

DW-N Series

Freeze Dryer

Operation Manual



Notices:

(Please read the instruction carefully before you use the machine)

Overview:

Vacuum Freezing Drying technology also called Sublimation Drying, it is preliminary freeze sample with water, then the moisture content sublimated under the vacuum method. The the original biological, chemical and physical properties of items basically unchanged after freeze drying, easy for long-term storage, water can be return to lyophilization state as before, and can keep its original and biochemical characteristics. Therefore, freeze drying technology used widely in medicine, food, chemical, biological products and other areas.

1. Features:

- (1) The machine adopts international brand Danfoss refrigeration compressor, refrigeration rapidly, Cold Trap in low temperature.
- (2) With 7 inches True color touch LCD control system, easy to operate, and powerful functions..
- (3) Automatically save lyophilizer data in control system in the form of curve view, the freeze-drying process clearly.
- (4) Drying chamber use colorless transparent Emerald Polycarbonate, can see sample clearly and ocular, observed the whole process of freeze-drying.
- (5) Vacuum pump and mainframe connection using international standards KF quick coupling, concise and reliable.
- (6) This machine can store many freeze-dried curve, and use U disk extract data to the computer, use an upper computer software in the computer to print and other options.

2. Technical Parameters:

- (1) Cold chamber Temperature: -56°C (no-load)
- (2) Vacuum Degree: $<10\text{Pa}$ (no-load)
- (3) Freeze Volume: Common model Sample disk 4 pcs \times 200 mm

3. Working Conditions:

- (1). Environment Temperature under Regular working condition: $10^{\circ}\text{C}\sim 30^{\circ}\text{C}$
Relative humidity: $\leq 70\%$
Voltage: $220 \pm 20\% \text{V}/50\text{Hz}$
Working environment should be no conductive dust, explosive, corrosive gas

- And strong electromagnetic interference.
- (2). Transport and Storage Conditions: Temperature: $-40^{\circ}\text{C}\sim 50^{\circ}\text{C}$
 Working Humidity: $\leq 93\%$
- Storage environment should be well ventilated, no corrosive gas.
- (3) Safety classification class I type B.

4. Machine Installation

4.1. Installation and preparation

4.1.1 Structure & name:

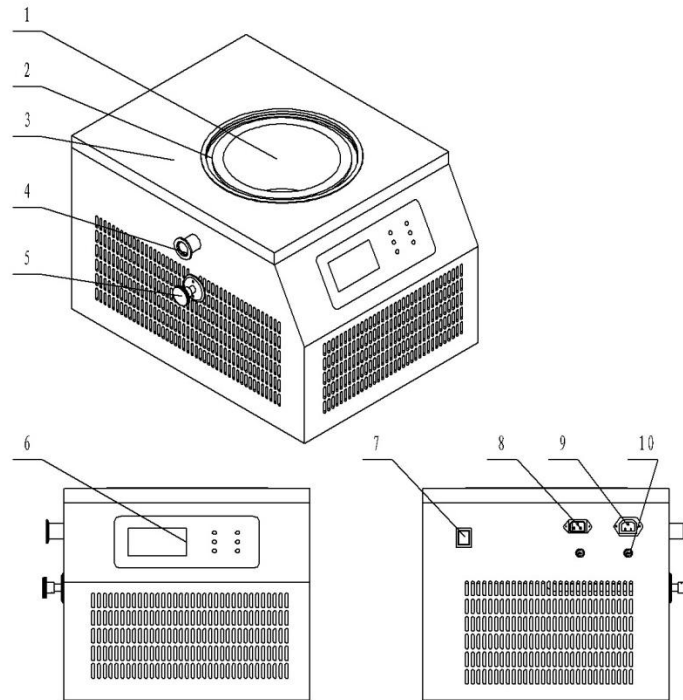


Figure 1-1 Main structure

- 1-1-1.Cold trap 1-1-2. Seal ring 1-1-3. Work surfaces 1-1-4. Vacuum pumping interface
 1-1-5. Waterproof (inflow) valve 1-1-6. The control (display) panel 1-1-7. Switch
 1-1-8. Power supply 1-1-9. The vacuum pump power 1-1-10. fuse

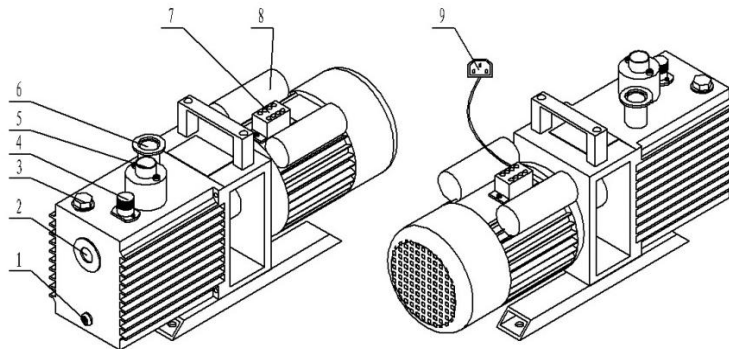


Figure 1-2 Vacuum Pump structure

1-2-1 oil drain hole 2. 1-2-2 oil level sight glass 1-2-3. Oil of filling hole 1-2-4 gas ballast valve 1-2-5.exhaust port 1-2-6. The intake port 1-2-7.the connection terminal 1-2-8.capacitor 1-2-9.vacuum pump power plug

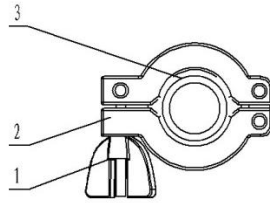


Figure 1-3 Clamp structure

1-3-1.Dovetail nut 1-3-2.bracket 1-3-3.seal rings

4.1.2 Installing of machine:

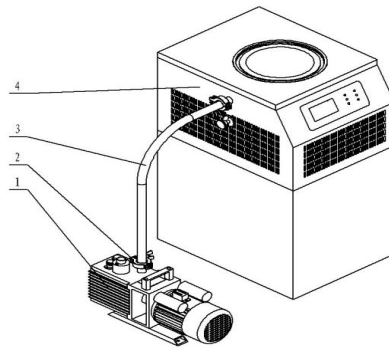


Figure 1-4 The connection of the apparatus

1-4-1 vacuum pump 1-4-2 clamp
1-4-3 vacuum connecting pipe 1-4-4 host

4.2 Equipment installation steps:

- 4.2.1 You can check the accessories according to the packing list, and make sure that they are Completely and undamaged.
- 4.2.2 "Vacuum pump" filling "the vacuum pump oil" level to the Endoscopy Center (Please Choose the specify of the vacuum pump oil GS-1 which our company applied.
- 4.2.3 Using the rapid clamp to connect the intake port of the vacuum pump with the vacuuming Pipe, then connect the vacuuming pipe to the other end with the host vacuum interface
- 4.2.4 The vacuum pump power plug is connected to the "vacuum pump power "interface;
- 4.2.5The power cord is plugged into the host interface, the other end of the power cord is connected to a power supply 220V 50Hz or 110v 60Hz (power supply should be connected to the ground)
- 4.2.6 Open the "switch" , then in accordance with the normal indicators of manual steps to test

Equipment (equipment indicators include vacuum degree $<10\text{Pa}$, cold trap temperature $<-50\text{ }^{\circ}\text{C}$).after that, the equipment can be put into use.

4.3 Note:

- 4.3.1.Host is placed which should be ensure that there are no obstructions around or behind the host for 30cm;
- 4.3.2.Before starting, please be sure that the machine has been filling the vacuum pump oil.

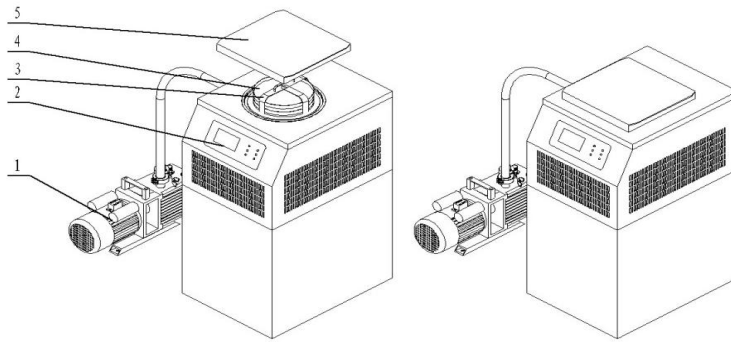


Figure 1-5 Pre-freeze

1-5-1 Vacuum pump 1-5-2 Control panel 1-5-3

Pre-freeze shelves 1-5-4. Material plate 5. Pre-freeze cover

4.4 Pre-freeze process

General pre-freezing process (low temperature refrigerator users can replace the step)

- 4.4.1 open the refrigerator, then pre-cooling for equipment, when the cold trap temperature is dropped to $-40\text{ }^{\circ}\text{C}$, the material can be pre-frozen
- 4.4.2 Put the material into the material disc (liquid can be injected directly into the material disc, solid or bottled materials can be placed on the material disc)
- 4.4.3 Put the material plate into the pre-iced shelves, then put the probe into the material plate to make sure that they can contact with the material fully, in order to reduce the sample temperature and the actual temperature of the error
- 4.4.4 Put the pre-iced shelves into a cold trap (Figure a)
- 4.4.5 cover with the pre-freezing cover
- 4.4.6 when the temperature of each part is dropped to below the eutectic point of the material, maintain the pre-freeze about 1 hour, and then ready to enter the drying stage.

4.5 Drying Process (Common configure)

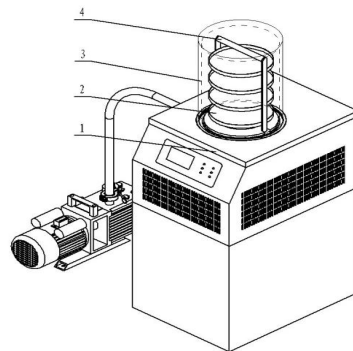


Figure 1-6 configurations drying

1-6-1. Host 1-6-2. Material tray 1-6-3. Plexiglass cylinder 1-6-4. Drying rack

- 4.5.1 Get the pre-frozen good material out and then put them on the drying rack;
- 4.5.2 Put the drying rack on the cold trap, as shown;
- 4.5.3 Check the seal rings intact and over the organic glass before making sure that there is no debris
- 4.5.4 Clockwise to tighten the drain valve;
- 4.5.5 Open the vacuum pump, open the vacuum gauge. The degree of vacuum will be dropped. Normally, the value of the degree of vacuum should less than 20pa in the general drying process.
- 4.5.6 After drying, first open water (intake) valve, and then close the vacuum pump. Remove the organic glass, then collect the dried material.
- 4.5.7 Turn off the water (intake) valve device, then to defrost the machine. After that, you can open the "spending (deflated) valve" for draining, and also make sure that to wipe clean the equipment in the end.
- 4.5.8 When the vacuum pump is not working, please cover the vent which is to prevent dust from entering.

Note: During the entire drying process, the machine cannot be shut;

Due to differences in the physical characteristics, the time of drying and pre-freezing will be differently.

4.6 The drying process of manifold configuration

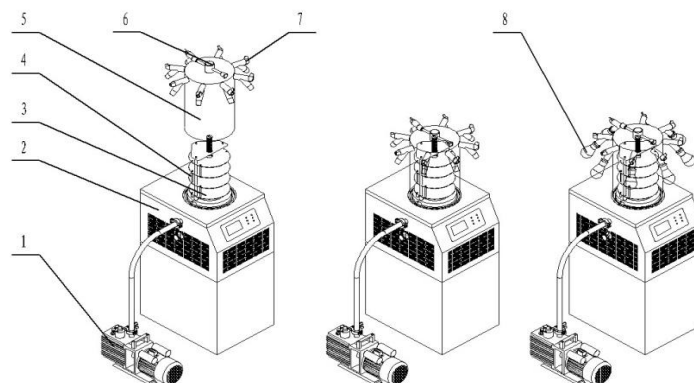


Figure 1-9 gland manifold drying process

1-9-1 vacuum pump 1-9-2 host 1-9-3 drying rack 1-9-4 Material tray

1-9-5 cylinder 1-9-6 gland handle 1-9-7 Manifold joint 1-9-8 flask

- 4.6.1 Get the pre-frozen good material out and then put them on the drying rack;
- 4.6.2 Put the drying rack on the cold trap, as shown;
- 4.6.3 Check the seal rings intact and over the organic glass before making sure that there is no debris
- 4.6.4 Clockwise to tighten the drain valve;
- 4.6.5 Turn the vacuum pump then turn on the vacuum gauge. The degree of vacuum will be dropped. normally, the value of the degree of vacuum should less than 20pa in the general drying process.
- 4.6.6 After drying, first open water (intake) valve, and then close the vacuum pump. remove the organic glass, then collect the dried material.
- 4.6.7 Turn off the water (intake) valve device, then to defrost the machine. After that, you can open the "spending (deflated) valve" for draining, and also make sure that to wipe clean the equipment in the end.
- 4.6.8 When the vacuum pump is not working, please cover the vent which is to prevent dust from entering.

Note: a During the entire drying process, the machine cannot be shut;

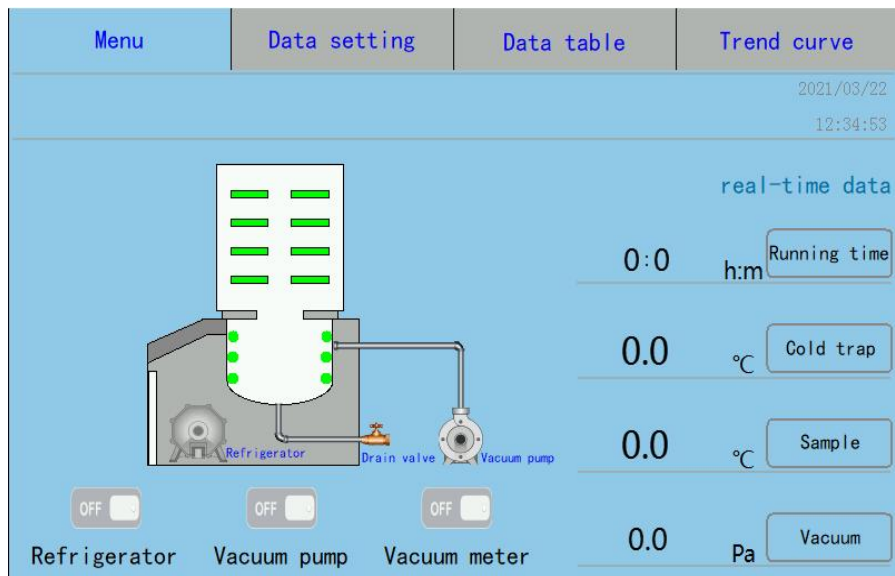
b Due to differences in the physical characteristics, the time of drying and pre-freezing will be differently.

5 . Control System Operation:

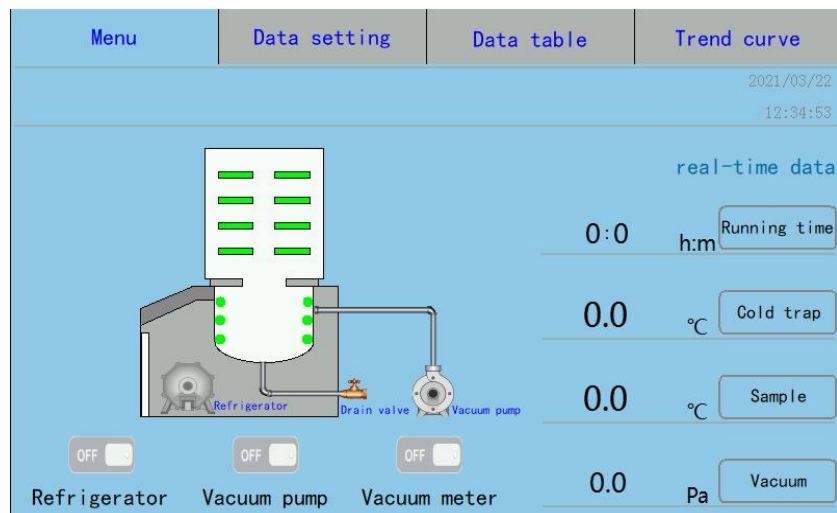
- 5.1 After material pre-frozen well ,then put the material in tray ,ensure the device prepared for drying state ,then turn on the "General Power" switch, the system displays as below



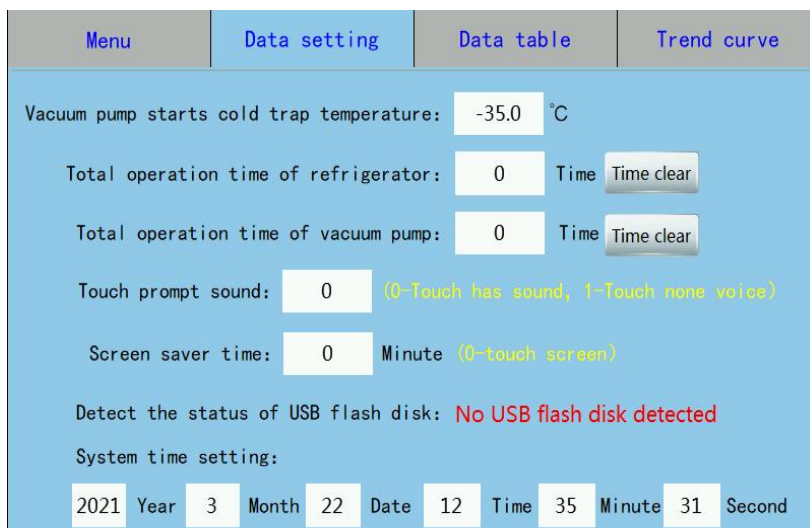
- 5.2 Press "go" button show below display enter the menu interface



5.3 Press “Refrigerator” button, the freezer machine starts, the cold trap starts to cool, turn on the vacuum gauge and vacuum pump in turn to perform vacuum freeze-drying.

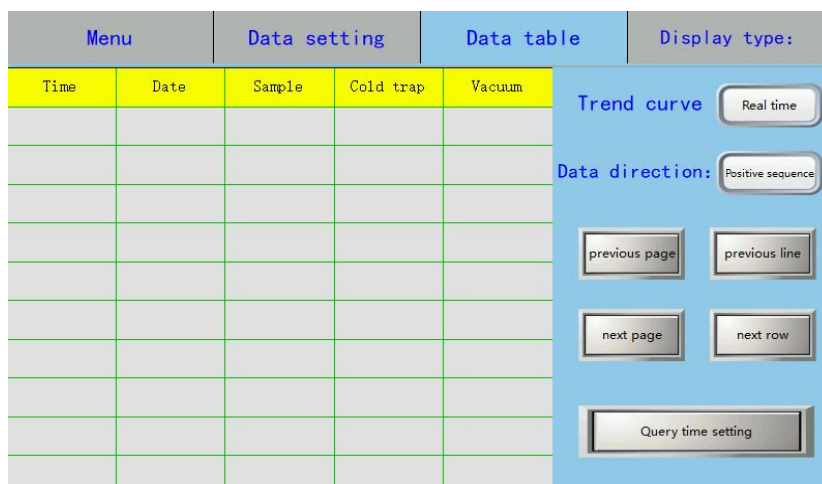


5.4 Click “data setting”, set data to ensure the normal operation of the machine.

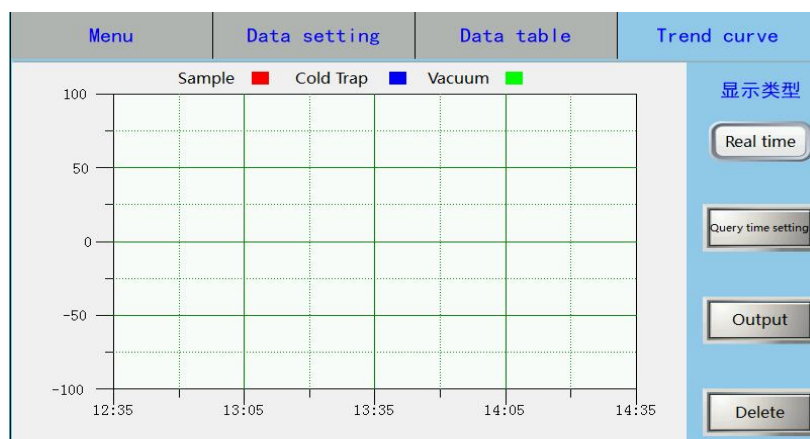


The starting temperature of vacuum pump refers that cold trap of the vacuum pump needs to reach;

5.5 Click the data table to set the query time setting, and you can observe real-time and historical data.



5.6 Click on “trend curve “, set the query time setting, and observe real-time and historical curve data



6. Note :

- 6.1 The refrigerating system of this instrument is strictly prohibited to start frequently.
-56°C model requires 3-5 minutes interval, -80 °C model requires 30 minutes rest
- 6.2 If the lyophilized sample contains organic solvents or radioactive materials, a corresponding adsorption material should be installed before the vacuum pump.
- 6.3 If the user inadvertently uses organic solvents or acidic substances, the vacuum pump oil should be replaced immediately, and the cold trap, cold trap, lyophilized bucket cover and corresponding pipeline should be cleaned and neutralized.
- 6.4 When shutting down, strictly follow the above shutdown procedure. (Shutdown is the reverse order of start up.)
- 6.5 Drying room door and cold trap box door sealing strips, vacuum pump tube clamp sealing rings are wearing parts, and should be kept clean when using.

7. Maintenance

- 7.1 Performing the necessary maintenance and repairs is beneficial to the life of the equipment and the operating status of the equipment.
- 7.2 The vacuum pump oil should be replaced after the first vacuum pump has worked for 200 hours. The vacuum pump oil should match the vacuum pump.
- 7.3 Check the silicone oil level once a year to see if it needs to be filled with silicone oil.
- 7.4 Check the circuit system every six months, clean up the dust, and check all the terminals. Whether the wiring harness is complete.
- 7.5 Check whether the drain valve is leaking.
- 7.6 Cover the exhaust hole of the vacuum pump and close the door of the drying chamber if not used for a long time. Turn off the main power and make the whole system power off.
- 7.7 Clean the internal dust regularly (please according to the use environment).

8. Common faults and solution

8.1. Vacuum degree can't reach below 15Pa

- a) Check the connection between the vacuum pump and the host and whether the clamp is properly tightened.
- b) Check whether the flat surface of the seal ring is clean or damaged.
- c) Check whether the vacuum pump works normally and observe whether the pump oil is clean.
- d) Check if the vacuum valve is tightened.

8.2. Vacuum pump oil leakage

- a) Check all parts of the fuselage, and replace the oil leakage parts.

8.3. Cold trap temperature is too high

- a) The ambient temperature is too high and the ventilation and heat dissipation are not good. Please try to move the machine to a well-ventilated place or improve the environmental conditions.
- b) The piping of the refrigeration unit is leaking, and the piping is overhauled. Add refrigerant.
- c) The refrigeration system is damaged, please contact the company's technical engineers.

9. Standard Accessories

Number	Name	Quantity
1	Host	1
2	Material shelf	1
3	Vacuum pump	1
4	Power lead	1
5	Vacuum pressure tubing	1
6	Pre-freezing shelf	1
7	Thermal cover	1
8	“O” type seal ring	1
9	Vacuum grease	1