



## Operating Instructions – Lyophilizer

**Manufacturer: Zirbus**

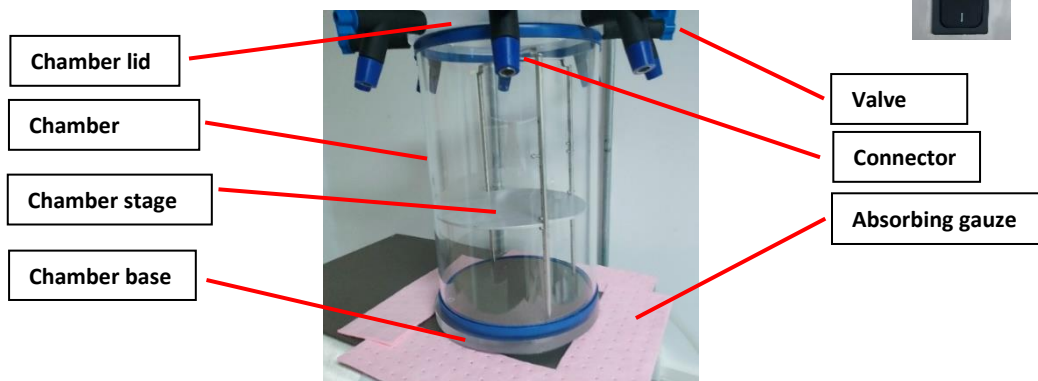
**Model: Vaco5**

**Safety:**

1. The instrument has very cold surfaces. Always check the chamber temperature before loading samples. Use protective gloves when necessary to prevent cold injury.
2. The chamber cover is heavy and high, ask for assistance or use a stool.
3. Place your samples at the center of the chamber to prevent accidental sample loss when placing the chamber cover.
4. Very high pressure difference! At the end of the drying process bring the system to pressure equilibrium gradually. Rotate the connector valve and the aeration valve very slowly.
5. Solvents other than water are not allowed in the lyophilizer. Consult with the staff.
6. Inspect every glass flask for any cracks before use.
7. Inform the Core Facility staff for any safety issue or misuse of the instrument.

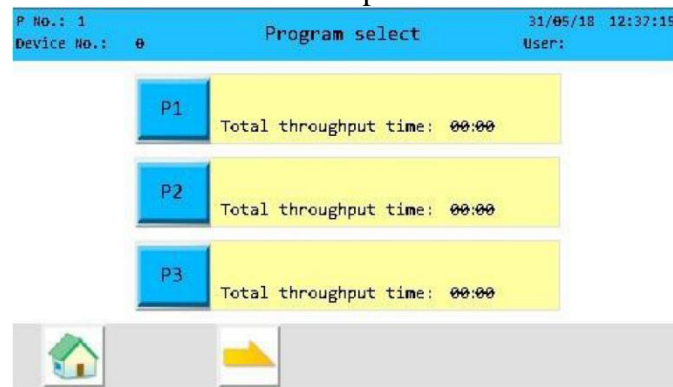
**Note:** Samples for freeze drying need to be pre-frozen at a temperature below  $-50^{\circ}\text{C}$  for at least 4 hours. It is better to use a  $-80^{\circ}\text{C}$  freezer.

1. Turn on the Lyophilizer using the switch on the right side of the instrument.



**Lyophilizer main parts**

2. Wait ~5 seconds until the main interface shows up.



**System interface**



3. Set the operating parameters.  
Up to 10 operating programs can be set.:

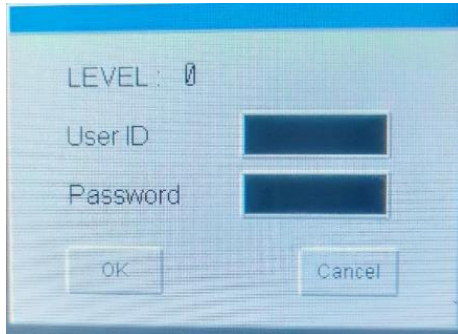




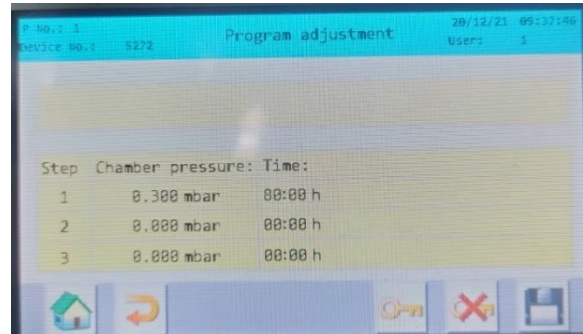
3.1 Click **P1** on the interface to enter the Setup parameter page. Click the **Key** button to enter the log in interface, input **1** as **User ID** and **255** as **Password** to get the access to setup.



3.2 Click  to set the **pressure** inside the chamber and the **operating hours** (duration) for each step of your freeze-drying process (up to 3 steps). Click  to save the parameters.



Log in interface



Setup parameter page

4. Start a program.

4.1 Before starting the program, check that the **Drain tube** is closed with the metal plug.

4.2 Make sure the oil in the vacuum pump is clear and in between the min and max level marks.

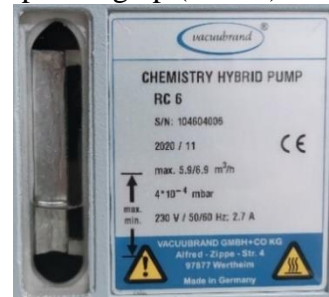
4.3 Make sure the valve of all the connectors in the chamber lid are pointing up (closed).



Connector valve point up



Drain tube closed with a metal plug



Oil level window

4.4 Put the chamber at its position on the lyophilizer and put the lid on the chamber.

Click **Precooling**, wait for the process to complete (~ 10 minutes).

4.5 Load samples – there are 2 optional locations for loading samples:

4.5.1 **Drying in the main chamber:**

Remove the chamber and its lid, put the samples on one of the stages on the stand, put the chamber back and cover with the lid.

4.5.2 **Drying in glass flasks:**

Put the samples inside a flask, attach the flask to one of the connectors of the chamber lid. Turn the valve 180 degrees (should point down)

4.5 After loading the samples, click **Start** to run the program.



**A valve pointing down**

**System interface**

4.6 When drying samples using the glass flasks, put the **gauzes** beneath the flasks to absorb condensed water vapors from reaching the instrument.

4.7 After starting the program, follow the air pressure until it reaches 1 mbar. If the air pressure does not reach 1 mbar, there is a leakage in the system. Check the **chamber lid, chamber itself and chamber base** to ensure good airtightness.

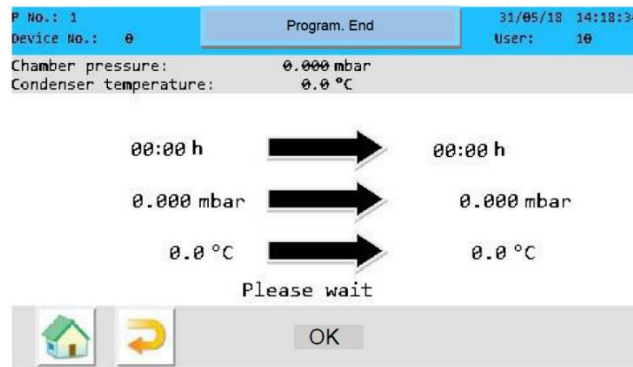
**Note:** For sample loading safety, refer to sections **1,2** in **Safety**.

5. Finish operation

5.1 Take out samples

5.1.1 **Drying in the main chamber:**

The interface image below will show up when the operation is finished. Click **OK** to switch off the vacuum pump.



**System interface**

Slowly open the switch of the aeration to ventilate. Remove the chamber lid carefully, and then remove the chamber and take out your samples from the chamber stage.

5.1.2 **Drying in glass flasks:**

Slowly rotate the valve of the connector, remove the flask from the connector, put the flask and the samples on a tray. Click **OK** on the image above to finish the program and switch off the pump.

**Note:**

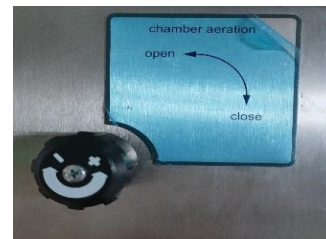
1. Pay attention to the different orders for taking out samples and switching off the machine.
2. For safety, refer to section **4** in **Safety**.

6. Defrosting the condenser.

6.1 Remove the base of the chamber.



**Chamber base**



**Chamber aeration switch**

6.2 Open the chamber aeration switch and ventilate the chamber.

6.3 **It is your responsibility to:**

- 6.3.1 Turn off the machine 2 hours after aeration begun.
- 6.3.2 Wipe the flasks from any spillage stains and store them in the box inside the cabinet.
- 6.3.3 Drain out the water after **two days** of ice defrosting.
- 6.3.4 Wipe the inner chamber from water that was not drained through the tube.
- 6.3.5 Connect the metal plug back to the drain tube. Make sure it is well connected.
- 6.3.6 Put the absorbing gauze in the small blue tray.