

# Instructions for freeze dryer

Freeze dryer: LEYBOLD HEARAEUS GT2 (grey)

Pump: LEYBOLD HEARAEUS TRIVAC

Drying space (pool) in the freeze dryer must be kept clean. The cupola can be washed only using wet towel. The edge of cupola can be cleaned using ethanol if silicon needs to be removed. Spiral can be rinsed using RO water and it need to be dry before using the freeze dryer. The amount of oil in the pump must be between min. and max. Oil must be changed regularly. The oil accumulated in the oil fog filter can be put into the pump.



Figure 1. Freeze dryer.

## Pre-cooling of freeze dryer and pre-heating of pump:

1. Empty the bottle where the melting solution is stored and put the hose on the floor (it may lie freely)
2. Press the button to the position pre cooling. The button is on the left on the top of the freeze dryer in the red box.
3. Turn the current switch to the position on and gas ballast coupler to the position 1/1.
4. Keep the cupola on the top of the drying space (pool) so that air can go inside of the cupola. Also aeration tap is open and melting tap is closed. These guarantee that vacuum is not formed inside the cupola yet.
5. Pre-cooling and pre-heating takes about one hour until the pump is warm.

Pre-heating of pump is done in order the pump is effective enough to make strong vacuum. Pre-cooling of freeze dryer is done in order to avoid melting of the samples at the beginning of the freeze drying. If samples are melting peaces of samples may fly around in the cupola and it can contaminate the freeze dryer.

### **Loading the samples and starting the freeze drying:**

1. Put the cupola on the table. Be carefully and do not hit edge of the cupola.
2. Turn off the tap of the pump (red ring can not be seen)
3. Put the samples onto the shelves of the freeze dryer (lid of the container under the container)
4. Put silicone on the edge of the cupola (do not put too much)
5. Check the cleanness of the border
6. Put the cupola on (press carefully and turn at the same time)
7. Turn off the aeration tap
8. Put the switcher on the position drying (The button is on the right side in the red box)
9. Open the tap of the pump (red ring can be seen)
10. Gas ballast 0/0

Look at the samples for awhile. Check that vacuum is formed and surface of the samples is good (no holes). If vacuum is not formed, turn off the tap of the pump and let the vacuum out from the cupola.

Freeze drying takes about 2 days.

### **Ending the freeze drying, removal of the samples and aeration of the pump:**

1. Turn off the valve of the pump (red ring can not be seen)
2. Gas ballast to the position 1/1
3. Let the vacuum out by opening the aeration tap carefully
4. Take the cupola away. It can be rather tight but take it off carefully using hugging hold and turning back and forth.
5. Take the samples from the shelves and put lid back to the container
6. Put the cupola back
7. Open the valve of the pump (red ring can be seen)
8. Turn off the switcher on the position drying and keep aeration tap open and melting tap closed (air is going to the pump).
9. Remove water from the oil
10. Aerate the pump 1 - 2 hours
11. Turn off the pre-cooling
12. Turn off the pump
13. Put the hose which comes from the freeze dryer into the bottle and open the tap for the melting solution.

Before loading new samples make sure that all ice is melt around of the metal spiral and dryer is dry. If needed warm water can be put in the pool, which quickens the melting.