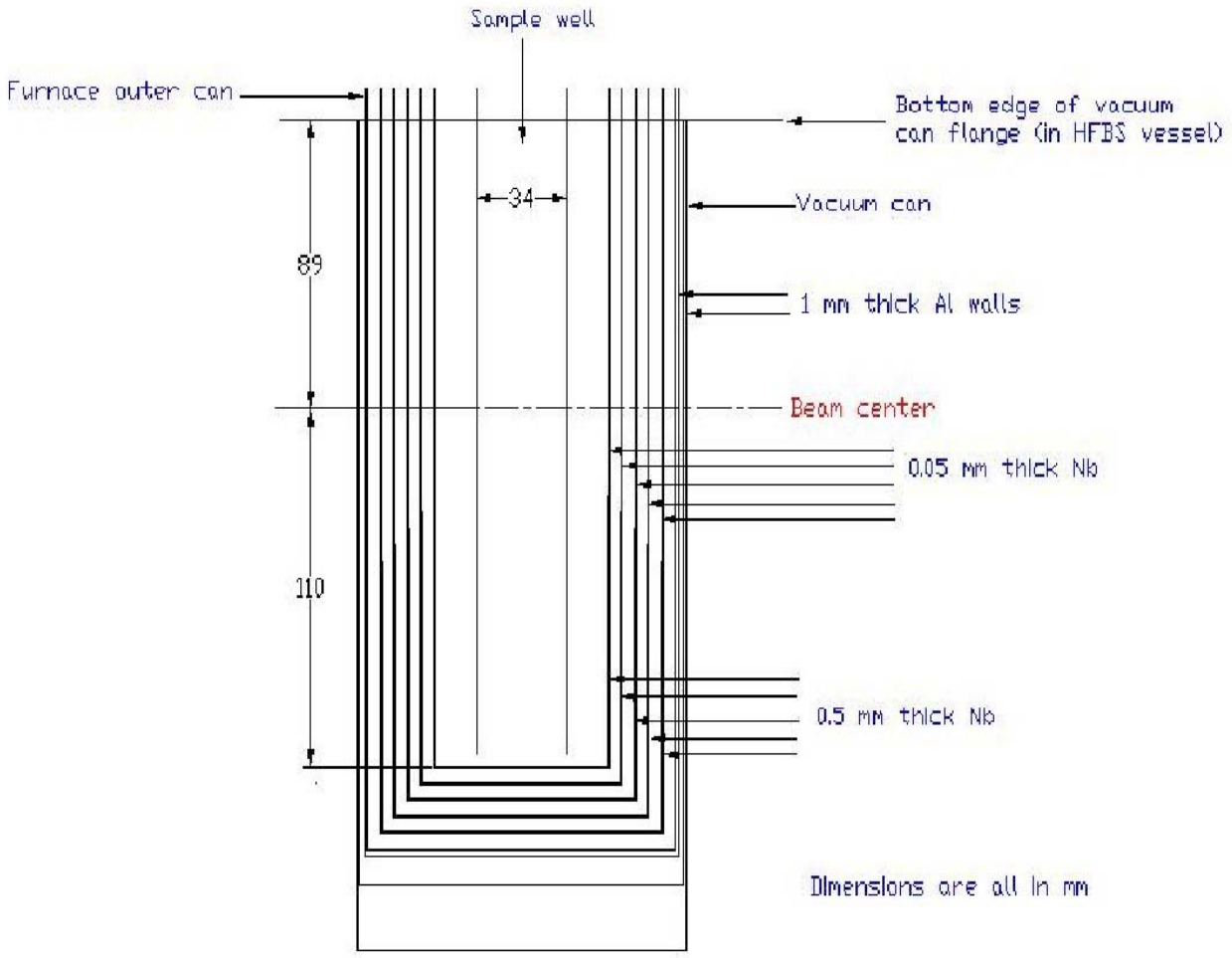
HFBS 1400°C Furnace
Quick Reference Manual



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This manual is for general reference only and should not be used as a substitute for the assistance of an experienced user. The individual components of the system also have user manuals, available at the HFBS instrument desk, that offer much more detailed information. Sample preparation and mounting are also not covered here, but should be discussed with the HFBS instrument contacts.

HFBS Contact:

- Victoria Garcia-Sakai x4404

Sample Environment Contacts:

- Juscelino Leão x8867
- Evan Fitzgerald x6657

Sample Loading:

- Sample Holders: The sample probe terminates in a threaded M8-1.25 stud. A user designed (NIST assistance is available) holder compatible with our probe is required. Ventilated (*i.e.* non-pressure building) crucible-type holders made of niobium or platinum are recommended. Any sealed sample holder must be tested off-line at the maximum desired temperature before loading into the furnace to ensure that an over-pressure burst will not occur on the beam line.
- Sample Geometry:
    - Note that the beam center is 130.4cm below the top of the sample well, and the probe height is adjustable to accommodate a wide range of sample sizes.
    - Your probe/sample length must be adjusted so that it DOES NOT TOUCH THE HEATING ELEMENT OR THE BOTTOM OF THE SAMPLE WELL
    - There is an offline test sample well that should be used to test fit all sample cans on the actual sample stick.

Setup:

Most of the setup involves connecting various cables and can be done in any order with one important exception. Do not connect the main, 240V, power supply cable until all other connections have been made!

1. Connect supply and return water hoses to matching chiller water hook-ups and open valves to allow flow (water must be flowing before turbo pump operation).
2. Connect High Voltage, sensor A and sensor A ground cables from furnace into back of Combivac controller.
3. Connect the turbo control cable from the cart into the turbo pump.
4. Connect the yellow plug from the cart into the flow switch on the water return line.
5. Connect the sensor cable to the sample stick in the furnace.
6. Connect the high current lines to the bolts on the lower part of the back of the cart, using a wrench to tighten the nuts down.
7. Connect the flexible metal tube from the rough pump to the turbo pump through the solenoid valve using KF25 clamps and o-rings.
8. Plug in the power cord for the solenoid valve if you wish it to be open at this time.
9. Connect the RS-232 cable from the West 5010 controller to your computer.

Startup:

1. Open the valve below the solenoid valve and provide power to the solenoid to open it. Then start the rough pump, making sure the vent valve is closed and sample stick is clamped down.

2. After making sure the “Mains On” and the “Furnace On” switches are off and the control switch is in the center position plug in the main power cable from the cart into a 240V outlet. This will turn on the controllers in the upper half of the cart. If the controllers do not turn on reset the large red “Emergency Stop” button.
3. Press the “TM1” button on the Combivac controller to read the pressure in the vacuum space. The pressure should read in the mid –2 Torr scale after about 10 minutes.
4. At this point press the start button on the Turbotronik controller to start the turbo pump. Initially the “Accel” light should come on until the turbo is powered up (~5 min.) at which time the “Normal” light will come on.
5. The pressure reading on the Combivac controller will eventually bottom out around the mid –3 scale. To get an accurate reading press the “PM” and then the “HV” button to switch to a low-pressure sensor.
6. Flip the “Mains On” switch to power the lower set of controls and relays. Press the “Reset” buttons on the water and vacuum relays. If only the small red lights above “On” are lit then the water flow is on and the vacuum is < 1.0 on the –3 scale. However, if one of the green lights is on then one of these conditions has not been met and the heater will not turn on.
7. Once the relays have been satisfied flip the “Furnace On” switch and the large red light should come on indicating the heater is enabled. If the red light is out, or goes out at some point, one of the relays has been tripped and the heater is disabled. When the relays have once

again been satisfied the heater will automatically be enabled and the red light will come back on.

8. To control the furnace at a specific temperature use the West 5010 controller. Press “ENT” to display the set point on the smaller display, use ▼▲ to change and “Exit” to return to the normal display. Press “MAN” to change out of manual control and let the controller increase the output to achieve the set point.
9. There is also a relay that will turn off the heater if a high temperature limit is exceeded. This is done by the Tracker 200 controller and can be changed depending on the user’s desired high temperature (not to exceed 1400^{o}C). To change the high temperature limit press and hold ↵ until the display shows “LoU” then press ⇄ multiple times until “Conf” displays. With “Conf” on the display press ↵ and then press ⇄ multiple times. When “AL1” appears press ↵ and then press ⇄ multiple times until “SP1” displays. Press ↵ and use ▲▼ to change the blinking digit, ⇄ to switch digits and ↵ to enter the value. To return to the normal display press ▲ multiple times or wait approximately 60 seconds.

Shutdown:

1. After use the set point should be set to approximately 10^{o}C for the safety of the next user. The “Furnace On” and the “Mains On” switches can be turned off.
2. The entire process of bringing the vacuum space inside the furnace up to atmospheric pressure, including the turbo deceleration, should take at least 20 minutes. This is to protect the delicate heat shields and heater element from excessive pressure gradients.

3. Once the temperatures of both sensors are near room temperature (<30^{o}C) hit stop on the Turbotronik controller and allow the turbo at least 10 minutes to decelerate. After disconnecting it by closing the valve below the solenoid the rough pump can be turned off. Press the "HV" and then the "TM1" button on the Combivac controller to turn off the low-pressure and switch to the high-pressure sensor.
4. To further raise the pressure inside the furnace slightly crack the vent valve connecting the turbo pump to a sintered bronze filter. The pressure reading on the Combivac controller should slowly rise to atmospheric pressure. The vent valve can then be completely opened and the sample stick removed if necessary.
5. To turn off the controllers on the top of the front of the cart either push the "Emergency Stop" button or unplug the main power cable.
6. The connections can now be undone, but the main power cable must be unplugged first!