

# SAFETY DATA SHEET



## Opteon™ XL55 (R-452B) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 2023/11/02
7.1	2024/01/03	2405390-00017	Date of first issue: 2018/02/02

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### 1. PRODUCT AND COMPANY IDENTIFICATION

Chemical product name : Opteon™ XL55 (R-452B) Refrigerant

SDS-Identcode : 130000143544

#### Supplier's company name, address and phone number

Company name of supplier : Chemours-Mitsui Fluoroproducts Co., Ltd

Address : Kamiyacho Prime Place, 4-1-17, Toranomom, Minato-ku, Tokyo, Japan

Telephone : 050-3823-0650

Emergency telephone number : Occupational Health, Safety & Environmental Management (054-334-4827) (Holiday,Night-time 054-335-5507)

Prepared by :

#### Recommended use of the chemical and restrictions on use

Recommended use : Refrigerant

Restrictions on use : For professional and industrial installation and use only.  
Do not use product for anything outside of the above specified uses

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### 2. HAZARDS IDENTIFICATION

#### GHS classification of chemical product

Flammable gases : Category 1

Gases under pressure : Liquefied gas

Hazardous to the ozone layer : Category 1

#### GHS label elements

Hazard pictograms :   

Signal word : Danger

Hazard statements : H220 Extremely flammable gas.  
H280 Contains gas under pressure; may explode if heated.

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H420 Harms public health and the environment by destroying ozone in the upper atmosphere.

### Precautionary statements

:

#### Prevention:

P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

#### Response:

P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381 In case of leakage, eliminate all ignition sources.

#### Storage:

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

#### Disposal:

P502 Refer to manufacturer or supplier for information on recovery or recycling.

### Other hazards which do not result in classification

Important symptoms and outlines of the emergency assumed

:

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.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture

: Mixture

### Components

Chemical name	CAS-No.	Concentration (% w/w)	ENCS No.
Difluoromethane#	75-10-5	67	2-3705
2,3,3,3-Tetrafluoropropene#	754-12-1	26	2-4136
Pentafluoroethane#	354-33-6	7	2-3713

# Voluntarily-disclosed substance

## 4. 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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If inhaled	: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
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.
Most important symptoms and effects, both acute and delayed	: 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 Gas reduces oxygen available for breathing. Contact with liquid or refrigerated gas can cause cold burns and frostbite.
Protection of first-aiders	: No special precautions are necessary for first aid responders.
Notes to physician	: 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.

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### 5. FIREFIGHTING MEASURES

Suitable extinguishing media	: Water spray Alcohol-resistant foam Carbon dioxide (CO <sub>2</sub> ) Dry chemical
Unsuitable extinguishing media	: None known.
Specific hazards during fire-fighting	: Vapours may form flammable mixture with air 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

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Fluorine compounds

- 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.  
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.  
Remove undamaged containers from fire area if it is safe to do so.  
Evacuate area.
- Special protective equipment for firefighters : Wear self-contained breathing apparatus for firefighting if necessary.  
Use personal protective equipment.
- 

### 6. ACCIDENTAL RELEASE MEASURES

- Personal precautions, protective equipment and emergency procedures : Evacuate personnel to safe areas.  
Only trained personnel should re-enter the area.  
Remove all sources of ignition.  
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).
- Environmental precautions : Avoid release to the environment.  
Prevent further leakage or spillage if safe to do so.  
Retain and dispose of contaminated wash water.
- Methods and materials for containment and cleaning up : Ventilate the area.  
Non-sparking tools should be used.  
Suppress (knock down) gases/vapours/mists with a water spray jet.  
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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### 7. HANDLING AND STORAGE

#### 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 : If sufficient ventilation is unavailable, use with local exhaust ventilation.

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If advised by assessment of the local exposure potential, use only in an area equipped with explosion-proof exhaust 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  
Keep container tightly closed.  
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.  
Prevent backflow into the gas tank.  
Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.  
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, hot surfaces, sparks, open flames and other ignition sources. No smoking.  
Take precautionary measures against static discharges.  
Take care to prevent spills, waste and minimize release to the environment.

Avoidance of contact : 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

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.

### Storage

Conditions for safe storage : 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 tightly closed.

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Keep in a cool, well-ventilated place.  
Keep away from direct sunlight.  
Store in accordance with the particular national regulations.  
Keep away from heat and sources of ignition.

Materials to avoid	:	Do not store with the following product types: Strong oxidizing agents
Recommended storage temperature	:	< 40 °C
Storage period	:	> 10 yr
Further information on storage stability	:	The product has an indefinite shelf life when stored properly.
Packaging material	:	Unsuitable material: None known.

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

#### Threshold limit value and permissible exposure limits for each component in the work environment

Contains no substances with occupational exposure limit values.

Engineering measures	:	Minimize workplace exposure concentrations. If sufficient ventilation is unavailable, use with local exhaust ventilation. If advised by assessment of the local exposure potential, use only in an area equipped with explosion-proof exhaust ventilation.
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#### Personal protective equipment

Respiratory protection	:	If adequate local exhaust ventilation is not available or exposure assessment demonstrates exposures outside the recommended guidelines, use respiratory protection.
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Filter type	:	Organic gas and low boiling vapour type
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Hand protection	:	
Material	:	Impervious 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 gloves often!
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Eye protection	:	Wear the following personal protective equipment: Chemical resistant goggles must be worn. Face-shield
Skin and body protection	:	Wear the following personal protective equipment: If assessment demonstrates that there is a risk of explosive atmospheres or flash fires, use flame retardant antistatic protective clothing.
Protective measures	:	Wear cold insulating gloves/ face shield/ eye protection.

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### 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	:	Liquefied gas
Colour	:	clear, colourless
Odour	:	slight, ether-like
Odour Threshold	:	No data available
Melting point/freezing point	:	No data available
Boiling point, initial boiling point and boiling range	:	-51 °C
Flammability (solid, gas)	:	Flammable
Lower explosion limit and upper explosion limit / flammability limit	:	
Upper explosion limit / Upper flammability limit	:	Upper flammability limit 23.3 %(V) Method: ASTM E681
Lower explosion limit / Lower flammability limit	:	Lower flammability limit 12 %(V) Method: ASTM E681
Flash point	:	Not applicable
Decomposition temperature	:	No data available
pH	:	No data available
Evaporation rate	:	> 1 (CCL4=1.0)

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Auto-ignition temperature	:	509 °C
Viscosity		
Viscosity, kinematic	:	Not applicable
Solubility(ies)		
Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	Not applicable
Vapour pressure	:	15,987 hPa (25 °C)
Density and / or relative density		
Relative density	:	0.99 (25 °C)
Density	:	0.99 g/cm <sup>3</sup> (25 °C)
Relative vapour density	:	No data available
Explosive properties	:	Not explosive
Oxidizing properties	:	The substance or mixture is not classified as oxidizing.
Particle characteristics		
Particle size	:	Not applicable
Hot Surface Ignition Temperature (HSIT)	:	> 850 °C Measurement method: ASTM D 8211

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### 10. STABILITY AND REACTIVITY

Reactivity	:	Not classified as a reactivity hazard.
Chemical stability	:	Stable if used as directed. Follow precautionary advice and avoid incompatible materials and conditions.
Possibility of hazardous reactions	:	Vapours may form flammable mixture with air Can react with strong oxidizing agents. Flammable gas.
Conditions to avoid	:	Heat, flames and sparks.
Incompatible materials	:	Avoid impurities (e.g. rust, dust, ash), risk of decomposition. Incompatible with acids and bases. Incompatible with oxidizing agents. Oxygen Peroxides

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peroxide compounds  
Powdered metals

Hazardous decomposition products : No hazardous decomposition products are known.

### 11. TOXICOLOGICAL INFORMATION

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

#### Acute toxicity

Not classified based on available information.

#### Components:

##### 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 toxicity

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

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

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

Cardiac sensitisation threshold limit (Dog): > 559,509 mg/m<sup>3</sup>  
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/m<sup>3</sup>  
Remarks: Cardiac sensitisation

### Skin corrosion/irritation

Not classified based on available information.

### Components:

#### Difluoromethane:

Result : No skin irritation

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

Result : No skin irritation

### Serious eye damage/eye irritation

Not classified based on available information.

### Components:

#### Difluoromethane:

Result : No eye irritation

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

Result : No eye irritation

### Respiratory or skin sensitisation

#### Skin sensitisation

Not classified based on available information.

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### Respiratory sensitisation

Not classified based on available information.

### Components:

#### Difluoromethane:

Exposure routes	:	Skin contact
Result	:	negative

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

Exposure routes	:	Skin contact
Result	:	negative

### Germ cell mutagenicity

Not classified based on available information.

### Components:

#### Difluoromethane:

Genotoxicity in vitro	:	Test Type: Bacterial reverse mutation assay (AMES) Method: OECD Test Guideline 471 Result: negative
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	:	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
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Germ cell mutagenicity - Assessment	:	Weight of evidence does not support classification as a germ cell mutagen.
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#### 2,3,3,3-Tetrafluoropropene:

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

### **Carcinogenicity**

Not classified based on available information.

### **Components:**

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

Result : negative

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

### **Reproductive toxicity**

Not classified based on available information.

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### Components:

#### **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
- 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)

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Method: OECD Test Guideline 414  
Result: negative

### STOT - single exposure

Not classified based on available information.

#### Components:

##### Difluoromethane:

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

### STOT - repeated exposure

Not classified based on available information.

#### Components:

##### Difluoromethane:

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.

### Repeated dose toxicity

#### Components:

##### 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

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

Species	: Rat, male and female
NOAEL	: 50000 ppm
LOAEL	: >50000 ppm

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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

### Aspiration toxicity

Not classified based on available information.

### Components:

#### Difluoromethane:

No aspiration toxicity classification

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

No aspiration toxicity classification

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## 12. ECOLOGICAL INFORMATION

### Ecotoxicity

### Components:

#### 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)

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

Toxicity to fish : LC50 (Cyprinus carpio (Carp)):  $> 197$  mg/l  
Exposure time: 96 h  
Method: OECD Test Guideline 203

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Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): > 100 mg/l  
Exposure time: 48 h  
Method: OECD Test Guideline 202

Toxicity to algae/aquatic plants : EC50 (Selenastrum capricornutum (green algae)): > 100 mg/l  
Exposure time: 72 h  
Method: OECD Test Guideline 201

NOEC (Selenastrum capricornutum (green algae)): > 75 mg/l  
Exposure time: 3 d  
Method: OECD Test Guideline 201

### Pentafluoroethane:

Toxicity to fish : LC50 (Oncorhynchus mykiss (rainbow trout)): > 100 mg/l  
Exposure time: 96 h  
Remarks: Based on data from similar materials

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): > 100 mg/l  
Exposure time: 48 h  
Remarks: Based on data from similar materials

Toxicity to algae/aquatic plants : ErC50 (Pseudokirchneriella subcapitata (green algae)): > 100 mg/l  
Exposure time: 72 h  
Method: OECD Test Guideline 201  
Remarks: Based on data from similar materials

NOEC (Pseudokirchneriella subcapitata (green algae)): > 1 mg/l  
Exposure time: 72 h  
Method: OECD Test Guideline 201  
Remarks: Based on data from similar materials

### Persistence and degradability

#### Components:

##### Difluoromethane:

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

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### Bioaccumulative potential

#### Components:

##### **Difluoromethane:**

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

##### **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

### Mobility in soil

No data available

### Hazardous to the ozone layer

#### Components:

##### **Difluoromethane:**

Ozone-Depletion Potential : Regulation: Japan.Enforcement Ordinance of the Law concerning the Protection of the Ozone Layer through the Control of Specified Substances and other measures (Update: 2018-08-10)  
Number: 12  
Group: Annex F - Group I

##### **Pentafluoroethane:**

Ozone-Depletion Potential : Regulation: Japan.Enforcement Ordinance of the Law concerning the Protection of the Ozone Layer through the Control of Specified Substances and other measures (Update: 2018-08-10)  
Number: 13  
Group: Annex F - Group I

### Other adverse effects

No data available

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### 13. DISPOSAL CONSIDERATIONS

#### Disposal methods

- Waste from residues : Do not discharge the gas into atmosphere unnecessarily and dispose of in accordance with the following regulations: High Pressure Gas Safety Act and Act on Rational Use and Proper Management of Fluorocarbons (in case of the fluorochemical substance). When consigning for disposal, remove to a industrial waste disposer approved by the local regulations.
- 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.  
Empty containers retain residue and can be dangerous.  
Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury and/or death.  
If not otherwise specified: Dispose of as unused product.

### 14. TRANSPORT INFORMATION

#### International Regulations

##### UNRTDG

- UN number : UN 3161
- Proper shipping name : LIQUEFIED GAS, FLAMMABLE, N.O.S.  
(Difluoromethane, 2,3,3,3-Tetrafluoropropene)
- Class : 2.1
- Packing group : Not assigned by regulation
- Labels : 2.1
- Environmentally hazardous : no

##### IATA-DGR

- UN/ID No. : UN 3161
- Proper shipping name : Liquefied gas, flammable, n.o.s.  
(Difluoromethane, 2,3,3,3-Tetrafluoropropene)
- Class : 2.1
- Packing group : Not assigned by regulation
- Labels : Flammable Gas
- Packing instruction (cargo aircraft) : 200
- Packing instruction (passenger aircraft) : Not permitted for transport

##### IMDG-Code

- UN number : UN 3161
- Proper shipping name : LIQUEFIED GAS, FLAMMABLE, N.O.S.  
(Difluoromethane, 2,3,3,3-Tetrafluoropropene)
- Class : 2.1
- Packing group : Not assigned by regulation
- Labels : 2.1

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EmS Code : F-D, S-U  
Marine pollutant : no

### Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

### National Regulations

Refer to section 15 for specific national regulation.

### 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.

ERG Code : 115

## 15. REGULATORY INFORMATION

### Related Regulations

#### Fire Service Law

Not applicable to dangerous materials / designated flammables.

#### Chemical Substance Control Law

Not applicable for Specified Chemical Substance, Monitoring Chemical Substance and Priority Assessment Chemical Substance.

#### Industrial Safety and Health Law

#### Harmful Substances Prohibited from Manufacture

Not applicable

#### Harmful Substances Required Permission for Manufacture

Not applicable

#### Substances Prevented From Impairment of Health

Not applicable

#### Circular concerning Information on Chemicals having Mutagenicity - Annex 2: Information on Existing Chemicals having Mutagenicity

Not applicable

#### Circular concerning Information on Chemicals having Mutagenicity - Annex 1: Information on Notified Substances having Mutagenicity

Not applicable

#### Substances Subject to be Notified Names

Article 57-2 (Enforcement Order Table 9)

Chemical name	Concentration (%)	Remarks
difluoromethane	$\geq 60$ - $< 70$	From April 1st, 2026
pentafluoroethane	$> 0$ - $< 10$	From April 1st, 2026

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### Substances Subject to be Indicated Names

Article 57 (Enforcement Order Article 18)

Chemical name	Remarks
difluoromethane	From April 1st, 2026
pentafluoroethane	From April 1st, 2026

### Carcinogenic Substances (Article 577-2 of the Occupational Health and Safety Regulations)

Not applicable

### Ordinance on Prevention of Hazards Due to Specified Chemical Substances

Not applicable

### Ordinance on Prevention of Lead Poisoning

Not applicable

### Ordinance on Prevention of Tetraalkyl Lead Poisoning

Not applicable

### Ordinance on Prevention of Organic Solvent Poisoning

Not applicable

### Enforcement Order of the Industrial Safety and Health Law - Attached table 1 (Dangerous Substances)

Combustible gas

### Poisonous and Deleterious Substances Control Law

Not applicable

### Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof

Not applicable

### High Pressure Gas Safety Act

Liquefied gas

### Explosive Control Law

Not applicable

### Vessel Safety Law

Gases (Article 2 and 3 of rules on shipping and storage of dangerous goods and its Attached Table 1)

### Aviation Law

Gases (Article 194 of The Enforcement Rules of Aviation Law and its Attached Table 1)

### Marine Pollution and Sea Disaster Prevention etc Law

Bulk transportation : Not classified as noxious liquid substance

Pack transportation : Not classified as marine pollutant

### Narcotics and Psychotropics Control Act

Narcotic or Psychotropic Raw Material (Export / Import Permission)

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Not applicable

Specific Narcotic or Psychotropic Raw Material (Export / Import permission)

Not applicable

### Waste Disposal and Public Cleansing Law

Not applicable

### International Regulations

Montreal Protocol : Difluoromethane  
Pentafluoroethane

## 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.

### 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/>

Date format : yyyy/mm/dd

### Full text of other abbreviations

AIIC - Australian Inventory of Industrial Chemicals; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); 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; ERG - Emergency Response Guide; 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 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; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect

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Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; 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; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TECL - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

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.

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