1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: CARBON DIOXIDE, REFRIGERATED LIQUID

Product Code(s): G-99

UN-No: UN2187

Recommended Use: Industrial use.

Synonyms: Carbonic Anhydride, Refrigerated Liquid

Supplier Address*:
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.
Las Palmas Village
Road No. 869, Street No. 7
Catano, Puerto Rico 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.

Chemical Emergency Phone Number: Chemtrec: 1-800-424-9300 for US/ 703-527-3887 outside US

2. HAZARDS IDENTIFICATION

WARNING!

Emergency Overview

Simple asphyxiant
Contents under pressure
Keep at temperatures below 52°C / 125°F
Contact with product may cause frostbite

Appearance: Colorless
Physical State: Cryogenic Liquid.
Odor: Odorless

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

Potential Health Effects:
Principle Routes of Exposure
Inhalation. Skin contact.

Acute Toxicity

Inhalation
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%.

Eyes
Contact with product may cause frostbite.

Skin
May cause frostbite.

Skin Absorption Hazard
No known hazard in contact with skin.

Ingestion
Contact with product may cause frostbite.

Chronic Effects
Chronic harmful effects are not known from repeated inhalation of concentrations below PEL/TLV.

Aggravated Medical Conditions

Environmental Hazard
See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No</th>
<th>Volume %</th>
<th>Chemical Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide</td>
<td>124-38-9</td>
<td>&gt;99</td>
<td>CO₂</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

Eye Contact
None required for gas. If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.

Skin Contact
None required for gas. 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.

Inhalation
PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF INHALATION OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, administer oxygen. Unconscious persons should be moved to an uncontaminated area and, as necessary, given artificial resuscitation and supplemental oxygen. Treatment should be symptomatic and supportive.

Ingestion
None under normal use. Get medical attention if symptoms occur.

Notes to Physician
Treat symptomatically.
5. FIRE-FIGHTING MEASURES

Flammable Properties  Not flammable.

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

Explosion Data

Sensitivity to Mechanical Impact  None

Sensitivity to Static Discharge  None

Specific Hazards Arising from the Chemical  Cylinders may rupture under extreme heat. Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.

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  Ensure adequate ventilation. Evacuate personnel to safe areas. Use personal protective equipment. Monitor oxygen level.

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

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

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.

Use only in ventilated areas. Never attempt to lift a cylinder by its valve protection cap. 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. Use equipment rated for cylinder pressure. Use 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. 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.
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.


**Storage**

Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. 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. 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. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**Exposure Guidelines**

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide</td>
<td>STEL = 30000 ppm</td>
<td>TWA: 5000 ppm</td>
<td>IDLH: 40000 ppm</td>
</tr>
<tr>
<td>124-38-9</td>
<td>TWA: 9000 mg/m³</td>
<td>TWA: 5000 ppm</td>
<td>TWA: 5000 ppm</td>
</tr>
<tr>
<td></td>
<td>(vacated) TWA: 18000 mg/m³</td>
<td>STEL: 30000 ppm</td>
<td>TWA: 9000 mg/m³</td>
</tr>
<tr>
<td></td>
<td>(vacated) STEL: 54000 mg/m³</td>
<td>STEL: 30000 ppm</td>
<td>STEL: 30000 ppm</td>
</tr>
</tbody>
</table>

*NIOSH IDLH: Immediately Dangerous to Life or Health.*

**Other Exposure Guidelines**

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

**Engineering Measures**

Local exhaust ventilation to prevent accumulation of high concentrations and maintain air-oxygen levels at or above 19.5%.

**Ventilation**

Ensure adequate ventilation, especially in confined areas.

**Personal Protective Equipment**

**Eye/Face Protection**

Wear protective eyewear (safety glasses). If splashes are likely to occur, wear: Goggles. Face-shield.

**Skin and Body Protection**

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

**Respiratory Protection**

**General Use**

No special protective equipment required.

**Emergency Use**

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

**Hygiene Measures**

Wear suitable gloves and eye/face protection.
9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>Flash Point</td>
<td>No information available</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>No information available</td>
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<tr>
<td>Freezing Point</td>
<td>-56.6°C / -69.8°F</td>
</tr>
<tr>
<td>Water Solubility</td>
<td>Very soluble</td>
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<tr>
<td>Vapor Pressure</td>
<td>856 PSIA @ 70°F</td>
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<tr>
<td>VOC Content (%)</td>
<td>Not applicable</td>
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<tr>
<td>Odor</td>
<td>Odorless</td>
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<tr>
<td>Physical State</td>
<td>Cryogenic Liquid</td>
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<tr>
<td>Autoignition Temperature</td>
<td>No information available</td>
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<tr>
<td>Boiling Point/Range</td>
<td>(Sublimes)</td>
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<tr>
<td>Molecular Weight</td>
<td>44.01</td>
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<tr>
<td>Evaporation Rate</td>
<td>No information available</td>
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<tr>
<td>Vapor Density</td>
<td>1.53 (air = 1)</td>
</tr>
<tr>
<td>Flammability Limits in Air</td>
<td>Upper: Not applicable</td>
</tr>
<tr>
<td></td>
<td>Lower: Not applicable</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Stability: Stable.
Incompatible Products: 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.
Conditions to Avoid: Due to the presence of Carbon dioxide, Carbonic acid is formed in the presence of moisture.
Hazardous Polymerization: Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity
LD50 Oral: No information available.
LD50 Dermal: No information available.
LC50 Inhalation: No information available.
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.
Repeated Dose Toxicity: Chronic, harmful effects are not known from repeated inhalation of low (3-5 molar%) concentrations.

Carcinogenicity: Contains no ingredient listed as a carcinogen.
Irritation
No information available.

Sensitization
No information available.

Reproductive Toxicity
No information available.

Developmental Toxicity
Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

Synergistic Materials
None known.

Target Organ Effects
Respiratory system.

12. ECOLOGICAL INFORMATION

Ecotoxicity

The environmental impact of this product has not been fully investigated.

Ozone depletion potential; ODP; (R-11 = 1): Does not contain ozone depleting chemical (40 CFR Part 82).

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods
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

Proper Shipping Name
Carbon dioxide, refrigerated liquid
Hazard Class
2.2
UN-No
UN2187
Description
UN2187, Carbon dioxide, refrigerated liquid, 2.2
Emergency Response Guide Number
120

TDG

Proper Shipping Name
Carbon dioxide, refrigerated liquid
Hazard Class
2.2
UN-No
UN2187
Description
UN2187, CARBON DIOXIDE, REFRIGERATED LIQUID, 2.2

MEX

Proper Shipping Name
Carbon dioxide, refrigerated liquid
Hazard Class
2.2
UN-No
UN2187
Description
UN2187, Carbon dioxide, refrigerated liquid, 2.2
IATA

UN-No  
Proper Shipping Name  
Hazard Class  
ERG Code  
Description  
Maximum Quantity for Passenger  
Maximum Quantity for Cargo Only  
Limited Quantity  

UN2187  
Carbon dioxide, refrigerated liquid  
2.2  
2L  
UN2187, Carbon dioxide, refrigerated liquid, 2.2  
50 kg  
500 kg  
No information available.

IMDG/IMO

Proper Shipping Name  
Hazard Class  
UN-No  
EmS No.  
Description  

Carbon dioxide, refrigerated liquid  
2.2  
UN2187  
F-C, S-V  
UN2187, Carbon dioxide, refrigerated liquid, 2.2

ADR

Proper Shipping Name  
Hazard Class  
UN-No  
Classification Code  
Description  

Carbon dioxide, refrigerated liquid  
2.2  
UN2187  
3A  
UN2187, Carbon dioxide, refrigerated liquid, 2.2

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 Commercial Chemical Substances/EU List of Notified Chemical Substances

U.S. 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  
Chronic Health Hazard  
Fire Hazard  
Sudden Release of Pressure Hazard  
Reactive Hazard  

Yes  
No  
No  
Yes  
No

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.

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.

CERCLA/SARA
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.

U.S. State Regulations
California Proposition 65
This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

International Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Carcinogen Status</th>
<th>Exposure Limits</th>
</tr>
</thead>
</table>
| Carbon Dioxide| -                 | Mexico: TWA= 5000 ppm  
                |                  | Mexico: TWA= 9000 mg/m³  
                |                  | Mexico: STEL= 15000 ppm  
                |                  | Mexico: STEL= 27000 mg/m³  |

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
A  Compressed gases
16. OTHER INFORMATION

Prepared By
Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Issuing Date
05-Mar-2010

Revision Date
25-Aug-2010

Revision Number
1

Revision Note
(M)SDS sections updated. 1.

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health Hazard</th>
<th>Flammability</th>
<th>Stability</th>
<th>Physical and Chemical Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>Simple asphyxiating</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HMIS</th>
<th>Health Hazard</th>
<th>Flammability</th>
<th>Physical Hazard</th>
<th>Personal Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

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

General Disclaimer
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End of Safety Data Sheet