



**Aceti-Oxígeno, S.A.**

FABRICANTES DE GASES PARA USO MÉDICO, ALIMENTICIO E INDUSTRIALES

## MATERIAL SAFETY DATA SHEET

(MSDS MATERIAL SAFETY DATA SHEET)

### CARBON DIOXIDE

Annex 9

#### 1. Product and company identification

- |      |                       |  |
|------|-----------------------|--|
| 1.1  | Product name:         | Carbon Dioxide   |
| 1.2  | Common chemical name: | Carbon Dioxide   |
| 1.3  | IUPAC chemical name:  | Carbonic Anhydride   |
| 1.4  | Chemical family:      | Family of acid anhydrides  |
| 1.5  | Condensed formula:    | CO <sub>2</sub>  |
| 1.6  | Synonyms:             | Carbonic Anhydride, Carbonic Acid Gas, Carbonic Gas, Carbon Anhydride, Carbon Dioxide USP, Dry Ice (in solid state).   |
| 1.7  | Company name:         | Aceti-Oxígeno, S.A.  |
| 1.8  | Company address:      | Panama Mañanitas-Industrial Zone   |
| 1.9  | Telephone:            | Tel. 321-8888  |
| 1.10 | Emergency Telephone:  | 103 Fire Brigade   |
| 1.11 | REVISION DATE:        | June 20. of 2022, rev. 1, valid until: June 20, 2027   |
| 1.12 | Use:                  | Carbonation of beverages, consumable soda, pH control, fire extinguishing, use in controlled atmospheres, pressurization of solvent media, fumigation of grains and cereals, supercritical extraction, in mixtures for respiratory therapy, chemical reactive. |

#### 2. Composition or information on ingredients

- |     |                                 |                |
|-----|---------------------------------|----------------|
| 2.1 | Ingredient name:                | Carbon Dioxide |
| 2.2 | CAS <sup>[1]</sup> Number:      | 124-38-9       |
| 2.3 | Percentage:                     | > 99%          |
| 2.4 | OSHA PEL-TWA <sup>[2]</sup> :   | 5,000 ppm      |
| 2.5 | ACGIH TLV <sup>[3]</sup> - TWA: | 5,000 ppm      |
| 2.6 | ACGIH STEL:                     | 30,000 ppm     |
| 2.7 | [LD <sub>50</sub> ]:            | None           |
| 2.8 | [LC <sub>50</sub> ]:            | None           |

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- <sup>[1]</sup> Chemical Abstracts Service (International Material Identification Number according to the Chemical Abstracts Service)
- <sup>[2]</sup> Occupational Safety and Health Administration. Permissible Exposure Limits. Time Weighted Average (Occupational Safety and Hygiene Administration. Permissible Exposure Limits. Time weighted average exposure)
- <sup>[3]</sup> American Conference of Governmental Industrial Hygienists. Threshold Limit Value (North American Conference of Governmental Industrial Public Health. Threshold Limit Value)

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Panama, July 28, 2022.

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RESOLUCIÓN No.151  
DE 4 DE DICIEMBRE 1989,  
PANAMÁ, REP. DE PANAMÁ

### **3. Risk identification**

- 3.1 Considerations and hazards during emergencies
  - 3.1.1 Liquid and gas at high pressure
  - 3.1.2 May cause asphyxia quickly
  - 3.1.3 May increase the respiratory and cardiac frequency
  - 3.1.4 The solid and liquid forms can cause severe injury by instant freezing
  - 3.1.5 Avoid breathing of gas
  - 3.1.6 Rescue workers must require self-contained breathing apparatus and thermal insulation garments.
- 3.2 Information on potential health effects
  - 3.2.1 Exposure routes
    - 3.2.1.1 Inhalation: Carbon dioxide is a simple asphyxiant and a powerful cerebral vasodilator. The inhalation of large amounts causes a rapid circulatory failure that leads to coma and death. **High concentrations of carbon dioxide can asphyxiate quickly without warning and with no possibility of self-rescue if the concentration of oxygen is too low.** Carbon dioxide concentrations equal to or above 10% can produce unconsciousness and death. Low concentrations can produce headache, sweating, physiological hyperventilation, tachycardia, shortness of breath, dizziness, mental depression, visual alterations and convulsions. No irreversible effects have been known from routine inhalation of low concentrations (3% to 5%) of carbon dioxide.
    - 3.2.1.2 Contact with eyes: Contact with solid, liquid or cold gaseous carbon dioxide can cause the fabrics to freeze.
    - 3.2.1.3 Skin contact: Contact with solid, liquid or cold gaseous carbon dioxide can cause injury by instant freezing. The cryogenic injury shows a change in the skin color to gray or white, followed by a possible blistering.
    - 3.2.1.4 Skin absorption: Not applicable
    - 3.2.1.5 Ingestion: Ingestion of the solid phase (dry ice) can cause internal cryogenic injury with severe consequences for the digestive system.
  - 3.2.2 Chronic effects: No chronic effects have been established due to its use.
  - 3.2.3 Medical conditions worsened by overexposure: None
  - 3.2.4 Other effects of overexposure: Damage to retinal ganglion cells and central nervous system can occur.
  - 3.2.5 Carcinogenicity: Carbon dioxide is not listed by NTP<sup>[4]</sup>, OSHA, or IARC<sup>[5]</sup>.

<sup>[4]</sup> National Toxicology Program

<sup>[5]</sup> International Agency for Research on Cancer

### **4. First aid**

- 4.1 Inhalation: Take the person to a place with fresh air. If there is no breathing, administer artificial respiration. If breathing is difficult, administer oxygen. Get immediate medical attention.
- 4.2 Contact with eyes: Contact of cold solid, liquid or gaseous carbon dioxide with the eyes can cause frostbite of the tissues. Wash eyes with plenty of lukewarm water. Request the help of a doctor, preferably an ophthalmologist.
- 4.3 Skin Contact: Contact with cold solid, liquid, or gaseous carbon dioxide can produce cryogenic injury. Immediately provide warmth to the affected area with lukewarm water not to exceed 105°F (41°C). Do not apply direct heat to the affected area. Apply dry, sterile gauze to protect the area from further infection or damage, adding glycerine to the gauze as needed. Get immediate medical attention.
- 4.4 Ingestion of the solid: Drink plenty of warm water. Get immediate medical attention.



- 4.5 Remarks to the doctor: There is no specific antidote. Treatment of overexposure should be directed at controlling the symptoms and the person's clinical condition.
- 5. Measures in case of fire**
- 5.1 Ignition point: Not applicable because it is a gas.
- 5.2 Auto ignition: Non-flammable
- 5.3 Flammable limits in air, volume by volume:
- 5.3.1 Lower: Not applicable
- 5.3.2 Superior: Not applicable
- 5.4 Extinguishing media: Carbon dioxide is non-flammable and does not stimulate combustion. Carbon dioxide is an extinguishing agent for class B and C fires, but should not be used for class D fires. Use the appropriate extinguishing medium according to the surrounding inflammation.
- 5.5 Special instructions to firefighters: Carbon dioxide is a simple asphyxiant. Evacuate the area. If possible, remove cylinders from fire area and cool with water, not directing water into cylinder vent. Rescue workers may require self-contained breathing equipment.
- 5.6 Unusual fire and explosion hazards: Upon exposure to intense heat or flame, a cylinder or flask of liquid may rapidly vent or rupture violently. Most containers are designed to vent their contents when exposed to elevated temperatures. The internal pressure of the container may rise due to heat and may rupture if the pressure relief devices fail to function. See Section 10 for more information.
- 5.7 Hazardous combustion products: None known.
- 5.8 Sensitivity to static discharge: None
- 5.9 Sensitivity to mechanical impact: None
- 6. Measures in case of accidental release**
- 6.1 Cylinders
- 6.1.1 Evacuate all personnel from the affected area until it is guaranteed that carbon dioxide levels are below exposure limits.
- 6.1.2 Disconnect the carbon dioxide source if there is no additional risk in doing so.
- 6.1.3 Ventilate confined areas or move cylinders outside the facility in a well-ventilated area.
- 6.1.4 If there is a leak from the cylinders or the valves, immediately contact Aceti-Oxígeno, S.A.
- 6.1.5 The cylinder or its valve may cool considerably after a rapid release of the product.
- 6.1.6 Handle the cylinder with care, wearing leather gloves
- 6.1.7 Solid carbon dioxide may form and remain inside the container until the container is thermalized. This thermalization must be carried out only by qualified Aceti-Oxígeno, S.A. personnel.
- 6.2 Liquid thermos and cryogenic tanks (bulk)
- 6.2.1 Evacuate all personnel from the affected area until it is guaranteed that carbon dioxide levels are below exposure limits.
- 6.2.2 Disconnect the carbon dioxide source if there is no additional risk in doing so.
- 6.2.3 Ventilate any closed or confined area.
- 6.2.4 If there is a leak from the cylinders or the valves, immediately contact Aceti-Oxígeno, S.A. Solid carbon dioxide can form and remain inside the container until it is thermalized. This thermalization must be carried out only by qualified personnel from Productos de Aceti-Oxígeno, S.A.
- 6.3 Dry ice
- 6.3.1 Evacuate all personnel from the affected area until it is guaranteed that the carbon dioxide levels are below the exposure limits.

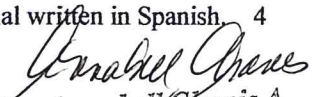
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- 6.3.2 Ventilate closed or confined areas and move the solid to an open area free from contact with pedestrians or workers.
- 6.3.3 Handle the solid with gloves and clothing that is insulating and resistant to cold.
- 7. Handling and storage**
- 7.1 Precautions for storage
- 7.1.1 Store and use with adequate ventilation.
- 7.1.2 Storage tanks and related equipment shall not be located in confined areas or at levels below the surface of the ground (basements, parking lots, etc.) unless they are designed to maintain carbon dioxide concentrations below exposure limits in the event of a leak or spill.
- 7.1.3 Cryogenic containers are equipped with pressure relief devices to control internal pressure. Under normal operating conditions, these containers periodically vent the product in gas form to release internal pressure. Relief valves should vent to a well-ventilated outside location.
- 7.1.4 The cylinders must be stored vertically, with the valve protection cap in position and properly secured to prevent them from falling or hitting each other.
- 7.1.5 Protect cylinders from any physical damage. Do not drag, roll, slide or drop them.
- 7.1.6 Do not allow the temperature in the storage area to exceed 125°F (52°C).
- 7.1.7 Full cylinders must be separated from empty ones.
- 7.1.8 Use a FIFO (first-in, first-out) inventory system to prevent full cylinders from being stored for long periods of time.
- 7.1.9 Solid carbon dioxide (dry ice) should be stored in thermally insulating containers with non-sealing lids to allow the escape of the gas formed. Store in a well-ventilated area to prevent build-up of carbon dioxide vapors above exposure limits.
- 7.2 Precautions to be taken into account when handling cylinders
- 7.2.1 Use a handcart for internal movement or transport of cylinders.
- 7.2.2 Never attempt to lift a cylinder by means of the valve protection plug.
- 7.2.3 High temperatures can cause cylinder damage or premature failure of the pressure relief device, resulting in venting of contents.
- 7.2.4 If difficulties arise in the operation of the container valves, discontinue their use and contact Aceti-Oxígeno, S.A.
- 7.2.5 Never insert an object (tool such as wrench, screwdriver, etc.) into the openings of the valve protection cap, as it may be damaged and generate carbon dioxide leakage.
- 7.2.6 Do not hit the valve protection cap with a hammer. Use an adjustable strap wrench to remove rusted or overtightened plugs.
- 7.2.7 Never bring an electric arc near a compressed gas cylinder or make it part of an electrical circuit.
- 7.2.8 For additional precautions in the use of carbon dioxide, see Section 16. Other Information.
- 7.3 Precautions to be taken into account for handling liquid
- 7.3.1 Use special protective clothing, insulating gloves and protective glasses or face shields when it is necessary to transfer liquid carbon dioxide.
- 7.3.2 Use a four-wheel cart to move the container to different places internally.
- 7.3.3 Check hoses and transfer equipment before refilling with liquid. Replace worn or cut hoses before proceeding. A leak will involve the formation of solid particles that will be expelled with force, with possible injury to the operator. A complete failure of the hose will result in a large release of carbon dioxide and violent movement of the hose and associated equipment, which can cause severe damage and death.
- 7.3.4 Great care must be taken when depressurizing and disconnecting hoses. The release of the contents of a line containing liquid at atmospheric pressure can cause the formation of a plug of dry ice in the line. This will prevent removal of liquid behind the plug in the pipe that will be released quickly and unexpectedly when it overheats, or catastrophic failure of the line when liquid heats up behind the plug. Sufficient vapor pressure must be applied and maintained behind the liquid before

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a discharge valve is opened. This will prevent depressurization of the liquid and the point of solid formation, before it leaves the line.

7.3.5 For additional precautions in the use of carbon dioxide, see Section 16. Other Information.

7.4 Precautions to be taken into account for handling solids

7.4.1 Direct contact with solid carbon dioxide (dry ice) should be avoided.

7.4.2 Wear appropriate clothing, safety shoes and insulated gloves when handling dry ice.

7.4.3 Do not ingest solid carbon dioxide under risk of internal cryogenic injury to the esophagus.

7.4.4 Wear safety glasses or face protection during any dry ice cutting process.

7.4.5 For additional precautions in the use of carbon dioxide, see Section 16. Other Information.

7.5 Precautions for the user of dry ice

7.5.1 Never use dry ice in confined areas: CO<sub>2</sub> sublimation can cause rapid suffocation.

7.5.2 Avoid contact with skin and eyes: The very low temperature of dry ice can cause severe cryogenic injury.

7.5.3 Never handle dry ice with bare hands. The use of cryogenic gloves, safety glasses, long-sleeved clothing and protective shoes is recommended.

7.5.4 Never ingest dry ice. This action can cause severe injury to the larynx or pharynx, as well as suffocation by sublimation. Do not put dry ice in drinks to try to cool them down.

7.5.5 Keep dry ice out of the reach of children. This is a special material and not a fun item.

7.5.6 The transport cabin must be kept well ventilated during the transport of dry ice. Do not leave dry ice stored in a parked vehicle for more than 1 hour, as the vehicle becomes a confined area.

7.5.7 If dry ice is transported as part of a refrigeration or freezing system or is stored in large stationary refrigerators or freezers, allow the occupied area to ventilate for 10 minutes before anyone can enter.

7.5.8 Do not place dry ice on ceramic or laminate floors as it can damage the fixing materials. The surfaces to put the dry ice at rest must be made of wood.

7.5.9 Do not place dry ice in direct contact with food or beverages to avoid over-cooling of the same, which may cause cryogenic injury to the oral cavity.

7.5.10 Do not throw dry ice in the garbage to avoid the creation of hypoxic confined areas. Let sublime in well ventilated areas.

7.5.11 Do not discard dry ice down sinks or lavatories to avoid damage to pipes and ceramic materials

## **8. Exposure control and personal protection**

8.1 Infrastructure controls

8.1.1 Ventilation: Provide adequate natural ventilation or mechanical ventilation to prevent exposures above the limits in the workers' breathing zones (see Section 2). Carbon dioxide levels should be monitored to ensure levels below exposure limits, even if oxygen levels are satisfactory. Remove vapors when they reach the lowest possible level and release them to a well-ventilated outdoor area. Carbon dioxide accumulates in layers near the ground and in places with little air movement.

8.2 Respiratory protection

8.2.1 General routine use: Not required

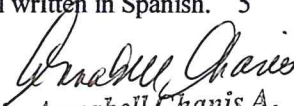
8.2.2 Use in emergencies: The use of self-contained breathing apparatus or a positive pressure airline with mask is required for use in atmospheres deficient in oxygen and with high concentrations of carbon dioxide. Air purifying respirator systems will not provide any protection. See 29 CFR 1910.34 for warnings and NIOSH/MSHA instructions for selection of the proper self-contained breathing apparatus.

8.3 Protective gloves: It is recommended to use thermal insulation or leather gloves for handling cylinders or carbon dioxide in liquid or solid phase.

8.4 Eye Protection: The use of a full-face shield and safety glasses is recommended when handling cylinders, vapors, liquid transfers or dry ice.

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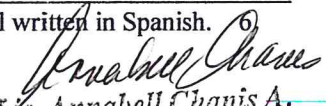
  
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- 8.5 Other protective equipment: The use of safety shoes with metatarsal protection is recommended for handling cylinders or blocks of dry ice. Protective clothing is required to prevent skin contact.
- 9. Physical and chemical properties**
- 9.1 Molecular Weight: 44.0098 g/mol
- 9.2 Boiling point (1 atmosphere): Not applicable at 1 atmospheric pressure (see Sublimation temperature)
- 9.3 Specific Gravity (Air = 1) at 70°F (21.1°C) and 1 atmospheric pressure: 1.522
- 9.4 Sublimation temperature (1 atmosphere): -109.3 °F (-78.5 °C)
- 9.5 Triple Point: -69.9°F (-56.6°C) at 60.4 psig (416 kPa)
- 9.6 Vapor pressure at 70°F (21.1°C): 838 psig (5778 kPa)
- 9.7 Gas density at 70°F (21.1°C) and 1 atmospheric pressure: 0.114 lb/cf or 1.833 Kg/m<sup>3</sup>
- 9.8 Liquid Density at 70°F (21.1°C) and 838 psig (5778 kPa): 47.35 lb/cf (761.338 Kg/m<sup>3</sup>)
- 9.9 Density of the solid at -109.3 °F (-78.5 °C) and 1 atmospheric pressure: 97.59 lb/cf (1596 Kg/m<sup>3</sup>)
- 9.10 Evaporation rate (Butyl Acetate = 1): Not applicable because it is a gas.
- 9.11 Solubility in water:
- 9.11.1 Vol/Vol at 68°F (20°C) and 1 atmosphere of pressure: 0.90
- 9.12 Expansion Ratio (for liquid to gas) at 70°F (21.1°C): 8.741cf/lb (solid to gas)
- 9.13 pH: 3.7 at 1 atmospheric pressure (corresponding to carbonic acid)
- 9.14 Appearance, odor and condition: Colorless and odorless gas. Slightly acidic, which some people describe as a slightly pungent odor and a slightly bitter taste. Clear, colorless and volatile liquid. Odorless solid.
- 9.15 Water/Oil Distribution Coefficient: Not applicable
- 9.16 Odor threshold: Not applicable as it is odorless.
- 10. Stability and reactivity**
- 10.1 Stability: Stable
- 10.2 Conditions to avoid: None
- 10.3 Incompatibilities (materials to avoid): None. Carbon dioxide will react with alkaline materials to form carbonates or bicarbonates.
- 10.4 Reactivity:
- 10.4.1 Hazardous decomposition products: Carbon monoxide and oxygen at temperatures above 3000°F (1,648.9°C).
- 10.4.2 Hazardous reaction conditions: Reactive with various metal dusts (Magnesium, Zirconium, Titanium and their alloys) that ignite and explode in the presence of carbon dioxide. Mixtures of dry ice with alloys containing sodium or potassium are sensitive to impact, exploding violently. In the presence of moisture, cesium oxide burns on contact with carbon dioxide. Metal acetylides and hydrides will burn and explode on contact with carbon dioxide.
- 10.4.3 Hazardous polymerization products: Will not occur.
- 10.4.4 In general terms, carbon dioxide will react with alkaline materials or Lewis bases to form carbonates and bicarbonates.

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## 11. Toxicological information

11.1 General toxicological effect: Carbon dioxide is an asphyxiant gas. Initially stimulates respiration, but later causes respiratory depression. High concentrations lead to narcosis. Symptoms in humans are described as follows:

11.1.1	Effect	Concentration (v/v)
11.1.1.1	Small increase in respiration rate	01%
11.1.1.2	Increased respiration rate to 50% of normal level	02%
	Prolonged exposure to this concentration can cause headache and fatigue.	
11.1.1.3	Breathing increases at twice the normal rate and becomes difficult	03%
	Small narcotic effect. Impaired hearing, headache, and increased blood pressure and pulse	
11.1.1.4	Breathing increases at approximately four times the normal rate.	04 to 07%
	Symptoms of intoxication are evident and a slight state of shock may be felt	
11.1.1.5	The sharp characteristic odor is perceptible	07 to 15%
	Very difficult breathing, headache, impaired vision, and ringing in the ears.	
	Faulty judgment followed by minutes of loss of consciousness	
11.1.1.6	Unconsciousness occurs more rapidly above the 10% level	Above 15%
	Prolonged exposure to high concentrations causes death by suffocation or severe acidosis.	

11.2 Ability to cause irritation: None

11.3 Sensitization to material: None

11.4 Effects on the reproductive system: None

11.5 Teratogenicity: None

11.6 Mutagenicity: None

11.7 Synergistic Materials: None

## 12. Ecological information

No adverse or negative ecological impacts are expected. Carbon Dioxide does not contain Class I or Class II chemicals, which deplete the ozone layer (40 CFR <sup>[6]</sup> Part 82). Carbon Dioxide is not listed as a marine pollutant by DOT <sup>[7]</sup> (49 CFR Part 171). Carbon dioxide is one of the gases responsible for global warming due to its high capacity to absorb infrared radiation (Rio Conference 2000).

Global warming capacity on a CO<sub>2</sub> caloric basis: 1x

<sup>[6]</sup> Code of Federal Regulations (United States Code of Federal Regulations)

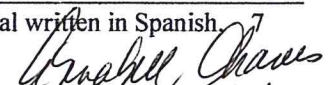
<sup>[7]</sup> Department of Transportation of the United States of America

## 13. Disposal considerations

13.1 Waste disposal method

13.1.1 Cylinders: Do not attempt to dispose of residual or unused quantities. Return the cylinder to the supplier. For emergency disposal, secure cylinder and slowly discharge gas to atmosphere in a well-ventilated area or outdoors.

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- 13.1.2 Storage tanks: Do not attempt to dispose of residual or unused amounts. Contact Aceti-Oxígeno, S.A. for a suitable disposal. For emergency disposal, slowly exhaust gas to atmosphere in a well-ventilated area or outdoors.
- 13.1.3 Dry Ice (Solid Carbon Dioxide): Do not attempt to dispose of residual or unused amounts. Return the dry ice container to Aceti-Oxígeno, S.A. Handle solid using cold resistant gloves and clothing only. For emergency disposal, allow carbon dioxide to subside by ventilating very well the area or in a well-ventilated area away from general traffic and protected from accidental contact.

#### 14. Transport information

##### 14.1 Gas

- 14.1.1 DOT/IMO/IATA Shipping Name: Carbon Dioxide
- 14.1.2 Hazard classification: 2.2 (Non-Flammable Gas)
- 14.1.3 Identification number: UN 1013
- 14.1.4 Product identification number: 1013
- 14.1.5 Shipping Labels: Non-Flammable Gas
- 14.1.6 Placard: Non-Flammable Gas



##### 14.2 Refrigerated liquid

- 14.2.1 DOT/IMO/IATA Shipping Name: Refrigerated Liquid Carbon Dioxide
- 14.2.2 Hazard Classification: 2.2 (Non-Flammable Gas)
- 14.2.3 Identification number: UN 2187
- 14.2.4 Product identification number: 2187
- 14.2.5 Shipping labels: Non-flammable Gas
- 14.2.6 Placard: Non-flammable Gas



##### 14.3 Solid

- 14.3.1 DOT/IMO/IATA Shipping name: Carbon Dioxide, Solid or Dry Ice
- 14.3.2 Hazard classification: 9
- 14.3.3 Identification number: UN 1845
- 14.3.4 Product identification number: 1845
- 14.3.5 Shipping label: No label is required for ground shipments. For air or sea shipments use a Class 9 label.
- 14.3.6 Placard: Not required for domestic shipments



##### 14.4 Product Reportable Quantity (RQ): Not applicable

- 14.5 Special shipping information: Cylinders must be transported in a secure upright position, in a well-ventilated vehicle. The transport of compressed gases in automobiles or closed body vehicles can present great safety risks and should not be recommended or encouraged. For air shipments, the label that indicates "Cryogenic Liquid" must be used in addition to the one that indicates Non-Flammable Gas (Division 2.2) in liquid cylinder packings and over-packings.

#### 15. Related regulations

The following information is related to United States regulatory requirements potentially applicable to this product in Panama. Users of this product are responsible for complying with their local or general regulatory requirements.

##### 15.1 United States Federal Regulations

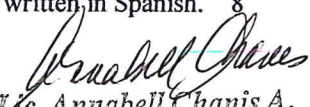
###### 15.1.1 EPA - Environmental Protection Agency

- 15.1.1.1 CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (40 CFR Parts 117 and 302). Reportable Quantity RQ: Not applicable

###### 15.1.1.2 SARA: Superfund Amendment and Reauthorization Act

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Section 302/304: Requires emergency planning based on Threshold Planning Quantities (TPQ) and release reporting based on Reportable Quantities (RQ) of EPA-scheduled substances as extremely hazardous (40 CFR Part 355)

Extremely Hazardous Substance: Not Applicable  
Planning Threshold Quantity: Not applicable

Section 311/312: Requires the submission of a Material Safety Data Sheet (MSDS) and a chemical inventory report with identification of the risk classes defined by the EPA (40 CFR Part 370). The hazard classes for this product are:

Immediate: Yes  
Late: No  
Pressure: Yes  
Reactivity: No  
Fire: No

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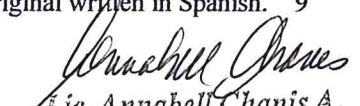
Section 313: Requires submission of annual toxic chemical release reports listed in 40 CFR Part 372. Carbon dioxide is not required to report under this Section.

- 15.1.2 40 CFR Part 68: Risk Management for Chemical Accidental Release: Requires the development and implementation of risk management programs in manufacturing facilities, use, storage, or any other Controlled substance handled in amounts exceeding specified thresholds. Carbon Dioxide is not listed as a regulated substance.
- 15.1.3 TSCA Toxic Substance Control Act: Carbon dioxide is listed on the inventory of controlled products by TSCA.
- 15.2 OSHA Occupational Safety and Health Administration
- 15.2.1 29 CFR 1910.119: Process Safety Management of Highly Hazardous Chemicals: Requires facilities to develop Process Safety Management based on Threshold Quantities (TQ) of products high-risk chemicals, such as those listed in Appendix A. Carbon Dioxide is not listed in Appendix A as a high-risk chemical.
- 15.3 FDA Food and Drug Administration
- 15.3.1 29 CFR 184.1240: Generally Recognized as Safe (GRCS) considered as a direct ingredient for human food when used as a preservative agent, process additive, propellant, pressurizing agent and gas.
- 15.3.2 Food Chemicals Codex IV: The Carbon Dioxide monograph defines its qualities for use in food.
- 15.3.3 Carbon Dioxide USP (United State Pharmacopea) is regulated as a prescription drug.

## 16. Additional information

- 16.1 Special precautions: Use piping and equipment properly designed to withstand working pressures and temperatures. Use a check valve or other cylinder protection device to prevent and avoid reverse flow. To prevent cryogenic liquids or cold gases from being trapped inside the distribution piping, it must be equipped with pressure relief devices. Atmospheric pressure liquid carbon dioxide discharge lines will result in the formation of solid dry ice, which can cause blockage of the liquid line.  
Shipping compressed gas cylinders that have not been filled with the consent of the cylinder owner is a violation of US federal law [49CFR Part 173.301(b)].
- 16.2 Mixtures: When two or more gases or liquefied products are mixed, their properties can combine to create additional unexpected hazards. Obtain and evaluate the safety information for each component before manufacturing the mixture. Seek advice from an industrial health worker or other qualified person, when carrying out the safety evaluation of the final product. Remember that gases and liquids have properties that can cause severe harm or death.

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Panama, July 28, 2022.

  
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RESOLUCIÓN No.151  
DE 4 DE DICIEMBRE 1989,  
PANAMÁ, REP. DE PANAMÁ

- 16.3 Other data:
- 16.3.1 NFPA (National Fire Protection Association) rating for the gas phase.
- |              |   |
|--------------|---|
| Health       | 1   |
| Flammability | 0   |
| Instability  | 0   |
| Special      | Simple Asphyxiant (CGA recommended designation) |
- 16.3.2 HMIS (Hazardous Materials Identification Systems) rating for the gas phase.
- |              |   |
|--------------|---|
| Health       | 1 |
| Flammability | 0 |
| Reactivity   | 0 |
- 16.3.3 NFPA (National Fire Protection Association) rating for the liquid phase.
- |              |   |
|--------------|---|
| Health       | 3   |
| Flammability | 0   |
| Instability  | 0   |
| Special      | Simple Asphyxiant (CGA recommended designation) |
- 16.6.4 HMIS (Hazardous Materials Identification Systems) Assessment for the liquid phase
- |              |   |
|--------------|---|
| Health       | 3 |
| Flammability | 0 |
| Reactivity   | 0 |
- 16.3.5 NFPA (National Fire Protection Association) rating for the solid phase.
- |              |   |
|--------------|---|
| Health       | 2   |
| Flammability | 0   |
| Instability  | 0   |
| Special      | Simple Asphyxiant (CGA recommended designation) |
- 16.6.5 16.3.6 HMIS (Hazardous Materials Identification Systems) rating for the solid phase
- |              |   |
|--------------|---|
| Health       | 2 |
| Flammability | 0 |
| Reactivity   | 0 |

**Classification of the chemical substance according to the SGA:**

**GAS**

Physical hazards: Gases under pressure – Refrigerated liquefied gas.

Health Hazards: N/A.

Environmental Hazards: N/A

**Elements for the communication and signalization of hazards:**

Signal word: Danger.

Hazard statements:

H280: Contains gas under pressure; may explode if heated.

Precautionary advice:

Prevention: N/A

Answer: N/A

Storage:

P410+P403: Protect from sunlight. Store in a well-ventilated place.

Elimination: N/A.

**Other hazards:**

It acts as a stimulant and depressant of the central nervous system. This product is physiologically active, it affects circulation and respiration. In concentrations of 2 to 10%, it can cause nausea, dizziness, headache, confusion, increased blood pressure and respiratory rate. At high

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concentrations it can cause suffocation. Symptoms may include loss of consciousness or mobility. At concentrations of 10% or higher they can cause loss of consciousness or death.

## **LIQUID**

Physical hazards: Gases under pressure – Refrigerated liquefied gas.

Health Hazards: N/A.

Environmental Hazards: N/A.

### **Elements for the communication and signalization of hazards:**

Word of warning: Attention.

Hazard statements:

H281: Contains refrigerated gas; may cause cryogenic burns or injuries.

Precautionary advice:

Prevention:

P282: Wear cold-insulating gloves and eye/face protection.

Response:

P315: Seek immediate medical assistance

P336: Thaw frozen parts with lukewarm water. Do not rub the affected part.

Storage:

P403: Store in a well-ventilated place.

Elimination: N/A.

Other hazards:

Extremely cold liquid and gas under pressure.

Direct contact with liquid can cause frostbite.

It can cause rapid suffocation.

Avoid inhalation of the gas.

The use of a self-contained breathing apparatus may be required. It acts as a stimulant and depressant of the central nervous system. This product is physiologically active, affects circulation and respiration. In concentrations of 2 to 10%, it can cause nausea, dizziness, headache, confusion, increased blood pressure and respiratory rate. At high concentrations it can cause suffocation. Symptoms may include loss of consciousness or mobility.

At concentrations of 10% or higher they can cause loss of consciousness or death.

## **SOLID**

**It is not classified as a dangerous substance.**

### **Elements for the communication and signalization of hazards:**

Does not apply.

Other hazards:

May cause cold burns or frostbite.

Dry ice sublimates at -78°C.

It acts as a stimulant and depressant of the central nervous system.

This product is physiologically active, affects circulation and respiration.

In concentrations of 2 to 10%, it can cause nausea, dizziness, headache, confusion, increased blood pressure and respiratory rate. At high concentrations it can cause suffocation. Symptoms may include loss of consciousness or mobility.

At concentrations of 10% or higher, they can cause loss of consciousness or death.

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## Pictogram/ Hazard Symbol



- 16.7 Standard valve connection for the United States and Canada
- 16.7.4 Coiled: Standard CGA 320. For Panama, the standard is CGA 320 for the liquid phase.
- 16.7.5 Indexed Pin Yoke: CGA 940 (Medical Use)
- 16.7.6 Ultra High Integrity: 716

Use the proper CGA connection. **DO NOT USE ADAPTERS.**

More detailed information on carbon dioxide can be found in the following documents published by the Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Phone (703) 412-0900:

- G-6 Carbon Dioxide
- G-6.1 Standard for Low Pressure Carbon dioxide Systems at Customer Sites
- G-6.2 Commodity specification for Carbon Dioxide
- G-6.3 Carbon Dioxide Cylinder Filling and Handling Procedures
- G-6.5 Standard for Small Stationary Carbon Dioxide Systems
- G-6.6 Standard for Elastomer Type Bulk Transfer Hose
- P-7 Standard for Requalification of Cargo Tank Hose
- P-14 Accident Prevention in Oxygen-Rich and Oxygen-Deficient Atmospheres
- SB-2 Oxygen Deficient Atmospheres

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### Change control:

Revision 01:

- Added safety color code for NFPA and the global harmonized system.
- The format was modified to the standards and approved by the sister companies Infra and Productos del Aire.

**Conversion Table**

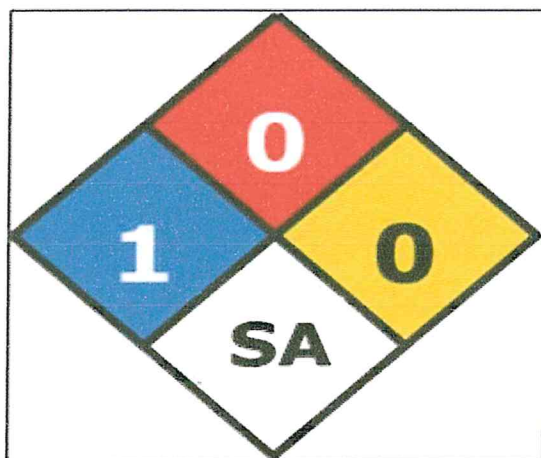
<b>CARBON DIOXIDE (CO<sub>2</sub>)</b>		<b>44.0098 g/mol</b>		<b>PS=-78.5 °C</b>			
<b>UNITS</b>	<b>WEIGHT</b>		<b>GAS VOLUME</b>		<b>LIQUID VOLUME</b>		<b>SOLID</b>
	<b>Pounds</b>	<b>Kilograms</b>	<b>SCF Gas</b>	<b>Nm Gas</b>	<b>Liquid gallons</b>	<b>Liquid liters</b>	<b>Solid SCE</b>
<b>Pounds</b>	<b>1</b>	<b>0.454</b>	<b>8.741</b>	<b>0.229</b>	<b>0.118</b>	<b>0.447</b>	<b>0.010</b>
<b>Kilograms</b>	<b>2.205</b>	<b>1</b>	<b>19.253</b>	<b>0.506</b>	<b>0.260</b>	<b>0.986</b>	<b>0.226</b>
<b>SCF Gas</b>	<b>0.0114</b>	<b>0.052</b>	<b>1</b>	<b>0.026</b>	<b>0.014</b>	<b>0.051</b>	<b>0.001</b>
<b>Nm Gas</b>	<b>4.359</b>	<b>1.977</b>	<b>38.040</b>	<b>1</b>	<b>0.515</b>	<b>1.948</b>	<b>0.045</b>
<b>Liquid gallons</b>	<b>8.470</b>	<b>3.842</b>	<b>74.040</b>	<b>1.943</b>	<b>1</b>	<b>3.785</b>	<b>0.087</b>
<b>Liquid liters</b>	<b>2.238</b>	<b>1.015</b>	<b>19.562</b>	<b>0.513</b>	<b>0.264</b>	<b>1</b>	<b>0.023</b>
<b>SCF Gas</b>	<b>97.560</b>	<b>44.250</b>	<b>852.800</b>	<b>22.380</b>	<b>11.518</b>	<b>43.600</b>	<b>1</b>

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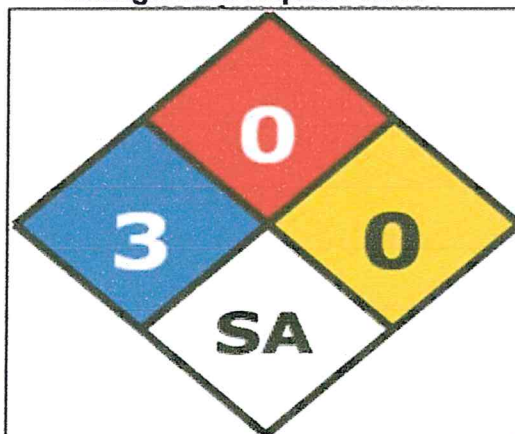
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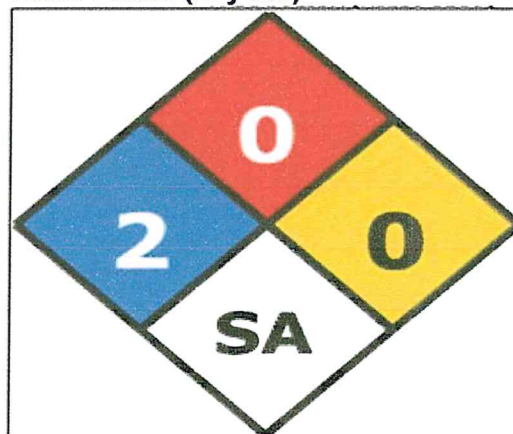
## Gaseous Phase



## Refrigerated Liquid Phase



## Solid Phase (Dry Ice)



## COMPATIBILITY WITH OTHER MATERIALS

### Metals

Bronze	Satisfactory
Iron	Satisfactory
303 Stainless	Satisfactory
316 Stainless Steel	Satisfactory
Aluminum	Satisfactory
Zinc	Satisfactory
Copper	Satisfactory
Monel-metal	Satisfactory

### Plastics

PCTFE	Satisfactory
Teflon	Satisfactory
Tefzel	Satisfactory
Kynar	Satisfactory
PVC	Satisfactory
Polycarbonate	Satisfactory

### Elastomers

Kalrez	Satisfactory
Viton	Satisfactory
Buna-N	Satisfactory
Neoprene	Satisfactory
Polyurethane	Satisfactory

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