

BOC GASES

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: CARBON MONOXIDE

1. Chemical Product and Company Identification

BOC Gases,
Division of
The BOC Group, Inc.
575 Mountain Avenue
Murray Hill, NJ 07974

BOC Gases
Division of
BOC Canada Limited
5975 Falbourne Street, Unit 2
Mississauga, Ontario L5R 3W6

TELEPHONE NUMBER: (908) 464-8100
24-HOUR EMERGENCY TELEPHONE NUMBER:
CHEMTREC (800) 424-9300

TELEPHONE NUMBER: (905) 501-1700
24-HOUR EMERGENCY TELEPHONE NUMBER:
(905) 501-0802
EMERGENCY RESPONSE PLAN NO: 20101

PRODUCT NAME: CARBON MONOXIDE
CHEMICAL NAME: Carbon Monoxide
COMMON NAMES/SYNONYMS: Carbonic Oxide, Exhaust Gas, Flue Gas
TDG (Canada) CLASSIFICATION: 2.3 (2.1)
WHMIS CLASSIFICATION: A, D1A, D2A, D2B, B1

PREPARED BY: Loss Control (908)464-8100/(905)501-1700
PREPARATION DATE: 6/1/95
REVIEW DATES: 6/7/96

2. Composition, Information on Ingredients

INGREDIENT	% VOLUME	PEL/OSHA	TLV/ACGIH	LC50/ Rat/50% Spikes
Carbon Monoxide FORMULA: CO CAS: 630-08-0 RTECS #: FG9500000	100.0	50 ppm TWA	25 ppm TWA	LC50 1807 ppm/4H (rat)

¹ As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)
² As stated in the ACGIH 1994-95 Threshold Limit Values for Chemical Substances and Physical Agents

3. Hazards Identification

EMERGENCY OVERVIEW
Inhaled Carbon Monoxide binds to the blood hemoglobin, greatly reducing the blood's ability to transport oxygen to body tissues. Effects may include headaches, dizziness, nausea, loss of consciousness and death. Extremely flammable gas.

PRODUCT NAME: CARBON MONOXIDE

ROUTE OF ENTRY:

Skin Contact No	Skin Absorption No	Eye Contact No	Inhalation Yes	Ingestion No
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HEALTH EFFECTS:

Exposure Limits Yes	Irritant No	Sensitization No
Teratogen Yes	Reproductive Hazard Yes	Mutagen Yes
Synergistic Effects None Reported		

Carcinogenicity: - NTP: No IARC: No OSHA: No

EYE EFFECTS:

None reported.

SKIN EFFECTS:

None reported.

INGESTION EFFECTS:

None reported.

INHALATION EFFECTS:

Inhaled carbon monoxide binds with blood hemoglobin to form carboxyhemoglobin. Carboxyhemoglobin can not take part in normal oxygen transport, greatly reducing the blood's ability to transport oxygen. Depending on levels and duration of exposure, symptoms may include headache, dizziness, heart palpitations, weakness, confusion, nausea, and even convulsions, eventual unconsciousness and death.

Some experimental evidence indicating teratogenic and reproductive effects.

NFPA HAZARD CODES

Health: 2
Flammability: 4
Reactivity: 0

HMS HAZARD CODES

Health: 2
Flammability: 4
Reactivity: 0

RATINGS SYSTEM

- 0 = No Hazard
- 1 = Slight Hazard
- 2 = Moderate Hazard
- 3 = Serious Hazard
- 4 = Severe Hazard

4. First Aid Measures

EYES:

None required.

SKIN EFFECTS:

None required.

INGESTION:

None required.

MSDS: G-112
Revised: 6/7/96

PRODUCT NAME: CARBON MONOXIDE

INGESTION EFFECTS:

None required.

INHALATION:

Conscious persons should be assisted to an uncontaminated area and be treated with supplemental oxygen. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area and be given artificial respiration and oxygen at the same time. The administering of the oxygen at an elevated pressure (up to 2 to 2.5 atmospheres) has shown to be beneficial as has treatment in a hyperbaric chamber. The physician should be informed that the patient has inhaled toxic quantities of carbon monoxide. **PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO CARBON MONOXIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.**

5. Fire Fighting Measures

Conditions of Flammability: Flammable gas		
Flash point: Not Available	Method: Not Applicable	Autoignition: Temperature: 116 °F (639 °C)
LEL(%): 12.5	UEL(%): 74.0	
Hazardous combustion products: None		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: Not Available		

FIRE AND EXPLOSION HAZARDS:

Having almost the same density as air, it will not diffuse by rising as with some lighter flammable gases such as hydrogen or natural gas (methane). Flammable in air over a very wide range. It reacts violently with oxygen difluoride and barium peroxide.

EXTINGUISHING MEDIA:

Water, dry chemical, carbon dioxide.

FIRE FIGHTING INSTRUCTIONS:

If possible, stop flow of gas; use water spray to cool surrounding containers.

6. Accidental Release Measures

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or container valve, contact the appropriate emergency telephone number listed in Section 1 or call your closest BOC location.

7. Handling and Storage

Electrical Classification:

Class 1, Group C

Earth-ground and bond all lines and equipment associated with the carbon monoxide system. Electrical equipment should be non sparking or explosion proof.

MSDS: G-112

Revised: 6/7/96

PRODUCT NAME: CARBON MONOXIDE

Carbon Monoxide can be handled in all commonly used metals up to approximately 500 psig (3450 kPa). Above that pressure it forms toxic and corrosive carbonyl compounds with some metals. Carbon steels, aluminum alloys, copper and copper alloys, low carbon stainless steels and nickel-based alloys such as Hastelloy A, B & C are recommended for higher pressure applications.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated areas away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130°F (54°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "NO SMOKING OR OPEN FLAMES" signs in the storage area or use area. There should be no sources of ignition in the storage area or use area.

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the system.

ENGINEERING CONTROLS:

Hood with forced ventilation. Use local exhaust to prevent accumulation above the exposure limit. Use general mechanical ventilation in accordance with electrical codes.

8. Exposure Controls, Personal Protection

EXPOSURE LIMITS¹:

Substance	Permissible Exposure Limit (PEL)	Recommended Exposure Limit (REL)	Recommended Exposure Limit (REL)	Recommended Exposure Limit (REL)
Carbon Monoxide FORMULA: CO CAS: 630-08-0 RTECS #: FG9500000	100.0	50 ppm TWA	25 ppm TWA	LC ₅₀ 1807 ppm/4H (rat)

¹ Refer to individual state or provincial regulations, as applicable, for limits which may be more stringent than those listed here.

² As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

³ As stated in the ACGIH 1994-1995 Threshold Limit Values for Chemical Substances and Physical Agents.

EYE/FACE PROTECTION:

Safety goggles or glasses.

SKIN PROTECTION:

Any material protective gloves.

RESPIRATORY PROTECTION:

Positive pressure air line with full-face mask and escape bottle or self-contained breathing apparatus should be available for emergency use.

OTHER/GENERAL PROTECTION:

Safety shoes.

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure	: >220.4	psia
Vapor density (Air = 1)	: Not Available	
Evaporation point	: Not Available	
Boiling point	: -312.7	°F
	: -191.5	°C
Freezing point	: -337.1	°F
	: -205.1	°C
pH	: Not Available	
Specific gravity	: 0.96	
Oil/water partition coefficient	: Not Available	
Solubility (H2O)	: Very slight	
Odor threshold	: Not Applicable	
Odor and appearance	: Odorless; colorless gas	

10. Stability and Reactivity

STABILITY:

Stable

INCOMPATIBLE MATERIALS:

Oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS:

Carbon dioxide

HAZARDOUS POLYMERIZATION:

Will not occur.

11. Toxicological Information

REPRODUCTIVE:

Inhalation of 150 ppm carbon monoxide for 24 hours by pregnant rats produced cardiovascular and behavioral defects in offspring. Toxic effects to fertility were observed in female rats exposed to 1 mg/m³ for 24 hours. Similar effects observed in other mammalian species.

MUTAGENIC:

Genetic changes observed in mammalian cell assay systems at exposures of 1500 to 2500 ppm for 10 minutes.

OTHER:

Degenerative changes to the brain in rats chronically exposed to 30 mg/m³.

12. Ecological Information

No data given.

MSDS: G-112

Revised: 6/7/96

PRODUCT NAME: CARBON MONOXIDE

13. Disposal Considerations

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to BOC Gases or authorized distributor for proper disposal.

14. Transport Information

PARAMETER	United States DOT	Canada / IBC
PROPER SHIPPING NAME:	Carbon Monoxide	Carbon Monoxide
HAZARD CLASS:	2.3	2.3 (2.1)
IDENTIFICATION NUMBER:	UN 1016	UN 1016
SHIPPING LABEL:	POISON GAS, FLAMMABLE GAS	POISON GAS, FLAMMABLE GAS

Additional Marking Requirement: "Inhalation Hazard"

Additional Shipping Paper Description Requirement: "Poison-Inhalation Hazard, Zone D"

15. Regulatory Information

SARA TITLE III NOTIFICATIONS AND INFORMATION

SARA TITLE III - HAZARD CLASSES:

Acute Health Hazard

Chronic Health Hazard

Fire Hazard

Sudden Release of Pressure Hazard

16. Other Information

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).

BOC GASES

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: AIR, COMPRESSED

1. Product and Company Identification

BOC Gases,
Division of,
The BOC Group, Inc.
575 Mountain Avenue
Murray Hill, NJ 07974

BOC Gases
Division of
BOC Canada Limited
5975 Falbourn Street, Unit 2
Mississauga, Ontario L5R 3W6

TELEPHONE NUMBER: (908) 464-8100
24-HOUR EMERGENCY TELEPHONE NUMBER:
CHEMTREC (800) 424-9300

TELEPHONE NUMBER: (905) 501-1700
24-HOUR EMERGENCY TELEPHONE NUMBER:
(905) 501-0802
EMERGENCY RESPONSE PLAN NO: 2-0101

PRODUCT NAME: AIR, COMPRESSED; COMPRESSED OXYGEN AND NITROGEN MIXTURE
CHEMICAL NAME: Oxygen (19.5-23.5%) in Nitrogen
COMMON NAMES/SYNONYMS: Air, Compressed
TDG (Canada) CLASSIFICATION: 2.2
WHMIS CLASSIFICATION: A

PREPARED BY: Loss Control (908)464-8100/(905)501-1700.
PREPARATION DATE: 6/1/95
REVIEW DATES: 06/18/04

2. Composition, Information on Ingredients

EXPOSURE LIMITS¹:

INGREDIENT	% VOLUME	PEL-OSHA ²	TLV ³ ACGIH ³	LD ₅₀ or LC ₅₀ Route/Species
Oxygen FORMULA: O ₂ CAS: 7782-44-7 RTECS #: RS2080000	19.5-23.5	Not Available	Not Available	Not Available
Nitrogen FORMULA: N ₂ CAS: 7727-37-9 RTECS #: QW9700000	76.5-80.5	None Established	Simple Asphyxiant	Not Available

¹ Refer to individual state or provincial regulations, as applicable, for limits which may be more stringent than those listed here.

² As stated in 29 CFR 1910, Subpart Z (revised July 1, 1993)

³ As stated in the ACGIH 2004 Threshold Limit Values for Chemical Substances and Physical Agents.

OSHA Regulatory Status: This material is classified as hazardous under OSHA regulations.

3. Hazards Identification

EMERGENCY OVERVIEW

Colorless, odorless nonflammable compressed gas. This product contains sufficient oxygen to support combustion and respiration. Contents under pressure. Use and store below 125 °F.

PRODUCT NAME: AIR, COMPRESSED

ROUTE OF ENTRY:

Skin Contact No	Skin Absorption No	Eye Contact No	Inhalation No	Ingestion No
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HEALTH EFFECTS:

Exposure Limits No	Irritant No	Sensitization No
Teratogen No	Reproductive Hazard No	Mutagen No
Synergistic Effects None reported		

Carcinogenicity: -- NTP: No IARC: No OSHA: No

EYE EFFECTS: None known for gas. Contact with rapidly expanding gas near the point of release may cause frostbite.

SKIN EFFECTS: None known for gas. Contact with rapidly expanding gas near the point of release may cause frostbite with redness, skin color change to gray or white, and blistering.

INGESTION EFFECTS: None known. Ingestion is unlikely as product is gas at room temperature.

ACUTE INHALATION EFFECTS: None expected. This product contains sufficient oxygen to sustain life.

This product is not intended for use as breathing air.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known.

POTENTIAL ENVIRONMENTAL EFFECTS: Not toxic to fish and wildlife.

4. First Aid Measures

EYES:

None required for gas. If frostbite is suspected, flush eyes with cool water for 15 minutes and obtain immediate medical attention.

SKIN:

None required for gas. For frostbite, immerse skin in lukewarm water. **DO NOT USE HOT WATER.** Obtain medical attention.

INGESTION:

None required.

INHALATION:

None required.

PRODUCT NAME: AIR, COMPRESSED

5. Fire Fighting Measures

Conditions of Flammability: Nonflammable		
Flash point: None	Method: Not Applicable	Autoignition Temperature: None
LEL(%): None	UEL(%): None	
Hazardous combustion products: None		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: None		

FIRE AND EXPLOSION HAZARDS: Nonflammable, non-combustible. Cylinder may vent rapidly or rupture violently from pressure when involved in a fire situation.

EXTINGUISHING MEDIA: None required. Use as appropriate for surrounding materials.

FIRE FIGHTING INSTRUCTIONS: Firefighters should wear a NIOSH/MSHA approved full-facepiece self-contained breathing apparatus (SCBA) operated in positive pressure mode and full turnout or bunker gear.

6. Accidental Release Measures

No hazard expected. Contact the appropriate emergency telephone number listed in Section 1 or call your closest BOC location if safety problems arise.

7. Handling and Storage

Electrical classification:
Non-hazardous.

This gas mixture is non-corrosive and may be used with all common structural materials.

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve protection outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure-reducing regulator when connecting cylinder to lower pressure piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Do not insert any object (i.e.: screwdriver) into valve cap openings as this can damage the valve causing leakage.

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125 °F (52 °C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional recommendations, consult Compressed Gas Association Pamphlets P-1.

Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

PRODUCT NAME: AIR, COMPRESSED

8. Exposure Controls, Personal Protection

ENGINEERING CONTROLS:

General ventilation.

EYE/FACE PROTECTION:

Safety goggles or glasses

SKIN PROTECTION:

Protective gloves of material appropriate for the job.

RESPIRATORY PROTECTION:

None normally required. Use as appropriate for the job.

OTHER/GENERAL PROTECTION:

Safety shoes, eyewash station.

9. Physical and Chemical Properties

PARAMETER	VALUE	UNITS
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure	: Above critical temp.	
Vapor density at STP (Air = 1)	: 1.0	
Evaporation point	: Not Available	
Boiling point	: -317.8	°F
	: -194	°C
Freezing point	: Not Available	
pH	: Not Applicable	
Specific gravity	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H ₂ O)	: Slightly soluble	
Odor threshold	: Not Applicable	
Odor and appearance	: Colorless, odorless gas	

10. Stability and Reactivity

STABILITY:

Stable

INCOMPATIBLE MATERIALS/CONDITIONS:

None

HAZARDOUS DECOMPOSITION PRODUCTS:

None

HAZARDOUS POLYMERIZATION:

Does not occur

MSDS: G-113
Revised: 06/18/04

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PRODUCT NAME: AIR, COMPRESSED

11. Toxicological Information

Product is non-toxic.

12. Ecological Information

Product does not contain Class I or Class II ozone depleting substances. Not toxic. Will not bioconcentrate.

13. Disposal Considerations

Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED, WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to BOC Gases or authorized distributor for proper disposal.

14. Transport Information

PARAMETER	United States DOT	Canada TDG
PROPER SHIPPING NAME:	Air, Compressed	Air, Compressed
HAZARD CLASS:	2.2	2.2
IDENTIFICATION NUMBER:	UN 1002	UN 1002
SHIPPING LABEL:	NONFLAMMABLE GAS	NONFLAMMABLE GAS

15. Regulatory Information

SARA TITLE III NOTIFICATIONS AND INFORMATION

SARA TITLE III - SECTION 313 SUPPLIER NOTIFICATION:

This product does not contain toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and 40 CFR 372.

SARA TITLE III - HAZARD CLASSES:

Sudden Release of Pressure Hazard

U.S. TSCA/Canadian DSL: All ingredients are listed on the U.S. Toxic Substances Control Act (TSCA) inventory or exempt from listing and on the Canadian Domestic Substance List (DSL).

California Proposition 65: This product does not contain ingredient(s) known to the State of California to cause cancer or reproductive toxicity.

Canadian Controlled Products Regulations (CPR): This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

PRODUCT NAME: AIR, COMPRESSED

16. Other Information

NFPA HAZARD CODES	HMIS HAZARD CODES	RATINGS SYSTEM
Health: 0	Health: 0	0 = No Hazard
Flammability: 0	Flammability: 0	1 = Slight Hazard
Instability: 0	Physical Hazard: 3	2 = Moderate Hazard
		3 = Serious Hazard
		4 = Severe Hazard

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2004, *CGA Recommended Hazard Ratings for Compressed Gases, 2nd Edition*.

ACGIH	American Conference of Governmental Industrial Hygienists
DOT	Department of Transportation
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
SARA	Superfund Amendments and Reauthorization Act
STEL	Short Term Exposure Limit
TDC	Transportation of Dangerous Goods
TLV	Threshold Limit Value
WHMIS	Workplace Hazardous Materials Information System

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES:

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).