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MATERIAL
SAFETY
DATA SHEET

No. 49

PRODUCT NAME Nitrogen, Refrigerated Liquid	CAS # 7727-37-9
TRADE NAME AND SYNONYMS Nitrogen, refrigerated liquid (D.O.T.); LIN; Liquid Nitrogen	DOT I.D. No.: UN 1977
CHEMICAL NAME AND SYNONYMS Liquid or Liquefied Nitrogen	DOT Hazard Class: Division 2.2
	Formula Liquefied N ₂
ISSUE DATES AND REVISIONS Revised January 1995	Chemical Family: Inert

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

Nitrogen is defined as a simple asphyxiant (ACGIH 1994-1995); OSHA 1993 PEL (8 Hr. TWA) = None listed.
(Continued on Page 4)

SYMPTOMS OF EXPOSURE

Effects of exposure to high concentrations so as to displace the oxygen in air necessary for life may include any, all or none of the following:

- Loss of balance or dizziness
- Tightness in the frontal area of the forehead (Continued on Page 4)

TOXICOLOGICAL PROPERTIES

Nitrogen is nontoxic but the liberation of a large amount in a confined area could displace the amount of oxygen in air necessary to support life.

Frostbite effects are a change in color of the skin to gray or white possibly followed by blistering.

Nitrogen is not listed in the IARC, NTP or by OSHA as a carcinogen or potential carcinogen.
(Continued on Page 4)

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO NITROGEN. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Inhalation: (conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given assisted respiration and supplemental oxygen. Further treatment should be symptomatic and supportive.

Dermal Contact or Frostbite: Flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

Information contained in this material safety data sheet is offered without charge for use by technically qualified personnel at their discretion and risk. All statements, technical information and recommendations contained herein are based on tests and data which we believe to be reliable, but the accuracy or completeness thereof is not guaranteed and no warranty of any kind is made with respect thereto. This information is not intended as a license to operate under or a recommendation to practice or infringe any patent of this Company or others covering any process, composition of matter or use. Since the Company shall have no control of the use of the product described herein, the Company assumes no liability for loss or damage incurred from the proper or improper use of such product.

NITROGEN, REFRIGERATED LIQUID

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	
Flammable over an extremely wide range in air. Explosive reactions may occur on ignition. Reacts explosively with halogens and halogenated compounds.	
PHYSICAL DATA	
BOILING POINT -320.5°F (-195.8°C)	LIQUID DENSITY AT BOILING POINT 50.46 lb/ft ³ (808.3 kg/m ³)
VAPOR PRESSURE @ 70°F (21.10C) = Above the critical temperature of -232.6°F (-147°C)	GAS DENSITY AT 700F, 1 atm .0725 lb/ft (1.161 kg/m ³)
SOLUBILITY IN WATER Very slightly	FREEZING POINT -345.9°F (-209.9°C)
EVAPORATION RATE Dependent on condition of insulation in container.	SPECIFIC GRAVITY (AIR=1) @ 70°F (21.1°C) = 0.97
APPEARANCE AND ODOR Colorless, odorless, gas or liquid. Liquid is clear.	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMABLE LIMITS % BY VOLUME (See Page 4) LEL N/A UEL N/A	
EXTINGUISHING MEDIA Nonflammable, inert		ELECTRICAL CLASSIFICATION Nonhazardous	
SPECIAL FIRE FIGHTING PROCEDURES If liquid cylinders are involved in a fire, safely relocate or keep cool with water spray.			
UNUSUAL FIRE AND EXPLOSION HAZARDS None			

REACTIVITY DATA

STABILITY Unstable		CONDITIONS TO AVOID None
Stable	X	
INCOMPATIBILITY (Materials to avoid) None		
HAZARDOUS DECOMPOSITION PRODUCTS None		
HAZARDOUS POLYMERIZATION May Occur		CONDITIONS TO AVOID
Will Not Occur	X	None

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED See Note on Page 4
WASTE DISPOSAL METHOD See Note on Page 4

NITROGEN, REFRIGERATED LIQUID

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.					
VENTILATION See Local Exhaust	<table border="1"> <tr> <td> LOCAL EXHAUST See Page 4 </td> <td> SPECIAL N/A </td> </tr> <tr> <td> MECHANICAL (Gen.) N/A </td> <td> OTHER N/A </td> </tr> </table>	LOCAL EXHAUST See Page 4	SPECIAL N/A	MECHANICAL (Gen.) N/A	OTHER N/A
LOCAL EXHAUST See Page 4	SPECIAL N/A				
MECHANICAL (Gen.) N/A	OTHER N/A				
PROTECTIVE GLOVES Loose fitting, insulated					
EYE PROTECTION Safety goggles or glasses plus face shield					
OTHER PROTECTIVE EQUIPMENT Safety shoes					

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION DOT Shipping Name: Nitrogen, refrigerated liquid DOT Hazard Class: Division 2.2 DOT Shipping Label: Nonflammable Gas I.D. No.: UN 1977
SPECIAL HANDLING RECOMMENDATIONS See Note on Page 4 re Spill or Leak Procedures For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-9, P-12, P-14, and Safety Bulletin SB-2.
SPECIAL STORAGE RECOMMENDATIONS See Note on Page 4 re Spill or Leak Procedures For additional handling recommendations, consult Compressed Gas Association's Pamphlets P-9, P-12, P-14, and Safety Bulletin SB-2.
SPECIAL PACKAGING RECOMMENDATIONS Liquid nitrogen cannot be handled in carbon or low alloy steels. Eighteen-eight and 18-10 stainless steels are acceptable as are copper and its alloys, nickel and its alloys, brass, bronze, silicon alloys, Monel®, Inconel®, and beryllium. Also see Compressed Gas Association's Pamphlets P-9, P-12, P-14, and Safety Bulletin SB-2.
OTHER RECOMMENDATIONS OR PRECAUTIONS Liquefied gas cylinders should not be refilled except by qualified producers of these products. Shipment of a compressed gas container which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR). (Continued on Page 4)

*Various Government Agencies (i.e. Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

NITROGEN, REFRIGERATED LIQUID

HEALTH HAZARD DATA

NOTE: Except where specified, the health hazard data and most of the other data in this Material Safety Data Sheet are for gaseous nitrogen. One volume of liquid nitrogen at its boiling point and atmospheric Pressure will vaporize into approximately 695 volumes of gaseous nitrogen at 70°F (21.1°C) and 1 atmosphere.

TIME WEIGHTED AVERAGE EXPOSURE LIMIT: (Continued)

Oxygen levels should be maintained at greater than 18 Molar percent at normal atmospheric pressure (pO₂~135 torr).

SYMPTOMS OF EXPOSURE: (Continued)

- Tingling of the tongue, fingertips or toes
- Weakened speech leading to the inability to utter sounds
- Rapid reduction in the ability to perform movements
- Reduced consciousness of the surroundings
- Loss of tactile sensations
- Heightened mental activity

It should be recognized that it is possible that none of the above symptoms may occur in nitrogen asphyxia so that there are no definite warning symptoms.

Contact with the cryogenic liquid or cold piping containing the liquid can cause tissue freezing or frostbite on dermal contact or if splashed into the eyes.

TOXICOLOGICAL PROPERTIES: (Continued)

Persons in ill health where such illness would be aggravated by exposure to nitrogen should not be allowed to work with or handle this product.

NOTE re SPILL OR LEAK PROCEDURES:

Liquid nitrogen is delivered to a customer into stationary vacuum-jacketed vessels at the customer's location or in portable vacuum-jacketed "liquid" cylinders.

Stationary customer-site vessels should be operated in accordance with the manufacturer's and your supplier's instructions. Do not attempt to repair, adjust, or in any other way modify the operation of these vessels. If there is a malfunction or other type of operational problem with the vessel, contact the closest supplier location immediately.

Liquid nitrogen cylinders should be used only in well-ventilated areas and in accordance with the manufacturer's and your supplier's instructions. These cylinders must always be kept in an upright position. Specialized hand trucks are needed for their movement. A "first in - first out" inventory system should be used with these cylinders.

SPECIAL PROTECTION INFORMATION

LOCAL EXHAUST:

To prevent accumulation of high concentrations so as to reduce the oxygen level in the air to less than 18 molar percent.

SPECIAL PRECAUTIONS

OTHER RECOMMENDATIONS OR PRECAUTIONS: (Continued)

Always secure cylinders in an upright position before transporting them. NEVER transport cylinders in trunks of vehicles, enclosed vans, truck cabs or in passenger compartments. Transport cylinders secured in open flatbed or in open pick-up type vehicles. Reporting under SARA, Title III, Section 313 not required. NFPA 704 No for liquid nitrogen = 3 0 0 Nonc