Hydrogen fluoride

Safety Data Sheet E-4608

according to the Hazardous Products Regulation (February 11, 2015)

Date of issue: 10-15-1979 Revision date: 07-28-2023 Supersedes: 01-01-2021 Version: 1.1

SECTION 1: Identification

1.1. Product identifier

Product form	:	Substance
Trade name	:	Hydrogen fluoride
CAS No	:	7664-39-3
Formula	:	HF
Other means of identification	:	Hydrogen fluoride
Product group	:	Core Products

1.2. Recommended use and restrictions on use

Recommended uses and restrictions	:	Industrial use,Use as directed.

1.3. Supplier

Linde Canada inc.
500 — 5015 Spectrum Way
Mississauga - Canada L4W 0E4
T 1-905-803-1600 - F 1-905-803-1682
www.lindecanada.ca

1.4. Emergency telephone number

Emergency number : 1-800-363-0042
Call emergency number 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product.
For routine information, contact your supplier or Linde sales representative.

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

GHS-CA classification

Gases under pressure : Compressed gas	H280
Acute toxicity (inhalation:gas) Category 3	H331
Acute toxicity (dermal), Category 1	H310
Skin corrosion/irritation, Category 1A	H314

2.2. GHS Label elements, including precautionary statements

GHS-CA labelling

Hazard pictograms :

GHS04 GHS06 GHS05

Signal word : DANGER

Hazard statements : CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
TOXIC IF INHALED
FATAL IN CONTACT WITH SKIN
CAUSES SEVERE SKIN BURNS AND EYE DAMAGE
SYMPTOMS MAY BE DELAYED
CORROSIVE TO THE RESPIRATORY TRACT (This statement supercedes H335)

Precautionary statements : Do not handle until all safety precautions have been read and understood
Avoid breathing vapours
Do not get in eyes, on skin, or on clothing.
Do not eat, drink or smoke when using this product
Use and store only outdoors or in a well-ventilated area.

Wear protective gloves, protective clothing, eye protection, respiratory protection, and/or face protection.
Store locked up
Dispose of contents/container in accordance with container Supplier/owner instructions
Protect from sunlight when ambient temperature exceeds 52°C (125°F).
Use a back flow preventive device in the piping.
Close valve after each use and when empty.
Use only with equipment rated for cylinder pressure.
Do not open valve until connected to equipment prepared for use.
Use only with equipment of compatible materials of construction and rated for cylinder pressure.
Read and follow the Safety Data Sheet (SDS) before use.

2.3. Other hazards

Other hazards which do not result in classification : None.

2.4. Unknown acute toxicity (GHS CA)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	CAS No.	% (Vol.)	Common Name (synonyms)
Hydrogen fluoride (Main constituent)	(CAS No) 7664-39-3	100	Hydrogen fluoride / Hydrogen fluoride, anhydrous / Hydrofluoric acid, anhydrous

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : If not breathing, give artificial respiration, with supplemental oxygen given by qualified personnel. If breathing is difficult, qualified personnel should give oxygen. Call a physician. WARNING: To avoid possible chemical burns, the rescuer should avoid breathing any exhaled air from the victim.

First-aid measures after skin contact : In case of contact, immediately flush affected areas with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash clothing before reuse. Discard contaminated shoes.

,Pay particular attention to skin under the nails,
Soak burned areas in ice and, if available, an aqueaous solution of 0.2% benzethonium chloride (aka Hyamine 1622 solution) or zephiran chloride (aka bezalkonium chloride solution) Alternatively, Apply calcium gluconate cream to affected areas on the skin.
,
If none of the recommended solutions is available, continue washing in cool water until medical attention arrives. If cream is not available and immersion is impractical, soaked compresses of either solution should be applied to the area.
,The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.

First-aid measures after 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. Contact an ophthalmologist immediately.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/injuries : No additional information available

Symptoms/injuries after inhalation	:	Overexposure to vapor concentrations moderately above the Threshold Limit Value (TLV) of 3 ppm irritates the upper respiratory tract. Concentrations ranging around 120 ppm for 1 minute result in intolerable irritation of the eyes and respiratory tract. High concentrations cause choking, coughing, burning of the throat, and severe irritation of the respiratory tract, with possible pulmonary edema (fluid on the lungs), general lung injury, bronchitis, and death. Symptoms may progress for 1-2 days and gradually diminish over 2-3 months.

4.3. Immediate medical attention and special treatment, if necessary

Other medical advice or treatment	:	Obtain medical assistance. SYMPTOMS MAY BE DELAYED.

SECTION 5: Fire-fighting measures

5.1. Suitable extinguishing media

Suitable extinguishing media	:	Use extinguishing media appropriate for surrounding fire.

5.2. Unsuitable extinguishing media

No additional information available

5.3. Specific hazards arising from the hazardous product

Fire hazard	:	Not flammable.
Reactivity in case of fire	:	No reactivity hazard other than the effects described in sub-sections below.

5.4. Special protective equipment and precautions for fire-fighters

Firefighting instructions	:	Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with their provincial and local fire code regulations.
Special protective equipment for fire fighters	:	Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
Other information	:	Cylinders are **NOT** equipped with a pressure relief valve.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	:	**DANGER: Toxic. Corrosive.** Wear a self-contained breathing apparatus and appropriate personal protective equipment (PPE). (gas tight, chemical-protective) Evacuate personnel to a safe area. Approach suspected leak area with caution. Remove all sources of ignition. Toxic, corrosive vapor can spread from spill. Ventilate area or move container to a well-ventilated area. Before entering the area, especially a confined area, check the atmosphere with an appropriate device.

6.2. Methods and materials for containment and cleaning up

Methods for cleaning up	:	Try to stop release. Reduce vapour with fog or fine water spray. Prevent waste from contaminating the surrounding environment. Prevent soil and water pollution. Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Do not breathe gas/vapour. Avoid all contact with skin, eyes, or clothing. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. 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. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store in a cool, well-ventilated place. Store and use with adequate ventilation. Store only where temperature will not exceed 52 °C (125 °F). Firmly secure containers upright to keep them from falling or being knocked over. Install valve protection cap firmly in place by hand. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods.

OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Hydrogen fluoride (7664-39-3)		
USA - ACGIH	ACGIH OEL TWA [ppm]	0.5 ppm
USA - ACGIH	ACGIH OEL C [ppm]	2 ppm
USA - OSHA	OSHA PEL TWA [2]	3 ppm
Canada (Quebec)	Plafond (OEL C)	2.6 mg/m³
Canada (Quebec)	Plafond (OEL C) [ppm]	3 ppm
Alberta	OEL C	1.6 mg/m³
Alberta	OEL C [ppm]	2 ppm
Alberta	OEL TWA	0.4 mg/m³
Alberta	OEL TWA [ppm]	0.5 ppm
British Columbia	OEL C [ppm]	2 ppm
Manitoba	OEL C [ppm]	2 ppm
Manitoba	OEL TWA [ppm]	0.5 ppm
New Brunswick	OEL C	2.3 mg/m³
New Brunswick	OEL C [ppm]	3 ppm
New Foundland & Labrador	OEL C [ppm]	2 ppm
New Foundland & Labrador	OEL TWA [ppm]	0.5 ppm
Nova Scotia	OEL C [ppm]	2 ppm
Nova Scotia	OEL TWA [ppm]	0.5 ppm
Nunavut	OEL C [ppm]	2 ppm

Hydrogen fluoride (7664-39-3)		
Nunavut	OEL TWA [ppm]	0.5 ppm
Northwest Territories	OEL C [ppm]	2 ppm
Northwest Territories	OEL TWA [ppm]	0.5 ppm
Ontario	OEL C [ppm]	2 ppm
Ontario	OEL TWA [ppm]	0.5 ppm
Prince Edward Island	OEL C [ppm]	2 ppm
Prince Edward Island	OEL TWA [ppm]	0.5 ppm
Québec	Plafond (OEL C)	2.6 mg/m³
Québec	Plafond (OEL C) [ppm]	3 ppm
Saskatchewan	OEL C [ppm]	2 ppm
Saskatchewan	OEL TWA [ppm]	0.5 ppm
Yukon	OEL STEL	2 mg/m³
Yukon	OEL STEL [ppm]	3 ppm
Yukon	OEL TWA	2 mg/m³
Yukon	OEL TWA [ppm]	3 ppm

8.2. Appropriate engineering controls

Appropriate engineering controls : Use a corrosion-resistant local exhaust ventilation system with sufficient air flow velocity to maintain concentration below all applicable exposure limits in the worker's breathing zone. Mechanical (General): Not recommended as a primary ventilation system to control worker's exposure. A canopy-type, forced-draft fume hood is preferred.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment : Safety glasses. Face shield. Gloves.

Hand protection : Natural rubber (NR) /. Neoprene rubber (HNBR). Nitrile rubber (NBR).

Eye protection : Wear goggles and a face shield when transfilling or breaking transfer connections. Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.

Respiratory protection : **Respiratory protection:** Use air supplied respirator when working in confined space or where local exhaust or ventilation does not keep exposure below OEL (if applicable). Select in accordance with provincial regulations, local bylaws or guidelines. Respirators should also be approved by NIOSH and MSHA. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).

Thermal hazard protection : Wear cold insulating gloves when transfilling or breaking transfer connections.

Other information : **Other protection :** Safety shoes for general handling at customer sites. Metatarsal shoes and cuffless trousers for cylinder handling at packaging and filling plants. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines. For working with flammable and oxidizing materials, consider the use of flame resistant anti-static safety clothing.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

(a) Physical state : Gas

(b) Colour : Colourless. Gives off white fumes in moist air.

(c) Odour : sharp. penetrating.

Odour threshold : No data available

(d) Melting point : -83.36 °C (-118.05 °F)

Freezing point : No data available

(e) Boiling point : 19.5 °C (67.14 °F)

(f) Flammability : Non flammable

(g) Flammability (solid, gas)	:	
(h) Flash point	:	Not applicable.
(i) Auto-ignition temperature	:	Not applicable.
(j) Decomposition temperature	:	No data available
(k) pH	:	If dissolved in water pH-value will be affected.
(l) Viscosity, kinematic	:	Not applicable.
(m) Solubility	:	Water: Completely soluble.
(n) Partition coefficient – n-octanol/water [log Pow/log Kow]	:	Not applicable for inorganic gases.
(o) Vapour pressure	:	1.03 bar (15 psia) (at 20°C (68 °F))
(p) Density	:	
Relative gas density	:	1.85 (air = 1) (at 25 °C (77 °F) and 1 atm)
(r) Particle characteristics	:	No data available
(s) Molecular mass	:	20 g/mol
(t) Critical temperature	:	188 °C (370.4 °F)
(u) Critical pressure	:	64.8 bar 64
(v) Oxidizing properties	:	None.
(w) Relative evaporation rate (butylacetate=1)	:	No data available
Relative evaporation rate (ether=1)	:	Not applicable.

9.2. Other information

Additional information : None.

SECTION 10: Stability and reactivity

Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	May occur.
Conditions to avoid	:	Avoid moisture in installation systems.
Incompatible materials	:	Reacts with most metals in the presence of moisture, liberating hydrogen, an extremely flammable gas. With water causes rapid corrosion of some metals. Reacts with water to form corrosive acids. May react violently with alkalis. Moisture. For additional information on compatibility refer to ISO 11114.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Likely routes of exposure : Inhalation

11.2 Symptoms related to the physical, chemical, and toxicological characteristics : No additional information available

11.3 Delayed and immediate effects and chronic effects

Acute toxicity (oral)	:	Not classified
Acute toxicity (dermal)	:	FATAL IN CONTACT WITH SKIN.
Acute toxicity (inhalation)	:	TOXIC IF INHALED.
Skin corrosion/irritation	:	CAUSES SEVERE SKIN BURNS. pH: If dissolved in water pH-value will be affected.

Serious eye damage/irritation	:	Assumed to cause serious eye damage pH: If dissolved in water pH-value will be affected.
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	Not classified
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified

11.4 Toxicity

Hydrogen fluoride (\f)7664-39-3	
LC50 inhalation rat (ppm)	1276 ppm/1h
ATE CA (Gases)	638 ppmv/4h

SECTION 12: Ecological information

12.1. Toxicity

Hydrogen fluoride (7664-39-3)	
EC50 - Crustacea [1]	270 mg/l (Exposure time: 48 h - Species: Daphnia species)

12.2. Persistence and degradability

Hydrogen fluoride (7664-39-3)	
Persistence and degradability	Not applicable for inorganic gases.

12.3. Bioaccumulative potential

Hydrogen fluoride (7664-39-3)	
BCF - Fish [1]	(no bioaccumulation)
Log Pow	Not applicable for inorganic gases.
Log Kow	Not applicable.
Bioaccumulative potential	No data available.

12.4. Mobility in soil

Hydrogen fluoride (7664-39-3)	
Mobility in soil	No data available.
Log Pow	Not applicable for inorganic gases.
Log Kow	Not applicable.
Ecology - soil	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5. Other adverse effects

Other adverse effects	:	May cause pH changes in aqueous ecological systems.
Effect on the ozone layer	:	None.
Effect on global warming	:	No known effects from this product.

SECTION 13: Disposal considerations

Waste treatment methods	:	Do not attempt to dispose of residual or unused quantities. Return container to supplier.
Product/Packaging disposal recommendations	:	Do not attempt to dispose of residual or unused quantities. Return container to supplier.

SECTION 14: Transport information

14.1. Basic shipping description

In accordance with TDG

TDG

UN-No. (TDG)	:	UN1052
Packing group	:	I - Great Danger
TDG Primary Hazard Classes	:	8 - Class 8 - Corrosives
TDG Subsidiary Classes	:	6.1
Proper shipping name	:	HYDROGEN FLUORIDE, ANHYDROUS
ERAP Index	:	1 000
Explosive Limit and Limited Quantity Index	:	0
Passenger Carrying Ship Index	:	Forbidden
Passenger Carrying Road Vehicle or Passenger Carrying Railway Vehicle Index	:	Forbidden

14.2. Air and sea transport

IMDG

UN-No. (IMDG)	:	1052
Proper Shipping Name (IMDG)	:	HYDROGEN FLUORIDE, ANHYDROUS
Class (IMDG)	:	8 - Corrosive substances
Packing group (IMDG)	:	I - substances presenting high danger
Subsidiary risk (IMDG)	:	(6.1)
MFAG-No	:	125

IATA

UN-No. (IATA)	:	1052
Proper Shipping Name (IATA)	:	Hydrogen fluoride, anhydrous
Class (IATA)	:	8 - Corrosives
Subsidiary risk (IATA)	:	(6.1)

SECTION 15: Regulatory information

15.1. National regulations

Hydrogen fluoride (7664-39-3)

Listed on the Canadian DSL (Domestic Substances List)

15.2. International regulations

Hydrogen fluoride (7664-39-3)

Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the United States TSCA (Toxic Substances Control Act) inventory
Japanese Poisonous and Deleterious Substances Control Law
Japanese Pollutant Release and Transfer Register Law (PRTR Law)
Listed on INSQ (Mexican National Inventory of Chemical Substances)

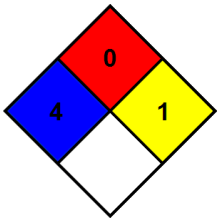
SECTION 16: Other information

Date of issue	:	15/10/1979
Revision date	:	28/07/2023
Supersedes	:	01/01/2021

Indication of changes:

Training advice	:	Users of breathing apparatus must be trained. Ensure operators understand the toxicity hazard.
Other information	:	When you mix two or more chemicals, 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. Before using any plastics, confirm their compatibility with this product. Linde Canada asks users of this product to study this SDS and become aware of the 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 SDS 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 Linde Canada Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Linde Canada Inc, it is the user's obligation to determine the conditions of safe use of the product. Linde Canada Inc, SDSs are furnished on sale or delivery by Linde Canada Inc, or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your Linde sales representative, local distributor, or supplier, or download from www.lindecanada.ca.

NFPA health hazard	:	4 - Very short exposure could cause death or serious residual injury even though prompt medical attention was given.
NFPA fire hazard	:	0 - Materials that will not burn.
NFPA instability	:	1 - Normally stable, but can become unstable at elevated temperatures and pressures or may react with water with some release of energy, but not violently.



HMIS III Rating

Health	:	3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given
Flammability	:	0 Minimal Hazard - Materials that will not burn
Physical	:	2 Moderate Hazard - Materials that are unstable and may undergo violent chemical changes at normal temperature and pressure with low risk for explosion. Materials may react violently with water or form peroxides upon exposure to air.

SDS Canada (GHS) - Linde NEW

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.