

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: CARBON MONOXIDE

SYNONYMS: Carbonic Oxide; Carbon Oxide.

CHEMICAL FAMILY NAME: Non-Metal Oxide Gas

FORMULA: CO

Document Number: 50000

Note: This Material Safety Data Sheet is for Carbon Monoxide supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). For Carbon Monoxide in large cylinders refer to Document Number 20022.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
SUPPLIER/MANUFACTURER'S NAME:	CALGAZ
ADDRESS:	821 Chesapeake Drive Cambridge, MD 21613
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	1-410-228-6400
	General MSDS Information 1-713/868-0440 Fax on Demand: 1-800/231-1366

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH IDLH ppm	OTHER ppm
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
Carbon Monoxide	630-08-0	> 99.0%	25	NE	50	200 (ceiling) 35 (Vacated 1989 PEL)	1200	NIOSH RELs: TWA = 35 STEL = 200 ceiling DFG MAKs: TWA = 30 PEAK = 2•MAK, 15 min., average value, 1 hr interval DFG MAK Pregnancy Risk Classification: B
Maximum Impurities		< 1.0%	None of the trace impurities in this product contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalents standards.					

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. 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.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Carbon Monoxide is a colorless, odorless, poisonous and flammable gas. This product is an extremely flammable, poison gas. Carbon Monoxide is a chemical asphyxiant and may be fatal if inhaled. Exposure to Carbon Monoxide can cause nausea, dizziness, headaches, and collapse. This product poses a serious fire hazard when it is accidentally released. Flame or high temperature impinging on a localized area of the cylinder of this product can cause the cylinder to explode without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situations.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation.

INHALATION: Due to the small size of an individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. Carbon monoxide is classified as a chemical asphyxiant, producing a toxic action by combining with the hemoglobin of the blood and replacing the available oxygen. Through this replacement, the body is deprived of the required oxygen, and asphyxiation occurs.

Since the affinity of carbon monoxide for hemoglobin is about 200-300 times that of oxygen, only a small amount of Carbon Monoxide will cause a toxic reaction to occur. Carbon Monoxide exposures in excess of 50 ppm will produce symptoms of poisoning if breathed for a sufficiently long time. If this product is released in a small, poorly ventilated area (i.e. an enclosed or confined space), symptoms such as described may occur. Other effects of exposure can be summarized as follows:

CARBON MONOXIDE

CONCENTRATION

OBSERVED EFFECT

All exposure levels:	Over-exposure to Carbon Monoxide can be indicated by the lips and fingernails turning bright red.
200 ppm:	Slight symptoms (headache, discomfort) after several hours of exposure.
400 ppm:	Headache and discomfort experienced within 2-3 hours of exposure.
1,000 -2000 ppm:	Within 30 minutes, slight palpitations of the heart occurs. Within 1.5 hours, there is a tendency to stagger.
200-2500 ppm:	Within 2 hours, there is mental confusion, headaches, and nausea. Unconsciousness within 30 minutes.
> 2500 ppm:	Potential for collapse and death before warning symptoms are produced.

NOTE: At high altitudes, individuals may be more susceptible to Carbon Monoxide over-exposures. Development of symptoms may also occur more rapidly if individuals are doing physically demanding tasks. Individuals who have heart conditions may experience a more rapid onset of symptoms. During recovery, victims can experience headaches, vision problems, and memory loss.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure to Carbon Monoxide may cause the following health effects:

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM		
HEALTH HAZARD	(BLUE)	2
FLAMMABILITY HAZARD	(RED)	4
PHYSICAL HAZARD	(YELLOW)	0
PROTECTIVE EQUIPMENT		
EYES	RESPIRATORY	HANDS
BODY		
See Section 8		
For Routine Industrial Use and Handling Applications		

3. HAZARD IDENTIFICATION (Continued)

ACUTE: Due to the small size of an individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. However, Carbon Monoxide is a toxic gas and symptoms of Carbon Monoxide poisoning can develop gradually, or can arise suddenly, depending on the concentration and duration of exposure. Lips and fingernails will turn bright red, which is a significant sign of Carbon Monoxide over-exposure. Other symptoms of over-exposure can include respiratory difficulty, headaches, shortness of breath, wheezing, headache, dizziness, indigestion, nausea, and, at high concentrations, unconsciousness or death may occur. Other symptoms of exposure can include blurred vision and memory loss.

CHRONIC: Clinical studies indicate that there is a relationship between exposure to Carbon Monoxide in specific occupations (i.e. fire-fighters, foundry workers) and an increased incidence of cardiovascular problems. Carbon Monoxide is a reproductive toxin. Refer to Section 11 (Toxicological Information) of this MSDS for further information.

TARGET ORGANS: ACUTE: Respiratory system, blood system, cardiovascular system. CHRONIC: Reproductive system, cardiovascular system.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF OVER-EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant Personal Protective equipment should be worn. Adequate fire protection must be provided during rescue situations. Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

No unusual health effects are anticipated after exposure to this product, due to the small cylinder size. If any adverse symptom develops after over-exposure to this product, remove victim(s) to fresh air, as quickly as possible. Only Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing respiratory conditions may be aggravated by over-exposure to this product. Carbon Monoxide can aggravate some diseases of the cardiovascular system, such as coronary artery disease and angina pectoris.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure. Provide oxygen. Hyperbaric oxygen is the most efficient antidote to Carbon Monoxide poisoning, the optimum range being 2-2.5 atm. A special mask, or, preferably, a compression chamber to utilize oxygen at these pressures is required. Avoid administering stimulant drugs.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable. Flammable gas.

AUTOIGNITION TEMPERATURE: 607°C (1125°F)

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 12.5%

Upper (UEL): 74.2%

FIRE EXTINGUISHING MATERIALS: Extinguish fires of this gas by shutting-off the source of the gas. Use water spray to cool fire-exposed structures and equipment.

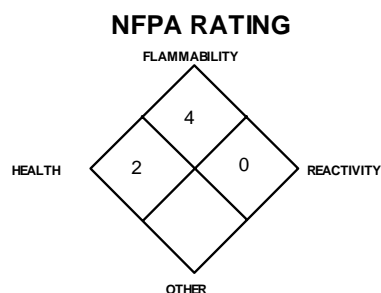
UNUSUAL FIRE AND EXPLOSION HAZARDS: An extreme explosion hazard exists in areas in which the gas has been released, but the material has not yet ignited. Carbon Monoxide decomposes to carbon and carbon dioxide between 400-700°C.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected cylinders of this product can be very dangerous. Exposure to fire could cause a catastrophic failure of the cylinder releasing the contents into a fireball and explosion of released gas. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the cylinder. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.

Explosion Sensitivity to Static Discharge: Static discharge may cause this gas to ignite explosively, upon accidental release. Due to low electrical conductivity, this substance can generate electrostatic charges during handling operations.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Because of the potential for a fire, evacuation of non-emergency personnel is essential. If water is not available for cooling or protection of cylinder exposures, evacuate the area. The North American Emergency Response Guidebook (Guide #115) recommends 0.5 miles



6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk of an Oxygen deficient environment and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate the immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

Eliminate any possible sources of ignition, and provide maximum explosion-proof ventilation. If the gas is leaking from cylinder, contact the supplier. Adequate fire protection must be provided. Use only non-sparking tools and equipment during the response.

In the event that a cylinder of this product leaks, and the oxygen levels in the surrounding area are below 19.5% or are unknown, the Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, gloves and Self-Contained Breathing Apparatus.** Use only non-sparking tools and equipment. For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors. Allow the gas, which is lighter than air to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for levels of Carbon Monoxide and for oxygen. Carbon Monoxide level must be below exposure level listed in Section 2 (Composition and Information on Ingredients) and Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area. If leaking incidentally from the cylinder or its valve, contact your supplier.

Monitor the surrounding area for oxygen and combustible gas levels. Colorimetric tubes can be used to detect the presence of Carbon Monoxide. Colorimetric tube reading should indicate that Carbon Monoxide is not present in the atmosphere above background levels before non-emergency personnel are permitted to re-enter the area. Combustible gas concentration must be below 10% of the LEL (12.5%) prior to entry. Attempt to close the leak prior to entering the area. If this does not stop the release, allow the gas to release in-place or remove it to a safe area and allow the gas to be released there.

THIS IS AN EXTREMELY FLAMMABLE, POISON GAS. Protection of all personnel and the area must be maintained.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this product could occur without any significant warning symptoms. Non-sparking tools should be used. Do not attempt to repair, adjust, or in any other way modify the cylinders containing Carbon Monoxide. If there is a malfunction, or another type of operational problem, contact nearest distributor immediately.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature approximately 21°C, 70°F. Cylinders should be stored in dry, well-ventilated areas away from sources of heat, ignition and direct sunlight. Keep storage area clear of materials which can burn. Protect cylinders against physical damage.

Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significantly safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

7. HANDLING and USE (Continued)

Cylinders should be separated from oxygen cylinders, or other oxidizers, by a minimum distance of 20 ft., or by a barrier of non-combustible material at least 5 ft. high, having a fire-resistance rating of at least 0.5 hours. Isolate from other incompatible chemicals (refer to Section 10, Stability and Reactivity).

Storage areas must meet national electrical codes for Class 1 Hazardous Areas. Post "No Smoking or Open Flames" signs in storage or use areas. Consider installation of leak detection and alarm for storage and use areas. Have appropriate extinguishing equipment in the storage area (i.e. sprinkler system, portable fire extinguishers).

Use non-sparking ventilation systems, approved explosion-proof equipment, and appropriate electrical systems. Electrical equipment used in gas-handling operations, or located in storage areas, should be non-sparking or explosion proof. Use a check valve in the discharge line to prevent hazardous backflow. Never tamper with pressure relief devices in cylinders.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (i.e. nitrogen) before attempting repairs. Always use product in areas where adequate ventilation is provided.

Note: Carbon Monoxide is mildly corrosive with nickel and iron.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this product in well-ventilated areas. If this product is used in a poorly-ventilated area, install automatic monitoring equipment to detect the level of oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Use supplied air respiratory protection if Oxygen levels are below 19.5%, or unknown, during emergency response to a release of this product. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Oxygen levels below 19.16.33% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). In the event that exposure limits may be exceeded for Carbon Monoxide, the following NIOSH respiratory protection equipment guidelines should be consulted.

CARBON MONOXIDE CONCENTRATION

Up to 350 ppm:
Up to 875 ppm:
Up to 1200 ppm:

RESPIRATORY PROTECTION

Any Supplied-Air Respirator (SAR).
Any SAR operated in a continuous-flow mode.
Any Air-Purifying, Full-Facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against Carbon Monoxide, or any Self-Contained Breathing Apparatus(SCBA) with a full facepiece, or any SAR with a full facepiece.

Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.

Escape: Any Air-Purifying, Full-Facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against Carbon Monoxide, or any appropriate escape-type, SCBA.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: No special protection is needed under normal circumstances of use. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: No special protection is needed under normal circumstances of use. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

GAS DENSITY @ 1 atm and 70°C (air = 1): 0.0725 lb/ft³

BOILING POINT (@ 101.325 kPa): -191.5°C (-312.7°F)

FREEZING/MELTING POINT (@ 10 psig): -205°C (-337°F)

SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.967

SOLUBILITY IN WATER vol/vol @ 32°F (0°C): 0.035

EVAPORATION RATE (nBuAc = 1): Not applicable.

ODOR THRESHOLD: Not applicable.

VAPOR PRESSURE @ 21.1°C [70°F] (psig): Gas, ambient.

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

APPEARANCE, ODOR AND COLOR: Colorless, odorless gas.

HOW TO DETECT THIS SUBSTANCE (warning properties): There are no distinct warning properties. In terms of leak detection, fittings and joints be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

pH: Not applicable.

MOLECULAR WEIGHT: 28.01

EXPANSION RATIO: Not applicable.

SPECIFIC VOLUME (ft³/lb): 13.8

10. STABILITY and REACTIVITY

STABILITY: Stable under conditions of normal temperature and pressure.

DECOMPOSITION PRODUCTS: Carbon Monoxide burns to form carbon and carbon dioxide between 400-700 °C.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizers (i.e. chlorine, bromine, pentafluoride, oxygen, oxygen difluoride, and nitrogen trifluoride). Carbon Monoxide is mildly corrosive with nickel and iron (especially at high temperatures and pressures). Natural rubber and neoprene are attacked by Carbon Monoxide. Carbon Monoxide is also incompatible with the following substances: metal oxides, nickel, iron, chromium, alkali and alkaline earth metals, aluminum powder, iodine heptafluoride, sulfur, bromine, bromine trifluoride, bromine pentafluoride, chlorine dioxide, peroxodisulfuryl difluoride.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks and other sources of ignition. If the cylinders are exposed to extremely high temperatures, these cylinders can rupture and rupture.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicity data are available for Carbon Monoxide:

LC₅₀ (Inhalation-Rat) 1807 ppm/4 hours

LC₅₀ (Inhalation-Mouse) 2444 ppm/4 hours

LC₅₀ (Inhalation-Guinea Pig) 5718 ppm/4 hours

LC₅₀ (Inhalation-wild bird species) 1334 ppm

LCLo (Inhalation-Human) 4 mg/m³/12 hours:

Behavioral: coma; Vascular: BP lowering not characterized in autonomic section; Blood: methemoglobinemia-carboxyhemoglobin

LCLo (Inhalation-Man) 4000 ppm/30 minutes

LCLo (Inhalation-Human) 5000 ppm/5 minutes

LCLo (Inhalation-Dog) 4000 ppm/46 minutes

LCLo (Inhalation-Rabbit) 4000 ppm

LCLo (Inhalation-Mammal-species unspecified) 5000 ppm/5 minutes

TCLo (Inhalation-Human) 600 mg/m³/10 minutes: Behavioral: headache

TCLo (Inhalation-Man) 650 ppm/45 minutes: Blood:

methemoglobinemia-carboxyhemoglobin; Behavioral: changes in psychophysiological tests

TCLo (Inhalation-Rat) 1800 ppm/1 hour/14

days-intermittent: Cardiac: other changes

TCLo (Inhalation-Rat) 30 mg/m³/8 hours/10

weeks-intermittent: Brain and Coverings: other degenerative changes; Behavioral: muscle contraction or spasticity

TCLo (Inhalation-Rat) 96 ppm/24 hours/90

days-continuous: Blood: pigmented or

nucleated red blood cells, other changes

TCLo (Inhalation-Rat) 250 ppm/5 hours/20

days-intermittent: Blood: pigmented or nucleated red blood cells, changes in other cell count (unspecified), changes in erythrocyte (RBC) count

TDLo (Subcutaneous-Rat) 5983 mg/kg/18

weeks-intermittent: Blood: changes in serum composition (e.g. TP, bilirubin, cholesterol)

TCLo (Inhalation-Mouse) 50 ppm/30 days-intermittent: Lungs, Thorax, or Respiration: structural or functional change in trachea or

bronchi

TCLo (Inhalation-Monkey) 200 ppm/24

hours/90 days-continuous: Blood: pigmented

or nucleated red blood cells, other changes

TCLo (Inhalation-Rabbit) 200 mg/m³/3 hours/13

weeks-intermittent: Brain and Coverings:

other degenerative changes; Cardiac: other

changes; Blood: hemorrhage

TCLo (Inhalation-Rabbit) 50 ppm/24 hours/8

weeks-continuous: Blood: changes in platelet count

TCLo (Inhalation-Guinea Pig) 200 mg/m³/5

hours/4 weeks-intermittent: Endocrine:

hyperglycemia
TCLo (Inhalation-Guinea Pig) 200 mg/m³/5

hours/30 weeks-continuous: Cardiac: arrhythmias (including changes in conduction), EKG changes not diagnostic of specified effects, pulse rate increase, without fall in BP

11. TOXICOLOGICAL INFORMATION (Continued)

<p>TCLo (Inhalation-Guinea Pig) 200 ppm/24 hours/90 days-continuous: Blood: pigmented or nucleated red blood cells, other changes</p> <p>TCLo (Inhalation-Rat) 75 ppm/24 hours: female 0-20 day(s) after conception: Reproductive: Maternal Effects: other effects; Effects on Newborn: behavioral</p> <p>TCLo (Inhalation-Rat) 150 ppm/24 hours: female 1-22 day(s) after conception: Reproductive: Specific Developmental Abnormalities: cardiovascular (circulatory) system</p> <p>TCLo (Inhalation-Rat) 150 ppm/24 hours: female 1-22 day(s) after conception: Reproductive: Effects on Newborn: growth statistics (e.g.%, reduced weight gain), behavioral</p> <p>TCLo (Inhalation-Rat) 1 mg/m³/24 hours: female 72 day(s) pre-mating: Reproductive: Maternal Effects: menstrual cycle changes or disorders, parturition; Fertility: female fertility index (e.g. # females pregnant per # sperm</p>	<p>positive females; # females pregnant per # females mated)</p> <p>TCLo (Inhalation-Rat) 150 ppm/24 hours: female 0-20 day(s) after conception: Reproductive: Effects on Newborn: behavioral</p> <p>TCLo (Inhalation-Rat) 75 ppm/24 hours: female 0-20 day(s) after conception: Reproductive: Specific Developmental Abnormalities: immune and reticuloendothelial system</p> <p>TCLo (Inhalation-Mouse) 65 ppm/24 hours: female 7-18 day(s) after conception: Reproductive: Effects on Newborn: behavioral</p> <p>TCLo (Inhalation-Mouse) 250 ppm/7 hours: female 6-15 day(s) after conception: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants); Specific Developmental Abnormalities: musculoskeletal system</p> <p>TCLo (Inhalation-Mouse) 125 ppm/24 hours:</p>	<p>female 7-18 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus</p> <p>TCLo (Inhalation-Mouse) 8 pph/1 hour: female 8 day(s) after conception: Reproductive: Fertility: litter size (e.g. # fetuses per litter; measured before birth); Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus), fetal death</p> <p>TCLo (Inhalation-Mouse) 8 pph/1 hour: female 8 day(s) after conception: Reproductive: Specific Developmental Abnormalities: Central Nervous System</p> <p>TCLo (Inhalation-Rabbit) 180 ppm/24 hours: female 1-30 day(s) after conception: Reproductive: Effects on Newborn: stillbirth, viability index (e.g., # alive at day 4 per # born alive)</p> <p>Micronucleus Test (Inhalation-Mouse) 1500 ppm/10 minutes</p> <p>Sister Chromatid Exchange (Inhalation-Mouse) 2500 ppm/10 minutes</p>
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SUSPECTED CANCER AGENT: Carbon Monoxide is not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: Contact with rapidly expanding gases can be irritating to exposed skin and eyes.

SENSITIZATION TO THE PRODUCT: Carbon Monoxide is not a skin or respiratory sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product on the human reproductive system.

Mutagenicity: This product is not expected to cause mutagenic effects in humans. In one available animal study, Carbon Monoxide increased chromosomal damage in the blood of mice.

Embryotoxicity: This product has not been reported to cause embryotoxic effects; see following paragraph for further information.

Teratogenicity: This product can cause teratogenic effects in humans. Severe exposure to Carbon Monoxide during pregnancy have caused adverse effects and the death of the fetus. In general, maternal symptoms are an indicator of the potential risk to the fetus since Carbon Monoxide is toxic to the mother before it is toxic to the fetus.

Reproductive Toxicity: This product is not expected to cause adverse reproductive effects in humans.

REPRODUCTIVE TOXICITY INFORMATION (continued): A *mutagen* is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An *embryotoxin* is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A *teratogen* is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A *reproductive toxin* is any substance which interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES (BEIs): Biological Exposure Indices (BEIs) have been determined for Carbon Monoxide, as follows:

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
CARBON MONOXIDE • Carboxyhemoglobin in blood • Carbon monoxide in end-exhaled air	• End of shift • End of shift	• 3.5% of hemoglobin • 20 ppm

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: Carbon Monoxide will be dissipated rapidly in well-ventilated areas.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Carbon Monoxide can be deadly to exposed animal life, producing symptoms similar to those experienced by humans. This gas may also be harmful to plant life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Carbon monoxide, compressed
HAZARD CLASS NUMBER and DESCRIPTION: 2.3 (Poison Gas), 2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1016
PACKING GROUP: Not applicable.
DOT LABEL(S) REQUIRED: Class 2.3 (Poison Gas), Class 2.1 (Flammable Gas)

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 119

MARINE POLLUTANT: Carbon Monoxide is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

SPECIAL PROVISION: Carbon Monoxide is poisonous by inhalation. Shipments must be properly described as inhalation hazards. ZONE D.

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is considered as Dangerous Goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Carbon monoxide, compressed
HAZARD CLASS NUMBER and DESCRIPTION: 2.3 (Poison Gas), 2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1016
PACKING GROUP: Not Applicable
HAZARD LABEL: Class 2.3 (Poison Gas), Class 2.1 (Flammable Gas)
SPECIAL PROVISIONS: None
EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0
ERAP INDEX: 500
PASSENGER CARRYING SHIP INDEX: Forbidden

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS (continued):

PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: Forbidden

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 119

NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992)

15. REGULATORY INFORMATION

ADDITIONAL UNITED STATES REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: This gas is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows:

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this gas. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

U.S. TSCA INVENTORY STATUS: Carbon Monoxide is listed on the TSCA Inventory. **OTHER U.S. FEDERAL REGULATIONS:**

- Carbon Monoxide is subject to the requirements of CFR 29 1910.1000. Carbon Monoxide is listed on Table Z.1.
- Carbon Monoxide does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82).
- Depending on specific operations involving the use of Carbon Monoxide, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Carbon Monoxide is not listed in Appendix A of this regulation, however, any process that involves a flammable gas on-site, in one location, in quantities of 10,000 lbs (4,553 kg) or greater is covered under this regulation unless it is used as a fuel.
- Carbon Monoxide is listed under Table 3 as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Releases as a flammable substance.

U.S. STATE REGULATORY INFORMATION: Carbon Monoxide is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Carbon Monoxide.

California - Permissible Exposure Limits for Chemical Contaminants: Carbon Monoxide.

Florida - Substance List: Carbon Monoxide.

Illinois - Toxic Substance List: Carbon Monoxide.

Kansas - Section 302/313 List: None.

Michigan - Critical Materials Register: No.

Massachusetts - Substance List: Carbon Monoxide.

Minnesota - List of Hazardous Substances: Carbon Monoxide.

Missouri - Employer Information/Toxic Substance List: Carbon Monoxide.

New Jersey - Right to Know Hazardous Substance List: Carbon Monoxide.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.

Pennsylvania - Hazardous Substance List: Carbon Monoxide.

Rhode Island - Hazardous Substance List: Carbon Monoxide.

Texas - Hazardous Substance List: No.

West Virginia - Hazardous Substance List: None.

Wisconsin - Toxic and Hazardous Substances: No

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Carbon Monoxide is on the California Proposition 65 lists. **WARNING:** Carbon Monoxide is a chemical known to the State of California to cause birth defects or other reproductive harm.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY STATUS: Carbon Monoxide is on the DSL Inventory.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: Carbon Monoxide is not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS REGULATIONS: Carbon Monoxide is categorized as a Controlled Product, Hazard Classes A, B1, D1A, and D2A as per the Controlled Product Regulations

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to 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 make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable Gas, n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. CALGAZ will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

Further information can be Carbon Monoxide found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1	"Safe Handling of Compressed Gases in Containers"
SB-2	"Oxygen Deficient Atmospheres"
AV-1	"Safe Handling and Storage of Compressed Gases" "Handbook of Compressed Gases"

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This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard, 29 CFR, 1910.1200. Other government regulations must be reviewed for applicability to this product. To the best of CALGAZ knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this product is combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.