



Carbon dioxide, refrigerated liquid

Safety Data Sheet P-4573

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Issue date: 01/01/1997 Revision date: 05/05/2022 Supersedes: 01/30/2021 Version: 2.1

SECTION: 1. Product and company identification

1.1. Product identifier

Product form	: Substance
Substance name	: Carbon dioxide, refrigerated liquid
CAS-No.	: 124-38-9
Formula	: CO ₂
Other means of identification	: Liquiflow Liquid Carbon Dioxide, Medipure Liquid Carbon Dioxide

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture	: Medical applications. Industrial use Food applications.
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1.3. Details of the supplier of the safety data sheet

Linde Inc.
10 Riverview Drive
Danbury, CT 06810-6268, USA
www.lindeus.com

Linde Inc. 1-844-44LINDE (1-844-445-4633)

1.4. Emergency telephone number

Emergency number : Onsite Emergency: 1-800-645-4633

CHEMTREC, 24 hr/day 7 days/week
— Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887
(collect calls accepted, Contract 17729)

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

GHS-US classification

Simple asphyxiant SIAS
Press. Gas (Ref. Liq.) H281

2.2. Label elements

GHS US labelling

Hazard pictograms (GHS US) :



GHS04

Signal word (GHS US)	: Warning
Hazard statements (GHS US)	: H281 - CONTAINS REFRIGERATED GAS; MAY CAUSE CRYOGENIC BURNS OR INJURY OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION. CGA-HG03 - MAY INCREASE RESPIRATION AND HEART RATE.
Precautionary statements (GHS US)	: P202 - Do not handle until all safety precautions have been read and understood. P271+P403 - Use and store only outdoors or in a well-ventilated place. P282 - Wear cold insulating gloves/face shield/eye protection. P304, P340, P313 - IF INHALED: Remove person to fresh air and keep comfortable for breathing. Get medical advice/attention. P302, P336, P315 - IF ON SKIN: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention. CGA-PG05 - Use a back flow preventive device in the piping. CGA-PG20+CGA-PG10 - Use only with equipment of compatible materials of construction and rated for cylinder pressure. CGA-PG24 - DO NOT change or force fit connections.



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CGA-PG12 - Do not open valve until connected to equipment prepared for use.

CGA-PG06 - Close valve after each use and when empty.

CGA-PG23 - Always keep container in upright position.

CGA-PG11 - Never put cylinders into unventilated areas of passenger vehicles.

2.3. Other hazards

Other hazards which do not result in classification

: Asphyxiant in high concentrations.

Contact with liquid may cause cold burns/frostbite.

WARNING: Concentration levels of carbon dioxide above about 1 percent are dangerous. Linde recommends continuous monitoring with alarms to indicate unsafe conditions before and during potential personnel exposure. Use appropriate monitoring devices to ensure a safe oxygen level (minimum of 19.5 percent) and a safe carbon dioxide level.

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%
Carbon dioxide, refrigerated liquid (Main constituent)	(CAS-No.) 124-38-9	100

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after 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.
First-aid measures after skin contact	: The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.
First-aid measures after eye contact	: The liquid may cause frostbite. Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately. Get immediate medical attention.
First-aid measures after ingestion	: Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

None.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture

Reactivity : No reactivity hazard other than the effects described in sub-sections below.



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5.3. Advice for firefighters

Firefighting instructions	: DANGER! Extremely cold liquid and gas under pressure. Take care not to direct spray onto vents on top of container. Do not discharge sprays directly into liquid; cryogenic liquid can freeze water rapidly. Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1910 Subpart L—Fire Protection.
Protection during firefighting	: Compressed gas: asphyxiant. Suffocation hazard by lack of oxygen.
Special protective equipment for fire fighters	: Use self-contained breathing apparatus. Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
Specific methods	: Stop flow of product if safe to do so. Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas containers to rupture. Cool endangered containers with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems. Use water spray or fog to knock down fire fumes if possible. If leaking do not spray water onto container. Water surrounding area (from protected position) to contain fire. Exposure to fire may cause containers to rupture/explode.
Other information	: Cryogenic liquid causes severe frostbite, a burn-like injury. Heat of fire can build pressure in a closed container and cause it to rupture. Venting vapors may obscure visibility. Air will condense on surfaces such as vaporizers or piping exposed to liquid or cold gas. Nitrogen, which has a lower boiling point than oxygen, evaporates first, leaving an oxygen-enriched condensate.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	: WARNING! Liquid and gas under pressure.. Rapid release of gaseous carbon dioxide through a pressure relief device (PRD) or valve can result in the formation of dry ice, which is very cold and can cause frostbite.. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Evacuate area. Ensure adequate air ventilation. Wear self-contained breathing apparatus when entering area unless atmosphere is proven to be safe. Stop leak if safe to do so.
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6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Try to stop release.

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.



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SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling

: **WARNING: Concentration levels of carbon dioxide above about 1 percent are dangerous.** Linde recommends continuous monitoring with alarms to indicate unsafe conditions before and during potential personnel exposure. Use appropriate monitoring devices to ensure a safe oxygen level (minimum of 19.5 percent) and a safe carbon dioxide level.

This gas is heavier than air and in an enclosed space tends to accumulate near the floor, displacing air and pushing it upward. This creates an oxygen-deficient atmosphere near the floor. Ventilate space before entry. Verify sufficient oxygen concentration.

Wear leather safety gloves and safety shoes when handling cylinders. Protect containers from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g. wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions

: Store in a cool, well-ventilated place. Store and use with adequate ventilation. Store only where temperature will not exceed 125°F (52°C). Firmly secure containers upright to keep them from falling or being knocked over. Install valve protection cap firmly in place by hand. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods.

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Carbon dioxide, refrigerated liquid (124-38-9)		
ACGIH	ACGIH OEL TWA [ppm]	5000 ppm
ACGIH	ACGIH OEL STEL [ppm]	30000 ppm
USA OSHA	OSHA PEL TWA [1]	9000 mg/m ³
USA OSHA	OSHA PEL TWA [2]	5000 ppm
USA IDLH	IDLH [ppm]	40000 ppm

8.2. Exposure controls

Appropriate engineering controls

: Use a local exhaust system with sufficient flow velocity to maintain an adequate supply of air in the worker's breathing zone. Mechanical (general): General exhaust ventilation may be acceptable if it can maintain an adequate supply of air. **WARNING: Concentration levels of carbon dioxide above about 1 percent are dangerous.** Linde recommends continuous monitoring with alarms to indicate unsafe conditions before and during potential personnel exposure. Use appropriate monitoring devices to ensure a safe oxygen level (minimum of 19.5 percent) and a safe carbon dioxide level.



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Eye protection	: Wear goggles and a face shield when transfilling or breaking transfer connections. Wear safety glasses when handling cylinders; vapor-proof goggles and a face shield during cylinder changeout or whenever contact with product is possible. Select eye protection in accordance with OSHA 29 CFR 1910.133.
Skin and body protection	: Wear metatarsal shoes and work gloves for cylinder handling, and protective clothing where needed. Wear appropriate chemical gloves during cylinder changeout or wherever contact with product is possible. Select per OSHA 29 CFR 1910.132, 1910.136, and 1910.138.
Respiratory protection	: When workplace conditions warrant respirator use, follow a respiratory protection program that meets or exceeds the requirements of the appropriate Health and Safety Regulations. Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).
Thermal hazard protection	: Wear cold insulating gloves. Wear cold insulating gloves when transfilling or breaking transfer connections.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Gas
Appearance	: Colourless gas.
Molecular mass	: 44 g/mol
Colour	: Colourless.
Odour	: No odour warning properties.
Odour threshold	: No data available
pH	: 3.7 (carbonic acid)
Relative evaporation rate (butylacetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: -78.5 °C
Freezing point	: No data available
Boiling point	: -78.4 °C
Flash point	: No data available
Critical temperature	: 31 °C
Auto-ignition temperature	: Not applicable.
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapour pressure	: 5730 kPa
Critical pressure	: 7375 kPa
Relative vapour density at 20 °C	: No data available
Relative density	: 0.82
Density	: 762 kg/m ³
Relative gas density	: 1.52
Solubility	: Water: 2000 mg/l Completely soluble.
Partition coefficient n-octanol/water (Log Pow)	: 0.83
Partition coefficient n-octanol/water (Log Kow)	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Not applicable.
Oxidizing properties	: None.
Explosive limits	: No data available

9.2. Other information

Sublimation point	: -78.5 °C
Gas group	: Press. Gas (Ref. Liq.)



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Additional information : Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

None.

10.4. Conditions to avoid

None under recommended storage and handling conditions (see section 7).

10.5. Incompatible materials

Alkali metals, Alkaline earth metals, Acetylide forming metals, Chromium, Titanium > 1022°F (550°C), Uranium (U) > 1382°F (750°C), Magnesium > 1427°F (775°C).

10.6. Hazardous decomposition products

Electrical discharges and high temperatures decompose carbon dioxide into carbon monoxide and oxygen. The welding process may generate hazardous fumes and gases. If using carbon dioxide for welding and cutting, see Linde SDS P-4574, Gaseous Carbon Dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral) : Not classified
Acute toxicity (dermal) : Not classified
Acute toxicity (inhalation) : Not classified

Carbon dioxide, refrigerated liquid (f)124-38-9

Additional information Low concentrations of CO₂ cause increased respiration and headache

Skin corrosion/irritation : Not classified
pH: 3.7 (carbonic acid)
Serious eye damage/irritation : Not classified
pH: 3.7 (carbonic acid)
Respiratory or skin sensitisation : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified
STOT-single exposure : Not classified
STOT-repeated exposure : Not classified
Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No ecological damage caused by this product.



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12.2. Persistence and degradability

Carbon dioxide, refrigerated liquid (124-38-9)

Persistence and degradability	No ecological damage caused by this product.
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12.3. Bioaccumulative potential

Carbon dioxide, refrigerated liquid (124-38-9)

BCF - Fish [1]	No bioaccumulation
Partition coefficient n-octanol/water (Log Pow)	0.83
Partition coefficient n-octanol/water (Log Kow)	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

12.4. Mobility in soil

Carbon dioxide, refrigerated liquid (124-38-9)

Mobility in soil	No data available.
Ecology - soil	No ecological damage caused by this product.

12.5. Other adverse effects

Other adverse effects	: Can cause frost damage to vegetation.
Effect on the ozone layer	: None.
Global warming potential [CO ₂ =1]	: 1
Effect on global warming	: When discharged in large quantities may contribute to the greenhouse effect.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product/Packaging disposal recommendations : Do not attempt to dispose of residual or unused quantities. Return container to supplier.

SECTION 14: Transport information

In accordance with DOT

Transport document description (DOT)	: UN2187 Carbon dioxide, refrigerated liquid, 2.2
UN-No.(DOT)	: UN2187
Proper Shipping Name (DOT)	: Carbon dioxide, refrigerated liquid
Class (DOT)	: 2.2 - Class 2.2 - Non-flammable compressed gas 49 CFR 173.115
Hazard labels (DOT)	: 2.2 - Non-flammable gas



DOT Special Provisions (49 CFR 172.102)	: T75 - When portable tank instruction T75 is referenced in Column (7) of the 172.101 Table, the applicable refrigerated liquefied gases are authorized to be transported in portable tanks in accordance with the requirements of 178.277 of this subchapter. TP5 - For a portable tank used for the transport of flammable refrigerated liquefied gases or refrigerated liquefied oxygen, the maximum rate at which the portable tank may be filled must not exceed the liquid flow capacity of the primary pressure relief system rated at a pressure not exceeding 120 percent of the portable tank's design pressure. For portable tanks used for the transport of refrigerated liquefied helium and refrigerated liquefied atmospheric gas (except oxygen), the maximum rate at which the tank is filled must not exceed the liquid flow capacity of the pressure relief device rated at 130 percent of the portable tank's design pressure. Except for a portable tank containing refrigerated liquefied helium, a portable tank shall have an outage of at least two percent below the inlet of the pressure relief device or pressure control valve, under conditions of incipient opening, with the portable tank in a level attitude. No outage is required for helium.
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Additional information

Emergency Response Guide (ERG) Number	: 120 (UN1013)
Other information	: No supplementary information available.



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Special transport precautions

: Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers:

- Ensure there is adequate ventilation.
- Ensure that containers are firmly secured.
- Ensure valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.

Transport by sea

UN-No. (IMDG) : 2187
Proper Shipping Name (IMDG) : CARBON DIOXIDE, REFRIGERATED LIQUID
Class (IMDG) : 2 - Gases
Division (IMDG) : 2.2 - Non-flammable, non-toxic gases
MFAG-No : 120

Air transport

UN-No. (IATA) : 2187
Proper Shipping Name (IATA) : Carbon dioxide, refrigerated liquid
Class (IATA) : 2 - Gases
Civil Aeronautics Law : Gases under pressure/Gases nonflammable nontoxic under pressure(Hazardous materials notice Appended Table 1 Article 194 of the Enforcement Regulations)

SECTION 15: Regulatory information

15.1. US Federal regulations

Carbon dioxide, refrigerated liquid (124-38-9)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory.

15.2. International regulations

CANADA

Carbon dioxide, refrigerated liquid (124-38-9)

Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

Carbon dioxide, refrigerated liquid (124-38-9)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.2.2. National regulations

Carbon dioxide, refrigerated liquid (124-38-9)

Listed introduction on Australian Industrial Chemicals Introduction Scheme (AICIS Inventory)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on KECL/KECI (Korean Existing Chemicals Inventory)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the Canadian IDL (Ingredient Disclosure List)
Listed on INSQ (Mexican National Inventory of Chemical Substances)
Listed on the TCSI (Taiwan Chemical Substance Inventory)



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15.3. US State regulations

Carbon dioxide, refrigerated liquid(124-38-9)	
U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm



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SECTION 16: Other information

Other information

: When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product.

Linde asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Linde Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Linde Inc, it is the user's obligation to determine the conditions of safe use of the product.

Linde SDSs are furnished on sale or delivery by Linde or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your sales representative, local distributor, or supplier, or download from www.lindeus.com. If you have questions regarding Linde SDSs, would like the document number and date of the latest SDS, or would like the names of the Linde suppliers in your area, phone or write the Linde Call Center (Phone: 1-844-44-Linde (1-844-445-4633); Address: Linde Call Center, Linde Inc, P.O. Box 44, Tonawanda, NY 14151-0044).

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NFPA health hazard

: 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard

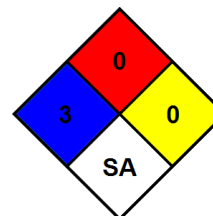
: 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA instability

: 0 - Material that in themselves are normally stable, even under fire conditions.

NFPA specific hazard

: SA - Materials that are simple asphyxiants.



SDS US (GHS HazCom 2012) - Linde 2022

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.