

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

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| Product Name: Liquid Methane | Trade Name: Liquid Methane |
| Product Use: Not available. | |
| Chemical Name: Methane | Synonym: Methane, cryogenic liquid; natural gas, refrigerated liquid with high methane content |
| Chemical Formula: CH ₄ | Chemical Family: Alkanes |
| Telephone: Emergencies: * 1-800-363-0042 | Supplier /Manufacture: Praxair Canada Inc. 1 City Centre Drive Suite 1200 Mississauga, ON L5B 1M2 |
| | Phone: 905-803-1600 |
| | Fax: 905-803-1682 |

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier or Praxair sales representative.*

2. Composition and Information on Ingredients

| INGREDIENTS | % (VOL) | CAS NUMBER | LD ₅₀ (Species & Routes) | LC ₅₀ (Rat, 4 hrs.) | TLV-TWA (ACGIH) |
|-----------------|---------|------------|--|-----------------------------------|--------------------|
| Methane, Liquid | 100 | 74-82-8 | Not available. | Not available. | 1000 ppm |

3. Hazards Identification

Emergency Overview

DANGER! Extremely cold, flammable liquid and gas under pressure. May form explosive mixtures with air. Can cause rapid suffocation. May cause severe frostbite. May cause dizziness and drowsiness. Self-contained breathing apparatus and protective clothing may be required by rescue workers.

ROUTES OF EXPOSURE: Inhalation.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION: Asphyxiant. Effects are due to lack of oxygen. Moderate concentrations may cause headaches, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconsciousness. Lack of oxygen can kill.

SKIN CONTACT: No harm expected from gas. Liquid may cause severe frostbite.

SKIN ABSORPTION: No harm expected from gas. Liquid may cause severe frostbite.

SWALLOWING: An unlikely route of exposure. This product is a gas at normal temperature and pressure, but frostbite of the lips and mouth may result from contact with the liquid.

EYE CONTACT: No harm expected from gas. Liquid may cause frostbite.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:

Not available.

OTHER EFFECTS OF OVEREXPOSURE:

Methane is an asphyxiant. Lack of oxygen can kill.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:

Repeated or prolonged exposure is not known to aggravate medical condition.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:

None known.

CARCINOGENICITY:

Not listed as carcinogen by OSHA, NTP or IARC.

4. First Aid Measures

INHALATION:

Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

SKIN CONTACT:

For exposure to liquid, immediately warm frostbite area with warm water not to exceed 41°C. In case of massive exposure, remove contaminated clothing while showering with warm water. Call a physician.

SWALLOWING:

An unlikely route of exposure; this product is a gas at normal temperature and pressure.

EYE CONTACT:

Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open.

NOTES TO PHYSICIAN:

There is no specific antidote. Treatment of over-exposure should be directed at the control of symptoms and the clinical condition.

5. Fire Fighting Measures

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| FLAMMABLE : Yes. | IF YES, UNDER WHAT CONDITIONS? | Forms explosive mixtures with air and oxidizing agents. |
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| FLASH POINT (test method) -187.8°C(-306°F) | AUTOIGNITION TEMPERATURE 537°C (998.6°F) |
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| FLAMMABLE LIMITS IN AIR, % by volume: | LOWER: 5 | UPPER: 15 |
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EXTINGUISHING MEDIA:

CO₂, dry chemical, water spray or fog.

SPECIAL FIRE FIGHTING PROCEDURES:

DANGER! Extremely cold, flammable liquid and gas under pressure. Evacuate all personnel from danger area. Immediately spray tank with water from maximum distance until cool. Take care not to direct spray onto vents; take care not to extinguish flames. Do not discharge sprays into liquid methane. Liquid methane will freeze water rapidly. Shut off flow of gas if without risk, while continuing cooling water spray. Remove sources of ignition if without risk. Allow flames to burn out. If flames are accidentally extinguished, explosive reignition may occur. All personnel, including fire and rescue workers should leave the area immediately. Reapproach with extreme caution. Self-contained breathing apparatus and protective clothing may be required by rescue workers.

UNUSUAL FIRE AND EXPLOSION HAZARD:

Highly flammable, extremely cold liquid and gas. Forms explosive mixtures with air and oxidizing agents. Fireball forms if gas is ignited immediately after release. Liquid causes frostbite, a freezing injury resembling a burn. Heat of fire can build pressure in tank and cause it to rupture. No part of tank should be subjected to a temperature higher than 52°C. Liquid methane tanks are equipped with pressure relief devices. Venting vapors may obscure visibility. If venting or leaking methane catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an approved explosion meter. (See section 3.)

HAZARDOUS COMBUSTION PRODUCTS:

CO/CO₂

SENSITIVITY TO IMPACT:

Avoid impact against container.

SENSITIVITY TO STATIC DISCHARGE:

Not available.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER! Extremely cold, flammable liquid and gas under pressure. Forms explosive mixtures with air. (See section 5.) Evacuate all personnel from danger area. Use self-contained breathing apparatus and protective clothing where needed. Remove sources of ignition if without risk. Reduce vapors with fog or fine water spray. Shut off flow of gas if without risk. Ventilate area of leak. Liquid methane exposed to the atmosphere will condense moisture from the air, producing a cloud. The flammable mixture may extend beyond this vapor cloud, so be sure to evacuate personnel well beyond the area of visible moisture. Flammable vapors may spread from leak, creating an explosive reignition hazard. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an approved explosion meter. (See section 3.)

WASTE DISPOSAL METHOD:

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, provincial, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE:

Store and use with adequate ventilation. Separate flammable cylinders from oxygen, chlorine, and other oxidizers by at least 20 ft. (6.1 m) or use a barricade of non-combustible 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. 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. 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. For full details and requirements, see NFPA 50A, published by the National Fire Protection Association.

PRECAUTIONS TO BE TAKEN IN HANDLING:

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. Leak check system with soapy water; never use a flame. 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. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions, see section 16.

For other precautions in using ethylene, see section 16. 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.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:

Flammable high-pressure gas. Use only in a closed system. Use piping and equipment adequately designed to withstand pressures and temperatures to be encountered. Use only spark-proof tools and explosion-proof equipment. Keep away from heat, open flame and sparks. **Gas can cause rapid suffocation due to oxygen deficiency.** Store and use with adequate ventilation. Close valve after each use; keep closed even when empty. **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. **Never work on a pressurized system.** If there is a leak, close the cylinder valve. Blow the system down in an environmentally safe manner in compliance with all federal, provincial, and local laws, then repair the leak. **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

8. Exposure Controls/Personal Protection**VENTILATION/ENGINEERING CONTROLS:**

LOCAL EXHAUST: An explosion-proof local exhaust system is acceptable.
See SPECIAL.

MECHANICAL (general): Inadequate.
See SPECIAL.

SPECIAL: Use only in a closed system.

OTHER: See SPECIAL.

PERSONAL PROTECTION:

RESPIRATORY PROTECTION: Use an air supplied respirator when working in confined space or where local exhaust or ventilation does not keep exposure below TLV. Select in accordance with the provincial regulations or guidelines. Selection should also be based on the current CSA standards Z94.4, "Selection, care and use of respirators". Respirators should be approved by NIOSH and MSHA.

SKIN PROTECTION: Wear work gloves when handling cylinders.

EYE PROTECTION: Wear safety glasses when handling cylinders.

Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Cuffless trousers should be worn outside the shoes. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines.

9. Physical and Chemical Properties

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| PHYSICAL STATE: Gas. (Liquefied.) | FREEZING POINT: -182.61°C (-296.7°F) | pH: Not available. |
| BOILING POINT -161.48°C (-258.7°F) | VAPOUR PRESSURE Not applicable. | MOLECULAR WEIGHT: 16.042 g/mole |
| SPECIFIC GRAVITY: LIQUID (Water = 1) 0.55491 (Water = 1) | SOLUBILITY IN WATER, Very slightly soluble in cold water. | |
| SPECIFIC GRAVITY: VAPOUR (air = 1) 0.55491 | EVAPORATION RATE (Butyl Acetate=1): >1 compared to (Butyl Acetate = 1) | COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable. |
| VAPOUR DENSITY: Not available. | % VOLATILES BY VOLUME: 100% (v/v). | ODOUR THRESHOLD: Not available. |
| APPEARANCE & ODOUR: Colorless. Odorless. | | |

10. Stability and Reactivity

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| STABILITY: | The product is stable. |
| CONDITIONS OF CHEMICAL INSTABILITY: | See Section 7. |
| INCOMPATIBILITY (materials to avoid): | Oxygen, oxidizing agents, air. Mixtures with bromine pentafluoride, chlorine, yellow mercuric oxide, nitrogen trifluoride, liquid oxygen, and oxygen difluoride may explode. |
| HAZARDOUS DECOMPOSITION PRODUCTS: | Thermal decomposition or burning may produce carbon monoxide/carbon dioxide. At temperature, exceeding 700°C, and in the absence of oxygen or air, methane may decompose to form hydrogen. |
| HAZARDOUS POLYMERIZATION: | Will not occur. |
| CONDITIONS OF REACTIVITY: | None known. |

11. Toxicological Information

See section 3.

12. Ecological Information

No adverse ecological effects expected. This product does not contain any Class I or Class II ozone-depleting chemicals. The components of this mixture are not listed as marine pollutants by TDG Regulations.

13. Disposal Considerations

WASTE DISPOSAL METHOD:

Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

TDG/IMO SHIPPING NAME:

Methane, refrigerated liquid

HAZARD CLASS:

CLASS 2.1:
Flammable gas.

IDENTIFICATION #:

UN1972

PRODUCT RQ:

Any accidental release in a quantity that could pose a danger to public safety or any sustained release of 10 minutes or more

SHIPPING LABEL(s):

Flammable gas

PLACARD (when required):

Flammable gas

SPECIAL SHIPPING INFORMATION:

Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, non-ventilated compartment of a vehicle can present serious safety hazards.

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, provincial, and local regulations.

DSL (Canada)

This product is on the DSL list

WHMIS (Canada)

CLASS A: Compressed gas.
CLASS B-1: Flammable gas.

International Regulations
EINECS

Not available.

DSCL (EEC)

This product is not classified according to the EU regulations.

International Lists

No products were found.

16. Other Information

MIXTURES:

When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

HAZARD RATING SYSTEM:
HMIS RATINGS:

HEALTH 3

FLAMMABILITY 4

PHYSICAL HAZARD 2

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: CGA Connection No. LNG-30. (3" Liquefied Natural Gas Connection).
Thread is 4.521-3-10 o MOD SQ-LH
-EXT (fixed end)
-INT (Hose nut and Headpiece)

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 pamphlets V-1 and V-7 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 about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, Fax (703) 961-1831, website: www.cganet.com.

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|----------|--|
| AV-1 | Safe Handling and Storage of Compressed Gases |
| CGA S1.2 | Pressure Relief Device Standards- Part 2- Cargo And Portable Tanks For Compressed Gases. |
| CGA S1.3 | Pressure Relief Device Standards- Part 3 -Stationary Storage Containers For Compressed Gases |
| P-14 | Accident Prevention in Oxygen-Rich, Oxygen-Deficient Atmospheres |
| SB-2 | Oxygen-Deficient Atmospheres |
| V-1 | Compressed Gas Cylinder Valve Inlet and Outlet Connections |
| V-6 | Standard Cryogenic Liquid Transfer Connections |
| — | Handbook of Compressed Gases, Fifth Edition |

PREPARATION INFORMATION:

DATE: October 15, 2016
DEPARTMENT: Safety and Environmental Services
TELEPHONE: 905-803-1600

The opinions expressed herein are those of qualified experts within Praxair Canada 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 Canada Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair Canada Inc. requests the users of this product to study this Material Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

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