thermionics laboratory, inc.

INSTRUCTION MANUAL

LIQUID NITROGEN VACUUM DEWARS

Version 1.2

SERIAL # _____

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Preface

SAMPLE DEWARS FED BY SMALL DIAMETER TUBING

Sample cooling Dewars fed by small diameter tubes require the following procedure for successful operation.

SAFETY:
Handling LN2, although a non-toxic material, requires special precautions. High-pressure liquid, Oxygen displacement by evaporation of LN2 into nitrogen gas, and freeze "burns" are a few of the potential hazards. Personnel must wear proper protective gear whenever working with liquid nitrogen. The following procedures should only be done by those individuals properly qualified in the safe handling of LN2. Consult your supplier of liquid nitrogen for an MSDS (Material Safety Data Sheet) and carefully read the precautions.

A) Inlet Connection:

Connect the inlet tube on the manipulator to the liquid feed valve on the pressurized LN2 Dewar. The Dewar must be capable of supplying liquid LN2 at 80 to 100 psi. The transfer line should be short, of low thermal mass, and insulated.

NOTE: Liquid nitrogen is slightly colder than liquid oxygen. It is possible to form liquid oxygen on the outside of LN2 lines when operated in atmosphere. Insulation can trap and collect this liquid. Liquid oxygen is dangerous because of its intense oxidation capabilities. Liquid oxygen and styrofoam type insulation can be a VERY dangerous combination.

All equipment must be dry. Water (moisture) can cause icing inside the small tubing causing blockage of flow. If this occurs in the exit line, over-pressurizing of the Dewar can occur.

*****WARNING*****

Blockage of the gas/liquid flow can cause over pressurization of the Dewar and possible equipment damage and/or harm to personnel.

If a high percentage of the LN2 does not arrive at the inlet fitting in the liquid state, a phase separator must be installed at the inlet connection. If unmarked, the shorter feed line is the inlet.

IMPORTANT: internally the feed lines in the Dewar are different. Hooking up in reverse order will reduce the flow, cause inefficiencies, and make the Dewar more sensitive to icing and possible damage.

B) Exit Connection:

Connect an exit pipe to the exit tube (the longer one unless otherwise identified). This tube will be expelling cold nitrogen gas and some LN2, both at high pressure. Terminate this pipe appropriately with these considerations in mind. Do not allow the exhaust to "ice up" due to condensation or to become blocked by any means.

*****WARNING*****

Blockage of the exit line can cause over pressurization of the Dewar and possible equipment damage and/or harm to personnel.

LN2 exhaust can freeze and crack or break many materials, including high voltage cable insulation, etc. This exhaust can be an equipment hazard and/or personnel hazard.

C) Operation:

1. INITIAL COOL DOWN

Cool down the LN2 system by supplying 80 to 100 psi LN2 to the system. Allow this to run for as long as necessary until liquid is observed exiting the exhaust tube with the gas phase. This may take 1 to 10 minutes, depending upon the size and length of your feed tubes, the liquid/gas LN2 ratio delivered, the Dewar size and type, and the thermal load attached to the Dewar.

2. OPERATION

Reduce the supply pressure until only small bursts of liquid nitrogen are observed exiting the exhaust. At steady state, these small liquid bursts should occur once every 10 seconds. The appropriate supply pressure should be about 60 psi, but the exact pressure may be different for your specific system. Stabilizing out and obtaining minimum running temperature may take 20 minutes to 1 hour for most systems. Again, each system will be different depending upon the factors mentioned above. Normally, systems are designed to obtain about 80° to 85°K on the Dewar wall.

NOTE:

Minimum temperature will be observed when the Dewar is full and adequate chilling time has been allowed, and then the supply is turned off. This reduces the pressure on the boiling LN2 in the Dewar, reducing its boiling temperature. This effect is commonly 2 to 6°C lower temperature. This condition will exist for only a few minutes, depending upon the heat load of your system.

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