Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Methyl Bromide (MSDS No. P-4620-G)	**Trade Names:** Methyl Bromide
Chemical Name: Bromomethane	**Synonyms:** Bromomethane, embafume, methylbromide, monobromomethane, R40B1
Chemical Family: Halogenated alkane	**Product Grades:** None assigned.

Telephone: **Emergencies:** 1-800-645-4633* **Company Name:** Praxair, Inc.
CHEMTREC: 1-800-424-9300* 39 Old Ridgebury Road
Routine: 1-800-PRAXAIR Danbury, CT 06810-5113

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

2. Hazards Identification

EMERGENCY OVERVIEW

DANGER! Toxic liquid and gas under pressure.
May be fatal if inhaled.
Harmful if absorbed through the skin.
Can cause eye, skin, and respiratory tract burns.
Symptoms may be delayed.
Can cause nervous system, lung, kidney, and liver damage.
Can catch fire.
Self-contained breathing apparatus and protective clothing must be worn by rescue workers.
Under ambient conditions, this is a colorless gas, with a chloroform-like odor.

OSHA REGULATORY STATUS: This material is considered hazardous by the OSHA Hazard Communications Standard (29 CFR 1910.1200).

POTENTIAL HEALTH EFFECTS:

Effects of a Single (Acute) Overexposure

Inhalation. Exposure to vapor irritates the respiratory tract, bringing possible pulmonary edema (fluid in the lungs). Inhalation may cause abdominal pain, nausea, vomiting, blurred vision, headache, mental confusion, and tremors. Liver, kidney, and central nervous system (CNS) damage may also occur, with paralysis, convulsion, coma, brain damage, and psychological disturbances.

Skin Contact. Moderate exposure may cause an itching dermatitis seen as local redness. The skin may swell and scale. With prolonged or widespread contact, the skin may absorb potentially harmful amounts of material.

A vertical line in the left margin indicates revised or new material.

Swallowing. An unlikely route of exposure; this product is a gas at normal temperature and pressure. Contact with the liquid may burn the lips and mouth.

Eye Contact. May cause moderate conjunctivitis, seen as redness and swelling of the eyes.

Effects of Repeated (Chronic) Overexposure. Prolonged or repeated overexposure can cause disturbances of the CNS with blurred vision, numbness, confusion, hallucination, and fainting. Bronchospasm may develop. Repeated skin exposure may cause dermatitis. Although there is no evidence that methyl bromide can cause cancer in humans, users should handle the material with adequate ventilation and avoid direct skin contact.

Other Effects of Overexposure. None known.

Medical Conditions Aggravated by Overexposure. Inhalation may aggravate asthma and inflammatory or fibrotic pulmonary disease. Skin contact may aggravate an existing dermatitis.

CARCINOGENICITY: The IARC lists methyl bromide as Group 3, *unclassifiable as to carcinogenicity to humans*. Methyl bromide is not listed by NTP or OSHA.

POTENTIAL ENVIRONMENTAL EFFECTS: None known. For further information, see section 12, Ecological Information.

3. Composition/Information on Ingredients

See section 16 for important information about mixtures.

COMPONENT	CAS NUMBER	CONCENTRATION
Bromomethane	74-83-9	>99%*

**The symbol > means "greater than."*

4. First Aid Measures

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Keep patient warm. Call a physician.

SKIN CONTACT: Avoid breathing vapor. Immediately flush skin with plenty of water for at least 15 minutes, while removing contaminated clothing and shoes. Discard clothing and shoes. Call a physician.

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

EYE CONTACT: Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Immediately see a physician, preferably an ophthalmologist..

NOTES TO PHYSICIAN: *Symptoms may be delayed, with latency from 30 minutes to several days. Neurological symptoms may appear in most cases of overexposure. There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

Contact the Poison Control Center in your area for additional information on patient management and follow-up.

5. Fire Fighting Measures

FLAMMABLE PROPERTIES: Can catch fire.

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

PRODUCTS OF COMBUSTION: CO, CO_2, bromide fumes.

PROTECTION OF FIREFIGHTERS: DANGER! Toxic liquid and gas under pressure. Immediately evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately cool cylinders with water spray from maximum distance, taking care not to extinguish flames. Remove ignition sources if without risk. If flames are accidentally extinguished, explosive reignition may occur. Reduce toxic vapors with water spray or fog. Reverse flow into cylinders may cause rupture. Stop flow of gas if without risk, while continuing cooling water spray. Remove all containers from area of fire if without risk. Allow fire to burn out. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

Specific Physical and Chemical Hazards. Heat of fire can build pressure in cylinder and cause it to rupture. Methyl bromide cylinders are not equipped with a pressure relief device to provide maximum containment up to cylinder burst pressure,. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). I f leaking or spilled methyl bromide catches fire, do not extinguish flames. Toxic, flammable vapors may spread from leak and could explode if reignited by sparks or flames. Explosive atmospheres may linger. Reignition may occur at locations distant from product handling point. To protect persons from cylinder fragments and toxic fumes if rupture occurs, evacuate the area if the fire cannot be brought under immediate control. Corrosive vapors may spread from spill. Vapors are irritating and may burn skin and eyes on contact. Before entering area, especially confined areas, check with an appropriate device.

Protective Equipment and Precautions for Firefighters. Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER! Toxic liquid and gas under pressure.

Personal Precautions. May form explosive mixtures with air. Immediately evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Reduce vapors with fog or fine water spray. Reverse flow into cylinder may cause rupture. Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Prevent runoff from contaminating surrounding environment. Toxic, flammable vapors may spread from spill. Before entering area, especially a confined area, check atmosphere with an appropriate device.

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

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING: Can catch fire. Do not breathe gas. Do not get vapors or liquid in eyes, on skin, or on clothing. Have safety showers and eyewash fountains immediately available. May form explosive mixtures with air. Keep away from heat, sparks, or open flame. Have a means of detection other than smell readily available. Methyl bromide is relatively odorless and does not give adequate warning of its presence. Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Electrical equipment must be non-sparking or explosion-proof. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open valve. If valve is hard to open, discontinue use and contact your supplier. For other precautions in using methyl bromide, see section 16.

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

RECOMMENDED PUBLICATIONS: For further information on storage, handling, and use of this product, see NFPA 55, *Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders*, published by the National Fire Protection Association. Also, see Praxair publication P-14-153, *Guidelines for Handling Gas Cylinders and Containers*. Obtain from your local supplier.

8. Exposure Controls/Personal Protection

COMPONENT	OSHA PEL	ACGIH TLV-TWA (2009)
Bromomethane	20 ppm (ceiling)*	1 ppm (skin)**

*(c) – ceiling. Ceiling values are not Time-Weighted-Average (TWA).
**The "skin" designation means that absorption through the skin and eyes may contribute significantly to overall exposure.

TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

IDLH = 250 ppm

ENGINEERING CONTROLS:

Local Exhaust. Use explosion-proof local exhaust ventilation with sufficient air flow to keep the methyl bromide concentration below applicable exposure limits in the worker's breathing zone.

Mechanical (General). Inadequate; see SPECIAL.

Special. Use only in a closed system. A canopy type of forced-air fume hood equipped with an explosion-proof device may be more desirable for certain applications.

Other. See SPECIAL.

PERSONAL PROTECTIVE EQUIPMENT:

Skin Protection. *Viton*® (Rubber and leather are unsatisfactory.) Metatarsal shoes for cylinder handling and protective clothing where needed. Select per OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

Eye/Face Protection. Wear safety glasses when handling cylinders; vapor-proof goggles and a face shield during cylinder changeout or wherever contact with product is possible. Select per OSHA 29 CFR 1910.133.

Respiratory Protection. A respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable) requirements must be followed whenever workplace conditions warrant respirator use. Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure (e.g., an organic vapor cartridge). For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus.

9. Physical and Chemical Properties

APPEARANCE:	Colorless gas
ODOR:	Chloroform-like
ODOR THRESHOLD:	Not available.
PHYSICAL STATE:	Gas at normal temperature and pressure
pH:	Not applicable.
MELTING POINT at 1 atm**:**	-136.48°F (-93.6°C)
BOILING POINT at 1 atm**:**	38.41°F (3.56°C)
FLASH POINT (test method)**:**	Not available.
EVAPORATION RATE (Butyl Acetate = 1)**:**	High
FLAMMABILITY:	Flammable
FLAMMABLE LIMITS IN AIR, % by volume**:**	**LOWER:** 10% **UPPER:** 16%
VAPOR PRESSURE at 70°F (21.1°C)**:**	29.3 psia (202 kPa abs)
VAPOR DENSITY at 70°F (21.1°C) and 1 atm**:**	Not available.
SPECIFIC GRAVITY (H_2O = 1) at 32°F (0°C) and 1 atm**:**	1.732
SPECIFIC GRAVITY (Air = 1) at 77°F (25°C) and 1 atm**:**	3.355
SOLUBILITY IN WATER 68°F (20°C)**:**	1.75 lb/100 lb (1.75 g/100 g)
PARTITION COEFFICIENT: n-octanol/water:	Not available.
AUTOIGNITION TEMPERATURE:	998°F (536.7°C)
DECOMPOSITION TEMPERATURE:	Not available.
PERCENT VOLATILES BY VOLUME:	100
MOLECULAR WEIGHT:	94.937
MOLECULAR FORMULA:	CH_3Br

10. Stability and Reactivity

CHEMICAL STABILITY: ☐ Unstable ☒ Stable

CONDITIONS TO AVOID: None known.

INCOMPATIBLE MATERIALS: Reacts with aluminum and its alloys to form methylated aluminum compounds that are spontaneously flammable in air. Reacts with zinc, magnesium, tin, and iron surfaces in the presence of impurities such as water or alcohol. Avoid the presence of acetylenic compounds, ammonia, dimethylsulfoxide, ethylene oxide, oxidizers, and hot metal surfaces.

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition or burning may produce CO/CO_2 and highly toxic fumes of bromides.

POSSIBILITY OF HAZARDOUS REACTIONS: ☒ May Occur ☐ Will Not Occur

Thermal decomposition or burning may produce CO/CO_2 and highly toxic fumes of bromides.

11. Toxicological Information

ACUTE DOSE EFFECTS: LC_{50} = 850 ppm, 1hr, rat.

STUDY RESULTS: Methyl bromide has been shown to cause cancer in laboratory animals when rats were repeatedly exposed through stomach intubation. Bacterial tests with the product have produced mutations. There is insufficient evidence to evaluate the carcinogenicity of methyl bromide in humans.

12. Ecological Information

ECOTOXICITY: Methyl bromide is listed as a Class I ozone-depleting chemical.

OTHER ADVERSE EFFECTS: WARNING: Contains methyl bromide, a substance which harms public health and environment by destroying ozone in the upper atmosphere.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

DOT/IMO SHIPPING NAME: Methyl bromide

HAZARD CLASS:	2.3	**PACKING GROUP/Zone:**		**IDENTIFICATION NUMBER:**	UN1062	**PRODUCT RQ:**	1,000 lb (454 kg)

SHIPPING LABEL(s):	POISON GAS *
PLACARD (when required):	POISON GAS *

**The words in the POISON GAS diamond are INHALATION HAZARD.* [Include for POISON GAS]

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

Additional Marking Requirement: INHALATION HAZARD

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

MARINE POLLUTANTS: Methyl bromide is not listed as a marine pollutant by DOT.

15. Regulatory Information

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

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

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

Reportable Quantity (RQ): 1,000 lb (454 kg)

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

TPQ: 1,000 lb (454 kg)
EHS RQ (40 CFR 355): 1,000 lb (454 kg)

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

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

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

Methyl bromide is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372.

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

Methyl bromide is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Methyl bromide is listed on the TSCA inventory.

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

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

Methyl bromide is listed in Appendix A as a highly hazardous chemical in quantities of 2,500 lb (1134 kg) or greater.

STATE REGULATIONS:

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

WARNING: Methyl bromide is a chemical known to the State of California to cause birth defects or other reproductive harm.
(California Health and Safety Code §25249.5 et seq.)

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

16. Other Information

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

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: Toxic liquid and gas under pressure. Use piping and equipment adequately designed to withstand pressures to be encountered. Ground all equipment. Use only spark-proof tools and explosion-proof equipment. Prevent reverse flow. Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. Store and use with adequate ventilation at all times. Use only in a closed system constructed of corrosion-resistant materials. Close valve after each use; keep closed even when empty. Have a means of detection other than smell readily available. Methyl bromide is relatively odorless and does not give adequate warning of its presence. Never work on a pressurized system. If there is a leak, close the cylinder valve. Blow down the system in an environmentally safe manner in compliance with all federal, state, and local laws; then repair the leak. Follow safe practices when returning cylinder to supplier. Ensure that the valve is closed; then install valve outlet plug tightly. Never place a compressed gas cylinder where it may become part of an electrical circuit.

NOTE: *Prior to using any plastics, confirm their compatibility with methyl bromide.*

Mixtures. When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Chemicals have properties that can cause serious injury or death.

RECOMMENDED EQUIPMENT: In semiconductor process gas and other suitable applications, Praxair recommends the use of engineering controls such as gas cabinet enclosures, automatic gas panels (used to purge systems on cylinder changeout), excess-flow valves throughout the gas distribution system, double containment for the distribution system, and continuous gas monitors.

HAZARD RATING SYSTEMS:

NFPA RATINGS:		**HMIS RATINGS:**	
HEALTH	= 3	HEALTH	= 2*
FLAMMABILITY	= 1	FLAMMABILITY	= 4
INSTABILITY	= 0	PHYSICAL HAZARD	= 2
SPECIAL	= None		

**An asterisk used in conjunction with HMIS health hazard ratings designates a carcinogenic or reproductive hazard.*

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: CGA-330

PIN-INDEXED YOKE: Not applicable.
ULTRA-HIGH-INTEGRITY CONNECTION: Not applicable.

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

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information can be found in the following materials published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, http://www.cganet.com/Publication.asp.

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

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

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

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Printed in USA