SAFETY DATA SHEET

SOLKANE® 227, SOLKAFLAM ® 227

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

1.1 Product identifier

- Trade name: SOLKANE® 227, SOLKAFLAM ® 227
- Chemical name: 1,1,1,2,3,3,3-heptafluoropropane
- Synonyms: HFC-227
- Molecular formula: C3HF7

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

- Uses of the Substance / Mixture
  - Refrigerant
  - Foaming agent
  - Fire extinguishing agent

1.3 Details of the supplier of the safety data sheet

Company
SOLVAY FLUORIDES, LLC
3737 Buffalo Speedway,
Suite 800,
Houston, TX 77098
USA
Tel: 800-515-6065

1.4 Emergency telephone

FOR EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT CONTACT: CHEMTREC 800-424-9300 within the United States and Canada, or 703-527-3887 for international collect calls.

SECTION 2: Hazards identification

Although WHMIS has not adopted the environmental portion of the GHS regulations, this document may include information on environmental effects

2.1 Classification of the substance or mixture

Hazardous Products Regulations (WHMIS 2015)

Gases under pressure, Liquefied gas

H280: Contains gas under pressure; may explode if heated.

2.2 Label elements

Hazardous Products Regulations (WHMIS 2015)

Pictogram

Signal Word
- Warning

Hazard Statements
- H280 Contains gas under pressure; may explode if heated.
Precautionary Statements

**Storage**
- P410 + P403 Protect from sunlight. Store in a well-ventilated place.

**Disposal**
- 

2.3 Other hazards which do not result in classification

- Liquefied gas
- Hazardous decomposition products formed under fire conditions.
- Gaseous hydrogen fluoride (HF).

### SECTION 3: Composition/information on ingredients

#### 3.1 Substance

**WHMIS Hazardous Ingredients and Impurities**

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Identification number</th>
<th>Concentration [% wt/wt or V/V]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,1,2,3,3,3-Heptafluoropropane</td>
<td>431-89-0</td>
<td>≥ 99 - ≤ 100</td>
</tr>
</tbody>
</table>

#### 3.2 Mixture

Not applicable, this product is a substance.

### SECTION 4: First aid measures

#### 4.1 Description of first-aid measures

**In case of inhalation**
- Remove to fresh air.
- Oxygen or artificial respiration if needed.
- If symptoms persist, call a physician.

**In case of skin contact**
- Allow to evaporate.
- Wash off with warm water.
- If symptoms persist, call a physician.

**In case of eye contact**
- Allow to evaporate.
- Rinse thoroughly with plenty of water, also under the eyelids.
- If eye irritation persists, consult a specialist.

**In case of ingestion**
- Not applicable

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

**In case of inhalation**

**Symptoms**
- At high concentrations:
- narcosis
- Asphyxia
- May cause cardiac arrhythmia.

**In case of skin contact**

**Symptoms**
- Cold sensation followed by redness of the skin.
- Frostbite

**Effects**
- gas
- none
- Liquefied gas
- Prolonged skin contact may defat the skin and produce dermatitis.

**In case of eye contact**

**Symptoms**
- Irritation
- Lachrymation
- Redness
- Swelling of tissue
- Frostbite

**Effects**
- gas
- Liquefied gas
- Severe eye irritation
- Causes burns.

**In case of ingestion**

**Effects**
- gas
- Not applicable

4.3 Indication of any immediate medical attention and special treatment needed

**Notes to physician**
- Immediate medical attention is not required.
- When symptoms persist or in all cases of doubt seek medical advice.

**SECTION 5: Firefighting measures**

5.1 Extinguishing media

**Suitable extinguishing media**
- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

**Unsuitable extinguishing media**
- None.

5.2 Special hazards arising from the substance or mixture

**Specific hazards during fire fighting**
- The product is not flammable.
- Hazardous decomposition products formed under fire conditions.
- Gas/vapors combustion possible in presence of air in very particular conditions (see section 9 and/or consult the producer).

**Hazardous combustion products:**
- Gaseous hydrogen fluoride (HF).
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- Fluorophosgene
- The release of other hazardous decomposition products is possible.

5.3 Advice for firefighters

**Special protective equipment for fire-fighters**

- Wear self-contained breathing apparatus and protective suit.
- Wear chemical resistant oversuit
- Special protective actions for fire-fighters
- In case of fire, use water spray.
- Keep product and empty container away from heat and sources of ignition.
- Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

**Advice for non-emergency personnel**

- Prevent further leakage or spillage if safe to do so.
- Keep away from incompatible products

**Advice for emergency responders**

- Immediately evacuate personnel to safe areas.
- Keep people away from and upwind of spill/leak.
- Wear self-contained breathing apparatus and protective suit.
- Vapors are heavier than air and can cause suffocation by reducing oxygen available for breathing.
- Suppress (knock down) gases/vapors/mists with a water spray jet.
- Avoid spraying the leak source.
- Ventilate the area.

6.2 Environmental precautions

- Discharge into the environment must be avoided.
- Inform the responsible authorities in case of gas leakage, or of entry into waterways, soil or drains.

6.3 Methods and materials for containment and cleaning up

- Allow to evaporate.
- Prevent product from entering sewage system.

6.4 Reference to other sections

- Refer to protective measures listed in sections 7 and 8.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- Use only equipment and materials which are compatible with the product.
- Prevent any product decomposition from contacting hot spots.
- Prevent product vapors decomposition from electric arc action (welding).
- Keep away from heat.
- Keep away from incompatible products
Hygiene measures
- Eye wash bottles or eye wash stations in compliance with applicable standards.
- When using do not eat, drink or smoke.
- Gloves, overalls and boots have to be double layered (protection against cold temperature).
- Handle in accordance with good industrial hygiene and safety practice.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions
- Keep only in the original container.
- Store in a receptacle equipped with a vent.
- Keep containers tightly closed in a cool, well-ventilated place.
- Keep in properly labeled containers.
- Keep in a contained area.
- Keep away from heat/sparks/open flames/hot surfaces. No smoking.
- Keep away from:
  - Incompatible products
- Refer to protective measures listed in sections 7 and 8.

Packaging material

Suitable material
- Steel drum

7.3 Specific end use(s)
- Contact your supplier for additional information

SECTION 8: Exposure controls/personal protection

Introductory Remarks: These recommendations provide general guidance for handling this product. Because specific work environments and material handling practices vary, safety procedures should be developed for each intended application. Assistance with selection, use and maintenance of worker protection equipment is generally available from equipment manufacturers.

8.1 Control parameters

Components with workplace occupational exposure limits

Consult local authorities for acceptable exposure limits.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Value type</th>
<th>Value</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,1,2,3,3,3-Heptafluoropropane</td>
<td>TWA</td>
<td>1,000 ppm</td>
<td>Solvay Acceptable Exposure Limit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7,000 mg/m3</td>
<td></td>
</tr>
</tbody>
</table>
8.2 Exposure controls

Control measures

Engineering measures
- Ensure adequate ventilation.
- Apply technical measures to comply with the occupational exposure limits.

Individual protection measures

Respiratory protection
- Use NIOSH approved respiratory protection.
- Wear self-contained breathing apparatus in confined spaces, in cases where the oxygen level is depleted, or in case of significant emissions.
- Use only respiratory protection that conforms to international/ national standards.

Hand protection
- Take note of the information given by the producer concerning permeability and break through times, and of special workplace conditions (mechanical strain, duration of contact).
- Protective gloves

Suitable material
- Fluoroelastomer

Eye protection
- Tightly fitting safety goggles
- If splashes are likely to occur, wear:
  - Face-shield

Skin and body protection
- Wear suitable protective clothing.
- If splashes are likely to occur, wear:
  - Apron
  - Boots

Hygiene measures
- Eye wash bottles or eye wash stations in compliance with applicable standards.
- When using do not eat, drink or smoke.
- Gloves, overalls and boots have to be double layered (protection against cold temperature).
- Handle in accordance with good industrial hygiene and safety practice.

SECTION 9: Physical and chemical properties

Physical and Chemical properties here represent typical properties of this product. Contact the business area using the Product information phone number in Section 1 for its exact specifications.

9.1 Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Form: compressed liquefied gas</td>
</tr>
<tr>
<td></td>
<td>Physical state: gaseous</td>
</tr>
<tr>
<td></td>
<td>Color: colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>odorless</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>no data available</td>
</tr>
</tbody>
</table>
Molecular weight | 170 g/mol
---|---
pH | neutral
Melting point/freezing point | Freezing point: -201.1 °F (-129.5 °C)
Initial boiling point and boiling range | Boiling point/boiling range: 2.3 °F (-16.5 °C)
Flash point | Not applicable
Evaporation rate (Butylacetate = 1) | no data available
Flammability (solid, gas) | The product is not flammable.
Flammability (liquids) | Not applicable
Flammability / Explosive limit | Explosiveness: Not explosive
Autoignition temperature | Not applicable
Vapor pressure | 405.03 mmHg (540 hPa) ( -22 °F (-30 °C))
| 2,925.24 mmHg (3,900 hPa) ( 68 °F (20 °C))
| 6,900.57 mmHg (9,200 hPa) ( 122 °F (50 °C))
| 22,021.81 mmHg (29,360 hPa) ( 253 °F (123 °C))
Vapor density | 4.2
Density | Bulk density: Not applicable
Relative density | 1.41 ( 77 °F (25 °C))
Solubility | Water solubility: 0.23 g/l ( 77 °F (25 °C))
Partition coefficient: n-octanol/water | log Pow: 2.29
Method: Calculation method
Decomposition temperature | no data available
Viscosity | Viscosity, dynamic: Not applicable
Explosive properties | no data available
Oxidizing properties | Not considered as oxidizing.
9.2 Other information
Henry's Constant | ca. 2.860 Pa.m3 / mol ( 68 °F (20 °C))
Method: Calculation method
Disperses rapidly in air., Air
SECTION 10: Stability and reactivity

10.1 Reactivity
- Risk of violent reaction.

10.2 Chemical stability
- Stable under recommended storage conditions.
- Strong oxidizers, alkali metals and alkaline earth metals may cause fires or explosions.
- Vapors are heavier than air and may spread along floors.

10.3 Possibility of hazardous reactions
- Polymerization
  - Hazardous polymerization does not occur.

10.4 Conditions to avoid
- Heat.

10.5 Incompatible materials
- Light and/or alkaline metals
- Powdered metals
- Alkaline earth metals
- Oxidizing agents

10.6 Hazardous decomposition products
- Gaseous hydrogen fluoride (HF).
- Fluorophosgene
- The release of other hazardous decomposition products is possible.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

**Acute toxicity**
- Acute oral toxicity: Not applicable

**Acute inhalation toxicity**
- LC50 - 4 h (gas): > 788,696 ppm - Rat, male and female
  - Not classified as hazardous for acute inhalation toxicity according to GHS.

**Acute dermal toxicity**
- Not classified as hazardous for acute dermal toxicity according to GHS.
  - Not applicable

**Acute toxicity (other routes of administration)**
- No data available

**Skin corrosion/irritation**
- Not applicable
Serious eye damage/eye irritation
Not applicable

Respiratory or skin sensitization
Not applicable

Mutagenicity

Genotoxicity in vitro
In vitro tests did not show mutagenic effects

Genotoxicity in vivo
In vivo tests did not show mutagenic effects

Carcinogenicity
no data available

This product does not contain any ingredient designated as probable or suspected human carcinogens by:
IARC
ACGIH

Toxicity for reproduction and development

Toxicity to reproduction / fertility
By analogy, Animal testing did not show any effects on fertility.

Developmental Toxicity/Teratogenicity

Inhalation
General Toxicity Maternal NOAEC: 731,690 mg/m³
OECD Test Guideline 414
Did not show teratogenic effects in animal experiments.

Inhalation
General Toxicity Maternal NOAEC: 731,690 mg/m³
OECD Test Guideline 414
Did not show teratogenic effects in animal experiments.

STOT

STOT-single exposure
The substance or mixture is not classified as specific target organ toxicant, single exposure according to GHS criteria.

STOT-repeated exposure
The substance or mixture is not classified as specific target organ toxicant, repeated exposure according to GHS criteria.

Inhalation Single exposure - Dog
NOAEL: >= 10 %
cardiac sensitization following adrenergic stimulation

Inhalation 90 Days - Rat, male and female
NOAEC: 731690 mg/m³
Aspiration toxicity
no data available

Further information
No appreciable toxic effect

SECTION 12: Ecological information

12.1 Toxicity

Aquatic Compartment
Acute toxicity to fish
LC50 - 96 h: > 200 mg/l - Danio rerio (zebra fish)
semi-static test
Test substance: 1,1,1,3,3-pentafluorobutane
By analogy

Acute toxicity to daphnia and other aquatic invertebrates.
EC50 - 48 h: > 200 mg/l - Daphnia magna (Water flea)
static test
Test substance: 1,1,1,3,3-pentafluorobutane
By analogy
Not harmful to aquatic invertebrates. (EC/EL50 > 100 mg/L)
NOEC - 48 h: 200 mg/l - Daphnia magna (Water flea)
Test substance: 1,1,1,3,3-pentafluorobutane

Toxicity to aquatic plants
EC50 - 72 h: > 114 mg/l - Algae: Pseudokirchneriella subcapitata (Selenastrum capricornutum)
Test substance: 1,1,1,3,3-pentafluorobutane
Method: OECD Test Guideline 201
By analogy
Not harmful to algae (EC/EL50 > 100 mg/L)
NOEC - 72 h: 13.2 mg/l - Algae: Pseudokirchneriella subcapitata (Selenastrum capricornutum)
Test substance: 1,1,1,3,3-pentafluorobutane
Method: OECD Test Guideline 201
By analogy
Not harmful to algae (EC/EL50 > 100 mg/L)

Toxicity to microorganisms
no data available

Chronic toxicity to fish
no data available
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Chronic toxicity to daphnia and other aquatic invertebrates.
no data available

Chronic Toxicity to aquatic plants
no data available

Terrestrial Compartment

Toxicity to terrestrial plants
NOEC: >= 6,000 g/l
Endpoint: Growth rate
Test substance: 1,1,1,3,3-pentafluorobutane
By analogy

12.2 Persistence and degradability

Abiotic degradation

Stability in water
non-significant hydrolysis, Medium, Water

Photodegradation
indirect photo-oxidation
Sensitizer: OH
Half-life indirect photolysis: 28.2 y
Air
Degradation products:
Carbon dioxide (CO2)
hydrofluoric acid
trifluoroacetic acid

Physical- and photo-chemical elimination
no data available

Biodegradation

Biodegradability
aerobic
Method: Closed Bottle test
1 % - 28 Days
The substance does not fulfill the criteria for ready biodegradability and ultimate aerobic biodegradability

12.3 Bioaccumulative potential

Partition coefficient: n-octanol/water
no data available

Bioconcentration factor (BCF)
weak bioaccumulation potential
Not potentially bioaccumulable
12.4 Mobility in soil

**Adsorption potential (Koc)**

Adsorption
Soil/sediments
non-significant adsorption

**Known distribution to environmental compartments**

no data available

12.5 Results of PBT and vPvB assessment

Not applicable

12.6 Other adverse effects

**Global warming potential (GWP)**

Regulatory basis: The Fourth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC)
20-year global warming potential: 5,360
100-year global warming potential: 3,350
Radiative efficiency: 0.26 Wm2ppb
Additional Information: Hydrofluorocarbons

### SECTION 13: Disposal considerations

13.1 Waste treatment methods

**Product Disposal**

- In accordance with local and national regulations.
- Refer to manufacturer/supplier for information on recovery/recycling.

**Advice on cleaning and disposal of packaging**

- To avoid treatments, as far as possible, use dedicated containers.
- Where possible recycling is preferred to disposal or incineration.

### SECTION 14: Transport information

Transportation status: IMPORTANT! Statements below provide additional data on listed transport classification.
The listed Transportation Classification does not address regulatory variations due to changes in package size, mode of shipment or other regulatory descriptors.

**TDG**

14.1 UN number  UN 3296
14.2 Proper shipping name  HEPTAFLUOROPROPAINE
14.3 Transport hazard class  2.2
   Label(s)  2.2
<table>
<thead>
<tr>
<th>Section</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>14.4 Packing group</strong></td>
<td>Packing group&lt;br&gt;ERG No 126</td>
</tr>
<tr>
<td><strong>14.5 Environmental hazards</strong></td>
<td>Marine pollutant&lt;br&gt;NO</td>
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</tbody>
</table>

**DOT**

<table>
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<tr>
<th>Section</th>
<th>Details</th>
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<tbody>
<tr>
<td><strong>14.1 UN number</strong></td>
<td>UN 3296</td>
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<tr>
<td><strong>14.2 Proper shipping name</strong></td>
<td>HEPTAFLUOROPROPAINE</td>
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<td><strong>14.3 Transport hazard class</strong></td>
<td>2.2&lt;br&gt;Label(s) 2.2</td>
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**NOM**

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<th>Section</th>
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<td><strong>14.1 UN number</strong></td>
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**IMDG**

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<tr>
<td><strong>14.3 Transport hazard class</strong></td>
<td>2.2&lt;br&gt;Label(s) 2.2</td>
</tr>
</tbody>
</table>

**14.5 Environmental hazards**

| Details | Marine pollutant<br>NO |

| Details | Marine pollutant<br>NO |

| Details | Marine pollutant<br>NO |
14.6 Special precautions for user

For personal protection see section 8.

IATA

14.1 UN number
UN 3296

14.2 Proper shipping name
HEPTAFLUOROPROPANE

14.3 Transport hazard class
2.2
Label(s):
2.2

14.4 Packing group
Packing instruction (cargo aircraft) 200
Max net qty / pkg 150.00 kg
Packing instruction (passenger aircraft) 200
Max net qty / pkg 75.00 kg

14.5 Environmental hazards
NO

14.6 Special precautions for user
For personal protection see section 8.

Note: The above regulatory prescriptions are those valid on the date of publication of this sheet. Given the possible evolution of transportation regulations for hazardous materials, it would be advisable to check their validity with your sales office.

SECTION 15: Regulatory information

15.1 Notification status

<table>
<thead>
<tr>
<th>Inventory Information</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States TSCA Inventory</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>Mexico INSQ (INSQ)</td>
<td>In compliance with the inventory</td>
</tr>
<tr>
<td>Canadian Domestic Substances List (DSL)</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>New Zealand. Inventory of Chemical Substances</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>Australia Inventory of Chemical Substances (AICS)</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>Japan. CSCL - Inventory of Existing and New Chemical Substances</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>Korea. Korean Existing Chemicals Inventory (KECI)</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>China. Inventory of Existing Chemical Substances in China (IECSC)</td>
<td>Listed on Inventory</td>
</tr>
<tr>
<td>Philippines Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>One or more components not listed on inventory</td>
</tr>
<tr>
<td>EU. European Registration, Evaluation, Authorisation and Restriction of Chemical (REACH)</td>
<td>If product is purchased from Solvay in Europe it is in compliance with REACH, if not please contact the supplier.</td>
</tr>
</tbody>
</table>

15.2 National Regulations

no data available
SECTION 16: Other information

Revision Date: 07/13/2017

NFPA (National Fire Protection Association) - Classification

Health: 0 minimal  
Flammability: 0 minimal  
Instability or Reactivity: 0 minimal  
Special Notices: None

HMIS (Hazardous Materials Identification System (Paint & Coating)) - Classification

Health: 0 minimal  
Flammability: 0 minimal  
Reactivity: 0 minimal  
PPE: Determined by User; dependent on local conditions

Key or legend to abbreviations and acronyms used in the safety data sheet

- SAEL: Solvay Acceptable Exposure Limit
- TWA: Long-term exposure limit (8-hour TWA reference period)
- ACGIH: American Conference of Governmental Industrial Hygienists
- OSHA: Occupational Safety and Health Administration
- NTP: National Toxicology Program
- IARC: International Agency for Research on Cancer
- NIOSH: National Institute for Occupational Safety and Health

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information, and belief at the date of its publication. Such information is only given as a guidance to help the user handle, use, process, store, transport, dispose, and release the product in satisfactory safety conditions and is not to be considered as a warranty or quality specification. It should be used in conjunction with technical safety sheets but do not replace them. Thus, the information only relates to the designated specific product and may not be applicable if such product is used in combination with other materials or in any other manufacturing process, unless otherwise specifically indicated. It does not release the user from ensuring he is in conformity with all regulations linked to its activity.