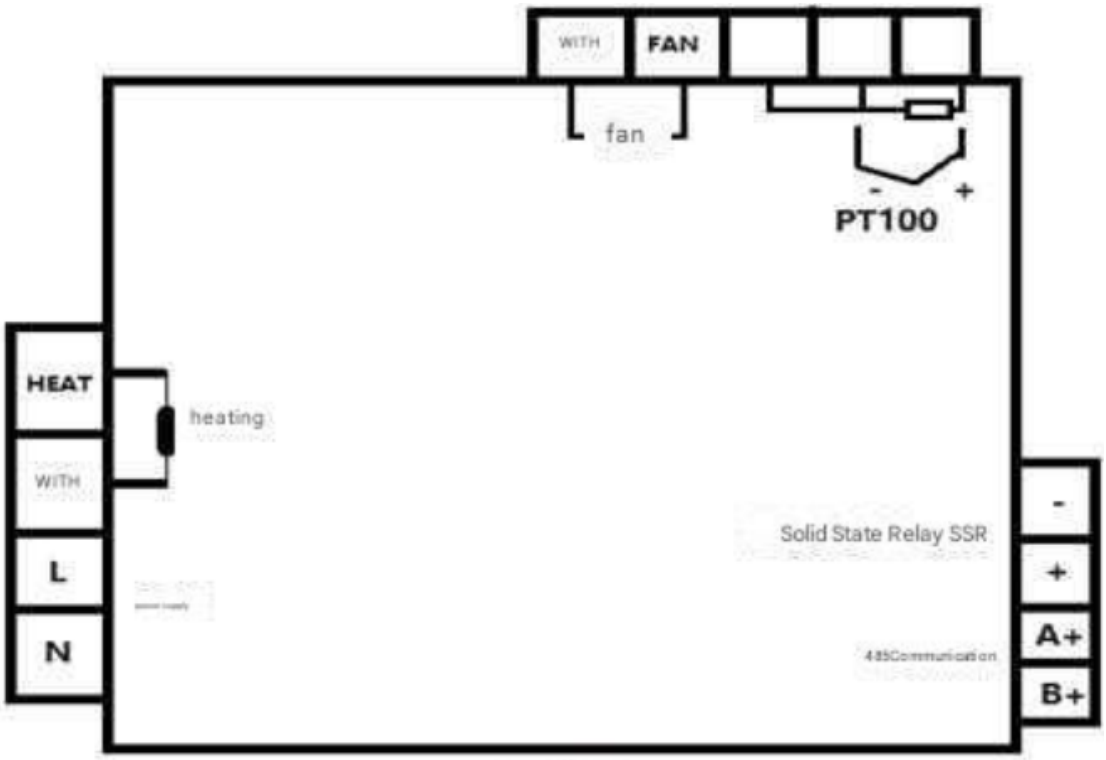
**Regular Maintenance**

1) It should always keep the equipment clean. Window glass should be cleaned with soft cotton fabric but should not be cleaned with corrosive chemical solvent to avoid chemical reactions or glass scratches.
2) If the equipment is not being used for a long time, it should smear neutral oil or Vaseline onto galvanized parts to prevent corrosion. Cover the equipment with a plastic dust cover. Keep it in a dry indoor environment to avoid moisture.
3) **Regular Repair**
   If you operate according to our manual and a breakdown happens, refer to the 9. Troubleshooting.

## 9. Troubleshooting

| Breakdown | Analysis and solution |
|---|---|
| No response after connecting to power and turning on the power switch | Power supply failure. Kindly seek assistance from the electrician. |
| | For the case of heater burnout, use a multimeter with an "Ohm" unit to test the resistance value of the heater's two ends. If the resistance value is 0 it means a short-circuit happens to heating wires. In this case, the switch could trip often. If the resistance value is hundreds of KOhm or infinity which means an open circuit happens. |
| | The power switchblade is off. |
| | Power switch lights on and check the control circuit board and cables. |
| Temperature fails to rise | Check if the timing met the set value.<br>**Note:** Many Users do not know about this function. When the set timing is over the heater and fan will stop working so that the temperature cannot rise. |
| | Check if a fan can work, if not (Use multimeter to test the voltage of the fan pin and see whether it is 220V). |
| | Use a multimeter to check if there is output from the control panel. |
| | Check if the working voltage is ~220V (voltage fluctuation is within 10%) |
| Fan fails to work | The result will be that heating can function but no circulation inside the interior chamber, so the temperature rises slowly. Replace the fan. |
| Broken Handle | Replace the handle. |
| The differential between the temperature showing on the controller display and the one showing on the mercurial thermometer which is put inside the chamber | The thermometer should be qualified by the testing department before being used. Where to put the thermometer: Hang the thermometer in the air inside the chamber's center. The thermometer should not be put on the shelf to detect temperature. |
| | Refer to the above-attached parameter instruction. |
| Temperature display fluctuates or stills. Or it shows abnormality like "□□□" | It identifies there is something wrong with the temperature sensor. Replace the temperature sensor. |

## 10. Circuit Diagram

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