OPERATING MANUAL

FREEZE DRYER

BFFT-305

CE ISO9001 CERTIFIED

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INDEX

1. Summary

The vacuum freeze-drying technology, which is also called sublimation drying, is a technical method that freezes the samples in advance, and then sublimates its moisture in the vacuum state. Goods are easier for long-term preservation after freeze-drying processing. They can be restored to the original state and maintain their chemical and biological characteristics after being watered. So the freeze-drying technology is widely used in medicine, food, chemistry industry and biological products etc.

2. Characteristics and technical parameters

1. Main characteristics
SECOP compressor, refrigeration rapid and condenser temperature low.
LCD touch screen control system, simple operation
The control system automatically stores data, and data can be viewed in form of curves. Data also can be output by USB port.
The drying chamber uses transparent acrylic drum. User can clearly view sample state and observe the whole freeze-drying process.
vacuum pump connected with host by international standard KF quick joint.
Performance of machine is stable, easy to operate and low noise.
2. Technical parameter
Minimum condenser temperature: -80°C(no-load)
Final vacuum:
Tray size: the diameter 200mm, 4 layers
Liquid bulk capacity: 1.2L (10 mm thickness)
Round bottom flask:250ml,100ml, each with 4pcs

3. Conditions in use

1. Ambient temperature in normal working condition: 10°C-25°C. Relative humidity: ≤70%.
Power supply: AC 220V±10%, 50/60Hz.
The working environment should be no conductive dust, explosive and corrosive gases and strong electromagnetic interference.
2. Transport and storage conditions Environment temperature: -40°C~50°C. Relative humidity: ≤93%.
The storage conditions should be well-ventilated, no corrosive gases.

4. Installation and preparations for freeze-drying

4.1 Structure of freeze dryer and name of partition

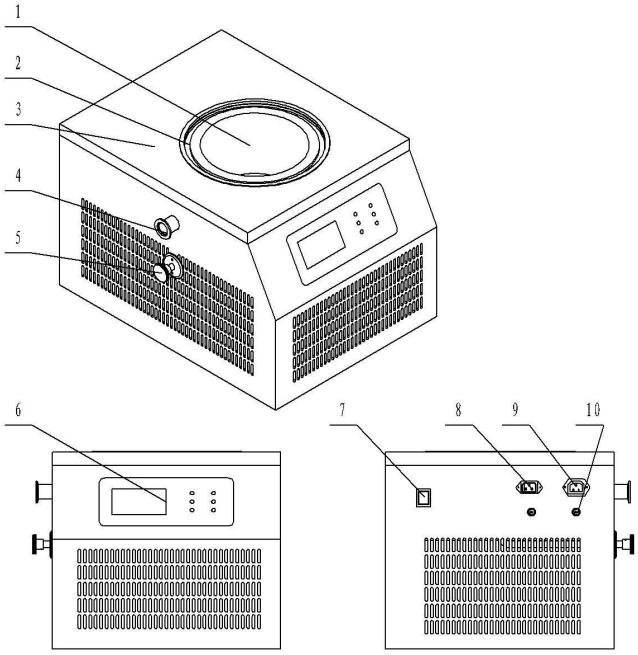


Figure 1-1 Structure of host

1. condenser
2,sealed ring
3,workbench
4,vacuum port
5,drain valve (air inlet valve)
6,control panel
7,switch
8,general power
9,vacuum pump power
10,fuse

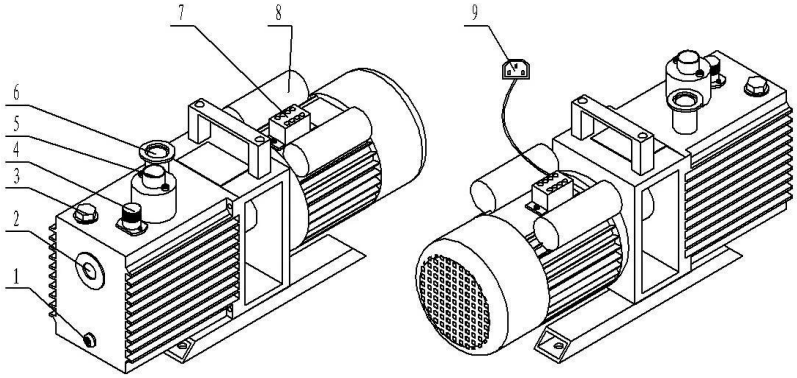


Figure 1-2 structure of vacuum pump

1. oil drain
2. oil level glass
3. oil filler hole
4. gas ballast valve
5. exhaust port
6. air inlet
7. connecting terminal
8. capacitor
9. vacuum pump power cord

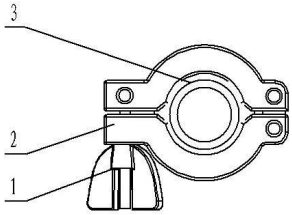


Figure 1-3 structure of clamp

1. screw nut
2. support
3. gasket ring

4.2 Installation of freeze dryer

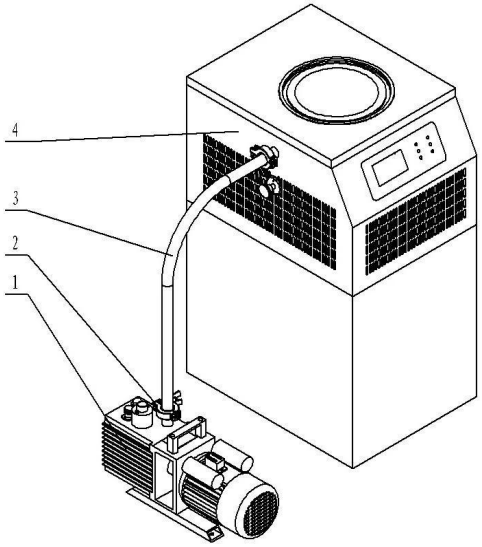


Figure 1-4 connection of the device
1. vacuum pump
2. clamp
3. tube that connects host with vacuum pump
4. host
Installation steps:
1. Check accessories complete and undamaged;
2. Add vacuum pump oil to middle of level glass;
3. Connect the air inlet on pump and tube by clamp; the other end of tube connected with vacuum port on host;
4. Connect "vacuum pump power cord" with "vacuum pump power "interface on host;

5. One end of the power line is inserted into "general power" interface on host; the other end is connected to power supply 220V,50Hz (the power should be connected with ground lead)
6. Turn on switch and test parameters of freeze dryer (final vacuum degree<10Pa, condenser temperature -80°C).Then the device is put into use.

4.3 Test of freeze dryer

Test of condenser temperature
1. Cover the pre-freeze lid
2. Turn on switch, to enter control system. Touch the screen, to go to main interface. Press "compressor" to turn on compressor to test refrigeration.
3. Condenser temperature drops to -80°C within 90 minutes, test is ok.
Test of vacuum degree
1. Press"vacuometer " to turn on vacuum gauge, standard atmosphere is displayed;
2. Put on sealed ring
3. tighten the air inlet valve
4. place organic glass drum, drum bottom full contact with sealed ring.
5. Turn on vacuum pump by pressing " vacuum pump " key. vacuum degree rapidly decline.
6. Vacuum degree goes down below 10 Pa within 20 minutes, test is ok.
7. After finishing tests, open air inlet valve on host to inflate host and restore normal pressure. Then the machine is ready for running.
Notices:
There are no obstructions behind and at sides of host within 30cm;
Make sure that the vacuum pump oil has been filled before starting up.

5. Operation of pre-freezing and drying process

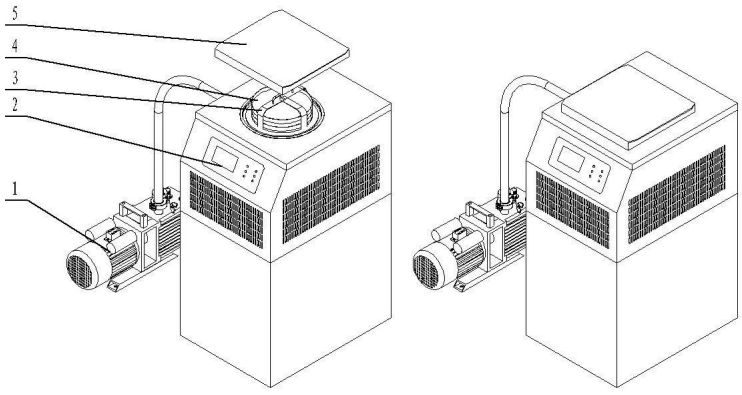
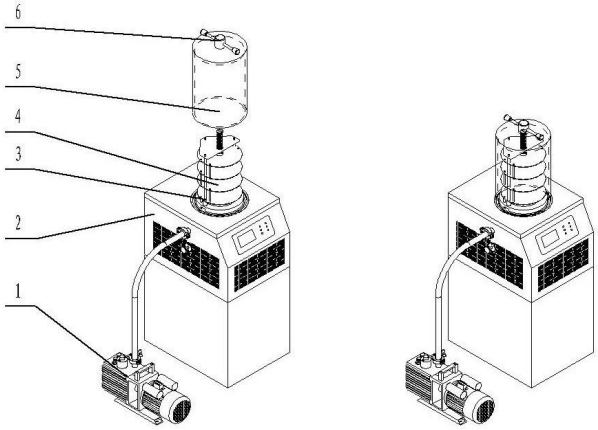


Figure 1-5 pre-freezing process
1. vacuum pump
2. control panel
3. pre-freeze shelf
4. material tray
5. pre-freeze lid
The general pre-freezing process with steps:

(If you have low-temperature refrigerator, this process may be canceled.)
1. Turn on machine and start compressor.When condenser temperature drops below -40°C, you begin to freeze material ;
2. Put material into tray (liquid directly into tray, solid material and vials evenly put on tray);
3. Put material tray into pre-freeze shelf and put the temperature sensor into material with full touch, to reduce error of sample temperature and actual temperature;
4. Put pre-freeze shelf into condenser;
5. Cover the pre-freeze lid;



6. When temperature of all parts of material drop below eutectic point, this condition will be still keeping about one hour .Then pre-freezing process is over and ready to make drying process.
Figure 1-6 drying process
1. vacuum pump
2. host
3. drying shelf
4. tray
5. acrylic drum
6. top press handle

5 Drying process

5.1 Ordinary configuration drying process

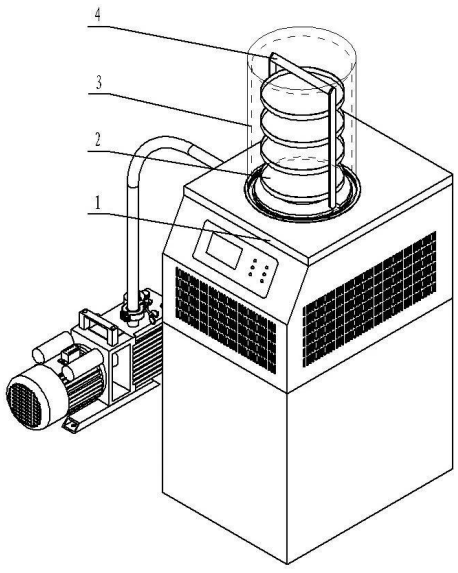


Figure 1-6 ordinary configuration drying process
1. main engine
2. material tray
3. organic glass barrel
4. drying shelf

1. Take out the material from cold trap and put them on drying shelf;
2. Put the drying shelf on cold trap;
3. Check sealed ring and cover the organic glass barrel;
4. Tight the drain valve in clockwise;
5. Open vacuum pump and vacuum gauge. The vacuum degree is decline. It's normal that the vacuum degree is less than 20Pa;
6. Open drain(inlet) valve and then close vacuum pump. Remove organic glass cover and collect material.
7. Close drain(inlet) valve. Open drain (outlet) valve and clean this freeze dryer.
8. When the vacuum pump doesn't work, please cover the exhaust hole.
Notice:
a. The refrigerator is mustn't turn off in drying process;
b. Drying time and freezing time is different because of differences in material properties.

5.2 Multi-manifold configuration drying process

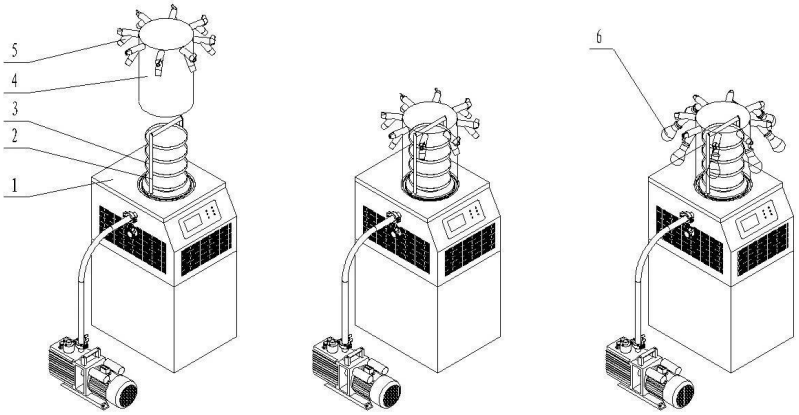


Figure 1-7 Multi-manifold drying process
1. main engine
2. drying shelf
3. material tray
4. multi-manifold organic glass barrel
5. bottle

1. Take out the material from cold trap and put them on drying shelf;
2. Put the drying shelf on cold trap;
3. Check sealed ring and cover the organic glass barrel;
4. Tight the drain valve in clockwise;
5. Open vacuum pump and vacuum gauge. The vacuum degree is decline. It's normal that the vacuum degree is less than 20Pa;
6. Hang up all bottles and open multi-manifold valve. When materials have been dried, please close multi-manifold valve.

7. Open drain(inlet) valve and then close vacuum pump. Remove organic glass cover and collect material.
8. Close drain(inlet) valve. Open drain (outlet) valve and clean this freeze dryer.
9. When the vacuum pump doesn't work, please cover the exhaust hole.

Notice:
a. The refrigerator is mustn't turn off in drying process;
b. Drying time and freezing time is different because of differences in material properties.

5.3 Top-press configuration drying process

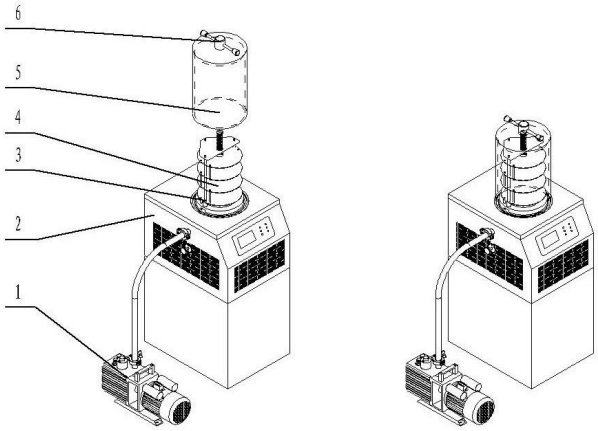


Figure 1-8 top-press configuration drying process
1. vacuum pump
2. main engine
3. top-press drying shelf
4. material tray
5. organic glass barrel
6. handle

1. Take out the material from cold trap and put them on drying shelf
2. Put the drying shelf on cold trap
3. Check sealed ring and cover the organic glass barrel
4. Tight the drain valve in clockwise;
5. Open vacuum pump and vacuum gauge. The vacuum degree is decline. It's normal that the vacuum degree is less than 20Pa;
6. Open drain(inlet) valve and then close vacuum pump. Remove organic glass cover and collect material.
7. Close drain(inlet) valve. Open drain (outlet) valve and clean this freeze dryer.
8. When the vacuum pump doesn't work, please cover the exhaust hole.

Notice:
a. The refrigerator is mustn't turn off in drying process;
b. Drying time and freezing time is different because of differences in material properties.

5.4 Top-press multi-manifold configuration drying process

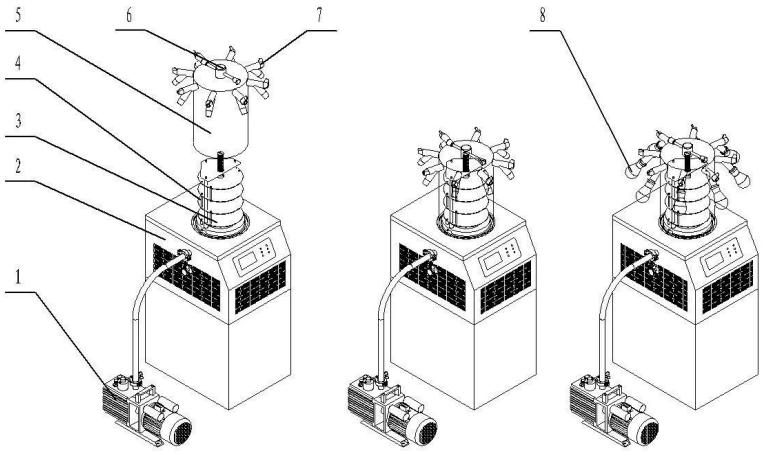


Figure 1-9 Top-press multi-manifold configuration drying process

1. vacuum pump
2. main engine
3. top-press drying shelf
4. material tray
5. top-press multi-manifold organic glass barrel
6. handle
7. multi-manifold interface
8. bottle

1. Take out the material from cold trap and put them on drying shelf;
2. Put the drying shelf on cold trap;
3. Check sealed ring and cover the organic glass barrel;
4. Tight the drain valve in clockwise;
5. Open vacuum pump and vacuum gauge. The vacuum degree is decline. It's normal that the vacuum degree is less than 20Pa;
6. Hang up all bottles and open multi-manifold valve. When materials have been dried, please close multi-manifold valve.
7. Open drain(inlet) valve and then close vacuum pump. Remove organic glass cover and collect material.
8. Close power and close drain(inlet) valve. Open drain (outlet) valve and clean this freeze dryer.
9. When the vacuum pump doesn't work, please cover the exhaust hole.

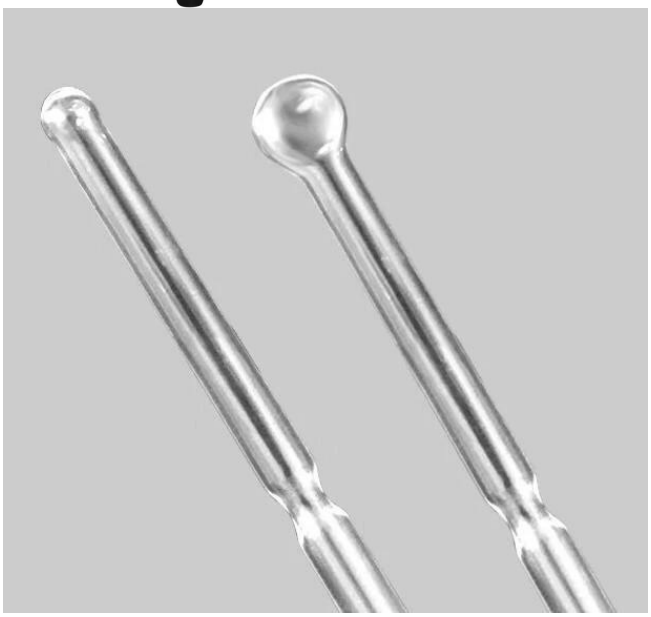
Notice:

a. The refrigerator is mustn't turn off in drying process;

b. Drying time and freezing time is different because of differences in material properties.

Note: If material is loaded in vials, turn top press handle clockwise, to seal vial at vacuum state. Then open air inlet valve to inflate host.

5 BFFT-305 Type Freeze Dryer is a configuration used for freeze-drying ampoule tubes.The specifications of ampoule tubes can be customized according to needs, such as 1ml, 5ml, 10ml, 20ml, etc.



The process of freeze-drying ampoules.

1. Turn on the compressor to keep the temperature of the condenser -40 °C.
2. Turn on the vacuum pump to make the vacuum degree lower than 30Pa
3. Install the ampoules one by one onto the freeze dryer and open the valves.

When a new ampoule tube is added to the freeze dryer, the vacuum value of the freeze dryer will increase. Only when the vacuum value of the freeze-drying machine is less than 60pa, can the subsequent ampoule tubes be added.

4. After the ampoule tube is dried, if vacuum sealing is required, use a flame sealing machine to seal the smaller diameter position for about 3 minutes to complete the vacuum sealing. If vacuum sealing is not required, close the valve and remove the ampoule tube.
5. After removing all ampoule tubes.Close drain valve, machine begins to defrost. After finishing defrosting, open drain valve to drain water. Clean the equipment.
6. When the vacuum pump does not work, please cover the exhaust port to prevent dust.

Notice: a. Compressor can not be turned off in whole freeze drying process;

b. For different materials , freezing time and drying time are not the same ,because of differences in material properties.

6. Turn off machine operation

1. Turn off power switch;
2. Unplug the power cord;
3. Clean condenser, drying shelf and organic glass drum and other parts;

7. Control system operation

The control system uses LCD touch screen display, easy to operate and the running status is clear. The system displays sample temperature curve, condenser temperature curve and vacuum degree curve. System adopts a variety of stable measures so that control system runs stable and reliable.
The control system contains following display screen.

1. Turn on switch, system goes into initial interface. Touch the screen center, it enters main interface.

Figure 1:
initial interface

2. On main interface, touch"compressor",compressor starts to work. Touch"vacuum pump", pump starts to work. Touch"vacuometer",vacuum degree displays.
Touch "real-time curve" for curves check. "History record" for earlier data check.

Figure 2:
main interface

3. Touch"real -time curve", to enter real-time curve interface.On right side, there are "sample","condenser"and "vacuum"buttons to control relative curves.

Figure 3:
"real-time curve"interface

4. Click"history record"on main interface, it goes into "history select" interface. User can choose specific file, to check this curve,delete it or output it to U flash disk.

Figure 4: "history select" interface

5. Click "confirm" on "history select" interface, user can see "history curve" interface.

Figure 5:
"history curve" interface

6. Click"Delete"button on "history select" interface. Selected file can be removed.

Figure 6:
"Delete" interface
7. Click"export to USB"button on "history select" interface.
(U disk capacity should be less than 8G). User needs to insert U disk in advance, then turn on switch to export data. Data can be checked by Excel format.

Figure 7:
"export to USB" interface

8. System time set
Please press system time place for some seconds, then you can see a system time set screen.

8. Notices

1. The vacuum pump should be put on ground so that it maintains a certain height difference with host(at least 50cm), to prevent oil return if power is suddenly off. If power off,you should open air inlet valve to inflate the host, take out the samples as soon as possible and properly store samples.
2. Working environment temperature ≤ 25°C. Humidity ≤70%.
3. When turn off machine, you should inflate host first, later turn off the vacuum pump to prevent oil return and sample pollution.
4. The organic glass drum is connected with host by "O" sealed ring.
Sealed ring should be kept clean , without organic solvent cleaning; Acrylic drum's touch end with sealed ring should be protected from strike and damage.
5. Grounding power socket must be used.
6. vacuum pump oil need change regularly after working 200 hours continuously.
7. Please don't frequently turn on and turn off power supply and compressor. If compressor stops working because of wrong operation, you need to restart the compressor after waiting for at least 3 minutes .

9. Common breakdown and elimination

9.1 The vacuum degree can not achieve below 15Pa.
1. Check the connection between vacuum pump and host, to make sure clamp is tight
2. Check whether acrylic drum bottom is clean,whether there is damage on touch surface
3. Check whether the "O" sealed ring is clean , whether its placement is correct.
4. Check whether the vacuum pump works normally and whether the pump oil is clean .
5. Check whether the air inlet valve is screwed tightly
9.2 High condenser temperature
Ambient temperature is too high ,leading to bad heat dissipation.
Please place the machine in proper environment with well ventilated condition.

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