



# MATERIAL SAFETY DATA SHEET

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

## SECTION 1. PRODUCT IDENTIFICATION

**PRODUCT NAME:** Less than 3,000 ppm Bromochloromethane, in Nitrogen and/or Helium  
**CHEMICAL NAME:** Mixture of Bromochloromethane (< 3,000 ppm ) in Balance of Nitrogen and/or Helium  
**FORMULA:** Bromochloromethane = CH<sub>2</sub>BrCl; Nitrogen = N<sub>2</sub>; Helium = He  
**SYNONYMS:** Bromochloromethane = Chlorobromomethane; Halon<sup>®</sup> 101; Fluorocarbon 101; CB

**MANUFACTURER:** SPECTRA GASES, INC.  
**ADDRESS:** 3434 Route 22 West  
 Branchburg, NJ 08876, U.S.A.  
**PHONE:** 908/252-9300  
**FAX:** 908/252-0811  
**WEB SITE:** www.spectra-gases.com

**SPECTRA GASES EMERGENCY CONTACT:** 800-932-0624 8:30am - 7:00pm (EST)  
**24 HOUR EMERGENCY CONTACT, CHEMTREC:** 800/424-9300, 703-527-3887  
**DATE OF PREPARATION:** January 22, 2001  
**MSDS NUMBER:** 1610  
**PRODUCT USE:** Various

## SECTION 2. COMPOSITION and INFORMATION ON INGREDIENTS

**COMPOSITION:** Bromochloromethane (< 3,000 ppm), Balance Nitrogen and/or Helium  
**CAS NUMBER:** Bromochloromethane: 74-97-5; Nitrogen: 7727-37-9; Helium: 7440-59-7  
**EINECS NUMBER:** Bromochloromethane: 200-826-3; Nitrogen: 231-783-9; Helium: 231-168-5  
**EXPOSURE LIMITS:** (10,000 ppm = 1%)

OSHA PELs:	ACGIH TLVs:	NIOSH RELs:
Bromochloromethane: TWA = 200 ppm	TWA = 200 ppm	TWA = 200 ppm IDLH = 2000 ppm
Helium: There are no exposure limits for Helium, Helium is a simple asphyxiant.		
Nitrogen: There are no exposure limits for Nitrogen, Nitrogen is a simple asphyxiant.		

## SECTION 3. HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:** This gas mixture is non-flammable, colorless, and has a slightly sweet, chloroform-like odor. This gas mixture may cause adverse health effects due to the Bromochloromethane content, which can reach exposure limits at the percentage in this mixture. This gas mixture may also cause asphyxiation, by displacement of oxygen. Pure Bromochloromethane has a sweet odor and a low odor threshold; however, persons using this gas mixture should be aware that the odor threshold for Bromochloromethane is 400 ppm, which is twice the level of the TWA of 200 ppm. If involved in a fire, this gas mixture will decompose to evolve toxic gases of hydrogen chloride, hydrogen bromide, carbon monoxide, carbon dioxide and phosgene. Persons responding to releases of this gas mixture must protect themselves appropriately.

**ROUTES OF ENTRY, SYMPTOMS OF ACUTE EXPOSURE: WARNING** - If rescue personnel need to enter an area of release of this gas mixture, they should be equipped with Self-Contained Breathing Apparatus (SCBA). High concentration of this gas will create an oxygen-deficient atmosphere, creating the risk of asphyxiation. Acute overexposure to this gas may cause the following health effects:

**EYE CONTACT:** Eye contact with this gas mixture will cause mild to moderate irritation, depending on concentration and duration of contact. Contact of the cold gas with the eyes can cause pain, redness, burns, and severe exposure could cause blindness. High-pressure gas may result in airborne objects.

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

**INHALATION:** Inhalation of this gas mixture will be irritating to the upper respiratory system and mucous membranes. Symptoms may include coughing, wheezing and difficulty breathing. Inhalation exposure may also result in gastric upset. (continued on following page)

**SECTION 3. HAZARD IDENTIFICATION (Continued)**

**INHALATION (continued):** Inhalation of this gas mixture for prolonged periods of time, in high concentration may have adverse effects on the central nervous system, due to the presence of Bromochloromethane. Symptoms may include dizziness, nausea, headache and chest pains. High concentrations of this gas can cause an oxygen-deficient environment. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. The skin of a victim may have a blue color. Under some circumstances of over-exposure, death may occur, due to the displacement of oxygen. 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:

8-10% Oxygen:

6-8% Oxygen:

4-6% 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, fainting, unconsciousness, ashen face, blueness of lips, nausea (upset stomach), and vomiting.

8 minutes, may be fatal in 50-100% of cases; 6 minutes, may be fatal in 25 to 50% of cases; 4-5 minutes, recovery with treatment.

Coma in 40 seconds, followed by convulsion, breathing failure, death.

**WARNING:** Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death.

**SKIN CONTACT:** Due to the presence of Bromochloromethane, skin contact with this gas mixture may be irritating.

**OTHER HEALTH EFFECTS:** Contact with rapidly expanding gases (which are released from under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain caused by frostbite can quickly subside, masking the injury. In addition, the sudden release of a pressurized gas (such as may occur in the event of a valve failure), presents a severe hazard of mechanical injury.

**HMIS RATINGS:** HEALTH: = 1; FLAMMABILITY: = 0; REACTIVITY: = 0;

PPE: Level B (see Section 8, Exposure Controls/Personal protective Equipment)

**ROUTES OF ENTRY, SYMPTOMS OF CHRONIC EXPOSURE:**

**ROUTE OF ENTRY:** Skin contact, inhalation.

**TARGET ORGANS:** Respiratory system, skin, liver.

**SYMPTOMS:** Persistent irritation of skin and respiratory system may result from repeated exposure to this gas mixture. The Bromochloromethane component of this gas mixture is considered a narcotic of moderate intensity. Animal test data has shown that prolonged exposure of 1000 ppm for several weeks has resulted in high blood bromide levels as high as 350/mg/100 g. As such, Bromochloromethane should be considered to be as toxic as Carbon Tetrachloride and inhalation exposure should be avoided. Repeated over-exposure to a gas mixture that contains Bromochloromethane can result in damage to the liver and kidneys.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** Pre-existing dermatitis, other skin conditions, and respiratory disorders may be aggravated by over-exposure to this gas mixture. Additionally, repeated over-exposure to the Bromochloromethane component of this gas mixture may aggravate pre-existing liver conditions.

**CARCINOGENICITY:** The Bromochloromethane component of this gas mixture is listed as an EPA-D suspect carcinogen. The remaining components of this gas mixture are not found on the FEDERAL OSHA Z LIST, NTP, CAL/OSHA, or IARC Carcinogenicity lists and therefore is neither considered to be nor suspected to be a cancer-causing agent by these agencies.

**SECTION 4. FIRST AID MEASURES**

**EYE CONTACT:** If this gas mixture enters the eyes, 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. If adverse effect occurs, victim should seek immediate medical attention from an ophthalmologist. In the event of mechanical injury, cover eye with bandage and seek appropriate medical attention.

**SECTION 4. FIRST AID MEASURES (Continued)**

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

**INHALATION:** Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. In the event of severe, immediate effects or delayed symptoms that develop after exposure, victim must seek appropriate medical attention.

**SKIN CONTACT:** In case of frostbite, place the frostbitten part in warm water. **DO NOT USE HOT WATER.** If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

**NOTES TO PHYSICIANS:** Administer oxygen, if necessary and treat symptoms.

**SECTION 5. FIRE FIGHTING MEASURES**

**FLASH POINT:** Not Applicable

**AUTOIGNITION:** Not Applicable

**FLAMMABLE RANGE:** Not Applicable

**NFPA RATINGS:**

HEALTH: = 0

FLAMMABILITY: = 0

REACTIVITY: = 0

SPECIAL: Not applicable.

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

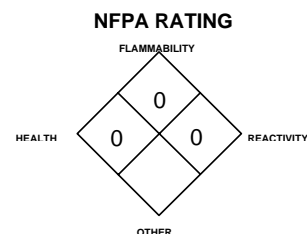
**SPECIAL FIRE-FIGHTING PROCEDURES:** Non-flammable gas. Use extinguishing media appropriate for surrounding fire.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** This gas does not burn; however, containers, when involved in fire, may rupture or burst in the heat of the fire. Most cylinders have a pressure release device, which will vent contents if the cylinder is exposed to high temperatures.

**EXPLOSION SENSITIVITY TO MECHANICAL IMPACT:** Not sensitive.

**EXPLOSION SENSITIVITY TO STATIC DISCHARGE:** Not sensitive.

**HAZARDOUS COMBUSTION PRODUCTS:** When heated to decomposition, this gas will emit fumes of hydrogen chloride, hydrogen bromide, carbon monoxide, carbon dioxide, and phosgene.



**See Section 16 for Definition of Ratings**

**SECTION 6. ACCIDENTAL RELEASE MEASURES**

**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:** In the event of a leak of this product, operator should close the gas source if possible to do so safely. Evacuate immediate area. Only trained personnel, wearing Self-Contained Breathing Apparatus (SCBA) and other appropriate personal protective equipment should re-enter a contaminated area.

Persons responding to a release of a pressurized gas should 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.

If leak is in user's gas handling equipment or system, close cylinder valve, safely vent high pressure and purge with inert gas, being sure to bring purge gas to near atmospheric pressure before attempting repairs. If leak is from the cylinder, cylinder valve or the valve pressure relief device (PRD), contact your supplier.

Levels of Bromochloromethane should be below applicable exposure levels listed in Section 2 (Composition / Information on Ingredients) before personnel can be allowed in the area without SCBA. Detection systems may be considered to monitor for leaks and to measure the level of Bromochloromethane.

**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. 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. Do not allow storage temperature to exceed 125°F (52°C). 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. Consideration should be taken to install leak detection and alarm equipment for storage areas. **NOTE:** Use only DOT or ASME code cylinders designed for compressed gas storage. Cylinders must not be recharged except by or with the consent of owner.

## SECTION 7. HANDLING AND STORAGE (Contained)

**HANDLING:** This gas mixture can be harmful and should only be handled by trained personnel. Wearing contact lenses is not recommended when handling this material. Monitoring may be considered for areas in which this compound is used.

**Releases of this gas mixture can create an oxygen-deficient atmosphere.** Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to oxygen-deficiency. Cylinder valves should be inspected regularly for physical damage or corrosion (apparent by discoloration or rust). Close valve after each use and when empty.

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. 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. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings; doing so may damage valve, causing a leak to occur. Use an adjustable strap-wrench to remove over-tight or rusted caps. Do not heat cylinders by any means 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). Relieve pressure before attempting repairs.

**SPECIAL PRECAUTIONS:** Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas could occur without any significant warning symptoms (due to oxygen deficiency). 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. 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 Bromochloromethane. If appropriate, install automatic monitoring equipment to detect the level of oxygen.

**RESPIRATORY PROTECTION:** Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if oxygen level is below 19.5%, or during emergency response to a release of this product. If respiratory protection is required, follow the requirements of the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, and EC member states. The following are NIOSH respiratory protection equipment recommendations for Bromochloromethane:

<u>CONCENTRATION</u>	<u>RESPIRATORY PROTECTION</u>
Up to 2000 ppm:	Any Supplied-Air Respirator (SAR) operated in a continuous-flow mode, or any Powered, Air-Purifying Respirator (PAPR) with organic vapor cartridge(s), or any Chemical Cartridge Respirator with a full facepiece and organic vapor cartridge(s), or any Air-Purifying, Full-Facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister, 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 organic vapor canister, or any appropriate escape-type, SCBA.

**SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION (Continued)**

**EYE PROTECTION:** Use approved safety goggles or safety glasses, as described in OSHA 29 CFR 1910.133 or by the European Standard EN166.

**SKIN PROTECTION:** Work (such as leather) gloves are recommended when handling cylinders of this gas. Wear gloves appropriate to the specific operation for which this gas mixture is used. Use triple gloves for spill response.

**OTHER PROTECTIVE EQUIPMENT:** Use body protection appropriate for task. Safety shoes are recommended when handling cylinders.

**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

The following information is for Helium, which may be a component of this mixture:

**MOLECULAR WEIGHT:** 4.00  
**GAS DENSITY @ 21.1°C (70°F):** 0.0103 lb./ft<sup>3</sup> (0.165 kg/m<sup>3</sup>)  
**BOILING POINT @ 1 atm:** -268.9°C (-452.1°F)  
**FREEZING/MELTING POINT @ 1 atm:** None.  
**SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F):** 1.38  
**SOLUBILITY IN WATER vol/vol at 0°C (32°F) and 1 atm:** 0.094  
**SPECIFIC VOLUME @ 21.1°C (70°F):** 97.09 lb/ft<sup>3</sup> (6.061 m<sup>3</sup>/kg)  
**CRITICAL PRESSURE:** 33.0 psia (227 kPa abs)  
**COEFFICIENT WATER/OIL DISTRIBUTION:** Not applicable.  
**ODOR THRESHOLD:** Helium is odorless.

The following information is for Nitrogen, which may be a component of this mixture:

**MOLECULAR WEIGHT:** 28.01  
**GAS DENSITY @ 21.1°C (70°F):** 0.072 lb./ft<sup>3</sup> (1.153 kg/m<sup>3</sup>)  
**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 lb/ft<sup>3</sup> (0.867 m<sup>3</sup>/kg)  
**CRITICAL PRESSURE:** 492.9 psia (3399 kPa abs)  
**COEFFICIENT WATER/OIL DISTRIBUTION:** Not applicable.

The following information is for the Bromochloromethane component of this gas mixture:

**MOLECULAR WEIGHT:** 129.39  
**SPECIFIC GRAVITY @ 20°C (68°F):** 1.934  
**ODOR THRESHOLD:** 400 ppm (2100 mg/m<sup>3</sup>)  
**VAPOR DENSITY (air = 1):** 4.49  
**VAPOR PRESSURE @ 20°C (68°F):** 115 mm Hg (15 kPa)  
**COEFFICIENT WATER/OIL DISTRIBUTION:** 1.41

The following is information on the gas mixture:

**APPEARANCE, ODOR AND STATE:** Colorless, gas with a mild, sweet, chloroform-like odor.

**WARNING PROPERTIES FOR THIS GAS:** Although the odor of this gas mixture may act as a warning property in event of accidental release; persons using this gas mixture should be aware that the odor threshold for Bromochloromethane is 400 ppm, which is twice the level of the TWA of 200 ppm.

**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 IS INCOMPATIBLE:** The Bromochloromethane component of this gas mixture is incompatible with strong bases, strong oxidizers, zinc, magnesium, aluminum powder, and other chemically active metals, such as calcium. Bromochloromethane will attack some forms of plastics, rubber and coatings.

**REACTIVITY:**

**A) HAZARDOUS DECOMPOSITION PRODUCTS:** When heated to decomposition, this gas will emit fumes of hydrogen chloride, hydrogen bromide, carbon monoxide, carbon dioxide, and phosgene.

**B) HAZARDOUS POLYMERIZATION:** Will not occur.

## SECTION 11. TOXICOLOGICAL INFORMATION

**TOXICITY DATA:** The Helium and Nitrogen components of this gas mixture are inert; toxicity data are not applicable to these gases. The following data are for the Bromochloromethane component:

LD<sub>50</sub> (Oral-Rat) 5 gm/kg  
 LD<sub>50</sub> (Oral-Mouse) 4300 mg/kg: Behavioral: general anesthetic  
 LD<sub>50</sub> (Skin-Rabbit) > 20 gm/kg  
 LC<sub>50</sub> (Inhalation-Mouse) 12,030 mg/m<sup>3</sup>/7 hours: Behavioral: general anesthetic, muscle weakness; Lungs, Thorax, or Respiration: dyspnea  
 LCLo (Inhalation-Rat) 28,800 ppm/15 minutes: Behavioral: general anesthetic, altered sleep time (including change in righting reflex), tremor  
 TCLo (Inhalation-Rat) 1000 ppm/7 hours/16 weeks-intermittent: Liver: fatty liver degeneration; Kidney, Ureter, Bladder: changes in bladder weight; Nutritional and Gross Metabolic: changes in metals, not otherwise specified  
 TCLo (Inhalation-Rat) 500 ppm/6 hours/26 weeks-intermittent: Lungs, Thorax, or Respiration: fibrosis, focal (pneumoconiosis); Nutritional and Gross Metabolic: weight loss or decreased weight gain, changes in metals, not otherwise specified  
 TCLo (Inhalation-Dog) 500 ppm/6 hours/26 weeks-intermittent: Nutritional and Gross Metabolic: changes in metals, not otherwise specified  
 TCLo (Inhalation-Rabbit) 1000 ppm/7 hours/16 weeks-intermittent: Nutritional and Gross Metabolic: changes in metals, not otherwise specified  
 Mutation in Microorganisms (Salmonella typhimurium) 10 mg/plate  
 Mutation in Microorganisms (Salmonella typhimurium) 10 µg/plate  
 Cytogenetic Analysis (Hamster-Lung) 1 µmol/L  
 Sister Chromatid Exchange (Hamster Lung) 5 µmol/L

**CARCINOGENICITY:** The Bromochloromethane component has been listed as follows:

**EPA-D** (Not Classifiable as to Human Carcinogenicity: Inadequate human and animal evidence of carcinogenicity, or no data are available; however, there are data indicative of genotoxic effects and structural relationships to halogenated methanes)

**IRRITANCY OF PRODUCT:** At high concentration, inhalation of this gas mixture may cause irritation of the respiratory system, eyes and skin.

**SENSITIZATION OF PRODUCT:** No component of this product is known to be a skin or respiratory sensitizer.

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

Mutagenicity: The components of this gas mixture have not been found to cause mutagenic effects in humans. Mutagenic data in microorganisms are available for Bromochloromethane. There are also data for animals from tests of specific animal tissues.

Embryotoxicity: The components of this gas mixture have not been found to cause embryotoxic effects in humans.

Teratogenicity: The components of this gas mixture have not been found to cause teratogenic effects in humans.

Reproductive Toxicity: The components of this gas mixture have not been found 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 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):** Currently, Biological Exposure Indices (BEIs) have not been determined for the components of this gas mixture.

## SECTION 12. ECOLOGICAL INFORMATION

**ENVIRONMENTAL STABILITY:** The Helium and Nitrogen components of this gas mixture occur naturally in the atmosphere. The Bromochloromethane component of this gas mixture will be dissipated rapidly in well-ventilated areas.

**EFFECT OF MATERIAL ON PLANTS or ANIMALS:** Currently, there are no data on the possible effect of this gas mixture on plants and animals in the natural environment.

**EFFECT OF CHEMICAL ON AQUATIC LIFE:** The Nitrogen and Helium components of this gas mixture are not toxic in an aquatic environment. Currently the following aquatic toxicity data are available for the Bromochloromethane component of this gas mixture.

LC<sub>50</sub> (*Oryzias latipes* Orange-red killifish) 48 hours = 338 mg/L

**MOBILITY:** Based on a classification scheme, an estimated Koc value of 24, determined from a structure estimation method, indicates that the Bromochloromethane component of this gas mixture is expected to have very high mobility in soil.

**PERSISTENCE AND BIODEGRADABILITY:** The Nitrogen and Helium components of this gas mixture have no hazard of persistence and are elements which do not biodegrade. Vapor-phase Bromochloromethane is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is 145 days, from its experimental rate constant of 1.11X10<sup>-13</sup> cubic cm/molecule-sec at 25°C. Direct photolysis will have only a minor effect on the atmospheric lifetime due to the very low ultra-violet absorption of Bromochloromethane in the environmentally significant range >290 nm<sup>(3)</sup>.

**SECTION 12. ECOLOGICAL INFORMATION (Continued)**

**POTENTIAL TO BIOACCUMULATE:** The components of this gas mixture do not bioaccumulate.  
**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 used 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 may be safely released in a well-ventilated area. This shall be done in accordance with U.S. Federal, State and local regulations, regulations of the provinces of Canada or EC member states.

**SECTION 14. TRANSPORT INFORMATION**

**U.S. SHIPPING INFORMATION:**

**U.S. DOT PROPER SHIPPING NAME:** Compressed gas, n.o.s. (Bromochloromethane, Helium) *or* (Bromochloromethane, Nitrogen)

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

**UN IDENTIFICATION NUMBER:** UN 1956

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

**PLACARD (When required):** Non-Flammable Gas

**SPECIAL SHIPPING INFORMATION:** Cylinders should be transported in a secure position in a well-ventilated truck. 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**

**CANADIAN SHIPPING INFORMATION:**

**TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:** This gas is considered as dangerous goods; use the above U.S. DOT information for the preparation of Canadian Shipments.

**INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA):**

**IATA DESIGNATION:** This gas is considered as dangerous goods, per the International Air Transport Association.

**PROPER SHIPPING NAME:** Compressed gas, n.o.s. (Bromochloromethane, Helium) *or* (Bromochloromethane, Nitrogen)

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

**UN IDENTIFICATION NUMBER:** UN 1956

**HAZARD LABEL(S) REQUIRED:** Non-Flammable Gas

**ERG CODE:** 2L

The following Packaging Information is applicable to this product:

PASSENGER AND CARGO AIRCRAFT				CARGO AIRCRAFT ONLY	
Limited Quantity		Packing Instruction	Max. Qty per Pkg	Packing Instruction	Max. Qty per Pkg
Packing Instruction	Max. Qty per Pkg				
////	////	200	75 kg	200	150 kg

<b>SECTION 14. TRANSPORT INFORMATION (Continued)</b>
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**INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO):**

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

**PROPER SHIPPING NAME:** Compressed gas, n.o.s. (Bromochloromethane, Helium) *or*  
(Bromochloromethane, Nitrogen)

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

**UN IDENTIFICATION NUMBER:** UN 1956

**HAZARD LABEL(S) REQUIRED:** Non-Flammable Gas

**IMDG CODE:** Page 2124

**STOWAGE CATEGORY:** Category A

**MARINE POLLUTANT:** The components of this product are not designated by the IMO to be Marine Pollutants.

**EUROPEAN SHIPPING INFORMATION:**

**EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):** This gas mixture is considered by the Economic Commission for Europe to be dangerous goods. Additional information is as follows:

**SUBSTANCE IDENTIFICATION NO.:** 1956

**NAME OF SUBSTANCE:** Compressed gas, n.o.s. (Bromochloromethane, Helium) *or*  
(Bromochloromethane, Nitrogen)

**HAZARD IDENTIFICATION NO.:** 20

**LABEL:** 2

**CLASS AND ITEM NUMBER:** 2, 1<sup>o</sup>A

<b>SECTION 15. REGULATORY INFORMATION</b>
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**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: The components of this gas mixture are not listed.

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 this gas mixture (or its components) do not require reporting under Section 313.

**CLEAN AIR ACT:**

**SECTION 112 (r):** Risk Management Programs for Chemical Accidental Release  
(40 CFR Part 68)

Threshold Planning Quantity (TPQ): Not Applicable

**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

## SECTION 15. REGULATORY INFORMATION (Continued)

**U.S. FEDERAL REGULATIONS (continued):****U.S. STATE REGULATORY INFORMATION (continued):**

**CALIFORNIA PROPOSITION 65:** The components of this gas mixture are not listed substances which the State of California requires warning under this statute.

The components of this gas are covered under the following specific State regulations:

**Alaska - Designated Toxic and Hazardous Substances:** Bromochloromethane, Helium.

**California - Permissible Exposure Limits for Chemical Contaminants:** Bromochloromethane, Helium, Nitrogen.

**Florida - Substance List:** Bromochloromethane, Helium, Nitrogen.

**Illinois - Toxic Substance List:** Bromochloromethane, Helium.

**Kansas - Section 302/313 List:** None.

**Massachusetts - Substance List:** Bromochloromethane, Helium.

**Michigan - Critical Materials Register:** None.

**Minnesota - List of Hazardous Substances:** Bromochloromethane, Helium.

**Missouri - Employer Information/Toxic Substance List:** Bromochloromethane, Helium.

**New Jersey - Right to Know Hazardous Substance List:** Bromochloromethane, Helium.

**North Dakota - List of Hazardous Chemicals, Reportable Quantities:** None.

**Pennsylvania - Hazardous Substance List:** Bromochloromethane, Helium.

**Rhode Island - Hazardous Substance List:** Bromochloromethane, Helium.

**Texas - Hazardous Substance List:** Bromochloromethane.

**West Virginia - Hazardous Substance List:** Bromochloromethane, Helium.

**Wisconsin - Toxic and Hazardous Substances:** Bromochloromethane.

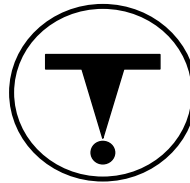
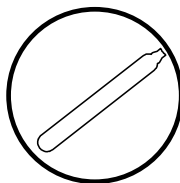
**CANADIAN FEDERAL REGULATIONS:**

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

**OTHER CANADIAN REGULATIONS:** This gas mixture would be categorized as a Controlled Product, Hazard Classes A, and D2B, as per the Controlled Product Regulations. The components of this gas mixture are not on the CEPA Priorities Substances Lists.

**CANADIAN WHMIS SYMBOLS:** **Class A:** Compressed Gas

**Class D2B:** Toxic Material/Materials Causing Other Toxic Effects- Irritation

**EUROPEAN ECONOMIC COMMUNITY REGULATIONS:**

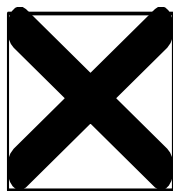
**EC LABELING AND CLASSIFICATION:** This gas mixture meets the definition hazardous, as defined by the European Community Council Directive 67/548/EEC, as follows:

**EC CLASSIFICATION:** [Xn] Irritating

**EC RISK PHRASES:** [R: 36/37/38] Irritating to eyes, respiratory system and skin.

**EC SAFETY PHRASES:** [S: 23] Do not breathe gas. [S: 24/25] Avoid contact with skin and eyes. [S: 26] In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. [S: 36] Wear suitable protective clothing. [S: 38] In case of insufficient ventilation, wear suitable respiratory protection.

**EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOL:** Xn (Irritating)

**EUROPEAN COMMUNITY INFORMATION FOR COMPONENTS:****BROMOCHLOROMETHANE:**

**EC EINECS/ELINCS NUMBER:** 200-826-3

**EC 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.

<b>SECTION 15. REGULATORY INFORMATION (Continued)</b>
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**EUROPEAN ECONOMIC COMMUNITY REGULATIONS (continued):****EUROPEAN COMMUNITY INFORMATION FOR COMPONENTS (continued):****HELIUM:****EC EINECS/ELINCS NUMBER:** 231-168-5**EC 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.**NITROGEN:****EC EINECS/ELINCS NUMBER:** 231-783-9**EC 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.

<b>SECTION 16. OTHER INFORMATION</b>
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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 about compressed gases can be 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.

<i>P-1</i>	<i>"Safe Handling of Compressed Gases in Containers"</i>
<i>AV-1</i>	<i>"Safe Handling and Storage of Compressed Gases"</i>
	<i>"Handbook of Compressed Gases"</i>

**PREPARED BY:**

CHEMICAL SAFETY ASSOCIATES, Inc.  
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858/565-0302

## DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

**CAS #:** This is the Chemical Abstract Service Number which uniquely identifies each constituent.

### EXPOSURE LIMITS IN AIR:

**ACGIH** - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits.

**TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit (**STEL**), and the instantaneous Ceiling Level (**C**). Skin absorption effects must also be considered.

**OSHA** - U.S. Occupational Safety and Health Administration.

**PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

**IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury.

**The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL.

**NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called **Recommended Exposure Levels (RELs)**. When no exposure guidelines are established, an entry of **NE** is made for reference.

### HAZARD RATINGS:

**HAZARDOUS MATERIALS IDENTIFICATION SYSTEM:** Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]). Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

**NATIONAL FIRE PROTECTION ASSOCIATION:** Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

### FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

### TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD<sub>50</sub>** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC<sub>50</sub>** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m<sup>3</sup>** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

### REGULATORY INFORMATION:

**U.S. and CANADA:** This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/NDL**); the U.S. Toxic Substance Control Act (**TSCA**); Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA** or **Superfund**); and various state regulations. This section also includes information on the precautionary warnings which appear on the material's package label.

**EUROPEAN:** **EC** is the European Community (formerly known as the **EEC**, European Economic Community). **EINECS**: This is the European Inventory of Now-Existing Chemical Substances. The **ARD** is the European Agreement Concerning the International Carriage of Dangerous Goods by Road and the **RID** are the International Regulations Concerning Transport by Rail.