Safety data sheet · UN 1013

Carbon dioxide (CO_2)

Safety Data Sheet

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Carbon dioxide (CO_2, CAS 124-38-9, UN 1013) is supplied as a liquefied gas under its own vapour pressure. It is heavier than air and collects at low level. Unlike nitrogen or argon it is physiologically active, causing effects from about 2 % in air — well below the level needed to displace oxygen.

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Safety data sheet (kigl.co.in/sds/oxygen)

UN 1013
UN number (compressed/liquefied)

UN 2187
UN number (refrigerated liquid)

124-38-9
CAS number

44.0095 g/mol
Molecular weight

31.0 °C
Critical temperature

Section 1 — Identification

Product name

Carbon dioxide **Chemical formula:** CO_2 **CAS number:** 124-38-9 · **EC number:** 204-696-9 · **UN number:** UN 1013 **Specification:** IS 307

Identified uses

MIG welding shielding gas; beverage carbonation and dispense (requires a gas qualified for food contact — see /carbon-dioxide-gas); modified-atmosphere food packaging; water and effluent pH control; greenhouse enrichment; fire suppression. **Uses advised against:** Any food or beverage application using industrial-grade product. Use in unventilated below-ground spaces without monitoring.

Supplier

The Kamrup Industrial Gases Limited.

Section 2 — Hazards identification

GHS classification

Gases under pressure — liquefied gas.

Signal word

WARNING

Hazard statements

- H280 — Contains gas under pressure; may explode if heated.

Precautionary statements

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

Hazards not covered by the harmonised classification. CO_2 carries no harmonised health-hazard classification, and that has misled people into treating it as inert. It is not. Carbon dioxide is **physiologically active**: it stimulates respiration, causes acidosis at concentration, and is dangerous at levels far below those at which oxygen displacement alone would harm you.

It is also **about 1.5 times heavier than air** and accumulates at low level.

Section 3 — Composition

Component	CAS	Concentration
Carbon dioxide	124-38-9	IS 307 : 2024 Grade 1 ≥99.7 % (reagent and welding) / Grade 2 ≥99.9 %

Single-substance product.

Section 4 — First aid

Inhalation

Remove the casualty to fresh air — **but do not enter the space without breathing apparatus and monitoring**. CO_2 incidents commonly claim rescuers. Give oxygen if trained to do so. If breathing has stopped, give artificial respiration. Seek immediate medical attention.

Skin contact

Cold burns from escaping gas or dry ice: flush with tepid water, do not rub, cover loosely with a sterile dressing and seek medical attention.

Eye contact

Flush with water for at least 15 minutes. Seek immediate medical attention for any cold-burn injury.

Note for medical personnel

CO_2 exposure produces hypercapnia and respiratory acidosis. Effects may persist after removal from exposure. Treat symptomatically and monitor blood gases.

Section 5 — Firefighting

CO_2 is non-flammable and is itself used as an extinguishing agent.

Specific hazards. Cylinders exposed to fire may rupture — CO_2 has a low critical temperature, so heating raises pressure very rapidly. Cool cylinders with water spray from a protected position, or evacuate.

Advice for firefighters. Self-contained breathing apparatus. Be aware that CO_2 discharged into a confined space during firefighting creates an asphyxiating and physiologically hazardous atmosphere.

Section 6 — Accidental release

Evacuate the area, **paying particular attention to low-lying areas, basements, pits and drains** where the gas will collect. Ventilate at low level. Do not enter to

isolate the leak without oxygen and CO_2 monitoring and appropriate breathing apparatus.

Escaping liquid CO_2 forms solid dry ice at approximately −78 °C; treat the discharge zone as a cold hazard as well as an atmospheric one.

RULES THAT MATTER

Handling.

Section 7 — Handling and storage

Weigh cylinders to determine contents; the pressure gauge does not indicate quantity.

Reduce withdrawal rate if the regulator ices up rather than forcing flow.

Wear cold-resistant gloves and eye protection when making and breaking connections.

Secure cylinders upright at all times.

Storage.

- **Protect from sunlight and heat.** CO_2's critical temperature is about 31 °C — readily exceeded in Indian summer conditions, after which pressure climbs steeply.
- Well-ventilated area, ventilated at **low level**.
- Never store in cellars, basements or pits without fixed monitoring.
- Segregate food-grade from industrial stock and keep them clearly identified.

Section 8 — Exposure controls

Carbon dioxide has recognised occupational exposure limits because it is physiologically active, not merely because it displaces oxygen.

The widely applied ACGIH values are **TWA 5,000 ppm (0.5 %)** and **STEL 30,000 ppm (3 %)**.

Indicative physiological effects, from standard literature:

Concentration in air	Typical effect
0.5 %	Occupational exposure limit (TWA)
1 %	Drowsiness, reduced concentration
2 %	Noticeably deeper and faster breathing
3 %	Short-term exposure limit; laboured breathing, headache
5 %	Severe breathing difficulty, headache, sweating
8–10 %	Impaired vision, confusion, unconsciousness within minutes
Above ~17 %	Rapid loss of consciousness; may be fatal

Note the top of that table against oxygen displacement. At 10 % CO_2, oxygen has only fallen to about 19 % — an oxygen meter alone would not alarm, yet the atmosphere is life-threatening. **Monitor for CO_2 specifically; an oxygen meter is not sufficient protection.**

Personal protection: cold-resistant gloves and eye protection for cylinder handling; CO_2 monitoring and breathing apparatus for confined-space work.

Section 9 — Physical and chemical properties

Property	Value	Source
Physical state	Liquefied gas under own vapour pressure	—
Appearance	Colourless	—
Odour	Odourless; slightly pungent at high concentration	—
Molecular weight	44.0095 g/mol	NIST
Triple point	−56.6 °C at 5.18 bar	NIST
Critical temperature	**31.0 °C**	NIST
Critical pressure	73.8 bar	NIST
Normal boiling point	**None** — sublimes at atmospheric pressure	NIST
Sublimation point at 1 atm	≈ −78.5 °C	NIST Chemistry WebBook
Vapour density (air = 1)	≈1.52	Calculated from molar mass, NIST Chemistry WebBook
Flammability	Non-flammable	—
Oxidising properties	None	—

Two consequences of that table. There is **no normal boiling point** — the triple-point pressure of 5.18 bar is above atmospheric, so solid CO_2 sublimes directly to gas. That is why dry ice behaves as it does. And the **critical temperature of 31.0 °C is below Indian summer ambient**: above it no liquid phase exists and cylinder pressure rises steeply with temperature. Shade and ventilation are not optional here.

Thermophysical constants from the NIST Chemistry WebBook (public domain). Remaining values are standard literature.

Section 10 — Stability and reactivity

Stable. Non-flammable and non-oxidising.

Incompatible materials: alkali metals and alkaline earth metals, and strong reducing agents. Carbon dioxide dissolved in water forms carbonic acid, which is corrosive to some metals over time — relevant to wet systems and dispense equipment.

Conditions to avoid: heat and direct sunlight, given the low critical temperature.

Section 11 — Toxicological information

Not toxic in the conventional sense, but physiologically active. Inhalation causes hypercapnia — elevated blood CO_2 — leading to increased respiratory rate, headache, dizziness, confusion, unconsciousness and, at high concentration, death. Effects arise at concentrations well below those at which oxygen deficiency alone would be dangerous.

Section 12 — Ecological information

Not classified as environmentally hazardous in the sense of ecotoxicity. Carbon dioxide is a greenhouse gas; avoid unnecessary venting and recover where practicable.

Section 13 — Disposal

Vent slowly to atmosphere in a safe, well-ventilated **outdoor** location, away from low-lying areas, basements and drains where the gas could collect. Return cylinders to the supplier.

Section 14 — Transport

UN number	UN 1013 · UN 2187 (refrigerated liquid)
Proper shipping name	CARBON DIOXIDE
Class	2.2

Transport upright and secured, in a ventilated vehicle. **Never carry CO_2 cylinders in an enclosed passenger compartment** — a leak in a closed vehicle is rapidly incapacitating.

Section 15 — Regulatory information

- **Gas Cylinders Rules, 2016** (PESO)

- **IS 307** — carbon dioxide specification
- **IS 3078** — cylinder valves for CO_2 service
- **IS 7285** — seamless steel cylinders
- **ADR 2025** — UN 1013 / UN 2187
- Food-grade product is additionally subject to food-safety regulation.

Section 16 — Other information

Revision 1, issued 6 August 2026.

Relates to carbon dioxide as supplied and does not release the user from assessing their own installation and application. A signed PDF copy is available on request for audit files; this HTML page is the current version.

PRODUCT	CAS NUMBER	UN NUMBER
Carbon dioxide	**124-38-9**	**UN 1013**
TRANSPORT CLASS	SPECIFICATION	REVISION
2.2 — Non-flammable, non-toxic gas	**IS 307**	**1 · 6 August 2026**

Also known as: CO_2 · Carbonic anhydride · Dry ice when solid

Carbon dioxide — frequently asked questions

Why is carbon dioxide more dangerous than nitrogen or argon? +

What happens to a CO_2 cylinder in Indian summer heat? +

Why does the pressure gauge not show how much CO_2 is left? +

Why does the regulator freeze during heavy use? +

Can CO_2 cause cold burns? +

Where do CO_2 accidents actually happen? +

References

Bureau of Indian Standards. (2024). *Carbon dioxide — Specification* (IS 307:2024, Third Revision).

Government of India. (2016). *Gas Cylinders Rules, 2016* (G.S.R. 1081(E)). Petroleum and Explosives Safety Organisation.

Linstrom, P. J., & Mallard, W. G. (Eds.). (n.d.). *NIST Chemistry WebBook* (NIST Standard Reference Database 69). National Institute of Standards and Technology.

ENQUIRIES

Request a quotation

State the gas or equipment, the quantity or capacity, and your location. KIGL will confirm the grade, the cylinder or plant size, and whether the location can be served from Noonmati, or through the agent network.

Request a quotation (kigl.co.in/contact)

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