

Cryo-Holders and the Dry Pumping Station

Here are some things to remember about using the Gatan cryo holders and dry pumping station. The most important thing to remember is that we have two holders with significantly different properties, and you should use the holder with the properties most suited to your purpose:

- 1) Gatan 626: This is the standard cryo holder that many experienced people will have used elsewhere. It uses a clip-ring to hold the grids in place. In our JEOL JEM 3200FS, the 626 has limited tilt ($<30^\circ$). This is the cryo holder to use for almost all applications.
- 2) Gatan 914: This holder is designed for tomography and is capable of high tilt ($>60^\circ$) even in the 3200. The grid loading mechanism is more complicated than that of the 626 and is less robust (easier to break!). Unless your application needs tilts beyond 30° , please do not use the 914.

We are currently storing both cryo holders in the dry pumping station and under vacuum. In this state, there should be two green lights (MDP STATUS and SYSTEM STATUS) and a yellow power light on the front of the dry pumping station that are constantly lit. If you discover that this is not the case, please inform the staff. While the cryo holders are attached to the dry pumping station, they should always be inverted (so that dust does not accumulate in the dewars) and arranged so that their dewars are being actively pumped. This means that there will be a piece of tubing running from each dewar to an arm on the dry pumping station and that the needle valve at each end of the sections of tubing are open as much as possible. When tubing is not attached to a cryo holder dewar, it should be attached to one of the two solid metal posts on the dry pumping station.

Here is the most basic procedure for removing a holder from the dry pumping station:

1. **Close the needle valves** at the ends of the tubing that connects BOTH cryo holder dewars to the dry pumping station. Remember to close the needle valve both on the holder you intend to use and also on the other holder, and only then close the valve on the dry pumping station itself.
2. **Detach the tubing** from the cryo holder and immediately reattach it to a metal post on the dry pumping station.
3. Close the valves labeled “V1” and “V2” (in this order) on the dry pumping station. These are butterfly valves operated by black levers on the vertical post on the front of the dry pumping station. When removing a cryo holder, **close V1 then V2**.
4. Gently **pull the holder out** of its horizontal sleeve. This sleeve is still under vacuum and you must pull hard enough to break the vacuum. If you hear loud noises and the red FAILURE light becomes lit, please let the staff know as soon as possible. Do not abort a cryo session when this happens, but do contact the staff as soon as you can safely leave the EM area.
5. After the holder has been removed, insert one of the plastic plugs into the empty horizontal sleeve and **re-evacuate the dry pumping station**: open V2 then V1.

Most of the time, a cryo holder returned to the dry pumping station will be cold. We have recently decided to warm cold cryo holders actively, so remember to follow step 3 listed below:

- 1) Close V1 and V2 (in this order) and **remove the plastic plug** from the horizontal sleeve.
- 2) **Insert the (cold) cryo holder** into the horizontal sleeve and close V2 and V1 (in this order).
- 3) **Attach the temperature controller** to the (cold) cryo holder and activate the warmup cycle (using default settings).
- 4) **Attach the tubing** to the dewar of the (cold) cryo holder.

- 5) Do not open any of the needle valves at this time.
- 6) If you are around 30 minutes later, please turn off the temperature controller. At this point, you may also open the needle valves that allow the dry pumping station to pump on the cryo holder dewar(s).

Please do not run a zeolite bake out cycle without first talking to the staff.

Most of the items mentioned above deal mainly with the cryo holders and only peripherally with the actual dry pumping station. Here are a few things to remember about the dry pumping station itself:

- 1) The turbo pump is happy to run continuously, but bad things happen to it when air is dumped into the system while it is operating at full speed. The red FAILURE light will indicate when this has happened.
- 2) The butterfly valves (V1 & V2) can get dirty and in that state, they will often not close completely. When this situation occurs, a user will do everything the correct way (as outlined above), but the vacuum will still crash and the red FAILURE light will light up. When this happens, please contact the staff as soon as it is convenient.
- 3) The vacuum gauge occasionally gets dirty and fails to read properly: the needle will be pinned to the right (indicating no vacuum, even though it is clear that there is some vacuum in the horizontal sleeves and the red FAILURE light is not lit). When this happens, please stop using the dry pumping station and contact the staff.
- 4) The plastic plugs should either be in the dry pumping station or in the black plastic sleeves that sit on top of the dry pumping station. We have had considerable problems with these plugs, so please treat them with care. At present, we are never inserting them tightly into their black plastic sleeves.