Safety Data Sheet

Version 1.12 SDS Number 300000000021
Revision Date 08/01/2016 Print Date 02/16/2019

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Carbon dioxide (Refrigerated)
Chemical formula	:	CO2
Synonyms	:	Carbon dioxide (refrigerated)
Product Use Description	:	General Industrial
Manufacturer/Importer/Distributor	:	Air Products and Chemicals, Inc 7201 Hamilton Blvd. Allentown, PA 18195-1501 GST No. 123600835 RT0001 QST No. 102753981 TQ0001
Telephone	:	1-610-481-4911 Corporate 1-800-224-2724 CSO
Emergency telephone number (24h)	:	800-523-9374 USA +1 610 481 7711 International

2. HAZARDS IDENTIFICATION

GHS classification

Gases under pressure - Refrigerated liquefied gas

GHS label elements

Hazard pictograms/symbols

Signal Word: Warning

Hazard Statements:

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

May displace oxygen and cause rapid suffocation.
May increase respiration and heartrate.

Precautionary Statements:

Prevention	:	P282:Wear cold insulating gloves/face shield/eye protection.
Response	:	P315 :Get immediate medical advice/attention. P336 :Thaw frosted parts with lukewarm water. Do not rub affected area.
Storage	:	P403:Store in a well-ventilated place.

Hazards not otherwise classified

Extremely cold liquid and gas under pressure.
Direct contact with liquid can cause frostbite.
Can cause rapid suffocation.
Avoid breathing gas.
Self contained breathing apparatus (SCBA) may be required.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Volume)
Carbon Dioxide	124-38-9	100 %

Concentration is nominal. For the exact product composition, please refer to technical specifications.

4. FIRST AID MEASURES

General advice	:	Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
Eye contact	:	In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Keep eye wide open while rinsing.
Skin contact	:	In case of frostbite, obtain medical treatment immediately. As soon as practical, place the affected area in a warm water bath- which has a temperature not to exceed 40 °C (105 °F). Do not rub frozen parts as tissue damage may result. Cover wound with sterile dressing.
Ingestion	:	Ingestion is not considered a potential route of exposure.
Inhalation	:	Move to fresh air. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. In

case of shortness of breath, give oxygen.

Most important symptoms/effects - acute and delayed	:	Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/consciousness.Shivering fit. Sweating. Blurred vision. Headache. Increased pulse rate. Shortness of breath. Rapid respiration.

Immediate Medical Attention and Special Treatment

Treatment	:	If exposed or concerned: Get medical attention/advice.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	All known extinguishing media can be used.
Specific hazards	:	Spill will rapidly vaporize forming an oxygen deficient vapor cloud. Vapor cloud may obscure visibility. Do not direct water spray at container vent. Move away from container and cool with water from a protected position. Keep containers and surroundings cool with water spray.
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures	:	Monitor carbon dioxide level. Evacuate personnel to safe areas. Ventilate the area. Monitor oxygen level. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Environmental precautions	:	Prevent further leakage or spillage. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Do not discharge into any place where its accumulation could be dangerous.
Methods for cleaning up	:	Ventilate the area.
Additional advice	:	If possible, stop flow of product. Increase ventilation to the release area and monitor oxygen level. Vapor cloud may obscure visibility. Do not spray water directly at leak. If leak is from cylinder or cylinder valve, call the emergency telephone number. If the leak is in the user's system, close the cylinder valve and safely vent the pressure before attempting repairs.

7. HANDLING AND STORAGE

Handling

Know and understand the properties and hazards of the product before use. Only experienced and properly instructed persons should handle compressed gases/cryogenic liquids. Before using the product, determine its identity by reading the label. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Close container valve after each use and when empty, even if still connected to

equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Do not remove or interchange connections. Ensure the complete gas system has been checked for leaks before use. Prevent entrapment of cryogenic liquid in closed systems not protected with relief device. A small quantity of liquid produces large volumes of vaporized gas at atmospheric pressure. Containers used in shipment, storage, and transfer of cryogenic liquid are specially designed, well-insulated containers equipped with a pressure relief device and valves to control pressure. Under normal conditions, these containers will periodically vent product to limit pressure buildup. Ensure that the container is in a well–ventilated area to avoid creating an oxygen–deficient atmosphere. Use adequate pressure relief in systems and piping to prevent pressure buildup; liquid in a closed container can generate extremely high pressures when vaporized by warming. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Only transfer lines designed for cryogenic liquids shall be used. Do not subject containers to abnormal mechanical shock. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier.

Storage

Open/close valve slowly. Close when not in use. Wear Safety Eye Protection. Check Safety Data Sheet before use. Use a back flow preventative device in the piping. Do not change or force fit connections. Close valve after each use and when empty. Always keep container in upright position. Read and follow the Safety Data Sheet (SDS) before use. Do not allow storage temperature to exceed 50°C (122°F). Containers should be stored in a purpose build compound which should be well ventilated, preferably in the open air. Full containers should be stored so that oldest stock is used first. Do not store in a confined space. Full and empty cylinders should be segregated. Store containers in location free from fire risk and away from sources of heat and ignition. Return empty containers in a timely manner. Stored containers should be periodically checked for general condition and leakage. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Cryogenic containers are equipped with pressure relief devices to control internal pressure. Under normal conditions these containers will periodically vent product. All vents should be piped to the exterior of the building. Observe all regulations and local requirements regarding storage of containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Provide natural or mechanical ventilation to prevent accumulation above exposure limits.
Natural or mechanical to prevent oxygen deficient atmospheres below 19.5% oxygen.
Keep self contained breathing apparatus readily available for emergency use.

Personal protective equipment

Respiratory protection	:	Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmosphere. Air purifying respirators will not provide protection. Users of breathing apparatus must be trained.
Hand protection	:	Wear working gloves when handling gas containers. If the operation involves possible exposure to a cryogenic liquid, wear loose fitting thermal insulated or cryo-gloves.
Eye protection	:	Safety glasses recommended when handling cylinders.

Protect eyes, face and skin from liquid splashes.
Wear goggles and a face shield when transfilling or breaking transfer connections.

Skin and body protection : Never allow any unprotected part of the body to touch uninsulated pipes or vessels which contain cryogenic fluids. The extremely cold metal will cause the flesh to stick fast and tear when one attempts to withdraw from it.
Safety shoes are recommended when handling cylinders.

Special instructions for protection and hygiene : Ensure adequate ventilation, especially in confined areas.

Exposure limit(s)

Carbon Dioxide	Time Weighted Average (TWA): ACGIH	5,000 ppm	-
Carbon Dioxide	Short Term Exposure Limit (STEL): ACGIH	30,000 ppm	-
Carbon Dioxide	Recommended exposure limit (REL): NIOSH	5,000 ppm	9,000 mg/m3
Carbon Dioxide	Short Term Exposure Limit (STEL): NIOSH	30,000 ppm	54,000 mg/m3
Carbon Dioxide	Permissible exposure limit: OSHA Z1	5,000 ppm	9,000 mg/m3
Carbon Dioxide	Time Weighted Average (TWA): TN OEL	10,000 ppm	18,000 mg/m3
Carbon Dioxide	Short Term Exposure Limit (STEL): TN OEL	30,000 ppm	54,000 mg/m3

Remarks : Simple asphyxiant.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Liquefied gas. Colorless.

Odor : No odor warning properties.

Odor threshold : No data available.

pH : Not applicable.

Melting point/range : -70 °F (-56.6 °C)

Boiling point/range : -109 °F (-78.5 °C)

Flash point : Not applicable.

Evaporation rate : Not applicable.

Flammability (solid, gas) : Refer to product classification in Section 2

Upper/lower explosion/flammability limit : No data available.

Vapor pressure : 831.04 psia (57.30 bara) at 68 °F (20 °C)

Water solubility	:	2.000 g/l
Relative vapor density	:	1.52 (air = 1)
Relative density	:	1.03 (water = 1)
Partition coefficient (n-octanol/water)	:	Not applicable.
Auto-ignition temperature	:	No data available.
Decomposition temperature	:	No data available.
Viscosity	:	Not applicable.
Molecular Weight	:	44 g/mol

10. STABILITY AND REACTIVITY

Chemical Stability	:	Stable under normal conditions.
Conditions to avoid	:	No data available.
Materials to avoid	:	Carbon steel.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Possibility of hazardous Reactions/Reactivity	:	No data available.

11. TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Likely routes of exposure

Effects on Eye	:	Contact with liquid may cause cold burns/frostbite.
Effects on Skin	:	Contact with liquid may cause cold burns/frostbite. May cause severe frostbite.
Inhalation Effects	:	Concentrations of 10% CO_2 or more can produce unconsciousness or death. Unlike simple asphyxiants, carbon dioxide has the ability to cause death even when normal oxygen levels (20-21%) are maintained. Carbon Dioxide is physiologically active, affecting circulation and breathing. At concentrations between 2 and 10%, carbon dioxide can cause nausea, dizziness, headache, mental confusion, increased blood pressure and respiratory rate. In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Asphyxiation may bring about unconsciousness without warning and so rapidly that victim

may be unable to protect themselves.

Ingestion Effects : Ingestion is not considered a potential route of exposure.

Symptoms : Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/consciousness. Shivering fit. Sweating. Blurred vision. Headache. Increased pulse rate. Shortness of breath. Rapid respiration.

Acute toxicity

Acute Oral Toxicity : No data is available on the product itself.

Inhalation : Unlike simple asphyxiants, carbon dioxide has the ability to cause death even when normal oxygen levels (20-21%) are maintained. 5% CO_2 has been found to act synergistically to increase the toxicity of certain other gases (CO, NO_2). CO_2 has been shown to enhance the production of carboxy- or met-hemoglobin by these gases possibly due to carbon dioxide's stimulatory effects on the respiratory and circulatory systems.

Acute Dermal Toxicity : No data is available on the product itself.

Skin corrosion/irritation : No data available.

Serious eye damage/eye irritation : No data available.

Sensitization. : No data available.

Chronic toxicity or effects from long term exposures

Carcinogenicity : No data available.

Reproductive toxicity : No data is available on the product itself.

Germ cell mutagenicity : No data is available on the product itself.

Specific target organ systemic toxicity (single exposure) : No data available.

Specific target organ systemic toxicity (repeated exposure) : No data available.

Aspiration hazard : No data available.

Delayed and Immediate Effects and Chronic Effects from Short and Long Term Exposure

Not applicable.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity : Not applicable.

Toxicity to fish - Components

Carbon Dioxide	LC50 (1 h) : 240 mg/l	Species : Rainbow trout (Oncorhynchus mykiss).
Carbon Dioxide	LC50 (96 h) : 35 mg/l	Species : Rainbow trout (Oncorhynchus mykiss).

Toxicity to other organisms : Not applicable.

Persistence and degradability

Biodegradability : No data is available on the product itself.

Mobility : Because of its high volatility, the product is unlikely to cause ground pollution.

Bioaccumulation : Refer to Section 9 "Partition Coefficient (n-octanol/water)".

Further information

When discharged in large quantities may contribute to the greenhouse effect.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products : Return unused product in original cylinder to supplier. Contact supplier if guidance is required.

Contaminated packaging : Return cylinder to supplier.

14. TRANSPORT INFORMATION

DOT

UN/ID No. : UN2187
Proper shipping name : Carbon dioxide, refrigerated liquid
Class or Division : 2.2
Label(s) : 2.2
Marine Pollutant : No

IATA

UN/ID No.	:	UN2187
Proper shipping name	:	Carbon dioxide, refrigerated liquid
Class or Division	:	2.2
Label(s)	:	2.2
Marine Pollutant	:	No

IMDG

UN/ID No.	:	UN2187
Proper shipping name	:	CARBON DIOXIDE, REFRIGERATED LIQUID
Class or Division	:	2.2
Label(s)	:	2.2
Marine Pollutant	:	No

TDG

UN/ID No.	:	UN2187
Proper shipping name	:	CARBON DIOXIDE, REFRIGERATED LIQUID
Class or Division	:	2.2
Label(s)	:	2.2
Marine Pollutant	:	No

Further Information

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. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact customer service.

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA) 12(b) Component(s):

None.

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on Inventory.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

EPA SARA Title III Section 312 (40 CFR 370) Hazard Classification

Acute Health Hazard

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other harm.

16. OTHER INFORMATION

Prepared by	:	Air Products and Chemicals, Inc. Global EH&S Product Safety Department
Telephone	:	1-610-481-4911 Corporate 1-800-224-2724 CSO
Preparation Date	:	02/16/2019

For additional information, please visit our Product Stewardship web site at
http://www.airproducts.com/productstewardship/