



## MATERIAL SAFETY DATA SHEET

### Carbon Dioxide (Refrigerated Liquid)

#### COMPANY INFORMATION

**Company Name** Reliant Gases, LTD  
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Midland, TX 79701  
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**MSDS Creation Date** 12/14/2007  
**Revision Date** 5/7/2009  
**MSDS Number** RG-MSDS\_CO2.Liquid

#### PRODUCT IDENTIFICATION

**Name** Carbon Dioxide  
**Synonym** Carbonic anhydride, carbonic acid gas, refrigerant gas R744  
**Chemical formula** CO<sub>2</sub>  
**Chemical Family** Acid anhydride  
**Department of Transportation shipping name:** Carbon dioxide, Refrigerated Liquid UN2187,  
CAS # 124-38-9

#### PHYSICAL & CHEMICAL INFORMATION

**Appearance, Odor & State:** At room temperature and atmospheric pressure, carbon dioxide is a colorless, odorless, slightly acidic gas. Carbon Dioxide is shipped as a liquefied gas under its own vapor pressure.

**Molecular weight:** 44.011  
**Sublimation Point:** -109.3°F (-78.5°C)  
**Critical temperature:** 87.6°F (30.9°C)  
**Gas density (@ 70°F (21.1°C) and 1 atm):** 0.114 lb/ft<sup>3</sup> (1.832 kg/m<sup>3</sup>)  
**Vapor pressure (@ 70°F (21.1°C)):** 838 psig  
**Specific volume (at 70°F (21.1°C) and 1 atm):** 8.74 ft<sup>3</sup>/lb (0.5457 m<sup>3</sup>/kg)  
**Triple point (@ 60.4 psig):** -69.9°F (-56.6°C)  
**Specific gravity (Air = 1) at 70°F (21.1°C):** 1.52  
**Solubility in water (vol / vol. at 68°F (20°C)):** 0.90

#### HEALTH HAZARDS

**Routes of Entry** - Inhalation, Dermal, Eyes

**CO<sub>2</sub> EXPOSURE LIMITS -**

Carbon dioxide is regulated for diverse purposes but not as a toxic substance.

- **IDLH 40,000-ppm**
- **ACGIH CO<sub>2</sub> Exposure Limits:** 5000-ppm TWA with a 30,000-ppm STEL
- **NIOSH CO<sub>2</sub> Exposure Limits:** TWA of 5,000-ppm with a 10-minute 30,000-ppm ceiling limit
- **OSHA CO<sub>2</sub> Exposure Limits:** 5,000-ppm PEL as an 8-hour TWA and a 30,000-ppm STEL

**Definitions**

- **PEL** = Permissible Exposure Limit is the maximum amount or concentration that a worker may be exposed to.
- **TWA**=Time-Weighted Average is an average value of exposure over the course of an 8 hour work shift.
- **IDLH** = Immediate Danger to Life and Health
- **STEL**= Short Term Exposure Limit is the maximum concentration of a chemical to which workers may be exposed continuously for up to 15 minutes without danger to health or work efficiency and safety .

**References:**

<http://www.osha.gov/dts/sltc/methods/inorganic/id172/id172bkr.html>  
<http://www.osha.gov/dts/sltc/methods/inorganic/id172/id172.html>  
<http://www.cdc.gov/Niosh/pel88/124-38.html>  
<http://www.cdc.gov/niosh/idlh/124389.html>  
<http://www.cdc.gov/niosh/npg/npgd0103.html>

**HAZARD RATINGS:**

	NFPA	HMIS (gas)	HMIS (liquid)
<b>HEALTH</b>	1	1	3
<b>FLAMMABILITY</b>	0	0	0
<b>REACTIVITY</b>	0	0	0
<b>SPECIAL</b>	SA <sup>(1)</sup>		

(1) *Compressed Gas Association (CGA) recommendation to designate simple asphyxiant*

**PERSONAL PROTECTION**

**Area Ventilation** - Use local exhaust and general ventilation to prevent accumulation above the acceptable exposure limits and to prevent oxygen deficiency.

**Eye protection** - Safety goggles, glasses, or face shields should be worn when handling liquid carbon dioxide to prevent contact with the eyes.

**Skin protection** - Use loose fitting insulated gloves, long sleeved shirts or coveralls, long legged trousers, or accepted clothing to protect from frostbite or cryogenic "burns".

**Respiratory protection** - When needed, use positive pressure breathing apparatus or self contained air supply systems. These should also be available for emergency use.

**Hearing protection** – Hearing protection that is of the approved variety should be worn to prevent hearing damage in the event that nearby relief valves may open unexpectedly and anytime that the lines or valves in the area may be relieved of pressure.

**Other protection** - Safety shoes or boots should be worn to protect against contact with liquid or cryogenic carbon dioxide.

**FIRST AID**

**Skin Contact** - flush the affected area with tepid water. DO NOT USE HOT WATER! A physician should be consulted promptly if the cryogenic "bum" has resulted in the blistering of the dermal surface or in deep tissue freezing.

**Eyes** - Never introduce ointments or oils into the eyes without medical advice. In case of freezing or cryogenic "burns" caused by rapidly evaporating liquid; DO NOT WASH THE EYES WITH HOT OR EVEN TEPID WATER! Remove the victim from the source of contamination. Open the eyelids wide to allow liquid to evaporate. If pain is present, refer the victim to an ophthalmologist for treatment and follow-up. If the victim cannot tolerate light, protect the eyes with a light bandage.

**Ingestion** - Treat in a manner similar to that of skin contact. Seek medical attention. Never give anything by mouth to an unconscious victim.

**Inhalation** - Prompt medical attention is mandatory in cases of overexposure to carbon dioxide. Rescue personnel should be equipped with self-contained breathing apparatus. Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given artificial resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive. Treat areas exposed to liquid carbon dioxide as "frostbite".

**GENERAL RESCUE AND FIRST AID** - In all cases of exposure, rescue personnel should use appropriate protective equipment. Victims should be immediately removed from the contaminated area. Particular attention should be given to establishing and maintaining proper respiration and cardiac function of the victims seek immediate medical help, keep victims warm and comfortable.

**Note to Physician** – There is no specific antidote. Treatment for overexposure should be directed at the control of symptoms and the clinical condition.

**TOXICOLOGICAL INFORMATION &  
EXPOSURE AND EFFECTS**

### Overexposure –

- At 1% concentration of carbon dioxide CO<sub>2</sub> (10,000 parts per million or ppm) and under continuous exposure at that level, such as in an auditorium filled with occupants and poor fresh air ventilation, some occupants are likely to feel drowsy.
- The concentration of carbon dioxide must be over about 2% (20,000 ppm) before most people are aware of its presence unless the odor of an associated material (auto exhaust or fermenting yeast, for instance) is present at lower concentrations.
- Above 2%, carbon dioxide may cause a feeling of heaviness in the chest and/or more frequent and deeper respirations.
- If exposure continues at that level for several hours, minimal "acidosis" (an acid condition of the blood) may occur but more frequently is absent.
- **Breathing rate** doubles at 3% CO<sub>2</sub> and is four times the normal rate at 5% CO<sub>2</sub>.
- **Toxic levels of carbon dioxide:** at levels above 5%, concentration CO<sub>2</sub> is directly toxic. [At lower levels we may be seeing effects of a reduction in the relative amount of oxygen rather than direct toxicity of CO<sub>2</sub>.]

Symptoms of high or prolonged exposure to carbon dioxide include headache, increased heart rate, dizziness, fatigue, rapid breathing, visual and hearing dysfunctions. Exposure to higher levels may cause unconsciousness or death within minutes of exposure.

**Skin** - Contact with liquid carbon dioxide can cause tissue freezing or frostbite and cryogenic "burns".

**Eyes** - Eye contact with solid CO<sub>2</sub> or compressed carbon dioxide should be considered as a corneal burn. Frostbite of the eye structure may also occur.

**Ingestion** - Ingestion is unlikely. Tissue contact with large quantities of carbon dioxide may cause tissue freezing and frostbite, similar to that of skin contact.

Avoid direct contact or exposure with carbon dioxide while in a cryogenic state as it may cause immediate freezing or frostbite to tissue.

Avoid areas near leaks or spills where heavy concentrations may have settled, displacing the oxygen, thus possibly causing suffocation!

<b>FIRE AND EXPLOSION HAZARD</b>
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**Flash Point:** No Applicable

**Auto ignition:** Nonflammable

**Flammable limits in air:** Nonflammable

**Firefighting instructions:** Use extinguishing agent suitable for surrounding fires

**Firefighting procedures** - Carbon dioxide is nonflammable and as such does not present a fire hazard. However, cylinders that are exposed to fire may rupture with explosive and violent force. Extinguish surrounding fire and keep cylinders cool by using a cold water spray applied from the maximum possible distance.

## HANDLING AND STORAGE

**Conditions to Avoid** - Avoid trapping or sealing of liquid carbon dioxide in lines, containers, or vessels without the benefit of pressure release valves or rupture disks set at the proper release points. These lines, containers or vessels could otherwise rupture with extremely violent force!

Avoid contact with eyes, skin and clothing. Keep container closed. Use only with adequate ventilation. Do not puncture or incinerate container. Wash thoroughly after handling High pressure gas. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement. Never allow any unprotected part of the body to touch non-insulated pipes or vessels that contain cryogenic liquids. Prevent entrapment of liquid in closed systems or piping without pressure relief devices. Some materials may become brittle at low temperatures and will easily fracture.

**Incompatible Materials** - None known

**Hazardous Decomposition Products** - Carbonic acid in the presence of water or moisture. Hazardous polymerization will not occur.

**Spills, leaks, or disposal procedure** - Using appropriate protective equipment, evacuate all personnel from the affected area. If the leak or spill is from a valve, try to stop the flow of CO<sub>2</sub> by closing off valves. Avoid contact with the CO<sub>2</sub>. Avoid contact with cold materials. Self-contained breathing apparatus may necessary where the oxygen has been replaced.

**Special precautions** - Keep all areas well ventilated. Never allow liquid to become entrapped in non-relieved lines, containers, or vessels. Be alert for the formation of "ice plugs" when venting lines or plumbing. Never hit or hammer on lines or plumbing that is frozen or pressurized. Always use lines, hoses, and vessels that are designed for the safe handling of liquid carbon dioxide.

Keep container tightly closed. Keep container in a cool, well-ventilated area. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

## SHIPPING INFORMATION))

**Proper shipping name**

CARBON DIOXIDE, REFRIGERATED LIQUID

**Hazard class**

2.2 (NONFLAMMABLE GAS)

**DOT identification number** UN2187  
**DOT shipping label(s)** NONFLAMMABLE GAS  
**Product RQ (Reportable Quantity):** None

## REGULATORY INFORMATION

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

### US FEDERAL REGULATIONS

TSCA 8(b) inventory: Carbon Dioxide

SARA 302/304/311/312 extremely hazardous substances: No products were found.  
SARA 302/304 emergency planning and notification: No products were found.  
SARA 302/304/311/312 hazardous chemicals: Carbon Dioxide  
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Carbon Dioxide: Sudden Release of Pressure, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard

Clean Water Act (CWA) 307: No products were found.  
Clean Water Act (CWA) 311: No products were found.  
Clean air act (CAA) 112 accidental release prevention: No products were found.  
Clean air act (CAA) 112 regulated flammable substances: No products were found.  
Clean air act (CAA) 112 regulated toxic substances: No products were found.

### STATE REGULATIONS

Pennsylvania RTK: Carbon Dioxide: (generic environmental hazard)  
Massachusetts RTK: Carbon Dioxide  
New Jersey: Carbon Dioxide

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