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MSDS V1.1	Carbon Dioxide	DG008G



Label 2.2: Non flammable, non toxic gas.



NFPA RATING

1 IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY / UNDERTAKING

Trade Name : Carbon Dioxide
Chemical Formula : CO₂
Chemical Family : Acid anhydride
MSDS No : DG008L
Company Identification : Aldakheel Industrial Gases Plant (DIGAS)
Emergency Phone Number : 04-8455-101

2 COMPOSITION / INFORMATION ON INGREDIENTS

COMPONENT	CAS NUMBER	CONCENTRATION
Carbon dioxide	124-38-9	>99%*

*The symbol > means "greater than"

3 HAZARDS IDENTIFICATION

Emergency Overview : Caution! High-pressure liquid and gas. Can cause rapid suffocation. Can cause rapid suffocation. Can increase respiration and heart rate. May cause nervous system damage. May cause frostbite. May cause dizziness and drowsiness. Self-contained breathing apparatus may be required by rescue workers.

Effects of a Single (Acute) Overexposure -Inhalation : In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Low concentrations of CO₂ cause increased respiration and headache. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

Skin/eye Contact : No harm expected from vapor. Cold gas, or liquid or solid carbon dioxide may cause severe frostbite.

Swallowing : An unlikely route of exposure. This product is a gas at normal temperature and pressure.


Eye Contact : No harm expected from vapor. Cold gas, or liquid or solid carbon dioxide may cause severe frostbite.

Effects of Repeated (Chronic) Overexposure : No harm expected.

Other Effects of Overexposure : Damage to retinal or ganglion cells and central nervous system may occur.

Medical Conditions Aggravated by Overexposure : The toxicology and the physical and chemical properties of carbon dioxide suggest that overexposure is unlikely to aggravate existing medical conditions.

Potential Environmental Effects : None known.

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4 FIRST AID MEASURES

Inhalation	: Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.
Skin/eye contact	: For exposure to cold vapor or solid, immediately warm frostbite area with warm water not to exceed 41°C (105°F). In case of massive exposure, remove contaminated clothing while showering with warm water. Call a physician.
Swallowing	: An unlikely route of exposure. This product is a gas at normal temperature and pressure.
Notes to Physician	: There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient. Victim may not be aware of asphyxiation.

5 FIRE-FIGHTING MEASURES


Flammable class	: Non flammable.
Extinguishing media Suitable extinguishing media	: All known extinguishants can be used.
Hazardous combustion products	: None.
Specific physical and chemical hazards	: Heat of fire can build pressure in cylinder and cause it to rupture. No part of cylinder should be subjected to a temperature higher than 52°C (125°F). Carbon dioxide cylinders are equipped with a pressure relief device. (Exceptions may exist).
Specific methods	: If possible, stop flow of product. Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool; then move them away from fire area if without risk. Self-contained breathing apparatus may be required by rescue workers.
Protective equipment and precautions for firefighters	: Firefighters should wear personal protective equipment and fire-fighting turnout gear as appropriate for surrounding fire.

6 ACCIDENTAL RELEASE MEASURES

Personal precautions	: Evacuate area. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ensure adequate air ventilation.
Environmental precautions	: Try to stop release. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
Clean up methods	: Ventilate area.

7 HANDLING AND STORAGE

Precautions to be taken in handling	: Avoid breathing gas. Do not get liquid in eyes, on skin, or clothing. Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact DIGAS. Keep cylinder upright when in use. Never apply flame or localized heat flame or directly to any part of the cylinder. High temperatures may damage the cylinder and could cause the pressure relief device to fail prematurely, venting the cylinder contents.
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7 HANDLING AND STORAGE (Continued)

Precautions to be taken in storage : Gas can cause rapid suffocation due to oxygen deficiency. Store and use with adequate ventilation. Store only where ure will not exceed 52°C (125°F). Carbon dioxide is heavier than air. It tends to accumulate near the floor of an enclosed space, displacing air and pushing it upward. This creates an oxygen deficient atmosphere near the floor. Ventilate space before entry. Verify sufficient oxygen concentration. Close cylinder valve after each use; keep closed even when empty. Prevent reverse flow. Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. Do not strike an arc on the cylinder. The defect produced by an arc burn could lead to cylinder rupture. Do not ground the cylinder or allow it to become part of an electrical circuit. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering controls

Local exhaust : Use a local exhaust system, if necessary, to keep the concentration of carbon dioxide below all applicable exposure limits in the worker's breathing zone.

Mechanical (General) : Under certain conditions, general exhaust ventilation may be acceptable to keep carbon dioxide below the exposure limits.

Special : None.

Other : None.

Personal protective equipment

Skin Protection : Wear insulated neoprene gloves for cylinder handling; welding gloves for welding. when using carbon dioxide or carbon dioxide mixtures in welding and cutting. Regardless of protective equipment, never touch live electrical parts.

Eye/Face Protection : when using carbon dioxide or carbon dioxide mixtures in welding and cutting.

Respiratory Protection : None required under normal use. An air-supplied respirators must be used in confined spaces.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: Colorless gas.
Odor	: Odorless. It is felt by some to have a slight, pungent odor and biting taste.
Odor Threshold	: Not applicable.
Physical State	: Gas at normal temperature and pressure.
pH	: 3.7 (for carbonic acid).
Sublimation Point at 1 atm	: -78.5°C (109.3°F)
Boiling Point at 1 atm	: Not applicable.
Flash Point (test method)	: Not applicable.
Evaporation Rate (Butyl Acetate = 1)	: High.
Flammability	: Nonflammable.
Flammable Limits In Air, % by volume	: Lower Not applicable Upper Not applicable
Vapor Pressure at 20°C (68°F)	: 838 psig (5778 kpa).

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9 PHYSICAL AND CHEMICAL PROPERTIES (Continued)

Liquid Density (Saturated) at 21.1°C (70°F) and 1 atm : 47.6 lb/ft³ (762 kg/m³).

Specific Gravity (H₂O = 1) at -7°C (19.4°F) : 1.22

Specific Gravity (Air = 1) at 21.1°C (70°F) and 1 atm : 1.52

Solubility In Water, vol/vol at 20°C (68°F) and 1 atm : 0.90

Partition Coefficient: n-octanol/water : Not available.

Autoignition Temperature : Not applicable.

Decomposition Temperature : Not available.

Percent Volatiles By Volume : 100

Molecular Weight : 44.01

Molecular Formula : CO₂

10 STABILITY AND REACTIVITY

Chemical Stability : Unstable Stable

Conditions to Avoid : Contact with incompatible materials, exposure to electrical discharges, and/or high temperatures as stated below.

Incompatible Materials : Alkali metals, alkaline earth metals, metal acetylides, chromium, titanium above 550°C (1022°F), uranium above 750°C (1382°F), magnesium above 775°C (1427°F).

Hazardous Decomposition Products : Electrical discharges and high temperatures decompose carbon dioxide into carbon monoxide and oxygen.

Possibility Of Hazardous Reactions : May Occur Will Not Occur

Decomposition into toxic, flammable, and/or oxidizing materials under above-stated conditions.

11 TOXICOLOGICAL INFORMATION

Acute Dose Effect : LCLo = 90,000 ppm, 5 min., human.

The welding process may generate hazardous fumes and gases. Carbon dioxide is an asphyxiant. It initially stimulates respiration and then causes respiratory depression. High concentrations result in narcosis. Symptoms in humans are as follows:

Effect:

Concentration:

-Breathing rate increases slightly : 1%


-Breathing rate increases to 50% above normal level. Prolonged exposure can cause headache, tiredness. : 2%

-Breathing increases to twice normal rate and becomes labored. Weak narcotic effect. : 3%

-Breathing increases to approximately four times normal rate, symptoms of intoxication become evident, and slight choking may be felt. : 4-5%

-Characteristic sharp odor noticeable. Very labored breathing, headache, visual impairment, and ringing in the ears. Judgment may be impaired, : 5-10%

-Unconsciousness occurs more rapidly above 10% level. Prolonged exposure to high concentrations may eventually result in death from asphyxiation. : 10 - 100%

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Reproductive Effects : A single study has shown an increase in heart defects in rats exposed to 6% carbon dioxide in air for 24 hours at different times during gestation. There is no evidence that carbon dioxide is teratogenic in humans.

12 ECOLOGICAL INFORMATION

Ecotoxicity : No Known effects.
Other Adverse Effects : No adverse ecological effects expected. Carbon dioxide does not contain any Class I or Class II ozone-depleting chemicals.

13 DISPOSAL CONSIDERATION

Waste Disposal Method : Do not attempt to dispose of residual or unused quantities. Return cylinder to DIGAS.

14 TRANSPORT INFORMATION

Transport 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.
: Before transporting product containers:
- Ensure that containers are firmly secured.
- Ensure cylinder valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.
- Ensure there is adequate ventilation.
- Compliance with applicable regulations.

15 OTHER INFORMATION

Asphyxiant in high concentrations.
Keep container in a well-ventilated place.
Do not breathe the gas.
Contact with liquid may cause cold burns/frostbite.
Ensure all national/local regulations are observed.
Ensure all national/local regulations are observed.
The hazard of asphyxiation is often overlooked and must be stressed during operator training.

HAZARD RATING SYSTEMS:

NFPA Ratings:

Health	=2	HMIS Ratings:	Health	=1
Flammability	=0		Flammability	=0
Instability	=0		Physical Hazard	=3
Special	= SA (CGA recommends this to designate Simple Asphyxiant.)			

STANDARD VALVE CONNECTIONS:

THREADED : CGA-320
PIN-INDEX YOKE : CGA-940 (Medical Use)

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

This Material Safety Data Sheet has been established for the best knowledge of DIGAS.

Details given in this document are believed to be correct at the best of DIGAS knowledge. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

End of Documents.