

**How to change a sample with the gas-flow furnace:**

1. Prepare the system for a sample change.
  - a. Stop gas flow by setting flow rates to 0 sccm and pressing the ON/OFF button for the appropriate gas on the AGES software.
  - b. Only if flowing a hazardous gas, run the pump/purge routine:
    - i. Beamline staff or IHC should open the tank valve on the nitrogen bottle and close the tank valves on all other gas bottles in the flammable side of the gas outbuilding (8780).
    - ii. Start the automated pump/purge sequence by pressing the inert-hazardous toggle button on the AGES software.
    - iii. Wait for the sequence to finish (~25 minutes) and status to be "Pump/Purge Sequence Complete".
  - c. Set temperature setpoint to 0°C.
  - d. Turn off power to the heating elements by moving the furnace power switch to OFF with a pull-then-flip.

**Sample temperature must be 100°C or lower before removing sample stick.**

2. Remove the previous sample.
  - a. Carefully disconnect both thermocouple leads on the sample stick.
  - b. Disconnect the gas inlet and outlet hoses at the fittings from the stick.
  - c. Remove the clamp using a 3/16" Allen key. Be careful to not drop the screws.
  - d. Unscrew the compression fitting completely.
  - e. Carefully remove stick and hang from stick holder in the sample pit.
  - f. Scan sample with RadEye G radiation monitor. If it alarms, call the RCT (865-274-8658).
  - g. **Caution: Sample may be hot. Wear thermal gloves.** Free sample from stick by removing bottom pin.
3. Load new sample.
  - a. Hang new sample on stick using pin.
  - b. Carefully place stick into furnace.
  - c. Screw on compression fitting, keeping the gas fittings oriented correctly with the gas lines.
  - d. Replace clamp.
  - e. Reconnect the gas inlet and outlet hoses.
  - f. Verify that the manual valve on the gas outlet line is open.
  - g. Reconnect both thermocouple leads, being careful to match the orientation marks.
4. Prepare the system for gas flow.
  - a. Only if flowing a hazardous gas, run the pump/purge routine.
    - i. Beamline staff or IHC should verify that the tank valve on the nitrogen bottle is open and that the tank valves on all other gas bottles are closed.
    - ii. Start the automated sequence by pressing the inert-hazardous button on the AGES software.
    - iii. Wait for the sequence to finish (~25 minutes) and status to be "Pump/Purge Sequence Complete".
  - b. Beamline staff or IHC should open the tank valves of the gases to be flowed.
  - c. Open sample valve "V-111B" by clicking on the valve picture in the AGES software so that it is green.
  - d. Start gas flow by pressing the appropriate ON/OFF button and setting a flow rate on the AGES software.
  - e. Verify that the desired flow rates are being measured on the AGES software and that the expected results are seen in the RGA and pO2 sensor.
  - f. Clear the furnace alarm by holding the up-arrow button until the display reads "----°C" on the blue furnace controller.
  - g. After verifying that the setpoint is 0°C, flip the furnace power to ON.

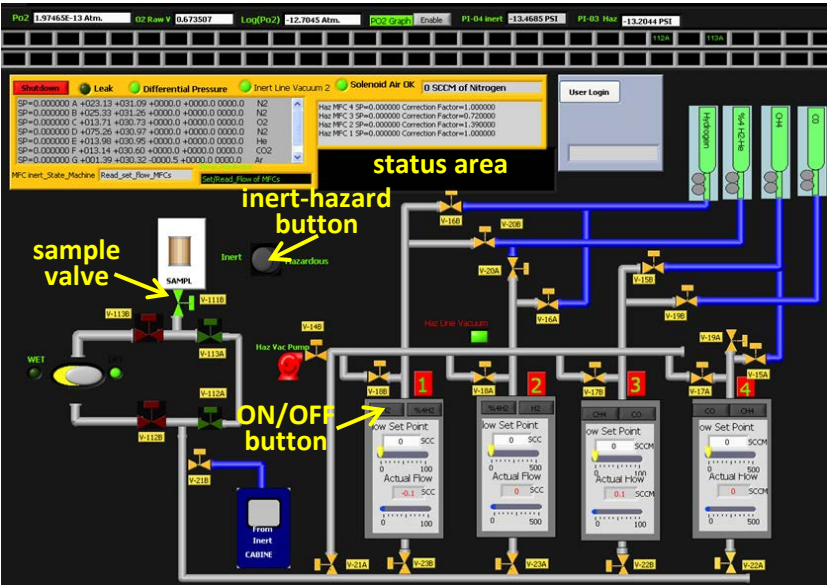


Figure 1. AGES software screen for hazardous cabinet

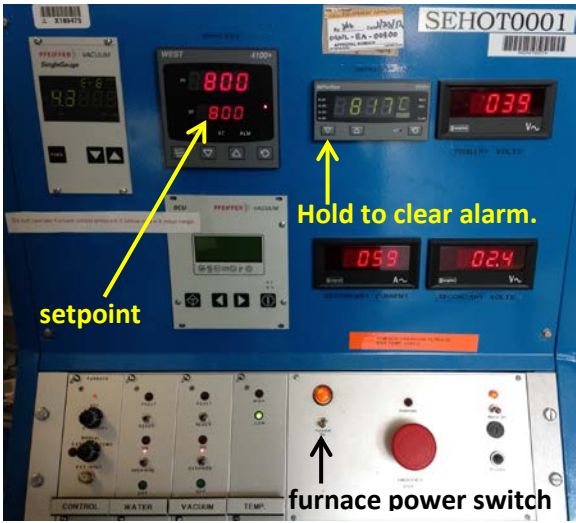


Figure 3. ILL furnace controller

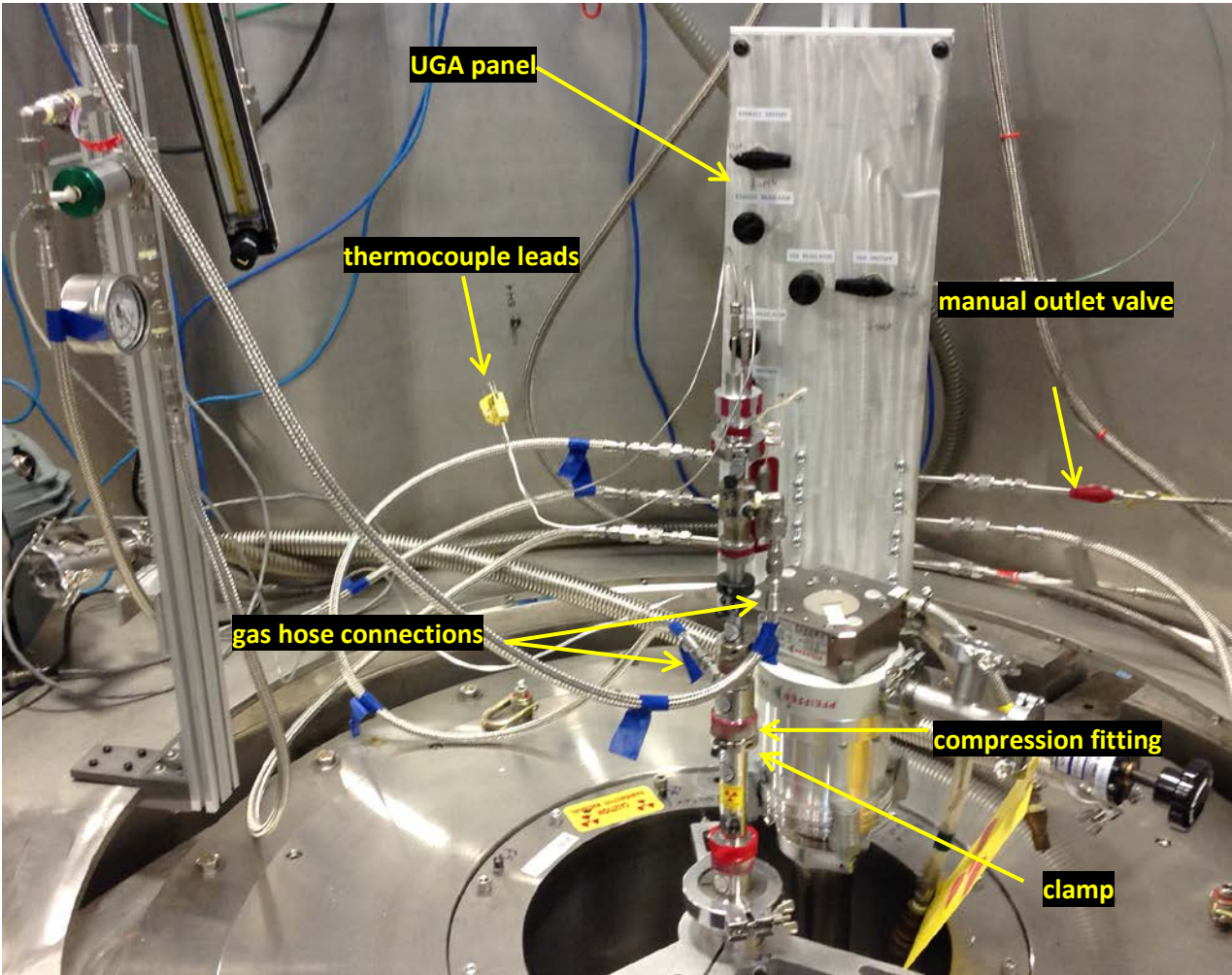


Figure 2. Gas-flow furnace sample stick