Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Dimethyl ether (MSDS No. P-4589-C)	**Trade Name:** Dimethyl Ether
Chemical Name: Dimethyl ether	**Synonyms:** Methyl ether, methyl oxide, wood ether, oxybismethane
Formula: C_2H_6O	**Chemical Family:** Ether
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	CONCEN-TRATION	OSHA PEL	ACGIH TLV-TWA (2004)
Dimethyl ether	115-10-6	>99%*	None currently established.	None currently established.

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

3. Hazards Identification

EMERGENCY OVERVIEW

DANGER! Flammable liquid and gas under pressure.
Can form explosive mixtures with air.
May cause anesthetic effects.
May irritate skin, eyes, and mucous membranes.
May cause frostbite.
May cause dizziness and drowsiness.
Self-contained breathing apparatus may be required by rescue workers.
Odor: Slightly ethereal

THRESHOLD LIMIT VALUE: TLV-TWA, none currently established (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–Narcotic. May cause incoordination, blurred vision, headache, unconsciousness, and respiratory failure due to depression of the Central Nervous System (CNS). Lack of oxygen can kill.

Revised

SKIN CONTACT–Exposure to liquid dimethyl ether may cause frostbite. If contact with the liquid is prolonged or widespread, the skin may absorb potentially harmful amounts of material.

SWALLOWING–A highly unlikely route of exposure. This product is a gas at normal temperature and pressure, but liquid dimethyl ether may cause frostbite of the lips and mouth. The liquid may also cause incoordination, blurred vision, headache, unconsciousness, and respiratory failure due to depression of the CNS.

EYE CONTACT–Concentrated vapor may irritate the eyes. Liquid may cause frostbite.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: Repeated overexposure of the skin to liquid dimethyl ether can cause cracking and drying. Repeated inhalation may cause loss of appetite, exhaustion, headaches, sleepiness, dizziness, excitation, and psychic disturbances.

OTHER EFFECTS OF OVEREXPOSURE: None known.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: The defatting properties of dimethyl ether on the skin can aggravate an existing dermatitis.

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

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

4. First Aid Measures

INHALATION: 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 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)**:**	-42°F (-41.1°C)	
AUTOIGNITION TEMPERATURE:	662°F (350°C)	
FLAMMABLE LIMITS IN AIR, % by volume**:**	**LOWER:** 3.4%	**UPPER:** 27%

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

SPECIAL FIRE FIGHTING PROCEDURES: DANGER! Flammable liquid and gas under pressure. Evacuate all personnel from danger area. Immediately spray cylinders with water from maximum distance until cool, taking care not to extinguish flames. Remove sources of ignition if without risk. Remove all cylinders from fire area if without risk; continue cooling water spray while moving cylinders. Do not extinguish any flames emitted from cylinders; stop flow of gas if without risk, or allow

flames to burn out. Self-contained breathing apparatus may be required by rescue workers. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Flammable gas. Forms explosive mixtures with air and oxidizing agents. Heat of fire can build pressure in cylinder and cause it to rupture. No part of a cylinder should be subjected to a temperature higher than 125°F (52°C). Dimethyl ether cylinders are equipped with a pressure-relief device. (Exceptions may exist where authorized by DOT.) If venting or leaking dimethyl ether catches fire, do not extinguish flames. Flammable gas may spread from leak, creating an explosive re-ignition 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 appropriate device.

HAZARDOUS COMBUSTION PRODUCTS: CO, CO_2

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: DANGER! Flammable liquid and gas under pressure. Forms explosive mixtures with air. (See section 5.) Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus where needed. Remove all sources of ignition if without risk. Reduce vapors with fog or fine water spray. Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Flammable vapors may spread from leak. Before entering area, especially confined areas, check atmosphere with an appropriate device.

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. Separate dimethyl ether cylinders from oxygen, chlorine, and other oxidizers by at least 20 feet or use a barricade of noncombustible material. This barricade should be at least 5 feet 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.

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. All piped dimethyl ether systems and associated equipment must be grounded. 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 in using dimethyl ether, 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–Use an explosion-proof local exhaust system with sufficient air flow velocity to maintain the oxygen concentration above 19.5% in the worker's breathing zone.

MECHANICAL (general)–Inadequate. See SPECIAL.

SPECIAL–Use only in a closed system.

OTHER–See SPECIAL.

RESPIRATORY PROTECTION: Respirators must be acceptable to MSHA and NIOSH. 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 work gloves for cylinder handling; neoprene where contact with product may occur.

EYE PROTECTION: Select in accordance with OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling; protective clothing where needed. 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:	46.07
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm**:**	1.59
LIQUID DENSITY at 77°F (25°C) and 1 atm**:**	40.9 lb/ft^3 (655 kg/m^3, 0.655 gm/cm^3)
VAPOR PRESSURE at 70°F (21.1°C)**:**	75.4 psia (520 kPa abs)
SOLUBILITY IN WATER:	Moderate
PERCENT VOLATILES BY VOLUME:	100
EVAPORATION RATE (Butyl Acetate = 1)**:**	High
BOILING POINT at 1 atm**:**	-12.71°F (-24.84°C)
MELTING POINT at 1 atm**:**	-222.68°F (-141.49°C)

APPEARANCE, ODOR, AND STATE: Colorless gas at normal temperature and pressure; slightly ethereal odor.

10. Stability and Reactivity

STABILITY: ☐ Unstable ☒ Stable

INCOMPATIBILITY (materials to avoid): Oxidizing agents, halogens, acids, carbon monoxide, aluminum hydride, lithium aluminum hydride

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition or burning of dimethyl ether may produce CO/CO_2. The presence of oxygen or prolonged standing in or exposure to direct sunlight may lead to formation of unstable peroxides, which may explode spontaneously or when heated.

HAZARDOUS POLYMERIZATION: ☐ May Occur ☒ Will Not Occur

CONDITIONS TO AVOID: High temperatures, exposure to sunlight or incompatible materials.

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. This product is not listed as a marine pollutant by DOT.

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:	Dimethyl ether	
HAZARD CLASS: 2.1	**IDENTIFICATION NUMBER:** UN 1033	**PRODUCT RQ:** None
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, nonventilated compartment of a vehicle can present serious safety hazards.

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)].

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: Yes	**REACTIVITY:** No
	FIRE: Yes

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

Dimethyl ether 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.

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

TSCA: TOXIC SUBSTANCES CONTROL ACT: Dimethyl ether 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.

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

PENNSYLVANIA: Dimethyl ether 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: ***Flammable liquid and gas under pressure.*** Use piping and equipment adequately designed to withstand pressures to be encountered. Use only in a closed system. Use only spark-proof tools and explosion-proof equipment. Keep away from heat, sparks, and open flame. ***May cause anesthetic effects.*** Avoid breathing gas. ***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. ***Never work on a pressurized system.*** If there is a leak, blow the system down in an environmentally safe manner in compliance with all federal, state, and local laws; then repair the leak. 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 dimethyl ether.*

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

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	CGA-510
PIN-INDEXED YOKE:	None
ULTRA-HIGH-INTEGRITY CONNECTION:	None

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 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*
P-1	*Safe Handling of Compressed Gases in Containers*
SB-2	*Oxygen-Deficient Atmospheres*
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