

Praxair™ Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name:	Hydrogen Chloride (MSDS No. P-4606-C)	Trade Name:	Hydrogen Chloride
Chemical Name:	Hydrogen Chloride	Synonyms:	Anhydrous Hydrochloric Acid
Formula:	HCl	Chemical Family:	Inorganic Acid Anhydride
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

For custom mixtures of this product request a Material Safety Data Sheet for each component. See Section 16 for important information about mixtures.

INGREDIENT NAME	CAS NUMBER	PERCENTAGE	OSHA PEL	ACGIH TLV
Hydrogen Chloride	7647-01-0	>99*	5 ppm ceiling	5 ppm ceiling

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

3. Hazards Identification

EMERGENCY OVERVIEW



DANGER! Toxic, corrosive, high-pressure liquid and gas.
May cause liver damage.
Can cause eye, skin, and respiratory tract burns.
Self-contained breathing apparatus must be worn by rescue workers.
Odor: Pungent, suffocating



THRESHOLD LIMIT VALUE: 5 ppm ceiling ACGIH 1997. Note: Ceiling limits are *not* Time Weighted Average (TWA).

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION—Overexposure to vapor concentrations moderately above the Threshold Limit Value (TLV) of 5 ppm irritates the upper respiratory tract. Concentrations ranging from 50-100 ppm are intolerable. High concentrations (e.g., greater than 50 ppm) cause choking, coughing, burning of the throat, and severe irritation of respiratory tract, with possible ulceration of the nose, throat, and larynx, laryngeal spasm, pulmonary edema, and general lung injury. Exposure to concentrations of 1500-2000 ppm is life-threatening. Liver and kidney injury has been reported after exposure to vapors.

SKIN CONTACT—Hydrogen chloride gas may severely irritate the skin, causing chemical burns with ulceration and scarring. Repeated exposure to vapors may produce dermatitis. With prolonged or widespread contact, the skin may absorb harmful amounts of material.

SWALLOWING—Highly toxic. May cause chemical burns of the mouth, throat, esophagus, and stomach, with severe pain, nausea, diarrhea, vomiting, dizziness, weakness, and collapse.

EYE CONTACT—Exposure to the eye causes immediate pain and irritation with excess tear production and closure of the eyelids. The severity of injury depends on the concentration and duration of contact and may range from slight excess redness and irritation of the conjunctiva to total corneal opacification and blindness.

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: Prolonged or repeated exposure to vapor may discolor or erode the teeth, cause the nose and gums to bleed, and ulcerate the nasal mucosa..

OTHER EFFECTS OF OVEREXPOSURE: None known.

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

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

CARCINOGENICITY: Hydrogen Chloride is not listed by NTP, OSHA, and 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. Keep victim warm. Seek medical attention promptly.

SKIN CONTACT: Immediately flush skin with plenty of water while removing contaminated clothing and shoes. Discard clothing and shoes.

SWALLOWING: Rinse mouth with water. Give two glasses of water. Do not induce vomiting. Call a physician.

EYE CONTACT: Immediately flush eyes thoroughly with 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: *Keep victims of overexposure under medical observation for 24-48 hours. The hazards of this material are mainly due to its severely irritant and corrosive properties on skin and mucosal surfaces. There is no specific antidote, and treatment should be directed at the control of symptoms and the clinical condition.*

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: Hydrogen Chloride cannot catch fire. Use media appropriate for surrounding fire, but note incompatibilities in section 10.

SPECIAL FIRE FIGHTING PROCEDURES:

DANGER! Toxic, corrosive, high-pressure liquid and gas (see section 3). Immediately evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus, protective clothing, and eye protection. 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 cylinders may cause rupture. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION 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). Hydrogen Chloride cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) Liquid and vapors are extremely irritating and may burn skin and eyes on contact. Contact with most metals in the presence of moisture produces flammable hydrogen.

HAZARDOUS COMBUSTION PRODUCTS: None known.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER! Corrosive, toxic, high-pressure liquid and gas (see section 3). 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. Shut off flow if without risk. Ventilate area or move cylinder to a well-ventilated area. Prevent runoff from contaminating surrounding environment. Toxic, corrosive vapors may spread from spill. Before entering area, especially a confined area, check atmosphere with an appropriate device. Reverse flow into cylinder may cause rupture.

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. 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 hydrogen chloride, 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 system with sufficient air flow to keep the hydrogen chloride concentration below the TLV 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 preferred for some applications.

OTHER—None

RESPIRATORY PROTECTION: Use air-supplied respirators for concentrations up to 10 times the applicable permissible exposure limit. For higher concentrations, a full-face, self-contained breathing apparatus operated in the pressure demand mode is required. Select per OSHA 29 CFR 1910.134 and ANSI Z88.2.

PROTECTIVE GLOVES: Wear work gloves for cylinder handling. Neoprene where needed.

EYE PROTECTION: Wear safety glasses when handling cylinders; vapor-proof goggles where needed. 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: 36.465	EXPANSION RATIO: Not applicable
SPECIFIC GRAVITY (air=1): At 68°F (20°C) and 1 atm: 1.268	SOLUBILITY IN WATER: At 32°F (0°C) and 1 atm, wt/wt solution: .823
GAS DENSITY: At 70°F (21.1°C) and 1 atm: 0.0950 lb/ft ³ (1.522 kg/m ³)	VAPOR PRESSURE: At 70°F (21.1°C): 613 psig (4227 kPa abs)
PERCENT VOLATILES BY VOLUME: 100	EVAPORATION RATE (Butyl Acetate=1): High
BOILING POINT (1 atm): -121°F (-85°C)	pH: Not applicable
MELTING POINT (1 atm): -173.6°F (-114.2°C)	

APPEARANCE, ODOR, AND STATE: Colorless gas at normal temperature and pressure; pungent, suffocating odor. Produces white fumes in moist air

10. Stability and Reactivity

STABILITY:	Unstable		Stable	X
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INCOMPATIBILITY (materials to avoid): Bases, unsaturated organics, most common metals and their alloys, fluorine, metal carbides, metal acetylides, potassium permanganate, sulfuric acid

HAZARDOUS DECOMPOSITION PRODUCTS: Decomposition may produce hydrogen and chlorine or chlorides.

HAZARDOUS POLYMERIZATION:	May Occur		Will Not Occur	X
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CONDITIONS TO AVOID: None known.

11. Toxicological Information

See section 3. One-hour rat LC₅₀ value for hydrogen chloride is 3120 ppm.

12. Ecological Information

Hydrogen Chloride does not contain any Class I or Class II ozone-depleting chemicals. Hydrogen Chloride is not listed as a marine pollutant by DOT.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Keep waste from contaminating surrounding environment. Keep personnel away. Do not dispose of unused quantities. Return cylinder to supplier.

14. Transport Information

DOT/IMO SHIPPING NAME: Hydrogen chloride, anhydrous	HAZARD CLASS: 2.3
IDENTIFICATION NUMBER: UN 1050	PRODUCT RQ: 5000 lbs (2270 Kg)
SHIPPING LABEL(s): TOXIC GAS, CORROSIVE	PLACARD (When required): TOXIC GAS, CORROSIVE

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): 5000 lbs (2270 kg)

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 (40 CFR Part 355):

Threshold Planning Quantity (TPQ): 500 lbs (227 kg)

Extremely Hazardous Substances (40 CFR 355): None

- **SECTIONS 311/312:** Require submission of Material Safety Data Sheets (MSDSs) and chemical inventory reporting with identification of EPA hazard categories. The hazard categories for this products 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.

Hydrogen Chloride requires 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.

Hydrogen Chloride is listed as a regulated substance in quantities of 5000 lbs (2270 kg) or greater.

TSCA: Toxic Substances Control Act: Hydrogen Chloride 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.

Hydrogen Chloride is listed in Appendix A as a highly hazardous chemical in quantities of 5000 pounds (2270 kg) or greater.

STATE REGULATIONS:

CALIFORNIA: This product is not listed by California under the Safe Drinking Water Toxic Enforcement Act of 1986 (Proposition 65).

PENNSYLVANIA: This product 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: *Corrosive, poisonous, high-pressure liquid and gas.* Do not breathe gas. Do not get vapors or liquid 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 sealed, pressure-tight system designed to prevent escape of product to the air. This system must be constructed of corrosion-resistant materials. Close 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 an environmentally safe manner in compliance with all federal, state, and local laws, then repair the leak. **Never ground a compressed gas cylinder or allow it to become part of an electrical circuit.**

Recommended Equipment: In semiconductor process gas and other suitable applications, Praxair recommends the use of engineering controls such as gas cabinet enclosures, automatic gas panels (used to purge systems on cylinder changeout), excess-flow valves throughout the gas distribution system, double containment for the distribution system, and continuous gas monitors.

NOTE: *Prior to using any plastics, confirm their compatibility with hydrogen chloride.*

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	= 0
REACTIVITY	= 0
SPECIAL	None

HMIS RATINGS:

HEALTH	= 1
FLAMMABILITY	= 0
REACTIVITY	= 0

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED: CGA-330 connection is standard.

PIN-INDEXED YOKE: Not applicable

ULTRA-HIGH-INTEGRITY CONNECTION: CGA-634

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 referenced on the label for this product; you may also obtain copies by calling 1-800-PRAXAIR. Further information about hydrogen chloride can be found

in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 1725 Jefferson Davis Highway, Arlington, VA 22202-4102, Telephone (703) 412-0900.

- AV-1 *Safe Handling and Storage of Compressed Gases*
- P-1 *Safe Handling of Compressed Gases in Containers*
- V-1 *Compressed Gas Cylinder Valve Inlet and Outlet Connections*
--- *Handbook of Compressed Gases, Third Edition*

Praxair asks users of this product to study this Material Safety Data Sheet (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 on 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. 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 14150-7891).

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