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

1.1 Product identifier
- Trade name: SOLKANE® 365/227 87/13
- Chemical name: Pentafluorobutane/Heptafluoropropane
- Molecular formula: C₄H₅F₅/C₃HF₇

1.2 Relevant identified uses of the substance or mixture and uses advised against
Uses of the Substance / Mixture
- Foaming 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 (24-Hour Number): 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)
Simple Asphyxiant, Category 1
May displace oxygen and cause rapid suffocation.

2.2 Label elements
Hazardous Products Regulations (WHMIS 2015)
Signal Word
- Warning
Hazard Statements
- May displace oxygen and cause rapid suffocation.
2.3 Other hazards which do not result in classification

- The product is not flammable.
- Hazardous decomposition products formed under fire conditions.
- Gaseous hydrogen fluoride (HF).
- Can become flammable in use.
- Can become highly flammable in use.

SECTION 3: Composition/information on ingredients

3.1 Substance
- Not applicable, this product is a mixture.

3.2 Mixture
- Formula \( \text{C}_4\text{H}_5\text{F}_5/\text{C}_3\text{HF}_7 \)

WHMIS Hazardous Ingredients and Impurities

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Identification number CAS-No.</th>
<th>Concentration [% wt/wt or V/V]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propane, 1,1,2,3,3,3-heptafluoro-</td>
<td>431-89-0</td>
<td>&gt;= 10 - &lt; 15</td>
</tr>
</tbody>
</table>

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
- Wash off with soap and water.
- If symptoms persist, call a physician.

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

In case of ingestion
- Clean mouth with water and drink afterwards plenty of water.
- If symptoms persist, call a physician.
- If victim is conscious:
  - Clean mouth with water and drink afterwards plenty of water.
- If victim is unconscious:
  - Not applicable

4.2 Most important symptoms and effects, both acute and delayed
In case of inhalation

Symptoms
- narcosis
- At high concentrations:
  - Asphyxia

In case of skin contact

Effects
- Prolonged skin contact may defat the skin and produce dermatitis.

In case of eye contact

Effects
- slight irritation

In case of ingestion

Effects
- Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician
- When symptoms persist or in all cases of doubt seek medical advice.
- Health injuries are not known or expected under normal use.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
- powder
- Foam
- Aqueous film forming foam (AFFF).
- Carbon dioxide (CO2)

Unsuitable extinguishing media
- Water may be ineffective.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting
- The product is not flammable.
- Vapors are heavier than air and may spread along floors.
- Risk of ignition.
- Vapours may form explosive mixtures with air.
- Hazardous decomposition products formed under fire conditions.
- In use, may form flammable/explosive vapor-air mixture.

Hazardous combustion products:
- Gaseous hydrogen fluoride (HF).
- Carbon monoxide
- 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.
- Full protective flameproof clothing
- 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.
- Protect intervention team with a water spray as they approach the fire.
- Clean contaminated surface thoroughly.

**Further information**
- Evacuate personnel to safe areas.
- Keep containers and surroundings cool with water spray.
- Approach from upwind.

---

**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**
- Evacuate personnel to safe areas.
- Keep people away from and upwind of spill/leak.
- Remove all sources of ignition.
- Wear self-contained breathing apparatus and protective suit.
- Cover the spreading liquid with foam in order to slow down the evaporation.
- Ventilate the area.

6.2 Environmental precautions
- Should not be released into the environment.
- If the product contaminates rivers and lakes or drains inform respective authorities.

6.3 Methods and materials for containment and cleaning up
- Dam up.
- Soak up with inert absorbent material.
- Prevent product from entering sewage system.
- Keep in properly labeled containers.
- Keep in suitable, closed containers for disposal.
- Treat recovered material as described in the section "Disposal considerations".

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
- Used in closed system
- Use only in well-ventilated areas.
- Keep away from heat and sources of ignition.
- Heating can release vapors which can be ignited.
- To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded.
- When transferring from one container to another apply grounding measures and use conductive hose material.
- Preferably transfer by pump or gravity.
- Do not use sparking tools.
- Keep away from incompatible products

Hygiene measures
- Use only in an area equipped with a safety shower.
- Use eye wash bottles or eye wash stations in compliance with applicable standards.
- When using do not eat, drink or smoke.
- Wash hands before breaks and at the end of workday.
- Handle in accordance with good industrial hygiene and safety practice.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/Storage conditions
- Store in original container.
- Keep container closed.
- Keep in a cool, well-ventilated place.
- Keep in a contained area.
- Keep away from heat/sparks/open flames/hot surfaces. No smoking.
- Ensure all equipment is electrically grounded before beginning transfer operations.
- Take measures to prevent the build up of electrostatic charge.
- Keep container tightly closed.
- Keep away from heat/sparks/open flames/hot surfaces. No smoking.
- Ensure all equipment is electrically grounded before beginning transfer operations.
- Refer to protective measures listed in sections 7 and 8.
- Keep container closed when not in use.
- Keep tightly closed.
- Keep away from:
- Incompatible products

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>Propane, 1,1,2,3,3,3-heptafluoro-</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
- Provide appropriate exhaust ventilation at machinery.
- Apply technical measures to comply with the occupational exposure limits.
- Refer to protective measures listed in sections 7 and 8.

Individual protection measures

Respiratory protection
- In case of insufficient ventilation, wear suitable respiratory equipment.
- When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
- In the case of vapor formation use a respirator with an approved filter.
- Self-contained breathing apparatus in confined spaces/insufficient oxygen/in case of large uncontrolled emissions/in all circumstances when the mask and cartridge do not give adequate protection.
- Use only respiratory protection that conforms to international/national standards.
- Use NIOSH approved respiratory protection.

Hand protection
- Wear suitable gloves.
- 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).

Suitable material
- Neoprene

Eye protection
- Chemical resistant goggles must be worn.
- If splashes are likely to occur, wear:
  - Tightly fitting safety goggles
  - Face-shield

Skin and body protection
- Flame-resistant clothing
- If splashes are likely to occur, wear:
  - Apron
  - Boots
  - Neoprene
Hygiene measures
- Use only in an area equipped with a safety shower.
- Eye wash bottles or eye wash stations in compliance with applicable standards.
- When using do not eat, drink or smoke.
- Wash hands before breaks and at the end of workday.
- 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>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Volatile</td>
</tr>
<tr>
<td>Form</td>
<td>Liquid</td>
</tr>
<tr>
<td>Physical state</td>
<td></td>
</tr>
<tr>
<td>Color</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>Ether-like</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>pH</td>
<td>6.0 (1.7 g/l)</td>
</tr>
<tr>
<td>Melting point/freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Initial boiling point and boiling range</td>
<td>Boiling point/boiling range: 75 °F (24 °C)</td>
</tr>
<tr>
<td>Flash point</td>
<td>Method: DIN 51755 Part 1</td>
</tr>
<tr>
<td></td>
<td>does not flash, The product is not flammable.</td>
</tr>
<tr>
<td>Evaporation rate (Butylacetate = 1)</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammability (liquids)</td>
<td>The product is not flammable.</td>
</tr>
<tr>
<td></td>
<td>Can become highly flammable in use.</td>
</tr>
<tr>
<td>Flammability / Explosive limit</td>
<td>Explosiveness:</td>
</tr>
<tr>
<td></td>
<td>Not explosive</td>
</tr>
<tr>
<td>Autoignition temperature</td>
<td>1076 °F (580 °C)</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>697.56 mmHg (930 hPa) (68 °F (20 °C))</td>
</tr>
<tr>
<td>Vapor density</td>
<td>6.5</td>
</tr>
<tr>
<td>Density</td>
<td>Bulk density: Not applicable</td>
</tr>
<tr>
<td>Relative density</td>
<td>1.29</td>
</tr>
</tbody>
</table>
Solubility

Water solubility:
5 g/l (68 °F (20 °C))

Solubility in other solvents:
miscible with most organic solvents:
log Pow: 1.6

Partition coefficient: n-octanol/water

Decomposition temperature

>= 392 °F (>= 200 °C)

Viscosity

Viscosity, dynamic: 0.4 mPa.s (77 °F (25 °C))

Explosive properties

Explosive properties

No data available

Oxidizing properties

Not considered as oxidizing.

9.2 Other information

Henry's Constant
cia. 3800 Pa.m³ / mol (68 °F (20 °C))
Method: Calculation method
considerable volatility, Air, 1,1,1,3,3-pentafluorobutane

SECTION 10: Stability and reactivity

10.1 Reactivity

- Risk of violent reaction.
- Risk of explosion.

10.2 Chemical stability

- Stable under recommended storage conditions.
- In use, may form flammable/explosive vapor-air mixture.
- Strong oxidizers, alkali metals and alkaline earth metals may cause fires or explosions.

10.3 Possibility of hazardous reactions

- Strong oxidizers, alkali metals and alkaline earth metals may cause fires or explosions.

10.4 Conditions to avoid

- Heat, flames and sparks.

10.5 Incompatible materials

- Light and/or alkaline metals
- Powdered metals
- Alkaline earth metals

10.6 Hazardous decomposition products

- Gaseous hydrogen fluoride (HF).
- Carbon monoxide
- 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
Propane, 1,1,1,2,3,3,3-heptafluoro- Not applicable

Acute inhalation toxicity
Propane, 1,1,1,2,3,3,3-heptafluoro- LC50 - 4 h (gas) : > 788,696 ppm - Rat, male and female
Not classified as hazardous for acute inhalation toxicity according to GHS.

Asphyxiation Hazard
This product is a simple asphyxiant.

Acute dermal toxicity
Propane, 1,1,1,2,3,3,3-heptafluoro- Not classified as hazardous for acute dermal toxicity according to GHS.

Acute toxicity (other routes of administration)
No data available

Skin corrosion/irritation
Propane, 1,1,1,2,3,3,3-heptafluoro- Not applicable

Serious eye damage/eye irritation
Propane, 1,1,1,2,3,3,3-heptafluoro- Not applicable

Respiratory or skin sensitization
Propane, 1,1,1,2,3,3,3-heptafluoro- Not applicable

Mutagenicity

Genotoxicity in vitro
Propane, 1,1,1,2,3,3,3-heptafluoro- In vitro tests did not show mutagenic effects

Genotoxicity in vivo
Propane, 1,1,1,2,3,3,3-heptafluoro- 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:
ACGIH

Toxicity for reproduction and development

Toxicity to reproduction / fertility
Propane, 1,1,1,2,3,3,3-heptafluoro- By analogy, Animal testing did not show any effects on fertility.

Developmental Toxicity/Teratogenicity
Propane, 1,1,2,3,3,3-heptafluoro-

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

Propane, 1,1,1,2,3,3,3-heptafluoro-

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
Propane, 1,1,1,2,3,3,3-heptafluoro-
The substance or mixture is not classified as specific target organ toxicant, single exposure according to GHS criteria.

STOT-repeated exposure
Propane, 1,1,1,2,3,3,3-heptafluoro-
The substance or mixture is not classified as specific target organ toxicant, repeated exposure according to GHS criteria.

Propane, 1,1,1,2,3,3,3-heptafluoro-

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

Inhalation 90 Days - Rat , male and female
NOAEC: 731690 mg/m3

Experience with human exposure
No data available

Aspiration toxicity
No data available

Further information
No data available

SECTION 12: Ecological information

12.1 Toxicity

Aquatic Compartment

Acute toxicity to fish
1,1,1,3,3-pentafluorobutane

LC50 - 96 h : > 200 mg/l - Danio rerio (zebra fish)
semi-static test

Method: OECD Test Guideline 203
Not harmful to fish (LC/LL50 > 100 mg/L)
Acute toxicity to daphnia and other aquatic invertebrates.

1,1,1,3,3-pentafluorobutane

EC50 - 48 h : > 200 mg/l - Daphnia magna (Water flea)
static test
Method: OECD Test Guideline 202
Not harmful to aquatic invertebrates. (EC/EL50 > 100 mg/L)

Toxicity to aquatic plants

1,1,1,3,3-pentafluorobutane

NOEC - 72 h : 13.2 mg/l - Pseudokirchneriella subcapitata (green algae)
static test
Method: OECD Test Guideline 201
Not harmful to algae (EC/EL50 > 100 mg/L)

EC50 - 72 h : > 114 mg/l - Pseudokirchneriella subcapitata (green algae)
static test
Method: OECD Test Guideline 201
Not harmful to algae (EC/EL50 > 100 mg/L)

Toxicity to microorganisms

1,1,1,3,3-pentafluorobutane

EC50 - 3 h : > 595 mg/l - activated sludge
static test

Chronic toxicity to fish

1,1,1,3,3-pentafluorobutane

NOEC: ca. 38.2 mg/l - 30 Days - Pimephales promelas (fathead minnow)
Method: Calculation method

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

1,1,1,3,3-pentafluorobutane

NOEC: >= 0.006 g/l
Endpoint: Growth rate

12.2 Persistence and degradability

Abiotic degradation

Stability in water

Hydrolysis
Medium, Water, Soil, not significant
Photolysis
Medium, Water, not significant

Photodegradation

1,1,1,3,3-pentafluorobutane

Indirect photo-oxidation
Half-life indirect photolysis: ca. 10.8 y
Air
Physical- and photo-chemical elimination

No data available

Biodegradation

Biodegradability
1,1,1,3,3-pentafluorobutane aerobic
Method: Closed Bottle test
2 % - 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
1,1,1,3,3-pentafluorobutane Not potentially bioaccumulable

Bioconcentration factor (BCF)
1,1,1,3,3-pentafluorobutane Does not bioaccumulate.

12.4 Mobility in soil

Adsorption potential (Koc)
1,1,1,3,3-pentafluorobutane Adsorption
Soil/sediments
Koc: ca. 9
not significant

Known distribution to environmental compartments
No data available

12.5 Results of PBT and vPvB assessment
Not applicable
12.6 Other adverse effects

Ozone-Depletion Potential

- Regulatory basis: Ozone-Depletion Potential
- Ozone-Depletion Potential: 0
- Additional Information: no effect on stratospheric ozone
- Ozone depletion potential; ODP; (R-11 = 1)

- Regulatory basis: Global warming potential
- Number on list: GWP = 1,170
- GWP (ITH 100 y)
- Reference value for carbon dioxide: GWP = 1

Global warming potential

1,1,1,3,3-pentafluorobutane

- Regulatory basis: The Fourth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC)
- 20-year global warming potential: 2,660
- 100-year global warming potential: 804
- Radiative efficiency: 0.22 Wm2ppb
- Additional Information: Hydrofluorocarbons

Ecotoxicity assessment

Acute aquatic toxicity

1,1,1,3,3-pentafluorobutane

- low toxicity for aquatic organisms.

Remarks

1,1,1,3,3-pentafluorobutane

- Product is not significantly hazardous for the aquatic environment due to;
- Disperses rapidly in air., Does not bioaccumulate., Product is persistent in air without impact on the ozone layer.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product Disposal

- In accordance with local and national regulations.
- The incinerator must be equipped with a system for the neutralization or recovery of HF.
- Refer to manufacturer/supplier for information on recovery/recycling.
- Must be incinerated in a suitable incineration plant holding a permit delivered by the competent authorities.

Advice on cleaning and disposal of packaging

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

SECTION 14: Transport information

TDG

- not regulated
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>One or more components not listed on 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>In compliance with the 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

Canada. CEPA 1999 Significant New Activity (SNAc) List:
- No substances are subject to a Significant New Activity Notification.
SECTION 16: Other information

Revision Date:
01/18/2018

NFPA (National Fire Protection Association) - Classification

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>0 minimal</td>
</tr>
<tr>
<td>Flammability</td>
<td>0 minimal</td>
</tr>
<tr>
<td>Instability or Reactivity</td>
<td>0 minimal</td>
</tr>
<tr>
<td>Special Notices</td>
<td>None</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>0 minimal</td>
</tr>
<tr>
<td>Flammability</td>
<td>0 minimal</td>
</tr>
<tr>
<td>Reactivity</td>
<td>0 minimal</td>
</tr>
<tr>
<td>PPE</td>
<td>Determined by User; dependent on local conditions</td>
</tr>
</tbody>
</table>

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 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.