MESA Specialty Gases & Equipment
2427 S. Anne Street
Santa Ana, California 92704 USA
Domestic US: (866) 470-6372; International 714-434-7102
www.mesagas.com

SAFETY DATA SHEET

SECTION 1 – IDENTIFICATION

Chemical Name:	Carbon Dioxide
Chemical Formula:	CO2
Chemical Family:	Inert Gas
Hazard Classification:	Carbon Dioxide, Non-Flammable Gas, UN1013, Green Label
Product Use Description:	Analytical Standard and General Laboratory Applications
Company:	MESA Specialty Gases & Equipment 2427 South Anne Street Santa Ana, California 92704 USA
Phone Number for Information:	Infotrac
Emergency Contact:	800-535-5053 (Int'l: 352-323-3500)

SECTION 2 – HAZARD(S) IDENTIFICATION

SIGNAL WORD - WARNING

HAZARD STATEMENTS: Contains gas under pressure; may explode if heated.
May cause suffocation by displacing oxygen in the air.

PRECAUTIONARY STATEMENTS:

General: Use in accordance with Safety Data Sheets.
Do not ingest or inhale. Avoid contact with skin and clothing.

Prevention: Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources. No smoking.

Response: Leaking gas fire: Do not extinguish unless leak can be stopped safely.
In case of leakage, eliminate all ignition sources.
Do not open valve until prepared to use.
Always use a back flow preventative device in piping.

Storage: Protect from sunlight. Store in a well-ventilated place.

OTHER HAZARDS: High pressure gas. May cause rapid suffocation.
May cause dizziness, nausea, drowsiness, vomiting, excess salivation, loss of mobility/consciousness, increased respiration and heart rate.
May react explosively even in absence of air at elevated pressure and/or temperature.
Self-contained breathing apparatus (SCBA) may be required.

SECTION 3 – COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT	CAS NO.	CONCENTRATION
Carbon Dioxide	124-38-9	>99.8%
Maximum impurities		<0.2%

SECTION 4 – FIRST AID MEASURES

ROUTE OF EXPOSURE:
Inhalation: Remove person to uncontaminated area. SCBA may be required to prevent asphyxiation of rescue workers. Keep warm and at rest. Lay victim face down with head and chest lower than hips to improve drainage from lungs. If breathing is labored, administer pure oxygen. If breathing has stopped, start artificial respiration. Get immediate medical attention for serious exposure.
Eye contact: N/A
Skin contact: N/A
Ingestion: N/A

SYMPTOMS: Carbon Dioxide is an asphyxiant and a powerful cerebral vasodilator. If the concentration of Carbon Dioxide reaches 10% or more, suffocation can occur rapidly. Inhalation of concentrations between 2 and 10% can cause nausea, dizziness, headache, mental confusion, increased blood pressure and respiratory rate. Carbon Dioxide initially stimulates respiration and then causes respiratory depression. Inhalation of low concentrations (3-5%) have no known permanent harmful effects. Symptoms in humans at various levels of concentration are as follows:

CONCENTRATION SYMPTOMS OF EXPOSURE
1%: Slight increase in breathing rate.
2%: Breathing rate increases to 50% above normal; exposure cause headache, tiredness.
3%: Breathing increases to twice normal rate and becomes labored. Weak narcotic effect. Impaired hearing, headache, increase in blood pressure and pulse rate.
4-5%: Breathing increases to approximately four times normal rate, symptoms of intoxication become evident and slight choking may be felt.
5-10%: Characteristic sharp odor noticeable. Very labored breathing, headache, visual impairment and ringing in the ears. Judgment may be impaired, followed by loss of consciousness.
50-100%: Unconsciousness occurs more rapidly above 10% level. Prolonged exposure to high concentrations may eventually result in death from asphyxiation.

High concentrations of this gas can also cause an oxygen-deficient environment. However, the asphyxiating properties of Carbon Dioxide will be reached before oxygen-deficiency is a factor.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	1
FLAMMABILITY	(RED)	0
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

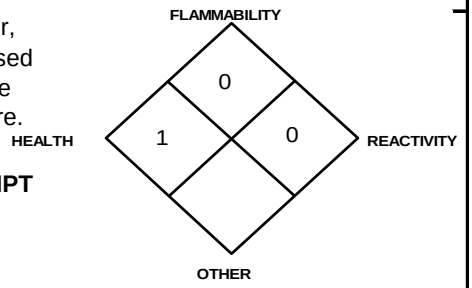
OTHER POTENTIAL HEALTH EFFECTS: Contact of the cold gas with the skin can lead to frostbite or dermatitis (red, cracked, irritated skin), depending upon concentration and duration of exposure. Contact of the cold gas with the eyes can cause pain, redness, burns, and severe exposure could cause blindness. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with cold gas can quickly subside. Moisture in the air could lead to the formation of carbonic acid, which can be irritating to the eyes.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Overexposure to Carbon Dioxide may

SECTION 5 – FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Carbon Dioxide is commonly used as an extinguishing agent, and therefore, should not present a problem when trying to control a blaze. Use extinguishing media appropriate for surrounding fire.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Nitrogen does not burn; however, containers may rupture violently when exposed to fire. Continue to cool fire exposed cylinders until flames are extinguished. Cylinder valve is equipped with a pressure relief device to safely vent the cylinder if it is exposed to elevated pressure in a fire.

NFPA RATING



SPECIAL FIRE FIGHTING PROCEDURES: RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus Personal Protective equipment should be worn. Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move fire-exposed cylinders if it can be done without risk to firefighters. Otherwise, cool containers with hose stream and protect personnel. Withdraw immediately in case of rising sounds from venting safety device or any discoloration of tanks due to the fire.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT, AND EMERGENCY PROCEDURES: Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Monitor oxygen level. Ventilate the area. SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people. Minimum Personal Protective Equipment should be Level B: protective clothing, mechanically-resistant gloves and Self-Contained Breathing Apparatus. Locate and seal the source of the leaking gas.

Allow the gas, which is heavier than air, to dissipate. Monitor the surrounding area for Carbon Dioxide and oxygen levels. Colorimetric tubes are available for Carbon Dioxide. The levels of Carbon Dioxide must be below those listed in Section 2 (Composition and Information on Ingredients) and the atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there.

ENVIRONMENTAL PRECAUTIONS: Prevent spreading of vapors through sewers, ventilation systems, and confined areas. Do not discharge materials into any place where their accumulation could be dangerous.

METHODS AND MATERIALS FOR CONTAINMENT AND CLEANING UP: Stop the folow of gas or remove cylinder to outdoor location if this can be done without risk. Ventilate enclosed areas. Move leaking cylinder to fume hood or safe outdoor area. Use monitoring equipment if hazardous conditions are suspected or likely to occur.

SECTION 7 – HANDLING AND STORAGE

PRECAUTIONS FOR SAFE HANDLING: Protect cylinders against physical damage. Store in cool, dry, well-ventilated, fireproof area, away from flammable materials and corrosive atmospheres. Store away from heat and ignition sources and out of direct sunlight. Do not store near elevators, corridors or loading docks. Do not allow area where cylinders are stored to exceed 52°C (125°F). Use only storage containers and equipment (pipes, valves, fittings to relieve pressure, etc.) designed for the storage of Solid, Gaseous or Liquefied Carbon Dioxide. Do not store containers where they can come into contact with moisture.

Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. Liquefied Carbon Dioxide must be stored and handled under positive pressure or in a closed system to prevent the infiltration and solidification of air or other gases. The following rules are applicable to situations in which cylinders are being used:

Before Use: Move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap in-place (where provided) until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap (where provided). Mark empty cylinders “EMPTY”.

NOTE: Use only DOT or ASME code containers. In the event of an electrical discharge, Carbon Dioxide gas will produce carbon monoxide and oxygen. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner.

CONDITIONS FOR SAFE STORAGE: Cylinders should be stored in dry, well-ventilated areas away from sources of heat, ignition and direct sunlight. Containers of Carbon Dioxide can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits. Store containers away from process and production areas, away from elevators, building and room exits or main aisles leading to exits. Protect containers against physical damage. Isolate from other non-compatible chemicals.
Cylinders should be secured with mounting brackets away from heavily traveled areas. Use oldest cylinders in stock first to prevent full cylinders from being stored for excessive periods of time. Full and empty cylinders should be segregated. Cylinders should be moved by suitable hand trucks. Close valve after each use and when empty.Cylinder valve guards or caps should be in place. Store containers in location free from fire risk and away from any sources of heat and ignition. Keep cylinder away from combustible material. Use equipment rated for cylinder pressure.

SECTION 8 – EXPOSURE CONTROLS/PERSONAL PROTECTION

COMPONENT	OSHA PEL	ACGIH TLV
Carbon Dioxide	5000 ppm	5000 ppm

APPROPRIATE ENGINEERING CONTROLS: : Use with adequate ventilation. Carbon Dioxide accumulates in low-lying areas with limited air movement. Natural or mechanical ventilation should be available in the worker’s breathing zone to prevent levels of Carbon Dioxide above exposure limits (see Section 2, Composition and Information on Ingredients). Local exhaust ventilation is preferred, because it prevents dispersion of this gas into the work place by eliminating it at its source. Areas of Carbon Dioxide use should be engineered to remove vapor from the lowest possible level and exhaust vapor to a well-ventilated area or to the outside. Carbon Dioxide levels should be monitored to assure levels are maintained below the TLV. If appropriate, install automatic monitoring equipment to detect the levels of Carbon Dioxide and of oxygen.

INDIVIDUAL PROTECTIVE MEASURES: Safety glasses, work gloves, and safety shoes should be worn when handling high pressure cylinders or hazardous materials.
RESPIRATORY PROTECTION: Maintain Carbon Dioxide levels below those listed in Section 2 (Composition and Information on Ingredients) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if Carbon Dioxide levels are above the IDLH (40,000 ppm) or during emergency response to a release of this product. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards. Respiratory selection guidelines from NIOSH for Carbon Dioxide are provided on the following page for further information on respiratory protection.

CONCENTRATION	RESPIRATORY EQUIPMENT
UP TO 40,000 ppm:	Supplied Air Respirator (SAR); or full-facepiece Self-Contained Breathing Apparatus (SCBA).
EMERGENCY OR PLANNED ENTRY INTO UNKNOWN CONCENTRATIONS OR IDLH CONDITIONS:	Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.
ESCAPE:	Escape-type SCBA.
NOTE:	The IDLH concentration for Carbon Dioxide is 40,000 ppm.

EYE PROTECTION: Splash goggles, face-shields or safety glasses. Face-shields must be worn when using cryogenic Carbon Dioxide.

HAND PROTECTION: Wear mechanically-resistant gloves when handling cylinders of Carbon Dioxide. Recommended use of low-temperature protective gloves (e.g. insulated polyvinyl chloride or insulated nitrile) when working with containers of Liquefied Carbon Dioxide.

BODY PROTECTION: Use body protection appropriate for task. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from splashes of liquefied product, as well provide sufficient insulation from extreme cold.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Colorless	Upper/lower flammability/explosive limits: No data available
Odor: Odorless	Vapor Pressure: 844.7
Odor threshold: No data available	Gas Density (Air=1): 0.1144 lb/ft3 (1.833 kg/m3)
pH: N/A	Relative Density (Water=1): Varies
Melting point/range: N/A	Solubility in water @ 20°C (68°F): 0.90%
Boiling point/range: -78.5°C (-109.3°F)	Partition coefficient (n-octanol/water): N/A
Flash Point: N/A	Auto-ignition temperature: No data available
Evaporation Rate (Butyl Acetate=1): N/A	Decomposition temperature: No data available
Flammability (solid, gas): No data available	Visocity: N/A

SECTION 10 – STABILITY AND REACTIVITY DATA

Reactivity: Refer to possibility of hazardous reactions and/or incompatible materials sections	**Conditions to avoid:** Avoid exposing cylinders of Carbon Dioxide to extremely high temperatures, which could cause the cylinders to rupture or burst. Do not store the solid form of Carbon Dioxide in gas-tight containers, which could also cause over-pressurization and rupture of the container.
Chemical Stability: Normally stable	**Incompatible materials:** Carbon Dioxide will ignite and explode when heated with powdered aluminum, beryllium, cerium alloys, chromium, magnesium-aluminum alloys, manganese, thorium, titanium, and zirconium. In the presence of moisture, Carbon Dioxide will ignite with cesium oxide. Metal acetylides will also ignite and explode on contact with Carbon Dioxide.
Possibility of hazardous reactions: No data available	**Hazardous Decomposition or Byproducts:** Carbon Dioxide gas in an electrical discharge yields carbon monoxide and oxygen. In the presence of moisture, Carbon Dioxide will form carbonic acid.

SECTION 11 – TOXICOLOGICAL INFORMATION

LIKELY ROUTES OF EXPOSURE: N/A

SYMPTOMS/EFFECTS FROM EXPOSURE:

Short term exposure:
Potential immediate effects: Not available
Potential delayed effects; Not available
Long term exposure:
Potential immediate effects: Not available
Potential delayed effects: Not available

General : No known significant effects or critical hazards.
Carcinogenicity : No known significant effects or critical hazards.
Mutagenicity : No known significant effects or critical hazards.
Teratogenicity : No known significant effects or critical hazards.
Developmental effects : No known significant effects or critical hazards.
Fertility effects : No known significant effects or critical hazards.

ACUTE/CHRONIC TOXICITY:

Aquatic toxicity: 100-200 mg/l/no time specified/various organisms/fresh water.
Waterfowl toxicity: Inhalation 5-8%, no effect.

CARCINOGENICITY: No data available.

SECTION 12 – ECOLOGICAL INFORMATION

Ecotocity (aquatic and terrestrial): Any adverse effect on animals would be related to oxygen deficient environments. No adverse effect is anticipated to occur to plant-life, except for frost produced in the presence of rapidly expanding gases. No evidence is currently available on the effects of Nitrogen on aquatic life.

Persistence and degradability: No data available

Bioaccumulative potential:

LogPow	BCF	Potential
0.83	-	low

Mobility in soil: No data available

Other Effects: The mixture does not contain any class I or Class II ozone depleting chemicals.

SECTION 13 – DISPOSAL CONSIDERATIONS

Disposal: Waste disposal must be in accordance with appropriate National, Federal, State, and local regulations. Do not dispose or discharge into the environment. Do not discharge into enclosed environment. Contact supplier if additional guidance is required.

SECTION 14 – TRANSPORTATION INFORMATION

DOT Classification:

Proper Shipping Name: Carbon Dioxide
Class: 2.2
UN/ID No.: UN1013
Label: Non-Flammable Gas, Green Label

IATA Classification:

Proper Shipping Name: Carbon Dioxide
Class: 2.2
UN/ID No.: UN1013
Label: Non-Flammable Gas, Green Label

Environment hazard: No

Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code: N/A

SPECIAL PRECAUTIONS FOR USER: Avoid transport on vehicles where the load space is not separated from driver's compartment. Ensure that transporter is aware of the potential hazards of the load and knows what to do in event of an emergency. Contact supplier for complete transportation information.

SECTION 15 – REGULATORY INFORMATION

U.S. Federal regulations: TSCA 8(a) CDR Exempt/Partial exemption: This material is listed or exempted.
United States inventory (TSCA 8b): This material is listed or exempted.
Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs): Not listed
Clean Air Act Section 602 Class I Substances: Not listed
Clean Air Act Section 602 Class II Substances: Not listed
DEA List I Chemicals (Precursor Chemicals): Not listed
DEA List II Chemicals (Essential Chemicals): Not listed\
SARA 302/304
Composition/information on ingredients: No products were found.
SARA 304 RQ: Not applicable
SARA 311/312
Classification: Sudden release of pressure

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Carbon Dioxide	>99.8%	No	Yes	No	Yes	No

State regulations:
Massachusetts: This material is listed
New York: This material is not listed.
New Jersey: This material is listed.
Pennsylvania: This material is listed.
Canada Inventory: This material is listed or exempted.
International regulations: International lists:
Australia Inventory (AICS): This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
Malaysia inventory (EHS Register) Not determined.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines Inventory (PICCS): This material is listed or exempted.
Taiwan inventory (CSNN): Not determined.

Chemical Weapons Convention List Shedule I Chemicals: Not listed.
Chemical Weapons Convention List Schedule II Chemicals: Not listed.
Chemical Weapons Convention List Schedule III Chemicals: Not listed.

Canada
WHMIS (Canada): Class A. Compressed gas.
CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is not listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances : This material is not listed.
Quebec Designated Substances: This material is not listed.

LABELING (For Compressed Gas):
WARNING: CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED. MAY CAUSE RAPID SUFFOCATION BY DISPLACING OXYGEN IN THE AIR. MAY INCREASE RESPIRATION AND HEART RATE. May cause dizziness, nausea, drowsiness, vomiting, excess salivation, and loss of mobility/consciousness. May cause frostbite. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources—No smoking. Use and store in well-ventilated areas. Leaking gas fire: Do not extinguish unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. Do not open valve until prepared to use. Always use a backflow preventative device in piping. Use only with equipment rated for cylinder pressure. Close valve after each use and when empty. Cylinder temperature should not exceed 52°C (125°F). Use in accordance with Safety Data Sheet. FIRST AID: IF INHALED, remove to fresh air. If breathing is difficult, give Oxygen. Call a physician. IN CASE OF FROSTBITE, obtain immediate medical attention. DO NOT REMOVE THIS LABEL.

SECTION 16 – OTHER INFORMATION

Information contained in this data sheet is offered without charge for use by technically qualified personnel at their discretion and risk. All statements, technical information and recommendations contained herein are based on tests and data which we believe to be reliable. But the accuracy and completeness thereof, is not guaranteed and no warranty of any kind, either expressed or implied, is made with respect thereto. Since MESA Specialty Gases and Equipment Division of MESA International Technologies, Inc. shall have no control over the use of the product described herein, we assume no liability for loss or damage incurred from the proper or improper use of such product.

HISTORY:

Date of printing:	5/28/2015
Date of issue/revision:	5/28/2015
Date of previous issue:	12/1/2014