



For PR No.1000014571 (RFx No.6100000404)

Technical specifications of Helium Liquifier & Helium Reliquifier

We intend to procure an accessory item for our existing Magnetic Properties Measurement System-XL (MPMS-XL; Ms/Quantum Design) instrument. The accessory will serve as "Closed cycle helium gas re-liquefier coupled with Liquid Helium Generator", where the boil-off gas from the MPMS instrument needs to be captured (without any impurities such as N₂ or O₂ gas) and liquefy again for re-use. This accessory item should not alter the major components of the existing instrument. The detailed technical requirements are given below.

Closed cycle helium-Reliquefier and Liquid Helium generator with recovery options for the existing MPMS-XL instrument

Unless otherwise mentioned, all the accessory components should be compatible with the Indian voltage condition (200-240 V; 50/60 Hz).

1. The helium re-liquefier cryo-refrigeration system should be capable of liquefying the helium gas (from atmospheric pressure) at room temperature and generate a minimum of 10 Liters or more per day and the re-liquefaction and re-condensing at the rate of minimum 18 Liters per day without disturbing the main instrument as it is sensitive to vibration.
2. The compressors used for this liquefaction purpose either can be water-cooled or air-cooled.
3. All the connections (for liquefaction and recovery) lines should be made of stainless steel.
4. The entire cryo-head assembly should be rest on an adjustable, firm platform, so that the height can be adjusted as and when required.
5. The accessory should possess pressure monitoring, relief, and safety valves and compatible with the hardware/software components of the MPMS-XL instrument.
6. The accessory should capable of monitoring/stabilizing the temperature using appropriate sensors, heaters, and controllers.
7. The entire cryo-refrigeration technology should be powered by advanced cooling technology with high reliability and less maintenance such as Pulse Tube Cryocooler.



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8. The closed-cycle helium re-liquefier should be operable 24/7 reliably, automatically, and safely.
9. The boil-off helium gas from the existing MPMS-XL instrument/other instruments should be recovered without any other gas impurities. The recovered gas should be re-liquefied again for re-use.
10. For this helium plant as well, cryo-refrigeration technology should be powered by advanced cooling technology with high reliability and less maintenance such as Pulse Tube Cryocooler. The plant should be capable of liquefying a minimum of 22-25 Liters per day.
11. According to point number 10, a suitable compressor with water cooling options.
12. All the connections (for liquefaction and recovery) lines should be made of flexible stainless steel.
13. A helium Dewar (stainless steel) of minimum 150 L capacity to collect and facility to transfer helium out it. This should also contain pressure regulators and safety devices.
14. The helium transfer line must in flexible stainless steel and vacuum jacketed i.e. Cryogenically insulated extraction line and valve for low loss liquid helium transfer.
15. The helium plant should be operable 24/7 and the entire system should be controlled by digital touch screen user interface that should include 1) remote monitoring and control 2) Digital automatic level indicator read-out 3) System diagnosis
16. An 8-9 cubic meters helium recovery storage bag/unit required to store recovered gas at the atmospheric pressure. This should consist of a pressure relief valve and a sensor to monitor the helium gas level.
17. A suitable compressor for the helium recovery/storage unit.
18. Required number of Cylinder Storage unit/manifold assembly/pressure regulator along with pressure transducer cable.
19. Automatic helium purifier/compressor/ heater blanket/other additional components/connector to link the recovery bag and helium liquefying unit so that the entire assembly is leak proof.
20. Please list out the number of installation of this accessory all around the world in the last five years and particularly in India.
21. Students/operator incharge/faculty incharge should be trained to operate the instrument at the installation site (IIT Bombay) safely and reliably.
22. For the proposed accessory item, we would like to have total five year(company provided + X = 5 year)warranty.