

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Methane, refrigerated liquid (MSDS No. P-4880-B)	Trade Name: Liquid Methane
Chemical Name: Methane	Synonyms: Methane, cryogenic liquid; natural gas, refrigerated liquid with high methane content
Formula: CH ₄	Chemical Family: Alkane
Telephone: Emergencies: 1-800-645-4633* CHEMTREC: 1-800-424-9300* Routine: 1-800-PRAXAIR	Company Name: Praxair, Inc. 39 Old Ridgebury Road 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. Composition/Information on Ingredients

See section 16 for important information about mixtures.

INGREDIENT	CAS NUMBER	CONCENTRATION	OSHA PEL	ACGIH TLV-TWA (2004)
Methane	74-82-8	>99%*	None currently established	1000 ppm

* The symbol > means "greater than."

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.
Odor: None

THRESHOLD LIMIT VALUE: TLV-TWA, 1000 ppm (ACGIH, 2004). TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION–Asphyxiant. Effects are due to lack of oxygen. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, vomiting, and unconsciousness.

SKIN CONTACT–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: No harm expected.

OTHER EFFECTS OF OVEREXPOSURE: Methane is an asphyxiant. Lack of oxygen can kill.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: The toxicology and the physical and chemical properties of this product suggest that overexposure is unlikely to aggravate existing medical conditions.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: None known.

CARCINOGENICITY: Methane is not listed by NTP, OSHA, 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 105°F (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 thoroughly with warm water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN: *There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

5. Fire Fighting Measures

FLASH POINT (test method):	-306°F (-187.8°C)	
AUTOIGNITION TEMPERATURE:	999°F (537.2°C)	
FLAMMABLE LIMITS IN AIR , % by volume:	LOWER: 5.0%	UPPER: 15%
EXTINGUISHING MEDIA: CO ₂ , 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. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS: 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 125°F (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: Carbon monoxide, carbon dioxide

6. Accidental Release Measures

STEPS TO BE TAKEN: 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.) On-site fire brigades must comply with OSHA 29 CFR 1910.156.

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, state, 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—never in a confined space. Do not store at temperatures above 125°F (52°C). Use adequate pressure relief devices in systems and piping to prevent pressure buildup; entrapped liquid can generate extremely high pressures when vaporized by warming. Separate containers 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. 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.

PRECAUTIONS TO BE TAKEN IN HANDLING: Never allow any unprotected part of your body to touch uninsulated pipes or vessels containing cryogenic fluids. Flesh will stick to the extremely cold metal and will tear when you try to pull free. All piped methane systems and associated equipment must be grounded. Electrical tools must be nonsparking or explosion-proof. Leak-check system with soapy water; never use a flame. If valve is hard to open, discontinue use and contact your supplier. For other precautions in using methane, 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.

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.

RESPIRATORY PROTECTION: None required under normal use. An air-supplied respirator must be used in confined spaces. Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134. Select per OSHA 29 CFR 1910.134 and ANSI Z88.2.

SKIN PROTECTION: Wear loose-fitting, cryogenic gloves.

EYE PROTECTION: Wear safety glasses and a full face shield. Select eye protection in accordance with OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Protective shoes and clothing where needed. Cuffless trousers should be worn outside shoes. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Properties

MOLECULAR WEIGHT:	16.042
EXPANSION RATIO for liquid at boiling point to gas at 60°F (15.6°C):	1 to 627
LIQUID DENSITY at boiling point:	26.57 lb/ft ³ (425.61 kg/m ³)
SPECIFIC GRAVITY (Air = 1) at 60°F (15.6°C) and 1 atm:	0.55491
SOLUBILITY IN WATER:	Slight
PERCENT VOLATILES BY VOLUME:	100
EVAPORATION RATE (Butyl Acetate = 1):	High
BOILING POINT at 1 atm:	-258.68°F (-161.49°C)
MELTING POINT at 1 atm:	-296.46°F (-182.48°C)
APPEARANCE, ODOR, AND STATE: Colorless, odorless cryogenic liquid	

10. Stability and Reactivity

STABILITY: Unstable Stable

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 temperatures exceeding 1292°F (700°C) and in the absence of oxygen or air, methane may decompose to form hydrogen.

HAZARDOUS POLYMERIZATION: May Occur Will Not Occur

CONDITIONS TO AVOID: None known.

11. Toxicological Information

Methane is a simple asphyxiant.

12. Ecological Information

No adverse ecological effects expected. Methane does not contain any Class I or Class II ozone-depleting chemicals. Methane is not listed as a marine pollutant by DOT.

13. Disposal Considerations

WASTE DISPOSAL METHOD: See section 6.

14. Transport Information

DOT/IMO SHIPPING NAME: Methane, refrigerated liquid

HAZARD CLASS: 2.1	IDENTIFICATION NUMBER: UN 1972	PRODUCT RQ: Not applicable
SHIPPING LABEL(s):	FLAMMABLE GAS	
PLACARD (when required):	FLAMMABLE GAS	

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): None

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: None

EHS RQ: None

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: No

REACTIVITY: No

FIRE: Yes

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

This product does not require reporting under Section 313.

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.

Methane is listed as a regulated substance in quantities of 10,000 lb (4536 kg) or greater.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Methane 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.

Methane is not listed in Appendix A as a highly hazardous chemical. However, any process that involves a flammable gas on site in one location in quantities of 10,000 lb (4536 kg) or greater is covered under this regulation unless the gas is used as a fuel.

STATE REGULATIONS:

CALIFORNIA: This product is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: This product 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 pertaining to the transport, storage, and handling of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: *Extremely cold, flammable liquid and gas under pressure. Use only in a closed system.* Use only spark-proof tools and explosion-proof equipment. Keep away from heat, sparks, and open flame. *Use piping and equipment adequately designed to withstand pressures to be encountered.* Avoid materials incompatible with cryogenic use; some metals such as carbon steel may fracture easily at low temperature. To prevent liquid or cold gas from being trapped in piping between valves, equip the piping with pressure relief

devices. Use only transfer lines designed for cryogenic liquids. Praxair recommends piping all vents to the exterior of the building. ***Methane gas can cause rapid suffocation due to oxygen deficiency.*** Always store and use with adequate ventilation. ***Never work on a pressurized system.*** If a leak occurs, follow established procedures for isolation and blow down before attempting any repair. ***Never place a compressed gas cylinder where it may become part of an electrical circuit.***

MIXTURES: When you mix two or more gases or liquefied gases, 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. Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:

HEALTH = 3
 FLAMMABILITY = 4
 INSTABILITY = 0
 SPECIAL = None

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 4.521-3-10⁰ 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.** See CGA pamphlets V-1 and V-6 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, <http://www.cganet.com/Publication.asp>.

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*

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, 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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Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113