

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Methane, refrigerated liquid (MSDS No. P-4880-C)	Trade Names: Liquid Methane
Chemical Name: Methane	Synonyms: Methane, cryogenic liquid; natural gas, refrigerated liquid with high methane content
Chemical Family: Alkane	Product Grades: 1.3, 2.0, 3.7-UHP, 5.0-Research
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. 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.
Under ambient conditions, this is a colorless, odorless gas.**

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. 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. No harm expected.

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.

CARCINOGENICITY: Methane is not listed by NTP, OSHA, or IARC.

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
Methane	74-82-8	>99%*

*The symbol > means "greater than."

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

FLAMMABLE PROPERTIES: Highly flammable, extremely cold liquid and gas.

SUITABLE EXTINGUISHING MEDIA: CO₂, dry chemical, water, spray, or fog

PRODUCTS OF COMBUSTION: Carbon monoxide, carbon dioxide

PROTECTION OF FIREFIGHTERS: 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.

Specific Physical and Chemical Hazards. 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.

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! Extremely cold, flammable liquid and gas under pressure.

Personal Precautions. Forms explosive mixtures with air. 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. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

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. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING: Use only spark-proof tools and explosion-proof equipment. Keep away from heat, sparks, and open flame. ***Methane gas can cause rapid suffocation due to oxygen deficiency.*** 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.

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.

RECOMMENDED PUBLICATIONS: For further information on storage, handling, and use, 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 (2008)
Methane	Not Established.	1000 ppm

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 = Not available.

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 PROTECTIVE EQUIPMENT:

Skin Protection. Wear loose-fitting, cryogenic gloves.

Eye/Face Protection. Wear safety glasses and a full face shield. Select eye protection in accordance with OSHA 29 CFR 1910.133. 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.

Respiratory Protection. A respiratory protection program that meet 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 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 liquid
ODOR:	Odorless
ODOR THRESHOLD:	Not available.
PHYSICAL STATE:	Cryogenic liquid
pH:	Not applicable.
MELTING POINT at 1 atm:	-296.5°F (-182.5°C)

BOILING POINT at 1 atm:	-258.7°F (-161.5°C)
FLASH POINT (test method):	-306°F (-187.8°C)
EXPANSION RATIO for liquid at boiling point to gas at 60°F (15.6°C):	1 to 627
EVAPORATION RATE (Butyl Acetate = 1):	High
FLAMMABILITY:	Flammable
FLAMMABLE LIMITS IN AIR , % by volume:	LOWER: 5.0% UPPER: 15.0%
VAPOR PRESSURE at 68°F (20°C):	Not available.
LIQUID DENSITY at boiling point:	26.57 lb/ft ³ (425.61 kg/m ³)
SPECIFIC GRAVITY (H ₂ O = 1) at 19.4°F (-7°C):	Not available.
SPECIFIC GRAVITY (Air = 1) at 60°F (15.6°C) and 1 atm:	0.56
SOLUBILITY IN WATER 68°F (20°C):	Slight
PARTITION COEFFICIENT: n-octanol/water:	Not available.
AUTOIGNITION TEMPERATURE:	1112°F (600°C)
DECOMPOSITION TEMPERATURE:	Not available.
PERCENT VOLATILES BY VOLUME:	100
MOLECULAR WEIGHT:	16.042
MOLECULAR FORMULA:	CH ₄

10. Stability and Reactivity

CHEMICAL STABILITY: Unstable Stable

INCOMPATIBLE MATERIALS: 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.

POSSIBILITY OF HAZARDOUS REACTIONS: May Occur Will Not Occur

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.

11. Toxicological Information

ACUTE DOSE EFFECTS: Methane is a simple asphyxiant.

STUDY RESULTS: None known.

12. Ecological Information

ECOTOXICITY: No known effects.

OTHER ADVERSE EFFECTS: Methane does not contain any Class I or Class II ozone-depleting chemicals.

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: Methane, refrigerated liquid

HAZARD CLASS:	PACKING GROUP/Zone:	IDENTIFICATION NUMBER:	PRODUCT RQ:
2.1	NA/NA*	UN1972	None

SHIPPING LABEL(s): FLAMMABLE GAS

PLACARD (when required): FLAMMABLE GAS

*NA=Not applicable.

MARINE POLLUTANTS: Methane 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): 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 (40 CFR 355): 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

DELAYED: No

PRESSURE: Yes

REACTIVITY: No

FIRE: Yes

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

Methane is not subject to 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: Methane is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: Methane 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: *Extremely cold, flammable liquid and gas under pressure. Use only in a closed system. 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. 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 = 3

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° 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 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>.

- AV-1 *Safe Handling and Storage of Compressed Gases*
- CGA *Pressure Relief Device Standards- Part 2- Cargo and Portable Tanks for*
- S1.2 *Compressed Gases.*
- CGA *Pressure Relief Device Standards- Part 3 -Stationary Storage Containers for*
- S1.3 *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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