

SOP - ZEUS TA3 & 500 TW Compressor pumping and venting

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Pumping preparation

Check the **gate valves** and **all venting valves**. All gate valves **except** for the one between turning box 1 and 2 should be closed. All leak valves should be closed.

Gate valve locations:

- Between turning box (TB) 1 and TB 2
- Between TB 2 and 500 TW diagnostic chamber
- Between TB 3 and the target chamber which is located in the experimental diagnostic room
- Between TB 3 and switchyard 3.
- Between TB 3 and the long tube for TA 2.
- Between target chamber and X-ray CCD mini chamber.

Venting valves locations:

- Compressor near TB 1.
- TB 3
- Main TA 3 chamber (below the two turbos) and on the opposite where the pressure gauges are.
- X-ray CCD mini chamber

Included below are instructions for pumping down and venting:

- The main gas target chamber and the breadboards
- The compressor
- The cube of the x-ray CCD

Pumping the 500 TW compressor

1. Close all venting valves.
2. Open the gate valve between TB 1 and 2.
3. Close the gate valve between TB 2 and the 500 TW diagnostic chamber.
4. Close the gate valve between TB 3 and TA3 target chamber.
5. Close the gate valve between TB 3 and TA 2 tube.
6. Close the gate valve between TB 3 and switchyard 3.
7. Open the dry nitrogen gas cylinder by the compressor. Flow rate should be set between 2-5 L/M (found on Kashiyama monitor).
8. Close the bypass on the water line, and open two water valves lines to begin flow. Flow rate should be 3-3.5 LMP on the Kashiyama monitor). Presently the flow rate is at 2.9 LMP. The water valves are located on the wall near to the laser diagnostic chamber.
9. Press Start on the Kashiyama pump monitor and allow the pumps to warm up for 15-20 minutes.
10. Once the pumps are warmed up (15-20 minutes), open the small gate valve on the roughing pump and sometimes on the turbo as well. (One of the two gate valves is redundant.)
11. Monitor the chamber pressure with the convection gauge near to the gas cylinder. Once the pressure in the compressor chamber is about 1 Torr, power on the Turbo (plug in the power cable) located at the rear of the chamber.
12. Once the reading is on the mTorr level. Turn on the ion gauge on the opposite of the chamber.
13. When the vacuum is good ($1e-4$), turn off the purging N2 gas.

Pumping the TA3 Target Chamber

1. Turn on the purging N2 gas for the kashiyama pump. The gas cylinder is on the wall opposite to the target chamber in the experimental diagnostic room. Flow rate should be set between 2-5 L/M (Kashiyama monitor located in the target area under the viewport for the pointing diagnostic line).
2. Cooling water. Water line on the north wall. Close the bypass, and open two water valves lines to begin flow. Flow rate should be 3-3.5 LMP on the Kashiyama monitor)
3. Press Start on the Kashiyama pump monitor and allow the pumps to warm up for 15-20 minutes.
4. Once the pumps are warmed up, open the Kashiyama gate valve (the closed one to the kashiyama pump).
5. Watch the reading on the vacuum gauges. The main chamber gauge is facing to the west wall (can be seen on the monitor in the control room); It takes about 25 minutes for the main chamber gauge to reach around 200mTorr.
6. Once the main chamber gauge is about 200mTorr, start the turbos. Press the start on a controller of the first turbo; Plug in the power cable for the second turbo. You should see the fans for both turbos start rotating.
7. Once the reading is on the mTorr level. Turn on the ion gauge.
8. When the vacuum is good ($1e-4$ for the main chamber), turn off the purging N2 gas.

Pumping the X-ray mini chamber

1. Close the leak valve.
2. Close the turbo gate valve (if exist) and the roughing pump gate valve.
3. Turn on the roughing pump to let it warm up for a few minutes.
4. Open the roughing pump gate valve and then the turbo gate valve (if exist).
5. Watch the reading, once it's below 1Torr you can start the turbo by pressing start on the controller.
6. Watch the reading, once it's below the level of 1mTorr, you can open the 10-inch gate valve on the main chamber so the pressure of the X-ray cube will be further decreased to the same level of the main chamber.
7. Only until the vacuum is on the level of $1e^{-4}$ or lower, you can start to cool down the X-ray CCD.

Venting

Venting the 500 TW compressor

1. Close the gate valve between TB 3 and the TA 3 target chamber.
2. If necessarily, close the gate valve between TB3 and TA2.
3. Turn off/unplug the turbos at the end of the experiment, and allow them to have 30 minutes to spin down before proceeding.
4. Turn off the pump using the Stop button on the Kashiyama monitor. Wait 3-5 minutes before turning off the cooling water.
5. Close the water valves and open the bypass.
6. Close the dry nitrogen cylinder if not during the pumping procedure.
7. Open the leak valve on the main chamber.

Venting the target chamber

1. Close the gate valve between turning box 3 and the target chamber.
2. Close the gate valve between the target chamber and the X-ray cube.
3. Turning off the turbos. Press stop for one and unplug the power cable for the other turbo at the end of the experiment, and allow them to have 20 minutes to spin down before proceeding. **(Don't close the turbos' gate valves for sake of the breadboards)**
4. Close the kashiyama gate valve.
5. Turn off the Kashiyama pump. Press Stop on the Kashiyama monitor. Wait 3-5 minutes before turning off the cooling.
6. Close the water valves and open the bypass.
7. Double check if the dry N2 gas was closed or not (just in case you didn't close it at the end of pumping).
8. Open the leak valves on the main chamber.

Venting the X-ray CCD cube

1. Warm the X-ray CCD up to 20 deg C.
2. Once the 10" gate valve on the main chamber is closed, close the turbo and roughing pump gate valves.
3. Turn off the turbo pump, while keeping the roughing pumping on for a while.
4. Once the turbo gate valve is closed, you can vent the x-ray chamber and then open the quick window.

Note: if the gate valve for the turbo was removed, then in step 3, after turning off the turbo pump, turn off the roughing pump as well and then wait for a while before venting.



