



Operating Instructions for Model CVSM Series Multishielded Liquid Helium Magnet Dewars

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Introduction

The CVSM series magnet dewar is ruggedly constructed and simple to use. However, the extremely low temperature of liquid helium requires the use of techniques that differ from those used in handling the more common cryogenic fluids. Remember that liquid helium will cause ALL other gases and liquids to solidify. The low latent heat of vaporization, characteristic of liquid helium, can cause unnecessary transfer losses to occur unless established procedures are closely followed.

Precautions

General precautions regarding liquefied gases are covered in the pamphlet attached to the container, however, the unique properties of liquid helium require that even further precautions be taken. Liquid helium is a colorless, nontoxic liquid with a density of one-eighth that of water, inert under all temperature and pressure conditions. At atmospheric pressure it has a temperature of approximately -452°F (132 degrees colder than the freezing point of liquid nitrogen). It is the only substance known that remains liquid under ordinary pressure at temperatures close to absolute zero.

Air liquefies and solidifies readily when exposed to the extremely low temperature of liquid helium. For this reason, the helium reservoir should be kept sealed at all times (except during filling) to prevent the accumulation of solidified air inside.

These dewars can only be operated if they are fitted with a properly designed cover that provides thermal insulation, gas-tight sealing of the reservoir, provisions for filling and adequate relief devices. This can be supplied by Cryofab as an option, or fabricated by the user.

Moving and Handling

The CVSM series dewar should not be subjected to rough handling either full or empty. Bumping, jostling or excessive agitation of any filled liquid helium container will cause abnormal evaporation and may result in increased flow of gas through relief devices. The CVSM container is designed for use in a vertical position and **MUST NEVER** be laid on its side.

If a container must be lifted, use a forklift or similar device beneath the base or hoist by means of the lifting lugs on the side. Do not attempt to lift by means of slings around the shell.

This dewar should not be moved when there is liquid in the reservoir, unless it is firmly supported and kept in an upright position.

Mounting by clamps applied to the vacuum jacket is not recommended as this can collapse the outer shell.

Pre-cooling

The CVSM series dewar should be pre-cooled to -300°F or less in order to conserve liquid helium during filling and to limit post-fill flashoff to a reasonable amount. Pre-cool the helium reservoir with LN₂ by filling to approximately 18" from the top. Let the dewar stand for approximately 24 hours, then remove the LN₂. Once ALL of the LN₂ is removed, purge the helium reservoir of residual dry nitrogen gas or other gases by introducing helium gas at the bottom of the dewar. Purge with approximately eight volumes of pure dry helium gas.

Any experimental apparatus should also be pre-cooled with LN₂, either as part of the dewar cool-down or in a separate operation.

Filling

Filling the dewar with liquid helium should only be done if a properly designed cover is installed. The filling procedure will depend on the design of the cover, but in general it will be as follows. Close off the low-pressure relief valve (if present) and open the vent valve. Open the liquid access port and insert the vacuum jacketed fill tube through it. Seal the fill tube in place, as appropriate. Admit liquid helium to the dewar under controlled conditions, for reasons noted previously. Avoid transfer pressures of more than a few PSI to reduce flashing. Fill to maximum of approximately 18" from the top of the vacuum jacket. When the dewar is full turn off the liquid helium supply. Remove the transfer line and close the liquid access port. After the venting vapor subsides, indicating that the dewar has stabilized, close the vent valve and open the low-pressure relief valve.

Pumping Arm

If the dewar is equipped with a pumping arm, it can be used to lower the temperature of the helium bath by reducing the saturation pressure below 1 atm. If not being used, the pumping arm must be either blanked off with a flange or fitted with an additional relief device.

WARNING

Never attempt to pump a vacuum on the helium section unless a vacuum already exists in the insulation areas of the dewar.

Maintenance

All dewars are evacuated before shipment. Under normal conditions the only maintenance required is an occasional re-pumping of the vacuum space. A pump-out operator is provided with the dewar for this purpose. Use a clean high vacuum pumping system, preferably with a cold trap. The final vacuum level should be no more than 10⁻⁴ torr for a warm dewar.

WARNING

Never leave the vacuum valve open to a pump while filling the dewar with liquid helium.

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