

**LIQUID NITROGEN VESSEL
OPERATING & HANDLING INSTRUCTIONS**



INTERNATIONAL CRYOGENICS, INC.

www.internationalcryogenics.com

KNOWLEDGE • PATIENCE • CARE • SAFETY

Liquid Nitrogen Is Dangerous

Handling liquid nitrogen and cryo-biological refrigerators, shippers and dewars can be extremely hazardous if proper precautions are not taken. Two basic properties of liquid nitrogen should always be remembered and respected:

- It is extremely cold. At atmospheric pressure, liquid nitrogen boils at -320°F (-196°C).
- Liquid nitrogen vaporizes into large amounts of gas (1 liter of liquid produces 25 cubic feet of gas @ NTP) displacing oxygen in the surrounding air.

The safety precautions in this booklet must be followed to prevent bodily injury or death, or equipment damage.

Respect liquid nitrogen - handle with care.

Never allow liquid nitrogen to touch bare skin - serious frostbite can result. Human flesh freezes almost instantaneously upon contact. Use only vessels that are specially designed for cryogenic fluid in storing and handling liquid nitrogen.

Always wear protective clothing.

When working with liquid nitrogen or items cooled by liquid nitrogen always wear gloves, boots, loose fitting clothes and a face shield. The gloves should be insulated or heavy leather and be loose fitting for quick removal should liquid splash into them. The face shield protects the operator's skin and eyes from splashing liquid and cold gases. Never tuck trousers inside boots.

Transfer liquid nitrogen carefully.

The major hazards when transferring liquid nitrogen are spilling and splashing. Use a funnel with a partially covered top to reduce splashing. When transferring from a small (light weight) vessel, pour carefully. When transferring liquid nitrogen from a large (heavy) vessel use a self pressurizing withdrawal device. The withdrawal devices are available from International Cryogenics. See "Accessories".

Fill cryogenic vessels slowly.

International Cryogenics cryo-biological vessels are designed and built to withstand the large temperature variances experienced when handling liquid nitrogen. However, these vessels should be filled slowly to minimize the expansion/contraction stresses that result from rapid cooling. Adding liquid nitrogen to a warm container will also generate a large volume of nitrogen gas. Keep your head clear of any vapor produced.

Never seal the vessels tightly.

International Cryogenics refrigerators, shippers, and dewars are designed to operate with little or no internal pressure build-up. The use of any tight fitting stopper or plug in the necktube that does not allow venting of the gas causes pressure build-up that can damage or burst the vessel.

Do not over fill the vessel.

Filling the refrigerators, shippers, and dewars above the bottom of the necktubes or the specified maximum level can result in possibly dangerous LN₂ spillage when the necktube insert is replaced.

Use a solid metal rod, plastic stick or wooden stick to measure volume of liquid nitrogen in a vessel.

When determining the volume of liquid nitrogen in a refrigerator or storage dewar, use a graduated solid metal rod, plastic stick or wooden stick to measure the liquid depth. Refer to the included depth/volume chart to determine the liquid nitrogen volume contained. Never use a hollow tube to measure the LN₂ level. The gasification and rapid expansion of the liquid inside the warm tube will cause liquid to spurt from the top of the tube. Always wear insulated/heavy gloves. International Cryogenic offers a plastic measuring stick. See "Accessories".

Do not allow objects cooled by liquid nitrogen to touch bare skin.

Objects cooled by liquid nitrogen will stick to bare skin and may tear flesh when removed. Always use forceps or tongs to remove objects from storage vessels.

Nitrogen Gas Can Be Deadly

Nitrogen gas is invisible.

As liquid nitrogen evaporates, the resulting gas displaces the oxygen in the air. Since it is tasteless, odorless, and colorless the undetectable gas can reduce the air's oxygen content below the level needed for safe breathing. This can cause dizziness, unconsciousness, and suffocation. Thus, liquid nitrogen must be stored and used only in a well ventilated area. The cloud of vapor observed when working with liquid nitrogen and/or cold nitrogen gas is condensed moisture and cold nitrogen gas.

Nitrogen gas is also extremely cold.

When exposed to cold nitrogen gas, delicate tissues such as those of the eyes can be damaged even when the contact is too brief to affect the skin of the hands and face. Always wear a face shield when working with or around liquid nitrogen/cold gas. High gas concentrations can burn exposed skin and/or cause frostbite.

Disposal of liquid nitrogen.

Liquid nitrogen should only be disposed in outdoor areas. Pour the liquid slowly onto the ground - never on concrete/blacktop surfaces. This allows evaporation into the open air.

First Aid

Anyone exposed to liquid nitrogen or cold gas or who becomes dizzy or loses consciousness while working with these products, should be moved to a well-ventilated area immediately. Call for medical assistance. Keep individual warm and at rest. Do Not Rub frozen parts as tissue damage may result.

If possible and if the individual cannot be transported to medical attention immediately, place the affected part of the body in warm-water bath, which has a temperature of not less than 105°F or more than 115°F (40°C to 46°C). Never use dry heat; thawing may require from 15 to 60 minutes.

Refrigerator, Shipper, and Dewar Care/Handling.

Storage/Cleaning

Store your cryogenic vessel in a clean dry area away from manure, chemicals and other substances which may cause corrosion. Never use caustic/abrasive cleaners - only wash with a mild detergent and plain water. Always wipe dry.

Periodically check the liquid level.

Always monitor the liquid level to insure proper refrigeration. If a rapid liquid level change (decrease) or frost build-up on the outside of the unit is observed, immediately move stored product to another cryogenic unit and call the local service representative or International Cryogenics. A possible weakening (loss) of vacuum is occurring.

Vapor Shippers

Cryogenic units employing vapor cooling are partially filled with a compound that absorbs liquid nitrogen. To obtain proper performance the following procedure should be used.

- A. Weigh the vessel as initially received (warm) without canisters. Record this weight.
- B. Fill the vessel with liquid nitrogen (to bottom of necktube maximum) and allow to stand for 24 hours (minimum) to insure saturation and continue to top off the vessel during the first few hours.
- C. To confirm the compound is fully saturated, pour off all liquid nitrogen and determine, by weight, the volume of LN₂ absorbed (1 liter of LN₂ = 1.78 lb). See vessel specifications for maximum LN₂ capacity.
- D. Pour off all the non-absorbed liquid nitrogen just prior to placing the unit in service.

Transportation

Transport all cryogenic vessels in an upright position - Do not allow to tip. Enclosed trucks and vans should not be used because of the nitrogen gas build-up with resultant oxygen displacement which can result in suffocation. Always provide for proper ventilation. Use protective cartons when shipping cryogenic containers. Contact International Cryogenics for custom designed shipping cartons.

Handle cryogenic containers with care.

Dropping the container, tipping the container, subjecting the container to vibration or shock, and hitting sharp objects can result in partial or total vacuum loss. To protect against this happening never slide, roll or "walk" the units. If containers are too heavy to be carried, use a roller base or dolly. International Cryogenics offers a roller base. See "Accessories".

Caution

Liquid nitrogen is constantly evaporating and must be replaced periodically. The evaporation rate will depend upon the use, age, and condition of the vessel.

Accessories

Roller Bases

Roller bases provide convenient movement of 20, 35, and 50 liter vessels. They are custom sized, with rotating casters.

IC P/N 14-5120 = 20 liter vessel

IC P/N 14-5135 = 35 and 50 liter vessel

Liquid Withdrawal Device

Retrieving liquid nitrogen from the Liquid Nitrogen Storage Dewars by using a liquid withdrawal device eliminates the necessity to lift the vessels to pour out the liquid. These devices are self pressurizing and provide a steady liquid nitrogen flow.

IC P/N 12-5120 =IC-10D,20D,35D

IC P/N 12-5135 =IC-35DX,50D

Dippers

A safe and convenient method to obtain a small amount of liquid nitrogen is the use of the dipper.

IC P/N 12-5100

Fill Hose

A safe and convenient method to transfer liquid nitrogen from a liquid cylinder or bulk tank. The fill hose is a non-vacuum insulated transfer hose with CGA nitrogen fittings on each end.

HOSE P/N = 92-0600

PHASE SEPARATOR P/N = 5135-15

Measuring Stick

A plastic measuring stick, in centimeters, to measure liquid nitrogen volume.

Cryo-Biological Tanks - Warranties

Cryo-biological Tanks - The Company warrants that its cryo-biological tanks as newly manufactured are free from defects in material and workmanship when shipped from its Indianapolis facility, and with accepted normal use, will remain free from such defects for ninety (90) days following the date of shipment to the original purchaser from the Company ("Purchaser"). The Company further warrants to the original Purchaser only, that if the cryo-biological tanks receive only normal use and maintenance as set forth in the Company's Operating Instructions, the evaporation rate of the cryo-biological tanks shall remain within 20% of the specifications published at the time of original shipment: (i) with respect to cryo-biological tanks other than shippers, for a period of five (5) years from the shipment date to the Purchaser; and (ii) with respect to shippers, for a period of two (2) years from the shipment date to the Purchaser, subject to the further condition that such warranty for the shipper is valid only so long as Purchaser has used exclusively the Company's packaging for the shipper or other packaging approved by the Company in writing, and except for any failure of any tank after 90 days caused by any defect in material and workmanship. These warranties are not assignable, and do not extend to: (i) defects arising from any use of the cryo-biological tanks other than use as set forth in the Company's Operating Instructions, (ii) any defects or damage caused by shipment, or (iii) defective replaceable components of its cryo-biological tanks that are manufactured by other companies (except defective components shipped prepaid to Company in Indianapolis within thirty (30) days from date of delivery). Any unauthorized alteration or repair or any misuse, abuse or exposure to adverse environment (such as fire, corrosion or explosion) of the cryo-biological tank by the Purchaser or any third party will void all warranties. If the Company is promptly notified of a cryo-biological tank failure to comply with the above warranties by a fully paid Purchaser who pre-pays all shipping charges of its cryo-biological tank to and from Indianapolis and ships the tank within fifteen (15) days of the notice, the Company, at its option, without charge, will repair or replace any defective cryo-biological tank that is returned to its Indianapolis facility for possible warranty repair. This shall be the Purchaser's sole remedy.

THE EXPRESS WARRANTIES ABOVE ARE THE COMPANY'S SOLE WARRANTIES OF ITS CRYO-BIOLOGICAL TANKS. THE COMPANY MAKES NO FURTHER OR ADDITIONAL WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND PURCHASER'S REMEDY SET FORTH HEREIN IS THE SOLE AND EXCLUSIVE REMEDY.

LIMITATION OF LIABILITY: The Company shall not under any circumstances be liable to Purchaser or any third party for special, indirect, incidental, or consequential damages, including, without limitation, loss of profits or revenues, loss or damage to other property or equipment (including loss of any material stored or shipped in the product), cost of capital, or of purchased or replacement goods, or expense, delay or inconvenience caused by or arising from the purchase, sale, use, repair or inability to use Company products. The Company's sole liability for any defective product shall be its repair or its replacement pursuant to the express warranties set forth above, or, if amended, as applicable at the time of manufacture or repair of product.

DISPUTE RESOLUTION: Any dispute between the Purchaser and Company regarding the application or interpretation of any warranty for, or with respect to, a cryo-biological tank ("Dispute") will be governed by the laws of the State of Indiana. The Indiana state and federal courts will have personal jurisdiction of both Purchaser and the Company. All lawsuits relating to any Dispute will be brought only in a state or federal court located in Marion County, Indiana. Purchaser hereby waives its right to a trial by jury in any action, proceeding, claim or counterclaim whether in contract or tort, at law or in equity, arising out of or relating in any way to any Dispute.

Liquid Level Calibration Chart

<u>INCHES</u>	<u>CM</u>	3Liter	5Liter	6Liter	10Liter	20Liter	22Liter	35Liter	38Liter	50Liter
20	50.8									FULL
18	45.7									47.3
16	40.6									41.9
15	38.1						FULL		FULL	39.2
14	35.5					FULL	20.0	FULL	36.5	36.5
12	30.5				FULL	18.3	18.3	31.2	31.2	31.2
10	25.4			FULL	8.6	15.2	15.2	25.7	25.7	25.7
8	20.5		FULL	4.8	6.8	12.0	12.0	20.2	20.2	20.2
6	15.2	FULL	3.6	3.6	5.0	8.8	8.8	14.8	14.8	14.8
4	10.2	2.4	2.4	2.4	3.2	5.6	5.6	9.3	9.3	9.3
2	5.1	1.0	1.0	1.0	1.4	2.4	2.4	3.9	3.9	3.9
0	0.0	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY	EMPTY

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