



Owners Manual

CM Class
SSC Class
SSC-ET Class
VS Class
LD Class

Dewar Construction

A cryogenic dewar is really two containers, one within the other. High-technology insulation is used in a sealed, vacuum space between the inner and outer containers. The integrity of the vacuum is the key to continued performance.

All dewars fail eventually. A perfect vacuum that does not leak cannot be achieved. Some minute leakage of air molecules into the vacuum occurs from the moment of manufacture. A "Vacuum Maintenance System", consisting of materials that trap and hold these molecules is built into the vacuum space to prolong the service life of the container by many years.

The Vacuum Maintenance System can intercept these trace leaks of air molecules only up to a point. Then the vacuum will become less efficient and more nitrogen refrigerant will be required between refills.

The most frequent cause of vacuum failure, however, is abuse. The inner container is supported by the necktube, which supports the weight of the nitrogen refrigerants as well. A blow to the dewar may cause the necktube to deform or break. Any unit subjected to physical damage may fail more rapidly than one that has been carefully handled.

Routine Care & Maintenance

If ice accumulates inside the necktube, a general cleaning of the dewar should be scheduled as soon as the stored material can be conveniently transferred to another dewar. To clean the unit, first remove stored material, then pour out the liquid. Dispose of it out-of-doors where the cold liquid will not damage driveways and other surfaces. Warm the dewar by purging it with a stream of room-temperature air. Continue purging with air even after the dewar has warmed to evaporate any collected moisture. When the dewar is ice-free and dry, rinse the inner vessel with household bleach. Wash the inner vessel with a solution (40 to 1 water to laundry detergent). Rinse and dry inside and out thoroughly before placing the dewar back into service. Do not use sharp instruments to chip ice: permanent damage to the dewar could result.

DO NOT attempt to fasten any device to the dewar. Welding, brazing, or piercing of the dewar in any manner will cause it permanent damage.

Refrigeration depends on the presence of liquid nitrogen in the dewar. Be sure to maintain correct refrigerant levels to prevent loss of stored material. Check liquid levels regularly. If high evaporation rates are apparent under normal operating conditions, the dewar may be losing its vacuum. Sweating or freezing of the outside casing are definite indications that the insulation integrity is not normal. All necessary steps should be taken to preserve valuable product. Read the Handle with Care section for more information on the proper handling of your cryogenic dewar.

Transportation "WARNING"

Although these dewars are rugged, they can be damaged if abused or otherwise mishandled. When moving or transporting a dewar, take every precaution to prevent sliding, tipping, bumping, or dropping the unit.

Dewars containing liquid nitrogen must never be transported in sealed compartments. Ventilation must be assured to prevent the displacement of air and the related suffocation hazard.

Safety "WARNING"

Before using any Cryogenic dewar, read the *Handle with Care* section provided with the unit. It details safety and unit-care precautions that must be read and understood before using the equipment.

Following are a few of the precautions described in *Handle with Care*. Please be sure to read the entire section.

Do not touch liquid or cold metal surfaces with your bare skin. The liquid nitrogen used as a cryogenic refrigerant in these dewars is **extremely cold**: -320°F (-196°C). Exposure of skin or eyes to liquid, cold gas, or frosted parts could result in a severe frostbite-like injury. **Because of the extremely low temperature, a**

face shield and gloves must be worn when transferring liquid nitrogen into or out of these containers.

Use only the necktube core provided with this unit or a listed replacement part. A tight-fitting plug or stopper will cause a pressure increase in the container that may damage the dewar and/or cause personal injury.

Store and use these dewars only in well-ventilated places. In a confined area, nitrogen gas from these units may cause suffocation by displacing air needed for breathing.

Operation

Filling--Adding liquid nitrogen to a warm dewar may cause splashing and will generate a significant volume of nitrogen gas as old liquid contacts warm dewar surfaces. Add liquid slowly to minimize these effects. Be sure there is adequate ventilation. Keep your head clear of the heavy volume of vapor that may be produced: it is extremely cold and could cause personal injury.

Determining Liquid Level--Liquid level must be checked at regular intervals--refrigeration depends on the presence of liquid nitrogen. The liquid level in the dewar can be determined by measuring with a dipstick. Insert the dipstick straight into the dewar so that it always rests on the canister-positioning fixture in the bottom of the unit. After 5 to 10 seconds, withdraw the dipstick and wave it back and forth in the air. A frosted section will form representing the depth of liquid in the dewar.

WARNING

Never use hollow rods or tubes as dipsticks. When a warm tube is inserted into liquid nitrogen, liquid will spout from the top of the tube and may cause personal injury.

Inserting or Removing Racks--To prevent the unnecessary loss of liquid nitrogen refrigerant, the necktube core should remain in the container when the stored material is not being accessed. When accessing

stored material, the necktube core should be removed as briefly as possible.

When inserting or removing the racks, grasp the rack handle, lift and tilt the rack toward the center of the dewar and withdraw the rack only far enough to remove the contents. Completely withdrawing the rack will unnecessarily expose stored material to warm conditions.

WARNING

Some racks have liquid drain openings; some do not. If racks are completely removed from the container, liquid nitrogen may remain in the rack or drain from the bottom. When removing racks, stop briefly at the necktube to allow the liquid to drain completely, and then handle the rack carefully to prevent personal injury.

When room temperature product is added, slowly lower the rack into the dewar to reduce the boiling of refrigerant and the surge of cold nitrogen gas. When inserting the rack, tilt the bottom of the rack in the direction of the index ring notch. The numbers on the index ring notches are a convenient aid to inventory control.

Handling LN₂ Safely

How to take care of your liquid nitrogen refrigerator or dewar while taking care of yourself.

Protect yourself and others. Read and understand this section. Keep it available for reference at all times. You can get additional copies through your supplier.

Warning

Use only liquid nitrogen or liquid argon in Liquid Nitrogen Refrigerators and Dewars. Do not use liquid air or liquid oxygen, both of which may present a combustion hazard with some materials used in the construction of these units, or materials stored in them.

Introduction

The safe handling and use of liquid nitrogen in cryogenic refrigerators and dewar flasks is largely a matter of knowing the potential hazards and using common-sense procedures based on that knowledge. There are two important properties of liquid nitrogen that present potential hazards:

1. It is extremely cold. At atmospheric pressure, liquid nitrogen boils at -320 F (-196 C).
2. Very small amounts of liquid vaporize into large amounts of gas. One liter of liquid nitrogen becomes 24.6 cu. ft. (0.7 m³) of gas.

The safety precautions in this section must be followed to avoid potential injury or damage that could result from these two characteristics. Do not attempt to handle liquid nitrogen until you read and fully understand the potential hazards, their consequences, and the related safety precautions. Keep this handy for ready reference and review.

Note: Because argon is an inert gas whose physical properties are very similar to those of nitrogen, the precautions and safe practices for the handling and use of liquid argon are the same as those for liquid nitrogen.

Handling Liquid Nitrogen

Contact of liquid nitrogen or cold gas with the skin or eyes may cause serious freezing (frostbite) injury.

Handle liquid nitrogen carefully.

The extremely low temperature can freeze human flesh very rapidly. When spilled on a surface the liquid tends to cover it completely and intimately, cooling a large

area. The gas issuing from the liquid is also extremely cold. Delicate tissue, such as that of the eyes, can be damaged by an exposure to the cold gas that would be too brief to affect the skin of the hands or face.

Never allow any unprotected part of your body to touch objects cooled by liquid nitrogen.

Such objects may stick fast to the skin and tear the flesh when you attempt to free yourself. Use tongs to withdraw objects immersed in the liquid, and handle the object carefully.

Wear protective clothing.

Protect your eyes with a face shield or safety goggles (safety glasses without side shields do not give adequate protection). Always wear gloves when handling anything that is, or may have been, in immediate contact with liquid nitrogen. Insulated gloves are recommended, but heavy leather gloves may also be used. The gloves should fit loosely, so that they can be thrown off quickly if liquid should splash into them. When handling liquid in open containers, it is advisable to wear high-top shoes. Trousers (which should be cuff less if possible) should be worn outside the shoes.

Use only containers designed for low-temperature liquids.

Cryogenic containers are specifically designed and made of materials that can withstand the rapid changes and extreme temperature differences encountered in working with liquid nitrogen. Even these special containers should be filled **SLOWLY** to minimize the internal stresses that occur when any material is cooled. Excessive internal stresses can damage the container.

Do not cover or plug the entrance opening of any liquid nitrogen refrigerator or dewar. Do not use any stopper or other device that would interfere with venting of gas.

These cryogenic liquid containers are generally designed to operate with little or no internal pressure. Inadequate venting can result in excessive gas pressure that could damage or burst the container. Use only the loose-fitting necktube core supplied or one of the approved accessories for closing the necktube. Check the unit periodically to be sure that venting is not restricted by accumulated ice or frost.

Handling LN₂ Safely (cont'd)

Use proper transfer equipment.

Use a phase separator or special filling funnel to prevent splashing and spilling when transferring liquid nitrogen into or from a dewar or refrigerator. The top of the funnel should be partly covered to reduce splashing. Use only small, easily handled dewars for pouring liquid. For the larger, heavier containers, use a cryogenic liquid withdrawal device to transfer liquid from one container to another. Be sure to follow instructions supplied with the withdrawal device. When liquid cylinders or other large storage containers are used for filling, follow the instructions supplied with those units and their accessories.

Do not overfill containers.

Filling above the bottom of the necktube (or specified maximum level) can result in overflow and spillage of liquid when the necktube core or cover is placed in the opening.

Never use hollow rods or tubes as dipsticks.

When a warm tube is inserted into liquid nitrogen, liquid will spout from the bottom of the tube due to gasification and rapid expansion of liquid inside the tube. Wooden or solid metal dipsticks are recommended; avoid using plastics that may become very brittle at cryogenic temperatures.

Nitrogen Gas can cause suffocation without warning.

Store and use liquid nitrogen only in a well-ventilated place.

As the liquid evaporates, the resulting gas tends to displace the normal air from the area. In closed areas, excessive amounts of nitrogen gas reduce the concentration of oxygen and can result in asphyxiation.

Because nitrogen gas is colorless, odorless and tasteless, it cannot be detected by the human senses and will be breathed as if it were air. Breathing an atmosphere that contains less than 18 percent oxygen can cause dizziness and quickly result in unconsciousness and death.

Note: The cloudy vapor that appears when liquid nitrogen is exposed to the air is condensed moisture, not the gas itself. The issuing gas is invisible.

Never dispose of liquid nitrogen in confined areas or places where others may enter.

Disposal of liquid nitrogen should be done outdoors in a safe place. Pour the liquid slowly on gravel or bare earth where it can evaporate without causing damage. Do not pour the liquid on the pavement.

First Aid Notice

If a person seems to become dizzy or loses consciousness while working with liquid nitrogen, move to a well-ventilated area immediately. If breathing has stopped, apply artificial respiration. If breathing is difficult, give oxygen. Call a physician. Keep warm and at rest.

If exposed to liquid or cold gas, restore tissue to normal body temperature 98.6 F (37 C) as rapidly as possible, followed by protection of the injured tissue from further damage and infection. Remove or loosen clothing that may constrict blood circulation to the frozen area. Call a physician. Rapid warming of the affected part is best achieved by using water at 108 F (42 C). Under no circumstances should the water be over 112 F (44 C), nor should the frozen part be rubbed either before or after re-warming. The patient should neither smoke, nor drink alcohol.

Handling Dewars and Refrigerators

Keep unit upright at all times except when pouring liquid from dewars specifically designed for that purpose.

Tipping the container or laying it on its side can cause spillage of liquid nitrogen. It may also damage the container and any materials stored in it.

Rough handling can cause serious damage to dewars and refrigerators.

Dropping the container, allowing it to fall over on its side, or subjecting it to sharp impact or severe vibration can result in partial or complete loss of vacuum. To protect the vacuum insulation system, handle containers carefully. Do not "walk", roll or drag these units across a floor. Use a dolly or handcart when moving containers, especially the larger portable refrigerators. Large units are heavy enough to cause personal injury or damage to equipment if proper lifting and handling techniques are not used.

Do not attempt to move large stationary-type refrigerators unless they are completely empty.

When transporting a liquid nitrogen container, maintain adequate ventilation and protect the unit from damage.

Do not place these units in closed vehicles where the nitrogen gas that is continuously vented from unit can accumulate. Prevent spillage of liquids and damage to unit by securing it in the upright position so that it cannot be tipped over. Protect the unit from severe jolting and impact that could cause damage.

Keep the unit clean and dry.

Do not store it in wet, dirty areas. Moisture, animal waste, chemicals, strong cleaning agents and other substances that could promote corrosion should be removed promptly. Use water or mild detergent for cleaning and dry the surface thoroughly. Do not use strong alkaline or acid cleaners that could damage the finish and corrode the metal shell.

Protect Refrigerator Contents

The extremely low temperature of the liquid nitrogen or the gas that issues from the evaporating liquid nitrogen protects materials stored in liquid nitrogen refrigerators. When all of the liquid nitrogen has evaporated, the temperature inside the unit will rise slowly to ambient. The rate at which the liquid nitrogen will evaporate depends upon the pattern of container use and the age and condition of the container. Evaporation increases as insulation efficiency deteriorates with age and rough handling. Opening and closing to insert and remove materials and moving the unit will also increase the evaporation rate.

To protect valuable material stored in a liquid nitrogen refrigerator:

Check the liquid level in unit frequently, at least once each week.

Failure to properly monitor liquid nitrogen level can permit undetected loss of refrigeration with resulting damage to the material stored in the unit.

Refill the refrigerator as required to maintain protection of the stored materials.

Always be sure that there is enough liquid nitrogen in the unit to last until the next scheduled refill. When contents must be kept at liquid temperature, keep the liquid level high enough to cover the materials. When gas-phase temperatures provide adequate protection, the liquid level can be lower.

Condensed moisture or frost on the outer shell of a refrigerator and abnormally rapid evaporation of the liquid nitrogen are indications of vacuum loss.

If vacuum loss is evident or suspected, transfer the materials stored in the unit to another refrigerator as soon as possible and remove the unit from service.

Fill Instructions For CryoSafe Vapor Shippers

THESE HIGH QUALITY VACUUM INSULATED UNITS ARE CONSTRUCTED OF DURABLE MATERIALS, COMPATIBLE WITH THE DIVERGENT TEMPERATURE EXTREMES AND BROAD APPLICATIONS OF CRYOBIOLOGY. THE MATERIAL USED IN CONSTRUCTION AFTER 1993 IS HYDROPHOBIC (WILL NOT ABSORB WATER) WHICH UNLIKE CALCIUM SILICATE DOES NOT NEED TO BE PERIODICALLY HEATED TO REMOVE ABSORBED MOISTURE.

THE CRYOSAFE VAPOR SHIPPERS WERE PRIMARILY DESIGNED AS VAPOR SHIPPING CONTAINERS; HOWEVER, THEY CAN BE USED FOR IMMERSION OF SAMPLES. WHEN USING IN EITHER CONDITION, THE RECOMMENDED FILLING PROCEDURE IS AS FOLLOWS: FILL THE UNIT TO THE BOTTOM OF THE NECK AND ALLOW THE LIQUID NITROGEN TO ABSORB. UPON COMPLETE ABSORPTION OF THE FIRST FILL OF LN₂, WHICH SHOULD TAKE A MINIMUM OF 12 HOURS, REPEAT WITH ANOTHER FILL. REPEAT AGAIN IF NECESSARY. COMPLETE ABSORPTION MAY TAKE UP TO 24 HOURS. AFTER COMPLETING THE LAST FILL, JUST PRIOR TO SHIPMENT, POUR OFF THE EXCESS LIQUID IF THEY ARE INTENDED TO BE USED AS A VAPOR (DRY) SHIPMENT.

TO ENSURE THAT THE VAPOR SHIPPERS HAVE ABSORBED THEIR FULL CAPACITY OF LIQUID, IT IS ADVISABLE TO WEIGH THEM. TO COMPLETELY FILL THE ABSORBENT, THE SUGGESTED ABSORBED WEIGHT OF THE UNITS (WITHOUT CANISTERS INSIDE) AS LISTED BELOW SHOULD BE REACHED. THIS WILL ALLOW THE CONTAINERS TO HOLD THE MAXIMUM NUMBER OF DAYS IN THE VAPOR PHASE.

MODEL	EMPTY WEIGHT	WEIGHT (SUGGESTED)	FULL	STATIC HOLD TIME (DAYS)
VS1	6	8.8		8
VS2	8.8	11.6		14
VS3	11	18		14
VS4	30.5	38		12
VS5	13	20.6		21
VS6	23	35		23
VS7	24	37.5		10
VS8	30	47		14
VS9	30	52		85

DURING THE INITIAL FILL, OR AFTER THE UNIT IS ALLOWED TO WARM, THE AMOUNT OF LN₂ NEEDED TO FILL THE ABSORBENT WILL BE GREATER. THE TIME NEEDED FOR THIS FILLING PROCEDURE WILL ALSO BE GREATER.

Fill Instructions For Testing CryoSafe Vapor Shippers (PRIOR TO EACH SHIPPING)

THESE HIGH QUALITY VACUUM INSULATED UNITS ARE CONSTRUCTED OF DURABLE MATERIALS COMPATIBLE WITH THE WIDE RANGE OF TEMPERATURE EXTREMES COMMONLY EXPERIENCED IN CRYOBIOLOGICAL PROCESSES. ALTHOUGH EVERY CRYOSAFE UNIT HAS BEEN FACTORY TESTED, IT IS RECOMMENDED THAT THE DEWARs BE TESTED AGAIN PRIOR TO SHIPPING TO END USER TO ENSURE THE VIABILITY AND SAFETY OF YOUR STORED MEDIA. ITEMS SUCH AS FREIGHT DAMAGE DO NOT ALWAYS APPEAR OBVIOUS AND THIS TEST PROCEDURE MAY PREVENT POSSIBLE PRODUCT & SAMPLE LOSS.

TO ENSURE MAXIMUM PERFORMANCE FROM YOUR CRYOSAFE DEWAR SIMPLY FOLLOW LISTED STEPS JUST PRIOR TO SHIPPING TO FINAL DESTINATION:

1. OPEN BOX THAT DEWAR IS IN & REMOVE FROM CARTON
2. OPEN LID & REMOVE CORK/COVER (do not twist)
3. FILL UNIT TO APPROXIMATELY $\frac{3}{4}$ FULL
 - A. Follow established safety practices & procedures for transferring LN₂
 - B. Transfer using LN₂ hose with phase separator or pouring container & approved funnel
 - C. Canisters are to remain inside dewar
4. REPLACE CORK/COVER & LET UNIT STAND FOR 24 HOURS (cooling down unit).
5. WEIGH UNIT (first weight)
6. ALLOW UNIT TO SIT FOR ANOTHER 24 HOURS
7. WEIGH SECOND TIME (second weight)
8. CALCULATE EVAPORATION RATE. THE DIFFERENCE BETWEEN THE FIRST WEIGHT AND THE SECOND WEIGHT IS THE EVAPORATION RATE IN LBS. THIS CAN BE CONVERTED TO LITERS BY MULTIPLYING LBS. X .5606. THIS FIGURE ROUGHLY SIGNIFIES THE N.E.R.=(first weight – second weight) X .5606 is liter/day
 - A. Also during this time take note of any uncommon occurrences such as excess frosting or sweating along outside of dewar. Take note of excess nitrogen boil off especially after the second weight. LN₂ should settle (cease boiling) after an hour.

Accessories

#RB1	Roller Base to fit model CM-1, SSB I
#RB2	Roller Base to fit model CM-2, SSB II
#RB3	Roller Base to fit model CM-3, SSB III
#RB4	Roller Base to fit model CM-4, SSB IV
#RB14	Roller Base to fit models SSC-20 & 22, SSC-ET20 & 20V, LD20
#RB18	Roller Base to fit models SSC-21, 32, 33, 34, 35, SSC-ET 33 & 36, LD30 & 50
#RB20	Roller Base to fit models SSC-43, 47-6, 47-10
#PSC 1	Protective Shipping Carton for models VS1, 2, 3, 5
#PSC 2	Protective Shipping Carton for model SSC-ET 11
#PSC 3	Protective Shipping Carton for model VS6
#PSC 4	Protective Shipping Carton for model VS4
#7BBR	Extra Blood Back Rack for model VS7
#LD-5PS	Pouring Spout for model LD5
#LD-10PS	Pouring Spout for model LD10
#LD-20PS	Pouring Spout for model LD20
#LD-30PS	Pouring Spout for model LD30
#LD-50PS	Pouring Spout for model LD50
#MWD-10	Manual W/D device for model LD10
#MWD-20	Manual W/D device for model LD20
#MWD-30	Manual W/D device for model LD30
#MWD-50	Manual W/D device for model LD50
#25P	Plastic Box with 25 cell grid
#25C	Cardboard Box with 25 cell grid
#81P	Plastic Box with 81 cell grid
#81C	Cardboard Box with 81 cell grid
#100P	Plastic Box with 100 cell grid
#100C	Cardboard Box with 100 cell grid
#CA	Canes – (50/pack) Aluminum 6-place
#uCRYO	uCryo-Sentry Low Level Alarm
#LLMR	Liquid Level Measuring Rod
#CGL	Cryo Gloves-Large, Mid-Arm Length
#VLG	Vial Gopher, Safety Tongs
#TH10	10' Stainless Steel Transfer Hose
#TH6	6" Stainless Steel Transfer Hose - CGA 295 to 3/8" NPT
#PS80	Phase Separator - 2 3/4" x 1 3/8" OD, 3/8" - 18 NPT
#TNG	Tongs – To retrieve lost vials
#TP-MFF	T-Piece Connection for Multiple Units
#CRDSL	Cardboard Sleeves for Canes (50/pack)
#PSLV	Plastic Sleeves for Canes (50/pack)
#TA160V	T-Valve

Ordering

Information

Ordering Information--Order all replacement parts and accessories from CryoSafe at the address listed below. Please include the part and model number of your dewar and the part number, quantity, and description of each part requested.

CryoSafe
800-562-2796
Fax: 843-821-8051

Or write:
CryoSafe
P.O. Box 1797
Summerville, SC 29484

Warranty Information

WARRANTY CRYOSAFE LIQUID NITROGEN DEWARS

CryoSafe warrants that each of its Dewars will be free from defects in material and workmanship, in the normal service for which the product was manufactured, for a period of three years from date of shipment to the original purchaser. The product is further warranted to maintain a Normal Evaporation Rate (NER) within 20% of CryoSafe's published specifications for the product, on the date of purchase. This NER warranty is in effect for all aluminum class dewars for three (3) years parts and labor, five (5) years on vacuum from date of shipment to the original purchaser if the product is used and maintained according to CryoSafe's published instructions.

To make a claim under this warranty, the purchaser must: 1) give CryoSafe written notice within ten (10) days after discovery of a claimed defect, 2) immediately discontinue use of the product, and 3) return such product freight prepaid to the location specified by CryoSafe for evaluation to validate the warranty claim. If the claimed defect is confirmed by CryoSafe's inspection, CryoSafe will, at its option and as the purchaser's sole remedy, repair or replace such product or any component part thereof, or refund the original purchase price.

This warranty is voided by alterations or by repairs made by others. CryoSafe shall not be liable under this warranty, or otherwise, for defects caused by negligence, abuse or misuse of the product, corrosion, fire, heat, or the effects of normal wear. Any related components or other equipment manufactured by others that may be sold with CryoSafe's product are not covered by this warranty.

THIS WARRANTY IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

THE REMEDIES SET FORTH HEREIN ARE EXCLUSIVE. CRYOSAFE SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, SPECIAL, OR INCIDENTAL DAMAGES RESULTING FROM THE DELIVERY, USE OR FAILURE OF THE PRODUCT (INCLUDING LOSS OF ANY MATERIAL STORED IN THE PRODUCT), OR FROM ANY OTHER CAUSE WHATSOEVER. BY ACCEPTING DELIVERY OF THE PRODUCT SOLD HEREUNDER, THE PURCHASER ACKNOWLEDGES THAT THIS LIMITATION OF REMEDIES IS REASONABLE AND ENFORCEABLE. IN NO EVENT SHALL CRYOSAFE'S LIABILITY EXCEED THE PURCHASE PRICE FOR THE PRODUCT.

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