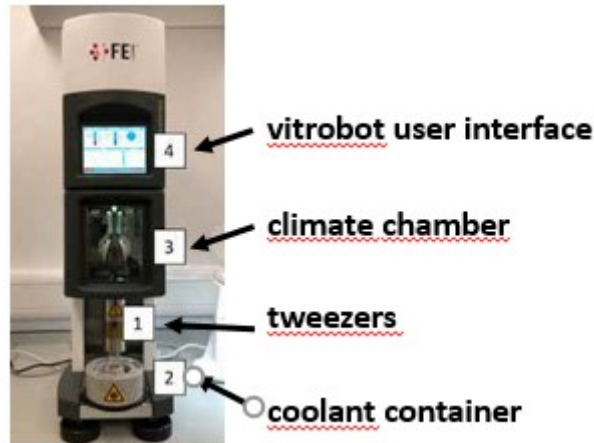


# Vitrobot procedure

The Vitrobot<sup>TM</sup> (Vitrification Robot) is a fully PC-controlled device for vitrification (= rapid cooling) of aqueous samples



## Before starting

- fill a dry 5 L tank with liquid nitrogen
- label grid boxes with the name of the experiment
- check several things:
  - plasma cleaner is reserved
  - EM\_grids grids are available and present in sufficient number
  - all part of the coolant container are dry
  - close climate chamber's door if open
  - Paper filter clipping ring are not missing

## Starting up the vitrobot

- 1. [Switching on vitrobot](#)
  - Press the hard lock switch on the right backside of the machine



- [The Vitrobot User Interface page will appear after a few seconds.](#)
  - Console page is dedicated to set humidity and temperature parameters
  - options page is dedicated to set blotting process parameters



- 2. Make sure the humidifier is operational
  - [check humidicator beaker state in humidity panel](#)

### Humidificator beaker ready to work



### Humidificator beaker empty need to be refilled



- [if EMPTY refill it with distilled water](#)

### **Use ONLY distilled water**

- 1. Fill a syringe with 60 ml distilled water
- 2. inject the whole volume through the plastic tube at the bottom part of the humidifier
- 3. When removing the syringe from the tube, be careful not to tear it from its location



- **3. hermetically close the chamber**
  - do the following dry Run:
    - Place new grid / continue / place ethane container
  
  - the white latch remains in open position after switch on the power.

## Set blotting process parameters

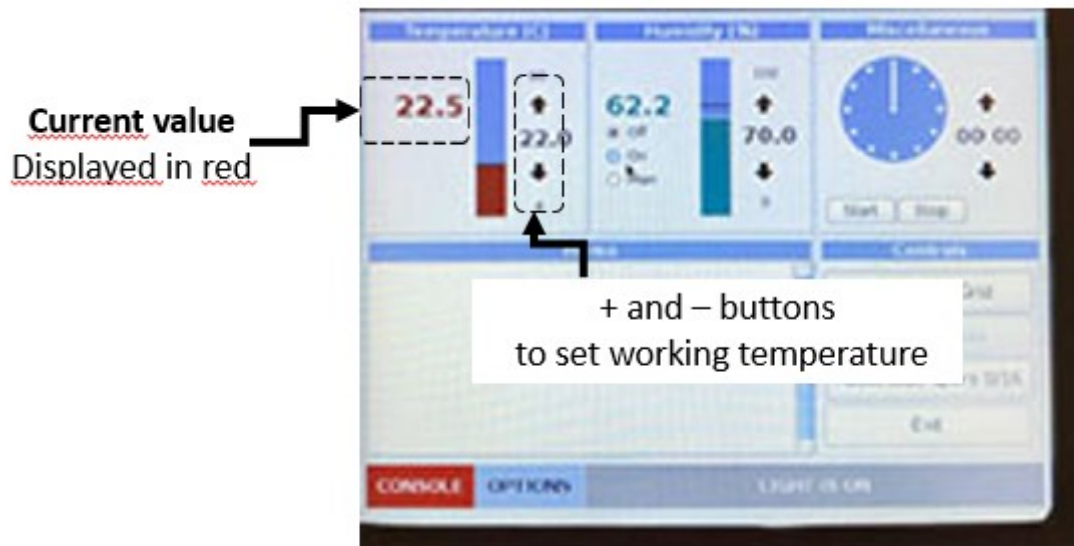
This step is done on the control panel, in the “options” page

- 1. 'blot total' needs to be '1' for blotting to occur
- 2. check 'Humidifier off during process' and 'Skip grid transfer' in the miscellaneous' side bar
- 3. set your desired blot time, force blot and waiting time (0 for unsupported condition )

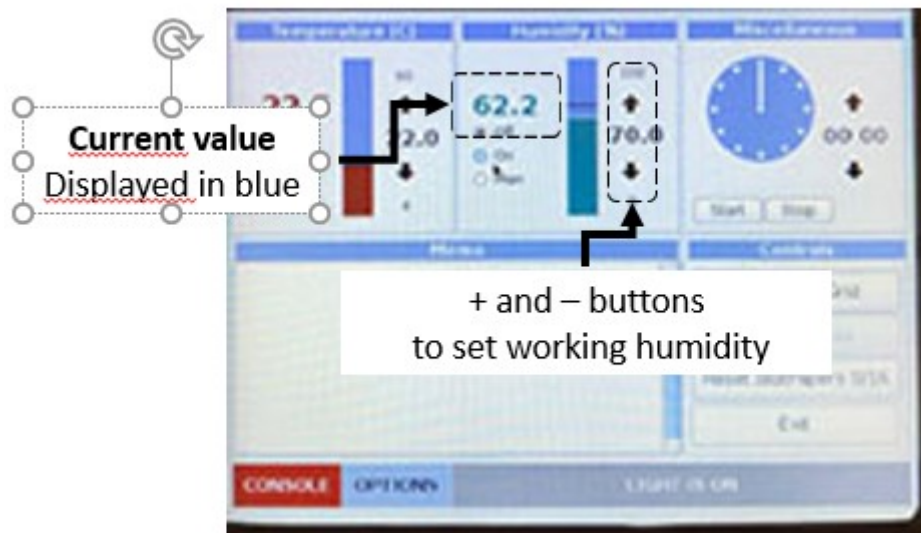
## Set humidity and temperature parameters in climate chamber

This step is done on the control panel, in the “console” page

- 1. adjust desired temperature value
  - : to any value between 4 and 60°
    - the actual temperature value is displayed in red
    - set to any desired value with + and buttons in temperature panel



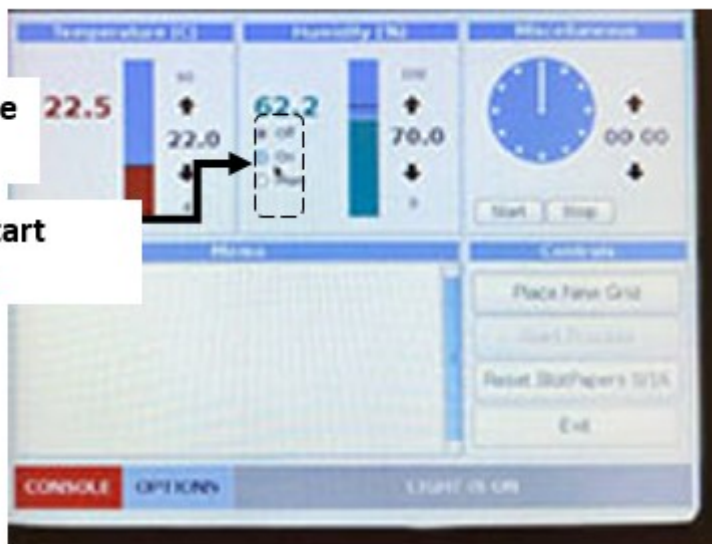
- 2. adjust desired humidity value
  - 96-100 % generally
    - the current humidity is displayed in blue
    - set to desired value with + and - buttons in humidity panel



- 3. wait until desired temperature is reached then enable the humidity switchbox to start
  - a. read current temperature (red value) in panel temperature
  - b. press ON/OFF switch in panel humidity

1. Desired temperature value reached

2. Press ON to start evaporation



- take advantages from this waiting time to do the two following steps

### Mounting the filter papers

### load grids inside the plasma cleaner

### Mounting the filter papers

- IMPORTANT **always wears gloves**
- place blot papers onto the blotting pads with clipping ring
- support the blotting arms during assembling to prevent damage to the arms

### load grids inside the plasma cleaner

- 1. [switch on plasma cleaner if not started](#)
  - If stopped, press the hard lock switch on the backside of the machine,
  - Press CLEAR to initialize the vaccum system

Not Initialized State  
Just after swithing on



Ready State  
fishione ready for use



- fishone started with chamber locked under vacuum
- READY / HIGH VACCUM messages

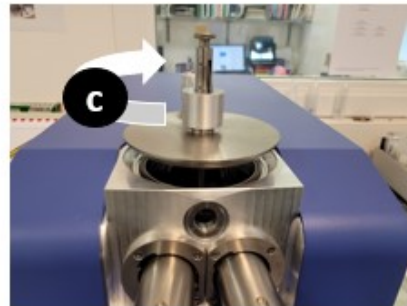
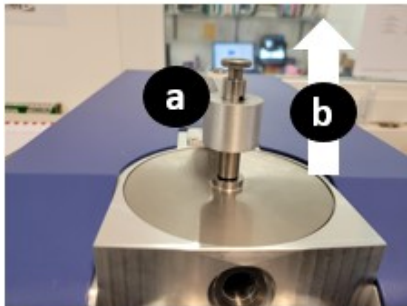


- 2. press Vent Lock to bring the chamber under atmospheric pressure
  - State is reached when message Lock At Atmosphere appears

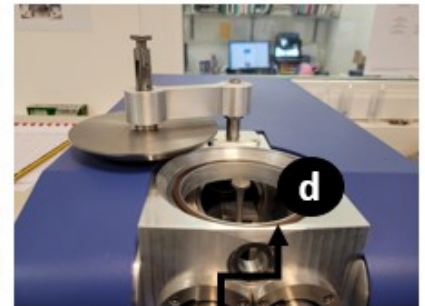
From now on IMPERATIVELY **wears gloves**

- 3. Open chamber and make sure the seal remains in place

### Chamber closed



### Chamber opened



**Seal in place**

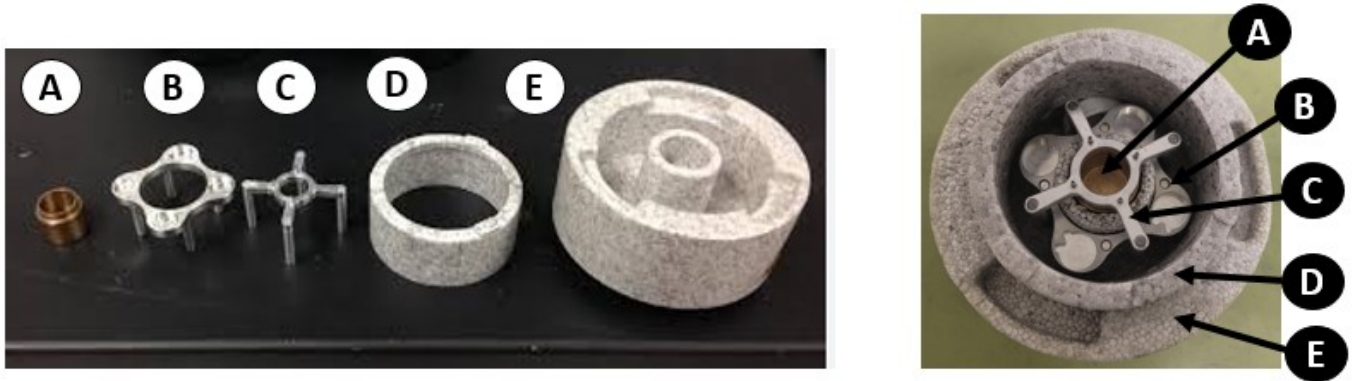
- a. unlock the rod by pushing the button on it
  - b. pull the rod upwards to lift the cover
  - c. move the cover on the side around its axis
  - d. if necessary put back the seal in place.
    - It can either stick on the cover or come out of its channel
- 4. retrieve the metallic drawer and place it on the table
    - the support carrying the drawer can be taken out by lifting it by the rod.
    - Be sure to keep the table horizontal so as not to slide the drawer
  - the metallic drawer is **ALWAYS stored in the chamber**
  - 5. close the door to prevent dust contamination inside the chamber
  - 6. place EM\_grids inside the metallic drawer
    - remove the cover of the metallic drawer by sliding
    - place EM\_grids inside

- generally sets of 4 to 8 **IDENTICAL** grids are loaded simultaneously
- close the drawer by putting back in place the cover
- put back in place the closed drawer on the support table
  
- generally sets of 4 to 8 **IDENTICAL** grids are loaded simultaneously
- 7. **open the door and make sure the seal remains in place**
  - a. if necessary put the seal back in place
    - It can either stick to the cover or come out of its channel
  - b. clean it just by passing your finger
  
- 8. put back in place the metallic drawer inside the chamber
  - on the platform **NOT on the inlet pump**



- 9. **close the door**
  - a. be sure the seal is in place and clean (see part.7)
  - b. move the lid around its axis to bring it over the opening of the chamber
  - c. unlock the rod by pushing the button
  - d. gently allow the lid to slide down
  
- 10. press VACCUM to bring the chamber under vacuum
  - State reached when message "HIGH VACCUM" appears
- 11. if not yet done on vitrobot, enable the humidity switchbox to start

**Assemble different part of the coolant container like showing below**



- **legende**
  - A : central ethane cup
  - B : grid box platform
  - C : spindle
  - D : Ice contamination protective sleeve (optional)
  - E : outer nitrogen container

## Cooling down the coolant container

- 1. Pour LN2 into both central ethan cup (A) and outer part (E) to faster the cooling
- 2. Wait for complete evaporation of the remaining nitrogen in the central part
- 3. up to now continuously fill the outer part to maintain the Nitrogen level
- 4. wait 10 to 15 min for system to equilibrate
- 5. then liquefy the ethan in the central cup already cooled to liquid nitrogen temperature

Ethan is liquefied by flowing a stream of gas through plastic tubing connected to an ethane flask into the central cup

- 6. let ethane start to solidify for few seconds

apparence of a white solid rim around the wall container indicates that ethane starts to solidify

- 7. then remove the spindle (C)

solidified ethan makes stick together the spindle and the ethan cup. Thawing the frozen ethan by placing the second ethan cup on the spindle for 10sec is the more careful way to remove it

- 8. place grid box into the grid box platform (B)
  - make sure that the grid box is labelled with the experiment name

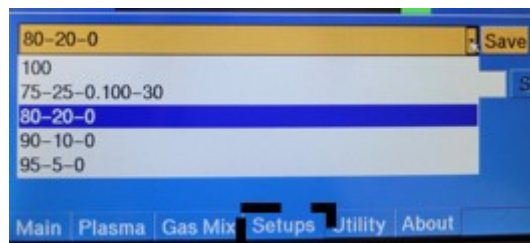
## plasma clean grids

- 1. Grids are already loaded inside the plasma cleaner
  - [if not yet done](#)

see part

## load grids inside the plasma cleaner

- 2. set desired plasma cleaning parameters :gas mixture/gas flow power
  - [commonly settings 80-20-0 are used](#)
    - The setup TABS store preset parameters
    - settings 80-20-0 corresponds to Gas mix Oxy/Ar : 80/20, power 34%
    - Gas Mix and plasma TABS show preset values



- Gas Mix and plasma TABS show preset values
- 3. [set the plasma cleaning time](#)
  - a. use up/down arrows head selectors
  - b. press set button to load the time in the time display
    - commonly 90 s are used
- 4. press START to apply plasma on grids
  - The gas plasma generated can be seen through the window as a pink light
  - remaining time can be followed in the time display
- 5. Retrieve the drawer
- 6. place the plasma cleaned grids on a glass slide

## Set blotting process parameters

## Set freezing condition

- 1. set or checkcheck the blotting condition
- 1. click on "place new grid" to bring in loading position the plunge rod
- 2. Attach Vitrobot tweezers with a Glow discharged grid onto the plunge rod
- 3. press to bring up the tweezers into the blotting chamber
- 4. place the container onto the ethane lift
- 5. press to lift it
- 6. click on "process"
- 7. apply sample to grid
- 8. click on "continue" to blot and plunge

- 9. carefully detach tweezers from the plunge rod
- 10. By maintaining the grid inside the ethan cup, place the coolant container on the table
- 11. transfer grid to the grid position
- 12. Dry tweezers then repeat

\* Now vitrobot is ready for freezing before Do it when you are almost ready to freeze to keep the soaking time as reproducible as possible

===== At this point already is ready for freezing =====

At this point already is ready for freezing:  
 climate chamber is equilibrated in temperature and humidity.  
 Filter paper are mounted and soaking time is controlled  
 ethane is liquefied  
 Grids are loaded and ready to be plasma cleaned

## Preparation of the grid

### 3. Bring the vitrobot to hermetically close the chamber

- do the following dry Run:
- A glow discharge grids is attached to the tweezers

## Start freezing

\* ++ Do it when you are almost ready to freeze to keep the soaking time as reproducible as possible|<div>

Decire

## Mounting the filter papers, IMPERATIVELY wear gloves

- Do it when you are almost ready to freeze to keep the soaking time as reproducible as possible

Decire

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