

**Fluorine****057****SECTION 1. Identification of the substance/mixture and of the company/undertaking****1.1. Product identifier**

Trade name : Fluorine  
SDS Nr : 057  
Chemical description : Fluorine  
CAS No : 7782-41-4  
EC No : 231-954-8  
Index No : 009-001-00-0  
Registration-No. : Registration deadline not expired.  
Chemical formula : F<sub>2</sub>

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

Relevant identified uses : Industrial and professional. Perform risk assessment prior to use.  
Test gas / Calibration gas.  
Chemical reaction / Synthesis.  
Contact supplier for more uses information.  
Use for manufacture of electronic/photovoltaic components.  
Laser gas.  
Uses advised against : Consumer use

**1.3. Details of the supplier of the safety data sheet**

Company identification : AIR LIQUIDE Deutschland GmbH  
Hans-Günther-Sohl-Straße 5  
D-40235 Düsseldorf GERMANY  
Telefon: +49 (0)211 6699-0 - Fax: +49 (0)211 6699-222  
E-Mail address (competent person) : Info.SDB@AirLiquide.de

**1.4. Emergency telephone number**

Emergency telephone number : +49 (0)2151 398668  
- Availability : ( 24 / 7 )

**SECTION 2. Hazards identification****2.1. Classification of the substance or mixture****Hazard Class and Category Code(s), Regulation (EC) No 1272/2008 (CLP)**

- Health hazards : Acute toxicity, Inhalation - Category 1 - Danger - (CLP : Acute Tox. 1) - H330  
Skin corrosion - Category 1A - Danger - (CLP : Skin Corr. 1A) - H314
- Physical hazards : Oxidizing gases - Category 1 - Danger - (CLP : Ox. Gas 1) - H270  
Gases under pressure - Compressed gas - Warning - (CLP : Press. Gas) - H280

**Classification EC 67/548 or EC 1999/45**

Classification : O; R8  
T+; R26  
C; R35

**2.2. Label elements****Labelling Regulation EC 1272/2008 (CLP)**

- Hazard pictograms





# SAFETY DATA SHEET in accordance with REACH regulation 1907/2006/EC

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**Fluorine****057****SECTION 2. Hazards identification (continued)**

- Hazard pictograms code : GHS06 - GHS03 - GHS05 - GHS04
- Signal words : Danger
- Hazard statements : H270 - May cause or intensify fire; oxidizer.  
H280 - Contains gas under pressure; may explode if heated.  
H330 - Fatal if inhaled.  
H314 - Causes severe skin burns and eye damage.
- Supplemental hazard information : EUH071 - Corrosive to respiratory tract.
- Precautionary statements
  - Prevention : P260 - Do not breathe gas, vapours.  
P280 - Wear protective gloves, protective clothing, eye protection, face protection.  
P244 - Keep valves and fittings free from oil and grease  
P220 - Keep away from combustible materials.
  - Response : 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.  
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.  
P370+P376 - In case of fire : Stop leak if safe to do so.
  - Storage : P403 - Store in a well-ventilated place.  
P405 - Store locked up.

**2.3. Other hazards**

Other hazards : None.

**SECTION 3. Composition/information on ingredients****3.1. Substance / 3.2. Mixture**

Substance.

Substance name	Content [Vol-%]	CAS No EC No Index No Registration no.	Classification(DSD)	Classification(CLP)
Fluorine	: 100 %	7782-41-4 231-954-8 009-001-00-0 *2	O; R8 T+; R26 C; R35	Acute Tox. 1 (H330) Ox. Gas 1 (H270) Skin Corr. 1A (H314) Press. Gas (H280)

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

\* 1: Listed in Annex IV / V REACH, exempted from registration.

\* 2: Registration deadline not expired.

\* 3: Registration not required: Substance manufactured or imported &lt; 1t/y

Full text of R-phrases see chapter 16. Full text of H-statements see chapter 16

**Fluorine****057****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. Apply artificial respiration 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**

- : May cause severe chemical burns to skin and cornea. Suitable first-aid treatment should be immediately available. Seek medical advice before using product. Prolonged exposure to small concentrations may result in pulmonary oedema. Delayed adverse effects possible. Refer to 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. Fire-fighting measures****5.1. Extinguishing media**

- Suitable extinguishing media : Water spray or fog.
- 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. Supports combustion.
- Hazardous combustion products : None that are more toxic than the product itself.

**5.3. Advice for firefighters**

- Specific methods : If possible, stop flow of product. Use fire control measures appropriate to 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. Use water spray or fog to knock down fire fumes if possible.
- Special protective equipment for fire fighters : Gas tight chemically protective clothing in combination with self contained breathing apparatus. Standard EN 137 - self-contained open-circuit compressed air breathing apparatus with full face mask. EN 943-2: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Gas-tight chemical protective suits for emergency teams.

**Fluorine****057****SECTION 6. Accidental release measures****6.1. Personal precautions, protective equipment and emergency procedures**

- : Ensure adequate air ventilation.
- Eliminate ignition sources.
- Evacuate area.
- Gas tight chemically protective clothing in combination with self contained breathing apparatus.
- Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
- Try to stop release.
- Monitor concentration of released product.

**6.2. Environmental precautions**

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

**6.3. Methods and material for containment and cleaning up**

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

**6.4. Reference to other sections**

- 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 no oil or grease.
- Passivate all equipment and pipework before introducing gas. Contact supplier for passivation procedure.
- Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt.
- Avoid exposure, obtain special instructions before use.
- Do not smoke while handling product.
- Keep equipment free from oil and grease.
- Avoid suck back of water, acid and alkalis.
- Only experienced and properly instructed persons should handle gases under pressure.
- Ensure the complete gas system was (or is regularly) checked for leaks before use.
- Installation of a cross purge assembly between the cylinder 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.
- The product must be handled in accordance with good industrial hygiene and safety procedures.
- Consider pressure relief device(s) in gas installations.

**Safe handling of the gas receptacle**

- : Open valve slowly to avoid pressure shock.
- Refer to supplier's container handling instructions.
- Do not allow backfeed into the container.
- Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
- Protect cylinders from physical damage; do not drag, roll, slide or drop.
- Do not remove or deface labels provided by the supplier for the identification of the cylinder contents.
- 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 cylinder valve discontinue use and contact supplier.

**Fluorine****057****SECTION 7. Handling and storage (continued)**

Close container valve after each use and when empty, even if still connected to equipment.  
Never attempt to repair or modify container valves or safety relief devices.  
Keep container valve outlets clean and free from contaminants particularly oil and water.  
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.  
Damaged valves should be reported immediately to the supplier.

**7.2. Conditions for safe storage, including any incompatibilities**

**Storage** : Keep container below 50°C in a well ventilated place.  
Segregate from flammable gases and other flammable materials in store. Store containers in location free from fire risk and away from sources of heat and ignition. Stored containers should be periodically checked for general condition and leakage.  
Observe all regulations and local requirements regarding storage of containers.  
Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. Container valve guards or caps should be in place. Keep away from combustible materials.

**7.3. Specific end use(s)**

: None.

**SECTION 8. Exposure controls/personal protection****8.1. Control parameters****Occupational Exposure Limits**

**Fluorine** : ILV (EU) - 8 H - [mg/m<sup>3</sup>] : 1.58  
: ILV (EU) - 8 H - [ppm] : 1  
: ILV (EU) - 15 min - [mg/m<sup>3</sup>] : 3.16  
: ILV (EU) - 15 min - [ppm] : 2  
: AGW (8h) - Germany [mg/m<sup>3</sup>] TRGS 900 : 1  
: AGW (8h) - Germany [ppm] TRGS 900 : 1.6  
: Exceeding factor AGW - Germany TRGS 900 : 2

**DNEL: Derived no effect level (Workers)**

: None available.

**PNEC: Predicted no effect concentration**

: None available.

**8.2. Exposure controls****8.2.1. Appropriate engineering controls**

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

**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  
Wear safety glasses with side shields  
Provide readily accessible eye wash stations and safety showers.  
Standard EN 166 - Personal eye-protection.

**- Hand protection**

: Standard EN 374 - Protective gloves against chemicals.  
Wear working gloves when handling gas containers.  
Standard EN 388 - Protective gloves against mechanical risk.  
Wear chemical resistant protective gloves.

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**SECTION 8. Exposure controls/personal protection (continued)**

- 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.  
Chloroprene rubber (CR) /  
Fluoroelastomer (FKM) /
- Other : Keep suitable chemically resistant protective clothing readily available for emergency use.  
Keep suitable chemically resistant protective clothing readily available for emergency use.  
Wear safety shoes while handling containers.  
Standard EN ISO 20345 Personal protective equipment - Safety footwear.  
Standard EN943-1 - Full protective suits against liquid, solid and gaseous chemicals.
  - Respiratory protection : Keep self contained breathing apparatus readily available for emergency use.  
Use gas filters and full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers.  
Gas filters do not protect against oxygen deficiency.  
Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known.  
Standard EN 14387 - gas filter(s), combined filter(s) and full face mask - EN 136.  
Consult respiratory device supplier's product information for the selection of the appropriate device.  
Standard EN 137 - self-contained open-circuit compressed air breathing apparatus with full face mask.  
Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems.  
Recommended: Filter B (grey)
  - Thermal hazards : None necessary.
- 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 : Colourless.
  - Odour : Pungent.
  - Odour threshold : Odour threshold is subjective and inadequate to warn for overexposure.
  - pH value : If dissolved in water pH-value will be affected.
  - Molar mass [g/mol] : 38
  - Melting point [°C] : -220
  - Boiling point [°C] : -188
  - Critical temperature [°C] : -129
  - Flash point [°C] : Not applicable for gases and gas-mixtures.
  - Evaporation rate (ether=1) : Not applicable for gases and gas-mixtures.
  - Flammability range [vol% in air] : Non flammable.
  - Vapour pressure [20°C] : Not applicable.
  - Relative density, gas (air=1) : 1.3
  - Relative density, liquid (water=1) : 1.5
  - Solubility in water [mg/l] : No reliable data available.
  - Partition coefficient n-octanol/water [log Pow] : Not applicable for inorganic gases.

**Fluorine****057****SECTION 9. Physical and chemical properties (continued)**

Auto-ignition temperature [°C] : Not applicable.  
Oxidising properties : Oxidiser.  
- Coefficient of oxygen equivalency ( : 40  
Ci) ISO10156:

**9.2. Other information**

Other data : Gas/vapour heavier than air. 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**

: Violently oxidises organic material.

**10.4. Conditions to avoid**

: Avoid moisture in installation systems.

**10.5. Incompatible materials**

: May react violently with alkalis.  
May react violently with combustible materials.  
May react violently with reducing agents.  
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 toxicological effects**

Acute toxicity : Absorption of excessive F- can result in acute systemic fluorosis with hypocalcemia, interference with various metabolic functions and organ damage (heart, liver, kidneys).  
Rat inhalation LC50 [ppm/4h] : 92.5  
Skin corrosion/irritation : Causes severe burns.  
Serious eye damage/irritation : Severe corrosion to the eyes at high concentrations.  
Respiratory or skin sensitisation : No known effects from this product.  
Carcinogenicity : No known effects from this product.  
Germ cell mutagenicity : No known effects from this product.  
Reproductive toxicity : No known effects from this product.  
STOT-single exposure : Severe corrosion to the respiratory tract at high concentrations.  
STOT-repeated exposure : No known effects from this product.

**Fluorine****057****SECTION 11. Toxicological information (continued)**

Aspiration hazard : Not applicable for gases and gas-mixtures.

**SECTION 12. Ecological information****12.1. Toxicity**

: No data available.

**12.2. Persistence and degradability**

: Not applicable for inorganic gases.

**12.3. Bioaccumulative potential**

: No data available.

**12.4. Mobility in soil**

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

**12.5. Results of PBT and vPvB assessment**

: No data available.

**12.6. Other adverse effects**:  
: May cause pH changes in aqueous ecological systems.  
Effect on ozone layer : None.  
Effect on the global warming : No known effects from this product.**SECTION 13. Disposal considerations****13.1. Waste treatment methods**: Gas may be scrubbed in alkaline solution under controlled conditions to avoid violent reaction. Must not be discharged to atmosphere. Refer to the code of practice of EIGA (Doc. 30/10 "Disposal of Gases, downloadable at <http://www.eiga.org>) for more guidance on suitable disposal methods

List of hazardous waste : 16 05 04: Gases in pressure containers (including halons) containing dangerous substances.

**13.2. Additional information**

: None.

**SECTION 14. Transport information**

UN number : 1045

Labelling ADR, IMDG, IATA

: 5.1 : Oxidizing substances.  
2.3 : Toxic gas.  
8 : Corrosive substance.**Land transport (ADR/RID)**

H.I. nr : --



**Fluorine****057****SECTION 14. Transport information (continued)**

UN proper shipping name : FLUORINE, COMPRESSED  
Transport hazard class(es) : 2  
Classification code : 1 TOC  
Packing Instruction(s) : P200  
Tunnel Restriction : D : Passage forbidden through tunnels of category D and E.  
Environmental hazards : None.

**Sea transport (IMDG)**

Proper shipping name : FLUORINE, COMPRESSED  
Class : 2.3  
Emergency Schedule (EmS) - Fire : F-C  
Emergency Schedule (EmS) - Spillage : S-W  
Packing instruction : P200  
IMDG-Marine pollutant : No  
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not applicable.

**Air transport (ICAO-TI / IATA-DGR)**

Proper shipping name (IATA) : FLUORINE, COMPRESSED  
Class : 2.3  
Passenger and Cargo Aircraft : DO NOT LOAD IN PASSENGER AIRCRAFT.  
Cargo Aircraft only : FORBIDDEN.

**Special precautions for user**

: - Ensure there is adequate ventilation.  
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 that containers are firmly secured.  
- Ensure cylinder 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.  
Avoid transport on vehicles where the load space is not separated from the driver's compartment.

**SECTION 15. Regulatory information****15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture****EU legislation**

Restrictions on use : None.  
Seveso directive 96/82/EC : Listed.

**National legislation**

: Ensure all national/local regulations are observed.  
- 4. BImSchV : Listed.  
- Water hazard class WGK (Germany) : 1 - schwach wassergefährdend  
- Other regulations and technical rules : [German regulations]  
(not complete) GefahrstoffV, BetriebssicherheitsV, BGR Regel 500 Teil 2.33: Umgang mit Gasen, Technische Regel Gase TRG 280, Technische Regeln Gefährliche Stoffe TRGS 400, 500, 510, 900.



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#### SECTION 15. Regulatory information (continued)

##### 15.2. Chemical safety assessment

: This product is either exempt from REACH, does not meet the minimum volume threshold for a CSR or the CSA has not yet been carried out.

#### SECTION 16. Other information

- Indication of changes** : Revised safety data sheet in accordance with commission regulation (EU) No 453/2010
- Training advice** : Users of breathing apparatus must be trained.  
Ensure operators understand the toxicity hazard.
- List of full text of R-phrases in section 3.** : R8 : Contact with combustible material may cause fire.  
R26 : Very toxic by inhalation.  
R35 : Causes severe burns.
- List of full text of H-statements in section 3.** : H270 - May cause or intensify fire; oxidizer.  
H280 - Contains gas under pressure; may explode if heated.  
H314 - Causes severe skin burns and eye damage.  
H330 - Fatal if inhaled.
- Note** : This Safety Data Sheet has been established in accordance with the applicable European Union legislation.
- 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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