



# 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 Singapore Pte Ltd

50 Jurong Island Highway, Singapore 627877

Phone: +65 68678998

[www.linde.com.sg](http://www.linde.com.sg)

For additional product information contact your local customer service.

Emergency telephone number

Company Phone Number +65 68670860

**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	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 <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.

#### 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, G-6.3, 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 <sup>3</sup> (vacated) TWA: 10000 ppm (vacated) TWA: 18000 mg/m <sup>3</sup> (vacated) STEL: 30000 ppm (vacated) STEL: 54000 mg/m <sup>3</sup>	IDLH: 40000 ppm TWA: 5000 ppm TWA: 9000 mg/m <sup>3</sup> STEL: 30000 ppm 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

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). 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 <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 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

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

TDG

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

MEX

UN/ID no.	UN1013
-----------	--------

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 INFORMATION

International Inventories

TSCA	Complies
DSL/NDL	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

## 16. OTHER INFORMATION

<u>NFPA</u>	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 Gas Singapore 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