

SDS LIST PURE GAS

ACETYLENE

ARGON

ARGON, REFRIGERATED LIQUID

CARBON DIOXIDE, GAS

CARBON DIOXIDE, REFRIGERATED LIQUID

CARBON MONOXIDE

HELIUM, GAS

HYDROGEN

NITROGEN, GAS

NITROGEN, REFRIGERATED LIQUID

NITROUS OXIDE, GAS

NITROUS OXIDE, REFRIGERATED LIQUID

OXYGEN, GAS

OXYGEN, REFRIGERATED LIQUID

PROPANE

PROPYLENE





ACETYLENE

Safety Data Sheet

1 IDENTIFICATION

Product identifier

Product Name ACETYLENE

Other means of identification

Safety data sheet number LIND-P001
 UN/ID no. UN1001
 Synonyms Ethyne, Ethine, Dissolved Acetylene

Recommended use of the chemical and restrictions on use

Recommended Use Industrial and professional use. Welding.
 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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 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 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 IDENTIFICATIONClassification

OSHA Regulatory Status

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

Flammable gases	Category 1
Gases under pressure	Dissolved gas
Simple asphyxiants	Yes

Label elements

Signal word

Danger

Hazard Statements

Extremely flammable gas

May react explosively even in the absence of air at elevated pressure and/or temperature

Contains gas under pressure; may explode if heated

May displace oxygen and cause rapid suffocation

May form explosive mixtures with air

Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood

Keep away from heat, sparks, open flames, hot surfaces. — No smoking

Use and store only outdoors or in a well ventilated place

Use backflow preventive device in piping

Fusible plugs in top, bottom, or valve melt at 98 °C to 107 °C (208° F to 224° F). Do not discharge at pressures above 15 psi (103 kPa)

Close valve after each use and when empty

Never put cylinders into unventilated areas of passenger vehicles

Precautionary Statements - Response

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical attention/advice.

Leaking gas fire: do not extinguish, unless leak can be stopped safely

Eliminate all ignition sources if safe to do so

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Precautionary Statements - Disposal

Dispose of contents/containers in accordance with container supplier/owner instructions

Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Acetylene	74-86-2	60 - 100	C ₂ H ₂
Acetone	67-64-1	5 - 10	C ₃ H ₆ O

Chemical Additions

For safety reasons, acetylene gas is dissolved in acetone in the gas cylinder.

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	Wash off immediately with soap and plenty of water. Contaminated clothing presents a fire hazard and should be removed immediately. Get medical attention if irritation develops and/or persists.
Eye contact	Consult a physician if direct contact with pressurized material occurs. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek immediate medical attention/advice.
Ingestion	Not an expected route of exposure.
Self-protection of the first aider	Remove all sources of ignition. 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. Symptoms of overexposure are dizziness, headache, tiredness, nausea, unconsciousness, cessation of breathing. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED. Dry chemical. Water spray or fog.

Specific extinguishing methods

If possible, stop the flow of gas. Do not extinguish the fire until supply is shut off as otherwise an explosive-ignition may occur. If the fire is extinguished and the flow of gas continues, GET AWAY!

Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not direct water at source of leak or safety devices; icing may occur. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical

GASEOUS ACETYLENE IS SPONTANEOUSLY COMBUSTIBLE IN AIR AT PRESSURES ABOVE 15 PSI (270 kPa). Pure acetylene is shock sensitive. It requires a very low ignition energy so that fires which have been extinguished without stopping the flow of gas can easily re-ignite with possible explosive force.

Fires involving acetylene occur occasionally at fusible metal pressure relief plugs at the tops and bottoms of cylinders, commonly due to hot metal or slag dropped on the fusible plugs. When the fusible plug releases a large volume of acetylene creating a "roaring" sound. The flame may extend a foot or two away from the cylinder until the pressure is reduced. In most cases, the other end of the cylinder may develop a coating of frost.

If the flame is large, burning from a fusible plug, DO NOT try to put it out unless the cylinder is outdoors or in a very well ventilated area free from sources of ignition. Usually it is very difficult to extinguish large fires because the escaping acetylene may be re-ignited by adjacent ignition sources, thereby possibly creating confined space explosion. Keep containers cool with water spray.

Vapors may travel to source of ignition and flash back. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars, etc.). Cylinders may rupture under extreme heat.

Hazardous combustion products Carbon monoxide. Carbon dioxide (CO₂).

Protective equipment and precautions for firefighters

Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. If the fire is extinguished and the flow of gas continues, GET AWAY!

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Consider the risk of potentially explosive atmospheres. Monitor oxygen level. All equipment used when handling the product must be grounded. Use non-sparking tools and equipment. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Do not touch or walk through spilled material.

Other Information

Gas/vapor is heavier than air. Prevent from entering sewers, basements and workpits, or any place where accumulation may be dangerous.

Environmental precautions

Environmental precautions

Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. Prevent spreading of vapors through sewers, ventilation systems and confined areas. See Section 12 for additional ecological information.

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. DO NOT ATTEMPT TO REMOVE CYLINDERS THAT HAVE BEEN EXPOSED TO HEAT.

Methods for cleaning up

Return cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling

Never use copper piping for acetylene service. Only steel or wrought iron pipe should be used. Open cylinder valve minimum amount required (no more than 1-1.5 turns) to deliver acceptable flow to enable the cylinder to be closed quickly in an emergency situation. Acetylene is shipped in a cylinder packed with a porous mass material, and a liquid solvent, commonly acetone. Acetylene is dissolved in the acetone solution and dispersed throughout the porous medium. When the valve of a charged acetylene cylinder is opened, the acetylene comes out of the solution and passes out in the gaseous form. **IT IS CRUCIAL THAT FUSE PLUGS IN THE TOPS AND BOTTOMS OF ALL ACETYLENE CYLINDERS BE THOROUGHLY INSPECTED WHENEVER HANDLED. REMOVE AND QUARANTINE IN SAFE LOCATION ANY DEFECTIVE CYLINDER.**

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. "NO SMOKING" signs should be posted in storage and use areas. Use only with equipment purged with inert gas or evacuated prior to discharge from cylinder. Avoid contact with pure copper, mercury, silver and brass with greater than 65% copper. Solvent (acetone) may accumulate in piping system. For maintenance use appropriate resistant gloves, eye goggles. Operating pressure should be limited to 15 psig (103 kPa) or less. Consider the use of flashback arrestors. Unless oxygen and acetylene are separated, there should be a non-combustible partition of at least 5 ft. high with a fire-resistance rating of one-half hour between cylinders. In the U.S. cylinders stored inside a building near user locations must be limited to total capacity of 2500 ft³ of gas, exclusive of in-use or attached for use cylinders.

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. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use backflow preventive device in piping. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. 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.

For additional information, consult the Compressed Gas Association's pamphlets P-1, G-1, G-1.1, AV-9, G-1.2, G-1.3, G-1.5, G-1.6, G-1.7, C-13, SB-4, NFPA #51, and OSHA 1910 Subpart H & Q.

Conditions for safe storage, including any incompatibilities**Storage Conditions**

Outside or detached storage is preferred. Do not store cylinders on their side. This makes the acetylene less stable and less safe, and increases the likelihood of solvent loss resulting in decomposition. If rough handling or other occurrences should cause any fusible plug to leak, move the cylinder to an open space well away from an possible source of a sign on the cylinder warning of "Leaking Flammable Gas".

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. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Stored containers should be periodically checked for general condition and leakage.

Incompatible materials

Oxidizing agents. Halogenated compounds. Halogens. Copper. Silver. Mercury. Brasses containing >65% copper and brazing materials containing silver or copper.

8. EXPOSURE CONTROLS/PERSONAL PROTECTIONControl parametersExposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Acetylene 74-86-2			Ceiling: 2500 ppm Ceiling: 2662 mg/m ³
Acetone 67-64-1	STEL: 750 ppm TWA: 500 ppm	TWA: 1000 ppm TWA: 2400 mg/m ³ (vacated) TWA: 750 ppm (vacated) TWA: 1800 mg/m ³ (vacated) STEL: 2400 mg/m ³	IDLH: 2500 ppm 10% LEL TWA: 250 ppm TWA: 590 mg/m ³

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health

Other Information

Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

Appropriate engineering controlsEngineering Controls

Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Explosion proof ventilation systems. Oxygen detectors should be used when asphyxiating gases may be released. Consider installation of leak detection systems in areas of use and storage. Systems under pressure should be regularly checked for leakages. Showers. Eyewash stations.

Individual protection measures, such as personal protective equipmentEye/face protection

Wear safety glasses with side shields (or goggles).

Skin and body protection

Work gloves and safety shoes are recommended when handling cylinders. Wear fire/flame resistant/retardant clothing. Take precautionary measures against static discharge.

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 PROPERTIESInformation on basic physical and chemical properties

Physical state	Compressed gas
Appearance	Colorless.
Odor	Slight garlic.
Odor threshold	No information available
pH	No data available
Melting point	-80.6 °C / -113 °F
Evaporation rate	Not applicable
Fire Hazard	Yes
Lower flammability limit:	2.5%
Upper flammability limit:	82%
Flash point	No information available
Autoignition temperature	296 °C / 565 °F
Decomposition temperature	No data available
Water solubility	Soluble in water.
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m ³ @20°C	Critical Temperature
Acetylene	26.03	-75.2 °C	4378 kPa @ 21.1 °C	0.90	1.72	36.0 °C

10. STABILITY AND REACTIVITY

Reactivity

Forms explosive acetylides with copper, silver and mercury. Do not use alloy containing more than 65% copper

Chemical stability

Do not allow free gas (outside of cylinder) to exceed 15 psig. Do not expose cylinders to sudden shock or heat. Acetylene will decompose violently with cylinder failure. Do not discharge at pressures above 15 psi (103 kPa).

Explosion data

Sensitivity to Mechanical Impact	Self-decomposition or self ignition may be triggered by heat, chemical reaction, friction or impact.
Sensitivity to Static Discharge	Yes.

Possibility of Hazardous Reactions

May react explosively even in absence of air at elevated pressure and/or temperature. May form explosive mixtures with air.

Hazardous polymerization	Temperatures as low as 250°F (121°C) at high pressure, or at low pressure in the presence of a catalyst are sufficient to initiate a polymerization reaction. The hazard is that the polymerization normally liberates heat and may lead to ignition and decomposition of acetylene if conditions permit.
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Conditions to avoid

Heat, flames and sparks.

Incompatible materials

Oxidizing agents. Halogenated compounds. Halogens. Copper. Silver. Mercury. Brasses containing >65% copper and brazing materials containing silver or copper.

Hazardous Decomposition Products

Hydrogen gas. Carbon monoxide (CO). Carbon dioxide (CO₂).

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation	High concentrations (10-20% in air) cause symptoms similar to that of being intoxicated. As a narcotic gas or intoxicant, it causes hypercapnia (an excessive amount of carbon dioxide in the blood). Repeated exposures to tolerable levels has not shown deleterious effects. TCl ₀ , human-inhalation of 20 pph inhaled has been shown to cause headaches and dyspnea.
Skin contact	May cause skin irritation and/or dermatitis.
Eye contact	May cause slight irritation.
Ingestion	Not an expected route of exposure.

Information on toxicological effects

Symptoms	High concentrations may cause asphyxia from lack of oxygen or act as a narcotic causing central nervous system depression. Symptoms of overexposure are dizziness, headache, tiredness, nausea, unconsciousness, cessation of breathing.
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Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	May cause skin and eye irritation.
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.
Target Organ Effects	Central nervous system (CNS), Respiratory system.
Aspiration hazard	Not applicable.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
Acetone 67-64-1	= 5800 mg/kg (Rat)	1700mg/kg (rabbit)	18892 mg/m ³	-

Product Information

Oral LD50	No information available
Dermal LD50	No information available
Inhalation LC50	No information available

The following values are calculated based on chapter 3.1 of the GHS document .

12. ECOLOGICAL INFORMATIONEcotoxicity

No known acute aquatic toxicity.

Persistence and degradability

No information available.

Bioaccumulation

Will not bioconcentrate.

Chemical Name	Partition coefficient
Acetylene 74-86-2	0.32
Acetone 67-64-1	-0.24

13. DISPOSAL CONSIDERATIONSWaste 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. This material, as supplied, is a hazardous waste according to federal regulations (40 CFR 261).

14. TRANSPORT INFORMATIONDOT

UN/ID no.	UN1001
Proper shipping name	Acetylene, dissolved

Hazard Class	2.1
Special Provisions	N86, N88
Description	UN1001, Acetylene, dissolved, 2.1
Emergency Response Guide Number	116

TDG

UN/ID no.	UN1001
Proper shipping name	Acetylene, dissolved mixture
Hazard Class	2.1
Description	UN1001, Acetylene, dissolved mixture, 2.1

MEX

UN/ID no.	UN1001
Proper shipping name	Acetylene, dissolved mixture
Hazard Class	2.1
Description	UN1001, Acetylene, dissolved mixture, 2.1

IATA

UN/ID no.	UN1001
Proper shipping name	Acetylene, dissolved mixture
Hazard Class	2.1
ERG Code	10L
Special Provisions	A1
Description	UN1001, Acetylene, dissolved mixture, 2.1

IMDG

UN/ID no.	UN1001
Proper shipping name	Acetylene, dissolved mixture
Hazard Class	2.1
EmS-No.	F-D, S-U
Description	UN1001, Acetylene, dissolved mixture, 2.1

ADR

UN/ID no.	UN1001
Proper shipping name	Acetylene, dissolved mixture
Hazard Class	2.1
Classification code	4F
Tunnel restriction code	(B/D)
Description	UN1001, Acetylene, dissolved mixture, 2.1, (B/D)

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

US Federal RegulationsSARA 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	No
Chronic Health Hazard	No
Fire Hazard	Yes
Sudden release of pressure hazard	Yes
Reactive Hazard	Yes

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302).

Chemical Name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Acetone 67-64-1	5000 lb		5000 lb 2270 kg

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPS) (see 40 CFR 61)

This product contains the following substances which are listed hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act:

Chemical Name	CAS No.	Hazardous air pollutants (HAPS) content	VOC Chemicals	Class 1	Class 2
Acetylene	74-86-2		X		

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, contains one or more regulated substances with specified thresholds under 40 CFR Part 68 or regulated as a highly hazardous chemical pursuant to the 29 CFR Part 1910.110 with specified thresholds:

Chemical Name	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances	U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals
Acetylene		10000 lb	

US State RegulationsCalifornia Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Acetylene 74-86-2	X	X	X
Acetone 67-64-1	X	X	X

International Regulations

Chemical Name	Carcinogenicity	Exposure Limits
Acetone		Mexico: TWA= 1000 ppm Mexico: TWA= 2400 mg/m ³ Mexico: STEL= 1260 ppm Mexico: STEL= 3000 mg/m ³

16. OTHER INFORMATIONNFPA

Health hazards 0

Flammability 4

Instability 2

Physical and Chemical
Properties -

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 10-Mar-2015
Revision Date 10-Mar-2015
Revision Note Initial Release.

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





ARGON

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name ARGON

Other means of identification

Safety data sheet number LIND-P005
 UN/ID no. UN1006
 Synonyms Argon, Gas; LASER Argon; Argon, Compressed

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 905-501-1700
 www.lindecana.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Emergency telephone number

Company Phone Number 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).

Gases under pressure	Compressed gas
Simple asphyxiants	Yes

Label elements



Signal word

Warning

Hazard Statements

Contains gas under pressure; may explode if heated
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
Use backflow preventive device in piping
Use only with equipment rated for cylinder pressure
Close valve after each use and when empty

Precautionary Statements - Response

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical attention/advice.

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Argon	7440-37-1	100	Ar

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	None under normal use. Get medical attention if symptoms occur.
Eye contact	None under normal use. Get medical attention if symptoms occur.
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.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURESSuitable 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, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURESPersonal 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.
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Environmental precautions

Environmental precautions	Prevent spreading of vapors through sewers, ventilation systems and confined areas.
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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 7 or call your closest Linde location.

Methods for cleaning up Return cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling

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. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use only with equipment rated for cylinder pressure. Use backflow preventive device in piping. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. 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.

For additional recommendations consult Compressed Gas Association's (CGA) Safety Bulletin SB-2: Oxygen-Deficient Atmospheres.

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. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Stored containers should be periodically checked for general condition and leakage.

Incompatible materials

None known.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering Controls

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. Systems under pressure should be regularly checked for leakages.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear safety glasses with side shields (or goggles).

Skin and body protection	Work gloves and safety shoes are recommended when handling cylinders.
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.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Compressed gas
Appearance	Colorless.
Odor	Odorless.
Odor threshold	Not applicable
pH	No data available
Melting point	-189.4 °C / -308.9 °F
Evaporation rate	Not applicable
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	Slightly soluble
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density Kg/m ³ @20°C	Critical Temperature
Argon	39.95	-185.9 °C	Above critical temperature	1.38	1.65	-122.3 °C

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	No data available.
Eye contact	No data available.
Ingestion	Not an expected route of exposure.

Information on toxicological effects

Symptoms	No information available.
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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.
STOT - single exposure	Not classified.
STOT - repeated exposure	Not classified.
Chronic toxicity	None known.
Target Organ Effects	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 INFORMATIONEcotoxicity

No known acute aquatic toxicity.

Persistence and degradability

Not applicable.

Bioaccumulation

No information available.

13. DISPOSAL CONSIDERATIONSWaste 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

UN/ID no.	UN1006
Proper shipping name	Argon, compressed
Hazard Class	2.2
Description	Argon, compressed, 2.2
Emergency Response Guide Number	121

TDG

UN/ID no.	UN1006
Proper shipping name	Argon, compressed
Hazard Class	2.2
Description	UN1006, Argon, compressed, 2.2

MEX

UN/ID no.	UN1006
Proper shipping name	Argon, compressed
Hazard Class	2.2
Description	UN1006, Argon, compressed, 2.2

IATA

UN/ID no.	UN1006
Proper shipping name	Argon, compressed
Hazard Class	2.2
ERG Code	2L
Special Provisions	A69
Description	UN1006, Argon, compressed, 2.2

IMDG

UN/ID no.	UN1006
Proper shipping name	Argon, compressed
Hazard Class	2.2
EmS-No.	F-C, S-V
Description	UN1006, Argon, compressed, 2.2

ADR

UN/ID no.	UN1006
Proper shipping name	Argon, compressed
Hazard Class	2.2
Classification code	1A
Tunnel restriction code	(E)
Description	UN1006, Argon, compressed, 2.2, (E)

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

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	No
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 Part 68. 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

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Argon 7440-37-1	X	X	X

International Regulations

16. OTHER INFORMATION

NFPA Health hazards 0 Flammability 0 Instability 0 Physical and Chemical Properties Simple asphyxiant

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 17-Feb-2015

Revision Note

Initial Release.

General Disclaimer

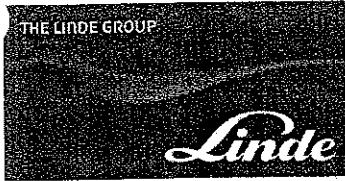
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Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability 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





ARGON, REFRIGERATED LIQUID

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name ARGON, REFRIGERATED LIQUID

Other means of identification

Safety data sheet number LIND-P006
 UN/ID no. UN1951
 Synonyms Argon, Liquid

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 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

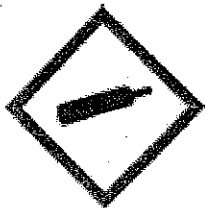
Company Phone Number 800-232-4726 (Linde National Operations Center, US)
 905-501-0802 (Canada)
 CHEMTREC: 1-800-424-9300 (North America) +1-703-527-3887 (International)

2. HAZARDS IDENTIFICATION

Classification

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

Gases under pressure	Refrigerated liquefied gas
Simple asphyxiants	Yes

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/eye protection
 Use 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

Other Information**3. COMPOSITION/INFORMATION ON INGREDIENTS**

Chemical Name	CAS No.	Volume %	Chemical Formula
Argon	7440-37-1	100	Ar

4. FIRST AID MEASURESDescription 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.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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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, MSHA/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.
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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 7 or call your closest Linde location.
Methods for cleaning up	Return cylinder to Linde or an authorized distributor. Return Portable Cryogenic Container to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	<p>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.</p> <p>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. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use backflow preventive device in piping. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Ensure the complete gas system has been checked for leaks before use.</p> <p>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.</p> <p>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.</p> <p>For additional recommendations consult Compressed Gas Association's Pamphlets AV-5, G-11.1, P-9, P-18, P-1, and Safety Bulletin SB-2.</p>
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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

Exposure Guidelines	This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.
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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.
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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: Face-shield. Goggles.
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 PROPERTIESInformation on basic physical and chemical properties

Physical state	Refrigerated liquefied gas
Appearance	Colorless.
Odor	Odorless.
Odor threshold	No information available
pH	No data available
Melting point	-189.4 °C / -308.9 °F
Evaporation rate	Not applicable
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	Very slight
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density Kg/m ³ @20°C	Critical Temperature
Argon	39.95	-185.9 °C	Above critical temperature	1.38	1.65	-122.3 °C

10. STABILITY AND REACTIVITYReactivity

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.
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 INFORMATIONDOT

UN/ID no.	UN1951
Proper shipping name	Argon, refrigerated liquid
Hazard Class	2.2
Special Provisions	T75, TP5
Description	UN1951, Argon, refrigerated liquid, 2.2
Emergency Response Guide Number	120

TDG

UN/ID no.	UN1951
Proper shipping name	Argon, refrigerated liquid
Hazard Class	2.2
Description	UN1951, Argon, refrigerated liquid, 2.2

MEX

UN/ID no.	UN1951
Proper shipping name	Argon, refrigerated liquid
Hazard Class	2.2
Description	UN1951, Argon, refrigerated liquid, 2.2

IATA

UN/ID no.	UN1951
Proper shipping name	Argon, refrigerated liquid
Hazard Class	2.2
ERG Code	2L
Description	UN1951, Argon, refrigerated liquid, 2.2

IMDG

UN/ID no.	UN1951
Proper shipping name	Argon, refrigerated liquid
Hazard Class	2.2
EmS-No.	F-C, S-V
Description	UN1951, Argon, refrigerated liquid, 2.2

ADR

UN/ID no.	UN1951
Proper shipping name	Argon, refrigerated liquid
Hazard Class	2.2
Classification code	3A
Tunnel restriction code	(C/E)
Special Provisions	593
Description	UN1951, Argon, refrigerated liquid, 2.2, (C/E)

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL	Complies

EINECS/ELINCS Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

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 Part 68.
 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

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Argon 7440-37-1	X	X	X

Canada

16. OTHER INFORMATION

<u>NFPA</u>	Health hazards 3	Flammability 0	Instability 0	Physical and Chemical Properties Simple asphyxiant
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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	17-Feb-2015
Revision Note	Initial Release.

General Disclaimer

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End of Safety Data Sheet





CARBON DIOXIDE

Safety Data Sheet

1 IDENTIFICATION

Product identifier

Product Name CARBON DIOXIDE

Other means of identification

Safety data sheet number LIND-P023
 UN/ID no. UN1013
 Synonyms LASER Carbon Dioxide, LASER Carbon Dioxide Ultra, Carbonic Anhydride, Carbonic Acid Gas, Carbon Dioxide USP

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 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 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 IDENTIFICATIONClassification

OSHA Regulatory Status

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

Gases under pressure	Liquefied gas
Simple asphyxiants	Yes

Label elements

Signal word

Warning

Hazard Statements

Contains gas under pressure; may explode if heated
May displace oxygen and cause rapid suffocation

May cause frostbite

May increase respiration and heart rate

Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood
Avoid breathing gas
Do not get in eyes, on skin, or on clothing
Use and store only outdoors or in a well ventilated place
Use a backflow preventive device in piping
Use only with equipment rated for cylinder pressure
Close valve after each use and when empty

Precautionary Statements - Response

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

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Carbon dioxide	124-38-9	100	CO ₂

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. Depending on concentration and duration of exposure to carbon dioxide may cause increased respirations, headache, mild narcotic effects, increased blood pressure and pulse, and asphyxiation. Symptoms of overexposure become more apparent when atmospheric oxygen is decreased to 15-17%. Contact with liquid may cause cold burns/frostbite.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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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, MSHA/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
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atmosphere is proved to be safe.

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 cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling For applications with moist Carbon Dioxide, 316, 309 and 310 stainless steels may be used as well as Hastelloy® A, B, & C and Monel®. Ferrous nickel alloys are slightly susceptible to corrosion. At normal temperatures carbon dioxide is compatible with most plastics and elastomers.

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. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use a backflow preventive device in piping. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. 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.

For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1, AV-7, G-6, G-6.1, G-6.2, G6.3, G-6.5, G-6.7, G-6.9, PS-5, TB-10, and SB-2.

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. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Stored containers should be periodically checked for general condition and leakage.

Incompatible materials Certain reactive metals, hydrides, moist cesium monoxide, or lithium acetylene carbide diammino may ignite. Passing carbon dioxide over a mixture of sodium peroxide and aluminum or magnesium may explode.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Carbon dioxide 124-38-9	STEL = 30000 ppm TWA: 5000 ppm	TWA: 5000 ppm TWA: 9000 mg/m ³ (vacated) TWA: 10000 ppm (vacated) TWA: 18000 mg/m ³ (vacated) STEL: 30000 ppm (vacated) STEL: 54000 mg/m ³	IDLH: 40000 ppm TWA: 5000 ppm TWA: 9000 mg/m ³ STEL: 30000 ppm STEL: 54000 mg/m ³

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health

Other Information

Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

Appropriate engineering controlsEngineering Controls

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. Systems under pressure should be regularly checked for leakages.

Individual protection measures, such as personal protective equipmentEye/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%). If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

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

Physical state	Compressed liquefied gas
Appearance	Colorless.
Odor	Odorless.
Odor threshold	No information available
pH	No data available
Melting point	-56.6 °C / -69.8 °F
Evaporation rate	Not applicable
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	0.145 g/ml @ 25°C
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Component Level Information:

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m ³ @20°C	Critical Temperature

Carbon dioxide	44.01	-78.5 °C (Sublimes)	838 psig (5778 kPa) @ 21.1°C	1.522	1.839	31.1 °C
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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

Due to the presence of Carbon dioxide, Carbonic acid is formed in the presence of moisture.

Incompatible materials

Certain reactive metals, hydrides, moist cesium monoxide, or lithium acetylene carbide diammino may ignite. Passing carbon dioxide over a mixture of sodium peroxide and aluminum or magnesium may explode.

Hazardous Decomposition Products

Oxygen. Carbon monoxide (CO).

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation	Acidosis, adrenal cortical exhaustion, and other metabolic stresses have resulted from prolonged continuous exposure to 1-2% carbon dioxide (10,000 ppm-20,000 ppm). The ACGIH TLV of 5,000 ppm is expected to provide a good margin of safety from asphyxiation and undue metabolic stress provided sufficient oxygen levels are maintained in the air. Increased physical activity, duration of exposure, and decreased oxygen content can affect systemic and respiratory effects resulting from exposure to carbon dioxide.
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	Depending on concentration and duration of exposure to carbon dioxide may cause increased respirations, headache, mild narcotic effects, increased blood pressure and pulse, and asphyxiation. Symptoms of overexposure become more apparent when atmospheric oxygen is decreased to 15-17%.
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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.

STOT - single exposure	Not classified.
STOT - repeated exposure	Not classified.
Chronic toxicity	Chronic harmful effects are not known from repeated inhalation of concentrations below PEL/TLV.
Target Organ Effects	Central Vascular System (CVS), Respiratory system.
Aspiration hazard	Not applicable.

Numerical measures of toxicity

Component Level Information:

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
Carbon dioxide 124-38-9	-	-	470,000 ppm (Rat)	-

Product Information

Oral LD50	No information available
Dermal LD50	No information available
Inhalation LC50	TCLo - 10,000 ppm (Rat) 24 hours/30 days-continuous

12. ECOLOGICAL INFORMATION

Ecotoxicity

No known acute aquatic toxicity.

Persistence and degradability

No information available.

Bioaccumulation

No information available.

Global warming potential (GWP) 1

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

UN/ID no.	UN1013
Proper shipping name	Carbon Dioxide
Hazard Class	2.2
Description	UN1013, Carbon dioxide, 2.2
Emergency Response Guide Number	120

IDG

UN/ID no.	UN1013
Proper shipping name	Carbon Dioxide
Hazard Class	2.2
Description	UN1013, Carbon dioxide, 2.2

MEX

UN/ID no.	UN1013
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Proper shipping name	Carbon Dioxide
Hazard Class	2.2
Description	UN1013, Carbon dioxide, 2.2

IATA

UN/ID no.	UN1013
Proper shipping name	Carbon Dioxide
Hazard Class	2.2
ERG Code	2L
Description	UN1013, Carbon dioxide, 2.2

IMDG

UN/ID no.	UN1013
Proper shipping name	Carbon dioxide
Hazard Class	2.2
EmS-No.	F-C, S-V
Description	UN1013, Carbon dioxide, 2.2

ADR

UN/ID no.	UN1013
Proper shipping name	Carbon Dioxide
Hazard Class	2.2
Classification code	2A
Tunnel restriction code	(C/E)
Special Provisions	584, 653
Description	UN1013, Carbon dioxide, 2.2, (C/E)

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL/NDSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

US Federal RegulationsSARA 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	No
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 Part 68. 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

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Carbon dioxide 124-38-9	X	X	X

International Regulations

Chemical Name	Carcinogenicity	Exposure Limits
Carbon dioxide	-	Mexico: TWA= 5000 ppm Mexico: TWA= 9000 mg/m ³ Mexico: STEL= 15000 ppm Mexico: STEL= 27000 mg/m ³

16. OTHER INFORMATION

NFPA Health hazards 2 Flammability 0 Instability 0 Physical and Chemical Properties Simple asphyxiant

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 17-Apr-2015
Revision Note Initial Release.

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





CARBON DIOXIDE, REFRIGERATED LIQUID

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name CARBON DIOXIDE, REFRIGERATED LIQUID

Other means of identification

Safety data sheet number LIND-P024
 UN/ID no. UN2187
 Synonyms Carbonic Anhydride, Refrigerated Liquid

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 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 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 IDENTIFICATIONClassification

OSHA Regulatory Status

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

Gases under pressure	Refrigerated liquefied gas
Simple asphyxiants	Yes

Label elements

Signal word

Warning

Hazard Statements

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

May increase respiration and heart rate

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

Chemical Name	CAS No.	Volume %	Chemical Formula
Carbon dioxide	124-38-9	100	CO ₂

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. Depending on concentration and duration of exposure to carbon dioxide may cause increased respirations, headache, mild narcotic effects, increased blood pressure and pulse, and asphyxiation. Symptoms of overexposure become more apparent when atmospheric oxygen is decreased to 15-17%. Contact with liquid may cause cold burns/frostbite.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURESSuitable 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, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURESPersonal 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. For applications with moist Carbon Dioxide, 316, 309 and 310 stainless steels may be used as well as Hastelloy® A, B, & C and Monel®. Ferrous nickel alloys are slightly susceptible to corrosion. At normal temperatures carbon dioxide is compatible with most plastics and elastomers.

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. Use an adjustable strap wrench to remove over-tight or rusted caps. 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. 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 strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Never attempt to refill a compressed gas cylinder without the owner's written consent.

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 storage recommendations, consult Compressed Gas Association's Pamphlets P-1, AV-7, G-6, G-6.1, G-6.2, G6.3, G-6.5, G-6.7, G-6.9, PS-5, TB-10, and SB-2.

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. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Stored containers should be periodically checked for general condition and leakage.

Incompatible materials Certain reactive metals, hydrides, moist cesium monoxide, or lithium acetylene carbide diammino may ignite. Passing carbon dioxide over a mixture of sodium peroxide and aluminum or magnesium may explode.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parametersExposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Carbon dioxide 124-38-9	STEL = 30000 ppm TWA: 5000 ppm	TWA: 5000 ppm TWA: 9000 mg/m ³ (vacated) TWA: 10000 ppm (vacated) TWA: 18000 mg/m ³ (vacated) STEL: 30000 ppm (vacated) STEL: 54000 mg/m ³	IDLH: 40000 ppm TWA: 5000 ppm TWA: 9000 mg/m ³ STEL: 30000 ppm STEL: 54000 mg/m ³

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health Immediately Dangerous to Life or Health.

Other Information Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

Appropriate engineering controls

Engineering Controls 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.

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%). If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

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

Physical state	Refrigerated liquefied gas
Appearance	Colorless.
Odor	Odorless.
Odor threshold	No information available
pH	No data available
Melting point	No data available
Evaporation rate	Not applicable
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	Very soluble
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m ³ @20°C	Critical Temperature
Carbon dioxide	44.01	-78.5 °C (Sublimes)	838 psig (5778 kPa) @ 21.1°C	1.522	1.839	31.1 °C

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

Due to the presence of Carbon dioxide, Carbonic acid is formed in the presence of moisture.

Incompatible materials

Certain reactive metals, hydrides, moist cesium monoxide, or lithium acetylene carbide diammino may ignite. Passing carbon dioxide over a mixture of sodium peroxide and aluminum or magnesium may explode.

Hazardous Decomposition Products

Oxygen. Carbon monoxide (CO).

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation	Acidosis, adrenal cortical exhaustion, and other metabolic stresses have resulted from prolonged continuous exposure to 1-2% carbon dioxide (10,000 ppm-20,000 ppm). The ACGIH TLV of 5,000 ppm is expected to provide a good margin of safety from asphyxiation and undue metabolic stress provided sufficient oxygen levels are maintained in the air. Increased physical activity, duration of exposure, and decreased oxygen content can affect systemic and respiratory effects resulting from exposure to carbon dioxide.
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	Depending on concentration and duration of exposure to carbon dioxide may cause increased respirations, headache, mild narcotic effects, increased blood pressure and pulse, and asphyxiation. Symptoms of overexposure become more apparent when atmospheric oxygen is decreased to 15-17%.
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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.
STOT - single exposure	Not classified.
STOT - repeated exposure	Not classified.
Chronic toxicity	Chronic harmful effects are not known from repeated inhalation of concentrations below PEL/TLV.
Target Organ Effects	Central Vascular System (CVS), Respiratory system.
Aspiration hazard	Not applicable.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
Carbon dioxide 124-38-9	-	-	470,000 ppm (Rat)	-

Product Information

Oral LD50	No information available.
Dermal LD50	TCLo - 10,000 ppm (Rat) 24 hours/30 days-continuous
Inhalation LC50	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity

No known acute aquatic toxicity.

Persistence and degradability

No information available.

Bioaccumulation

No information available.

Other adverse effects

Can cause frost damage to vegetation.

Global warming potential (GWP)

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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.
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14. TRANSPORT INFORMATION

DOT

UN/ID no.	UN2187
Proper shipping name	Carbon dioxide, refrigerated liquid
Hazard Class	2.2
Special Provisions	T75, TP5
Description	UN2187, Carbon dioxide, refrigerated liquid, 2.2
Emergency Response Guide Number	120

TDG

UN/ID no.	UN2187
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Proper shipping name	Carbon dioxide, refrigerated liquid
Hazard Class	2.2
Description	UN2187, Carbon dioxide, refrigerated liquid, 2.2

MEX

UN/ID no.	UN2187
Proper shipping name	Carbon dioxide, refrigerated liquid
Hazard Class	2.3
Description	UN2187, Carbon dioxide, refrigerated liquid, 2.3

IATA

UN/ID no.	UN2187
Proper shipping name	Carbon dioxide, refrigerated liquid
Hazard Class	2.2
ERG Code	2L
Description	UN2187, Carbon dioxide, refrigerated liquid, 2.2

IMDG

UN/ID no.	UN2187
Proper shipping name	Carbon dioxide, refrigerated liquid
Hazard Class	2.2
EmS-No.	F-C, S-V
Description	UN2187, Carbon dioxide, refrigerated liquid, 2.2

ADR

UN/ID no.	UN2187
Proper shipping name	Carbon dioxide, refrigerated liquid
Hazard Class	2.2
Classification code	3A
Tunnel restriction code	(C/E)
Special Provisions	593
Description	UN2187, Carbon dioxide, refrigerated liquid, 2.2, (C/E)

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL/NDSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

US Federal RegulationsSARA 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 Part 68. This product does not contain any substances regulated as Highly Hazardous Chemicals pursuant to the 29 CFR Part 1910.110.

US State RegulationsCalifornia Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Carbon dioxide 124-38-9	X	X	X

International Regulations

Chemical Name	Carcinogenicity	Exposure Limits
Carbon dioxide		Mexico: TWA= 5000 ppm Mexico: TWA= 9000 mg/m ³ Mexico: STEL= 15000 ppm Mexico: STEL= 27000 mg/m ³

16. OTHER INFORMATION

NFPA Health hazards 3 Flammability 0 Instability 0 Physical and Chemical Properties Simple asphyxiant

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 17-Feb-2015
Revision Note Initial Release.

General Disclaimer

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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



CARBON MONOXIDE

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name CARBON MONOXIDE

Other means of identification

Safety data sheet number LIND-P027
 UN/ID no. UN1016
 Synonyms Carbonic Oxide; Carbon Oxide; Exhaust Gas; Flue Gas

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 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 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).

Acute toxicity - Inhalation (Gases)	Category 3
Reproductive toxicity	Category 1A
Specific target organ toxicity (repeated exposure)	Category 1
Flammable gases	Category 1
Gases under pressure	Compressed gas

Label elements

Signal word

Danger

Hazard Statements

Extremely flammable gas

Contains gas under pressure; may explode if heated

Toxic if inhaled

May damage fertility or the unborn child

Causes damage to central nervous system through prolonged or repeated exposure.

May form explosive mixtures with air

Asphyxiating even with adequate oxygen

Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood

Keep away from heat, sparks, open flames, hot surfaces. — No smoking

Do not breathe gas.

Use and store only outdoors or in a well ventilated place

Wear protective gloves, protective clothing, eye protection, respiratory protection, and/or face protection

Use a backflow preventive device in piping

Do not open valve until connected to equipment prepared for use

Close valve after each use and when empty

Precautionary Statements - Response

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/physician. IF EXPOSED OR

CONCERNED: Get medical advice/ attention.

Leaking gas fire: do not extinguish, unless leak can be stopped safely

Eliminate all ignition sources if safe to do so

Precautionary Statements - Storage

Store locked up

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Precautionary Statements - Disposal

Dispose of contents/containers in accordance with container supplier/owner instructions

Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Carbon monoxide	630-08-0	100	CO

4. FIRST AID MEASURESDescription 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. Quick removal from the contaminated area is most important. The administering of oxygen at an elevated pressure (up to 2 to 2.5 atmospheres) has shown to be beneficial as has treatment in a hyperbaric chamber. The physician should be informed that the patient has inhaled toxic quantities of carbon monoxide.
Skin contact	None under normal use. Get medical attention if symptoms occur.
Eye contact	None under normal use. Get medical attention if symptoms occur.
Ingestion	Not an expected route of exposure.
Self-protection of the first aider	Use personal protective equipment as required. Avoid contact with skin, eyes or clothing. Remove all sources of ignition.

Most important symptoms and effects, both acute and delayed

Symptoms	Carbon monoxide is odorless and colorless. There may be no warning of overexposure until symptoms occur. Inhaled carbon monoxide binds with blood hemoglobin to form carboxyhemoglobin, a substance that can not take part in the normal oxygen transport. This greatly reduces the blood's ability to transport oxygen. Depending on levels and duration of exposure, symptoms may include headache, dizziness, heart palpitations, weakness, confusion, nausea, convulsions, eventual unconsciousness and death.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURESSuitable extinguishing media

Dry chemical or CO₂. Water spray (fog). DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Specific extinguishing methods

If possible, stop the flow of gas. Do not extinguish the fire until supply is shut off as otherwise an explosive-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Ventilation fans must be explosion proof. Use non-sparking tools to close container valves.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on

surrounding containers. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical

Extremely flammable gas. May form explosive mixtures with air. Having almost the same density as air, carbon monoxide will not diffuse by rising. Flammable in air over a very wide range. Will be easily ignited by heat, sparks or flames. Vapors may travel to source of ignition and flash back. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars, etc.). Cylinders may rupture under extreme heat.

Hazardous combustion products None.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Monitor oxygen level. Consider the risk of potentially explosive atmospheres. All equipment used when handling the product must be grounded. Use non-sparking tools and equipment. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

Environmental precautions

Environmental precautions Beware of vapors accumulating to form explosive concentrations. 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 cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. Separate flammable gas cylinders from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire resistance rating of a half an hour. "NO SMOKING" signs should be posted in storage and use areas. Carbon monoxide can be handled in all commonly used metals up to approximately 500 psig (3450 kPa). Above that pressure it forms toxic and corrosive carbonyl compounds with some metals. Carbon steels, aluminum alloys, copper and copper alloys, low carbon stainless steel and nickel-based alloys such as Hastelloy A, B, & C are recommended for higher pressure applications.

Protect cylinders from physical damage; do not drag, roll, slide or drop. Never attempt to lift a cylinder by its valve protection cap. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use a backflow preventive device in piping. Use only with equipment rated for cylinder pressure. Close valve after

each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. 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.

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. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Stored containers should be periodically checked for general condition and leakage. Outside or detached storage is preferred.

Incompatible materials

Oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Carbon monoxide 630-08-0	TWA: 25 ppm	TWA: 50 ppm TWA: 55 mg/m ³ (vacated) TWA: 35 ppm (vacated) TWA: 40 mg/m ³ (vacated) Ceiling: 200 ppm (vacated) Ceiling: 229 mg/m ³	IDLH: 1200 ppm Ceiling: 200 ppm Ceiling: 229 mg/m ³ TWA: 35 ppm TWA: 40 mg/m ³

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health

Other Information

Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

Appropriate engineering controls

Engineering Controls

Explosion proof ventilation systems. Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Consider installation of leak detection systems in areas of use and storage. Systems under pressure should be regularly checked for leakages.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear safety glasses with side shields (or goggles).

Skin and body protection

Work gloves and safety shoes are recommended when handling cylinders. Wear fire/flame resistant/retardant clothing. Take precautionary measures against static discharge.

Respiratory protection

If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

General Hygiene Considerations

Handle in accordance with good industrial hygiene and safety practice. Do not eat, drink or smoke

when using this product. Wash hands before breaks and immediately after handling the product.
Regular cleaning of equipment, work area and clothing is recommended.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Gas
Appearance	Colorless.
Odor	Odorless.
Odor threshold	No information available
pH	No data available
Melting point	-205.1 °C / -337.1 °F
Evaporation rate	Not applicable
Fire Hazard	Yes
Lower flammability limit:	12.5%
Upper flammability limit:	74%
Flash point	Not applicable
Autoignition temperature	639 °C / 1182 °F
Decomposition temperature	No data available
Water solubility	Very slight
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m ³ @20°C	Critical Temperature
Carbon monoxide	28.01	-191.5 °C	Above critical temperature	0.97	1.16	-138.7 °C

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	Yes.

Possibility of Hazardous Reactions

May form explosive mixtures with air.

Conditions to avoid

Heat, flames and sparks.

Incompatible materials

Oxidizing agents.

Hazardous Decomposition Products

Carbon dioxide (CO₂).

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation

Chemical Asphyxiant-interferes with oxygen transport.

Skin contact	No data available.
Eye contact	No data available.
Ingestion	Not an expected route of exposure.

Information on toxicological effects

Symptoms	Carbon monoxide is odorless and colorless. There may be no warning of overexposure until symptoms occur. Inhaled carbon monoxide binds with blood hemoglobin to form carboxyhemoglobin, a substance that can not take part in the normal oxygen transport. This greatly reduces the blood's ability to transport oxygen. Depending on levels and duration of exposure, symptoms may include headache, dizziness, heart palpitations, weakness, confusion, nausea, convulsions, eventual unconsciousness and death.
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Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Not classified.
Sensitization	Not classified.
Germ cell mutagenicity	Genetic changes observed in mammalian cell assay systems at exposures of 1500 to 2500 ppm of carbon monoxide for 10 minutes.
Carcinogenicity	This product does not contain any carcinogens or potential carcinogens listed by OSHA, IARC or NTP.
Reproductive toxicity	Category 1A. Overexposure to carbon monoxide may decrease the likelihood of successful pregnancy. In rats treated with carbon monoxide, the rate of successful pregnancy in the control group was 100% whereas the rate of successful pregnancy in animals treated with 30 and 90 ppm of carbon monoxide was 69% and 38% respectively.
Developmental Toxicity	Mice exposed to concentrations of carbon monoxide at 65 ppm and higher demonstrated dose-dependent effects on the fetus (increased mortality and decreased weight) with no signs of maternal toxicity. Offspring of rats exposed to 150 ppm carbon monoxide had minor reductions in birth weight and persistent memory deficits which became more pronounced in adulthood.
STOT - single exposure	Not classified.
STOT - repeated exposure	Category 1.
Chronic toxicity	Causes damage to central nervous system through prolonged or repeated exposure.
Target Organ Effects	Lungs, Central nervous system (CNS), Blood, Central vascular system (CVS).
Aspiration hazard	Not applicable.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
Carbon monoxide 630-08-0	-	-	-	3760 ppm (Rat) 1hr

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

12. ECOLOGICAL INFORMATIONEcotoxicity

No known acute aquatic toxicity.

Persistence and degradability

Not applicable.

Bioaccumulation

No information available.

13. DISPOSAL CONSIDERATIONSWaste 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 INFORMATIONDOT

UN/ID no.	UN1016
Proper shipping name	Carbon monoxide, compressed
Hazard Class	2.3
Subsidiary class	2.1
Special Provisions	4
Description	UN1016, Carbon monoxide, compressed, 2.3 (2.1)
Additional Description:	"Toxic-Inhalation Hazard Zone D"
Additional Marking Requirements:	"Inhalation Hazard"
Emergency Response Guide Number	119

TDG

UN/ID no.	UN1016
Proper shipping name	Carbon monoxide, compressed
Hazard Class	2.3
Subsidiary class	2.1
Description	UN1016, Carbon monoxide, compressed, 2.3 (2.1)

MEX

UN/ID no.	UN1016
Proper shipping name	Carbon monoxide, compressed
Hazard Class	2.3
Subsidiary class	2.1
Description	UN1016, Carbon monoxide, compressed, 2.3 (2.1)

IATA

Forbidden

IMDG

UN/ID no.	UN1016
Proper shipping name	Carbon monoxide, compressed
Hazard Class	2.3
Subsidiary hazard class	2.1
EmS-No.	F-D, S-U
Description	UN1016, Carbon monoxide, compressed, 2.3 (2.1)

ADR

UN/ID no.	UN1016
Proper shipping name	Carbon monoxide, compressed
Hazard Class	2.3
Classification code	1TF
Tunnel restriction code	(B/D)
Description	UN1016, Carbon monoxide, compressed, 2.3 (2.1), (B/D)
Labels	2.1

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL/NDSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

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	Yes
Fire Hazard	Yes
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 Part 68. 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 contains the following Proposition 65 chemicals

Chemical Name	California Proposition 65
Carbon monoxide - 630-08-0	Developmental

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Carbon monoxide 630-08-0	X	X	X

International Regulations

Chemical Name	Carcinogenicity	Exposure Limits
Carbon monoxide	-	Mexico: TWA 50 ppm Mexico: TWA 55 mg/m ³ Mexico: STEL 400 ppm Mexico: STEL 400 mg/m ³

Chemical Name	NPRI
Carbon monoxide	X

Legend
Canada NPRI - National Pollutant Release Inventory

16. OTHER INFORMATION

NFPA

Health hazards 2

Flammability 4

Instability 0

Physical and Chemical
Properties -

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 26-Feb-2015
Revision Date 26-Feb-2015
Revision Note Initial Release.

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End of Safety Data Sheet



HELIUM

Safety Data Sheet

1. IDENTIFICATION

Product Identifier

Product Name HELIUM

Other means of identification

Safety data sheet number LIND-P060
 UN/ID no. UN1046
 Synonyms LASER Helium; LASER Helium Ultra; Helium; Helium, compressed; Helium-4

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 905-501-1700
 www.lindecana.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Emergency telephone number

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

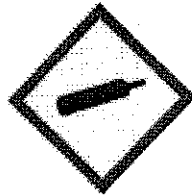
2. HAZARDS IDENTIFICATION

Classification

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

Gases under pressure	Compressed gas
Simple asphyxiants	Yes

Label elements



Signal word

Warning

Hazard Statements

Contains gas under pressure; may explode if heated
 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
 Use backflow preventive device in piping
 Use only with equipment rated for cylinder pressure
 Close valve after each use and when empty

Precautionary Statements - Response

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical attention/advice.

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)

Not applicable

Other Information

Intentional inhalation of helium balloon gas can cause asphyxiation, lung damage, and death

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Helium	7440-59-7	100	He

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	None under normal use. Get medical attention if symptoms occur.
Eye contact	None under normal use. Get medical attention if symptoms occur.
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.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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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, MSHA/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.
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Environmental precautions

Environmental precautions	Prevent spreading of vapors through sewers, ventilation systems and confined areas.
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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 cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling

Proper handling, storage of regulating equipment and cylinders is required to safely fill helium balloons. **DO NOT ALLOW CHILDREN OR UNQUALIFIED PEOPLE TO OPERATE BALLOON FILLING EQUIPMENT. INTENTIONAL INHALATION OF HELIUM CAN CAUSE SERIOUS LUNG DAMAGE OR DEATH.** A balloon filling helium regulator must be attached to the valve before it is opened.

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. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use equipment rated for cylinder pressure. Use backflow preventive device in piping. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. 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.

For additional recommendations consult Compressed Gas Association's (CGA) Safety Bulletin SB-2, Oxygen-Deficient Atmospheres. Use only with equipment rated for cylinder pressure.

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

Exposure Guidelines

This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering Controls

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. Systems under pressure should be regularly checked for leakages.

Individual protection measures, such as personal protective equipment

Eye/face protection

Wear safety glasses with side shields (or goggles).

Skin and body protection

Work gloves and safety shoes are recommended when handling cylinders.

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.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties.

Physical state	Compressed gas
Appearance	Colorless.
Odor	Odorless.
Odor threshold	Not applicable
pH	No data available
Melting point	No data available
Evaporation rate	Not applicable
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	Slightly soluble
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density Kg/m ³ @20°C	Critical Temperature
Helium	4.00	-268.9 °C	Above critical temperature	0.138	0.165	-267.9 °C

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	No data available.
Eye contact	No data available.
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.

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

UN/ID no.	UN1046
Proper shipping name	Helium, compressed
Hazard Class	2.2
Description	UN1046, Helium, compressed, 2.2
Emergency Response Guide Number	121

TDG

UN/ID no.	UN1046
Proper shipping name	Helium, compressed
Hazard Class	2.2
Description	UN1046, Helium, compressed, 2.2

MEX

UN/ID no.	UN1046
Proper shipping name	Helium, compressed
Hazard Class	2.2
Description	UN1046, Helium, compressed, 2.2

IATA

UN/ID no.	UN1046
Proper shipping name	Helium, compressed
Hazard Class	2.2
ERG Code	2L
Special Provisions	A69
Description	UN1046, Helium, compressed, 2.2

IMDG

UN/ID no.	UN1046
Proper shipping name	Helium, compressed
Hazard Class	2.2
EmS-No.	F-C, S-V
Description	UN1046, Helium, compressed, 2.2

ADR

UN/ID no.	UN1046
Proper shipping name	Helium, compressed
Hazard Class	2.2
Classification code	1A
Tunnel restriction code	(E)
Description	UN1046, Helium, compressed, 2.2. (E)

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

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	No
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 Part 68.
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

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Helium 7440-59-7	X	X	X

Canada

16. OTHER INFORMATION

NFPA Health hazards 0 Flammability 0 Instability 0 Physical and Chemical Properties Simple asphyxiant

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 17-Feb-2015
Revision Note Initial Release.

General Disclaimer

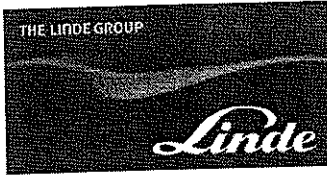
For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Linde LLC, Linde Merchant Production, Inc. or Linde Gas North America LLC (or any of their affiliates and subsidiaries) and the purchaser.

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





HYDROGEN

Safety Data Sheet

1. IDENTIFICATION

<u>Product identifier</u>	
Product Name	HYDROGEN
<u>Other means of identification</u>	
Safety data sheet number	LIND-P066
UN/ID no.	UN1049
Synonyms	Normal Hydrogen; Hydrogen, Compressed
<u>Recommended use of the chemical and restrictions on use</u>	
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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 905-501-1700
www.lindecana.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

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

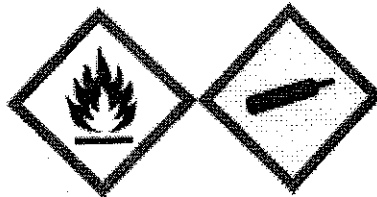
2. HAZARDS IDENTIFICATION

Classification

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

Flammable gases	Category 1
Gases under pressure	Compressed gas
Simple asphyxiants	Yes

Label elements



Signal word

Danger

Hazard Statements

Extremely flammable gas
 Contains gas under pressure; may explode if heated
 May displace oxygen and cause rapid suffocation

May form explosive mixtures with air
 Burns with invisible flame

Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood
 Keep away from heat, sparks, open flames, hot surfaces. — No smoking
 Use and store only outdoors or in a well ventilated place
 Use a backflow preventive device in piping
 Use only with equipment rated for cylinder pressure
 Do not open valve until connected to equipment prepared for use
 Close valve after each use and when empty

Precautionary Statements - Response

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical attention/advice.
 Leaking gas fire: do not extinguish, unless leak can be stopped safely
 Eliminate all ignition sources if safe to do so

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Hydrogen	1333-74-0	100	H ₂

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	None under normal use. Get medical attention if symptoms occur.
Eye contact	None under normal use. Get medical attention if symptoms occur.
Ingestion	Not an expected route of exposure.
Self-protection of the first aider	RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Remove all sources of ignition.

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.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Dry chemical or CO₂. Water spray (fog). DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Specific extinguishing methods

If possible, stop the flow of gas. Do not extinguish the fire until supply is shut off as otherwise an explosive-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Ventilation fans must be explosion proof. Use non-sparking tools to close container valves.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical

Extremely flammable gas. May form explosive mixtures with air. Hydrogen is very light and may collect in the upper portions of storage areas. Hydrogen burns with an almost invisible flame. High pressure releases may ignite with no apparent ignition source possibly via static electricity. Vapors may travel to source of ignition and flash back. Cylinders may rupture under extreme heat.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Monitor oxygen level. Consider the risk of potentially explosive atmospheres. All equipment used when handling the product must be grounded. Use non-sparking tools and equipment. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

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 cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. Separate flammable gas cylinders from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire resistance rating of a half an hour. "NO SMOKING" signs should be posted in storage and use areas. Hydrogen is non-corrosive. However hydrogen can interact with metals (hardened steels) to cause embrittlement.

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. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use a backflow preventive device in piping. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. 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.

For additional recommendations, consult Compressed Gas Association's pamphlets P-1, G-5, G-5.3, G-5.5, P-6 and Safety Bulletin SB-2. NFPA 50A covers gaseous hydrogen at consumer sites.

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. Outside or detached storage is preferred.

Incompatible materials Oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering Controls Explosion proof 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. Systems under pressure should be regularly checked for leakages. Consider installation of leak detection systems in areas of use and storage.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles).

Skin and body protection Work gloves and safety shoes are recommended when handling cylinders. Wear fire/flame resistant/retardant clothing. Take precautionary measures against static discharge.

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.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Compressed gas
Appearance	Colorless.
Odor	Odorless.
Odor threshold	No information available
pH	No data available
Melting point	-259.2 °C / -434.8 °F
Evaporation rate	Not applicable
Fire Hazard	Yes
Lower flammability limit:	4%
Upper flammability limit:	75%
Flash point	No information available
Autoignition temperature	570 °C / 1058 °F
Decomposition temperature	No data available
Water solubility	0.019 vol/vol @ 15.6°C
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m ³ @20°C	Critical Temperature
Hydrogen	1.00	-252.8 °C	Above critical temperature	0.07	0.083	-240 °C

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 Yes.

Possibility of Hazardous Reactions

May form explosive mixtures with air. May react violently with oxidizers.

Conditions to avoid

Heat, flames and sparks. Flammable or explosive when mixed with chlorine or other oxidizing materials. Fluorine and hydrogen react at -418°F (-250°C) when impurities are present. Chlorine/hydrogen mixtures explode if exposed to light. Lithium metal will burn in a hydrogen atmosphere.

Incompatible materials

Oxidizing agents.

Hazardous Decomposition Products

None known.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation Product is a simple asphyxiant.
Skin contact No data available.
Eye contact No data available.
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.
STOT - single exposure Not classified.
STOT - repeated exposure Not classified.
Chronic toxicity None known.
Aspiration hazard Not applicable.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
Hydrogen 1333-74-0	-	-	> 15000 ppm (Rat) 1 h	-

Product Information

Oral LD50	No information available
Dermal LD50	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.

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

UN/ID no.	UN1049
Proper shipping name	Hydrogen, compressed
Hazard Class	2.1
Special Provisions	N89
Description	UN1049, Hydrogen, compressed, 2.1
Emergency Response Guide Number	115

TDG

UN/ID no.	UN1049
Proper shipping name	Hydrogen, compressed
Hazard Class	2.1
Description	UN1049, Hydrogen, compressed, 2.1

MEX

UN/ID no.	UN1049
Proper shipping name	Hydrogen, compressed
Hazard Class	2.1
Description	UN1049, Hydrogen, compressed, 2.1

IATA

UN/ID no.	UN1049
Proper shipping name	Hydrogen, compressed
Hazard Class	2.1
ERG Code	10L
Special Provisions	A1
Description	UN1049, Hydrogen, compressed, 2.1

LIND-P066 HYDROGEN

IMDG

UN/ID no.	UN1049
Proper shipping name	Hydrogen, compressed
Hazard Class	2.1
EmS-No.	F-D, S-U
Description	UN1049, Hydrogen, compressed, 2.1

ADR

UN/ID no.	UN1049
Proper shipping name	Hydrogen, compressed
Hazard Class	2.1
Classification code	1F
Tunnel restriction code	(B/D)
Description	UN1049, Hydrogen, compressed, 2.1, (B/D)

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL/NDSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDSL - Canadian Domestic Substances List/ Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

US Federal RegulationsSARA 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	No
Chronic Health Hazard	No
Fire Hazard	Yes
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, contains one or more regulated substances with specified thresholds under 40 CFR Part 68 or regulated as a highly hazardous chemical pursuant to the 29 CFR Part 1910.110 with specified thresholds:

Chemical Name	U.S. - CAA (Clean Air Act) -	U.S. - CAA (Clean Air Act) -	U.S. - OSHA - Process Safety

	Accidental Release Prevention - Toxic Substances	Accidental Release Prevention - Flammable Substances	Management - Highly Hazardous Chemicals
Hydrogen		10000 lbs	

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Hydrogen 1333-74-0	X	X	X

International Regulations

16. OTHER INFORMATION

NFPA Health hazards 0 Flammability 4 Instability 0 Physical and Chemical Properties -

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 24-Feb-2015
 Revision Date 24-Feb-2015
 Revision Note Initial Release.

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

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End of Safety Data Sheet





NITROGEN

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name NITROGEN

Other means of identification

Safety data sheet number LIND-P086
 UN/ID no. UN1066
 Synonyms LASER Nitrogen, LASER Nitrogen Ultra, Nitrogen, compressed

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 905-501-1700
 www.lindecana.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Emergency telephone number

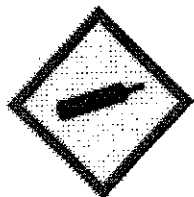
Company Phone Number 800-232-4726 (Linde National Operations Center, US)
 905-501-0802 (Canada)
 CHEMTREC: 1-800-424-9300 (North America) +1-703-527-3887 (International)

2. HAZARDS IDENTIFICATION

Classification

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

Gases under pressure	Compressed gas
Simple asphyxiants	Yes

Label elements

Signal word

Warning

Hazard Statements

Contains gas under pressure; may explode if heated
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
Use backflow preventive device in piping
Use only with equipment rated for cylinder pressure
Close valve after each use and when empty

Precautionary Statements - Response

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical attention/advice.

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)

Not applicable

Other information

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Nitrogen	7727-37-9	100	N ₂

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	None under normal use. Get medical attention if symptoms occur.
Eye contact	None under normal use. Get medical attention if symptoms occur.
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.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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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, MSHA/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.
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Environmental precautions

Environmental precautions	Prevent spreading of vapors through sewers, ventilation systems and confined areas.
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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 cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handlingAdvice on safe handling

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. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use equipment rated for cylinder pressure. Use backflow preventive device in piping. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. 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.

For additional recommendations consult Compressed Gas Association's (CGA) Safety Bulletin SB-2, Oxygen-Deficient Atmospheres.

Conditions for safe storage, including any incompatibilitiesStorage 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. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Stored containers should be periodically checked for general condition and leakage.

Incompatible materials

None known.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parametersExposure Guidelines

This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controlsEngineering Controls

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. Systems under pressure should be regularly checked for leakages.

Individual protection measures, such as personal protective equipmentEye/face protection

Wear safety glasses with side shields (or goggles).

Skin and body protection

Work gloves and safety shoes are recommended when handling cylinders.

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.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state	Compressed gas
Appearance	Colorless.
Odor	Odorless.
Odor threshold	Not applicable
pH	No data available
Melting point	-209.9 °C / -345.9 °F
Evaporation rate	Not applicable
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	Slightly soluble
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density Kg/m ³ @20°C	Critical Temperature
Nitrogen	28.01	-196 °C	Above critical temperature	0.97	1.153	-146.9 °C

10. STABILITY AND REACTIVITYReactivity

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 INFORMATIONInformation on likely routes of exposure

Inhalation	Product is a simple asphyxiant.
Skin contact	No data available.
Eye contact	No data available.

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.

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

UN/ID no.	UN1066
Proper shipping name	Nitrogen, compressed
Hazard Class	2.2
Description	UN1066, Nitrogen, compressed
Emergency Response Guide Number	121

TDG

UN/ID no.	UN1066
Proper shipping name	Nitrogen, compressed
Hazard Class	2.2
Description	UN1066, Nitrogen, compressed

MEX

UN/ID no.	UN1066
Proper shipping name	Nitrogen, compressed
Hazard Class	2.2
Description	UN1066, Nitrogen, compressed

IATA

UN/ID no.	UN1066
Proper shipping name	Nitrogen, compressed
Hazard Class	2.2
ERG Code	2L
Special Provisions	A69
Description	UN1066, Nitrogen, compressed

IMDG

UN/ID no.	UN1066
Proper shipping name	Nitrogen, compressed
Hazard Class	2.2
EmS-No.	F-C, S-V
Description	UN1066, Nitrogen, compressed, 2.2

ADR

UN/ID no.	UN1066
Proper shipping name	Nitrogen, compressed
Hazard Class	2.2
Classification code	1A
Tunnel restriction code	(E)
Special Provisions	653
Description	UN1066, Nitrogen, compressed

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

US Federal RegulationsSARA 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	No
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 Part 68. 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

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Nitrogen 7727-37-9	X	X	X

Canada

16. OTHER INFORMATION

NFPA Health hazards 0 Flammability 0 Instability 0 Physical and Chemical Properties Simple asphyxiant

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 17-Feb-2015
 Revision Note Initial Release.

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





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

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 905-501-1700
 www.lindecana.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Emergency telephone number

Company Phone Number 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).

Gases under pressure	Refrigerated liquefied gas
Simple asphyxiants	Yes

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/eye protection
Use 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

Other Information**3. COMPOSITION/INFORMATION ON INGREDIENTS**

Chemical Name	CAS No.	Volume %	Chemical Formula
Nitrogen	7727-37-9	100	N ₂

4. FIRST AID MEASURESDescription 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.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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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, MSHA/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.
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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 7 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 backflow preventive device in piping. Use an adjustable strap wrench to remove over-tight 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 PROPERTIESInformation on basic physical and chemical properties

Physical state	Refrigerated liquefied gas
Appearance	Colorless.
Odor	Odorless.
Odor threshold	No information available
pH	No data available
Melting point	-209.9 °C / -345.9 °F
Evaporation rate	Not applicable
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	Very slight
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density Kg/m ³ @20°C	Critical Temperature
Nitrogen	28.01	-196 °C	Above critical temperature	0.97	1.153	-146.9 °C

10. STABILITY AND REACTIVITYReactivity

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 INFORMATIONInformation 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 INFORMATIONEcotoxicity

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 CONSIDERATIONSWaste 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 INFORMATIONDOT

UN/ID no.	UN1977
Proper shipping name	Nitrogen, refrigerated liquid
Hazard Class	2.2
Special Provisions	T75, TP5, 346, 345
Description	UN1977, Nitrogen, refrigerated liquid, 2.2
Emergency Response Guide Number	120

TDG

UN/ID no.	UN1977
Proper shipping name	Nitrogen, refrigerated liquid
Hazard Class	2.2
Description	UN1977, Nitrogen, refrigerated liquid, 2.2

MEX

UN/ID no.	UN1977
Proper shipping name	Nitrogen, refrigerated liquid
Hazard Class	2.2
Description	UN1977, Nitrogen, refrigerated liquid, 2.2

IATA

UN/ID no.	UN1977
Proper shipping name	Nitrogen, refrigerated liquid
Hazard Class	2.2
ERG Code	2L
Special Provisions	A152
Description	UN1977, Nitrogen, refrigerated liquid, 2.2

IMDG

UN/ID no.	UN1977
Proper shipping name	Nitrogen, refrigerated liquid
Hazard Class	2.2
EmS-No.	F-C, S-V
Special Provisions	345, 346
Description	UN1977, Nitrogen, refrigerated liquid, 2.2

ADR

UN/ID no.	UN1977
Proper shipping name	Nitrogen, refrigerated liquid
Hazard Class	2.2

Classification code 3A
 Tunnel restriction code (C/E)
 Special Provisions 345, 346, 593
 Description UN1977, Nitrogen, refrigerated liquid, 2.2, (C/E)



5. REGULATORY INFORMATION

International Inventories

TSCA Complies
 DSL Complies
 EINECS/ELINCS Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

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 Part 68. 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

Chemical Name	New Jersey	Massachusetts	Pennsylvania
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Nitrogen 7727-37-9	X	X	X
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Canada

16. OTHER INFORMATION

NFPA Health hazards 3 Flammability 0 Instability 0 Physical and Chemical Properties Simple asphyxiant

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 17-Feb-2015
 Revision Note Initial Release.

General Disclaimer

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End of Safety Data Sheet





NITROUS OXIDE

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name NITROUS OXIDE

Other means of identification

Safety data sheet number LIND-P090
 UN/ID no. UN1070
 Synonyms Dinitrogen Monoxide; Laughing Gas; Fictitious Air; Hyponitrous Acid Anhydride; Nitrogen(I) Oxide

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 905-501-1700
 www.lindecana.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Emergency telephone number

Company Phone Number 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).

Specific target organ toxicity (single exposure)	Category 3
Oxidizing gases	Category 1
Gases under pressure	Liquefied gas
Simple asphyxiants	Yes

Label elements



Signal word

Danger

Hazard Statements

- May cause or intensify fire; oxidizer
- Contains gas under pressure; may explode if heated
- May displace oxygen and cause rapid suffocation
- May cause drowsiness or dizziness
- May cause frostbite

Precautionary Statements - Prevention

- Do not handle until all safety precautions have been read and understood
- Keep and store away from clothing and other combustible materials
- Keep valves and fittings free from oil and grease
- Avoid breathing gas
- Do not get in eyes, on skin, or on clothing
- Use and store only outdoors or in a well ventilated place
- Use backflow preventive device in piping
- Use only equipment of compatible materials of construction and rated for cylinder pressure
- Use only with equipment cleaned for oxygen service
- Open valve slowly
- Close valve after each use and when empty

Precautionary Statements - Response

- IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.
- IF ON SKIN: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
- In case of fire: Stop leak if safe to do so

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)

Not applicable

Other Information

Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal

This product contains one or more chemicals known to the State of California to cause cancer, birth defects or other reproductive harm

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Nitrous oxide	10024-97-2	100	N ₂ O

4. FIRST AID MEASURESDescription of first aid measures

General advice	Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.
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. Central nervous system depression. Contact with liquid may cause cold burns/frostbite.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURESSuitable 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

May cause or intensify fire; oxidizer. Will support and accelerate combustion of combustible materials (wood, paper, oil, debris, etc). May decompose violently at temperatures above 1112°F (600°C). Cylinders may rupture under extreme heat.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/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. Eliminate all ignition sources if safe to do so.
Other Information	Gas/vapor is heavier than air. Prevent from entering sewers, basements and workpits, or any place where accumulation may be dangerous.

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 cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	<p>Due to increased misuse and abuse of nitrous oxide, handling and storage precautions should be implemented to prevent theft and improper use. The following recommendations may not include all precautions which are necessary. Nitrous oxide systems should be installed in accordance with CGA G-8.1, "Standard for Nitrous Oxide Systems at Consumer Sites". Keep full and empty nitrous oxide containers and utilization equipment stored in a secured area. Allow only authorized personnel to remove containers, inventory and account for both full and empty containers and bulk product. Promptly report any theft of nitrous oxide to the police and the supplier. Establish other procedures as necessary to check for unusual use or loss of nitrous oxide.</p> <p>Keep valves and fittings free from oil and grease. Use only with equipment cleaned for oxygen service. Use only equipment of compatible materials of construction. Open valve slowly. "NO SMOKING" signs should be posted in storage and use areas. Separate flammable gas cylinders from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire resistance rating of a half an hour.</p>
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Protect cylinders from physical damage; do not drag, roll, slide or drop. Never attempt to lift a cylinder by its valve protection cap. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use backflow preventive device in piping. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. 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 Pamphlet G-8.2 and SB-6.

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. Do not store near combustible materials. Stored containers should be periodically checked for general condition and leakage.

Incompatible materials Combustible materials. Organic material. Reducing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitrous oxide 10024-97-2	TWA: 50 ppm		TWA: 25 ppm over the time exposed to waste anesthetic gas TWA: 46 mg/m ³ over the time exposed to waste anesthetic gas

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health

Appropriate engineering controls

Engineering Controls Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Consider installation of leak detection systems in areas of use and storage. Systems under pressure should be regularly checked for leakages. 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. Gloves must be clean and free from grease or oil.

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

Physical state	Compressed gas
Appearance	Colorless.
Odor	Slight sweet.
Odor threshold	No information available
pH	No data available
Melting point	-90.81 °C / -131.5 °F
Evaporation rate	Not applicable
Fire Hazard	Yes
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	Slightly soluble
Partition coefficient	0.4
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m ³ @20°C	Critical Temperature
Nitrous oxide	44.01	-88.56 °C	Gas at atmospheric pressure.	1.53	1.95	36.4 °C

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

Heat, flames and sparks. Nitrous oxide will serve as the oxidant for most flammable materials. Some flammables will have a lower flammable limit in nitrous oxide than in pure oxygen.

Incompatible materials

Combustible materials. Organic material. Reducing agents.

Hazardous Decomposition Products

At elevated temperatures, nitrous oxide decomposes into nitrogen and oxygen, the rate of decomposition being appreciable at about 1112°F (600°C). Nitrous oxide exposed to fire or other intense heat source may decompose violently.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation	Anesthetic effects may occur when mixed with oxygen at a ratio of 80% nitrous oxide to 20% oxygen. Laughter effects seem to occur after incipient asphyxia accompanied by the sudden return of oxygen. Nitrous oxide is a slight narcotic. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal. 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	Central nervous system depression.
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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.

Chemical Name	ACGIH	IARC	NTP	OSHA
Nitrous oxide 10024-97-2	-	Group 3	-	-

*IARC (International Agency for Research on Cancer)
Not classifiable as a human carcinogen*

Reproductive toxicity	Reproductive toxicity has been observed in humans and animals following exposure to nitrous oxide in concentrations in excess of the TLV. Exposure to nitrous oxide alone resulted in a 50% increase in congenital abnormalities and a 100% increase in spontaneous abortion in female dental assistants compared to nonusers of nitrous oxide.
Developmental Toxicity	Fetal mortality increased at all concentrations in pregnant rats exposed to 0, 100, 1000, or 15,000 ppm nitrous oxide (8 or 24 H/day for 5-9 days, 2-3 week of pregnancy) and teratogenic effects (skeletal abnormalities) were seen at 1000 ppm.
STOT - single exposure	Category 3. Central nervous system.
STOT - repeated exposure	Not classified.
Chronic toxicity	Possible risk of irreversible effects. Prolonged or repeated exposure increases the risk. Contains a known or suspected reproductive toxin.
Target Organ Effects	Central nervous system, Reproductive System, Respiratory system.
Neurological effects	Neurological impairment from nitrous oxide exposure has been reported at concentrations of several hundred to several thousand ppm; however, decrements in human cognitive and psychomotor functions have been reported at much lower concentrations. Dentists exposed to nitrous oxide longer than 3000 hours within the prior 10 years exhibited neurologic symptoms such as weakness, tingling and numbness.
Aspiration hazard	Not applicable.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
Nitrous oxide 10024-97-2	-	-	> 250 ppm (Rat) 4 h	-

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

The following values are calculated based on chapter 3.1 of the GHS document .

12. ECOLOGICAL INFORMATION

Ecotoxicity

No known acute aquatic toxicity.

Persistence and degradability

Not applicable.

Bioaccumulation

No information available.

Chemical Name	Partition coefficient
Nitrous oxide 10024-97-2	0.4

Global warming potential (GWP) 298

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

UN/ID no. UN1070
 Proper shipping name Nitrous oxide
 Hazard Class 2.2
 Subsidiary class 5.1
 Special Provisions A14
 Description UN1070, Nitrous oxide, 2.2 (5.1)
 Emergency Response Guide Number 122

TDG

UN/ID no. UN1070
 Proper shipping name Nitrous oxide
 Hazard Class 2.2
 Subsidiary class 5.1
 Description UN1070, Nitrous oxide, 2.2 (5.1)

MEX

UN/ID no. UN1070
 Proper shipping name Nitrous oxide
 Hazard Class 2.2
 Subsidiary class 5.1
 Description UN1070, Nitrous oxide, 2.2 (5.1)

IATA

UN/ID no. UN1070
 Proper shipping name Nitrous oxide
 Hazard Class 2.2
 Subsidiary hazard class 5.1

ERG Code	2AX
Description	UN1070, Nitrous oxide, 2.2 (5.1)

IMDG

UN/ID no.	UN1070
Proper shipping name	Nitrous oxide
Hazard Class	2.2
Subsidiary hazard class	5.1
EmS-No.	F-C, S-W
Description	UN1070, Nitrous oxide, 2.2 (5.1)

ADR

UN/ID no.	UN1070
Proper shipping name	Nitrous oxide
Hazard Class	2.2
Classification code	20
Tunnel restriction code	(C/E)
Special Provisions	584
Description	UN1070, Nitrous oxide, 2.2 (5.1), (C/E)
Labels	5.1

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

US Federal RegulationsSARA 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	Yes
Fire Hazard	Yes
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 Part 68. 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 contains the following Proposition 65 chemicals

Chemical Name	California Proposition 65
Nitrous oxide - 10024-97-2	Developmental Female Reproductive

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Nitrous oxide 10024-97-2	X	X	X

International Regulations

16 OTHER INFORMATION

NFPA Health hazards 2 Flammability 0 Instability 0 Physical and Chemical Properties OX

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 06-Mar-2015
 Revision Date 06-Mar-2015
 Revision Note Initial Release.

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



NITROUS OXIDE, REFRIGERATED LIQUID

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name NITROUS OXIDE, REFRIGERATED LIQUID

Other means of identification

Safety data sheet number LIND-P091
 UN/ID no. UN2201
 Synonyms Dinitrogen Monoxide; Laughing Gas; Factitious Air; Hyponitrous Acid Anhydride; Nitrogen(I) Oxide

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 905-501-1700
 www.lindecandana.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Emergency telephone number

Company Phone Number 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).

Specific target organ toxicity (single exposure)	Category 3
Oxidizing gases	Category 1
Gases under pressure	Refrigerated liquefied gas
Simple asphyxiants	Yes

Label elements



Signal word

Danger

Hazard Statements

- May cause or intensify fire; oxidizer
- Contains refrigerated gas; may cause cryogenic burns or injury
- May displace oxygen and cause rapid suffocation
- May cause drowsiness or dizziness

Precautionary Statements - Prevention

- Do not handle until all safety precautions have been read and understood
- Keep and store away from clothing and other combustible materials
- Keep valves and fittings free from oil and grease
- Avoid breathing gas
- Use and store only outdoors or in a well ventilated place
- Wear cold insulating gloves, face shield, and eye protection
- Use backflow preventive device in piping
- Use only equipment of compatible materials of construction and rated for cylinder pressure
- Use only with equipment cleaned for oxygen service
- Avoid spills. Do not walk on or roll equipment over spills
- Close valve after each use and when empty

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.
- In case of fire: Stop leak if safe to do so

Hazards not otherwise classified (HNOC)

Not applicable

Other Information

Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal
 This product contains one or more chemicals known to the State of California to cause cancer, birth defects or other reproductive harm

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Nitrous oxide	10024-97-2	100	N ₂ O

4. FIRST AID MEASURESDescription of first aid measures

General advice	Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.
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. Central nervous system depression. Contact with liquid may cause cold burns/frostbite.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURESSuitable 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

May cause or intensify fire; oxidizer. Will support and accelerate combustion of combustible materials (wood, paper, oil, debris, etc). May decompose violently at temperatures above 1112°F (600°C). Cylinders may rupture under extreme heat.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/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. Avoid spills. Do not walk on or roll equipment over spills. Monitor oxygen level. Eliminate all ignition sources if safe to do so. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Use personal protection recommended in Section 8.
Other Information	Gas/vapor is heavier than air. Prevent from entering sewers, basements and workpits, or any place where accumulation may be dangerous. 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.
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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	<p>Due to increased misuse and abuse of nitrous oxide, handling and storage precautions should be implemented to prevent theft and improper use. The following recommendations may not include all precautions which are necessary. Nitrous oxide systems should be installed in accordance with CGA G-8.1, "Standard for Nitrous Oxide Systems at Consumer Sites". Keep full and empty nitrous oxide containers and utilization equipment stored in a secured area. Allow only authorized personnel to remove containers, inventory and account for both full and empty containers and bulk product. Promptly report any theft of nitrous oxide to the police and the supplier. Establish other procedures as necessary to check for unusual use or loss of nitrous oxide.</p> <p>Keep valves and fittings free from oil and grease. Use only with equipment cleaned for oxygen service. Use only equipment of compatible materials of construction. Open valve slowly. "NO SMOKING" signs should be posted in storage and use areas. Separate flammable gas cylinders from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire resistance rating of a half an hour. 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.</p>
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Protect cylinders from physical damage; do not drag, roll, slide or drop. Never attempt to lift a cylinder by its valve protection cap. When moving cylinders, even for short distance, use a cart designed to transport cylinders. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use backflow preventive device in piping. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. 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 Pamphlet G-8.2 and SB-6.

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. Do not store near combustible materials

Incompatible materials Combustible material. Organic material. Reducing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Nitrous oxide 10024-97-2	TWA: 50 ppm		TWA: 25 ppm over the time exposed to waste anesthetic gas TWA: 46 mg/m ³ over the time exposed to waste anesthetic gas

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health

Appropriate engineering controls

Engineering Controls Showers. Eyewash stations. Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Consider installation of leak detection systems in areas of use and storage. Systems under pressure should be regularly checked for leakages.

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. Gloves must be clean and free from grease or oil.

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

Physical state	Compressed gas
Appearance	Colorless.
Odor	Slight sweet.
Odor threshold	No information available
pH	No data available
Melting point	-90.81 °C / -131.5 °F
Evaporation rate	Not applicable
Fire Hazard	Yes
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Water solubility	Slightly soluble
Partition coefficient	0.4
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density kg/m ³ @20°C	Critical Temperature
Nitrous oxide	44.01	-88.56 °C	Gas at atmospheric pressure.	1.53	1.95	36.4 °C

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

Heat, flames and sparks. Nitrous oxide will serve as the oxidant for most flammable materials. Some flammables will have a lower flammable limit in nitrous oxide than in pure oxygen.

Incompatible materials

Combustible material. Organic material. Reducing agents.

Hazardous Decomposition Products

At elevated temperatures, nitrous oxide decomposes into nitrogen and oxygen, the rate of decomposition being appreciable at about 1112°F (600°C). Nitrous oxide exposed to fire or other intense heat source may decompose violently.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation Anesthetic effects may occur when mixed with oxygen at a ratio of 80% nitrous oxide to 20% oxygen. Laughter effects seem to occur after incipient asphyxia accompanied by the sudden return of oxygen. Nitrous oxide is a slight narcotic. Intentional misuse by deliberately concentrating and inhaling contents may be harmful or fatal. 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 Central nervous system depression.

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 The table below indicates whether each agency has listed any ingredient as a carcinogen.

Chemical Name	ACGIH	IARC	NTP	OSHA
Nitrous oxide 10024-97-2	-	Group 3	-	-

*IARC (International Agency for Research on Cancer)
Not classifiable as a human carcinogen*

Reproductive toxicity Reproductive toxicity has been observed in humans and animals following exposure to nitrous oxide in concentrations in excess of the TLV. Exposure to nitrous oxide alone resulted in a 50% increase in congenital abnormalities and a 100% increase in spontaneous abortion in female dental assistants compared to nonusers of nitrous oxide.

Developmental Toxicity Fetal mortality increased at all concentrations in pregnant rats exposed to 0, 100, 1000, or 15,000 ppm nitrous oxide (8 or 24 H/day for 5-9 days, 2-3 week of pregnancy) and teratogenic effects (skeletal abnormalities) were seen at 1000 ppm.

STOT - single exposure Category 3. Central nervous system.

STOT - repeated exposure Not classified.

Chronic toxicity Possible risk of irreversible effects. Prolonged or repeated exposure increases the risk. Contains a known or suspected reproductive toxin.

Target Organ Effects Central nervous system, Reproductive System, Respiratory system.

Neurological effects Neurological impairment from nitrous oxide exposure has been reported at concentrations of several hundred to several thousand ppm; however, decrements in human cognitive and psychomotor functions have been reported at much lower concentrations. Dentists exposed to nitrous oxide longer than 3000 hours within the prior 10 years exhibited neurologic symptoms such as weakness, tingling and numbness.

Aspiration hazard Not applicable.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
Nitrous oxide 10024-97-2	-	-	> 250 ppm (Rat) 4 h	-

Product Information

Oral LD50 No information available

Dermal LD50 No information available

Inhalation LC50 No information available

The following values are calculated based on chapter 3.1 of the GHS document .

12. ECOLOGICAL INFORMATIONEcotoxicity

No known acute aquatic toxicity.

Persistence and degradability

Not applicable.

Bioaccumulation

No information available.

Chemical Name	Partition coefficient
Nitrous oxide 10024-97-2	0.4

Other adverse effects

Can cause frost damage to vegetation.

Global warming potential (GWP) 298

13. DISPOSAL CONSIDERATIONSWaste 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 INFORMATIONDOT

UN/ID no. UN2201
 Proper shipping name Nitrous oxide, refrigerated liquid
 Hazard Class 2.2
 Subsidiary class 5.1
 Special Provisions B6, T75, TP5, TP22
 Description UN2201, Nitrous oxide, refrigerated liquid, 2.2 (5.1)
 Emergency Response Guide Number 122

TDG

UN/ID no. UN2201
 Proper shipping name Nitrous oxide, refrigerated liquid
 Hazard Class 2.2
 Subsidiary class 5.1
 Description UN2201, Nitrous oxide, refrigerated liquid, 2.2 (5.1)

MEX

UN/ID no. UN2201
 Proper shipping name Nitrous oxide, refrigerated liquid
 Hazard Class 2.2
 Subsidiary class 5.1
 Description UN2201, Nitrous oxide, refrigerated liquid, 2.2 (5.1)

IATA

Forbidden

IMDG

UN/ID no.	UN2201
Proper shipping name	Nitrous oxide, refrigerated liquid
Hazard Class	2.2
Subsidiary hazard class	5.1
EmS-No.	F-C, S-W
Description	UN2201, Nitrous oxide, refrigerated liquid, 2.2 (5.1)

ADR

UN/ID no.	UN2201
Proper shipping name	Nitrous oxide, refrigerated liquid
Hazard Class	2.2
Classification code	30
Tunnel restriction code	(C/E)
Description	UN2201, Nitrous oxide, refrigerated liquid, 2.2 (5.1), (C/E)
Labels	5.1

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

US Federal RegulationsSARA 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	Yes
Fire Hazard	Yes
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 Part 68. 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 contains the following Proposition 65 chemicals

Chemical Name	California Proposition 65
Nitrous oxide - 10024-97-2	Developmental Female Reproductive

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Nitrous oxide 10024-97-2	X	X	X

International Regulations

16 OTHER INFORMATION

NFPA Health hazards 3 Flammability 0 Instability 0 Physical and Chemical Properties OX

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 06-Mar-2015
 Revision Date 06-Mar-2015
 Revision Note Initial Release.

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



OXYGEN

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name OXYGEN

Other means of identification

Safety data sheet number LIND-P097
 UN/ID no. UN1072
 Synonyms LASER Oxygen; Oxygen, Compressed

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 905-501-1700
 www.lindecana.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Emergency telephone number

Company Phone Number 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

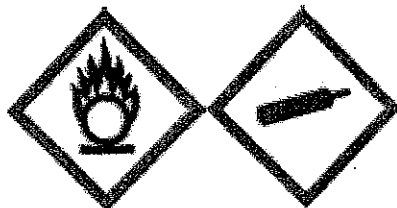
Classification

OSHA Regulatory Status

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

Oxidizing gases	Category 1
Gases under pressure	Compressed gas

Label elements



Signal word

Danger

Hazard Statements

May cause or intensify fire; oxidizer
 Contains gas under pressure; may explode if heated

Precautionary Statements - Prevention

- Do not handle until all safety precautions have been read and understood
- Keep and store away from clothing and other combustible materials
- Keep valves and fittings free from oil and grease
- Use and store only outdoors or in a well ventilated place
- Use backflow preventive device in piping
- Use only equipment of compatible materials of construction and rated for cylinder pressure
- Use only with equipment cleaned for oxygen service
- Open valve slowly
- Close valve after each use and when empty

Precautionary Statements - Response

In case of fire: Stop leak if safe to do so

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Oxygen	7782-44-7	100	O ₂

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance.
Inhalation	Move victim to fresh air. Seek immediate medical attention/advice.
Skin contact	None under normal use. Get medical attention if symptoms occur.
Eye contact	None under normal use. Get medical attention if symptoms occur.
Ingestion	Not an expected route of exposure.

Most important symptoms and effects, both acute and delayed

Symptoms	Oxygen is not acutely toxic under normal pressure. Oxygen is more toxic when inhaled at elevated pressures. Depending upon pressure and duration of exposure, pure oxygen at elevated pressures may cause cramps, dizziness, difficulty breathing, convulsions, edema and death.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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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

May cause or intensify fire; oxidizer. Will support and accelerate combustion of combustible materials (wood, paper, oil, debris, etc). Cylinders may rupture under extreme heat.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/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. Eliminate all ignition sources if safe to do so.
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Environmental precautions

Environmental precautions	Prevent spreading of vapors through sewers, ventilation systems and confined areas.
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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 cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling

Keep valves and fittings free from oil and grease. Use only equipment of compatible materials and construction. Open valve slowly. NO SMOKING" signs should be posted in storage and use areas. Separate flammable gas cylinders from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire resistance rating of a half an hour. Dry product is non-corrosive and may be used with all materials of construction. Moisture causes metal oxides which are formed with air to be hydrated so that they include volume and lose their protective role (rust formation). Concentrations of SO₂, Cl₂, salt, etc. in the moisture enhances the rusting of metals in air. Carbon steels and low alloy steels are acceptable for use at lower pressures. For high pressure applications stainless steels are acceptable as are copper and its alloys, nickel and its alloys, brass bronze, silicon alloys, Monel®, Inconel®, and beryllium. Lead and silver or lead tin alloys are good gasket materials. Teflon®, Teflon® composites, or Kel-F® are preferred non-metallic gasket materials. Oxygen should not be used as a substitute for compressed air in pneumatic equipment since they generally contain flammable lubricants. Equipment able to use oxygen must be "cleaned for oxygen service". Check with the equipment supplier to verify oxygen compatibility for the service conditions.

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. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use only with equipment rated for cylinder pressure. Use backflow preventive device in piping. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.

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. Ensure the complete gas system has been checked for leaks before use.

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.

For additional recommendations, consult Compressed Gas Association's Pamphlets SB-7, G-4.3, G-4.1, G-4.4, P-2.5, G-4.9, P-14, and SB-2.

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. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Stored containers should be periodically checked for general condition and leakage. Do not store near combustible materials

Incompatible materials

Reducing agents. Combustible material. Organic material.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering Controls Ventilation systems. Use local exhaust in combination with general ventilation as necessary to keep oxygen concentrations below 23.5%. Consider installation of leak detection systems in areas of use and storage. Systems under pressure should be regularly checked for leakages.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses with side shields (or goggles).

Skin and body protection Work gloves and safety shoes are recommended when handling cylinders. Gloves must be clean and free from grease or oil.

Respiratory protection No special protective equipment required.

General Hygiene Considerations Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIESInformation on basic physical and chemical properties

Physical state	Compressed gas
Appearance	Colorless.
Odor	Odorless.
Odor threshold	No information available
pH	No data available
Melting point	-218.8 °C / -361.8 °F
Evaporation rate	Not applicable
Fire Hazard	Yes
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	No information available
Autoignition temperature	No data available
Decomposition temperature	No data available
Oxidizing properties	Oxidizer
Water solubility	Slightly soluble
Partition coefficient	0.65
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density Kg/m ³ @20°C	Critical Temperature
Oxygen	31.99	-182.9 °C	Above critical temperature	1.11	1.331	-118.6 °C

10. STABILITY AND REACTIVITYReactivity

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

Heat, flames and sparks.

Incompatible materials

Reducing agents. Combustible material. Organic material.

Hazardous Decomposition Products

None known.

11. TOXICOLOGICAL INFORMATIONInformation on likely routes of exposure

Inhalation	Symptoms of overexposure are dizziness, headache, tiredness, nausea, unconsciousness, cessation of breathing. Poisoning began in dogs 36 hours after inhalation of pure oxygen at atmospheric pressure. Distress was seen within 48 hours and death within 60 hours.
Skin contact	No data available.
Eye contact	The incompletely developed retinal circulation is more susceptible to toxic levels of oxygen. In premature infants, arterial oxygen tension above 150 mm Hg may cause retrolental fibroplasia. Permanent blindness may occur several months later. One case of severe retinal damage in an adult was reported. An individual suffering from myasthenia gravis developed irreversible retinal atrophy after breathing 80% oxygen for 150 days.
Ingestion	Not an expected route of exposure.

Information on toxicological effects

Symptoms	Oxygen is not acutely toxic under normal pressure. Oxygen is more toxic when inhaled at elevated pressures. Depending upon pressure and duration of exposure, pure oxygen at elevated pressures may cause cramps, dizziness, difficulty breathing, convulsions, edema and death.
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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.
STOT - single exposure	Not classified.
STOT - repeated exposure	Not classified.
Chronic toxicity	Prolonged inhalation of high oxygen concentrations (>75%) may affect coordination, attention, and cause tiredness of respiratory irritation.
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

12. ECOLOGICAL INFORMATIONEcotoxicity

Will not bioconcentrate.

Persistence and degradability
Not applicable.

Bioaccumulation
Will not bioconcentrate.

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

UN/ID no.	UN1072
Proper shipping name	Oxygen, compressed
Hazard Class	2.2
Subsidiary class	5.1
Description	UN1072,Oxygen, compressed,2.2,(5.1)
Emergency Response Guide Number	122

TDG

UN/ID no.	UN1072
Proper shipping name	Oxygen, compressed
Hazard Class	2.2
Subsidiary class	(5.1)
Description	UN1072,OXYGEN, COMPRESSED,2.2(5.1)

MEX

UN/ID no.	UN1072
Proper shipping name	Oxygen, compressed
Hazard Class	2.2
Subsidiary class	5.1

IATA

UN/ID no.	UN1072
Proper shipping name	Oxygen, compressed
Hazard Class	2.2
Subsidiary hazard class	5.1
Description	UN1072,Oxygen, compressed,2.2(5.1)

IMDG

UN/ID no.	UN1072
Proper shipping name	Oxygen, compressed
Hazard Class	2.2
Subsidiary hazard class	5.1
EmS-No.	F-C, S-W
Description	UN1072, Oxygen, compressed,2.2(5.1)

ADR

UN/ID no.	UN1072
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Proper shipping name Oxygen, compressed
 Hazard Class 2.2
 Classification code 10
 Description UN1072 Oxygen, compressed,2.2,
 Labels 5.1



15 REGULATORY INFORMATION

International Inventories

TSCA Complies
 DSL Complies
 EINECS/ELINCS Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDL - Canadian Domestic Substances List/Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

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 No
 Chronic Health Hazard No
 Fire Hazard Yes
 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 Part 68. 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

Chemical Name	New Jersey	Massachusetts	Pennsylvania
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Oxygen 7782-44-7	X	X	X
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International Regulations

16. OTHER INFORMATION

NFPA Health hazards 0 Flammability 0 Instability 0 Physical and Chemical Properties OX

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 24-Feb-2015
 Revision Date 24-Feb-2015
 Revision Note Initial Release.

General Disclaimer

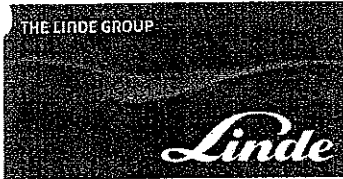
For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Linde LLC, Linde Merchant Production, Inc. or Linde Gas North America LLC (or any of their affiliates and subsidiaries) and the purchaser.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES

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End of Safety Data Sheet





OXYGEN, REFRIGERATED LIQUID

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name OXYGEN, REFRIGERATED LIQUID

Other means of identification

Safety data sheet number LIND-P098
 UN/ID no. UN1073
 Synonyms Liquid Oxygen; LOX

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 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 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).

Oxidizing gases	Category 1
Gases under pressure	Refrigerated liquefied gas

Label elements



Signal word

Danger

Hazard Statements

- May cause or intensify fire; oxidizer
- Contains refrigerated gas; may cause cryogenic burns or injury
- Combustibles in contact with liquid oxygen may explode on ignition or impact

Precautionary Statements - Prevention

- Do not handle until all safety precautions have been read and understood
- Keep and store away from clothing and other combustible materials
- Keep valves and fittings free from oil and grease
- Use and store only outdoors or in a well ventilated place
- Wear cold insulating gloves/face shield/eye protection
- Use backflow preventive device in piping
- Use only with equipment of compatible materials of construction and rated for cylinder pressure
- Use only with equipment cleaned for oxygen service
- Do NOT change or force fit connections
- Avoid spills. Do not walk on or roll equipment over spills
- Close valve after each use and when empty
- Always keep container in upright position

Precautionary Statements - Response

- IF ON SKIN: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
- In case of fire: Stop leak if safe to do so

Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Oxygen	7782-44-7	100	O ₂

4. FIRST AID MEASURES

Description of first aid measures

General advice	Show this safety data sheet to the doctor in attendance.
Inhalation	Move victim to fresh air. Seek immediate medical attention/advice.
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.

Most important symptoms and effects, both acute and delayed

Symptoms	Oxygen is not acutely toxic under normal pressure. Oxygen is more toxic when inhaled at elevated pressures. Depending upon pressure and duration of exposure, pure oxygen at elevated pressures may cause cramps, dizziness, difficulty breathing, convulsions, edema and death. Contact with liquid may cause cold burns/frostbite.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURESSuitable 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

May cause or intensify fire; oxidizer. Combustibles in contact with liquid oxygen may explode on ignition or impact. Will support and accelerate combustion of combustible materials (wood, paper, oil, debris, etc). Cylinders may rupture under extreme heat.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURESPersonal precautions, protective equipment and emergency procedures

Personal precautions	Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Avoid spills. Do not walk on or roll equipment over spills. Monitor oxygen level. Eliminate all ignition sources if safe to do so. 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.
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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 8 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

Liquid oxygen cannot be handled in carbon or low alloy steel, 18-8 and 18-10 stainless steel are acceptable as are copper and its alloys, brass bronze, silicon alloys, Monel®, Inconel®, and beryllium. Teflon®, Teflon® composites, or Kel-F® are preferred non-metallic gasket materials. Oxygen should not be used as a substitute for compressed air in pneumatic equipment since they generally contain flammable lubricants. Equipment able to use oxygen must be "cleaned for oxygen service". Check with the equipment supplier to verify oxygen compatibility for the service conditions. Keep valves and fittings free from oil and grease. Use only equipment of compatible materials and construction. Do NOT change or force fit connections. Open valve slowly. NO SMOKING" signs should be posted in storage and use areas. Separate flammable gas cylinders from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire resistance rating of a half an hour. 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. Stationary customer site vessels should be operated in accordance with the manufacturer's and Linde's instruction. 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 operations problem with the vessel, contact the closest Linde location immediately for assistance.

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

For additional recommendations, consult Compressed Gas Association's Pamphlets SB-7, G-4.3, G-4.1, G-4.4, P-2.5, G-4.9, P-14, and SB-2.

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. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Stored containers should be periodically checked for general condition and leakage. Do not store near combustible materials

Incompatible materials

Combustible materials. Organic material. Reducing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTIONControl parametersExposure Guidelines

This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controlsEngineering Controls

Showers. Eyewash stations. Use local exhaust in combination with general ventilation as necessary to keep oxygen concentrations below 23.5%. Consider installation of leak detection systems in areas of use and storage. Systems under pressure should be regularly checked for leakages.

Individual protection measures, such as personal protective equipmentEye/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. Gloves must be clean and free from grease or oil. Wear cold insulating gloves when handling liquid.

Respiratory protection

No special protective equipment required.

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 PROPERTIESInformation on basic physical and chemical properties

Physical state	Cryogenic Liquid
Appearance	Pale blue.
Odor	Odorless.
Odor threshold	No information available
pH	No data available
Melting point	-218.8 °C / -361.8 °F
Evaporation rate	Not applicable
Fire Hazard	Yes
Lower flammability limit:	Not applicable
Upper flammability limit:	Not applicable
Flash point	Not applicable
Autoignition temperature	No data available
Decomposition temperature	No data available
Oxidizing properties	Oxidizer
Water solubility	Slightly soluble
Partition coefficient	No data available
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density Kg/m ³ @20°C	Critical Temperature
Oxygen	31.99	-182.9 °C	Above critical temperature	1.11	1.331	-118.6 °C

10. STABILITY AND REACTIVITYReactivity

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

Heat, flames and sparks.

Incompatible materials

Combustible materials. Organic material. Reducing agents.

Hazardous Decomposition Products

None known.

11. TOXICOLOGICAL INFORMATIONInformation on likely routes of exposure

Inhalation

Symptoms of overexposure are dizziness, headache, tiredness, nausea, unconsciousness, cessation of breathing. Poisoning began in dogs 36 hours after inhalation of pure oxygen at atmospheric pressure. Distress was seen within 48 hours and death within 60 hours.

Skin contact

Contact with liquid may cause cold burns/frostbite.

Eye contact

The incompletely developed retinal circulation is more susceptible to toxic levels of oxygen. In premature infants, arterial oxygen tension above 150 mm Hg may cause retrolental fibroplasia. Permanent blindness may occur several months later. One case of severe retinal damage in an adult was reported. An individual suffering from myasthenia gravis developed irreversible retinal atrophy after breathing 80% oxygen for 150 days. Contact with liquid may cause cold burns/frostbite.

Ingestion

Not an expected route of exposure.

Information on toxicological effects

Symptoms

Oxygen is not acutely toxic under normal pressure. Oxygen is more toxic when inhaled at elevated pressures. Depending upon pressure and duration of exposure, pure oxygen at elevated pressures may cause cramps, dizziness, difficulty breathing, convulsions, edema and death.

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.

STOT - single exposure

Not classified.

STOT - repeated exposure

Not classified.

Chronic toxicity

Prolonged inhalation of high oxygen concentrations (>75%) may affect coordination, attention, and cause tiredness of respiratory irritation.

Target Organ Effects

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

12. ECOLOGICAL INFORMATIONEcotoxicity

No known acute aquatic toxicity.

Persistence and degradability

Not applicable.

Bioaccumulation

Will not bioconcentrate.

Other adverse effects

Can cause frost damage to vegetation.

13. DISPOSAL CONSIDERATIONSWaste 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 INFORMATIONDOT

UN/ID no.	UN1073
Proper shipping name	Oxygen, refrigerated liquid
Hazard Class	2.2
Subsidiary class	5.1
Special Provisions	T75, TP5, TP22
Description	UN1073, Oxygen, refrigerated liquid, 2.2 (5.1)
Emergency Response Guide Number	122

IDG

UN/ID no.	UN1073
Proper shipping name	Oxygen, refrigerated liquid
Hazard Class	2.2
Subsidiary class	5.1
Description	UN1073, Oxygen, refrigerated liquid, 2.2 (5.1)

MEX

UN/ID no.	UN1073
Proper shipping name	Oxygen, refrigerated liquid
Hazard Class	2.2
Subsidiary class	5.1
Description	UN1073, Oxygen, refrigerated liquid, 2.2 (5.1)

IATA ForbIDDEN

IMDG

UN/ID no. UN1073
 Proper shipping name Oxygen, refrigerated liquid
 Hazard Class 2.2
 Subsidiary hazard class 5.1
 EmS-No. F-C, S-W
 Description UN1073, Oxygen, refrigerated liquid, 2.2 (5.1)

ADR

UN/ID no. UN1073
 Proper shipping name Oxygen, refrigerated liquid
 Hazard Class 2.2
 Classification code 30
 Tunnel restriction code (C/E)
 Description UN1073, Oxygen, refrigerated liquid, 2.2 (5.1), (C/E)
 Labels 5.1

15. REGULATORY INFORMATION

International Inventories

TSCA Complies
 DSL Complies
 EINECS/ELINCS Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

US Federal RegulationsSARA 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	No
Chronic Health Hazard	No
Fire Hazard	Yes
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 Part 68.
 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

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Oxygen 7782-44-7	X	X	X

International Regulations

16. OTHER INFORMATION

NFPA Health hazards 3 Flammability 0 Instability 0 Physical and Chemical Properties OX

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 24-Feb-2015
 Revision Date 24-Feb-2015
 Revision Note Initial Release.

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





PROPANE

Safety Data Sheet

1 IDENTIFICATION

Product identifier

Product Name PROPANE

Other means of identification

Safety data sheet number LIND-P105
 UN/ID no. UN1978
 Synonyms Dimethylmethane

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 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 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).

Flammable gases	Category 1
Gases under pressure	Liquefied gas
Simple asphyxiants	Yes

Label elements

Signal word

Danger

Hazard Statements

Extremely flammable gas
 Contains gas under pressure; may explode if heated
 May displace oxygen and cause rapid suffocation
 May form explosive mixtures with air
 May cause frostbite

Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood
 Keep away from heat/sparks/open flames/hot surfaces. — No smoking
 Use and store only outdoors or in a well ventilated place
 Use backflow preventive device in piping
 Do not open valve until connected to equipment prepared for use
 Close valve after each use and when empty
 Never put cylinders into unventilated areas of passenger vehicles

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.
 Leaking gas fire: do not extinguish, unless leak can be stopped safely
 Eliminate all ignition sources if safe to do so

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Propane	74-98-6	100	C ₃ H ₈

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. Remove all sources of ignition.

Most important symptoms and effects, both acute and delayed

Symptoms	High concentrations may cause asphyxia from lack of oxygen or act as a narcotic causing central nervous system depression. May cause nausea, dizziness, headaches, shortness of breath, lethargy, narcosis, unconsciousness and possibly cardiac arrhythmias. Contact with liquid may cause cold burns/frostbite.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	A patient adversely affected by exposure to this product should not be given adrenaline (epinephrine) or similar heart stimulant since these would increase the risk of cardiac arrhythmias.
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5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Dry chemical or CO₂. Water spray (fog). DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Specific extinguishing methods

If possible, stop the flow of gas. Do not extinguish the fire until supply is shut off as otherwise an explosive-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Ventilation fans must be explosion proof. Use non-sparking tools to close container valves.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical

Extremely flammable gas. May form explosive mixtures with air. Will be easily ignited by heat, sparks or flames. Vapors may travel to source of ignition and flash back. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars, etc.). Cylinders may rupture under extreme heat.

Hazardous combustion products Carbon monoxide. Carbon dioxide (CO₂).

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Consider the risk of potentially explosive atmospheres. Monitor oxygen level. All equipment used when handling the product must be grounded. Use non-sparking tools and equipment. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Other Information	Gas/vapor is heavier than air. Prevent from entering sewers, basements and workpits, or any place where accumulation may be dangerous.

Environmental precautions

Environmental precautions	Prevent spreading of vapors through sewers, ventilation systems and confined areas.
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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	Do not direct water at spill or source of leak. Return cylinder to Linde or an authorized distributor.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	<p>Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. Separate flammable gas cylinders from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire resistance rating of a half an hour. NO SMOKING" signs should be posted in storage and use areas.</p> <p>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. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use backflow preventive device in piping. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Ensure the complete gas system has been checked for leaks before use.</p> <p>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.</p> <p>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.</p>
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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. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Stored containers should be periodically checked for general condition and leakage. Outside or detached storage is preferred.

Incompatible materials Oxidizing agents.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Propane 74-98-6	TWA: 1000 ppm	TWA: 1000 ppm TWA: 1800 mg/m ³	IDLH: 2100 ppm TWA: 1000 ppm TWA: 1800 mg/m ³

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health.

Other Information Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).

Appropriate engineering controls

Engineering Controls Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Explosion proof ventilation systems. Oxygen detectors should be used when asphyxiating gases may be released. Consider installation of leak detection systems in areas of use and storage. Systems under pressure should be regularly checked for leakages. 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. Wear fire/flame resistant/retardant clothing. Take precautionary measures against static discharge.

Respiratory protection If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

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

Physical state	Compressed gas
Appearance	Colorless.
Odor	Odorless.
Odor threshold	No information available
pH	No data available
Melting point	No data available

Evaporation rate	Not applicable
Fire Hazard	Yes
Lower flammability limit:	2.2%
Upper flammability limit:	9.5%
Flash point	-104 °C / -156 °F
Autoignition temperature	450 °C / 842 °F
Decomposition temperature	No data available
Water solubility	Negligible
Partition coefficient	2.3
Kinematic viscosity	Not applicable

Chemical Name	Molecular weight	Boiling point	Vapor Pressure	Vapor density (air =1)	Gas Density Kg/m ³ @20°C	Critical Temperature
Propane	44.09	-42.04 °C	8.39 bar @ 20 °C	1.55	1.858	96.67 °C

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 Yes.

Possibility of Hazardous Reactions

May form explosive mixtures with air.

Conditions to avoid

Heat, flames and sparks.

Incompatible materials

Oxidizing agents.

Hazardous Decomposition Products

Carbon monoxide. Carbon dioxide (CO₂).

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Inhalation	High concentrations of aliphatic hydrocarbon gases may cause CNS depression. Recent information suggest that C1-C4 aliphatic (alkane) hydrocarbon gases can cause potentially fatal cardiac arrhythmias. Cardiac sensitization to adrenalin in dogs has been noted following inhalation. In dogs, the heart is more sensitive to epinephrine induced ventricular fibrillations following exposure to 15-90% propane for 10 minutes. Ventricular fibrillations have been reported in humans following inhalation of n-butane.
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 High concentrations may cause asphyxia from lack of oxygen or act as a narcotic causing central nervous system depression. Symptoms of overexposure are dizziness, headache, tiredness, nausea, unconsciousness, cessation of breathing.

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.
STOT - single exposure	Not classified.
STOT - repeated exposure	Not classified.
Chronic toxicity	None known.
Target Organ Effects	Central nervous system (CNS).
Aspiration hazard	Not applicable.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
Propane 74-98-6	-	-	= 658 mg/L (Rat) 4 h	-

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

12. ECOLOGICAL INFORMATION

Ecotoxicity
 No known acute aquatic toxicity.

Persistence and degradability
 No information available.

Bioaccumulation
 Will not bioconcentrate.

Chemical Name	Partition coefficient
Propane 74-98-6	2.3

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

Note: In US and Canada, Petroleum gases, liquefied (UN1075), or Liquefied petroleum gas (UN1075) is also acceptable. Identification number used must be consistent on package markings, shipping papers and emergency response information.

DOT

UN/ID no.	UN1978
Proper shipping name	Propane
Hazard Class	2.1
Special Provisions	19, T50
Description	UN1978, Propane, 2.1
Emergency Response Guide Number	115

TDG

UN/ID no.	UN1978
Proper shipping name	Propane
Hazard Class	2.1
Description	UN1978, Propane, 2.1

MEX

UN/ID no.	UN1978
Proper shipping name	Propane
Hazard Class	2.1
Description	UN1978, Propane, 2.1

IATA

UN/ID no.	UN1978
Proper shipping name	Propane
Hazard Class	2.1
ERG Code	10L
Special Provisions	A1
Description	UN1978, Propane, 2.1

IMDG

UN/ID no.	UN1978
Proper shipping name	Propane
Hazard Class	2.1
EmS-No.	F-D, S-U
Description	UN1978, Propane, 2.1

ADR

UN/ID no.	UN1978
Proper shipping name	Propane
Hazard Class	2.1
Classification code	2F
Tunnel restriction code	(B/D)
Special Provisions	652, 657, 660
Description	UN1978, Propane, 2.1, (B/D)

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL	Complies
EINECS/ELINCS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
 EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

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	Yes
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, contains one or more regulated substances with specified thresholds under 40 CFR Part 68 or regulated as a highly hazardous chemical pursuant to the 29 CFR Part 1910.110 with specified thresholds:

Chemical Name	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances	U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals
Propane		10000 lb	

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Propane 74-98-6	X	X	X

International Regulations

16. OTHER INFORMATION

NFPA Health hazards 2 Flammability 4 Instability 0 Physical and Chemical Properties -

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 23-Feb-2015
Revision Date 23-Feb-2015
Revision Note Initial Release.

General Disclaimer

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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



PROPYLENE

Safety Data Sheet

1 IDENTIFICATION

Product identifier

Product Name PROPYLENE

Other means of identification

Safety data sheet number LIND-P106
 UN/ID no. UN1077
 Synonyms Propene; 1-Propene; 1-Propene (9ci); 1-Propylene; Methylethene; Methylene

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
 575 Mountain Ave.
 Murray Hill, NJ 07974
 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
 5860 Chedworth Way
 Mississauga, Ontario L5R 0A2
 Phone: 905-501-1700
www.lindecana.com

* May include subsidiaries or affiliate companies/divisions.

For additional product information contact your local customer service.

Emergency telephone number

Company Phone Number 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).

Flammable gases	Category 1
Gases under pressure	Liquefied gas
Simple asphyxiants	Yes

Label elements

Signal word

Danger

Hazard Statements

Extremely flammable gas
 Contains gas under pressure; may explode if heated
 May displace oxygen and cause rapid suffocation
 May form explosive mixtures with air
 May cause frostbite

Precautionary Statements - Prevention

Do not handle until all safety precautions have been read and understood
 Keep away from heat, sparks, open flames, hot surfaces. — No smoking
 Use and store only outdoors or in a well ventilated place
 Use a backflow preventive device in piping
 Do not open valve until connected to equipment prepared for use
 Close valve after each use and when empty
 Never put cylinders into unventilated areas of passenger vehicles

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.
 Leaking gas fire: do not extinguish, unless leak can be stopped safely
 Eliminate all ignition sources if safe to do so

Precautionary Statements - Storage

Protect from sunlight when ambient temperature exceeds 52°C/125°F

Hazards not otherwise classified (HNOC)

Not applicable

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	Volume %	Chemical Formula
Propene	115-07-1	100	C ₃ H ₆

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. Remove all sources of ignition.

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. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination. Contact with liquid may cause cold burns/frostbite.
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Indication of any immediate medical attention and special treatment needed

Note to physicians	Treat symptomatically.
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5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

Dry chemical or CO₂. Water spray (fog). DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.

Specific extinguishing methods

If possible, stop the flow of gas. Do not extinguish the fire until supply is shut off as otherwise an explosive-ignition may occur. If the fire is extinguished and the flow of gas continues, use increased ventilation to prevent build-up of explosive atmosphere. Ventilation fans must be explosion proof. Use non-sparking tools to close container valves.

Use water spray to cool surrounding containers. Be cautious of a Boiling Liquid Evaporating Vapor Explosion, BLEVE, if flame is impinging on surrounding containers. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible withdraw from area and let fire burn. Damaged cylinders should be handled only by specialists.

Specific hazards arising from the chemical

Extremely flammable gas. May form explosive mixtures with air. May burn with an almost invisible flame in bright light. This product will ignite at ambient temperatures and can be expected to form a flammable mixture upon release to the atmosphere. Will be easily ignited by heat, sparks or flames. Vapors may travel to source of ignition and flash back. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars, etc.). Cylinders may rupture under extreme heat.

Carbon monoxide. Carbon dioxide (CO₂).

Hazardous combustion products

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Consider the risk of potentially explosive atmospheres. Monitor oxygen level. All equipment used when handling the product must be grounded. Use non-sparking tools and equipment. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Other Information	Gas/vapor is heavier than air. Prevent from entering sewers, basements and workpits, or any place where accumulation may be dangerous.

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 cylinder to Linde or an authorized distributor. Do not direct water at spill or source of leak.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling	<p>Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Ground and bond all lines and equipment associated with product system. All equipment should be non-sparking and explosion proof. Separate flammable gas cylinders from oxygen and other oxidizers by a minimum distance of 20 ft. or by a 5 ft. high barrier with a minimum fire resistance rating of a half an hour. "NO SMOKING" signs should be posted in storage and use areas.</p> <p>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. Use a backflow preventive device in piping. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Use only with adequate ventilation. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Ensure the complete gas system has been checked for leaks before use.</p> <p>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.</p> <p>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.</p>
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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. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Stored containers should be periodically checked for general condition and leakage. Outside or detached storage is preferred.
Incompatible materials	Reacts with oxides of nitrogen to form an explosive product. Acids. Oxidizing agents. Halogenated compounds. Molten sulfur.

8. EXPOSURE CONTROLS/PERSONAL PROTECTIONControl parametersExposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Propene 115-07-1	TWA: 500 ppm	-	-

ACGIH TLV: American Conference of Governmental Industrial Hygienists - Threshold Limit Value. OSHA PEL: Occupational Safety and Health Administration - Permissible Exposure Limits. NIOSH IDLH: Immediately Dangerous to Life or Health.

Appropriate engineering controls

Engineering Controls	Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%. Explosion proof ventilation systems. Oxygen detectors should be used when asphyxiating gases may be released. Consider installation of leak detection systems in areas of use and storage. Systems under pressure should be regularly checked for leakages. Showers. Eyewash stations.
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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. Wear fire/flame resistant/retardant clothing. Take precautionary measures against static discharge.
Respiratory protection	Use positive pressure airline respirator with escape cylinder or self contained breathing apparatus for oxygen-deficient atmospheres (<19.5%). If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.
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 PROPERTIESInformation on basic physical and chemical properties

Physical state	Compressed gas
Appearance	Colorless.
Odor	Mild olefinic.
Odor threshold	23 ppm (detection); 68-80 ppm (recognition)
pH	No data available
Melting point	-185.25 °C / -301.5 °F

oxygen-deficient atmosphere ($\leq 18\%$) 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. May cause central nervous system depression with nausea, headache, dizziness, vomiting, and incoordination.

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 The table below indicates whether each agency has listed any ingredient as a carcinogen.

Chemical Name	ACGIH	IARC	NTP	OSHA
Propene 115-07-1	-	Group 3	-	-

*IARC (International Agency for Research on Cancer)
 Not classifiable as a human carcinogen*

Reproductive toxicity Not classified.
 STOT - single exposure Not classified.
 STOT - repeated exposure Not classified.
 Chronic toxicity None known.
 Target Organ Effects No information available.
 Aspiration hazard Not applicable.

Numerical measures of toxicity

Chemical Name	Oral LD50	Dermal LD50	Inhalation LC50	Inhalation LC50 (CGA P-20)
Propene 115-07-1	-	-	= 658 mg/L (Rat) 4 h	-

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

12. ECOLOGICAL INFORMATION

Ecotoxicity
 No known acute aquatic toxicity.

Persistence and degradability
 No information available.

Bioaccumulation
 Will not bioconcentrate.

Chemical Name	Partition coefficient
Propene 115-07-1	≤ 2.8

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

Note: In US and Canada, Petroleum gases, liquefied (UN1075), or Liquefied petroleum gas (UN1075) is also acceptable. Identification number used must be consistent on package markings, shipping papers and emergency response information.

DOT

UN/ID no.	UN1077
Proper shipping name	Propylene
Hazard Class	2.1
Special Provisions	19, T50
Description	UN1077, Propylene, 2.1
Emergency Response Guide Number	115

TDG

UN/ID no.	UN1077
Proper shipping name	Propylene
Hazard Class	2.1
Description	UN1077, Propylene, 2.1

MEX

UN/ID no.	UN1077
Proper shipping name	Propylene
Hazard Class	2.1
Description	UN1077, Propylene, 2.1

IATA

UN/ID no.	UN1077
Proper shipping name	Propylene
Hazard Class	2.1
ERG Code	10L
Special Provisions	A1
Description	UN1077, Propylene, 2.1

IMDG

UN/ID no.	UN1077
Proper shipping name	Propylene
Hazard Class	2.1
EmS-No.	F-D, S-U
Description	UN1077, Propylene, 2.1

ADR

UN/ID no.	UN1077
Proper shipping name	Propylene
Hazard Class	2.1
Classification code	2F
Tunnel restriction code	(B/D)
Description	UN1077, Propylene, 2.1, (B/D)

15. REGULATORY INFORMATIONInternational Inventories

TSCA	Complies
DSL/NDSL	Complies
EINECS/ELINGS	Complies

Legend:

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
 DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances

US Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product contains a chemical or chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

Chemical Name	SARA 313 - Threshold Values %
Propene - 115-07-1	1.0

SARA 311/312 Hazard Categories

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

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, contains one or more regulated substances with specified thresholds under 40 CFR Part 68 or regulated as a highly hazardous chemical pursuant to the 29 CFR Part 1910.110 with specified thresholds:

Chemical Name	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances	U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals
Propene		10000 lb	

US State Regulations

California Proposition 65

This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Chemical Name	New Jersey	Massachusetts	Pennsylvania
Propene 115-07-1	X	X	X

International Regulations

Chemical Name	NPRI
Propene	X

Legend
Canada NPRI - National Pollutant Release Inventory

16. OTHER INFORMATION

NFPA Health hazards 2 Flammability 4 Instability 1 Physical and Chemical Properties -

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 28-Apr-2015
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End of Safety Data Sheet