

# SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006



## Opteon™ XP40 (R-449A) Refrigerant

Version 5.0      Revision Date: 01.10.2020      SDS Number: 1349448-00046      Date of last issue: 28.02.2020  
Date of first issue: 27.02.2017

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

#### 1.1 Product identifier

Trade name : Opteon™ XP40 (R-449A) Refrigerant  
SDS-Identcode : 130000133420

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

Use of the Sub-stance/Mixture : Refrigerant  
Recommended restrictions on use : For professional and industrial installation and use only.

#### 1.3 Details of the supplier of the safety data sheet

Company : Chemours Netherlands B.V.  
Baanhoekweg 22  
3313 LA Dordrecht Netherlands  
Telephone : +31-(0)-78-630-1011  
Telefax : +31-78-6163737  
E-mail address of person responsible for the SDS : sds-support@chemours.com

#### 1.4 Emergency telephone number

+(44)-870-8200418 (CHEMTREC - Recommended)

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### SECTION 2: Hazards identification


#### 2.1 Classification of the substance or mixture

##### Classification (REGULATION (EC) No 1272/2008)

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

#### 2.2 Label elements

##### Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms : 

Signal word : Warning

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

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

### Additional Labelling

|| Contains fluorinated greenhouse gases. (HFC-134a, HFC-125, HFC-32)

### 2.3 Other hazards

|| This mixture contains no substance considered to be persistent, bioaccumulating and toxic (PBT).  
|| This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB).  
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.  
Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects.  
Rapid evaporation of the product may cause frostbite.  
May displace oxygen and cause rapid suffocation.

## SECTION 3: Composition/information on ingredients

### 3.2 Mixtures

#### Components

Chemical name	CAS-No. EC-No. Index-No. Registration number	Classification	Concentration (% w/w)
1,1,1,2-Tetrafluoroethane#	811-97-2 212-377-0 01-2119459374-33	Press. Gas Liquefied gas; H280	25.7
2,3,3,3-Tetrafluoropropene#	754-12-1 468-710-7 01-0000019665-61	Flam. Gas 1B; H221 Press. Gas Liquefied gas; H280	25.3
Pentafluoroethane#	354-33-6 206-557-8 01-2119485636-25	Press. Gas Liquefied gas; H280	24.7
Difluoromethane#	75-10-5 200-839-4 01-2119471312-47	Flam. Gas 1B; H221 Press. Gas Liquefied gas; H280	24.3

# Voluntarily-disclosed non-hazardous substance  
For explanation of abbreviations see section 16.

## SECTION 4: First aid measures

### 4.1 Description of first aid measures

General advice : In the case of accident or if you feel unwell, seek medical advice immediately.  
When symptoms persist or in all cases of doubt seek medical advice.

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- Protection of first-aiders : No special precautions are necessary for first aid responders.
- If inhaled : If inhaled, remove to fresh air.  
Get medical attention if symptoms occur.
- In case of skin contact : Thaw frosted parts with lukewarm water. Do not rub affected area.  
Get medical attention immediately.
- In case of eye contact : Get medical attention immediately.
- If swallowed : Ingestion is not considered a potential route of exposure.

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

- Symptoms : May cause cardiac arrhythmia.
- Other symptoms potentially related to misuse or inhalation abuse are  
Cardiac sensitisation  
Anaesthetic effects  
Light-headedness  
Dizziness  
confusion  
Lack of coordination  
Drowsiness  
Unconsciousness
- Skin contact may provoke the following symptoms:  
Irritation  
Swelling of tissue  
Itching  
Discomfort  
Redness
- Eye contact may provoke the following symptoms  
tearing  
Redness  
Discomfort
- Risks : Contact with liquid or refrigerated gas can cause cold burns and frostbite.

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

- Treatment : Because of possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, that may be used in situations of emergency life support should be used with special caution.

## SECTION 5: Firefighting measures

### 5.1 Extinguishing media

- Suitable extinguishing media : Not applicable

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Will not burn

Unsuitable extinguishing media : Not applicable  
Will not burn

### 5.2 Special hazards arising from the substance or mixture

Specific hazards during fire-fighting : Exposure to combustion products may be a hazard to health. If the temperature rises there is danger of the vessels bursting due to the high vapor pressure.

Hazardous combustion products : Hydrogen fluoride  
carbonyl fluoride  
Carbon oxides  
Fluorine compounds

### 5.3 Advice for firefighters

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

Specific extinguishing methods : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Fight fire remotely due to the risk of explosion. Use water spray to cool unopened containers. Remove undamaged containers from fire area if it is safe to do so. Evacuate area.

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## SECTION 6: Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions : Evacuate personnel to safe areas.  
Avoid skin contact with leaking liquid (danger of frostbite).  
Ventilate the area.  
Follow safe handling advice (see section 7) and personal protective equipment recommendations (see section 8).

### 6.2 Environmental precautions

Environmental precautions : Avoid release to the environment.  
Prevent further leakage or spillage if safe to do so.  
Retain and dispose of contaminated wash water.

### 6.3 Methods and material for containment and cleaning up

Methods for cleaning up : Ventilate the area.  
Local or national regulations may apply to releases and disposal of this material, as well as those materials and items employed in the cleanup of releases. You will need to determine which regulations are applicable. Sections 13 and 15 of this SDS provide information regarding certain local or national requirements.

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### 6.4 Reference to other sections

See sections: 7, 8, 11, 12 and 13.

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## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

- Technical measures : Use equipment rated for cylinder pressure. Use a backflow preventative device in piping. Close valve after each use and when empty.
- Local/Total ventilation : Use only with adequate ventilation.
- Advice on safe handling : Avoid breathing gas.  
Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment  
Wear cold insulating gloves/ face shield/ eye protection.  
Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point.  
Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.  
Prevent backflow into the gas tank.  
Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems.  
Close valve after each use and when empty. Do NOT change or force fit connections.  
Prevent the intrusion of water into the gas tank.  
Never attempt to lift cylinder by its cap.  
Do not drag, slide or roll cylinders.  
Use a suitable hand truck for cylinder movement.  
Keep away from heat and sources of ignition.  
Take precautionary measures against static discharges.  
Take care to prevent spills, waste and minimize release to the environment.
- Hygiene measures : If exposure to chemical is likely during typical use, provide eye flushing systems and safety showers close to the working place. When using do not eat, drink or smoke. Wash contaminated clothing before re-use.

### 7.2 Conditions for safe storage, including any incompatibilities

- Requirements for storage areas and containers : Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Separate full containers from empty containers. Do not store near combustible materials. Avoid area where salt or other corrosive materials are present. 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.
- Advice on common storage : Do not store with the following product types:

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Self-reactive substances and mixtures  
Organic peroxides  
Oxidizing agents  
Flammable liquids  
Flammable solids  
Pyrophoric liquids  
Pyrophoric solids  
Self-heating substances and mixtures  
Substances and mixtures, which in contact with water, emit flammable gases  
Explosives  
Acutely toxic substances and mixtures  
Substances and mixtures with chronic toxicity

Storage period : > 10 yr  
Recommended storage temperature : < 52 °C  
Further information on storage stability : The product has an indefinite shelf life when stored properly.

### 7.3 Specific end use(s)

Specific use(s) : No data available

## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Occupational Exposure Limits

Components	CAS-No.	Value type (Form of exposure)	Control parameters	Basis
1,1,1,2-Tetrafluoroethane	811-97-2	TWA	1,000 ppm 4,240 mg/m <sup>3</sup>	GB EH40
Further information: Where no specific short-term exposure limit is listed, a figure three times the long-term exposure limit should be used.				

#### Derived No Effect Level (DNEL) according to Regulation (EC) No. 1907/2006:

Substance name	End Use	Exposure routes	Potential health effects	Value
1,1,1,2-Tetrafluoroethane	Workers	Inhalation	Long-term systemic effects	13936 mg/m <sup>3</sup>
	Consumers	Inhalation	Long-term systemic effects	2476 mg/m <sup>3</sup>
2,3,3,3-Tetrafluoropropene	Workers	Inhalation	Long-term systemic effects	950 mg/m <sup>3</sup>
	Pentafluoroethane	Workers	Inhalation	Long-term systemic effects
Consumers		Inhalation	Long-term systemic effects	1753 mg/m <sup>3</sup>

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Difluoromethane	Workers	Inhalation	Long-term systemic effects	7035 mg/m <sup>3</sup>
	Consumers	Inhalation	Long-term systemic effects	750 mg/m <sup>3</sup>

### Predicted No Effect Concentration (PNEC) according to Regulation (EC) No. 1907/2006:

Substance name	Environmental Compartment	Value
1,1,1,2-Tetrafluoroethane	Fresh water	0.1 mg/l
	Marine water	0.01 mg/l
	Intermittent use/release	1 mg/l
	Fresh water sediment	0.75 mg/kg dry weight (d.w.)
	Sewage treatment plant	73 mg/l
2,3,3,3-Tetrafluoropropene	Fresh water	0.1 mg/l
	Intermittent use/release	1 mg/l
	Fresh water sediment	1.77 mg/kg dry weight (d.w.)
	Soil	1.54 mg/kg dry weight (d.w.)
	Marine water	0.01 mg/l
Pentafluoroethane	Marine sediment	0.178 mg/kg dry weight (d.w.)
	Fresh water	0.1 mg/l
	Freshwater - intermittent	1 mg/l
Difluoromethane	Fresh water sediment	0.6 mg/kg dry weight (d.w.)
	Fresh water	0.142 mg/l
	Intermittent use/release	1.42 mg/l
	Fresh water sediment	0.534 mg/kg dry weight (d.w.)

## 8.2 Exposure controls

### Engineering measures

Ensure adequate ventilation, especially in confined areas.  
Minimize workplace exposure concentrations.

### Personal protective equipment

Eye protection : Wear the following personal protective equipment:  
Chemical resistant goggles must be worn.  
Face-shield  
Equipment should conform to BS EN 166

Hand protection  
Material : Low temperature resistant gloves

Remarks : Choose gloves to protect hands against chemicals depending on the concentration and quantity of the hazardous substance and specific to place of work. For special applications, we recommend clarifying the resistance to chemicals of the aforementioned protective gloves with the glove manufacturer. Wash hands before breaks and at the end of workday. Breakthrough time is not determined for the product. Change

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- gloves often!
- Skin and body protection : Skin should be washed after contact.
- Respiratory protection : If adequate local exhaust ventilation is not available or exposure assessment demonstrates exposures outside the recommended guidelines, use respiratory protection. Equipment should conform to BS EN 14387
- Filter type : Organic gas and low boiling vapour type (AX)
- Protective measures : Wear cold insulating gloves/ face shield/ eye protection.

### SECTION 9: Physical and chemical properties

#### 9.1 Information on basic physical and chemical properties

- Appearance : Liquefied gas
- Colour : clear
- Odour : slight, ether-like
- Odour Threshold : No data available
- pH : No data available
- Melting point/freezing point : No data available
- Initial boiling point and boiling range : -46 °C
- Flash point : Not applicable
- Evaporation rate : > 1  
(CCL4=1.0)
- Flammability (solid, gas) : Will not burn
- Upper explosion limit / Upper flammability limit : Upper flammability limit  
Method: ASTM E681  
None.
- Lower explosion limit / Lower flammability limit : Lower flammability limit  
Method: ASTM E681  
None.
- Vapour pressure : 12,748 hPa (25 °C)
- Relative vapour density : 3.07  
(Air = 1.0)
- Relative density : 1.10 (25 °C)



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Solubility(ies)	
Water solubility	: No data available
Partition coefficient: n-octanol/water	: Not applicable
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
Viscosity	
Viscosity, kinematic	: Not applicable
Explosive properties	: Not explosive
Oxidizing properties	: The substance or mixture is not classified as oxidizing.

### 9.2 Other information

Particle size	: Not applicable
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## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Not classified as a reactivity hazard.

### 10.2 Chemical stability

Stable if used as directed. Follow precautionary advice and avoid incompatible materials and conditions.

### 10.3 Possibility of hazardous reactions

Hazardous reactions : Can react with strong oxidizing agents.

### 10.4 Conditions to avoid

Conditions to avoid : This substance is not flammable in air at temperatures up to 100 °C (212 °F) at atmospheric pressure. However, mixtures of this substance with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. This substance can also become combustible in an oxygen enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing this substance and air, or this substance in an oxygen enriched atmosphere become combustible depends on the inter-relationship of 1) the temperature 2) the pressure, and 3) the proportion of oxygen in the mixture. In general, this substance should not be allowed to exist with air above atmospheric pressure or at high temperatures; or in an oxygen enriched environment. For example this substance should NOT be mixed with air under pressure for leak testing or other purposes.  
Heat, flames and sparks.

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### 10.5 Incompatible materials

Materials to avoid : Avoid impurities (e.g. rust, dust, ash), risk of decomposition.  
Incompatible with acids and bases.  
Incompatible with oxidizing agents.  
Oxygen  
Peroxides  
peroxide compounds  
Powdered metals

### 10.6 Hazardous decomposition products

No hazardous decomposition products are known.

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## SECTION 11: Toxicological information

### 11.1 Information on toxicological effects

Information on likely routes of exposure : Inhalation  
Skin contact  
Eye contact

#### Acute toxicity

Not classified based on available information.

#### Components:

##### 1,1,1,2-Tetrafluoroethane:

Acute oral toxicity : Assessment: The substance or mixture has no acute oral toxicity

Acute inhalation toxicity : LC50 (Rat): > 567000 ppm  
Exposure time: 4 h  
Test atmosphere: gas  
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 40000 ppm  
Test atmosphere: gas  
Remarks: Cardiac sensitisation

Lowest observed adverse effect concentration (Dog): 80000 ppm  
Test atmosphere: gas  
Symptoms: May cause cardiac arrhythmia.

Cardiac sensitisation threshold limit (Dog): 334,000 mg/m<sup>3</sup>  
Test atmosphere: gas  
Symptoms: May cause cardiac arrhythmia.

Acute dermal toxicity : Assessment: The substance or mixture has no acute dermal toxicity

##### 2,3,3,3-Tetrafluoropropene:

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Acute inhalation toxicity : LC50 (Rat): > 405800 ppm  
Exposure time: 4 h  
Test atmosphere: gas  
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 120000 ppm  
Test atmosphere: gas  
Remarks: Cardiac sensitisation

Lowest observed adverse effect concentration (Dog): > 120000 ppm  
Test atmosphere: gas  
Remarks: Cardiac sensitisation

Cardiac sensitisation threshold limit (Dog): > 559,509 mg/m3  
Test atmosphere: gas  
Remarks: Cardiac sensitisation

### Pentafluoroethane:

Acute inhalation toxicity : LC50 (Rat): > 800000 ppm  
Exposure time: 4 h  
Test atmosphere: gas  
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 75000 ppm  
Remarks: Cardiac sensitisation

Cardiac sensitisation threshold limit (Dog): 368.159 mg/m3  
Remarks: Cardiac sensitisation

### Difluoromethane:

Acute oral toxicity : Assessment: The substance or mixture has no acute oral toxicity

Acute inhalation toxicity : LC50 (Rat): > 520000 ppm  
Exposure time: 4 h  
Test atmosphere: gas  
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 350000 ppm  
Test atmosphere: gas  
Remarks: Cardiac sensitisation

Lowest observed adverse effect concentration (Dog): > 350000 ppm  
Test atmosphere: gas  
Remarks: Cardiac sensitisation

Cardiac sensitisation threshold limit (Dog): > 735,000 mg/m3  
Test atmosphere: gas  
Remarks: Cardiac sensitisation

Acute dermal toxicity : Assessment: The substance or mixture has no acute dermal

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|||      toxicity

### **Skin corrosion/irritation**

Not classified based on available information.

### **Components:**

#### **1,1,1,2-Tetrafluoroethane:**

|||Result      :    No skin irritation

#### **2,3,3,3-Tetrafluoropropene:**

|||Result      :    No skin irritation

#### **Difluoromethane:**

|||Result      :    No skin irritation

### **Serious eye damage/eye irritation**

Not classified based on available information.

### **Components:**

#### **1,1,1,2-Tetrafluoroethane:**

|||Result      :    No eye irritation

#### **2,3,3,3-Tetrafluoropropene:**

|||Result      :    No eye irritation

#### **Difluoromethane:**

|||Result      :    No eye irritation

### **Respiratory or skin sensitisation**

#### **Skin sensitisation**

Not classified based on available information.

#### **Respiratory sensitisation**

Not classified based on available information.

### **Components:**

#### **1,1,1,2-Tetrafluoroethane:**

|||Exposure routes      :    Skin contact  
|||Result      :    negative

|||Exposure routes      :    Inhalation  
|||Species      :    Rat  
|||Result      :    negative

|||Exposure routes      :    Inhalation  
|||Species      :    Humans

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|||Result : negative

### 2,3,3,3-Tetrafluoropropene:

|||Exposure routes : Skin contact  
|||Result : negative

### Difluoromethane:

|||Exposure routes : Skin contact  
|||Result : negative

|||Exposure routes : Inhalation  
|||Result : negative

### Germ cell mutagenicity

Not classified based on available information.

### Components:

#### 1,1,1,2-Tetrafluoroethane:

|||Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)  
Method: OECD Test Guideline 471  
Result: negative

Test Type: Chromosome aberration test in vitro  
Method: OECD Test Guideline 473  
Result: negative

|||Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)  
Species: Mouse  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 474  
Result: negative

Test Type: Unscheduled DNA synthesis (UDS) test with mammalian liver cells in vivo  
Species: Rat  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 486  
Result: negative

|||Germ cell mutagenicity- Assessment : Weight of evidence does not support classification as a germ cell mutagen.

#### 2,3,3,3-Tetrafluoropropene:

|||Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)  
Method: OECD Test Guideline 471  
Result: positive

Test Type: Chromosome aberration test in vitro  
Method: OECD Test Guideline 473

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Genotoxicity in vivo : Result: negative  
: Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)  
Species: Mouse  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 474  
Result: negative  
  
Test Type: In vivo mammalian alkaline comet assay  
Species: Rat  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 489  
Result: negative  
  
Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)  
Species: Rat  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 474  
Result: negative  
  
Germ cell mutagenicity- Assessment : Weight of evidence does not support classification as a germ cell mutagen.

### Pentafluoroethane:

Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)  
Method: OECD Test Guideline 471  
Result: negative  
  
Test Type: In vitro mammalian cell gene mutation test  
Result: negative  
Remarks: Based on data from similar materials  
  
Test Type: Chromosome aberration test in vitro  
Method: OECD Test Guideline 473  
Result: negative  
  
Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)  
Species: Mouse  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 474  
Result: negative

### Difluoromethane:

Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)  
Method: OECD Test Guideline 471  
Result: negative  
  
Test Type: Chromosome aberration test in vitro  
Method: OECD Test Guideline 473  
Result: negative

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Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)  
Species: Mouse  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 474  
Result: negative

Germ cell mutagenicity- Assessment : Weight of evidence does not support classification as a germ cell mutagen.

### **Carcinogenicity**

Not classified based on available information.

### **Components:**

#### **1,1,1,2-Tetrafluoroethane:**

Species : Rat  
Application Route : inhalation (gas)  
Exposure time : 2 Years  
Method : OECD Test Guideline 453  
Result : negative

Carcinogenicity - Assessment : Weight of evidence does not support classification as a carcinogen

#### **2,3,3,3-Tetrafluoropropene:**

Result : negative

Carcinogenicity - Assessment : Weight of evidence does not support classification as a carcinogen

#### **Difluoromethane:**

Carcinogenicity - Assessment : Weight of evidence does not support classification as a carcinogen

### **Reproductive toxicity**

Not classified based on available information.

### **Components:**

#### **1,1,1,2-Tetrafluoroethane:**

Effects on fertility : Species: Mouse  
Application Route: Inhalation  
Result: negative

Effects on foetal development : Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test  
Species: Rabbit  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 414  
Result: negative

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Reproductive toxicity - Assessment : Weight of evidence does not support classification for reproductive toxicity

### **2,3,3,3-Tetrafluoropropene:**

Effects on fertility : Test Type: Two-generation reproduction toxicity study  
Species: Rat  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 416  
Result: negative

Effects on foetal development : Test Type: Prenatal development toxicity study (teratogenicity)  
Species: Rat  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 414  
Result: negative

Reproductive toxicity - Assessment : Weight of evidence does not support classification for reproductive toxicity, No effects on or via lactation

### **Pentafluoroethane:**

Effects on fertility : Test Type: One-generation reproduction toxicity study  
Species: Rat  
Application Route: inhalation (vapour)  
Result: negative  
Remarks: Based on data from similar materials

Effects on foetal development : Test Type: Embryo-foetal development  
Species: Rat  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 414  
Result: negative

### **Difluoromethane:**

Effects on fertility : Species: Mouse  
Application Route: Inhalation  
Result: negative  
Remarks: Based on data from similar materials

Effects on foetal development : Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test  
Species: Rat  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 414  
Result: negative

Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test  
Species: Rabbit  
Application Route: inhalation (gas)  
Method: OECD Test Guideline 414  
Result: negative



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Reproductive toxicity - Assessment : Weight of evidence does not support classification for reproductive toxicity

### STOT - single exposure

Not classified based on available information.

#### Components:

##### 1,1,1,2-Tetrafluoroethane:

Exposure routes : inhalation (gas)  
Assessment : No significant health effects observed in animals at concentrations of 20000 ppmV/4h or less

##### 2,3,3,3-Tetrafluoropropene:

Exposure routes : inhalation (gas)  
Assessment : No significant health effects observed in animals at concentrations of 20000 ppmV/4h or less

##### Difluoromethane:

Exposure routes : inhalation (gas)  
Assessment : No significant health effects observed in animals at concentrations of 20000 ppmV/4h or less

### STOT - repeated exposure

Not classified based on available information.

#### Components:

##### 1,1,1,2-Tetrafluoroethane:

Exposure routes : inhalation (gas)  
Assessment : No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

##### 2,3,3,3-Tetrafluoropropene:

Exposure routes : inhalation (gas)  
Assessment : No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

##### Difluoromethane:

Exposure routes : inhalation (gas)  
Assessment : No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

### Repeated dose toxicity

#### Components:

##### 1,1,1,2-Tetrafluoroethane:

Species : Rat, male and female

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NOAEL : 50000 ppm  
LOAEL : >50000 ppm  
Application Route : inhalation (gas)  
Exposure time : 2 yr  
Method : OECD Test Guideline 453

### **2,3,3,3-Tetrafluoropropene:**

Species : Rat, male and female  
NOAEL : 50000 ppm  
LOAEL : >50000 ppm  
Application Route : inhalation (gas)  
Exposure time : 13 Weeks  
Method : OECD Test Guideline 413

### **Pentafluoroethane:**

Species : Rat  
NOAEL :  $\geq 50000$  ppm  
Application Route : inhalation (gas)  
Exposure time : 13 Weeks  
Method : OECD Test Guideline 413

### **Difluoromethane:**

Species : Rat, male and female  
NOAEL : 49100 ppm  
LOAEL : > 49100 ppm  
Application Route : inhalation (gas)  
Exposure time : 13 Weeks  
Method : OECD Test Guideline 413

### **Aspiration toxicity**

Not classified based on available information.

### **Components:**

#### **1,1,1,2-Tetrafluoroethane:**

|| No aspiration toxicity classification

#### **2,3,3,3-Tetrafluoropropene:**

|| No aspiration toxicity classification

#### **Difluoromethane:**

|| No aspiration toxicity classification

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### SECTION 12: Ecological information

#### 12.1 Toxicity

##### Components:

##### **1,1,1,2-Tetrafluoroethane:**

- |   |   |   |
|---|---|---|
| Toxicity to fish                                    | : | LC50 (Oncorhynchus mykiss (rainbow trout)): 450 mg/l<br>Exposure time: 96 h<br>Method: Regulation (EC) No. 440/2008, Annex, C.1 |
| Toxicity to daphnia and other aquatic invertebrates | : | EC50 (Daphnia magna (Water flea)): 980 mg/l<br>Exposure time: 48 h<br>Method: Regulation (EC) No. 440/2008, Annex, C.2          |
| Toxicity to algae/aquatic plants                    | : | ErC50 (green algae): > 100 mg/l<br>Exposure time: 96 h<br>Remarks: Based on data from similar materials                         |

##### **2,3,3,3-Tetrafluoropropene:**

- |   |   |  |
|---|---|--|
| Toxicity to fish                                    | : | LC50 (Cyprinus carpio (Carp)): > 197 mg/l<br>Exposure time: 96 h<br>Method: OECD Test Guideline 203  |
| Toxicity to daphnia and other aquatic invertebrates | : | EC50 (Daphnia magna (Water flea)): > 100 mg/l<br>Exposure time: 48 h<br>Method: OECD Test Guideline 202  |
| Toxicity to algae/aquatic plants                    | : | EC50 (Selenastrum capricornutum (green algae)): > 100 mg/l<br>Exposure time: 72 h<br>Method: OECD Test Guideline 201<br><br>NOEC (Selenastrum capricornutum (green algae)): > 75 mg/l<br>Exposure time: 3 d<br>Method: OECD Test Guideline 201 |

##### **Pentafluoroethane:**

- |   |   |   |
|---|---|---|
| Toxicity to fish                                    | : | LC50 (Oncorhynchus mykiss (rainbow trout)): > 100 mg/l<br>Exposure time: 96 h<br>Remarks: Based on data from similar materials  |
| Toxicity to daphnia and other aquatic invertebrates | : | EC50 (Daphnia magna (Water flea)): > 100 mg/l<br>Exposure time: 48 h<br>Remarks: Based on data from similar materials   |
| Toxicity to algae/aquatic plants                    | : | ErC50 (Pseudokirchneriella subcapitata (green algae)): > 100 mg/l<br>Exposure time: 72 h<br>Method: OECD Test Guideline 201<br>Remarks: Based on data from similar materials<br><br>NOEC (Pseudokirchneriella subcapitata (green algae)): > 1 |

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mg/l  
Exposure time: 72 h  
Method: OECD Test Guideline 201  
Remarks: Based on data from similar materials

### Difluoromethane:

Toxicity to fish : LC50 (Fish): 1,507 mg/l  
Exposure time: 96 h  
Method: ECOSAR (Ecological Structure Activity Relationships)

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia (water flea)): 652 mg/l  
Exposure time: 48 h  
Method: ECOSAR (Ecological Structure Activity Relationships)

Toxicity to algae/aquatic plants : EC50 (green algae): 142 mg/l  
Exposure time: 96 h  
Method: ECOSAR (Ecological Structure Activity Relationships)

## 12.2 Persistence and degradability

### Components:

#### 1,1,1,2-Tetrafluoroethane:

Biodegradability : Result: Not readily biodegradable.  
Method: OECD Test Guideline 301D

#### 2,3,3,3-Tetrafluoropropene:

Biodegradability : Result: Not readily biodegradable.  
Method: OECD Test Guideline 301F

#### Pentafluoroethane:

Biodegradability : Result: Not readily biodegradable.  
Biodegradation: 5 %  
Exposure time: 28 d  
Method: OECD Test Guideline 301D

#### Difluoromethane:

Biodegradability : Result: Not readily biodegradable.  
Method: OECD Test Guideline 301D

## 12.3 Bioaccumulative potential

### Components:

#### 1,1,1,2-Tetrafluoroethane:

Bioaccumulation : Remarks: Bioaccumulation is unlikely.

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|| Partition coefficient: n-octanol/water : log Pow: 1.06

### 2,3,3,3-Tetrafluoropropene:

|| Bioaccumulation : Remarks: Bioaccumulation is unlikely.

|| Partition coefficient: n-octanol/water : log Pow: 2 (25 °C)

### Pentafluoroethane:

|| Partition coefficient: n-octanol/water : Pow: 1.48  
Method: OECD Test Guideline 107

### Difluoromethane:

|| Partition coefficient: n-octanol/water : log Pow: 0.714

## 12.4 Mobility in soil

No data available

## 12.5 Results of PBT and vPvB assessment

### Product:

|| Assessment : This mixture contains no substance considered to be persistent, bioaccumulating and toxic (PBT).. This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB)..

## 12.6 Other adverse effects

### Global warming potential

|| Regulation (EU) No 517/2014 on fluorinated greenhouse gases

### Product:

|| 100-year global warming potential: 1,397

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## SECTION 13: Disposal considerations

### 13.1 Waste treatment methods

Product : Dispose of in accordance with local regulations. According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user, preferably in discussion with the waste disposal authorities.

Contaminated packaging : Empty containers should be taken to an approved waste handling site for recycling or disposal. Empty pressure vessels should be returned to the supplier. If not otherwise specified: Dispose of as unused product.

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### SECTION 14: Transport information

#### 14.1 UN number

ADN : UN 1078  
ADR : UN 1078  
RID : UN 1078  
IMDG : UN 1078  
IATA : UN 1078

#### 14.2 UN proper shipping name

ADN : REFRIGERANT GAS, N.O.S.  
(1,1,1,2-Tetrafluoroethane, 2,3,3,3-Tetrafluoropropene)  
ADR : REFRIGERANT GAS, N.O.S.  
(1,1,1,2-Tetrafluoroethane, 2,3,3,3-Tetrafluoropropene)  
RID : REFRIGERANT GAS, N.O.S.  
(1,1,1,2-Tetrafluoroethane, 2,3,3,3-Tetrafluoropropene)  
IMDG : REFRIGERANT GAS, N.O.S.  
(1,1,1,2-Tetrafluoroethane, 2,3,3,3-Tetrafluoropropene)  
IATA : Refrigerant gas, n.o.s.  
(1,1,1,2-Tetrafluoroethane, 2,3,3,3-Tetrafluoropropene)

#### 14.3 Transport hazard class(es)

ADN : 2  
ADR : 2  
RID : 2  
IMDG : 2.2  
IATA : 2.2

#### 14.4 Packing group

ADN  
Packing group : Not assigned by regulation  
Classification Code : 2A  
Hazard Identification Number : 20  
Labels : 2.2  
ADR  
Packing group : Not assigned by regulation  
Classification Code : 2A  
Hazard Identification Number : 20  
Labels : 2.2  
Tunnel restriction code : (C/E)  
RID  
Packing group : Not assigned by regulation  
Classification Code : 2A  
Hazard Identification Number : 20

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Labels	:	2.2 ((13))
<b>IMDG</b>		
Packing group	:	Not assigned by regulation
Labels	:	2.2
EmS Code	:	F-C, S-V
<b>IATA (Cargo)</b>		
Packing instruction (cargo aircraft)	:	200
Packing group	:	Not assigned by regulation
Labels	:	Non-flammable, non-toxic Gas
<b>IATA (Passenger)</b>		
Packing instruction (passenger aircraft)	:	200
Packing group	:	Not assigned by regulation
Labels	:	Non-flammable, non-toxic Gas

### 14.5 Environmental hazards

**ADN**  
Environmentally hazardous : no

**ADR**  
Environmentally hazardous : no

**RID**  
Environmentally hazardous : no

**IMDG**  
Marine pollutant : no

### 14.6 Special precautions for user

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

### 14.7 Transport in bulk according to Annex II of Marpol and the IBC Code

Remarks : Not applicable for product as supplied.

## SECTION 15: Regulatory information

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

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, preparations and articles (Annex XVII) : Not applicable

REACH - Candidate List of Substances of Very High Concern for Authorisation (Article 59). : Not applicable

REACH - List of substances subject to authorisation (Annex XIV) : Not applicable

Regulation (EC) No 1005/2009 on substances that de- : Not applicable

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plete the ozone layer

Regulation (EU) 2019/1021 on persistent organic pollutants (recast) : Not applicable

Regulation (EC) No 649/2012 of the European Parliament and the Council concerning the export and import of dangerous chemicals : Not applicable

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.  
Not applicable

### 15.2 Chemical safety assessment

Chemical Safety Assessments have been carried out for these substances.

## SECTION 16: Other information

Other information : Opteon™ and any associated logos are trademarks or copyrights of The Chemours Company FC, LLC.  
Chemours™ and the Chemours Logo are trademarks of The Chemours Company.  
Before use read Chemours safety information.  
For further information contact the local Chemours office or nominated distributors.

Items where changes have been made to the previous version are highlighted in the body of this document by two vertical lines.

### Full text of H-Statements

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

### Full text of other abbreviations

Flam. Gas : Flammable gases  
Press. Gas : Gases under pressure  
GB EH40 : UK. EH40 WEL - Workplace Exposure Limits  
GB EH40 / TWA : Long-term exposure limit (8-hour TWA reference period)

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road; AIIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of



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Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - Substance of Very High Concern; TCSI - Taiwan Chemical Substance Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

### Further information

Sources of key data used to compile the Safety Data Sheet : Internal technical data, data from raw material SDSs, OECD eChem Portal search results and European Chemicals Agency, <http://echa.europa.eu/>

### Classification of the mixture:

Press. Gas Liquefied gas H280

### Classification procedure:

Based on product data or assessment

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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. The information is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and shall not be considered a warranty or quality specification of any type. The information provided relates only to the specific material identified at the top of this SDS and may not be valid when the SDS material is used in combination with any other materials or in any process, unless specified in the text. Material users should review the information and recommendations in the specific context of their intended manner of handling, use, processing and storage, including an assessment of the appropriateness of the SDS material in the user's end product, if applicable.

GB / EN