



CARBON DIOXIDE, SOLID

Safety Data Sheet

1. IDENTIFICATION

Product identifier

Product Name CARBON DIOXIDE, SOLID

Other means of identification

Safety data sheet number LIND-P025
UN/ID no. UN1845
Synonyms Dry Ice, Carbon Ice, Solid Carbon Dioxide

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

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status

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

Simple asphyxiants	Yes
--------------------	-----

Label elements

Signal word

Warning

Hazard Statements

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

Wear cold insulating gloves, face shield, and eye protection

Use and store only outdoors or in a well ventilated place

Keep out of reach of children

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

Store in a well-ventilated place

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	Swallowing must be absolutely avoided, since coldness and developing pressure could be dangerous. Immediate medical attention is required.
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	<p>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.</p> <p>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 product may cause frostbite.</p>
----------	---

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 containers until flames are extinguished.

Specific hazards arising from the chemical

Non-flammable gas. Sealed containers may rupture when heated.

Protective equipment and precautions for firefighters

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

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions	Evacuate personnel to safe areas. Ensure adequate ventilation, especially in confined areas. Monitor oxygen level. Monitor concentration of released product. 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 Remove container to outdoor location if this can be done without risk. Ventilate area.

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

7. HANDLING AND STORAGE

Precautions for safe handlingAdvice on safe handling

Use only with adequate ventilation. Never handle dry ice with bare hands. Always use insulated gloves. Never put containers into trunks of cars or unventilated areas of passenger vehicles. Keep out of reach of children.

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 Carbon dioxide solid should be stored in insulated containers equipped with loose fitting lids which allow escape of vapor caused by sublimation. Do not store in subsurface or enclosed areas. Locate the insulated storage container in an area where there is adequate ventilation so as to prevent the accumulation of carbon dioxide vapors/gas above exposure limits. **DO NOT PUT DRY ICE IN A CLOSED CONTAINER WHERE EVOLVED GAS CANNOT ESCAPE!** Remove scrap solid (snow or dry ice) to a hood with forced ventilation or take to a remote outside location and allow to sublime. 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. Always keep container in upright position

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

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. 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). Face-shield.
Skin and body protection	Wear cold insulating gloves. Safety shoes.
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 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	Solid
Appearance	A white solid liberating a colorless gas.
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

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

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 product may cause frostbite.
Eye contact	Contact with product may cause frostbite.
Ingestion	Swallowing must be absolutely avoided, since coldness and developing pressure could be dangerous.

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 toxicityComponent 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

Not applicable.

Bioaccumulation

Not applicable.

Global warming potential (GWP) 1

13. DISPOSAL CONSIDERATIONSWaste treatment methods

Disposal of wastes Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container to Linde or authorized distributor for proper disposal. Allow to sublime (evaporate) in a well-ventilated area.

14. TRANSPORT INFORMATIONDOT

UN/ID no.	UN1845
Proper shipping name	Carbon dioxide, solid
Hazard Class	9
Description	UN1845, Carbon dioxide, solid, 9
Emergency Response Guide Number	120

TDG

UN/ID no.	UN1845
Proper shipping name	Carbon dioxide, solid
Hazard Class	9
Packing Group	III
Description	UN1845, Carbon dioxide, solid, 9, III

MEX

UN/ID no.	UN1845
Proper shipping name	Carbon dioxide, solid
Hazard Class	9
Packing Group	III
Description	UN1845, Carbon dioxide, solid, 9, III

IATA

UN/ID no.	UN1845
Proper shipping name	Carbon dioxide, solid
Hazard Class	9
Packing Group	P904
ERG Code	9L
Special Provisions	A48, A151, A805
Description	UN1845, Carbon dioxide, solid, 9

IMDG

UN/ID no.	UN1845
Proper shipping name	Carbon dioxide, solid
Hazard Class	9
Packing Group	P003

EmS-No.	F-C, S-V
Description	UN1845, Carbon dioxide, solid, 9

ADR

UN/ID no.	UN1845
Proper shipping name	Carbon dioxide, solid
Hazard Class	9
Classification code	M11
Tunnel restriction code	(C/E)
Special Provisions	584, 653
Description	UN1845, Carbon dioxide, solid, 9

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	No
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

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 01-Jun-2015
Revision Date 01-Jun-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