NITROGEN, REFRIGERATED LIQUID
Safety Data Sheet

1. IDENTIFICATION

Product identifier
Product Name NITROGEN, REFRIGERATED LIQUID

Other means of identification
Safety data sheet number LIND-P087
UN/ID no. UN1977
Synonyms Nitrogen, liquid, MAPAX® N

Recommended use of the chemical and restrictions on use
Recommended Use Industrial and professional use.
Uses advised against Consumer use

Details of the supplier of the safety data sheet
Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC
200 Somerset Corporate Blvd, Suite 7000
Bridgewater, NJ 08807
Phone: 908-464-8100
www.lindeus.com

Linde Gas Puerto Rico, Inc.
Road 869, Km 1.8
Barrio Palmas, Catano, PR 00962
Phone: 787-641-7445
www.pr.lindegas.com

Linde Canada Limited
3860 Chedworth Way
Mississauga, Ontario L5R 0A2
Phone: 905-501-2500/ 905-501-1700
www.lindecanada.com

* May include subsidiaries or affiliate companies/ divisions.

For additional product information contact your local customer service.

Emergency telephone number
Company Phone Number +1 800-232-4726 (Linde National Operations Center, US) 905-501-0802 (Canada)
CHEMTREC: 1-800-424-9300 (North America) +1-703-527-3887 (International)
2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

<table>
<thead>
<tr>
<th>Gases under pressure</th>
<th>Refrigerated liquefied gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple asphyxiants</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Label elements

Signal word Warning

Hazard Statements
Contains refrigerated gas; may cause cryogenic burns or injury
May displace oxygen and cause rapid suffocation

Precautionary Statements - Prevention
Do not handle until all safety precautions have been read and understood
Use and store only outdoors or in a well ventilated place
Wear cold insulating gloves, face shield, and eye protection
Use a backflow preventive device in piping
Do NOT change or force fit connections
Close valve after each use and when empty
Always keep container in upright position

Precautionary Statements - Response
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical attention/advice.
IF ON SKIN: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.

Hazards not otherwise classified (HNOC)
Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS No.</th>
<th>Volume %</th>
<th>Chemical Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>7727-37-9</td>
<td>100</td>
<td>N₂</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES
Description of first aid measures

General advice
Show this safety data sheet to the doctor in attendance.

Inhalation
Remove to fresh air and keep comfortable for breathing. If breathing is difficult, give oxygen. If breathing has stopped, give artificial respiration. Get medical attention immediately.

Skin contact
For dermal contact or suspected frostbite, remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER. A physician should see the patient promptly if contact with the product has resulted in blistering of the dermal surface or in deep tissue freezing.

Eye contact
If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.

Ingestion
Not an expected route of exposure.

Self-protection of the first aider
RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Most important symptoms and effects, both acute and delayed

Symptoms
Simple asphyxiant. May cause suffocation by displacing the oxygen in the air. Exposure to oxygen-deficient atmosphere (<19.5%) may cause dizziness, drowsiness, nausea, vomiting, excess salivation, diminished mental alertness, loss of consciousness and death. Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that the individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death. Contact with liquid may cause cold burns/frostbite.

Indication of any immediate medical attention and special treatment needed

Note to physicians
Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Specific extinguishing methods
Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical
Non-flammable gas. Cylinders may rupture under extreme heat.

Protective equipment and precautions for firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions
Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Monitor oxygen level. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Use personal protection recommended in Section 8.

Other Information
When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

Environmental precautions
Environmental precautions
Prevent spreading of vapors through sewers, ventilation systems and confined areas.

Methods and material for containment and cleaning up

Methods for containment
Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest Linde location.

Methods for cleaning up
Return Portable Cryogenic Container to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling
Never allow any unprotected part of the body to touch uninsulated pipes or vessels that contain cold fluids. The extremely cold metal will cause moist flesh to stick fast and tear when one attempts to withdraw from it. Do NOT change or force fit connections.

Liquid nitrogen is delivered into stationary vacuum jacketed vessels at the customer's location or in portable vacuum-jacketed "liquid" cylinders requiring special handling methods. Consult manufacturer's instructions.

Due to the extremely cold liquid, uninsulated transfer may condense air. The liquefied air may flash off nitrogen, leaving an oxygen enriched liquid. Do not allow the liquefied air to contact oils, grease, or other combustible materials such as asphalt or motor oil. Vessels for liquid nitrogen are designed specifically for nitrogen service. Vessels and associated structures are not designed to support higher density fluids. Density, liquid at saturation pressure at 2.17°K (-271°C): 0.146 Kg/l.

Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Never attempt to lift a cylinder by its valve protection cap. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Use only with adequate ventilation. Use a backflow preventive device in piping. Use an adjustable strap wrench to remove overtight or rusted caps. Close valve after each use and when empty. Ensure the complete gas system has been checked for leaks before use.

Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill a compressed gas cylinder without the owner's written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.

Only experienced and properly instructed persons should handle gases under pressure. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers. Use only with equipment rated for cylinder pressure.

For additional recommendations, consult Compressed Gas Association's Pamphlets, AV-8, CGA-341, G-10.1, P-1, P-9, P-12, P-14, and P-18.

Conditions for safe storage, including any incompatibilities

Storage Conditions
Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Keep at temperatures below 52°C / 125°F. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Full and empty cylinders should be segregated. Stored containers should be periodically checked for general condition and leakage.

Incompatible materials
None known.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Appropriate engineering controls

Engineering Controls
Ventilation systems. Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Oxygen detectors should be used when asphyxiating gases may be released. Showers. Eyewash stations.

Individual protection measures, such as personal protective equipment

Eye/ face protection
Wear safety glasses with side shields (or goggles). If splashes are likely to occur, wear: Goggles. Face-shield.

Skin and body protection
Work gloves and safety shoes are recommended when handling cylinders. Wear cold insulating gloves when handling liquid.

Respiratory protection
Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%).

General Hygiene Considerations
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin, or on clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Physical state</th>
<th>Refrigerated liquefied gas</th>
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</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Colorless.</td>
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<tr>
<td>Odor</td>
<td>Odorless.</td>
</tr>
<tr>
<td>Odor threshold</td>
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<tr>
<td>pH</td>
<td>No data available</td>
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<tr>
<td>Melting point</td>
<td>-209.9 °C / -345.9 °F</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Lower flammability limit</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Upper flammability limit</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Autoignition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Water solubility</td>
<td>Very slight</td>
</tr>
<tr>
<td>Partition coefficient</td>
<td>No data available</td>
</tr>
<tr>
<td>Kinematic viscosity</td>
<td>Not applicable</td>
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<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Molecular weight</th>
<th>Boiling point</th>
<th>Vapor Pressure</th>
<th>Vapor density (air =1)</th>
<th>Gas Density kg/ m³@ 20°C</th>
<th>Critical Temperature</th>
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<tbody>
<tr>
<td>Nitrogen</td>
<td>28.01</td>
<td>-196 °C</td>
<td>Above critical temperature</td>
<td>0.97</td>
<td>1.153</td>
<td>-146.9 °C</td>
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</table>

10. STABILITY AND REACTIVITY

Reactivity
Not reactive under normal conditions

Chemical stability
Stable under normal conditions.
Explosion data
Sensitivity to Mechanical Impact  None.
Sensitivity to Static Discharge  None.

Possibility of Hazardous Reactions
None under normal processing.

Conditions to avoid
None under recommended storage and handling conditions (see Section 7).

Incompatible materials
None known.

Hazardous Decomposition Products
None known.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation  Product is a simple asphyxiant.
Skin contact  Contact with liquid may cause cold burns/ frostbite.
Eye contact  Contact with liquid may cause cold burns/ frostbite.
Ingestion  Not an expected route of exposure.

Information on toxicological effects

Symptoms  No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation  Not classified.
Sensitization  Not classified.
Germ cell mutagenicity  Not classified.
Carcinogenicity  This product does not contain any carcinogens or potential carcinogens listed by OSHA, IARC or NTP.
Reproductive toxicity  Not classified.
Developmental Toxicity  Not classified.
STOT - single exposure  Not classified.
STOT - repeated exposure  Not classified.
Chronic toxicity  None known.
Aspiration hazard  Not applicable.

Numerical measures of toxicity

Product Information
Oral LD50  No information available
Dermal LD50  No information available
Inhalation LC50  No information available
Inhalation LC50  No information available.

12. ECOLOGICAL INFORMATION
**Ecotoxicity**
No known acute aquatic toxicity.

**Persistence and degradability**
Not applicable.

**Bioaccumulation**
No information available

**Other adverse effects**
Can cause frost damage to vegetation.

### 13. DISPOSAL CONSIDERATIONS

**Waste treatment methods**

**Disposal of wastes**
Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container properly labeled with any valve outlet plugs or caps secured and valve protection cap in place to Linde for proper disposal.

### 14. TRANSPORT INFORMATION

**DOT**

<table>
<thead>
<tr>
<th>UN/ ID no.</th>
<th>UN1977</th>
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<tbody>
<tr>
<td>Proper shipping name</td>
<td>Nitrogen, refrigerated liquid</td>
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<tr>
<td>Hazard Class</td>
<td>2.2</td>
</tr>
<tr>
<td>Special Provisions</td>
<td>T75, TP5, 346, 345</td>
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<tr>
<td>Description</td>
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<tr>
<td>Emergency Response Guide Number</td>
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**TDG**

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**MEX**

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<td>2.2</td>
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<tr>
<td>ERG Code</td>
<td>2L</td>
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<tr>
<td>Special Provisions</td>
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**IMDG**

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<td>Nitrogen, refrigerated liquid</td>
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<tr>
<td>Hazard Class</td>
<td>2.2</td>
</tr>
<tr>
<td>EmS-No.</td>
<td>F-C, S-V</td>
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<tr>
<td>Special Provisions</td>
<td>345, 346</td>
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<tr>
<td>Description</td>
<td>UN1977, Nitrogen, refrigerated liquid, 2.2</td>
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</tbody>
</table>
15. REGULATORY INFORMATION

International Inventories

<table>
<thead>
<tr>
<th>Legend:</th>
<th>TSCA</th>
<th>DSL/ NDSL</th>
<th>EINECS/ ELINCS</th>
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</thead>
<tbody>
<tr>
<td>TSCA - United States Toxic Substances Control Act Section 8(b) Inventory</td>
<td>Complies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DSL/ NDSL - Canadian Domestic Substances List/ Non-Domestic Substances List</td>
<td></td>
<td>Complies</td>
<td></td>
</tr>
<tr>
<td>EINECS/ ELINCS - European Inventory of Existing Chemical Substances/ European List of Notified Chemical Substances</td>
<td></td>
<td></td>
<td>Complies</td>
</tr>
</tbody>
</table>

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/ 312 Hazard Categories

- Acute Health Hazard: Yes
- Chronic Health Hazard: No
- Fire Hazard: No
- Sudden release of pressure hazard: Yes
- Reactive Hazard: No

CERCLA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)
This product does not contain any substances regulated as hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act Amendments of 1990.

CWA (Clean Water Act)
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

Risk and Process Safety Management Programs
This material, as supplied, does not contain any regulated substances with specified thresholds under 40 CFR 60. This product does not contain any substances regulated as Highly Hazardous Chemicals pursuant to the 29 CFR Part 1910.110.

US State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations
16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health hazards</th>
<th>Flammability</th>
<th>Instability</th>
<th>Physical and Chemical Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>Simple asphyxiant</td>
</tr>
</tbody>
</table>

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2009, CGA Recommended Hazard Ratings for Compressed Gases, 3rd Edition.

Issue Date: 17-Feb-2015
Revision Date: 12-Jul-2016
Revision Note: SDS sections updated; 1

General Disclaimer
For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Linde LLC, Linde Merchant Production, Inc. or Linde Gas North America LLC (or any of their affiliates and subsidiaries) and the purchaser.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES
Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user’s intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

End of Safety Data Sheet