

How to fill the Quantum Design reservoir with Helium (SQUID Lab)

Frequency : two times week - each time it goes below 30%

There should be Helium in the large (250 L) Helium Dewar, that should be located in the big lab or in the SQUID lab. A transfer typically requires 50 L of Helium. Every week and if requested, the big Dewar is returned to the central facility to be refilled. The Dewar should be placed in the corridor on monday evenings and will should be returned on tuesdays. For "urgent" need of Helium, send an email to stephane.carre@epfl.ch and ask for Helium on behalf of LQM. They will ship a 100 L Dewar the next day.

Two manometers are important : the recovery line and the helium Dewar ones. Keep in mind that the SQUID system is connected to the recovery line.

It is not recommended to excess a 200 mbar pressure in the He Dewar because then any human error could result in huge losses of expensive He and potential damage to people and equipment.

5 K is a good temperature when no experiment is going on, not to use liquid He to heat. This prevents evaporation.

Always fill up at zero field.

1. TRANSFER any excess helium in the Dewar to the recovery line. This Helium would otherwise be lost.
2. CHECK that the SQUID temperature is around (if possible equal to) 5 K
3. CHECK that the field is set to 0 (avoid quenching)
4. If possible, REMOVE any sample in the tube
5. CLOSE the recovery line (Dewar). Its pressure should be $\simeq 20 - 30$ mbar
6. OPEN the red lever, it will get the Dewar rid of the excess pressure. This step is necessary and may result in cold burns if forgotten.
7. OPEN the Dewar by removing the KF blind flange. KEEP the O-ring and the clamp.
8. INSERT the collect tube in the Dewar (try not to evaporate too much Helium), using the O-ring and the clamp.
9. CHECK that a minimum flow goes out of the other end (SQUID) of the tube. LOWER the tube if no flow can be felt. DO NOT LOWER completely the tube yet (gas has to be pumped first to cool the tubes)
10. CLOSE excess pressure valve
11. INSERT the tube in the SQUID reservoir

12. MONITOR the helium level with the computer. Once the tube is cooled, the liquid will be pumped and the helium level will increase faster
13. COMPARE both manometers values and if necessary, LOWER the tube in the Dewar so that the Dewar pressure becomes higher than the recovery line pressure
14. ADJUST the position of the tube in the He Dewar, so that the gas is transferred faster. Somewhat ideal conditions : 80 mbar Dewar, 30 mbar recovery line. DO NOT GO above 100 mbar when transferring gas (Dewar pressure), the SQUID recovery line could pop out. WAIT approximately ten minutes to cool the tube
15. If at any point, the transfer tube starts freezing then SHUT everything DOWN (REMOVE the transfer tube, CLOSE both ends, REOPEN the recovery line.). This means that the vacuum in the transfer tube has been broken and the chances of transferring liquid Helium are zero. PUMP the tube to install vacuum again and START OVER at step one.
16. Once the liquid starts to be transferred, the pressure in both the Dewar and recovery line will drop by a few mbars. WATCH both manometers and the monitor for the pressure to decrease and the Helium filling curve to get steeper, after maybe a rebound. When this is the case, LOWER completely the two tubes (be careful if using the long tip, not to hit the bottom of the Dewar, 10 cm are enough)
17. OPEN overpressure valve to provide an excess of He pressure to start the liquid transfer. Do not go faster than 2.2% / min or 200 mbar. Ideally 1.5 % / min and 150 mbar. Beware that the response to overpressure is not instantaneous
18. CLOSE overpressure valve at 90%, due to the shape of the container, this pressure is not needed anymore. 150 mbar are enough to fill from 90%
19. LEAVE 2-3 minutes at 100% to fill completely
20. Before lifting up the SQUID and Dewar tubes, RELEASE the pressure in the recovery line. This has to be done because there can be a lot of pressure if the tubes are removed fast
21. REMOVE both tubes until frozen parts are visible
22. WAIT for five minutes
23. HEAT the joint
24. CLOSE recovery line before pulling out the tube in the SQUID reservoir
25. OPEN red excess valve

26. REMOVE transfer tubes (both ends) and CLOSE the brass valve (SQUID part)
27. HEAT the brass joint if cold, so that it cannot freeze. A defreezing could cause the joint to pop out later due to thermal expansion.
28. CLOSE hole where transfer tube was (Dewar)
29. REOPEN recovery line (Dewar)