

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Phosphorus pentafluoride (MSDS No. P-4645-D)	Trade Name: Phosphorus Pentafluoride
Chemical Name: Phosphorus pentafluoride	Synonyms: Pentafluorophosphorane, phosphorus (V) fluoride
Formula: PF ₅	Chemical Family: Inorganic halide
Telephone:	Company Name: Praxair, Inc. 39 Old Ridgebury Road Danbury, CT 06810-5113
Emergencies: 1-800-645-4633*	
CHEMTREC: 1-800-424-9300*	
Routine: 1-800-PRAXAIR	

* 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)
Phosphorus pentafluoride	7647-19-0	>99%*	None currently established**	None currently established**

*The symbol > means "greater than."

**Praxair recommends the TWA of 2.5 mg/m³ for fluorides as F.

3. Hazards Identification

	<p>EMERGENCY OVERVIEW</p> <p>DANGER! Toxic, corrosive high-pressure gas. May be fatal if inhaled.</p> <p>Causes eye, skin, and respiratory tract burns. May cause liver, kidney, and respiratory system damage. Contact with combustible materials may cause fire. Contact with water may cause violent reaction.</p> <p>Self-contained breathing apparatus and protective clothing must be worn by rescue workers.</p> <p>Odor: Irritating</p>	
---	--	---

THRESHOLD LIMIT VALUE: None currently established (ACGIH, 2004).

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION—May be fatal if inhaled at high concentrations. Extremely irritating to the mucous membranes and the upper respiratory tract. May cause coughing, chest pain, pulmonary edema, and death.

SKIN CONTACT—Phosphorus pentafluoride causes burns; pain may be delayed. Skin burns may result in absorption of harmful amounts of material.

SWALLOWING—A highly unlikely route of exposure. This product is a gas at normal temperature and pressure.

EYE CONTACT—Causes burns.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: Repeated overexposure may cause phosphorus necrosis of the jaw, cough, bronchitis, and pneumonia.

OTHER EFFECTS OF OVEREXPOSURE: May cause liver and kidney damage.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Breathing of vapor or mist may aggravate asthma and inflammatory or fibrotic pulmonary disease.

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

CARCINOGENICITY: Phosphorus pentafluoride is not listed by NTP, OSHA, and IARC.

4. First Aid Measures

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. **WARNING: Rescuer could receive chemical burns from giving mouth-to-mouth respiration.** If breathing is difficult, qualified personnel may give oxygen. Call a physician.

SKIN CONTACT: Avoid breathing vapor. Immediately remove contaminated clothing and shoes, and flush skin with plenty of cool water until all acid is removed. Pay particular attention to skin under nails. Call a physician. Soak burned areas with a 0.2% iced alcoholic or aqueous solution of zephiran chloride or Hyamine 1622. If solution is not available, continue washing in cool water for 2 to 4 hours or until medical attention is obtained. Discard contaminated clothing and shoes.

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

EYE CONTACT: Immediately flush eyes with plenty of cool water for 15 to 30 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; direct treatment to control of symptoms and the clinical condition of the patient.*

5. Fire Fighting Measures

FLASH POINT (test method):	Not applicable
AUTOIGNITION TEMPERATURE:	Not applicable
FLAMMABLE LIMITS IN AIR , % by volume:	LOWER: Not applicable UPPER: Not applicable
EXTINGUISHING MEDIA: Phosphorus pentafluoride cannot catch fire. Use media appropriate for surrounding fire. Reacts with water to produce phosphoric acid.	

SPECIAL FIRE FIGHTING PROCEDURES: DANGER! Toxic, corrosive high-pressure gas. (See section 3.) Immediately evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately cool cylinders with water spray from maximum distance; then move them away from fire if without risk. If cylinders are leaking, reduce toxic vapors with water spray or fog. Shut off leak if without risk. Reverse flow into cylinder may cause rupture. (See section 16.) On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Nonflammable, poisonous, corrosive gas. 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). Phosphorus pentafluoride cylinders may be equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) Vapors are extremely irritating and may burn skin and eyes on contact.

HAZARDOUS COMBUSTION PRODUCTS: Not applicable. (See section 10 for products of decomposition.)

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: DANGER! Toxic, corrosive high-pressure gas. Immediately evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Reduce vapors with fog or fine water spray. Reverse flow into cylinder may cause rupture. (See section 16.) Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Prevent runoff from contaminating surrounding environment. Poisonous, corrosive vapors may spread from spill. Before entering area, especially a confined area, 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 away from flammables. 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.

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. 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 phosphorus pentafluoride, see section 16.

For additional information on storage and handling, refer to Compressed Gas Association (CGA) pamphlet P-1, *Safe Handling of Compressed Gases in Containers*, available from the CGA. Refer to section 16 for the address and phone number along with a list of other available publications.

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST—Use a corrosion-resistant local exhaust ventilation system, if necessary, to control the concentration of this product in the worker's breathing zone.

MECHANICAL (general)—Not recommended as a primary ventilation system to control worker's exposure.

SPECIAL—A corrosion-resistant, canopy-type, forced-draft fume hood may be more desirable for certain applications.

OTHER—See SPECIAL.

RESPIRATORY PROTECTION: Select per OSHA 29 CFR 1910.134 and ANSI Z88.2. Use air-supplied respirators or self-contained breathing apparatus where local exhaust ventilation is not adequate to control the worker's exposure to this product. For higher concentrations, a full-face, self-contained breathing apparatus must be worn. Respiratory protection must conform to OSHA 29 CFR 1910.134. Select per OSHA 29 CFR 1910.134 and ANSI Z88.2.

PROTECTIVE GLOVES: Use work gloves for cylinder handling; neoprene during change out or wherever contact with product may occur.

EYE PROTECTION: Wear safety glasses when handling cylinders; vapor-proof goggles and a face shield during cylinder changeout or wherever contact with product may occur. Select per OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling and protective clothing where needed. Select per OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Properties

MOLECULAR WEIGHT:	125.97
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	4.46
GAS DENSITY at 68°F (20°C) and 1 atm:	0.335 lb/ft ³ (5.372 kg/m ³)
VAPOR PRESSURE at 70°F (21.1°C):	414.7 psia (2859 kPa abs)
SOLUBILITY IN WATER:	Reacts
PERCENT VOLATILES BY VOLUME:	100
BOILING POINT at 1 atm:	-120.1°F (-84.5°C)
MELTING POINT at 1 atm:	-136.8°F (-93.8°C)

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

10. Stability and Reactivity

STABILITY: Unstable Stable

INCOMPATIBILITY (materials to avoid): Water, organics, and, at elevated temperatures, alkali metals and alkaline earth metals. In moist air, PF₅ produces acidic hydrogen fluoride vapors.

HAZARDOUS DECOMPOSITION PRODUCTS: Fluorine, phosphorus

HAZARDOUS POLYMERIZATION: May Occur Will Not Occur

CONDITIONS TO AVOID: Can become a catalyst for polymerization.

11. Toxicological Information

LC₅₀ = 255 ppm, 1 hour, rat (estimated at 1/5 HF) (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. Phosphorus pentafluoride 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: Phosphorus pentafluoride

HAZARD CLASS:	IDENTIFICATION NUMBER:	PRODUCT RQ:
2.3	UN 2198	None

SHIPPING LABEL(s): POISON GAS, CORROSIVE*

PLACARD (when required): POISON GAS, CORROSIVE*

**The words in the POISON GAS diamond are INHALATION HAZARD.*

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.

Additional Marking Requirement: INHALATION HAZARD.

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: Yes

FIRE: No

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

Phosphorus pentafluoride is not subject to the reporting requirements of 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.

Phosphorus pentafluoride is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Phosphorus pentafluoride 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.

Phosphorus pentafluoride is not listed in Appendix A.

STATE REGULATIONS:

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

PENNSYLVANIA: Phosphorus pentafluoride 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: *Toxic, corrosive high-pressure gas.* Do not breathe vapors. Do not get vapors in eyes, on skin, or on clothing. (See section 3.) Have safety showers and eyewash fountains immediately available. Use piping and equipment adequately designed to withstand pressures to be encountered. **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. **Store and use with adequate ventilation at all times.** Use only in a closed system constructed of corrosion-resistant materials. Close cylinder valve after each use; keep closed even when empty. **Never work on a pressurized system.** 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. **Follow safe practices when returning cylinder to supplier.** Be sure valve is closed; then install valve outlet plug tightly. **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 phosphorus pentafluoride.*

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	= 4
FLAMMABILITY	= 0
INSTABILITY	= 2
SPECIAL	= None

HMIS RATINGS:

HEALTH	= 4
FLAMMABILITY	= 0
PHYSICAL HAZARD	= 3

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: CGA-330 connection is standard; CGA 66, limited standard.

PIN-INDEXED YOKE: Not applicable

ULTRA-HIGH-INTEGRITY CONNECTION: CGA-642

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>.

P-1	<i>Safe Handling of Compressed Gases in Containers</i>
V-1	<i>Compressed Gas Cylinder Valve Inlet and Outlet Connections</i>
—	<i>Handbook of Compressed Gases, Fourth Edition</i>

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 Praxair 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 other countries.



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