

Vacuum Freeze Dryer

Specification

(CTFD-10/12/18 series)

(Version: A0 202108)

Content

I. Code of safe operation	1
1. Electrical safety.....	1
2. Operational safety.....	1
3. Environmental safety.....	1
II. Overview	2
1. Introduction to Product.....	2
2. Features.....	3
3. Technical indicators.....	3
4. Working conditions.....	4
III. Installation of products	5
IV. Operation	7
1. Operation of control panel.....	7
2. Freeze-drying operations.....	11
3. Electric defrosting.....	13
4. Instructions for freeze-drying.....	13
V. Precautions	17
VI. Common faults and troubleshooting	18
VII. Packing list	22
X. After-sales service	23

I. Code of safe operation

1. Electrical safety

1) The main power switch must be equipped with current leakage protection and operated independently.

2) The installation of the freeze dryer must be reliably grounded.

3) It is strictly forbidden to have the power cables extended, stretched, knotted or squeezed.

4) Make sure to disconnect the main power supply of the freeze dryer before repair and maintenance, which are strictly prohibited when the dryer is energized.

5) When the dryer is unattended or not used for a long time, make sure to cut off the main power supply.

2. Operational safety

1) In case of an emergency, cut off the main power supply before performing any other operations.

2) In the event of abrupt shutdown, abnormal noise or odor in the operation of the freeze dryer, it should be shut down immediately for inspection; contact the manufacturer for after-sales inspection and repair.

3. Environmental safety

1) The ambient temperature and humidity of the freeze dryer should be kept between 10°C-30°C, and the relative humidity should be kept $\leq 80\%$.

2) The freeze dryer shall be kept $> 30\text{cm}$ away from the walls, and the working environment should be free of conductive dust, explosive or corrosive gas or interference from strong electromagnetic field.

II. Overview

1. Introduction to Product

The vacuum freeze-drying technology is also known as sublimation drying. Its working principle is to pre-freeze the water-containing sample, and then have the water therein sublimed under vacuum. As for the freeze-dried samples, their original biological, chemical and physical properties remain basically unchanged, which can be preserved easily for a long time and restored to the original state before freeze-drying when exposed to water with their original biochemical properties retained. Therefore, freeze-drying technology is widely used in the fields of medicine, food, chemical industry, and biological products.

The CTFD-10/12/18 series vacuum freeze dryers (hereinafter referred to as "freeze dryer") are available in the following four models:

- 1) Model S-general type: In this model of freeze dryer, the sample is pre-frozen in the material tray before it is dried.
- 2) Model T-capping type: In this model of freeze dryer, the vial containing the sample is pre-frozen and dried, after that the cap is manually compressed under vacuum, which is equivalent to vacuum packaging.
- 3) Model P-manifold type: In this model of freeze dryer, the sample is pre-frozen in a special bottle and connected to the PC cover via a rubber valve. In the process of freeze-drying, the freeze-drying bottles can be replaced at any time with the on-off valve, so different types of samples can be freeze-dried simultaneously; up to 8 special bottles of different capacities can be accommodated at the same time, which results in high drying efficiency.
- 4) Model PT type-manifold and capping type: This model of freeze dryer has the features of model T and model P.

2. Features

1) Equipped with high-quality imported compressors for refrigeration, the freeze dryer can bring about high freezing rate.

2) Provided with LCD touch screen, the freeze dryer is operator-friendly and versatile.

3) The control system can automatically save the freeze-drying data, which can be viewed in the form of a curve to get an intuitive and clear impression of the entire freeze-drying process.

4) The drying chamber is designed with a colorless and transparent PC cover (hereinafter referred to as "PC cover"), through which the samples can be seen clearly and intuitively, and the whole process of freeze-drying can be observed.

5) The vacuum pump and the main unit is connected with the international standard KF quick connector, which is operator-friendly and reliable.

6) The freeze dryers are characterized with stable performance, simple operation and low noise.

7) Pre-freezing function: Put the items in the cold trap to pre-freeze them, saving the user the cost of the low-temperature refrigerator.

8) The electric defrosting heater is optional for the cold trap.

3. Technical indicators

Model	10 S/P	10 T/PT	12 S/P	12 T/PT	18 S/P	18 T/PT
Temperature in the cold trap (°C)	< -60		< -60 (-80)			
Vacuum degree (Pa)	< 10					
Water capture capacity (kg/24h)	3				6	
Freeze-dried area (m ²)	0.12	0.09	0.12	0.09	0.18	0.14
Layers of material tray	4	3	4	3	4	3
Dimensions of material tray (mm)	Φ200×20				Φ240×20	
Spacing between material trays (mm)	76	68	76	68	76	68

4. Working conditions

1) Working conditions:

- a) Ambient temperature: 10°C~30°C
- b) Relative humidity: ≤80%
- c) Main power supply: 220V±10%/50Hz;
- d) Power supply of vacuum pump: 220V±10%/50Hz



Attention: The working environment should be free of conductive dust, explosive or corrosive gas or interference from strong electromagnetic field!

2) Installed power

Model	CTFD-10	CTFD-12	CTFD-18	CTFD-12	CTFD-18
	-60°C			-80°C	
Standard power (kW)	0.9	0.9	1.4	1.5	1.8
Defrosting power (kW)	1.2	1.2	1.8	1.8	2.2

3) Transportation/storage conditions:

- a) Ambient temperature: -40°C~50°C
- b) Relative humidity: ≤90%
- c) The storage environment should be well ventilated and free of corrosive gases.

4) Safety rating: Type I and Type B

III. Installation of products

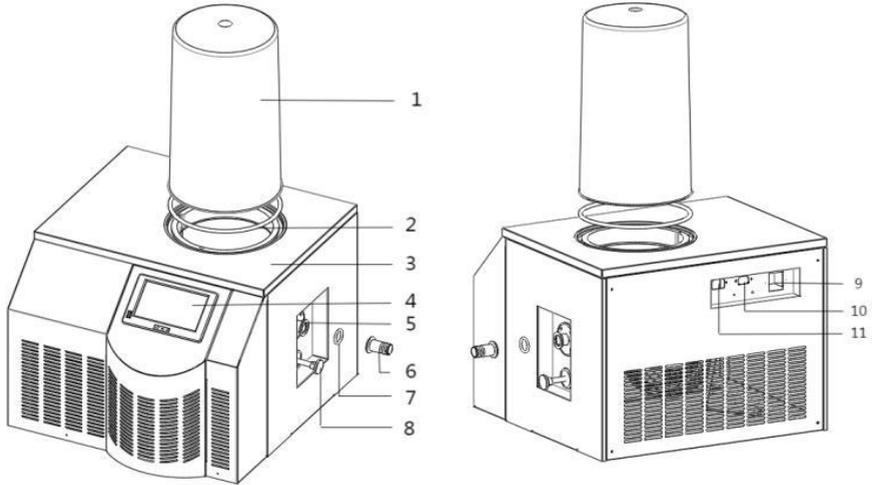
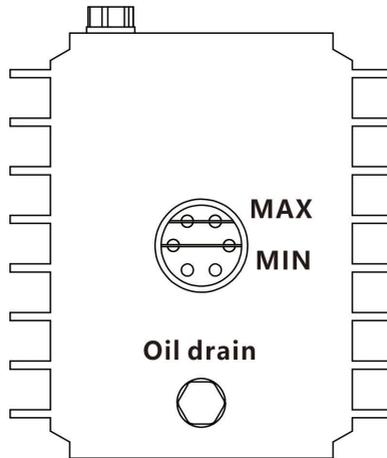


Diagram of freeze dryer

S.N.	Description of goods	S.N.	Description of goods
1	PC cover	7	rubber sealing ring
2	Silicone sealing ring	8	Drain and charging valve
3	Main unit of freeze dryer	9	Main Power Switch
4	Monitor	10	Main power socket
5	Connector of vacuum pump	11	Power socket of vacuum pump
6	Connection pipe of vacuum pump		

• The vacuum pump and the main unit are connected with the vacuum pipe, both ends of which are connected with standard KF25 clamps lined with the rubber sealing rings. Apply a proper amount of vacuum silicone grease on the sealing ring before connecting the pipes, and then tighten the clamp tightly.

- Connect one end of the power cable to the "main power supply" on the top part of the rear panel of the main unit, and connect the other end to a standard power socket. Connect the power cable of the vacuum pump to the "power supply of vacuum pump".
- Read the operation manual of the vacuum pump carefully, and check the vacuum pump to see if the vacuum pump has been filled with oil, and the oil level is not lower than the center line of the sight glass (MIN mark); do not run it without oil.



- The O-ring above the cold trap should be kept clean, on which a layer of vacuum silicone grease can be applied evenly before use.

IV. Operation



Attention: Make sure that the power supply and vacuum pump are connected properly before operation!

1. Operation of control panel

The machine is equipped with the color LCD touch screen and the large-capacity FAT32 file system capable of storing the data of each channel for more than one month. It is designed with standard USB interface, which can be used to export historical data into the USB flash drive connected. The system can display working parameters such as sample temperature, cold trap temperature, and vacuum degree in curves.

- 1) Turn on the main power switch, and the "Startup interface" is displayed (Fig. 1).



Fig. 1 Startup interface

- 2) Setting of system time (Performed when the time displayed on the interface is inconsistent with the local time): Click the date or time in the lower left corner, the interface shown in Fig. 2 is displayed, where you can set the corresponding time; press the OK button to change and save modification in turn. After the time is set, the main operation interface will be displayed.

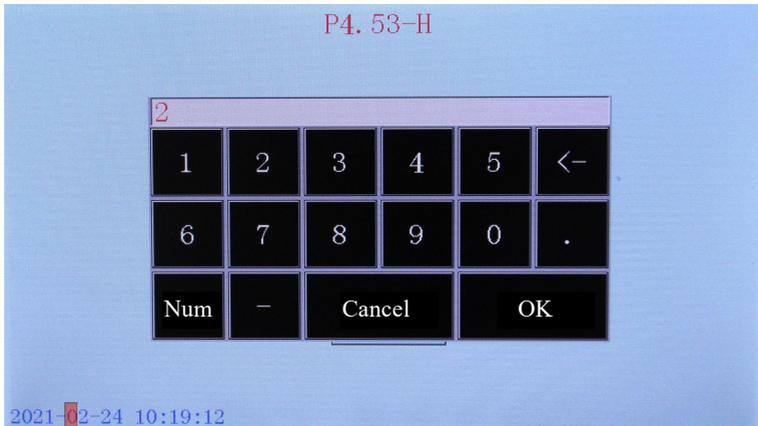


Fig. 2 Time setting interface

3) Click the center of the display to enter the "Main operation interface" (Fig. 3).

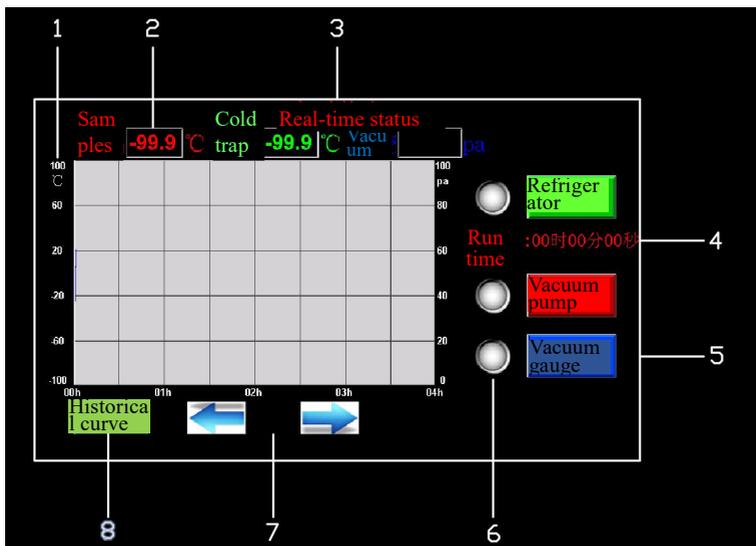


Fig. 3 Main operation interface

4) Information displayed on the main operation interface

a) Real-time curve display bar: The real-time parameter curves of samples, cold trap and vacuum degree are displayed;

The color of the curve corresponds to that of the letters of sample, cold trap and vacuum.

b) Real-time data display bar: The real-time running data of samples, cold traps, and vacuum degree are displayed.

c) Interface status bar: The "real-time status" or "historical curve" is shown in the current interface.

d) Run time: The run time of the refrigeration system is recorded.

e) Equipment control bar: The chiller, vacuum pump, vacuum gauge can be switched on or off here. In case of any damage to the compressor because the "refrigerator" is turned on or off at short intervals, when the "refrigerator" is turned on again, the compressor will be started with a delay of 300s.

f) Equipment status bar: The refrigerator, vacuum pump and vacuum gauge are displayed in white when they are turned off (Fig. 3), and in red when they are turned on (Fig. 4).

g) Page up/down button: Press the left and right arrow keys to view the real-time status curve or historical data curve in several hours.

h) Date bar: The current year, month, day, hour, minute, and second are displayed here. The date and time are automatically updated without manual intervention. Press the arrow keys on the left side of the date and time to hide or display the date and time.

i) Historical and real-time curve switch button: Press the historical curve button to query historical data.

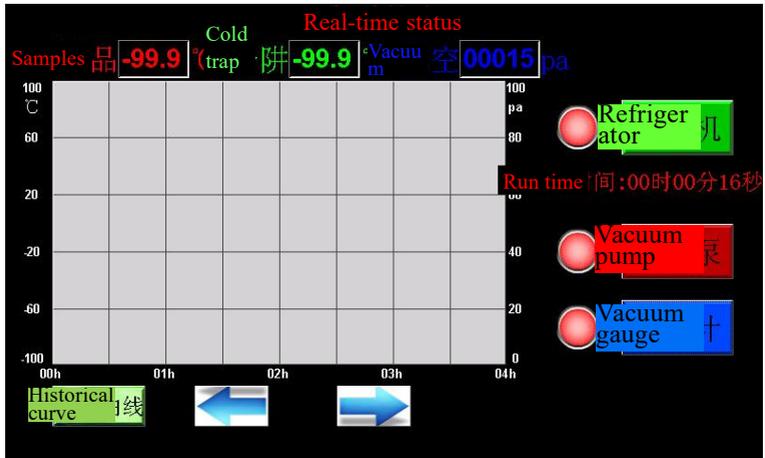


Fig. 4 Device start-up interface

5) Historical curve interface

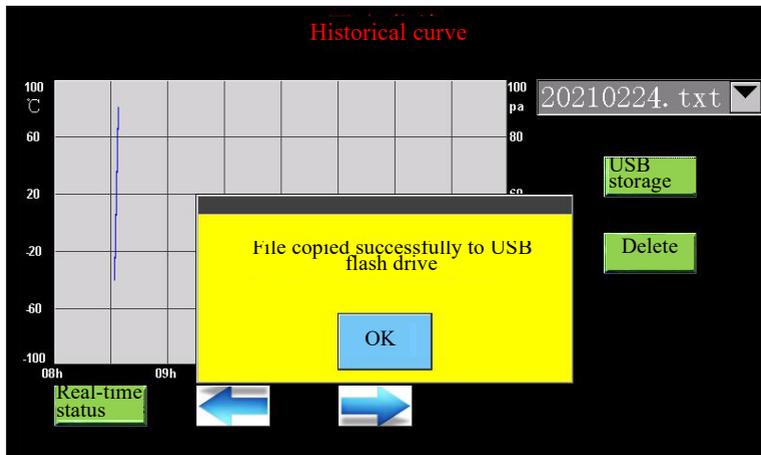


Fig. 5 Historical curve interface

a) Historical curve selection bar: Touch the "▼" button to select freeze-dried data of any date for viewing, storing or deleting.

b) USB storage button: Insert the USB flash drive, and select the freeze-dried data of the date to be stored; press the USB storage button to copy the data to the USB flash drive.

c) Delete button: Select the freeze-drying data of the date to be deleted, and press the USB flash drive delete button to delete the data.

d) Storage prompt bar: Press the "USB storage" button, and the "File successfully copied to USB flash drive!" prompt will pop up, which means that the data have been stored successfully; press the "Delete" button, and the "File deleted successfully!" prompts will pop up, which means that the data is deleted successfully; if you press the "USB storage" button, but the USB flash drive is not inserted correctly, the "File copy error Oxfff8270" prompt will pop up.

2. Freeze-drying operations

1) Placement of samples:

a) Place the pre-processed items in the material tray, and then put the material tray in the pre-freezing rack.

b) Put the temperature sensor in any layer of the material tray to measure the temperature of the material.

c) Put the pre-freezing rack into the cold trap, seal it with the insulation cover, and prepare for pre-freezing.

2) Pre-freezing the samples:

a) Turn on the main power switch on the back of the device.

b) Click the center of the screen to display the interface as shown in Fig. 3, and click the "Refrigerator" button to start the pre-freezing, which is recommended to last for about 4 hours.

c) After the items are completely frozen, take out the pre-freezing rack from the cold trap.



Attention: Please wear safety gloves when taking out the freeze-drying rack in case of injury due to frost!

3) Drying the samples

a) Take the pre-freezing rack out of the cold trap, and transfer the material tray to the freeze-drying rack, which can be placed above the cold trap opening (For general and manifold type freeze dryers, refer to the

operations of CTFD-10S and CTFD-10P below), or after placing the material tray on the freeze-drying rack, put the freeze-drying rack directly above the cold trap (refer to the operations of CTFD-10T below for capping type and manifold gland type).

b) Place the probe on the material tray of any layer and put on the PC cover.

c) Close the drainage and charging valve.

d) Press the "Vacuum gauge" button on the display, after which the vacuum degree of 110KPa is displayed; then, press the "Vacuum pump" button to turn on the vacuum pump. The vacuum degree drops rapidly until the it reaches the normal value $\leq 10\text{Pa}$, and the drying officially begins (It is recommended to dry for about 20 hours, and the specific moisture content of the material is at the discretion of the user).



Attention: The lower end of the PC cover is in full contact with the silicone rubber sealing ring!

The PC cover reacts with some organic solvents, resulting in marks!

4) Removing the samples

a) Check the sample curve and visually check if the samples are completely dry. After opening the drain and charging valve, press the "Vacuum Pump" button to stop the vacuum pump. Press the "Vacuum gauge" button to turn off the vacuum gauge.

b) Remove the PC cover, and take out the material tray from the freeze-drying rack; package the samples in the tray. Click the "Refrigerator" button to turn off the compressor and the equipment stops running.

5) Power-off operation

a) Turn off the main power switch and power off the control system of the whole machine.

b) Unplug the power plug and vacuum pump plug.

c) Wipe the cold trap, freeze-drying rack, tray and PC cover with soft cloth.

d) When the vacuum pump is not running, cover the exhaust hole to prevent dust from entering.

6) Draining water

After the ice formed on the inner wall of the cold trap is completely melted into water, open the drain and charging valve to drain the condensate.



Attention: It is necessary to check whether the water in the cold trap has been drained before operation; otherwise, the equipment will not run as expected!

3. Electric defrosting

This is an optional function: Turn on the electric defrosting switch on the rear panel to start defrosting. This function will be automatically stopped after heating for a period of time (15min~20min). If the ice layer has not completely melted into water, turn on the switch again. After the defrosting is over, turn off the defrosting switch and the main power supply.

4. Instructions for freeze-drying

● Operation of model S

a) Place the samples in the material tray, and then put the material tray on the pre-freezing rack; arrange and fix the sample temperature sensors, and put the pre-freezing rack in the cold trap; put on the cover for heat preservation and start pre-freezing until the samples are completely frozen and kept for a period of time.

b) Take the pre-frozen material tray together with the pre-freezing rack out of the cold trap, and transfer the material tray to the freeze-drying rack; place it above the cold trap, and put a PC cover over it.

c) Close the charging valve tightly. Press the "Vacuum gauge" button on the display, after which the vacuum degree of 110KPa is displayed; then, press

the "Vacuum pump" button to turn on the vacuum pump. The vacuum degree declines rapidly until it reaches the normal value $\leq 10\text{Pa}$.

d) After a long period of drying operation, check the sample curve and visually check if the samples are completely dry. After opening the vacuum charging valve, press the "Vacuum Pump" button to stop the vacuum pump. Press the "Vacuum gauge" button to turn off the vacuum gauge.

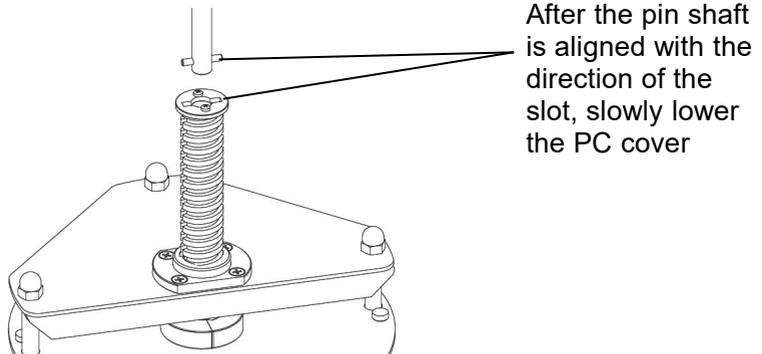
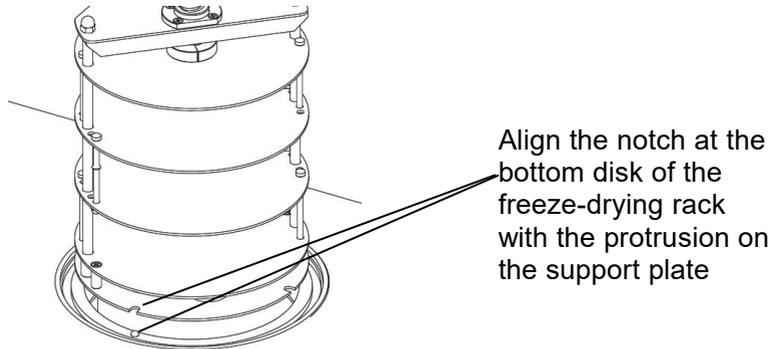
e) Remove the PC cover, and take out the material tray from the freeze-drying rack; package the samples in the tray. The ordinary drying operation is completed. Click the "Refrigerator" button to turn off the compressor and the equipment stops running.

● Operation of model T

a) Place the vials injected with samples in the capped material tray, and then put the material tray on the pre-freezing rack; arrange and fix the sample temperature sensors, and put the pre-freezing rack in the cold trap; put on the cover for heat preservation and start pre-freezing until the samples are completely frozen and kept for a period of time.

b) Take out the pre-freezing rack from the cold trap, quickly transfer the material tray to the capped freeze-drying rack; place the freeze-drying rack above the cold trap, and put on the PC cover. Make sure that the lower end of the PC cover is in full contact with the silicone sealing ring.

c) Close the charging valve tightly. Press the "Vacuum gauge" button on the display, after which the vacuum degree of 110KPa is displayed; then, press the "Vacuum pump" button to turn on the vacuum pump. The vacuum degree declines rapidly until it reaches the normal value $\leq 10\text{Pa}$.



d) After a long period of drying operation, check the sample curve, and visually check if the samples are completely dry; rotate the capping handle above the PC cover clockwise to rotate the screw on the capping frame, so as to lower the capping plate; the bottle cap will be pressed onto the bottle, and the capping will be realized under vacuum. Then open the drain and charging valve, and press the "Vacuum pump" button to switch off the vacuum pump. Press the "Vacuum gauge" button to turn off the vacuum gauge.

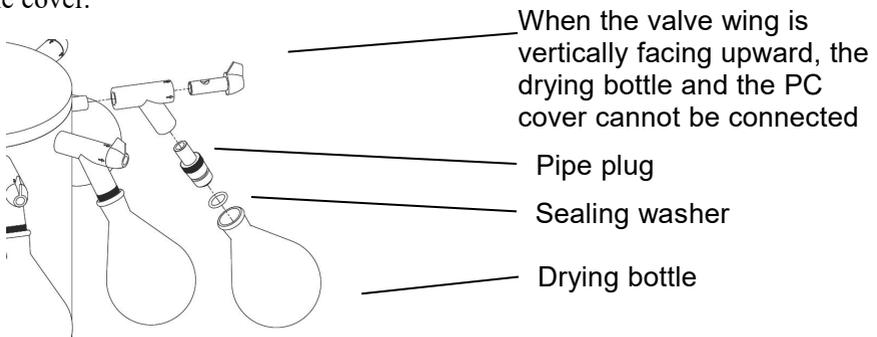
e) Remove the PC cover, and take out the material tray from the freeze-drying rack; package the samples (vials) in the tray. The capping and drying operation is completed. Click the "Refrigerator" button to turn off the compressor and the equipment stops running.

● Operation of model P

a) Put the drying bottle filled with the sample in a low-temperature refrigerator with the temperature below -40°C to pre-freeze it until the sample is completely frozen and keep it there for a period of time. If possible, it is preferred to rotate the edge of the drying bottle to get it pre-frozen, so that the sample is evenly frozen on the bottle wall, which is beneficial to accelerate the drying.

b) Take the pre-frozen material tray together with the pre-freezing rack out of the cold trap, and transfer the material tray to the freeze-drying rack; place it above the opening of the cold trap, and put a PC cover over it.

c) Take out the pre-frozen drying bottle from the low-temperature refrigerator and connect it with the standard pipe plug on the PC cover. Insert the pipe plug into the center of the freeze-dried bottle. Then, rotate the valve wing to make it face vertically downwards, so the drying bottle is connected to the cover.



d) Close the charging valve tightly. Press the "Vacuum gauge" button on the display, after which the vacuum degree of 110KPa is displayed. Then press the "Vacuum pump" button to turn on the vacuum pump, and the vacuum degree drops rapidly until it reaches the normal value below 10Pa; freeze-drying begins. To replace the freeze-dried bottle or remove the dried bottle during the freeze-drying process, turn the valve wing to make it vertically upward. The drying bottle is isolated from the PC cover and

connected to the atmosphere. The bottle is filled with gas; remove the drying bottle.

e) If the drying bottle and the sample in the tray are all dried, first remove the drying flask, and fill in the gas; turn off the vacuum pump and vacuum gauge. Remove the PC cover, and store the samples. Do not remove the PC cover when it is connected with the freeze-drying bottle.

- **Operation of model PT**

Refer to the operation of model P and model T.

V. Precautions

- **Use a grounded power socket.**

- **The vacuum pump is placed on the ground, and the height difference with the main unit is not less than 0.5 meters. When the power is suddenly cut off, it can prevent the oil from returning from the vacuum pump. In the event of a power failure, immediately open the charging valve to fill gas into the main unit; take out the samples as soon as possible, and store it properly.**

- **Before shutting it down, fill in gas first; and then turn off the vacuum pump to prevent the oil from returning from the vacuum pump and contaminating the samples.**

- **The PC cover and the main unit are connected with the silicone sealing ring, which shall be kept clean.**

- **Do not clean the PC cover and silicone sealing ring with organic solvents. The contact surface of the PC cover and the silicone sealing ring should be protected to prevent it from being dented and scratched.**

- **Do not switch on the power supply and the refrigerator frequently. If the refrigerator is turned off, wait at least 3 minutes before turning it on again if necessary.**



Attention: Refer to the manual of the vacuum pump; the vacuum pump oil must be replaced after it has been running for 200 hours to ensure the service life of the vacuum pump.

VI. Common faults and troubleshooting

S.N.	Fault	Fault identification and troubleshooting measures
1	The touch screen can not be turned on	Check whether the power supply is working properly.
2		Check whether the main power cable is firmly plugged in.
3		Check whether the power switch is turned on
4	The touch screen is not accurate	Refer to the touch screen calibration steps on the next page.
5	The vacuum pump fails	Check whether the power cable of the vacuum pump is securely plugged in.
6	The vacuum degree does not reach below 10Pa	Check the connection between the vacuum pump and the main unit, and check whether the clamp is properly tightened.
7		Check whether the lower end of the PC cover is clean and whether there is any damage.
8		Check whether the silicone sealing ring is clean and placed correctly.
9		Check whether the vacuum pump is working properly and whether the pump oil is clean.
10		Check whether the charging valve is tightened.
11	Temperature in the cold trap is excessively high	The ambient temperature is too high and the heat is not well dissipated. Locate the machine in a place with suitable temperature and proper ventilation.
12		In case of any fault in the refrigeration system, contact the technical engineer in time.
13	There is oil leakage in the vacuum pump	Check if there is any damage or leakage in the machine; if so, contact the manufacturer to replace the parts as necessary.
14		Check whether the vacuum pump is placed in the tilted position.

◆ Touch screen calibration steps

1) Press and hold the upper left corner of the startup interface in Fig. 6 (area marked in red), and the password interface as shown in Fig. 7 will be displayed in 5S.



Fig. 6 Startup interface

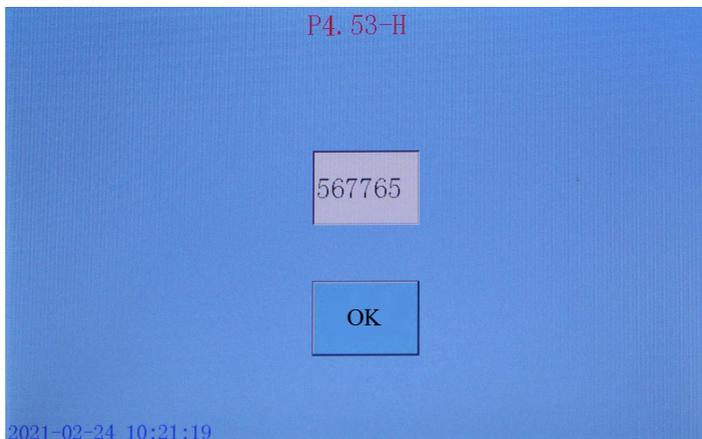


Fig. 7 Password interface

2) After entering the password 567765, the system parameter interface will be displayed as shown in Fig. 8.

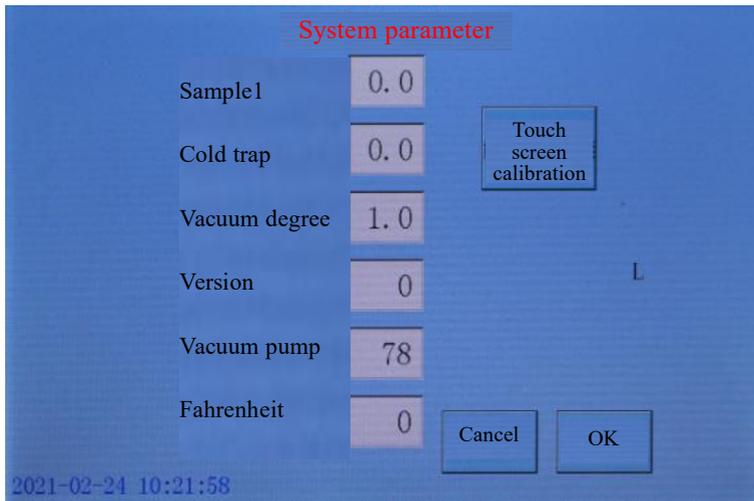


Fig. 8 System parameter interface

3) Click the touch screen calibration button to display the calibration interface as shown in Fig. 9.

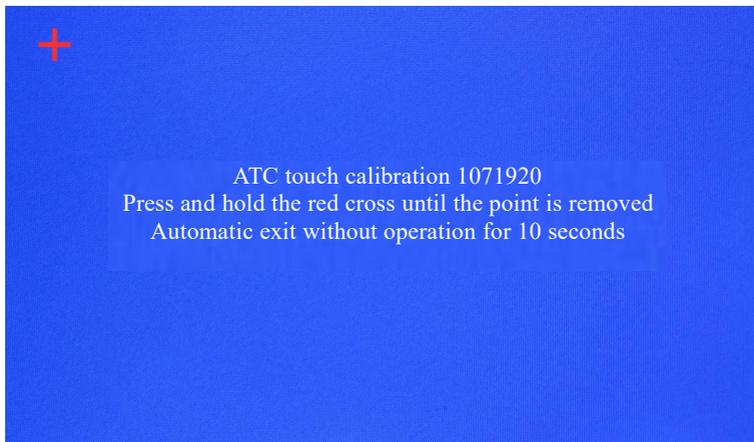


Fig. 9 System parameter interface

4) Press and hold the "+" symbol on the calibration interface as shown in Fig. 9 (You will hear a beep when you click on the symbol; if you hear a continuous beep, it means you have not clicked on the symbol), and the screen will flash after 5 seconds. At this time "+" symbol will appear in another place, repeat the above operation. After repeat the step above for 12 times, the result saving interface as shown in Fig. 10 will appear automatically.

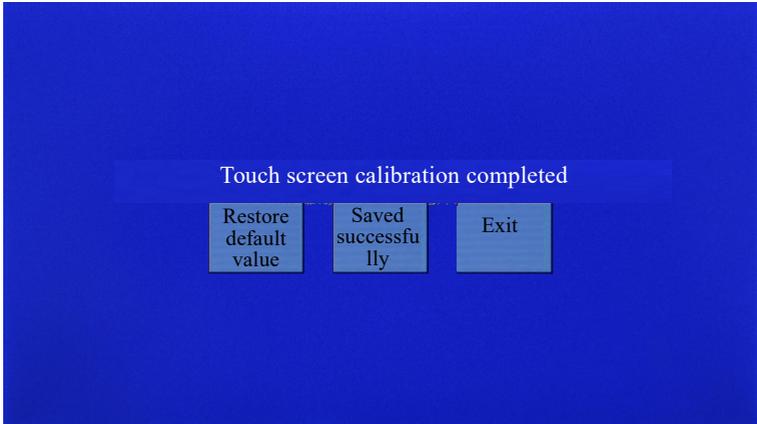


Fig. 10 Result saving interface

5) Click the "Save results" button in the result saving interface as shown in Fig. 10. Click the Exit button, and the system parameter interface as shown in Fig. 8 will appear. Click the "OK" button in Fig. 8 to display the main interface.

6) The touch screen calibration is completed.

VII. Packing list

S.N.	Model	Description of goods	Unit	Quantity
1	S,P T,PT	Main unit of vacuum freeze dryer	Set	1
2		Drying rack	Piece	1
3		Material tray (model S and P/model T and PT)	Piece	4/3
4		Pre-freezing rack	Piece	1
5		PC cover	Piece	1
6		VACUUM PUMP	Unit	1
7		Vacuum pump connecting pipe	Piece	1
8		Vacuum pump oil	Barrel	1
9		Connection clamp (including sealing ring)	Set	2
10		Manual and certificate	Set	1
11		Power line	Piece	1
12	18 S,P	Support plate of freeze-drying rack	Piece	1
13	P,PT	Vacuum silicone grease	Box	1
14	T,PT	Capping freeze-drying rack (model T and PT)	Set	1
15	P,PT	Tee assembly	Set	8
16		Freeze-drying bottle	Piece	8

X. After-sales service

1. This machine is entitled to a warranty period of one year for free from the date of sale.

2. Our company is responsible for its maintenance for service life.

3. Technical service hotline:

4. Keep the parts of the machine properly, and mail the product warranty card to our Sales Department for record

after checking it, which will be retained in the technical service file for providing service as needed in your operation.

Warranty card

Important statement: This card is only used for recording purposes. If there is any alteration, this card will be invalid.

Product name		Model	
Ex-factory code		Date of purchased	
User's name		Tel.	
User's address			
Repair record	Data	Fault type and troubleshooting	Signature

WARRANTY

I. After purchasing this product, please fill in this card carefully and read the following warranty terms meticulously to ensure that the product is under effective warranty.

1. The user shall properly keep this card when purchasing the product, which shall be stamped by the salesperson.

2. This warranty card must be provided when the warranty services are required.

3. The information filled in this warranty card must be authentic, otherwise it will be invalid.

4. The warranty period is one year, within which if the product fails due to poor part quality or manufacturing, our company will provide free repair and replacement services.

II. The products subjected to damage or malfunctions due to the following reasons shall not be covered by the warranty:

1. Damage caused in operation and installation inconsistent with the instructions.

2. All damages caused on purpose or by accident.

3. Repairs and modifications not approved by our company.

4. Aging, dents and scratches on the surface of the product.

5. Failure or damage caused by accidents and natural disasters.

III. After the warranty period expires, the user can still get the repair service provided by the company with the corresponding costs charged.

Conformity Certificate
Name: Freeze Dryer
Model:
Inspector:
Date: