

HANDLE WITH CARE

How to take care of our liquid nitrogen dewar while taking care of yourself.

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

Warning

Use only liquid nitrogen in Liquid Nitrogen Dewars. Any other product 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 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 -196 degrees Celsius
2. Very small amounts of liquid vaporize into large amounts of gas. One litre of liquid nitrogen becomes 0.7m³ of gas.

The safety precautions in this document must be followed to avoid potential injury or damage which 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 document handy ready for reference and review.

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 eyes, can be damaged by the exposure to the cold gas which 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 cuffless 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 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 which 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.

Use proper transfer equipment.

Use a phase separator or special funnel to prevent splashing and spilling when transferring liquid nitrogen into or from a dewar. The top of the funnel should be partly covered to reduce splashing. Use only small, easily handled dewars for pouring liquid. For 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 top 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 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 37 degrees Celsius 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 42 degrees Celsius. Under no circumstances should the water be over 44 degrees Celsius, nor should the frozen part be rubbed either before or after rewarming. The patient should neither smoke, nor drink alcohol.

Handling Dewars

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.

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 the containers carefully. Do not 'walk' roll or drag these units across a floor. Use a dolly or handcart when moving containers. Large units are heavy enough to cause personal injury or damage to equipment if proper lifting and handling techniques are not used.

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 the unit can accumulate. Prevent spillage of liquids and damage to unit by securing it in an 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 which 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.

Reference Publications

Worthington Industries – Handle with Care Booklet

For more detailed information concerning safety precautions and safe practices to be observed when handling liquid nitrogen refer to CGA publication P-12 Safe handling of Cryogenic Liquids, available from the Compressed Gas Association Inc.