

Hazards associated with purging the gas system and how to mitigate them

Do not enter the gas shack if the rotating red light at the entrance is on. This warns of an oxygen deficiency.

**In General the Gas Mixing shack can be a hazardous place – BE AWARE OF YOUR ENVIRONMENT.**

There are hazardous gas detectors that will cut off any gas flow at 10% of the lower explosive limit and oxygen deficiency monitors that will alarm if there is a less than 19% oxygen level.

**Gas bottles are a hazard to move. Breaking the stem on a gas bottle can cause flying debris**

Never move a bottle without the cap fastened. Always earthquake brace bottles at two points in the place they are to be used or stored. Always keep control of the bottle with two hands while moving.

**The gases used in the calibration routine present a cryogenic hazard.**

Be certain that the bottle is plumbed into the correct gas circuit and the fittings are tight before opening. When removing a bottle be certain to valve off the gas; At the bottle first, at the gas panel second. Slowly bleed the lines before disconnecting.

**There is a marked step up both on to the gas pad and into the gas shack.**

Be aware. It easy to trip while making a step into empty space when coming out of either one.

**Side of racks must be removed.**

To access some of the valves the side of the rack should be removed. This can fall rapidly and cause alarm or an injury. The rack side panel should be supported by one hand while turning the locking screw. Two hands should be used to lift and carry the side panel out of the way.

## Transition from Rest (Helium) to Rest (Air) or Flowing Air

The chamber must be filled with air prior to non-permit required accesses, and must continue to flow throughout the access. The chamber should be returned to a helium atmosphere upon completion of the access.

Name: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

- Check that Rest Mode light on electrical rack is on.
- Verify that "Isobutane not Present" input to nanoautomate is green (no isobutane).  
Shut off house air input on neutral gas pad. *BOTTLED AIR ONLY IS TO BE PUT IN THE CHAMBER.* Initial that you have verified this: \_\_\_\_\_
- Select "VME Mode" on electrical panel
- Open VVM-41 (exhaust line)
- Close VVM-45 (circulation line)
- Open (via EPICS) VVPC\_2 (rotameter manifold)
- Open VVPC\_3 (fresh gas in)
- Open VVPC\_4 (chamber input)
- Open VVM\_82 ("Air Hi-Flow" line)
- Set VVT\_7 (Air Hi/Low switch) to High
- Set Air hi-flow rotameter to 40 l/min (50%)..
  
- It will take approximately 2 hours per volume change.*  
Oxygen content of return line gas is >19% (use Rosemount Analytical 7003M display in neutral gas rack)
- Set VVT\_7 (Air Hi/Low switch) to Low
- Open VVM\_83 ("Low-Flow" Line)
- Close VVM\_82
- Set Air low-flow rotameter to 5 l/min (50%)  
Verify chamber inlet pressure (DPRT-4) stabilizes at a pressure > 3 mbar. If pressure is below this value, increase flow to 10 l/min.
  
- Upon completion of access:*
- Close VVM\_83
- Close Air low-flow rotameter
- Select Rest mode on electrical panel or via EPICS
- Close VVM\_41

- Open VVM\_45
- Open house air valve on neutral gas pad.
  
- The chamber should now be filled with helium using “Transition from Rest (air) to Rest (helium)” checklist.*