NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
U.S. DEPARTMENT OF COMMERCE

Date of Issue:
25 November 2025

# SAFETY DATA SHEET

## 1. Substance and Source Identification

**Product Identifier**

**SRM Number:** 2619a
**SRM Name:** Carbon Dioxide in Nitrogen (Nominal Amount-of-Substance Fraction 0.5 % mol/mol)
**Other Means of Identification:** Not applicable.

**Recommended Use of This Material and Restrictions of Use**

This Standard Reference Material (SRM) is a primary gas mixture of carbon dioxide in nitrogen supplied in a DOT 3AL specification aluminum (6061 alloy) cylinder with a water volume of 6 L. This SRM is intended for the calibration of instruments used for carbon dioxide determinations and for other applications. Mixtures are shipped with a nominal pressure exceeding 12.4 MPa (1800 psig), which provides the user with 0.73 $m^3$ (25.8 $ft^3$) of useable mixture. The cylinder is the property of the purchaser and is equipped with a CGA-580 brass valve, which is the recommended outlet for this carbon dioxide mixture.

**Company Information**

National Institute of Standards and Technology
Standard Reference Materials Program
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## 2. Hazards Identification

**Classification**

**Physical Hazard:** Compressed Gas.
**Health Hazard:** Simple Asphyxiant.

**Label Elements**

**Symbol**



**Signal Word**
WARNING

**Hazard Statement(s)**

| | |
|---|---|
| H280 | Contains gas under pressure; may explode if heated. |
| ------ | May displace oxygen and cause rapid suffocation. |

**Precautionary Statement(s)**

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

**Hazards Not Otherwise Classified:** Not applicable.

**Ingredients(s) with Unknown Acute Toxicity:** Not applicable.

## 3. Composition and Information on Hazardous Ingredients

**Substance:** Carbon dioxide in nitrogen, compressed gas

**Other Designations:**

Carbon Dioxide**:** Carbonic acid gas, carbonic anhydride, $CO_2$.
Nitrogen**:** Dinitrogen, nitrogen compressed.

Components are listed in compliance with OSHA's 29 CFR 1910.1200; for the actual values see the Certificate of Analysis.

| Hazardous Components | CAS Number | EC Number (EINECS) | Nominal Mass Concentration (%) |
|---|---|---|---|
| Nitrogen | 7727-37-9 | 231-783-9 | >99 |
| Carbon Dioxide | 124-38-9 | 204-696-9 | 0.5 |

## 4. First Aid Measures

**Description of First Aid Measures:**

**Inhalation:** If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration or oxygen by qualified personnel. Seek immediate medical attention.

**Skin Contact:** Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed.

**Eye Contact:** Immediately flush eyes, including under the eyelids with copious amounts of water for at least 15 minutes. Seek immediate medical attention.

**Ingestion:** Ingestion of a gas is unlikely. As this product is a gas, refer to the inhalation section.

**Most Important Symptoms/Effects, Acute and Delayed:** Harmful if inhaled, blood damage, difficulty breathing, and suffocation.

**Indication of any immediate medical attention and special treatment needed, if necessary:** If any of the above symptoms are present, seek immediate medical attention.

## 5. Fire Fighting Measures

**Fire and Explosion Hazards:** Negligible fire hazard applicable to the identified NIST cylinder. Cylinders may rupture or explode if exposed to heat. See Section 9, "Physical and Chemical Properties" for flammability properties.

**Extinguishing Media:**

Suitable: Use extinguishing media appropriate to the surrounding fire.
Unsuitable: None listed.

**Specific Hazards Arising from the Chemical:** Oxides of nitrogen, oxides of carbon.

**Special Protective Equipment and Precautions for Fire-Fighters:** Move cylinder from fire area if it can be done without personal risk. Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH approved self-contained breathing apparatus (SCBA).

## 6. Accidental Release Measures

**Personal Precautions, Protective Equipment and Emergency Procedures:** Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment; see Section 8, "Exposure Controls and Personal Protection". Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

**Methods and Materials for Containment and Clean up:** Stop leak if possible without personal risk. Isolate hazard area and deny entry. Stay upwind and keep out of low areas.

## 7. Handling and Storage

**Safe Handling Precautions:** Use only with adequate ventilation. Do not puncture or incinerate container. Close valve after each use and when empty. Keep valve protection cap on cylinder when not in use.

**Storage:** Store and handle in accordance with all current regulations and standards. Secure cylinder to prevent physical damage. Keep separated from incompatible substances (oxidizing materials, halogens, metal oxides, metals, combustible materials, lithium). Store in well-ventilated area. Subject to storage regulations, OSHA 29 CFR 1910.101.

## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

**Exposure Limits:**

**Carbon Dioxide**

| | |
|---|---|
| OSHA (PEL): | 9 000 mg/m$^3$ (5 000 ppm) TWA |
| ACGIH (TLV): | 9 000 mg/m$^3$ (5 000 ppm) TWA |
| | 30 000 ppm STEL |
| NIOSH (REL): | 9 000 mg/m$^3$ (5 000 ppm) TWA |
| | 54 000 mg/m$^3$ (30 000 ppm) STEL |
| | 40 000 ppm IDLH |

**Nitrogen**

ACGIH (TLV): Simple asphyxiant.

**Engineering Controls:** Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

**Personal Protection:** In accordance with OSHA 29 CFR 1910.132, subpart I, wear appropriate Personal Protective Equipment (PPE) to minimize exposure to this material.

**Respiratory Protection:** If workplace conditions warrant a respirator, a respiratory protection program that meets OSHA 29 CFR 1910.134 must be followed. Refer to NIOSH 42 CFR 84 for applicable certified respirators.

**Eye/Face Protection:** Wear safety goggles. An eye wash station should be readily available near areas of use.

**Skin and Body Protection:** Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Chemical-resistant gloves should be worn at all times when handling chemicals.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| **Descriptive Properties:** | |
| **Appearance (physical state, color, etc.):** | colorless compressed gas |
| **Molecular Formula:** | not available |
| **Molar Mass (g/mol):** | not available |
| **Odor:** | odorless |
| **Odor threshold:** | not available |
| **pH:** | not applicable |
| **Evaporation rate:** | not applicable |
| **Melting point/freezing point (ºC):** | –210 (–346 ºF) (Nitrogen) |
| **Relative Density (g/L):** | 1.2506 (Nitrogen) |
| **Vapor Pressure (mmHg):** | 760 at –196 ºC (Nitrogen) |
| **Vapor Density (air = 1):** | 0.967 (Nitrogen) |
| **Viscosity (cP):** | 0.01787 (27 ºC) (Nitrogen) |
| **Solubility(ies):** | water, 1.6 % at 20 ºC; liquid ammonia (Nitrogen) |
| **Partition coefficient (n-octanol/water):** | not available |
| **Particle Size** | not applicable |
| **Thermal Stability Properties:** | |
| **Autoignition Temperature:** | not applicable |
| **Thermal Decomposition** | not applicable |
| **Initial boiling point and boiling range (ºC):** | –196 (–321 ºF) (Nitrogen) |
| **Explosive Limits, LEL:** | not applicable |
| **Explosive Limits, UEL:** | not applicable |
| **Flash Point:** | not applicable |
| **Flammability (solid, gas):** | not applicable |

## 10. STABILITY AND REACTIVITY

**Reactivity:** Not reactive.

**Stability:** X Stable _____ Unstable

**Possible Hazardous Reactions:** None listed.

**Conditions to Avoid:** Minimize contact with material. Containers may rupture or explode if exposed to heat.

**Incompatible Materials:** Oxidizing materials, halogens, metal oxides, metals, combustible materials, metal salts, halocarbons.

**Fire/Explosion Information:** See Section 5, "Fire Fighting Measures".

**Hazardous Decomposition:** Miscellaneous decomposition products.

**Hazardous Polymerization:** _____ Will Occur __X__ Will Not Occur

## 11. TOXICOLOGICAL INFORMATION

**Route of Exposure:** __X__ Inhalation _____ Skin _____ Ingestion

**Symptoms Related to the Physical, Chemical and Toxicological Characteristics:** Nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, disorientation, emotional disturbances, pain in extremities, tremors, loss of coordination, hearing loss, visual disturbances.

**Potential Health Effects (Acute, Chronic and Delayed):**

**Inhalation:**

Carbon Dioxide: Acute exposure to carbon dioxide at concentrations of 2 % to 10 %, (NIST provided cylinder is 0.5 %), may cause acidic taste, dyspnea, headache, vertigo, nausea, labored breathing, weakness, drowsiness, mental confusion, and increase in blood pressure. At higher concentrations, visual disturbances, tinnitus, tremors, perspiration, restlessness, discomfort, convulsions, loss of consciousness, coma, and death. In addition, carbon dioxide/nitrogen compressed gas mixture is an asphyxiant. Release in an enclosed space may result in asphyxiation. The symptoms of asphyxia depend on the rapidity with which the oxygen deficiency develops and how long it continues. In sudden acute asphyxia, unconsciousness may be immediate. With slow development, there may be rapid respiration and pulse, air hunger, dizziness, reduced awareness, tightness in the head, tingling sensations, incoordination, faulty judgment, emotional instability, and rapid fatigue. As the asphyxia progresses, nausea, vomiting, collapse, unconsciousness, convulsions, deep coma, and death are possible.

Nitrogen: Nitrogen compressed gas is a simple asphyxiant. Release in an enclosed space may result in asphyxiation. The symptoms of asphyxia depend on the rapidity with which the oxygen deficiency develops and how long it continues. In sudden acute asphyxia, unconsciousness may be immediate. With slow development, there may be rapid respiration and pulse, air hunger, dizziness, reduced awareness, tightness in the head, tingling sensations, incoordination, faulty judgment, emotional instability, and rapid fatigue. As the asphyxia progresses, nausea, vomiting, collapse, unconsciousness, convulsions, deep coma, and death are possible.

**Skin Contact:** No information on significant adverse effects.

**Eye Contact:** Carbon dioxide at high concentration in air may cause a stinging sensation of the eyes. Not applicable for exposure to nitrogen.

**Ingestion:** Ingestion of a gas is unlikely under normal conditions of use (see "Inhalation").

**Numerical Measures of Toxicity:**

**Acute Toxicity:** Not classified.
Carbon dioxide: Rat, Inhalation LC50: 470 000 ppm (30 min)
Nitrogen: Simple asphyxiant

**Skin Corrosion/Irritation:** Not applicable.

**Serious Eye damage/ Eye irritation:** Not applicable.

**Respiratory Sensitization:** No data available.

**Skin Sensitization:** No data available.

**Germ Cell Mutagenicity:** No data available.

**Carcinogenicity:** Not classified.

**Listed as a Carcinogen/Potential Carcinogen** _____ Yes __X__ No

Nitrogen is not listed by NTP, IARC or OSHA as a carcinogen.

Carbon dioxide is not listed by NTP, IARC or OSHA as a carcinogen.

**Reproductive Toxicity:** Not classified, effect due mostly to asphyxia.
Carbon dioxide: Rat, Inhalation TCLo: 6 % (24 h, pregnant 10 d).

**Specific Target Organ Toxicity, Single Exposure:** Not classified.

**Specific Target Organ Toxicity, Repeated Exposure:** Not classified.

**Aspiration Hazard:** No data available.

## 12. ECOLOGICAL INFORMATION

**Ecotoxicity Data:**

**Carbon Dioxide**

Rainbow trout (*Oncorhynchus mykiss*), LC50: 35 mg/L (96 h)

**Persistence and Degradability:** No data available.

**Bioaccumulative Potential:** No bioaccumulation.

**Mobility in Soil:** No data available.

**Other Adverse effects:** No data available.

## 13. DISPOSAL CONSIDERATIONS

**Waste Disposal:** Dispose of waste in accordance with all applicable federal, state, and local regulations.

## 14. TRANSPORTATION INFORMATION

**U.S. DOT and IATA:** UN1956, Compressed gas, n.o.s. (Carbon Dioxide in Nitrogen); Hazard Class 2.2.

## 15. REGULATORY INFORMATION

**U.S. Regulations:**

CERCLA Sections 102a/103 (40 CFR 302.4): Identified cylinder not regulated.

SARA Title III Section 302 (40 CFR 355.30): Identified cylinder not regulated.

SARA Title III Section 304 (40 CFR 355.40): Identified cylinder not regulated

SARA Title III Section 313 (40 CFR 372.65): Identified cylinder not regulated.

OSHA Process Safety (29 CFR 1910.119): Identified cylinder not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

| | |
|---|---|
| ACUTE HEALTH: | Yes. |
| CHRONIC HEALTH: | No. |
| FIRE: | No. |
| REACTIVE: | No. |
| PRESSURE: | Yes. |

**State Regulations:**

California Proposition 65: Not listed.

**U.S. TSCA Inventory:** Carbon dioxide listed. Nitrogen listed.

**TSCA 12(b), Export Notification:** No components are listed.

**Canadian Regulations:**

WHMIS Information: Not provided for this material.

## 16. OTHER INFORMATION

**Issue Date:** 25 November 2025

**Sources:** ChemADVISOR, Inc., SDS, *Nitrogen, Compressed Gas*, 09 December 2015.

ChemADVISOR, Inc., SDS, *Carbon Dioxide*, 09 December 2015.

NIOSH RTECS, *Carbon Dioxide, No. FF6400000*, CAS No. 124-38-9; March 2019; available at https://www.cdc.gov/niosh-rtecs/FF61A800.html (accessed Nov 2025).

National Library of Medicine, Pubchem, *Carbon Dioxide*; available at https://pubchem.ncbi.nlm.nih.gov/compound/Carbon-Dioxide (accessed Nov 2025).

**Key of Acronyms:**

| | | | |
|---|---|---|---|
| ACGIH | American Conference of Governmental Industrial Hygienists | NRC | Nuclear Regulatory Commission |
| ALI | Annual Limit on Intake | NTP | National Toxicology Program |
| CAS | Chemical Abstracts Service | OSHA | Occupational Safety and Health Administration |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act | PEL | Permissible Exposure Level |
| CFR | Code of Federal Regulations | RCRA | Resource Conservation and Recovery Act |
| DOT | Department of Transportation | REL | Recommended Exposure Limit |
| EINECS | European Inventory of Existing Commercial Chemical Substances | RQ | Reportable Quantity |
| EPCRA | Emergency Planning and Community Right-to-Know Act | RTECS | Registry of Toxic Effects of Chemical Substances |
| IARC | International Agency for Research on Cancer | SARA | Superfund Amendments and Reauthorization Act |
| IATA | International Air Transport Association | SCBA | Self-Contained Breathing Apparatus |
| IDLH | Immediately Dangerous to Life and Health | SRM | Standard Reference Material |
| LC50 | Lethal Concentration | STEL | Short Term Exposure Level |
| LD50 | Median Lethal Dose or Lethal Dose, 50 % | TLV | Threshold Limit Value |
| LEL | Lower Explosive Limit | TPQ | Threshold Planning Quantity |
| MSDS | Material Safety Data Sheet | TSCA | Toxic Substances Control Act |
| NIOSH | National Institute for Occupational Safety and Health | TWA | Time Weighted Average |
| NIST | National Institute of Standards and Technology | UEL | Upper Explosive Limit |
| n.o.s. | Not Otherwise Specified | WHMIS | Workplace Hazardous Materials Information System |

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