

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Octafluorocyclobutane (MSDS No. P-4671-E)	Trade Names: Halocarbon C318
Chemical Name: Octafluorocyclobutane	Synonyms: Cyclooctafluorobutane, halon 48, perfluorocyclobutane, refrigerant gas RC318
Chemical Family: Cyclic	Product Grades: None assigned.
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

CAUTION! Liquid and gas under pressure.

Can cause rapid suffocation.

May cause frostbite.

May cause dizziness and drowsiness.

Self-contained breathing apparatus 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. High concentrations may cause dizziness, nausea, vomiting, disorientation, confusion, incoordination, and narcosis. Lack of oxygen can kill.

Skin Contact. Liquid octafluorocyclobutane may cause frostbite; harmful amounts may be absorbed if skin contact is prolonged or widespread.

Swallowing. 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. Liquid may cause severe corneal injury.

Effects of Repeated (Chronic) Overexposure. No harm expected.

Other Effects of Overexposure. At high concentrations, octafluorocyclobutane may produce cardiac arrhythmias or arrest due to sensitization of the heart to adrenaline and noradrenalin. Exposure to fluorocarbon thermal decomposition products may produce flu-like symptoms including chills, fever, weakness, muscular aches, headache, chest discomfort, sore throat, and dry cough. Complete recovery usually occurs within 24 hours after exposure.

Medical Conditions Aggravated by Overexposure. The toxicology and the physical and chemical properties of octafluorocyclobutane suggest that overexposure is unlikely to aggravate existing medical conditions.

CARCINOGENICITY: Octafluorocyclobutane 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
Octafluorocyclobutane	115-25-3	>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 immediately.

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. Wash clothing before reuse. Discard shoes and leather goods. Call a physician.

SWALLOWING: This product is a gas at normal temperature and pressure.

EYE CONTACT: For contact with the liquid, immediately flush eyes thoroughly with warm water. 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: Do not administer adrenaline; it is contraindicated because of the sensitizing effect of fluorocarbons on the myocardium. There is no specific antidote. Treatment of over-exposure should be directed at the control of symptoms and the clinical condition of the patient. Exposure to fluorocarbon pyrolysis products should be considered in the diagnostic evaluation of occupationally related fever of short duration and unknown origin. Signs of exposure include tachycardia, hyperpnea, and pharyngeal congestion; investigation may reveal pulmonary edema and leucocytosis.

5. Fire Fighting Measures

FLAMMABLE PROPERTIES: Octafluorocyclobutane cannot catch fire.

SUITABLE EXTINGUISHING MEDIA: Octafluorocyclobutane cannot catch fire. Use media appropriate for surrounding fire.

PRODUCTS OF COMBUSTION: Not applicable. Decomposition due to heating may produce toxic fumes. (See section 10.)

PROTECTION OF FIREFIGHTERS: CAUTION! Liquid and gas under pressure. Evacuate all personnel from danger area. Immediately deluge cylinders with water from maximum distance until cool; then move them away from fire area if without risk. Self-contained breathing apparatus may be required by rescue workers. 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. No part of cylinder should be subjected to a temperature higher than 125°F (52°C). Octafluorocyclobutane cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) Reverse flow into cylinder may cause rupture.

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:

CAUTION! Liquid and gas under pressure.

Personal Precautions. Immediately evacuate all personnel from danger area. Octafluorocyclobutane is an asphyxiant – Lack of oxygen can kill. Use self-contained breathing apparatus where needed. Prevent runoff from contaminating surrounding environment. Shut off flow if without risk. Ventilate area of leak or move cylinder to a well-ventilated area. Test for sufficient oxygen, especially in confined spaces, before allowing reentry. Reverse flow into cylinder may cause rupture.

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: Do not get liquid, in eyes, on skin or clothing. Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Wash hands thoroughly after handling fluorocarbons or materials sprayed with them, especially before eating, smoking, or using the toilet. Close valve after each use; keep closed even when empty. **Do not smoke in areas where fluorocarbons are used. Never work on a pressurized system.** 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 octafluorocyclobutane, see section 16.

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation. 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.

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 (2007)
Octafluorocyclobutane	None currently established	None currently established

IDLH = Not available.

ENGINEERING CONTROLS:

Local Exhaust. Preferred. See SPECIAL.

Mechanical (General). Acceptable. See SPECIAL.

Special. Use only in a closed system.

Other. None

PERSONAL PROTECTIVE EQUIPMENT:

Skin Protection. Wear work gloves when handling cylinders; neoprene when changing them out. Metatarsal shoes for cylinder handling. Select in accordance with 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. Select eye protection in accordance with OSHA 29 CFR 1910.133.

Respiratory Protection. For entry into an oxygen-deficient atmosphere, wear a self-contained breathing apparatus operated in the pressure-demand mode. 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.

9. Physical and Chemical Properties

APPEARANCE:	Colorless gas
ODOR:	Odorless
ODOR THRESHOLD:	Not available.
PHYSICAL STATE:	Gas at normal temperature and pressure
pH:	Not applicable.
MELTING POINT at 1 atm:	-40.34°F (-40.19°C)
BOILING POINT at 1 atm:	21.24°F (-5.98°C)
FLASH POINT (test method):	Not available.
EVAPORATION RATE (Butyl Acetate = 1):	High
FLAMMABILITY:	Not applicable.
FLAMMABLE LIMITS IN AIR , % by volume:	LOWER: Not applicable. UPPER: Not applicable.
VAPOR PRESSURE at 70°F (21.1°C):	39.7 psia (273.72 kPa abs)
VAPOR DENSITY at 70°F (21.1°C) and 1 atm:	0.5172 lb/ft ³ (8.284 kg/m ³)
SPECIFIC GRAVITY (H ₂ O = 1) at 19.4°F (-7°C):	Not available.

SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C)

and 1 atm: 6.907

SOLUBILITY IN WATER at 32°F (0°C) and 1 atm: Negligible, slightly hydrolyzed**PARTITION COEFFICIENT: n-octanol/water:** Not available.**AUTOIGNITION TEMPERATURE:** Not applicable.**DECOMPOSITION TEMPERATURE:** Not available.**PERCENT VOLATILES BY VOLUME:** 100**MOLECULAR WEIGHT:** 200.03**MOLECULAR FORMULA:** C₄F₈

10. Stability and Reactivity

CHEMICAL STABILITY: Unstable Stable**CONDITIONS TO AVOID:** None known.**INCOMPATIBLE MATERIALS:** Polystyrene, alloys containing more than 2% magnesium in the presence of water.**HAZARDOUS DECOMPOSITION PRODUCTS:** Thermal decomposition may produce toxic fumes of fluorides, carbon, and carbon tetrafluoride.**POSSIBILITY OF HAZARDOUS REACTIONS:** May Occur Will Not Occur

Thermal decomposition may produce toxic fumes of fluorides, carbon, and carbon tetrafluoride.

11. Toxicological Information

ACUTE DOSE EFFECTS: None known.**STUDY RESULTS:** Octafluorocyclobutane causes mutations in fruit flies; the significance to human health is unknown.

12. Ecological Information

ECOTOXICITY: No adverse ecological effects expected.**OTHER ADVERSE EFFECTS:** Octafluorocyclobutane 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: Octafluorocyclobutane

HAZARD CLASS:	PACKING GROUP/Zone:	IDENTIFICATION NUMBER:	PRODUCT RQ:
2.2	NA*	UN1976	None

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

* NA = Not available.

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)].

MARINE POLLUTANTS: Octafluorocyclobutane 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

PRESSURE: Yes

DELAYED: No

REACTIVITY: No

FIRE: No

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

Octafluorocyclobutane 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.

Octafluorocyclobutane is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Octafluorocyclobutane 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.

Octafluorocyclobutane is not listed in Appendix A as a highly hazardous chemical.

STATE REGULATIONS:

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

PENNSYLVANIA: Octafluorocyclobutane 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: *Liquid and gas under pressure.* Use piping and equipment adequately designed to withstand pressures to be encountered. Use only in a closed system. **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. **Gas can cause rapid suffocation due to oxygen deficiency.** Store and use with adequate ventilation at all times. If there is a leak, close the cylinder valve. Blow the system down in a safe and environmentally sound 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**

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 = 2
FLAMMABILITY = 0
INSTABILITY = 0
SPECIAL = None

HMIS RATINGS:

HEALTH = 1
FLAMMABILITY = 0
PHYSICAL HAZARD = 2

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: CGA-660. (CGA-165, CGA-182 (Limited standard))

PIN-INDEXED YOKE: Not applicable.

ULTRA-HIGH-INTEGRITY CONNECTION: CGA-716

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*
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.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current MSDSs for these products, contact your Praxair sales representative or local distributor or supplier, or download from www.praxair.com. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14151-0044).

Praxair and the *Flowing Airstream* design are trademarks or registered trademarks of Praxair Technology, Inc. in the United States and/or other countries.



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