Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name:	Carbon monoxide, compressed (MSDS No. P-4576-G)		**Trade Name:**	Carbon Monoxide
Chemical Name:	Carbon monoxide		**Synonyms:**	Carbonic oxide, carbon oxide
Formula:	CO		**Chemical Family:**	Not applicable
Telephone:	**Emergencies:**	1-800-645-4633*	**Company Name:**	Praxair, Inc.
	CHEMTREC:	1-800-424-9300*		39 Old Ridgebury Road
	Routine:	1-800-PRAXAIR		Danbury, CT 06810-5113

** Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).*

2. Composition/Information on Ingredients

For custom mixtures of this product, request an MSDS for each component. See section 16 for important information about mixtures.

INGREDIENT	CAS NUMBER	CONCENTRATION	OSHA PEL	ACGIH TLV-TWA
Carbon Monoxide	630-08-0	>99*	50 ppm	25 ppm

**The symbol > means "greater than"; the symbol <, "less than."*

3. Hazards Identification

EMERGENCY OVERVIEW

DANGER! Flammable, toxic, odorless high-pressure gas.
Acts on blood, causing damage to central nervous system.
Can be fatal even with adequate oxygen.
Can form explosive mixtures with air.
Harmful if inhaled.
Self-contained breathing apparatus must be worn by rescue workers.
Odor: None

THRESHOLD LIMIT VALUE: TLV-TWA 25 ppm (ACGIH , 1998). TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

Revised

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION–Depending on the concentration and duration of exposure, may cause headache, drowsiness, dizziness, excitation, rapid breathing, pallor, cyanosis, excess salivation, nausea, vomiting, hallucinations, confusion, angina, convulsions and unconsciousness. With well-established poisoning, the mucosal surface will be bright red (cherry red). Lack of oxygen can kill.

SKIN CONTACT–No harm expected.

SWALLOWING–A highly unlikely route of exposure. This product is a gas at normal temperature and pressure.

EYE CONTACT–No harm expected.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: Repeated hypoxia from CO exposure will cause gradually increasing central nervous system (CNS) damage, with loss of sensation in the fingers, poor memory, and mental deterioration. Chronic exposure may facilitate development of atherosclerosis.

OTHER EFFECTS OF OVEREXPOSURE: Other effects include embryotoxicity, impaired cardiovascular function, pulmonary edema, pneumonia, gross neuropsychiatric damage, memory impairment, permanent CNS damage and cerebral edema with irreversible brain damage. Late, fatal demyelinization is a rare, but possible, complication.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Hypoxia from carboxyhemoglobin formation may aggravate established coronary and cerebral circulatory insufficiency.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: Carbon monoxide produces embryofetal toxicity in laboratory animals, but only at doses which cause maternal toxicity. There is no information available on possible effects in humans.

CARCINOGENICITY: Carbon monoxide is not listed by NTP, OSHA, and IARC.

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 CONTACT: Wash with soap and water.

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

EYE CONTACT: An unlikely route of exposure. Flush with water. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Get medical attention if discomfort persists.

***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. Angina and depression of the ST segment of the electrocardiogram indicates myocardial hypoxia. Exposure to high concentrations can result in cerebral edema. With severe doses, the use of hyperbaric oxygen may be beneficial. Individuals repeatedly overexposed may present positive Romberg's sign.*

5. Fire Fighting Measures

FLASH POINT (test method)**:** Flammable gas	Flammable gas	
AUTOIGNITION TEMPERATURE:	1128°F (609°C)	
FLAMMABLE LIMITS IN AIR, % by volume**:**	**LOWER:** 12.5%	**UPPER:** 74%

EXTINGUISHING MEDIA: CO_2, dry chemical, water spray, or fog.

SPECIAL FIRE FIGHTING PROCEDURES: DANGER! Flammable, toxic, odorless high-pressure gas. Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately cool cylinders with water spray from maximum distance, taking care not to extinguish flames. Remove ignition sources if without risk. If flames are accidentally extinguished, explosive reignition may occur. Stop flow of gas if without risk, while continuing cooling water spray. Remove all cylinders from area of fire if without risk. Allow fire to burn out. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Toxic, flammable gas. Cannot be detected by odor. Forms explosive mixtures with air and oxidizing agents. 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 125°F (52°C). Carbon Monoxide cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) If leaking carbon monoxide catches fire, do not extinguish flames. Flammable and toxic vapors may spread from leak and could explode if reignited by sparks or flames. Explosive atmospheres may linger. Before entering area, especially confined areas, check with an appropriate device.

HAZARDOUS COMBUSTION PRODUCTS: None known.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: DANGER! Flammable, toxic, odorless high-pressure gas. Cannot be detected by odor. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. May form explosive mixtures with air (see Section 5). Toxic, flammable gas may spread. Before entering area, especially a confined area, check atmosphere with an appropriate device. Remove all sources of ignition if without risk. Reduce gas with fog or fine water spray. Shut off flow if without risk. Ventilate area or move cylinder to well-ventilated area.

WASTE DISPOSAL METHOD: Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation. Separate carbon monoxide cylinders from oxygen and other oxidizers by at least 20 ft (6.1 m) or use a barricade of noncombustible material. This barricade should be at least 5 ft (1.53 m) high and have a fire resistance rating of at least ½ hr. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods. Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas.

PRECAUTIONS TO BE TAKEN IN HANDLING: Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide or drop. Electrical equipment must be non-sparking or explosion-proof. 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 your supplier. For other precautions in using carbon monoxide, see section 16.

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST–Use an explosion-proof local exhaust system with sufficient air flow to keep the carbon monoxide concentration below the TLVs in the worker's breathing zone.

MECHANICAL (general)– Not recommended as a primary ventilation system to control worker's exposure.

SPECIAL–None

OTHER–None

RESPIRATORY PROTECTION: Use air-supplied respirators for concentrations up to 10 times the applicable permissible exposure limit. For higher concentrations, a full-face, self-contained breathing apparatus is required. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134.

SKIN PROTECTION: Wear work gloves when handling cylinders.

EYE PROTECTION: Wear safety glasses when handling cylinders. Select per OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling and protective clothing where needed. Select per OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Properties

MOLECULAR WEIGHT:	28.01
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm**:**	0.9676
GAS DENSITY at 68°F (20°C) and 1 atm**:**	0.0725 lb/ft^3 (1.161 kg/m^3)
SOLUBILITY IN WATER, vol/vol at 32°F (0°C) and 1 atm**:**	0.035
BOILING POINT at 1 atm**:**	-312.7°F (-191.5°C)
MELTING POINT at 1 atm**:**	-340.6°F (-207.0°C)

APPEARANCE, ODOR, AND STATE: Colorless, odorless gas at normal temperature and pressure.

10. Stability and Reactivity

STABILITY: ☐ Unstable ☒ Stable

INCOMPATIBILITY (materials to avoid): Oxidizing agents, oxygen, flammables, metal oxides, metals in the presence of moisture and/or sulfur compounds

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide will decompose above 752°F (400°C) to form carbon dioxide and carbon.

HAZARDOUS POLYMERIZATION: ☐ May Occur ☒ Will Not Occur

CONDITIONS TO AVOID: Temperatures above 752°F (400°C)

11. Toxicological Information

See section 3.

12. Ecological Information

No information available on ecological effects. Carbon monoxide does not contain any Class I or Class II ozone-depleting chemicals. Carbon monoxide is not listed as a marine pollutant by DOT.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier. For emergency disposal, see section 6.

14. Transport Information

DOT/IMO SHIPPING NAME: Carbon monoxide, compressed		**HAZARD CLASS:** 2.3
IDENTIFICATION NUMBER:	UN 1016	**PRODUCT RQ:** Not applicable
SHIPPING LABEL(s):	TOXIC GAS, FLAMMABLE GAS	
PLACARD (when required)**:**	TOXIC GAS, FLAMMABLE GAS	

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Additional Marking Requirement: Inhalation Hazard

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): None

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of extremely hazardous substances (40 CFR Part 355):

Threshold Planning Quantity (TPQ): None
Extremely Hazardous Substances (40 CFR 355): None

SECTIONS 311/312: Require submission of MSDSs and chemical inventory reporting with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: Yes	**PRESSURE:** Yes
DELAYED: Yes	**REACTIVITY:** No
	FIRE: Yes

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Carbon monoxide does not require reporting under Section 313.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Carbon monoxide is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Carbon monoxide is listed on the TSCA inventory.

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION**:**

29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Carbon monoxide is not listed in Appendix A as a highly hazardous chemical ; however, any process that involves a flammable gas on site in one location, in quantities of 10,000 lbs (4536 kg) or more is covered under this regulation unless the gas is used as fuel.

STATE REGULATIONS:

CALIFORNIA: Carbon monoxide is listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

WARNING: Carbon monoxide is a chemical known to the State of California to cause birth defects or other reproductive harm.

(California Health and Safety Code §25249.5 et seq.)

PENNSYLVANIA: Carbon monoxide is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: ***Toxic, flammable, odorless high-pressure gas.*** Cannot be detected by odor. Harmful if inhaled. Use piping and equipment adequately designed to withstand pressures to be encountered. ***May form explosive mixtures with air.*** Keep away from heat, sparks, and open flame. Ground all equipment Use only spark-proof tools and explosion-proof equipment. Keep away from oxidizing agents and other flammables. ***Store and use with adequate ventilation at all times.*** Use only in a closed system. Close valve after each use; keep closed even when empty. ***Protect cylinders from direct sunlight. Never work on a pressurized system.*** If a leak occurs, close the cylinder valve, blow the system down by venting vapor to a safe place in an environmentally safe manner in compliance with all federal, state, and local laws, then repair the leak. ***Never place a compressed gas cylinder where it may become part of an electrical circuit.***

NOTE: *Prior to using any plastics, confirm their compatibility with carbon monoxide. Avoid using pure nickel. Corrosion of pure nickel in CO atmospheres exceeds 50 mil/yr (1.27 mm/yr) at room temperatures.*

MIXTURES: When you mix two or more gases or liquefied gases, 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. Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:		**HMIS RATINGS:**	
HEALTH	= 3	**HEALTH**	= 1
FLAMMABILITY	= 4	**FLAMMABILITY**	= 4
REACTIVITY	= 0	**REACTIVITY**	= 0
SPECIAL	= None		

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	CGA-350 connection is standard
PIN-INDEXED YOKE:	Not applicable
ULTRA-HIGH-INTEGRITY CONNECTION:	CGA-724 *NOTE: Do not use a nickel gasket.*

Use the proper CGA connections. DO NOT USE ADAPTERS. Additional limited-standard connections may apply. See pamphlet CGA V-1 listed below.

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 1725 Jefferson Davis Highway, Arlington, VA 22202-4102, Telephone (703) 412-0900.

AV-1	*Safe Handling and Storage of Compressed Gases*
P-1	*Safe Handling of Compressed Gases in Containers*
V-1	*Compressed Gas Cylinder Valve Inlet and Outlet Connections*
—	*Handbook of Compressed Gases, Third Edition*

Praxair asks users of this product to study this MSDS and become aware of 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 MSDS 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.

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

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PRAXAIR

Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113

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