



郑州成越科学仪器有限公司

Zhenazhou CY Scientific Instrument Co., Ltd

Box atmosphere furnace Operating instruction



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1.Overview

The atmosphere box furnace uses a resistance wire as a heating element, and the furnace is made of alumina polycrystal fiber material, which can quickly rise and fall temperature, and can reach 1000 degrees in 30 minutes. The outer casing is sealed, the cover is sealed with a silicone pad, and The furnace door is made of silicone pad and has a water cooling system. The gas passes through the flowmeter and then enters and exits through the back. There are multiple inlet ports, which can pass protective gas such as argon gas and nitrogen. The furnace has the advantages of temperature field balance, low surface temperature, fast temperature rise and fall, and energy saving. It is an ideal product for universities, research institutes, industrial and mining enterprises to do atmosphere protection and sintering, and to reduce atmosphere. With its unbeatable value for money, the compact furnace is used in a wide range of laboratory applications.

2. Technical Parameters

Item	Detail
Supply voltage	AC380V (3 phase), 50Hz
Maximum power	10.5KW
Furnace size	500x400x200
Operating temperature	≤1200°C
Temperature control accuracy	±1°C
Temperature control mode	AI-PID 30-stage process curve, can store multiple Independent control of three temperature zones with overheating and break protection
Mode of operation	Seven-inch full color touch screen operation
Heating method	Vacuum equipment Bipolar rotary vane vacuum pump
Flowmeter	two-way float flowmeter
Cooling method	Air cooling + water cooling
Overall size	925mm x 980mm x 1250mm



3. Equipment composition

The overall structure:

- | | | |
|-----------------------|-----------------------------|------------------------|
| 1. Pressure gauge | 2.Outlet valve | 3. Intake valve |
| 4.Handwheel | 5. Furnace door drain valve | 6. Float flow meter A |
| 7. Touch screen | 8. Power switch | 9.Float flowmeter B |
| 10.Furnace outer door | 11.Furnace | 12. Furnace inner door |

13. Air switch
16. Outlet
19. Vacuum interface

14. Furnace door drain
17. Intake port A

15. Inlet
18. Inlet port B

4. Device connection

4.1 Furnace body installation:

Place the furnace body on a dry, ventilated, high-dust-free indoor platform. The distance from other objects around is not less than 25CM and the relative humidity of the surrounding environment should not exceed 85%, so that the equipment has good ventilation and heat dissipation conditions during normal operation.

Attention should be paid to the heat resistance of peripheral equipment. During the use, the equipment will release a certain amount of heat to the surrounding environment. The heat value is within the safe range. However, it is not excluded that the distance is too close during long-term use, and the possibility of discoloration of the surrounding equipment casing due to heat radiation.

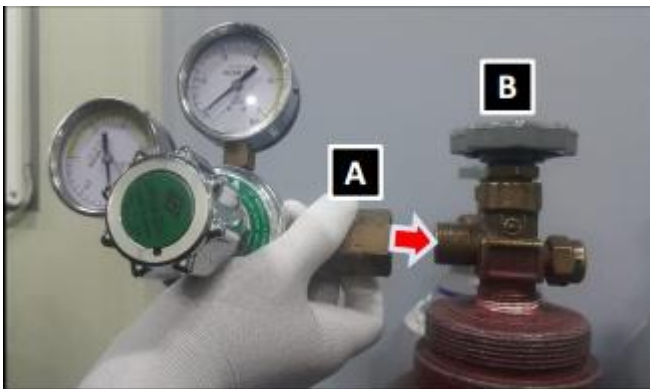


NOTE!

It is strictly forbidden to place flammable or explosive materials around the furnace body.

4.2 Pneumatic installation:

The atmosphere furnace supports two intakes. Please follow the label instructions. First,



connect the two gases to the inlet A and the inlet B respectively, and the inlet of the bipolar rotary vane vacuum pump and the vacuum interface of the furnace are connected by a KF flange and a bellows.

The installation process of the gas cylinder and the pressure reducing valve is as follows.

1) Connect A and B

A: Pressure reducing valve inlet

B: cylinder outlet

*** Check the condition of the screws before tightening.**

Tighten A with a wrench





2) Install air guide hose

Connect C and D with a $\varnothing 6$ hose

C: pressure reducing valve outlet

D: Argon air inlet (here, for example, Ar gas, the gas type can be changed according to customer needs))



3) Open the cylinder valve



4) Pressurization

Turn the valve clockwise (INC direction)

 **NOTE!**

The gas path should be leak tested before use, and it can be used only after confirming that there is no gas leakage. The detection method can adopt the soap water bubble method. The specific operation is to evenly apply a layer on the interface with the foamed soapy water, and then open the valve for a period of time to observe whether there is soapy water at the interface blowing. If not, the airtightness is good.



NOTE!

It is strictly forbidden to pass flammable, explosive and corrosive gases!

4.3 Waterway preparation:

According to the label, connect the water inlet of the water cooler to the water outlet of the furnace body. The water outlet of the water cooler is connected with the water inlet of the furnace to ensure the formation of a circuit, otherwise the cooling effect will be affected and the instrument may be damaged.

According to the label, a hose is connected to the drain of the furnace door and connected to the waste water tank or the laboratory drain.



NOTE!

Before using, check the waterway for leak detection. Turn on the water cooler for a period of time and observe whether there is water seepage at the location of the furnace, furnace door and inlet nozzle. If water seepage occurs, the water pipe should be reconnected and fastened.

4.4 Thermocouple installation:

Open the upper cover of the furnace body and there is a metal round hole at the top of the furnace. It is specially used for inserting the thermocouple. First insert the sealing ring into the groove inside the fixing nut, then insert the thermocouple into the fixing sleeve through the fixing nut. After the thermocouple is installed in place, tighten the fixing nut. At this time, the thermocouple is locked by the sealing ring and the fixing nut. Then connect the positive "+" and negative "-" of the thermocouple. The composition of each part is shown on the left of the figure below. The schematic diagram after installation is shown in the figure below:



- 1) Thermocouple
- 2) fixing nut
- 3) Sealing ring
- 4) Fixing sleeve
- 5) Hearth

4.5 Circuit connection:

When turning on the power cord of the device, please pay attention to the power supply identifier on the power cord of the device. Do not introduce a power supply voltage that does not meet the requirements to avoid damage to the control system. Turn off the power when not in use. The wiring of the power cord is as shown:



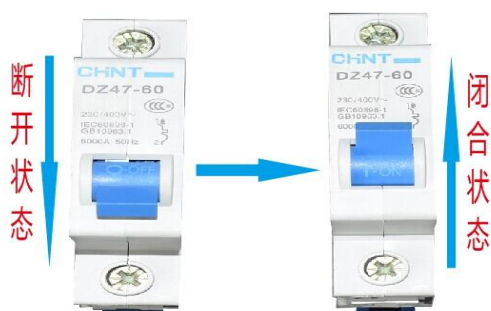
NOTE!

This device is a high-current device and requires high processing for the connector of the power cord. The wire end of the power cord should be directly pressed to the terminal block of the air circuit breaker, and the bolts should be tightened, and the power cord head should be tightened. It should not be loose or connected. Otherwise, the contact resistance at the junction of the wire ends will be too high to cause heat, resulting in malfunction or danger.

5.Boot operation

5.1 Start operation

Close the air switch on the back of the furnace, press the power switch on the front panel, turn on the power switch on the water cooler, and the instrument enters the running state.



5.2 Gas preparation operation:

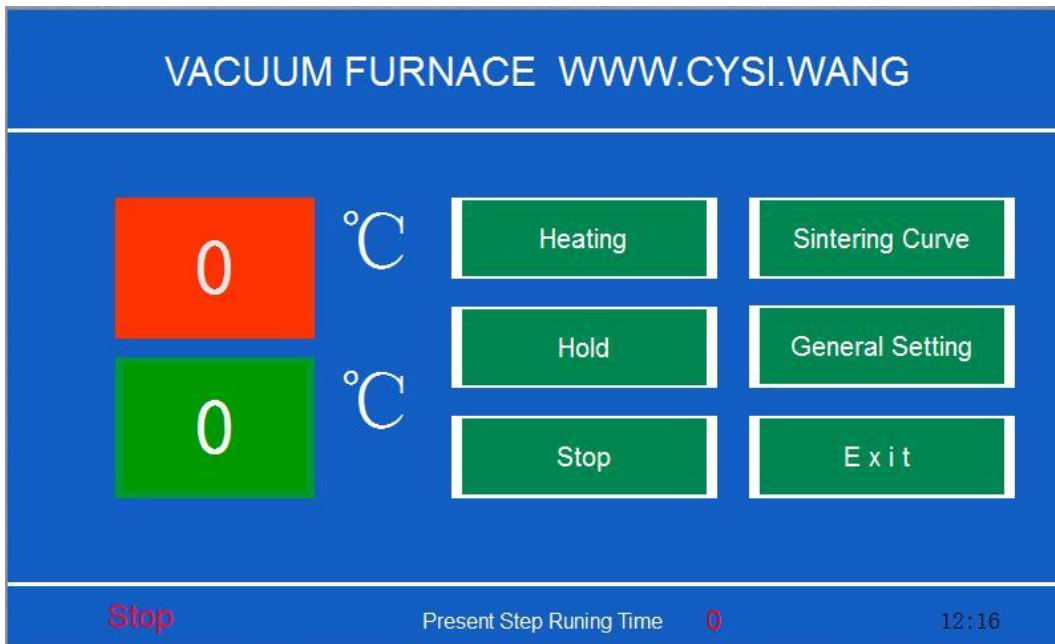
- 1) After placing the sample to be treated, close the inner door of the furnace and the outer door of the furnace, all the handwheels are tightened, and then the vacuum pump is turned on;
- 2) After the furnace is under negative pressure, tighten the handwheel one by one to ensure the seal of the furnace;
- 3) Observe the reading of the air pressure gauge above the furnace door and the vacuum gauge on the vacuum pump, and close the mechanical pump after the required vacuum is reached;
- 4) Unscrew the intake valve A, you can pass the protective gas (usually N₂), adjust the knob on the flow meter A to control the gas flow;
- 5) Close the intake valve A after the required pressure is reached;
- 6) Turn on the mechanical pump again to perform vacuuming operation, and close the mechanical pump after the required vacuum is reached;
- 7) Repeat steps 4) to 6) according to the experimental requirements until the content of impurity gases in the furnace is lower than the experimental requirements.

5.3 Tube furnace heating operation

After startup, the screen display is displayed as follows



Click **Monitor** to enter the monitoring interface, as follows



The red bottom number on the left side of the interface indicates the current temperature of the furnace, the lower green number indicates the programmed temperature, and the right side is the operation area. The functions of each button are as follows:

Sintering Curve

Curve Settings: The Curve Settings are buttons that enter the Temperature Settings screen. The specific setting method is explained later in this manual.

Heating

Heating: Click on the heating to display the “Program Start” box, click “Confirm” to warm up and start running. The heating indication in the lower left corner is as shown in the figure.

Heating.....

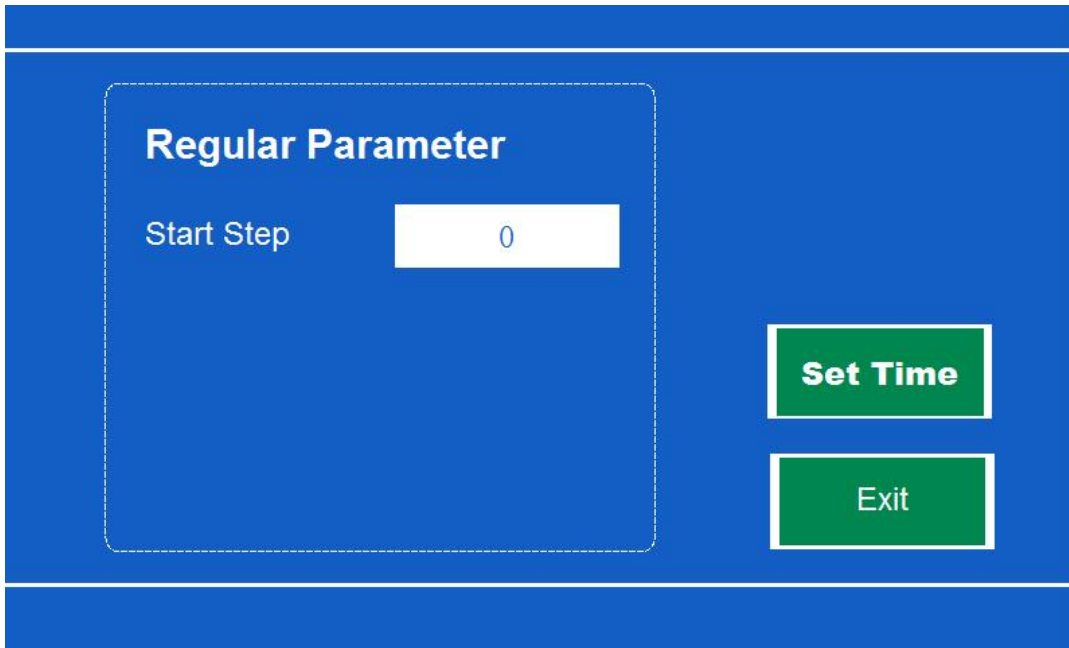
Stop

Stop: Click to stop the “Stop heating” box and click “Confirm” to stop heating. The stop heating indication "stop" appears in the lower left corner.

General Setting

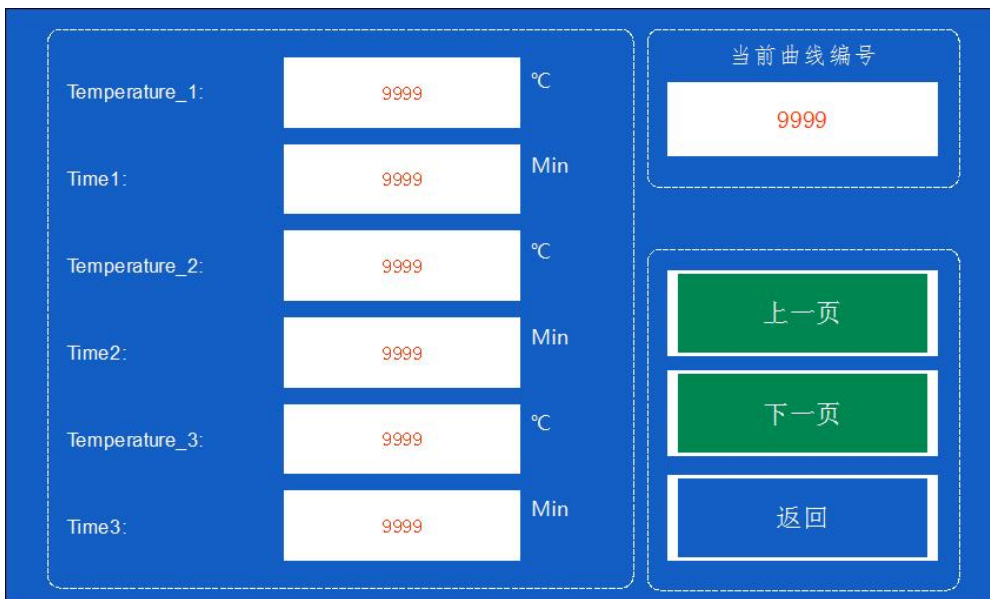
General parameter setting: After clicking, enter the general parameter setting interface, you can set the running section of the current program (for the specific meaning, please refer to the explanation in this manual)

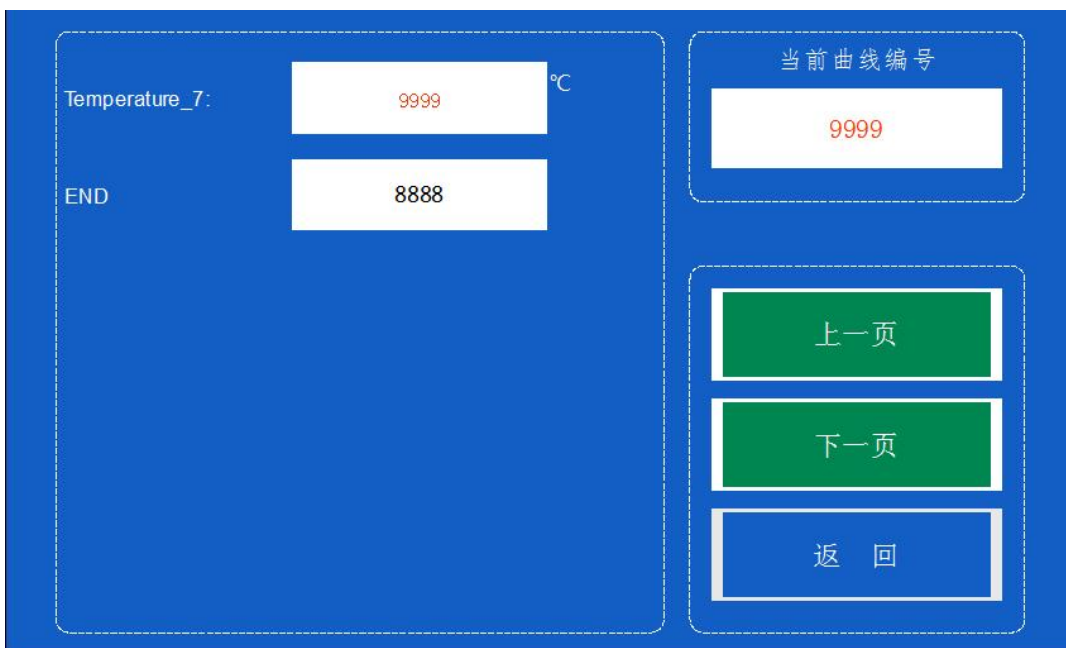
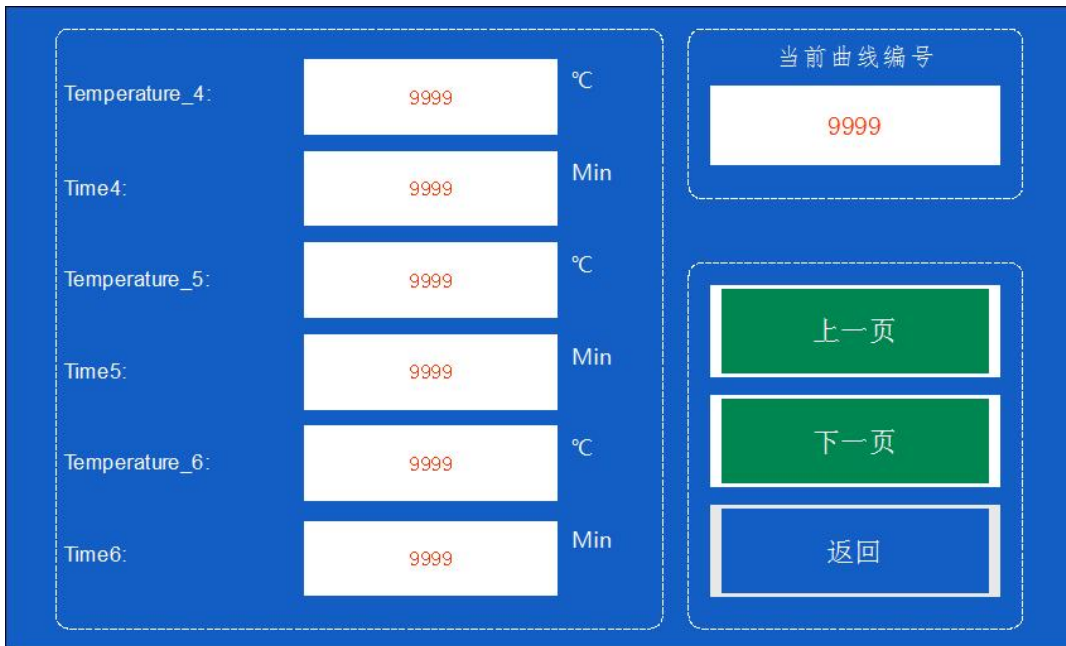
The meaning of "current block":



Usually the temperature segment number will automatically increase or jump with the execution of the program without human intervention. After the program finishes running, it will return directly to the first paragraph. Sometimes due to special factors, sometimes it is desirable to start from a certain temperature range of the program during program operation, or jump directly to a certain temperature range to execute the program. At this time, it can be realized by modifying the temperature segment number. For example, when the temperature is high, it stops running for some reason. When the furnace temperature has not dropped to the first starting temperature range, we want to continue to heat up, and we don't want to wait too much time, then we can modify the temperature segment number to start the temperature point of the program execution from the temperature range close to the current furnace temperature value to save unnecessary waiting time.

The curve setting interface is as follows:





Current curve number: indicates the number of temperature rise curves. The furnace can store 21 heating curves, each with 7 segments. The temperature and time values can be modified directly by clicking on the screen display position. The setting method is as follows:

Temperature 1: used to fill in the "starting point temperature value" is usually set to: 0°C;

Time 1: The running time of the first program, the setting range is: 0~9999 minutes;

Temperature 2: The end temperature value for the first program run is also the starting point temperature value for the second program run. If C1 → C2 is the temperature rise program, the C2 setting range is usually recommended as:

(C2-C1)/Time1 $\leq 10^{\circ}$ C/min;

Time 2: is the running time of the second program, the setting range is: 0~9999 minutes;

Temperature 3: The end temperature value for the second program run is also the starting point temperature value for the third program run. If C2 \rightarrow C3 is the temperature rise program, the C3 setting range is usually recommended as:

(C3-C2)/Time1 $\leq 30^{\circ}$ C/min;

Time 3: is the running time of the third program, the setting range is: 0~9999 minutes;

The “Temperature-Time” parameters of other temperature segments are set as described above.

End: Set to "-121" to indicate the program end command, the thermostat runs according to the set "temperature-time" parameter. When the program detects "-121", the control program will execute the "stop command" and return to the " a block",

"-121" is equivalent to the end of the input of a single sintering curve.

Previous page Next page: Switch between different sections of the curve;

Back: After setting, click the “ Back ” button to return to the main interface of the sintering program.

5.4 Sampling operation:

After the end of the experiment, the furnace is cooled to room temperature, and the venting valve and the furnace door drain are opened. After the internal and external pressure is balanced, the condensed water generated by the furnace door is emptied, and the hand wheel can be rotated to open the inner and outer doors of the furnace to take out the sample.

6.Matters needing attention

(1) When the tube furnace is used for the first time or after it is not in use for a long period of time, it should be baked at 120°C for 1 hour and baked at 300°C for 2 hours to avoid cracking of the furnace. The furnace temperature must not exceed the rated temperature to avoid damage to the heating element and the furnace lining.

(2) The user is not allowed to modify the equipment privately; it is forbidden to place poisonous and harmful chemical products and highly polluting items into the cavity, which may cause harm to the human body; the surface temperature of the furnace may locally generate 70°C during continuous heating work. For the above overheating phenomenon, do not use the body to directly touch the surface of the furnace to avoid injury. Please cut off the power when cleaning the furnace. Do not use any cleaning agent or flammable liquid for cleaning. Please wipe it with a damp towel. Do not click on the control unit's display to avoid damage to the body due to screen damage. Use the screen cleaner to clean the display of the control unit. This cleaner will not cause any scratches and static

electricity. The damage to the display caused by improper use of the cleaning or cleaning operation is not covered by the warranty; It is equipped with an exhaust fan, which is used to control the temperature of the system to ensure the safety of the system. Do not block the top cover of the furnace when in use.

(3) When the furnace is used, since the furnace is cold, it needs a large amount of heat absorption, so the heating rate in the low temperature section is not easy to be too fast, and the difference in the heating rate of each temperature section is not too large. When setting the heating rate, the physical and chemical properties of the sintered material should be fully considered to avoid the phenomenon of spraying.

(4) Before heating and cooling to room temperature, please ensure the normal operation of the water cooler, otherwise the high temperature will leak out of the furnace and may cause damage to personnel and equipment.

(5) Regularly check the contact of the electrical connection part of the temperature control system is good, pay special attention to whether the connection of each connection point of the heating element is tight.

(6) Adopt B type high temperature double platinum rhodium (30%-6%) temperature sensor. The measuring accuracy of the instrument is 0.5 level at 0-600°C, and 0.2 level can be guaranteed at 600-1700°C. The measurement accuracy of the S-type single platinum rhodium temperature sensor is guaranteed to be 0.2.

(7) Under the conditions of custody, use, installation and transportation, the user will not be able to work properly due to product quality problems within 12 months from the date of shipment from our company. Service (except for man-made damage). After the expiration of the warranty period, our company will continue to perform paid lifetime maintenance according to user requirements. Heating elements and sintered bismuth are general consumables and are not covered by the warranty.

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