



Carbon dioxide, Solid or Dry Ice

Safety Data Sheet P-4575

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Issue date: 01/01/1997 Revision date: 05/23/2022 Supersedes: 02/04/2021 Version: 2.1

SECTION 1: Product and company identification

1.1. Product identifier

Product form : Substance
Trade name : Dry Ice, Ultralce
CAS-No. : 124-38-9
Formula : CO₂
Other means of identification : Dry ice (nuggets, pellets, or blocks), carbonice, carbonic anhydride

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Industrial use; Use as directed.

1.3. Details of the supplier of the safety data sheet

Linde Inc.
10 Riverview Drive
Danbury, CT 06810-6268, USA
www.lindeus.com

Linde Inc. 1-844-44LINDE (1-844-445-4633)

1.4. Emergency telephone number

Emergency number : Onsite Emergency: 1-800-645-4633

CHEMTREC, 24 hr/day 7 days/week
— Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887
(collect calls accepted, Contract 17729)

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

GHS-US classification

2.2. Label elements

GHS US labelling

Hazard statements (GHS US) : MAY CAUSE FROSTBITE.
MAY CAUSE CRYOGENIC BURNS OR INJURY
MAY INCREASE RESPIRATION AND HEART RATE.
VAPOUR MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION

Precautionary statements (GHS US) : Do not handle until all safety precautions have been read and understood
Use and store only outdoors or in a well-ventilated place.
Do not handle with bare hands
Contact with skin may cause frostbite; flesh may stick to material.
Use protective gloves
Dry ice sublimates to carbon dioxide vapor at -109°F (-78°C). VAPOUR MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION
Do not put in closed containers
Do not enter confined areas where used or stored until areas are adequately ventilated

2.3. Other hazards

Other hazards which do not result in classification : Refrigerated solidified gas. CONTACT WITH PRODUCT MAY CAUSE COLD BURNS OR FROSTBITE.

Dry ice sublimates to carbon dioxide vapor at -109°F (-78°C). VAPOUR MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION.

2.4. Unknown acute toxicity (GHS US)

Not applicable



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SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%
Carbon dioxide, Solid or Dry Ice (Main constituent)	(CAS-No.) 124-38-9	100

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- First-aid measures after inhalation : Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, trained personnel should give oxygen. Call a physician.
- First-aid measures after skin contact : MAY CAUSE FROSTBITE. For exposure to liquid, cold vapor, or solid carbon dioxide (dry ice), immediately warm frostbite area with warm water not to exceed 41°C (105°F). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.
- First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately. Get immediate medical attention.
- First-aid measures after ingestion : Rinse mouth out with water. Give water to drink if victim completely conscious/alert. Never give anything by mouth to an unconscious person. Do not induce vomiting. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

No additional information available

4.3. Indication of any immediate medical attention and special treatment needed

None.

SECTION 5: Firefighting measures

5.1. Extinguishing media

No additional information available

5.2. Special hazards arising from the substance or mixture

Reactivity : None.

5.3. Advice for firefighters

- Firefighting instructions : Evacuate all personnel from danger area. Do not discharge sprays onto solid carbon dioxide. Solid carbon dioxide will freeze water rapidly. NEVER HANDLE SOLID CARBON DIOXIDE WITH YOUR BARE HANDS. USE GLOVES OR DRY ICE TONGS OR A DRY SHOVEL OR SCOOP. Move packages away from fire area if safe to do so. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with applicable standards e.g. 29 CFR 1910 Subpart L—Fire Protection in the U.S.).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- General measures : Use protective clothing. Wear cold-insulating gloves/face shield/eye protection. Chemical asphyxiant. Exposure to low concentrations for extended periods may result in dizziness or unconsciousness, and may lead to death. Wear self-contained breathing apparatus when entering area unless atmosphere is proven to be safe. NEVER HANDLE SOLID CARBON DIOXIDE WITH YOUR BARE HANDS. USE GLOVES OR DRY ICE TONGS OR A DRY SHOVEL OR SCOOP.

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available



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6.2. Environmental precautions

Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with container supplier/owner instructions.

6.3. Methods and material for containment and cleaning up

No additional information available

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Avoid materials incompatible with cryogenic use; some metals such as carbon steel may fracture easily at low temperature. Vapor can cause rapid suffocation due to oxygen deficiency. Never allow any unprotected part of your body to touch solid carbon dioxide or to touch uninsulated pipes or vessels containing solid or liquid carbon dioxide or cold carbon dioxide gas. Not only can you suffer frostbite, your skin may stick fast to the cold surfaces. Use tongs or insulated gloves when handling solid carbon dioxide or objects in contact cold carbon dioxide in any form. Wear protective clothing and equipment as prescribed in section 8. For other precautions in using carbon dioxide, see section 16.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store and use with adequate ventilation. Do not store in tight containers or confined spaces. Storage areas should be clean and dry. Solid carbon dioxide is generally delivered to customers in 50-lb (22.7-kg), 1/2-cubic ft (0.0142 cubic meter) blocks (approximate dimensions), wrapped in kraft paper. Small pellets or nuggets are also produced. The product should be stored in insulated containers that open from the top. Lids should fit loosely so the carbon dioxide vapor given off as the solid sublimates can escape into the atmosphere. Carbon dioxide gas is about 1 1/2 times as heavy as air and will accumulate in low-lying areas, so ventilation must be adequate at floor or below grade level.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

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ACGIH	ACGIH OEL TWA [ppm]	5000 ppm
ACGIH	ACGIH OEL STEL [ppm]	30000 ppm
USA OSHA	OSHA PEL TWA [1]	9000 mg/m ³
USA OSHA	OSHA PEL TWA [2]	5000 ppm
USA IDLH	IDLH [ppm]	40000 ppm

8.2. Exposure controls

Appropriate engineering controls : Oxygen detectors should be used when asphyxiating gases may be released. Ensure exposure is below occupational exposure limits (where available). Systems under pressure should be regularly checked for leakages. Provide adequate general and local exhaust ventilation. Consider the use of a work permit system e.g. for maintenance activities.

Hand protection : Cold-insulating gloves.

Eye protection : Wear safety glasses with side shields.

Respiratory protection : When workplace conditions warrant respirator use, follow a respiratory protection program that meets or exceeds the requirements of the appropriate Health and Safety Regulations. Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).

Thermal hazard protection : Wear cold insulating gloves.

Environmental exposure controls : None necessary.

Other information : Wear safety shoes while handling containers.



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SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Solid
Appearance	: Opaque. White crystalline solid.
Molecular mass	: 44 g/mol
Colour	: White.
Odour	: No odour warning properties.
Odour threshold	: No data available
pH	: 3.7 (carbonic acid)
Relative evaporation rate (butylacetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: -78.5 °C
Freezing point	: No data available
Boiling point	: -78.4 °C
Flash point	: Not applicable.
Critical temperature	: 30 °C
Auto-ignition temperature	: Not applicable.
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapour pressure	: 5730 kPa
Critical pressure	: 7375 kPa
Relative vapour density at 20 °C	: No data available
Relative density	: 0.82
Density	: 1562 kg/m ³
Relative gas density	: 1.52
Solubility	: Water: 2000 mg/l Completely soluble.
Partition coefficient n-octanol/water (Log Pow)	: 0.83
Partition coefficient n-octanol/water (Log Kow)	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Not applicable.
Oxidizing properties	: None.
Explosive limits	: Not applicable.

9.2. Other information

Sublimation point	: -78.5 °C Expansion ratio for solid to gas at sublimation point is 1 to 554.
Additional information	: Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

None.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

None.

10.4. Conditions to avoid

None under recommended storage and handling conditions (see section 7).



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10.5. Incompatible materials

Alkali metals, Alkaline earth metals, Acetylide forming metals, Chromium, Titanium > 1022°F (550°C), Uranium (U) > 1382°F (750°C), Magnesium > 1427°F (775°C).

10.6. Hazardous decomposition products

Electrical discharges and high temperatures decompose carbon dioxide into carbon monoxide and oxygen.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral) : Not classified
Acute toxicity (dermal) : Not classified
Acute toxicity (inhalation) : Not classified

Skin corrosion/irritation : Not classified
pH: 3.7 (carbonic acid)
Serious eye damage/irritation : Not classified
pH: 3.7 (carbonic acid)
Respiratory or skin sensitisation : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified
STOT-single exposure : Not classified
STOT-repeated exposure : Not classified
Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No ecological damage caused by this product.

12.2. Persistence and degradability

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Persistence and degradability	No ecological damage caused by this product.
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12.3. Bioaccumulative potential

Carbon dioxide, Solid or Dry Ice (124-38-9)

BCF - Fish [1]	(no bioaccumulation)
Partition coefficient n-octanol/water (Log Pow)	0.83
Partition coefficient n-octanol/water (Log Kow)	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.

12.4. Mobility in soil

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Mobility in soil	No data available.
Ecology - soil	No ecological damage caused by this product.

12.5. Other adverse effects

Other adverse effects : Can cause frost damage to vegetation.
Effect on the ozone layer : None.



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- Global warming potential [CO₂=1] : 1
Effect on global warming : When discharged in large quantities may contribute to the greenhouse effect.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

- Waste treatment methods : See Section 6.
Product/Packaging disposal recommendations : Dispose of contents/container in accordance with container supplier/owner instructions.

SECTION 14: Transport information

- In accordance with DOT
Transport document description (DOT) : UN1845 Carbon dioxide, solid, 9
UN-No.(DOT) : UN1845
Proper Shipping Name (DOT) : Carbon dioxide, solid
Class (DOT) : 9 - Class 9 - Miscellaneous hazardous material 49 CFR 173.140
Hazard labels (DOT) : 9 - Class 9 (Miscellaneous dangerous materials)



- DOT Symbols : A - Material is regulated as a hazardous material only when transported by air, W - Material is regulated as a hazardous material only when transported by water

Additional information

- Emergency Response Guide (ERG) Number : 120 (UN1013)
Other information : No supplementary information available.
Special transport precautions : 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 there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure 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.

Transport by sea

- UN-No. (IMDG) : 1845
Proper Shipping Name (IMDG) : CARBON DIOXIDE, SOLID (DRY ICE)
Class (IMDG) : 9 - Miscellaneous dangerous substances and articles

Air transport

- UN-No. (IATA) : 1845
Proper Shipping Name (IATA) : Carbon dioxide, solid
Class (IATA) : 9 - Miscellaneous Dangerous Substances and Articles

SECTION 15: Regulatory information

15.1. US Federal regulations

Carbon dioxide, Solid or Dry Ice (124-38-9)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. International regulations

CANADA



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Carbon dioxide, Solid or Dry Ice (124-38-9)

Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

Carbon dioxide, Solid or Dry Ice (124-38-9)

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.2.2. National regulations

Carbon dioxide, Solid or Dry Ice (124-38-9)

Listed introduction on Australian Industrial Chemicals Introduction Scheme (AICIS Inventory)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the Japanese ENCS (Existing New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on KECL/KECI (Korean Existing Chemicals Inventory)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the Canadian IDL (Ingredient Disclosure List)
Listed on INSQ (Mexican National Inventory of Chemical Substances)
Listed on the TCSI (Taiwan Chemical Substance Inventory)

15.3. US State regulations

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U.S. - California - Proposition 65 - Carcinogens List	No
U.S. - California - Proposition 65 - Developmental Toxicity	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List



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SECTION 16: Other information

Other information

: When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product.

The opinions expressed herein are those of qualified experts within Linde Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Linde Inc, it is the user's obligation to determine the conditions of safe use of the product.

Linde SDSs are furnished on sale or delivery by Linde or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your sales representative, local distributor, or supplier, or download from www.lindeus.com. If you have questions regarding Linde SDSs, would like the document number and date of the latest SDS, or would like the names of the Linde suppliers in your area, phone or write the Linde Call Center (Phone: 1-844-44-Linde (1-844-445-4633); Address: Linde Call Center, Linde Inc, P.O. Box 44, Tonawanda, NY 14151-0044).

Linde asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

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NFPA health hazard

: 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

NFPA fire hazard

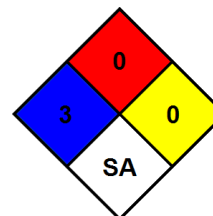
: 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA instability

: 0 - Material that in themselves are normally stable, even under fire conditions.

NFPA specific hazard

: SA - Materials that are simple asphyxiants.



SDS US (GHS HazCom 2012) - Linde 2022

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.