Safety Data Sheet

Hydrogen fluoride

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878
Reference number: 070
Revision date: 14/03/2023
Supersedes version of: 21/07/2021
Version: 7.0

Danger

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Trade name	:	Hydrogen fluoride
SDS no	:	070
Other means of identification	:	Hydrogen fluoride
		CAS-No. : 7664-39-3
		EC-No. : 231-634-8
		EC Index-No. : 009-002-00-6
REACH registration No	:	01-2119458860-33
Chemical formula	:	HF

1.2. Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	:	Industrial and professional uses. Perform risk assessment prior to use. Test gas/Calibration gas. Chemical reaction / Synthesis. Laboratory use. Use for manufacture of electronic/photovoltaic components. Contact supplier for more information on uses. Industrial use. Perform risk assessment prior to use.
Uses advised against	:	Consumer use. Uses other than those listed above are not supported, contact your supplier for more information on other uses.

1.3. Details of the supplier of the safety data sheet

Company identification	:	SOL SpA Via G. Borgazzi 27 20900 MONZA - Italia T +39 039 23.96.1 http:\\www.sol.it msds@sol.it
E-Mail address (competent person)	:	msds@sol.it

1.4. Emergency telephone number

Emergency telephone number	:	Linea verde SET - 800452661 (24h/24h, 365 giorni l'anno); Dall'estero +39 0283421263

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Health hazards	Acute toxicity (oral), Category 2	H300
	Acute toxicity (dermal), Category 1	H310
	Skin corrosion/irritation, Category 1, Sub-Category 1A	H314
	Serious eye damage/eye irritation, Category 1	H318
	Acute toxicity (inhalation:gas) Category 2	H330

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP) :

GHS05 GHS06

Signal word (CLP) : Danger

Hazard statements (CLP) : H314 - Causes severe skin burns and eye damage.
H300 - Fatal if swallowed.
H310 - Fatal in contact with skin.
H330 - Fatal if inhaled.
EUH071 - Corrosive to the respiratory tract.

Precautionary statements (CLP)

- Prevention : P280 - Wear eye protection, face protection, protective clothing, protective gloves.
P260 - Do not breathe gas, vapours.
P262 - Do not get in eyes, on skin, or on clothing.

- Response : P303+P361+P353+P315 - IF ON SKIN : (or hair) Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Get immediate medical advice / attention.
P304+P340+P315 - IF INHALED : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice / attention.
P305+P351+P338+P315 - IF IN EYES : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice / attention.

- Storage : P405 - Store locked up.
P403 - Store in a well-ventilated place.

2.3. Other hazards

Not classified as PBT or vPvB.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	%	Product identifier	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Hydrogen fluoride	100	CAS-No.: 7664-39-3 EC-No.: 231-634-8 EC Index-No.: 009-002-00-6 REACH registration No: 01-2119458860-33	Acute Tox. 2 (Oral), H300 Acute Tox. 1 (Dermal), H310 Skin Corr. 1A, H314 Eye Dam. 1, H318 Acute Tox. 2 (Inhalation:gas), H330

Contains no other components or impurities which will influence the classification of the product.

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- Inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.

- Skin contact	:	In case of skin contact, wearing rubber gloves rub 2.5% calcium gluconate gel continuously into the affected area for 1.5 hours or until further medical care is available. Remove contaminated clothing. Drench affected area with water for at least 15 minutes.
- Eye contact	:	Immediately flush eyes thoroughly with water for at least 15 minutes.
- Ingestion	:	Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

Prolonged exposure to small concentrations may result in pulmonary oedema.
May cause severe chemical burns to skin and cornea. Suitable first-aid treatment should be immediately available. Seek medical advice before using product.
Delayed adverse effects possible.
Material is destructive to tissue of the mucuous membranes and upper respiratory tract.
Cough, shortness of breath, headache, nausea.
See section 11.

4.3. Indication of any immediate medical attention and special treatment needed

Obtain medical assistance.
Treat with corticosteroid spray as soon as possible after inhalation.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media	:	Water spray or fog. Product does not burn, use fire control measures appropriate for the surrounding fire.
- Unsuitable extinguishing media	:	Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

Specific hazards	:	Exposure to fire may cause containers to rupture/explode.
Hazardous combustion products	:	None that are more hazardous than the product itself.

5.3. Advice for firefighters

Specific methods	:	Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems. If possible, stop flow of product. Use water spray or fog to knock down fire fumes if possible. Move containers away from the fire area if this can be done without risk.
Special protective equipment for fire fighters	:	Wear gas tight chemically protective clothing in combination with self contained breathing apparatus. Standard EN 943-2: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Gas-tight chemical protective suits for emergency teams. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel	:	Act in accordance with local emergency plan. Try to stop release. Evacuate area. Ensure adequate air ventilation. Stay upwind. See section 8 of the SDS for more information on personal protective equipment.
For emergency responders	:	Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Use chemically protective clothing. Monitor concentration of released product. See section 5.3 of the SDS for more information.

6.2. Environmental precautions

Reduce vapour with fog or fine water spray.
Try to stop release.

6.3. Methods and material for containment and cleaning up

Hose down area with water.
Wash contaminated equipment or sites of leaks with copious quantities of water.

6.4. Reference to other sections

See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Safe use of the product : Use only lubricants and sealings approved for the specific gas service.
The product must be handled in accordance with good industrial hygiene and safety procedures.
Only experienced and properly instructed persons should handle gases under pressure.
Consider pressure relief device(s) in gas installations.
Ensure the complete gas system was (or is regularily) checked for leaks before use.
Do not smoke while handling product.
Avoid exposure, obtain special instructions before use.
Avoid contact with aluminium.
Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt.
Installation of a cross purge assembly between the container and the regulator is recommended.
Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service.
Avoid suck back of water, acid and alkalis.
Do not breathe gas.
Avoid release of product into work area.

Safe handling of the gas receptacle : Refer to supplier's container handling instructions.
Do not allow backfeed into the container.
Protect containers from physical damage; do not drag, roll, slide or drop.
When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders.
Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use.
If user experiences any difficulty operating valve discontinue use and contact supplier.
Never attempt to repair or modify container valves or safety relief devices.
Damaged valves should be reported immediately to the supplier.
Keep container valve outlets clean and free from contaminants particularly oil and water.
Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
Close container valve after each use and when empty, even if still connected to equipment.
Never attempt to transfer gases from one cylinder/container to another.
Never use direct flame or electrical heating devices to raise the pressure of a container.
Do not remove or deface labels provided by the supplier for the identification of the content of the container.
Suck back of water into the container must be prevented.
Open valve slowly to avoid pressure shock.

7.2. Conditions for safe storage, including any incompatibilities

Observe all regulations and local requirements regarding storage of containers.
Containers should not be stored in conditions likely to encourage corrosion.
Container valve guards or caps should be in place.
Containers should be stored in the vertical position and properly secured to prevent them from falling over.
Stored containers should be periodically checked for general condition and leakage.
Keep container below 50°C in a well ventilated place.
Store containers in location free from fire risk and away from sources of heat and ignition.
Keep away from combustible materials.
EIGA recommends a pressure check be conducted every two years for continued storage of unused product. Excess pressure must be vented through an appropriate scrubber system.
If user wishes to return cylinder after two years, please contact your supplier for return.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Hydrogen fluoride (7664-39-3)	
EU - Indicative Occupational Exposure Limit (IOEL)	
Local name	Hydrogen fluoride
IOEL TWA	1.5 mg/m³
IOEL TWA [ppm]	1.8 ppm
IOEL STEL	2.5 mg/m³
IOEL STEL [ppm]	3 ppm
Regulatory reference	COMMISSION DIRECTIVE 2000/39/EC
Italy - Occupational Exposure Limits	
Local name	Acido fluoridrico
OEL TWA	1.5 mg/m³
OEL TWA [ppm]	1.8 ppm
OEL STEL	2.5 mg/m³
OEL STEL [ppm]	3 ppm
Regulatory reference	Allegato XXXVIII del D.Lgs. 9 aprile 2008, n. 81 e s.m.i.

Hydrogen fluoride (7664-39-3)	
DNEL: Derived no effect level (Workers)	
Acute - local effects, inhalation	2.5 mg/m³
Acute - systemic effects, inhalation	2.5 mg/m³
Long-term - local effects, inhalation	1.5 mg/m³
Long-term - systemic effects, inhalation	1.5 mg/m³

Hydrogen fluoride (7664-39-3)	
PNEC: Predicted no effect concentration	
Aqua (freshwater)	0.9 mg/l
Aqua (marine water)	0.9 mg/l
Soil, agricultural	11 mg/kg dwt
Micro-organisms in sewage treatment plant (STP)	51 mg/l

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Product to be handled in a closed system and under strictly controlled conditions.
Provide adequate general and local exhaust ventilation.
Preferably use permanent leak-tight installations (e.g. welded pipes).
Systems under pressure should be regularly checked for leakages.
Ensure exposure is below occupational exposure limits (where available).
Gas detectors should be used when toxic gases may be released.
Consider the use of a work permit system e.g. for maintenance activities.

8.2.2. Individual protection measures, e.g. personal protective equipment

A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk.
The following recommendations should be considered:
PPE compliant to the recommended EN/ISO standards should be selected.

• Eye/face protection :
Wear goggles and a face shield when transfilling or breaking transfer connections.
Standard EN 166 - Personal eye-protection - specifications.
Provide readily accessible eye wash stations and safety showers.

• Skin protection

- Hand protection :
Wear working gloves when handling gas containers.
Wear chemically resistant protective gloves.
Standard EN 388 - Protective gloves against mechanical risk, performance level 1 or higher.
Standard EN 374 - Protective gloves against chemicals.
Permeation time: minimum >480min long term exposure: material / thickness [mm]
Fluoroelastomer (FKM) 0,7.
Consult glove manufacturer´s product information on material suitability and material thickness.
The breakthrough time of the selected gloves must be greater than the intended use period.

- Other :
Keep suitable chemically resistant protective clothing readily available for emergency use.
Standard EN943-1 - Full protective suits against liquid, solid and gaseous chemicals.
Wear safety shoes while handling containers.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

• Respiratory protection :
Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known.
Use gas filters with full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.
Recommended: Filter E (yellow).
Gas filters do not protect against oxygen deficiency.
Standard EN 14387 - Gas filter(s), combined filter(s) and standard EN136, full face masks .
Keep self contained breathing apparatus readily available for emergency use.
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.

• Thermal hazards :
None in addition to the above sections.

8.2.3. Environmental exposure controls

Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance		
- Physical state at 20°C / 101.3kPa	:	Gas.
- Colour	:	Gives off white fumes in moist air. Colourless.
Odour	:	Pungent. Odour threshold is subjective and inadequate to warn of overexposure.
Melting point / Freezing point	:	-83 °C -83 °C
Boiling point	:	19.5 °C
Flammability	:	Non flammable.
Lower explosion limit	:	Not available
Upper explosion limit	:	Not available
Flash point	:	Not applicable for gases and gas mixtures.
Auto-ignition temperature	:	Non flammable.
Decomposition temperature	:	Not applicable.
pH	:	If dissolved in water pH-value will be affected.
Viscosity, kinematic	:	No reliable data available.
Water solubility [20°C]	:	Not available
Partition coefficient n-octanol/water (Log Kow)	:	Not available
Vapour pressure [20°C]	:	1 bar(a)
Vapour pressure [50°C]	:	Not applicable.
Density and/or relative density	:	Not applicable.
Relative vapour density (air=1)	:	Lighter or similar to air.
Particle characteristics	:	Not applicable.

9.2. Other information

9.2.1. Information with regard to physical hazard classes

Explosive properties	:	Not applicable.
Explosion limits	:	Non flammable.
Oxidising properties	:	Not applicable.
Critical temperature [°C]	:	188 °C

9.2.2. Other safety characteristics

Molar mass	:	20 g/mol
Evaporation rate	:	Not applicable for gases and gas mixtures.
Other data	:	Considered heavier than air because of hydrogen bonding between molecules. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

No reactivity hazard other than the effects described in sub-sections below.

10.4. Conditions to avoid

Avoid moisture in installation systems.

10.5. Incompatible materials

May react violently with alkalis.
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.
Moisture.
For additional information on compatibility refer to ISO 11114.

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity : Fatal if inhaled.
Fatal in contact with skin.

LC50 Inhalation - Rat [ppm]	483 ppm/4h

Skin corrosion/irritation : Causes severe skin burns and eye damage.

Serious eye damage/irritation : Causes serious eye damage.

Respiratory or skin sensitisation : No known effects from this product.

Germ cell mutagenicity : No known effects from this product.

Carcinogenicity : No known effects from this product.

Toxic for reproduction : Fertility : No known effects from this product.

Toxic for reproduction : unborn child : No known effects from this product.

STOT-single exposure : Severe corrosion to the respiratory tract at high concentrations.

Target organ(s) : Respiratory system.

STOT-repeated exposure : No known effects from this product.

Target organ(s) : Cardiovascular system.
Central nervous system.
Kidneys.
liver.
Respiratory system.

Aspiration hazard : Not applicable for gases and gas mixtures.

11.2. Information on other hazards

Other information : Absorption of excessive fluorides can result in acute systemic fluorosis with hypocalcemia, interference with various metabolic functions and organ damage (heart, liver, kidneys).

SECTION 12: Ecological information

12.1. Toxicity

Assessment : Classification criteria are not met.

EC50 48h - Daphnia magna [mg/l] : 97 - 352 mg/l
EC50 72h - Algae [mg/l] : 43 - 122 mg/l
LC50 96 h - Fish [mg/l] : 51 - 340 mg/l

12.2. Persistence and degradability

Assessment : Not applicable for inorganic products.

12.3. Bioaccumulative potential

Assessment : No data available.

12.4. Mobility in soil

Assessment : Because of its high volatility, the product is unlikely to cause ground or water pollution. Partition into soil is unlikely.

12.5. Results of PBT and vPvB assessment

Assessment : Not classified as PBT or vPvB.

12.6. Endocrine disrupting properties

Assessment :

12.7. Other adverse effects

Other adverse effects : May cause pH changes in aqueous ecological systems.
Effect on the ozone layer : No effect on the ozone layer.
Effect on global warming : No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Contact supplier if guidance is required.
Must not be discharged to atmosphere.
Gas may be scrubbed in alkaline solution under controlled conditions to avoid violent reaction.
Ensure that the emission levels from local regulations or operating permits are not exceeded.
Refer to the EIGA code of practice Doc.30 "Disposal of Gases", downloadable at http://www.eiga.org for more guidance on suitable disposal methods.
Return unused product in original container to supplier.

List of hazardous waste codes (from Commission Decision 2000/532/EC as amended) : 16 05 04 *: Gases in pressure containers (including halons) containing hazardous substances.

13.2. Additional information

External treatment and disposal of waste should comply with applicable local and/or national regulations.

SECTION 14: Transport information

14.1. UN number or ID number

In accordance with ADR / RID / IMDG / IATA / ADN
UN-No. : 1052

14.2. UN proper shipping name

Transport by road/rail (ADR/RID) : HYDROGEN FLUORIDE, ANHYDROUS
Transport by air (ICAO-TI / IATA-DGR) : Hydrogen fluoride, anhydrous
Transport by sea (IMDG) : HYDROGEN FLUORIDE, ANHYDROUS

14.3. Transport hazard class(es)

Labelling :

8 : Corrosive substances.
6.1 : Toxic substances.

Transport by road/rail (ADR/RID)
Class : 8
Classification code : CT1
Hazard identification number : 886
Tunnel Restriction : C/D - Tank carriage : Passage forbidden through tunnels of category C, D and E. Other carriage : Passage forbidden through tunnels of category D and E

Transport by sea (IMDG)

Class / Div. (Sub. risk(s))	:	8 (6.1)
Emergency Schedule (EmS) - Fire	:	F-C
Emergency Schedule (EmS) - Spillage	:	S-U

14.4. Packing group

Transport by road/rail (ADR/RID)	:	I - substances presenting high danger.
Transport by air (ICAO-TI / IATA-DGR)	:	Not applicable.
Transport by sea (IMDG)	:	I - substances presenting high danger.

14.5. Environmental hazards

Transport by road/rail (ADR/RID)	:	None.
Transport by air (ICAO-TI / IATA-DGR)	:	None.
Transport by sea (IMDG)	:	None.

14.6. Special precautions for user

Packing Instruction(s)

Transport by road/rail (ADR/RID)	:	P200.
Transport by air (ICAO-TI / IATA-DGR)		
Passenger and Cargo Aircraft	:	Forbidden.
Cargo Aircraft only	:	Forbidden.
Transport by sea (IMDG)	:	P200.

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment.
Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.
Before transporting product containers:
- Ensure there is adequate ventilation.
- Ensure that containers are firmly secured.
- Ensure valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.

14.7. Maritime transport in bulk according to IMO instruments

Not applicable.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

EU-Regulations

Restrictions on use	:	None.
Other information, restriction and prohibition regulations	:	Not listed on the PIC list (Regulation EU 649/2012).
Seveso Directive : 2012/18/EU (Seveso III)	:	Listed.

National regulations

Regulatory reference	:	Ensure all national/local regulations are observed.

15.2. Chemical safety assessment

A CSA has been carried out.

SECTION 16: Other information

Indication of changes	:	Revised safety data sheet in accordance with commission regulation (EU) No 2015/830.

Abbreviations and acronyms	:	ATE - Acute Toxicity Estimate. CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008. REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006. EINECS - European Inventory of Existing Commercial Chemical Substances. CAS# - Chemical Abstract Service number. PPE - Personal Protection Equipment. LC50 - Lethal Concentration to 50 % of a test population. RMM - Risk Management Measures. PBT - Persistent, Bioaccumulative and Toxic. vPvB - Very Persistent and Very Bioaccumulative. STOT- SE : Specific Target Organ Toxicity - Single Exposure. CSA - Chemical Safety Assessment. EN - European Standard. UN - United Nations. ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road. IATA - International Air Transport Association. IMDG code - International Maritime Dangerous Goods. RID - Regulations concerning the International Carriage of Dangerous Goods by Rail. WGK - Water Hazard Class. STOT - RE : Specific Target Organ Toxicity - Repeated Exposure. UFI : Unique Formula Identifier.
Training advice	:	Users of breathing apparatus must be trained. Ensure operators understand the toxicity hazard.
Further information	:	Classification in accordance with the procedures and calculation methods of Regulation (EC) 1272/2008 (CLP). Key literature references and sources of data are maintained in EIGA doc 169 : 'Classification and Labelling Guide', downloadable at http://www.Eiga.eu .

Full text of H- and EUH-statements	
Acute Tox. 1 (Dermal)	Acute toxicity (dermal), Category 1
Acute Tox. 2 (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 2
Acute Tox. 2 (Oral)	Acute toxicity (oral), Category 2
EUH071	Corrosive to the respiratory tract.
Eye Dam. 1	Serious eye damage/eye irritation, Category 1
H300	Fatal if swallowed.
H310	Fatal in contact with skin.
H314	Causes severe skin burns and eye damage.
H318	Causes serious eye damage.
H330	Fatal if inhaled.
Skin Corr. 1A	Skin corrosion/irritation, Category 1, Sub-Category 1A

DISCLAIMER OF LIABILITY : Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.
Details given in this document are believed to be correct at the time of going to press.
Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

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