

Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name: Phosphine	Trade Name: Phosphine
Product Use: Many.	
Chemical Name: Phosphine	Synonym: Hydrogen Phosphine, Phosphorus Trihydride, Phosphuretted Hydrogen
Chemical Formula: PH ₃	Chemical Family: Covalent Hydride
Telephone: Emergencies: * 1-800-363-0042	Supplier /Manufacture: Praxair Canada Inc. 1 City Centre Drive Suite 1200 Mississauga, ON L5B 1M2
	Phone: 905-803-1600
	Fax: 905-803-1682

**Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier or Praxair sales representative.*

2. Composition and Information on Ingredients

INGREDIENTS	% (VOL)	CAS NUMBER	LD ₅₀ (Species & Routes)	LC ₅₀ (Rat, 4 hrs.)	TLV-TWA (ACGIH)
Phosphine	100	7803-51-2	Not applicable.	11 ppm	0.3 ppm

3. Hazards Identification



Emergency Overview



DANGER! Toxic, flammable high-pressure liquid and gas. May be fatal if inhaled. Causes irritation of the respiratory tract. May cause dizziness and drowsiness. May cause liver, kidney, heart, nervous system, and respiratory system damage. Symptoms may be delayed. Liquid may cause frostbite. May form explosive mixtures with air. Can ignite on contact with air. Self-contained breathing apparatus must be worn by rescue workers.

ROUTES OF EXPOSURE:

Inhalation. Swallowing. Skin contact. Eye contact.

THRESHOLD LIMIT VALUE: TLV-TWA Data from 2004 Guide to Occupational Exposure Values (ACGIH). 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: Highly toxic. May be fatal if inhaled. Effects include irritation of the respiratory track and lungs, chest pains, difficulties in breathing, fatigue, dizziness, headache, nausea, vomiting, and abdominal pain, diarrhea and collapse. The interval between onset of exposure and symptoms is dependent on the concentration of gas and duration of exposure. Symptoms can be delayed up to 48 hours. STEL: 1 ppm (ACGIH, OSHA)

SKIN CONTACT:

No harm expected from vapour. Liquid may cause frostbite.

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

SWALLOWING:

An unlikely route of exposure, but frostbite of the lips and mouth may result from contact with the liquid. This product is a gas at normal temperature and pressure.

EYE CONTACT:

No harm expected from vapour. Liquid may cause frostbite.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:

When inhaled, phosphine releases inorganic phosphorous. Repeated exposure to phosphorous can result in anemia, bronchitis, and gastrointestinal disturbances.

OTHER EFFECTS OF OVEREXPOSURE:

May cause heart, liver and kidney damage. Central nervous system depression and cardiac arrhythmia may also occur.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:

Breathing of vapour (and/or mist) may aggravate asthma and inflammatory or fibrotic pulmonary disease.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:

None currently known.

CARCINOGENICITY:

Not listed as carcinogen by OSHA, NTP or IARC.

4. First Aid Measures

INHALATION:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately, even if no symptoms are present..

SKIN CONTACT:

If exposed to liquid, avoid breathing vapour. Immediately warm frostbite area with warm water (not to exceed 40 C). In case of massive exposure, remove clothing and shoes while showering with warm water. Get medical attention immediately.

SWALLOWING:

This product is a gas at normal temperature and pressure.

EYE CONTACT:

For contact with the liquid, immediately flush eyes throughly 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:

Phosphine is a severe pulmonary irritant; delayed onset of pulmonary edema can occur. Serious phosphine poisoning produces symptoms within several hours, however, symptoms can be delayed for up to 48 hours. Organs with the greatest oxygen requirements appear to be especially sensitive to damage. There is no specific antidote. Treatment of over-exposure should be directed at the control of symptoms and the clinical condition.

5. Fire Fighting Measures

FLAMMABLE : Yes.	IF YES, UNDER WHAT CONDITIONS?	Forms explosive mixtures with air and oxidizing agents.
FLASH POINT (test method) Flammable gas.	AUTOIGNITION TEMPERATURE	37.7°C (99.9°F)
FLAMMABLE LIMITS IN AIR, % by volume:	LOWER: 1.6	UPPER: 98

EXTINGUISHING MEDIA:

CO₂, dry chemical, water spray or fog.

SPECIAL FIRE FIGHTING PROCEDURES:

DANGER! DANGER: Poisonous gas. Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately cool containers with water spray from maximum distance taking care not to extinguish flames. Solid streams of water may be ineffective. Remove ignition sources if without risk. If flames are accidentally extinguished, explosive re-ignition may occur. Reduce toxic vapours with water spray or fog. Shut off leak if without risk while continuing cooling water spray. Remove containers away from fire area of fire if without risk. Allow fire to burn out.

UNUSUAL FIRE AND EXPLOSION HAZARD:

Toxic, flammable gas. Forms explosive mixtures with air and oxidizing agents. Phosphine may spontaneously ignite in contact with air. The cylinders are not equipped with pressure relief devices to release pressure. Container may rupture due to heat of fire. Do not extinguish flames due to possibility of explosive re-ignition. Flammable and toxic vapours form from this product may travel or be moved by air currents and ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with approved device. No part of a container should be subjected to temperature higher than 52 C. The cylinders are not equipped with pressure relief devices to release pressure. Evacuate the area if the fire cannot be brought under immediate control to protect persons from cylinder rupture and toxic fumes.

HAZARDOUS COMBUSTION PRODUCTS:

Hydrogen, phosphorus and phosphorus oxides.

SENSITIVITY TO IMPACT:

Avoid impact against container.

SENSITIVITY TO STATIC DISCHARGE:

Possible, ground container.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER! Immediately evacuate all personnel from danger area. DANGER: Poisonous, flammable gas. Forms explosive mixtures with air. Use self-contained breathing apparatus and protective clothing where needed. Remove all sources of ignition if without risk. Reduce vapours with fog or fine water spray. Shut off leak if without risk. Ventilate area of leak or move leaking container to well ventilated area. Prevent runoff from contaminating surrounding environment. CAUTION: Poisonous, flammable vapours may spread from spill. Before entering area, especially confined areas, check atmosphere with 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, provincial, 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 flammable cylinders from oxygen, chlorine, and other oxidizers by at least 6.1 m or use a barricade of non-combustible material. This barricade should be at least 1.53 m 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 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, 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.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:

Toxic, flammable high-pressure gas. May be fatal if inhaled. Do not breathe gas. Use only in a closed system. Use piping and equipment adequately designed to withstand pressures to be encountered. Use only spark-proof tools and explosion-proof equipment. Keep away from heat, sparks, and open flame. **May form explosive mixtures with air.** Ground all equipment. Store and use with adequate ventilation. Close valve after each use; keep closed even when empty. **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. **When returning cylinder to supplier,** be sure valve is closed, then install valve outlet plug tightly. **Never work on a pressurized system.** If there is a leak, close the cylinder valve. Vent the system down in a safe and environmentally sound manner in compliance with all federal, provincial, and local laws; then repair the leak. **Never place a compressed gas cylinder where it may become part of an electrical circuit.**

8. Exposure Controls/Personal Protection**VENTILATION/ENGINEERING CONTROLS:**

LOCAL EXHAUST: Use local exhaust ventilation to maintain exposure below the applicable limits.

MECHANICAL (general): Not recommended. Inadequate. See SPECIAL.

SPECIAL: Explosion-proof, corrosion resistant, forced draft fume hood is preferred.

OTHER: Not applicable.

PERSONAL PROTECTION:

RESPIRATORY PROTECTION: For concentrations up to 10 times the applicable exposure limit any NIOSH/MSHA approved supplied air respirator is recommended. Up to 50 times the TLV, a NIOSH/MSHA approved respirator with a full-face piece or self-contained breathing apparatus is recommended. For higher concentration use only self-contained breathing apparatus operated in the pressure demand mode.

SKIN PROTECTION: Neoprene gloves.

EYE PROTECTION: Wear safety glasses when handling cylinders.

Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for cylinder handling. Protective clothing where needed. Cuffless trousers should be worn outside the shoes. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines.

9. Physical and Chemical Properties

PHYSICAL STATE: Gas. (Compressed Gas.)	FREEZING POINT: -133.8°C (-208.8°F)	pH: Not applicable.
BOILING POINT: -87.7°C (-125.9°F)	VAPOUR PRESSURE: 4186 kPa (@ 20°C)	MOLECULAR WEIGHT: 33.998 g/mole
SPECIFIC GRAVITY: LIQUID (Water = 1) Not available.	SOLUBILITY IN WATER: Slight.	
SPECIFIC GRAVITY: VAPOUR (air = 1) 1.18 @ 25 C	EVAPORATION RATE (Butyl Acetate=1): >1 compared to (Butyl Acetate = 1)	COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable.
VAPOUR DENSITY: 0.00141 g/ml 21.1 C	% VOLATILES BY VOLUME: 100% (v/v).	ODOUR THRESHOLD: Not available.

APPEARANCE & ODOUR: Colourless. Odour: Decaying fish.

10. Stability and Reactivity

STABILITY:	Unstable.
CONDITIONS OF CHEMICAL INSTABILITY:	Decomposes at temperatures in excess of 365 C.
INCOMPATIBILITY (materials to avoid):	Halogenated hydrocarbons, oxidizing agents, especially oxygen and halogens, acids, as well as aluminum alloys and copper.
HAZARDOUS DECOMPOSITION PRODUCTS:	Thermal decomposition or burning may produce hydrogen, phosphorous, phosphorus oxides.
HAZARDOUS POLYMERIZATION:	Will not occur.
CONDITIONS OF REACTIVITY:	None known.

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. The components of this mixture are not listed as marine pollutants by TDG Regulations.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

TDG/IMO SHIPPING NAME: Phosphine

HAZARD CLASS:	IDENTIFICATION #:	PRODUCT RQ:
CLASS 2.3: Poisonous gas. C L A S S 2 . 1 : Flammable gas.	UN2199	All

SHIPPING LABEL(s): Poison gas, Flammable gas

PLACARD (when required): Poison gas, 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 vehicle can present serious safety hazards.

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, provincial, and local regulations.

WHMIS (Canada)
 Class A: Compressed gas.
 Class B-1: Flammable gas.
 Class D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
 Class D-2B: Material causing other toxic effects (TOXIC).

International Regulations

EINECS Not available.
DSCL (EEC) R26- Very toxic by inhalation.

International Lists No products were found.

16. Other Information

MIXTURES:

When two or more gases, or liquefied gases are mixed, their hazardous properties may combine to 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 make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

HAZARD RATING SYSTEM:

HMS RATINGS:

HEALTH 4
 FLAMMABILITY 4
 PHYSICAL HAZARD 2

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: CGA-350
PIN-INDEXED YOKE: Not available.

**ULTRA-HIGH-INTEGRITY
CONNECTION:**

CGA-632

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 and V-7 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, Fax (703) 961-1831, website: www.cganet.com.

AV-1 Safe Handling and Storage of Compressed Gas
P-1 Safe Handling of Compressed Gases in Containers
V-1 Compressed Gas Cylinder Valve Inlet and Outlet Connections
V-7 Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures
--- Handbook of Compressed Gases, Fourth Edition

PREPARATION INFORMATION:

DATE: 10/15/2004
DEPARTMENT: Safety and Environmental Services
TELEPHONE: 905-803-1600

The opinions expressed herein are those of qualified experts within Praxair Canada 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 Canada Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair Canada Inc. requests the users of this product to study this Material Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

Praxair and the *Flowing Airstream* design are trademarks of
Praxair Canada Inc.

Other trademarks used herein are trademarks or registered trademarks of their respective owners.



Praxair Canada Inc.
1 City Centre Drive
Suite 1200
Mississauga, ON L5B 1M2