

Product: FORANE® 449A (XP40)

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SDS No.: 006714-001 (Version 3.0)

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SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING**1.1. Identification of the product**

Identification of the mixture: FORANE® 449A (XP40)

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

Use of the Substance/Mixture : Refrigerant

1.3. Details of the supplier of the safety data sheet

Supplier	Arkema UK Ltd Common Road, Stafford, ST16 3EH United Kingdom E-mail address : pars-drp-fds@arkema.com http://www.arkema.com
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1.4. Emergency telephone number

+ 33 1 49 00 77 77
European emergency phone number: 112
+44-870-8200418 (CHEMTREC United kingdom - Emergency phone number)

SECTION 2: HAZARDS IDENTIFICATION**2.1. Classification of the substance or mixture****Classification (REGULATION (EC) No 1272/2008, as amended for Great Britain):**
Gases under pressure, LG, H280**Additional information:**

For the full text of the H, EUH-phrases mentioned in this Section, see Section 16.

2.2. Label elements**Label elements (REGULATION (EC) No 1272/2008, as amended for Great Britain):**Hazard
pictograms:

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.

Special labelling:

Contains fluorinated greenhouse gases covered by the Kyoto Protocol. Contains: 1,1,1,2-Tetrafluoroethane; Pentafluoroethane; Difluoromethane.

2.3. Other hazards**Potential health effects:**

Inhalation: As with other volatile aliphatic halogenated compounds, through vapour accumulation and/or inhalation of large quantities, the product can cause : Loss of consciousness and cardiac disorders aggravated by stress and lack of oxygen, risk of mortality
Inhalation of vapours due to thermal decomposition : Risk of irritation of respiratory system Toxic effects cannot be excluded
At high vapour/fog concentrations : Risk of : headache Dizziness Drowsiness

Skin contact: Ejection of liquefied gas : frostbite possible

Environmental Effects:

Not readily biodegradable. Practically not bioaccumulable

Physical and chemical hazards:

Thermal decomposition giving toxic and corrosive products.
Decomposition products: See chapter 10

Other:

Results of PBT and vPvB assessment : According to REACH regulation, annex XIII, this mixture contains no substance meeting PBT and vPvB criteria.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.2. Mixtures

Chemical nature of the mixture¹:

Hazardous components (accordance with Annex II of Regulation (EC) No 1907/2006, as amended by UK REACH Regulations SI 2019/758) :

Chemical name ¹ & REACH Registration Number ²	EC-No.	CAS-No.	Concentration	Classification REGULATION (EC) No 1272/2008, as amended for Great Britain
1,1,1,2-Tetrafluoroethane (01-2119459374-33)	212-377-0	811-97-2	25,5 - 26,7 %	Press. Gas LG; H280
1-Propene, 2,3,3,3-tetrafluoro- (01-0000019665-61)	468-710-7	754-12-1	24,3 - 25,5 %	Flam. Gas 1B; H221 Press. Gas LG; H280
Pentafluoroethane (01-2119485636-25)	206-557-8	354-33-6	24,5 - 25,7 %	Press. Gas LG; H280
Difluoromethane (01-2119471312-47)	200-839-4	75-10-5	23,3 - 24,5 %	Flam. Gas 1B; H221 Press. Gas LG; H280

¹: See chapter 14 for Proper Shipping Name

²: See the text of the regulation for applicable exceptions or provisions -

SECTION 4: FIRST AID MEASURES

4.1. Description of necessary first-aid measures:

General advice:

In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
When symptoms persist or in all cases of doubt seek medical advice.

Inhalation:

If inhaled Remove person to fresh air. If signs/symptoms continue, get medical attention.

Skin contact:

If on skin, flush exposed skin with lukewarm water (not hot), or use other means to warm skin slowly. Get medical attention immediately.

Eye contact:

Get medical attention immediately.

Ingestion:

Not applicable

Protection of first-aiders:

No special precautions are necessary for first aid responders.

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

Symptoms: Dizziness confusion Lack of coordination Drowsiness Unconsciousness Skin contact may provoke the following symptoms:
Irritation Swelling of tissue Itching Discomfort Redness

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

Treatment: Do not administer catecholamines (because of the cardiac effect caused by the product).

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

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

5.2. Special hazards arising from the substance or mixture:

Formation of toxic products through combustion:., At high temperature :., Hydrogen fluoride, Carbon oxides, One of the components of this preparation gives flammable mixtures with air

5.3. Advice for firefighters:

Specific methods:

In the event of fire and/or explosion do not breathe fumes. Use water spray to cool unopened containers. Extinguish using suitable media, or isolate and allow to burn out.

Special protective actions for fire-fighters:

Wear self-contained breathing apparatus for firefighting if necessary. Use personal protective equipment.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures:

Evacuate personnel to safe areas. Avoid skin contact with leaking liquid (danger of frostbite). Ventilate the area. Consult a regulatory specialist to determine appropriate state or local reporting requirements, for assistance in waste characterization and/or hazardous waste disposal and other requirements listed in pertinent environmental permits. Pump off large amounts. See Section 13, Disposal considerations, for additional information.

6.2. Environmental precautions:

Prevent further leakage or spillage if safe to do so. Retain and dispose of contaminated wash water.

6.3. Methods and materials for containment and cleaning up:

Recovery:

Ensure adequate ventilation.

Elimination: See chapter 13

6.4. Reference to other sections: None.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling:

Technical measures/Precautions:

Storage and handling precautions applicable to products: pressurised liquified gas
Provide appropriate exhaust ventilation at machinery. Provide showers, eye-baths. Provide self-contained breathing apparatus nearby (for emergency intervention). Well ventilate empty vats and tanks before entering.

Safe handling advice:

Avoid breathing gas. Handle in accordance with good industrial hygiene and safety practices. Wear cold-insulating gloves/face shield/eye protection. Use a backflow preventative device in piping. Close valve after each use and when empty. Do NOT change or force fit connections. Use only with adequate ventilation/personal protection. Keep away from heat and sources of ignition. Do not smoke. Take maximum precautions when handling. Take care to avoid waste and spillage when weighing, loading and mixing the product.

Hygiene measures:

Wash hands after handling. Remove contaminated clothing and protective equipment before entering eating areas.

7.2. Conditions for safe storage, including any incompatibilities:

Keep cylinders restrained. Separate full and empty cylinders. Do not store near combustible materials. Keep in properly labelled containers. Keep in a cool, well-ventilated place. Keep away from direct sunlight. Store in accordance with the particular national regulations.

Storage period: > 10 y, Storage temperature: < 52 °C

Incompatible products:

Do not store together with oxidizing and self-igniting products. Organic peroxides Self-heating substances and mixtures Substances and mixtures, which in contact with water, emit flammable gases Pyrophoric liquids Pyrophoric solids Flammable liquids Explosives

Packaging material:

Recommended: Ordinary steel

To be avoided: Alloys containing more than 2% of magnesium, Plastic materials

7.3. **Specific end use(s):** None.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. **Control parameters:**

Exposure Limit Values

1,1,1,2-Tetrafluoroethane

Source	Date	Value type	Value (ppm)	Value (mg/m3)	Remarks
WEEL	2010	TWA	1.000	4.240	-
EH40 WEL	12 2011	TWA	1.000	4.240	-
EH40 WEL	12 2011		-	-	Listed

Pentafluoroethane

Source	Date	Value type	Value (ppm)	Value (mg/m3)	Remarks
WEEL	2010	TWA	1.000	4.900	-

Difluoromethane

Source	Date	Value type	Value (ppm)	Value (mg/m3)	Remarks
ARKEMA		TWA	1.000	2.130	Value recommended by the "Exposure Limit Value Committee" of ARKEMA

Derived No Effect Level (DNEL): 1,1,1,2-TETRAFLUOROETHANE :

End Use	Inhalation	Ingestion	Skin contact
Workers	13936 mg/m3 (LT, SE)		
Consumers	2476 mg/m3 (LT, SE)		

LE : Local effects, SE : Systemic effects, LT : Long term, ST : Short term

Derived No Effect Level (DNEL): 1-PROPENE, 2,3,3,3-TETRAFLUORO- :

End Use	Inhalation	Ingestion	Skin contact
Workers	950 mg/m3 (SE, LT)		
Consumers	186400 mg/m3 (SE, LT)		

LE : Local effects, SE : Systemic effects, LT : Long term, ST : Short term

Derived No Effect Level (DNEL): PENTAFLUOROETHANE :

End Use	Inhalation	Ingestion	Skin contact
Workers	16444 mg/m3 (LT, SE)		
Consumers	1753 mg/m3 (LT, SE)		

LE : Local effects, SE : Systemic effects, LT : Long term, ST : Short term

Derived No Effect Level (DNEL): DIFLUOROMETHANE :

End Use	Inhalation	Ingestion	Skin contact
Workers	7035 mg/m3 (LT, SE)		
Consumers	750 mg/m3 (LT, SE)		

LE : Local effects, SE : Systemic effects, LT : Long term, ST : Short term

Predicted No Effect Concentration: 1,1,1,2-TETRAFLUOROETHANE :

Compartment:	Value:
Fresh water	0,1 mg/l
Marine water	0,01 mg/l
Water (Intermittent release)	1 mg/l
Effects on waste water treatment plants	73 mg/l
Fresh water sediment	0,75 mg/kg dw

Predicted No Effect Concentration: 1-PROPENE, 2,3,3,3-TETRAFLUORO- :

Compartment:	Value:
Water	0,1 mg/l
Water (Intermittent release)	1 mg/l

Predicted No Effect Concentration: PENTAFLUOROETHANE :

Compartment:	Value:
Fresh water	0,1 mg/l
Water (Intermittent release)	1 mg/l
Fresh water sediment	0,6 mg/kg dw

Predicted No Effect Concentration: DIFLUOROMETHANE :

Compartment:	Value:
Fresh water	0,313 mg/l
Water (Intermittent release)	3,13 mg/l
Fresh water sediment	1,8069 mg/kg dw

8.2. Exposure controls:

General protective measures:

Provide adequate ventilation., Wear suitable protective equipment., Ensure that eye flushing systems and safety showers are located close to the working place., When using do not eat, drink or smoke., Take off immediately all contaminated clothing.

Personal protective equipment:

Respiratory protection:

Recommended Filter type: Organic gas and low boiling vapour type
Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines.

Hand protection:

Low temperature resistant gloves

Eye/face protection:

Chemical resistant goggles must be worn., Face-shield

Skin and body protection:

Skin should be washed after contact., Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.

Environmental exposure controls: See chapter 6

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance:

Physical state (20°C):	gaseous
Form:	Liquefied gas
Colour:	Clear - colourless
Odour:	Slightly ether-like
Olfactory threshold:	No data available.
pH:	Not applicable No data available
Boiling point/boiling range :	-45,8 °C
Flash point:	Not applicable
Evaporation rate:	> 1
Flammability (solid, gas):	
Flammability:	The product is not flammable.
Lower flammable limit :	None. (ASTM E681-01)
Upper flammable limit :	None. (ASTM E681-01)
Vapour pressure:	1,27 MPa , at 25 °C
Relative vapour density:	3,09 Reference substance: Air=1
Density:	1.097 kg/m3 , at 25 °C
Relative density (Water=1):	1,10 at 25 °C
Water solubility:	No data available
Partition coefficient: n-octanol/water:	Not applicable
Partition coefficient: n-octanol/water:	DIFLUOROMETHANE : log Kow : 0,21 , at 25 °C (OECD Test Guideline 107)

	1-PROPENE, 2,3,3,3-TETRAFLUORO- :
	log Kow : 2 (OECD Test Guideline 117)
	1,1,1,2-TETRAFLUOROETHANE :
	log Kow : 1,06 , at 25 °C (OECD Test Guideline 107)
	PENTAFLUOROETHANE :
	log Kow : 1,48 , at 25 °C (OECD Test Guideline 107)
Auto-ignition temperature:	> 400 °C
Decomposition temperature:	No data available
Viscosity, kinematic:	Not applicable
Viscosity, dynamic:	Not applicable
Explosive properties:	
Explosivity:	Not explosive
Oxidizing properties:	The substance or mixture is not classified as oxidizing.

9.2. Other information:

Critical point: Critical temperature: 81,5 °C

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity: No data available.

10.2. Chemical stability:
The product is stable at normal handling and storage temperatures.

10.3. Possibility of hazardous reactions:
Strong oxidizing agents

10.4. Conditions to avoid:
Heat, flames and sparks.

10.5. Incompatible materials to avoid:
Do not store together with oxidizing and self-igniting products., Organic peroxides, Self-heating substances and mixtures, Substances and mixtures, which in contact with water, emit flammable gases, Pyrophoric liquids, Pyrophoric solids, Flammable liquids, Explosives

10.6. Hazardous decomposition products:

Thermal decomposition:
No data available

Thermal decomposition giving toxic and corrosive products : , Gaseous hydrogen fluoride (HF) , Carbon oxides, One of the components of this preparation gives flammable mixtures with air

SECTION 11: TOXICOLOGICAL INFORMATION

All available and relevant data on this product and/or the components quoted in section 3 and/or the analogue substances/metabolites have been taken into account for the hazard assessment.

11.1. Information on toxicological effects:

Acute toxicity:

Inhalation: **According to its composition : Slightly harmful by inhalation**
The inhalation of vapours produced by product decomposition can cause : , Risk of irritation of respiratory system, Toxic effects cannot be excluded

1,1,1,2-TETRAFLUOROETHANE :
As with other volatile aliphatic halogenated compounds, through vapour accumulation and/or inhalation of large quantities, the product can cause : , Loss of consciousness and cardiac disorders aggravated by stress and lack of oxygen, risk of mortality
• In animals : No mortality/4 h/Rat: 567000 ppm (Method: OECD Test Guideline 403)
Central nervous system depression, narcosis

DIFLUOROMETHANE :
At high vapour/fog concentrations : , headache, Dizziness, Drowsiness
As with other volatile aliphatic halogenated compounds, through vapour accumulation and/or inhalation of large quantities, the product can cause : , Loss of consciousness and cardiac disorders aggravated by stress and lack of oxygen, risk of mortality
• In animals : No mortality/4 h/Rat: 520000 ppm (Method: OECD Test Guideline 403)

PENTAFLUOROETHANE :

- Effects of breathing high concentrations of vapour may include: headache, Dizziness, Drowsiness
As with other volatile aliphatic halogenated compounds, through vapour accumulation and/or inhalation of large quantities, the product can cause: Loss of consciousness and cardiac disorders aggravated by stress and lack of oxygen, risk of mortality
- In animals : No mortality/4 h/Rat: 800000 ppm (Method: OECD Test Guideline 403)
- 1-PROPENE, 2,3,3,3-TETRAFLUORO- :
- In man : Effects of breathing high concentrations of vapour may include: headache, Dizziness, Drowsiness
 - In animals : No mortality/4 h/Rat: 398379 ppm (Method: OECD Test Guideline 403)
- HYDROGEN FLUORIDE :
- At high vapour/mist concentrations, Severely irritating to respiratory system, Risk of pulmonary oedema, Delayed effects possible
- In animals : LC50/10 min/Rat: 3,15 mg/l

Local effects (Corrosion / Irritation / Serious eye damage):

Skin contact: Slightly irritating to skin
Ejection of liquefied gas : frostbite possible

Eye contact: Slightly irritating to eyes
Ejection of liquefied gas : frostbite possible

Respiratory or skin sensitisation:

Inhalation:

- 1,1,1,2-TETRAFLUOROETHANE :
- In animals : No-observed-effect level 5 % (cardiac sensitization, Dog)
- 1-PROPENE, 2,3,3,3-TETRAFLUORO- :
- In animals : No-observed-effect level 12 % (cardiac sensitization, Dog)
- PENTAFLUOROETHANE :
- In animals : No-observed-effect level 7 % (cardiac sensitization, Dog)
- DIFLUOROMETHANE :
- In animals : No-observed-effect level 35 % (cardiac sensitization, Dog)

Skin contact: Not relevant (gas)

CMR effects :

Mutagenicity: According to its composition, this product should not be harmful in normal conditions of use

In vitro

- 1,1,1,2-TETRAFLUOROETHANE :
Ames test in vitro: Inactive (Method: OECD Test Guideline 471)
In vitro chromosomal abnormality test on human lymphocytes: Inactive (Method: OECD Test Guideline 473)
In vitro gene mutations test on mammalian cells: Inactive
- DIFLUOROMETHANE :
Ames test in vitro: Inactive (Method: OECD Test Guideline 471)
In vitro chromosomal abnormality test on human lymphocytes: Inactive (Method: OECD Test Guideline 473)
May be considered as comparable to a similar product for which experimental results are:
In vitro gene mutations test on mammalian cells: Inactive (Method: OECD Test Guideline 476)
- PENTAFLUOROETHANE :
Ames test: Inactive (Method: OECD Test Guideline 471)
In vitro test for chromosomal abnormalities on CHO cells: Inactive (Method: OECD Test Guideline 473)
In vitro chromosomal abnormality test on human lymphocytes: Inactive (Method: OECD Test Guideline 476)
- 1-PROPENE, 2,3,3,3-TETRAFLUORO- :
Ames test in vitro: (Method: OECD Test Guideline 471)
Active (76 %)
Inactive (12 %)
In vitro chromosomal abnormality test on human lymphocytes: Inactive (Method: OECD Test Guideline 473) (76 %)
In vitro gene mutations test on mammalian cells: Active (Method: OECD Test Guideline 476) (76 %)

In vivo

- 1,1,1,2-TETRAFLUOROETHANE :
Micronucleus test in vivo mouse: Inactive (Method: OECD Test Guideline 474)
DNA repair test on rats hepatocytes: Inactive
- DIFLUOROMETHANE :
Micronucleus test in vivo mouse: Inactive (Method: OECD Test Guideline 474)
- PENTAFLUOROETHANE :
Micronucleus test in vivo mouse: Inactive (Method: OECD Test Guideline 474)
- 1-PROPENE, 2,3,3,3-TETRAFLUORO- :
micronucleus test: Inactive (Method: OECD Test Guideline 474)
comet assay: Inactive (Method: OECD Test Guideline 489)

Carcinogenicity: Based on the available data, the substance is not suspected of having carcinogenic potential

- 1,1,1,2-TETRAFLUOROETHANE :
• In animals :
Absence of carcinogenic effects (Rat, 2 years, By inhalation)
No Observed Adverse Effect Level (NOAEL): 10.000 ppm
- Absence of carcinogenic effects (Rat, 1 year, By oral route)
No Observed Adverse Effect Level (NOAEL): 300 mg/kg bw/day

Reproductive toxicity:

Fertility: Based on the available data, the substance is not suspected of having reprotoxic potential.

- 1,1,1,2-TETRAFLUOROETHANE :
• In animals :
Two-generation study
NOAEL (Parental toxicity): 50.000 ppm
NOAEL (Fertility): 50.000 ppm
NOAEL (Developmental Toxicity): 50000 ppm
(rat, By inhalation)

Foetal development: Based on the available data, the substance is not suspected of having developmental toxicity potential.

- 1,1,1,2-TETRAFLUOROETHANE :
• In animals :
Absence of toxic effects for foetal development.
NOAEL (Developmental Toxicity): 40.000 ppm
NOAEL (Maternal Toxicity): 2.500 ppm
(Method: OECD Test Guideline 414, Rabbit, By inhalation)
Absence of toxic effects for foetal development.
NOAEL (Developmental Toxicity): 50.000 ppm
NOAEL (Maternal Toxicity): 50.000 ppm
(Method: OECD Test Guideline 414, Rat, By inhalation)

- DIFLUOROMETHANE :
• In animals :
Absence of toxic effects for foetal development.
NOAEL (Developmental Toxicity): 50.000 ppm
NOAEL (Maternal Toxicity): 50.000 ppm
(Method: OECD Test Guideline 414, rat, rabbit, By inhalation)

PENTAFLUOROETHANE :

- In animals :
Absence of toxic effects for foetal development.
NOAEL (Developmental Toxicity): 245 mg/l
NOAEL (Maternal Toxicity): 245 mg/l
(Method: OECD Test Guideline 414, rat, rabbit, By inhalation)

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

According to available experimental data:
(Method: OECD Test Guideline 414, By inhalation)
NOAEL (Developmental Toxicity): 4.000 ppm
NOAEL (Maternal Toxicity): 2.500 ppm
(Rabbit)
NOAEL (Developmental Toxicity): > 50.000 ppm
NOAEL (Maternal Toxicity): > 50.000 ppm
(Rat)

Specific target organ toxicity :

Single exposure : No data available.

Repeated exposure: **The substance or mixture is not classified as specific target organ toxicant, repeated exposure.**

1,1,1,2-TETRAFLUOROETHANE :

- In animals :
Inhalation: No adverse effects reported.
NOAEL= 50000ppm (Rat, Several years)

DIFLUOROMETHANE :

- In animals :
Inhalation: No specific toxic effects
NOAEL= 50000ppm (Method: OECD Test Guideline 413, Rat, 3 Months)

PENTAFLUOROETHANE :

- In animals :
Studies of prolonged inhalation in animals have not shown sub-chronic toxic effects
Inhalation: NOAEL= 50000ppm (Method: OECD Test Guideline 413, Rat, 3 Months)

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

Inhalation: No adverse effects reported.
NOAEL= 50000ppm (Method: OECD Test Guideline 412, Rat, Subacute)
(Method: OECD Test Guideline 413, rat, 3 months)
inhalation: No specific toxic effects, NOAEL= 50000ppm
Target organs: Teeth, NOAEL= 15000ppm

Aspiration hazard:

Not relevant

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicology Assessment: All available and relevant data on this product and/or the components quoted in section 3 and/or the analogue substances/metabolites have been taken into account for the hazard assessment.

Acute aquatic toxicity : Harmful to aquatic life.

12.1. Toxicity :

Fish: **From its composition, it must be considered as: Harmful to fish.**

DIFLUOROMETHANE :

LC50, 96 h (Freshwater fish) : 1.731 mg/l (Method: calculated)

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

LC50, 96 h (Oryzias latipes) : 33 mg/l (Method: OECD Test Guideline 203)

1,1,1,2-TETRAFLUOROETHANE :

LC50, 96 h (Salmo gairdneri) : 450 mg/l (Method: OECD Test Guideline 203)

PENTAFLUOROETHANE :

May be considered as comparable to a similar product for which experimental results are:

1,1,1,3,3-PENTAFLUOROPROPANE :

LC50, 96 h (Danio rerio (zebra fish)) : > 200 mg/l (Method: OECD Test Guideline 203)

Aquatic invertebrates:

From its composition, it must be considered as: Harmful to daphnia.

DIFLUOROMETHANE :

EC50, 48 h (Daphnia (water flea)) : 833 mg/l (Method: calculated)

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

EC50, 48 h (Daphnia magna (Water flea)) : 65 mg/l (Method: OECD Test Guideline 202)

1,1,1,2-TETRAFLUOROETHANE :

EC50, 48 h (Daphnia magna (Water flea)) : 980 mg/l (Method: OECD Test Guideline 202)

PENTAFLUOROETHANE :

May be considered as comparable to a similar product for which experimental results are:

1,1,1,3,3-PENTAFLUOROBUTANE :

EC50, 48 h (Daphnia magna (Water flea)) : > 200 mg/l (Method: OECD Test Guideline 202)

Aquatic plants:

From its composition, it must be considered as: Slightly harmful to algae

DIFLUOROMETHANE :

ErC50, 96 h (algae) : 313 mg/l (Method: calculated)

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

ErC50 (Pseudokirchneriella subcapitata (green algae)) : > 100 mg/l (Method: OECD Test Guideline 201)

1,1,1,2-TETRAFLUOROETHANE :

May be considered as comparable to a similar product for which experimental results are:

PENTAFLUOROETHANE :

May be considered as comparable to a similar product for which experimental results are:

1,1,1,3,3-PENTAFLUOROPROPANE :

ErC50, 72 h (Pseudokirchneriella subcapitata) : > 118 mg/l (Method: OECD Test Guideline 201)

Microorganisms:

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

NOEC, 28 d (Activated sludge) : 8,37 mg/l (Method: OECD Test Guideline 301D)

1,1,1,2-TETRAFLUOROETHANE :

EC10, 6 h (Pseudomonas putida) : > 730 mg/l

Aquatic toxicity / Long term toxicity:

Fish:

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

NOEC, 28 d (Cyprinus carpio (Carp)) : 2,7 mg/l (Method: OECD Test Guideline 215, Growth inhibition)

Aquatic invertebrates:

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

NOEC, 21 d (Daphnia magna (Water flea)) : >= 15,2 mg/l (Method: OECD Test Guideline 211, reproduction)

Aquatic plants:

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

NOEC r, 72 d (Pseudokirchneriella subcapitata (green algae)) : >= 75 mg/l (Method: OECD Test Guideline 201)

12.2. Persistence and degradability :

Biodegradation (In water):

All the products and/or main components quoted in section 3 and/or analogue substances/metabolites are not readily biodegradable.

DIFLUOROMETHANE :

Not readily biodegradable.: 5 % after 28 d (Method: OECD Test Guideline 301 D)

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

Not readily biodegradable.: 1 - 2 % after 28 d (Method: OECD Test Guideline 301 D)

1,1,1,2-TETRAFLUOROETHANE :

Not readily biodegradable.: 3 % after 28 d (Method: OECD Test Guideline 301D)

PENTAFLUOROETHANE :

Not readily biodegradable.: 5 % after 28 d (Method: OECD Test Guideline 301 D)

Photodegradation (In air):

DIFLUOROMETHANE :

Degradation by radicals OH: Direct photolysis (Half-life) : 3,39 y

1,1,1,2-TETRAFLUOROETHANE :

Degradation by radicals OH: Direct photolysis (Half-life) : 9,7 y

12.3. Bioaccumulative potential :

Bioaccumulation: **None of the product and /or main component quoted in section 3 and/or analogue substance/metabolite is expected to bioaccumulate.**
Not applicable

DIFLUOROMETHANE : Partition coefficient: n-octanol/water: log Kow : 0,21 , at 25 °C (Method: OECD Test Guideline 107)

1-PROPENE, 2,3,3,3-TETRAFLUORO- : Partition coefficient: n-octanol/water: log Kow : 2 (Method: OECD Test Guideline 117)

1,1,1,2-TETRAFLUOROETHANE : Partition coefficient: n-octanol/water: log Kow : 1,06 , at 25 °C (Method: OECD Test Guideline 107)

PENTAFLUOROETHANE : Partition coefficient: n-octanol/water: log Kow : 1,48 , at 25 °C (Method: OECD Test Guideline 107)

12.4. Mobility in soil - Distribution among environmental compartments:

Substance : DIFLUOROMETHANE :
Water: 0,01 %
Air: 99,99 %
Soil: 0 %
sediment: 0 %
(Method: Calculation according Mackay, Level I)

1,1,1,2-TETRAFLUOROETHANE :
Water: 0,07 %
Air: 99,93 %
(Method: Calculation according Mackay, Level I)

Vapor pressure: 1,27 MPa, 25 °C

Absorption / desorption:

DIFLUOROMETHANE : log Koc: 0,17 - 1,34 (Method: calculated)

1-PROPENE, 2,3,3,3-TETRAFLUORO- : log Koc: < 1,26 (Method: OECD Test Guideline 121)

1,1,1,2-TETRAFLUOROETHANE : log Koc: 1,57 (Method: calculated)

PENTAFLUOROETHANE : log Koc: 1,3 - 1,7 (Method: calculated)

12.5. Results of PBT and vPvB assessment :

According to REACH regulation, annex XIII, this mixture contains no substance meeting PBT and vPvB criteria.

12.6. Other adverse effects:

Global warming potential:

DIFLUOROMETHANE
Global warming potential with respect to CO2 (time horizon 100 years) , Value: 675

1-Propene, 2,3,3,3-tetrafluoro-
Global warming potential with respect to CO2 (time horizon 100 years) , Value: 4

1,1,1,2-TETRAFLUOROETHANE
Global warming potential with respect to CO2 (time horizon 100 years) , Value: 1.430

PENTAFLUOROETHANE
Global warming potential with respect to CO2 (time horizon 100 years) , Value: 3.500

Ozone depletion potential: Ozone depletion potential; ODP; (R-11 = 1) , Value: 0

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods:

Disposal of product: Recycle or incinerate at an approved waste disposal site. In accordance with local and national regulations.
Do not vent the container contents, or product residuals, to the atmosphere. Recover and reclaim unused contents or residuals as appropriate. Recovered/reclaimed product can be returned to an approved certified reclaimer or back to the seller depending on the material. Completely emptied disposable containers can be disposed of as recyclable steel. Returnable cylinders must be returned to seller.

SECTION 14: TRANSPORT INFORMATION

Regulation	14.1. UN number	14.2. UN proper shipping name	14.3. Class ^s *	Label	14.4. PG [*]	14.5. Environmental hazards	14.6. Special precautions for user
ADR	1078	REFRIGERANT GAS, N.O.S. (, 2,3,3,3-TETRAFLUOROPROPENE)	2	2.2		no	
ADN	1078	REFRIGERANT GAS, N.O.S. (, 2,3,3,3-TETRAFLUOROPROPENE)	2	2.2		no	
RID	1078	REFRIGERANT GAS, N.O.S. (, 2,3,3,3-TETRAFLUOROPROPENE)	2	2.2		no	
IATA Cargo	1078	Refrigerant gas, n.o.s. (1,1,1,2-Tetrafluoroethane, 2,3,3,3-Tetrafluoropropene)	2.2	2.2		no	
IATA Passenger	1078	Refrigerant gas, n.o.s. (1,1,1,2-Tetrafluoroethane, 2,3,3,3-Tetrafluoropropene)	2.2	2.2		no	
IMDG	1078	REFRIGERANT GAS, N.O.S. (, 2,3,3,3-TETRAFLUOROPROPENE)	2.2	2.2		no	EmS Number: F-C, S-V

*Description: 14.3. Transport hazard class(es)
14.4. Packing group

14.7. Maritime transport in bulk according to IMO instruments: Not applicable

SECTION 15: REGULATORY INFORMATION

Safety data sheets: accordance with Annex II of Regulation (EC) No 1907/2006, as amended by UK REACH Regulations SI 2019/758

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

Listed in:

EU. F-Gases Subject to Emission Limits/Reporting (Annexes I, II), Regulation 517/2014/EU on FGGs: Difluoromethane: Pentafluoroethane :
1-Propene, 2,3,3,3-tetrafluoro-: Norflurane
Kyoto Protocol to the United Nations Framework Convention on Climate Change, Annex A, Greenhouse Gases: Norflurane:
Pentafluoroethane: Difluoromethane

Major Accident Hazard Legislation

Not applicable

15.2. Chemical safety assessment:

As the substance doesn't meet the criteria for classification and is neither PBT nor vPvB, according to REACH regulation, article 14(4), development of specific exposure scenarios is not required.

INVENTORIES:

European union/EEA : In the event of purchase from an Arkema legal entity based in the European Economic Area (EEA), it is established that this product complies with the registration provisions of REACH Regulation (EC) No. 1907/2006, given that all of its components are excluded, exempted and / or registered. If purchasing from a legal entity established outside the EEA, please contact your local representative for more information.

- TSCA (USA) : The components of this product are all on the TSCA Inventory
- DSL/NDSL (CA) : All components of this product are on the Canadian DSL
- IECSC (CN) : Not all components of this product are listed or exempted
- ENCS (JP) : All components of this product are listed or exempted
- ISHL (JP) : All components of this product are listed or exempted
- KECI (KR) : All components of this product are listed or exempted
- PICCS (PH) : All components of this product are listed or exempted
- NZIOC (NZ) : Consult ARKEMA
- AIIC (AU) : All components of this product are listed or exempted
- TCSI (TV) : All components of this product are listed or exempted

SECTION 16: OTHER INFORMATION

Full text of H, EUH-phrases referred to under sections 2 and 3

- H221 Flammable gas.
- H280 Contains gas under pressure; may explode if heated.

Update:

Safety datasheet sections which have been updated:		Type:
3	Hazardous components	Revisions
11	SECTION 11: TOXICOLOGICAL INFORMATION	Revisions
12	SECTION 12: ECOLOGICAL INFORMATION	Revisions
15	Inventories	Revisions
	REGULATION N°2020/878	Revisions

Thesaurus:

- NOAEL : No Observed Adverse Effect Level (NOAEL)
- LOAEL : Lowest Observed Adverse Effect Level (LOAEL)
- bw : Body weight
- food : oral feed
- dw : Dry weight
- vPvB : very Persistent and very Bioaccumulative
- PBT : Persistent, Bioaccumulative and Toxic

This information applies to the PRODUCT AS SUCH and conforming to specifications of ARKEMA. In case of formulations or mixtures, it is necessary to ascertain that a new danger will not appear. The information contained is based on our knowledge of the product, at the date of publishing and it is given quite sincerely. Users are advised of possible additional hazards when the product is used in applications for which it was not intended. This sheet shall only be used and reproduced for prevention and security purposes. The references to legislative, regulatory and codes of practice documents cannot be considered as exhaustive. It is the responsibility of the person receiving the product to refer to the totality of the official documents concerning the use, the possession and the handling of the product. It is also the responsibility of the handlers of the product to pass on to any subsequent persons who will come into contact with the product (usage, storage, cleaning of containers, other processes) the totality of the information contained within this safety data sheet and necessary for safety at work, the protection of health and the protection of environment.

NB: In this document the numerical separator of the thousands is the "." (point), the decimal separator is "," (comma).

