



MATERIAL SAFETY DATA SHEET

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

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: 25 ppm - 10% CARBON MONOXIDE IN NITROGEN
CHEMICAL NAME: Mixture of Carbon Monoxide (25 ppm - 10%) and Nitrogen (Balance)
FORMULA: Carbon Monoxide = CO; Nitrogen = N₂
SYNONYMS: Not Applicable
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PRODUCT USE: Environmental Calibration and Auditing Gas

ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 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. The product is also classified per all applicable EU Directives through EC 1907: 2006

SECTION 2. HAZARD IDENTIFICATION

EU LABELING AND CLASSIFICATION: This gas mixture meets the definition hazardous as defined by current guidelines under EC 1907: 2006.

EU CLASSIFICATION: Xn [Harmful]

EU RISK PHRASES: R: 20; R: 61

EU SAFETY PHRASES: S: 45; S: 53

See Section 15 for full definition of Risk and Safety Phrases.

EMERGENCY OVERVIEW: EMERGENCY OVERVIEW: Product Description: This is a colorless, odorless, non-flammable gas mixture. **Health Hazards:** This gas mixture can produce significant, adverse health effects at relatively low concentrations, due to the presence of Carbon Monoxide. Overexposure to Carbon Monoxide, a chemical asphyxiant, can cause nausea, dizziness, headaches, and collapse. Additionally, this gas mixture can act as a simple asphyxiant by causing the displacement of oxygen to the extent that an oxygen deficient atmosphere may result. **Flammability Hazards:** This gas mixture is not flammable. **Environmental Hazards:** Release of this mixture may cause harm to the environment. **Reactivity Hazards:** This gas mixture is not reactive. **Emergency Response Considerations:** Emergency Responders must protect themselves from inhalation exposures.

SECTION 3. COMPOSITION and INFORMATION ON INGREDIENTS

(10,000 ppm = 1%)

CHEMICAL NAME	CAS #	EINECS#	Mole%	Risk Phrases Safety Phrases	European Hazard Classification
Carbon Monoxide	630-08-0	211-128-3	25 ppm to 10%	HAZARD CLASSIFICATION: F+ (Extremely Flammable); T (Toxic) RISK PHRASES: R: 12; R: 12; R: 23; R: 48/23 SAFETY PHRASES: S: 45, S: 53	
Nitrogen	7727-37-9	231-783-9	Balance	HAZARD CLASSIFICATION: Not Applicable RISK PHRASES: Not Applicable SAFETY PHRASES: Not Applicable	

See Section 15 for full definition of Risk and Safety Phrases.

SECTION 4. FIRST AID MEASURES

EYE CONTACT: If irritation of the eye develops after exposure to this gas, open victim's eyes while under gentle, lukewarm, running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention from an ophthalmologist.

INGESTION: Ingestion is an unlikely route of exposure for this gas.

INHALATION: Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

SKIN CONTACT: If release of this gas has resulted in frostbite, warm affected area slowly. Seek immediate medical attention.

SECTION 4. FIRST AID MEASURES (Continued)

NOTES TO PHYSICIANS: Administer oxygen, if necessary and treat symptoms. Patients with 40% carboxyhemoglobin or more and an uncompensated metabolic acidosis (arterial pH less than 7.4) should be managed aggressively with ventilatory support or hyperbaric oxygenation. Infuse sodium bicarbonate and balanced electrolyte solutions if blood analyses indicate a significant metabolic acidosis. Ancillary therapy for brain edema may be necessary if hypoxia has been severe. Ensure absolute bed rest for at least 48 hours; in severe poisonings, 2-4 weeks in bed may prevent sequelae. Watch for late neurological, psychiatric and cardiac complications.

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT: Not Applicable

AUTOIGNITION: Not Applicable

FLAMMABLE RANGE: Not Applicable

NFPA RATINGS:

HEALTH: = 2 FLAMMABILITY: = 0

REACTIVITY: = 0 SPECIAL: None

EXTINGUISHING MEDIA: This is a non-flammable gas mixture; use fire-extinguishing media appropriate for the surrounding materials.

EXTINGUISHING MEDIA NOT TO BE USED: None.

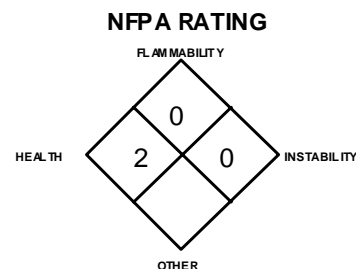
SPECIAL FIRE-FIGHTING PROCEDURES: Evacuate all personnel from area. If possible without risk, shut off source of gas, then fight fire according to types of materials burning. If cylinder is not actively a part of the fire, remove from fire area. If this is not possible, cool cylinder with a water spray to prevent violent rupture. Fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If necessary, decontaminate fire-response equipment with soap and water solution.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This gas mixture presents a significant inhalation hazard to firefighters, due to the presence of Carbon Monoxide. This gas mixture does not burn; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

EXPLOSION SENSITIVITY TO MECHANICAL IMPACT: Not sensitive.

EXPLOSION SENSITIVITY TO STATIC DISCHARGE: Not sensitive.

HAZARDOUS COMBUSTION PRODUCTS: If involved in a fire, the Carbon Monoxide in this mixture will decompose to form oxides of carbon and carbon dioxide between 400-700°C (752-1292°F).

**SECTION 6. ACCIDENTAL RELEASE MEASURES****STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:**

- Close the gas source if possible to do so safely.
- Evacuate area.
- Prior to re-entry, area should be monitored to ensure level of Carbon Monoxide is below applicable exposure levels listed in Section 8 (Exposure Controls / Personal Protection) and oxygen level is adequate.
- Contact your supplier if leak was from the cylinder, cylinder valve or the valve pressure relief device (PRD).

Notes for trained emergency responders:

- Self-Contained Breathing Apparatus (SCBA) and chemically resistant suit should be used when entering contaminated area.
- Monitor area for carbon monoxide and oxygen levels.
- When responding to a release of pressurized gas, be aware of the severe hazard of mechanical injury in the event of valve failure or other event causing a rapid release of cylinder contents.
- Attempt to close the main source valve prior to entering the area.
- Locate and seal the source of the leaking gas.
- If it is not possible to stop release, allow remaining gas to release in-place or remove gas cylinder to a safe area and allow the gas to be released there.
- If leak is in user's gas handling equipment or system, close cylinder valve, and safely vent high pressure. Purge gas handling equipment with inert gas and relieve pressure before attempting repairs.

SECTION 7. HANDLING AND STORAGE**STORAGE:**

- Cylinders should be stored upright (with valve protection caps or plugs in place) and firmly secured to prevent falling or being knocked over. Cylinders should be stored in dry, well-ventilated areas. Do not allow storage temperature to exceed 125°F (52°C). Protect from salt or other corrosive materials. Storage should be away from heavily traveled areas, walkways, elevators, platform edges or other objects or situations that could damage the cylinder wall. Do not store in a manner that will block emergency exits, fire extinguishers or other safety equipment.
- Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. Store empty cylinders away from full cylinders.
- Cylinders must not be recharged except by or with the consent of owner.
- Consider installation of leak detection and alarm systems for storage areas.
- Isolate from incompatible chemicals (refer to Section 10, Stability and Reactivity).
- Use only DOT or ASME code cylinders designed for compressed gas storage.

SECTION 7. HANDLING AND STORAGE (cont'd)

HANDLING:

- This gas mixture can be dangerous and should only be handled by trained personnel. Spectra Gases, Inc., strongly recommends the following: handle only in areas with extensive venting capabilities, preferably a gas handling cabinet; before use do meticulous leak checking using inert gas -- particularly after new connections are made; install carbon monoxide and/or detectors for oxygen deficiency in use areas.
- Do not drag, roll, slide or drop cylinder. Use a suitable hand truck designed for cylinder movement. Never attempt to lift a cylinder by its cap.
- Secure cylinders at all times while in use.
- Inspect cylinder valves regularly for physical damage or corrosion (apparent by discoloration or rust). Valve inspection should include neck (where valve inserts into cylinder) and bonnet nut (where handle attaches to valve body).
- Use an adjustable strap-wrench to remove over-tight or rusted caps.
- Use a pressure regulator to safely discharge product from cylinder.
- Use a check valve to prevent reverse flow into cylinder.
- Once cylinder has been connected to properly purged process, open cylinder valve slowly and carefully. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier.
- Close valve after each use and when empty.
- Never tamper with pressure relief devices in valves and cylinders. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings; doing so may damage valve, causing leak to occur.
- Do not heat cylinders to increase the discharge rate of product from the cylinder. Never apply flame or localized heat directly to any part of the cylinder. Cylinders should not be artificially cooled as certain types of steel undergo property changes when cryogenically cooled, thus making the cylinder unstable.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures).

SPECIAL PRECAUTIONS: Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms. All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Inc. (telephone 703-412-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage and use.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Forced ventilation systems for the general work area should be provided. Spectra Gases, Inc. recommends that cylinders in use be secured within a ventilated enclosure such as a gas cabinet. Employee exposure should be monitored and reduced to the lowest practical levels using ventilation or other appropriate engineering controls. If appropriate, install automatic monitoring equipment to detect the level of Carbon Monoxide.

EXPOSURE LIMITS: (10,000 ppm = 1%)

OSHA PELs:	ACGIH TLVs:	NIOSH RELs:	DFG MAKs:
Carbon Monoxide:			
TWA = 50 ppm	TWA = 25 ppm	TWA = 35 ppm	TWA = 30 ppm
TWA = 35 ppm (vacated 1989 PEL)		Ceiling = 200 ppm	PEAK = 1•MAK, 15 average value
Ceiling = 200 ppm (vacated 1989 PEL)		IDLH = 1200 ppm	1-hr interval, 4 per shift

Nitrogen:

There are no exposure limits for Nitrogen, Nitrogen is a simple asphyxiant.

INTERNATIONAL OCCUPATIONAL EXPOSURE LIMITS: In addition to the exposure limit values cited in this section, other exposure limits have been established by various countries for Carbon Monoxide. The exposure limits given may not be the most current; individual country authorities should be contacted to check on more current limits.

CARBON MONOXIDE:

ARAB Republic of Egypt: TWA = 50 ppm (55 mg/m³), JAN 1993
 Australia: TWA = 50 ppm (55 mg/m³), STEL = 400 ppm (440 mg/m³), JAN 1993
 Belgium: TWA = 50 ppm (57 mg/m³), STEL = 400 ppm (458 mg/m³), JAN 1993
 Denmark: TWA = 25 ppm (29 mg/m³), OCT 2002
 Finland: TWA = 30 ppm (34 mg/m³), STEL = 75 ppm (86 mg/m³), JAN 1999
 France: VME = 50 ppm (55 mg/m³), JAN 1999
 Germany: MAK = 35 mg/m³ (30 mL/m³), 2005
 India: TWA = 50 ppm (55 mg/m³), STEL = 400 ppm (440 mg/m³), JAN1993
 Japan: OEL = 50 ppm (57 mg/m³), MAY 2006

CARBON MONOXIDE (continued):

Korea: TWA = 50 ppm (55 mg/m³), STEL 400 ppm (440 mg/m³), 2006
 Mexico: TWA = 50 ppm (55 mg/m³); STEL = 400 ppm (400 mg/m³), 2004
 The Netherlands: MAC-TGG = 29 mg/m³, 2003
 New Zealand: STEL = 200 ppm (15 min), JAN 2002
 New Zealand: STEL = 100 ppm (30 min), JAN2002
 New Zealand: STEL = 50 ppm (60 min), JAN2002
 Norway: TWA = 35 ppm (40 mg/m³), JAN1999
 The Philippines: TWA = 50 ppm (55 mg/m³), JAN 1993
 Poland: MAC(TWA) = 30 mg/m³, MAC(STEL) = 180 mg/m³, JAN 1999

CARBON MONOXIDE (continued):

Russia: STEL = 200 mg/m³ (15 minutes), JUN2003
 Russia: STEL = 100 mg/m³ (30 minutes), JUN2003
 Russia: STEL = 50 mg/m³ (1 hour), JUN 2003
 Russia: STEL = 20 mg/m³, JUN2003
 Sweden: NGV = 35 ppm (40 mg/m³), KTVSTEL = 100 ppm (120 mg/m³), JAN 1999
 Switzerland: MAK-W = 30 ppm (35 mg/m³), KZG-W = 30 ppm (35 mg/m³), DEC 2006
 Thailand: TWA = 50 ppm (55 mg/m³), JAN1993
 Turkey: TWA = 50 ppm (55 mg/m³), JAN1993
 United Kingdom: TWA = 30 ppm (35 mg/m³); STEL = 200 ppm, 2005
 In Argentina, Bulgaria, Colombia, Jordan, Singapore, Vietnam check ACGIH TLV

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with regulations found in U.S. OSHA 29 CFR Subpart I (beginning at 1910.132), equivalent standards of Canada (including CSA Standard Z94.4-02 and CSA Standard Z94.3-07 and, standards of EU member states (including EN 529:2005 for respiratory PPE, CEN/TR 15419:2006 for hand protection, and CR 13464:1999 for face/eye protection. Please reference applicable regulations and standards for relevant details.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION (Continued)

RESPIRATORY PROTECTION: Maintain exposure levels of Carbon Monoxide below the levels listed in this section and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if Carbon Monoxide levels exceed exposure limits, if oxygen level is below 19.5%, or during emergency response to a release of this product. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-02, the European Standard EN 529:2005, and EU member state standards. The following NIOSH respiratory protection recommendations are for Carbon Monoxide.

<u>CONCENTRATION</u> <u>of CARBON MONOXIDE</u>	<u>RESPIRATORY EQUIPMENT</u>
Up to 350 ppm	Supplied Air Respirator (SAR).
Up to 875 ppm	SAR operated in a continuous flow mode.
Up to 1200 ppm	Gas mask with canister to protect against carbon monoxide or full-facepiece Self-Contained Breathing Apparatus (SCBA) or full-facepiece SAR.
Emergency or Planned Entry into Unknown Concentration or IDLH Conditions:	Positive pressure, full-facepiece SCBA or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.
Escape:	Gas mask with canister to protect against carbon monoxide or escape-type SCBA.

NOTE: End of Service Life Indicator (ESLI) required for gas masks. The IDLH concentration for Carbon Monoxide is 1200 ppm. **EYE PROTECTION:** Use approved safety goggles or safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian CSA Standard Z94.3-07 or the European Standard CR 13464:1999. Eye wash stations/safety showers should be available.

SKIN PROTECTION: Work (such as leather) gloves are recommended when handling cylinders of this gas. Use appropriate gloves for spill response. If necessary, refer to U.S. OSHA 29 CFR 1910.138, appropriate Standards of Canada or the European Standard CEN/TR 15419:2006.

OTHER PROTECTIVE EQUIPMENT: Use body protection appropriate for task. Safety shoes are recommended when handling cylinders. If necessary, refer to the OSHA Technical Manual (Section VII: Personal Protective Equipment) appropriate Standards of Canada or the European Standard CEN/TR 15419:2006. 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 and the Canadian CSA Standard Z195-M1984, *Protective Footwear*.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

The following information is for Nitrogen, the component of greatest percentage:

MOLECULAR WEIGHT: 28.01
GAS DENSITY @ 21.1°C (70°F): 0.072 lb./ft³ (1.153 kg/m³)
BOILING POINT @ 1 atm: -195.8°C (-320.4°F)
FREEZING/MELTING POINT @ 1 atm: -210°C (-345.8°F)
SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F): 0.906
SOLUBILITY IN WATER vol/vol at 0°C (32°F) and 1 atm: 0.023
SPECIFIC VOLUME @ 21.1°C (70°F): 13.8 ft³/lb (0.867 m³/kg)
CRITICAL PRESSURE: 492.9 psia (3399 kPa abs)
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

The following information is for the Carbon Monoxide component of this gas mixture.

ODOR THRESHOLD: Not applicable.
GAS DENSITY @ 21.1°C (70°F): 0.0725 lb./ft³ (1.161 kg/m³)
VAPOR PRESSURE @ 20°C (68°F): > 760 mm Hg

Information for gas mixture:

APPEARANCE, ODOR AND STATE: Colorless, odorless gas.
WARNING PROPERTIES FOR THIS GAS MIXTURE: There are no distinct warning properties in event of accidental release. Monitoring for levels of Carbon Monoxide and oxygen deficiency are recommended. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

SECTION 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable.

CONDITIONS TO AVOID: Cylinders should not be exposed to temperatures in excess of 125°F (52°C).

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

REACTIVITY:

A) HAZARDOUS DECOMPOSITION PRODUCTS: None, other than combustion products (see Section 5, Fire-Fighting Measures).

B) HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

ROUTES OF ENTRY, SYMPTOMS OF ACUTE EXPOSURE: WARNING - If rescue personnel need to enter an area suspected of having a toxic level of Carbon Monoxide, they should be equipped with Self-Contained Breathing Apparatus (SCBA), and, if available, a full-body chemically resistant suit. Acute overexposure to this gas mixture may cause the following health effects:

EYE CONTACT: Release of a high-pressure gas may result in airborne objects.

INGESTION: Ingestion of this gas mixture is not a likely route of industrial exposure.

INHALATION: This gas mixture can produce significant, adverse health effects at relatively low concentrations, due to the presence of Carbon Monoxide. 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 can cause a toxic reaction to occur. Carbon Monoxide exposures in excess of 25 ppm can produce symptoms of poisoning if breathed for a sufficiently long time. If this gas mixture is inhaled, symptoms from Carbon Monoxide which may develop include those described below.

CONCENTRATION
of CARBON MONOXIDE

All exposure levels:

200 ppm:

400 ppm:

1,000 -2000 ppm:

2000-2500 ppm:

> 2500 ppm:

EXPOSURE SYMPTOM

Over-exposure to Carbon Monoxide can be indicated by the lips and fingernails turning bright red.

Slight symptoms (headache, discomfort) after several hours of exposure.

Headache and discomfort experienced within 2-3 hours of exposure.

Within 30 minutes, slight palpitations of the heart occur. Within 1.5 hours, there is a tendency to stagger. Within 2 hours, there is mental confusion, headache, and nausea.

Unconsciousness within 30 minutes.

Potential for collapse and death before warning symptoms are produced.

In addition, this gas mix can act as a simple asphyxiant by causing the displacement of oxygen to the extent that an oxygen deficient atmosphere may result -- particularly if gas mixture is released in poorly-ventilated areas (i.e. enclosed or confined spaces). (**Note:** Asphyxiation hazard is secondary to hazard associated with carbon monoxide. If gas level is high enough to create an oxygen deficient atmosphere, overexposure to Carbon Monoxide and resulting adverse effects will have already occurred.) Individuals breathing an oxygen-deficient atmosphere may experience symptoms that include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. The following effects associated with various levels of oxygen are as follows:

CONCENTRATION

of OXYGEN

20.9% Oxygen:

15-19% Oxygen:

12-15% Oxygen:

10-12% Oxygen:

Less than 10% Oxygen:

EXPOSURE SYMPTOM

Normal oxygen concentration in air.

Decreased ability to perform tasks. May impair coordination and may induce early symptoms in persons with heart, lung, or circulatory problems.

Breathing increases, especially in exertion. Pulse up. Impaired coordination, perception, and judgment.

Breathing further increases in rate and depth, poor coordination and judgment, lips slightly blue.

Mental failure, inability to perform various movements, loss of consciousness without warning, convulsions, death

SKIN CONTACT: Rapidly released gases can cause frostbite.

ROUTES OF ENTRY, SYMPTOMS OF CHRONIC EXPOSURE:

ROUTE OF ENTRY: Inhalation

TARGET ORGANS: Respiratory system, circulatory system, cardiovascular system, central nervous system, reproductive system.

SYMPTOMS: Clinical studies indicate that there is a relationship between exposure to Carbon Monoxide in specific occupations (e.g., fire-fighters, foundry workers) and an increased incidence of cardiovascular problems. Carbon Monoxide is a reproductive toxin.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Acute or chronic respiratory conditions and cardiac conditions may be aggravated by over-exposure to this gas mixture.

CARCINOGENIC POTENTIAL OF COMPONENTS: Components of this gas mixture are not found on the U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, GERMAN MAK, ACGIH or IARC Carcinogenicity lists and therefore are neither considered to be nor suspected to be cancer-causing agents by these agencies.

TOXICITY DATA ON COMPONENTS:

CARBON MONOXIDE:

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

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

LCLo (Inhalation-Human) 5000 ppm/5 minutes

LCLo (Inhalation-Human) 3520 mg/m³/5 minutes:

Behavioral: headache

LCLo (Inhalation-Human) 3400 mg/m³/20 minutes:

Cardiac: pulse rate; Lungs, Thorax, or Respiration: respiratory depression

LCLo (Inhalation-Human) 5700 mg/m³/2

LCLo (Inhalation-Human) 14,080 mg/m³/1 minute:

Gastrointestinal: nausea or vomiting; Behavioral: general anesthetic

LCLo (Inhalation-Man) 4000 ppm/30 minutes

LC₅₀ (Inhalation-Rat) 1807 ppm/4 hours

LC₅₀ (Inhalation-Rat) 1900 mg/m³/4 hours

LC₅₀ (Inhalation-Rat) 13,500 mg/m³/15 minutes

LC₅₀ (Inhalation-Rat) 6600 ppm/30 minutes

LC₅₀ (Inhalation-Mouse) 2444 ppm/4 hours

LC₅₀ (Inhalation-Mouse) 2230 mg/m³/2 hours

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

LC (Inhalation-Rat) 5200 mg/m³/1 hour

NITROGEN: Nitrogen is a simply asphyxiant.

IRRITANCY OF PRODUCT: This gas mixture irritates the eyes and may irritate the skin. In addition, contact with rapidly expanding gases can cause frostbite to exposed tissue.

SENSITIZATION OF PRODUCT: The components of this gas mixture are not known to cause sensitization in humans.

SECTION 11. TOXICOLOGICAL INFORMATION (Continued)

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this gas mixture and its components on the human reproductive system.

Mutagenicity: The components of this gas mixture are not reported to cause mutagenic effects in humans.

Embryotoxicity: Severe acute exposures to Carbon Monoxide during pregnancy have caused adverse effects and 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 becomes toxic to the fetus. In animal studies involving chronic Carbon Monoxide exposure during pregnancy to relatively high doses, developmental effects have occurred in the absence of maternal toxicity.

Teratogenicity: Exposure to Carbon Monoxide during pregnancy may have teratogenic effects.

Reproductive Toxicity: The components of this gas mixture are not reported to cause adverse reproductive effects in humans.

A *mutagen* is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An *embryotoxin* is a chemical that 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 that causes damage to a developing fetus, but the damage does not propagate across generational lines. A *reproductive toxin* is any substance that interferes in any way with the reproductive process.

BIOLOGICAL EXPOSURE INDICES (BEIs): Biological Exposure Indices (BEIs) have been determined for the Carbon Monoxide component of this gas mixture, 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

SECTION 12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas mixture will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this gas mixture.

CARBON MONOXIDE: Water solubility = 3.3 ml/100 cc at 0 EC, 2.3 ml at 20 EC. The presence of more than a trace of carbon monoxide is a hazard to fish.

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C and 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on plants would be related to oxygen-deficient environments or frost from rapidly expanding gases, unless exposure occurs in a confined space. This gas mixture may have adverse effects on animal life exposed to very high concentrations.

EFFECT OF CHEMICAL ON AQUATIC LIFE: This gas mixture may have adverse effects on aquatic life. Currently, the following aquatic toxicity data are available for Carbon Monoxide, a component of this gas mixture:

Lethal (minnows and sunfish/) 1-6 hours = 1.5 ppm (fresh water)

MOBILITY: The components of this gas mixture will not be mobile in the soil.

PERSISTENCE AND BIODEGRADABILITY: Persistence: Nitrogen and Carbon Monoxide present no hazard of persistence. Biodegradation: No data are available on the biodegradation of Carbon Monoxide.

POTENTIAL TO BIOACCUMULATE: The components of this gas mixture do not have bioaccumulation or food chain contamination potential.

OZONE-DEPLETION POTENTIAL: The components of this gas mixture are not Class I or Class II ozone depleting chemicals (40 CFR Part 82).

SECTION 13. DISPOSAL CONSIDERATIONS

UNUSED PRODUCT / EMPTY CONTAINER: Do not dispose of residual product. Return residual product in cylinders to: Spectra Gases, Inc., 80 Industrial Drive, Alpha, NJ 08865 or Spectra Gases, Inc., 1261 Activity Drive, Vista, CA 92083.

DISPOSAL INFORMATION: Residual product in the system may be burned if suitable burning unit (flair incinerator) is available on-site. This shall be done in accordance with U.S. Federal, State and local regulations, regulations of the provinces of Canada or EU member states.

SECTION 14. TRANSPORT INFORMATION

U.S. SHIPPING INFORMATION:

U.S. DOT PROPER SHIPPING NAME: Compressed gases, n.o.s. (Nitrogen, Carbon Monoxide)

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1956

U.S. DOT SHIPPING LABEL(S) REQUIRED: Class 2.2 (Non-Flammable Gas)

PLACARD (When required): Not Applicable

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position in a well-ventilated truck (never transport in passenger compartment of a vehicle). Ensure cylinder valve is properly closed, valve outlet cap has been reinstalled, and valve protection cap is secured before shipping cylinder.

CAUTION: Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with the owner's written consent is a violation of Federal law (49 CFR 173.301).

NAERG (NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK) #: 126

SECTION 14. TRANSPORT INFORMATION (Continued)
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CANADIAN SHIPPING INFORMATION:

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is classified as Dangerous Goods, per regulations of Transport Canada. The use of the above U.S. DOT information from the U.S. 49 CFR regulations is allowed for shipments that originate in the U.S. For shipments via ground vehicle or rail that originate in Canada, the following information is applicable.

UN IDENTIFICATION NUMBER:	UN 1956
PROPER SHIPPING NAME:	Compressed gases, n.o.s. (Nitrogen, Carbon Monoxide)
HAZARD CLASS NUMBER and DESCRIPTION:	2.2 (Non-Flammable Gas)
PACKING GROUP:	Not Applicable
HAZARD SHIPPING LABEL(S) REQUIRED:	Class 2.2 (Non-Flammable Gas)
PLACARD (When required):	Class 2.2 (Non-Flammable Gas)
SPECIAL PROVISIONS:	None
EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX:	0.125
ERAP INDEX:	None
PASSENGER CARRYING SHIP INDEX:	None
PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX:	75

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA) - IATA DESIGNATION:

This gas mixture is classified as dangerous goods, per the International Air Transport Association.

UN IDENTIFICATION NUMBER:	UN 1956
PROPER SHIPPING NAME:	Compressed gases, n.o.s. (Nitrogen, Carbon Monoxide)
HAZARD CLASS NUMBER and DESCRIPTION:	2.2 (Non-Flammable Gas)
PACKING GROUP:	Not Applicable
HAZARD SHIPPING LABEL(S) REQUIRED:	Class 2.2 (Non-Flammable Gas)

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA) [continued]:

PASSENGER and CARGO AIRCRAFT PACKING INSTRUCTION:	200
PASSENGER and CARGO AIRCRAFT MAXIMUM NET QUANTITY PER PKG:	75 kg
PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY PACKING INSTRUCTION:	None
PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY MAXIMUM NET QUANTITY PER PKG:	None
CARGO AIRCRAFT ONLY PACKING INSTRUCTION:	200
CARGO AIRCRAFT ONLY MAXIMUM NET QUANTITY PER PKG:	150 kg
SPECIAL PROVISIONS:	None
ERG CODE:	2L

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO)

IMO DESIGNATION: This gas mixture is classified as dangerous goods, per the International Maritime Organization.

UN IDENTIFICATION NUMBER:	UN 1956
PROPER SHIPPING NAME:	Compressed gases, n.o.s. (Nitrogen, Carbon Monoxide)
HAZARD CLASS NUMBER and DESCRIPTION:	2.2 (Non-Flammable Gas)
HAZARD SHIPPING LABEL(S) REQUIRED:	2.2 (Non-Flammable Gas)
PACKING GROUP:	None
SPECIAL PROVISIONS:	274, 292
LIMITED QUANTITIES:	120 mL
PACKING INSTRUCTIONS:	P200
EmS:	F-C, S-A
STOWAGE CATEGORY:	Category A.

MARINE POLLUTANT: The components of this gas mixture are not designated by the IMO to be a Marine Pollutant.

EUROPEAN SHIPPING INFORMATION**EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS**

BY ROAD (ADR): This gas is classified by the Economic Commission for Europe to be dangerous goods. Additional information is as follows:

UN NO.:	1956
NAME and DESCRIPTON:	Compressed gases, n.o.s. (Nitrogen, Carbon Monoxide)
CLASS:	2
CLASSIFICATION CODE:	1A
PACKING GROUP:	Not Applicable
LABELS:	2.2
SPECIAL PROVISIONS:	274, 292, 567
LIMITED QUANTITIES:	LQ1
PACKING INSTRUCTIONS:	P200
MIXED PACKING PROVISIONS:	MP9
HAZARD IDENTIFICATION No.:	20

SECTION 15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:**EPA - ENVIRONMENTAL PROTECTION AGENCY:**

CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act of 1990
(40 CFR Parts 117 and 302)

Reportable Quantity (RQ): Not applicable.

SARA TITLE III: Superfund Amendment and Reauthorization Act

SECTIONS 302/304: Emergency Planning and Notification (40 CFR Part 355)

Extremely Hazardous Substances: Not applicable.

Threshold Planning Quantity (TPQ): Not applicable.

Reportable Quantity (RQ): Not applicable.

SECTIONS 311/312: Hazardous Chemical Reporting (40 CFR Part 370)

IMMEDIATE HEALTH: Yes

PRESSURE: Yes

DELAYED HEALTH: No

REACTIVITY: No

FIRE: No

SECTION 313: Toxic Chemical Release Reporting (40 CFR 372)

Releases of Carbon Monoxide and Nitrogen do not require reporting under Section 313.

CLEAN AIR ACT:

SECTION 112 (r): Risk Management Programs for Chemical Accidental Release

(40 CFR Part 68)

Carbon Monoxide is listed under Table 1 as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Release Prevention, as a flammable substance.

Threshold Planning Quantity (TPQ): Carbon Monoxide = 10,000 lb (4,553 kg).

TSCA: Toxic Substances Control Act

The components of this gas mixture are listed on the TSCA Inventory.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR Part 1910.119: Process Safety Management of Highly Hazardous Chemicals.

Threshold Planning Quantity (TPQ): Not applicable

CALIFORNIA PROPOSITION 65: The Carbon Monoxide component of this gas mixture is on the California Proposition 65 lists. **WARNING:** This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

CANADIAN FEDERAL REGULATIONS:

CANADIAN DSL INVENTORY STATUS: The components of this gas mixture are listed on the Canadian DSL Inventory.

OTHER CANADIAN REGULATIONS: The components of this product are not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS CLASSIFICATION AND SYMBOLS: This gas is categorized as a Controlled Product, Hazard Classes A, and D2B as per the Controlled Product Regulations.

**EUROPEAN ECONOMIC COMMUNITY REGULATIONS:**

EU LABELING AND CLASSIFICATION: This gas mixture does not meet the definition hazardous as defined by current guidelines under EC 1907: 2006.

EU CLASSIFICATION: Xn [Harmful]

EU RISK PHRASES: [R: 20]: Harmful by inhalation. [R: 61]: May cause harm to unborn child.

EU SAFETY PHRASES: [S: 45]: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible). [S: 53]: Avoid exposure – obtain special instructions before use.

EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOL: Xn



SECTION 15. REGULATORY INFORMATION (Continued)

EUROPEAN COMMUNITY INFORMATION FOR COMPONENTS:

CARBON MONOXIDE:

EU CLASSIFICATION: An official classification for this substance has been published in Commission Directives as follows.

EU CLASSIFICATION: F+ [Extremely Flammable]; T [Toxic]; Toxic for Reproduction, Category 1

EU RISK PHRASES: [R: 12]: Extremely Flammable. [R: 23]: Toxic by inhalation. [R: 48/23]: Toxic: danger of serious damage to health by prolonged exposure through inhalation. [R: 61]: May cause harm to unborn child.

EU SAFETY PHRASES: [S: 45]: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible). [S: 53]: Avoid exposure – obtain special instructions before use.

EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOL: F+, T

NITROGEN:

EU CLASSIFICATION: An official classification for this substance has not been published in Commission Directives 93/72/EEC, 94/69 EC, or and 96/54/EC.

GLOBAL HARMONIZATION SYSTEM WARNINGS:

HAZARD CATEGORIES:

Compressed Gas
Toxic to Reproduction, Hazard Class 1A
Acute Toxicity – Inhalation, Category 4

HAZARD STATEMENTS:

SIGNAL WORDS: Danger! Warning
Contains gas under pressure; may explode if heated.
May cause damage to the unborn child by inhalation.
Harmful if inhaled.

PREVENTION STATEMENTS:

Obtain special instructions before use.
Do not handle until all safety instructions have been read and understood.
Use personal protective equipment, as required.
Use only outdoors or in a well-ventilated place.
Avoid breathing gas.

STORAGE:

Do not eat, drink or smoke when using this gas.
Store locked-up.
Protect from sunlight and store in well-ventilated place. Keep valves tightly closed.

RESPONSE STATEMENTS:

If exposed or concerned: Get medical attention/advice.
In case of fire, stop leak if it is safe to do so.
If inhaled: remove to fresh air and keep at rest in a comfortable position for breathing. Call a Poison Center or doctor/physician if you feel unwell.

DISPOSAL STATEMENTS:

Reclaim/recycle/dispose of contents and cylinder per local, regional, national and international regulations.

SYMBOLS:



SECTION 16. OTHER INFORMATION

Information contained in this Material Safety Data Sheet is provided to our customers so they may comply with 29 CFR 1910.1200, Hazard Communication Standard, the Canadian WHMIS Standard, and the requirements of the European Community Directives. The intent of this Material Safety Data Sheet is to provide end users of this product with the health and physical hazards associated with possible exposure to this product. All statements, technical data and recommendations are based on readily available texts and data that Spectra Gases, Inc., believes to be reliable and accurate. Spectra Gases, Inc., makes no warranties, guarantees or representations of any kind with respect to this product or this data. It is the responsibility of the user to obtain and use the most recent version of this MSDS.

Further information can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 421 Walney Road, 5th Floor, Chantilly, VA 20151. Telephone: (703) 788-2700, Fax: (703) 961-1831.

P-1 "Safe Handling of Compressed Gases in Containers"
AV-1 "Safe Handling and Storage of Compressed Gases"
"Handbook of Compressed Gases"

For Definition of Terms used in Spectra MSDSs see Spectra Gases, Inc. website: www.spectra-gases.com. Or contact your Customer Service Representative.

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