



# 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](http://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](http://www.pr.lindegas.com)

Linde Canada Limited  
5860 Chedworth Way  
Mississauga, Ontario L5R 0A2  
Phone: 905-501-1700  
[www.lindecana.com](http://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

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 <sub>2</sub>  |

## 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. |
|----------|--|

Indication of any immediate medical attention and special treatment needed

|                    |                        |
|--------------------|------------------------|
| Note to physicians | Treat symptomatically. |
|--------------------|------------------------|

## 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media

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

Specific extinguishing methods

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

Specific hazards arising from the chemical

Non-flammable gas. Cylinders may rupture under extreme heat.

Protective equipment and precautions for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, 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.

#### 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<br>124-38-9 | STEL = 30000 ppm<br>TWA: 5000 ppm | TWA: 5000 ppm<br>TWA: 9000 mg/m <sup>3</sup><br>(vacated) TWA: 10000 ppm<br>(vacated) TWA: 18000 mg/m <sup>3</sup><br>(vacated) STEL: 30000 ppm<br>(vacated) STEL: 54000 mg/m <sup>3</sup> | IDLH: 40000 ppm<br>TWA: 5000 ppm<br>TWA: 9000 mg/m <sup>3</sup><br>STEL: 30000 ppm<br>STEL: 54000 mg/m <sup>3</sup> |

*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 <sup>3</sup> @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%. |
|----------|--|

### 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<br>124-38-9 | -         | -           | 470,000 ppm (Rat) | -                          |

Product Information

|                 |   |
|-----------------|---|
| Oral LD50       |   |
| Dermal LD50     | No information available.                           |
| Inhalation LC50 | 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)                    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.                       | 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 |
|-----------|--------|

|                      |  |
|----------------------|--|
| 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) |

|                                   |
|-----------------------------------|
| <b>15. REGULATORY INFORMATION</b> |
|-----------------------------------|

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 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<br>124-38-9 | X          | X             | X            |

International Regulations

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

## 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

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