SAFETY DATA SHEET
in accordance with Regulation (EC) No. 1907/2006

Opteon™ XP44 (R-452A) Refrigerant

Version	Revision date:	SDS number:	Date of last issue: 16.08.2021 Date of first issue: 27.02.2017
5.5	18.04.2022	1348611-00050	

SECTION 1. Identification of the substance or mixture and of the company or undertaking

1.1 Product identifier

Trade name : Opteon™ XP44 (R-452A) Refrigerant

SDS-Identcode : 130000132272

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

Use of the substance/mixture : Refrigerant

Recommended restrictions on use : For professional and industrial uses and installations only.

1.3 Supplier details on the safety data sheet

Company : Chemours Netherlands B.V.
Baanhoekweg 22
3313 LA Dordrecht Netherlands

Telephone : +31-(0)-78-630-1011

Fax : +31-78-6163737

Email address of the person responsible for the SDS : sds-support@chemours.com

1.4 Emergency telephone number

+(34)-931768545 or 900-868538 (CHEMTREC - Recommended) ; Toxicological Information Service (National Institute of Toxicology and Forensic Sciences) Tel: + 34 91 562 04 20

SECTION 2. Hazard identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Pressurised gases, Liquefied gas	H280: Contains gas under pressure; danger of explosion in case of heating.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :

Word of caution : Warning

Hazard statements : H280 Contains gas under pressure; danger of explosion if heated.

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

Additional labelling

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

2.3 Other hazards

This substance/mixture does not contain components that are considered to be persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

Ecological information: The substance/mixture does not contain components that have endocrine-disrupting properties in accordance with Article 57(f) of REACH or Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

Toxicological information: The substance/mixture does not contain components that have endocrine-disrupting properties in accordance with Article 57(f) of REACH or Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

The vapours are heavier than air and may cause asphyxiation by reducing the oxygen in the air breathed.
Incorrect use or intentional inhalation abuse can cause death without warning symptoms due to cardiac effects.
Rapid evaporation of the product may cause frostbite. It may displace oxygen and cause rapid asphyxiation.

SECTION 3. Composition/information on ingredients

3.2 Mixtures

Components

Chemical name	CAS No. EC No. Index No. Registration number	Classification	Concentration (% w/w)
Pentafluoroethane#	354-33-6 206-557-8 01-2119485636-25	Press. Gas Liquefied gas; H280	59
2,3,3,3-Tetrafluoropropene#	754-12-1 468-710-7 01-0000019665-61	Flam. Gas 1B; H221 Press. Gas Liquefied gas; H280	30
Difluoromethane#	75-10-5 200-839-4 01-2119471312-47	Flam. Gas 1B; H221 Press. Gas Liquefied gas; H280	11

For an explanation of abbreviations, see section 16. #
Substance published voluntarily

SECTION 4. First aid

4.1 Description of first aid

General recommendations	:	In the event of an accident or feeling unwell, seek medical attention immediately. If symptoms persist or in case of doubt, seek medical advice.
Protection for first aiders	:	Persons trained in first aid do not need to take any special precautions.
If inhaled	:	If inhaled, move to fresh air. If breathing has stopped, perform artificial respiration. If breathing is difficult, give oxygen. Consult a doctor immediately.
In case of skin contact	:	Thaw the frozen parts with warm water. Do not rub the affected area. Seek medical attention immediately.
In case of contact with the eyes	:	Seek medical attention immediately.
If swallowed	:	Ingestion is not considered a potential route of exposure.

4.2 Main symptoms and effects, acute and delayed

Symptoms	:	May cause cardiac arrhythmia. Other symptoms potentially related to misuse or abuse by inhalation include the following Cardiac sensitisation Anaesthetic effects Mild dizziness Vertigo Confusio n Lack of coordination Drowsiness Unconsciousness
Risks	:	The gas reduces the oxygen available for breathing. Contact with refrigerated liquid or gas may cause frostbite and freezing.

4.3 Indication of any medical attention and special treatment required immediately

Treatment	:	Due to possible cardiac arrhythmias, catecholamines such as epinephrine, which may be used in situations

emergency life-support situations, they should be used with particular caution.

SECTION 5. Firefighting measures

5.1 Extinguishing equipment

Appropriate extinguishing agents	:	Not applicable Do not burn
Unsuitable extinguishing media	:	Not applicable Will not burn

5.2 Specific hazards arising from the substance or mixture

Specific hazards during firefighting	:	Exposure to combustion products may be a health hazard. Due to high vapour pressure, there is a risk of containers bursting if the temperature rises.
Hazardous combustion products	:	Fluorine compounds Carbon oxides Hydrogen fluoride Carbonyl fluoride

5.3 Recommendations for firefighting personnel

Special protective equipment for firefighting personnel	:	If necessary, use self-contained breathing apparatus for firefighting. Use personal protective equipment.
Specific extinguishing methods	:	Use extinguishing measures that are appropriate to the circumstances of the premises and its surroundings. Fight the fire from a distance, given the risk of explosion. Spray water may be used to cool closed containers. Remove containers that are not in danger outside the fire area if it can be done safely. Evacuate the area.

SECTION 6. Measures in case of accidental spillage

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions	:	Evacuate personnel to safe areas. Avoid skin contact with leaking liquid (freezing hazard). Ventilate the area. Follow the recommendations for personal protective equipment (see Section 7) and safe handling advice (see Section 8).

6.2 Environmental precautions

Environmental precautions	:	Avoid release into the environment. Prevent further leaks or spills if it can be done without risk. Contain and dispose of contaminated water.

6.3 Containment and cleaning methods and materials

Clean-up methods	:	Ventilate the area. Local or national regulations may apply to the release and disposal of this material and to the materials and elements used in cleaning up spills. You must determine which regulations apply. Sections 13 and 15 of this safety data sheet provide information on certain local or national requirements.

6.4 Reference to other sections

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

SECTION 7. Handling and storage

7.1 Precautions for safe handling

Technical measures	:	Use equipment rated for cylinder pressure. Use a backflow prevention device on the pipe. Close the valve after each use and after emptying.
Local/total ventilation	:	Use only with good ventilation.
Tips for safe handling	:	Avoid breathing in the gas. Handle in accordance with good industrial safety and hygiene practices, based on the results of the workplace exposure assessment. Wear gloves that insulate against the cold/goggles/mask. Protective valves and caps must remain in place unless the container is secured by a valve outlet with piping to the point of use. Use a non-return valve or trap (exhaust, siphon trap interceptor) in the discharge line to prevent dangerous backflow into the cylinder. Prevent gas from flowing back into the gas container. Use a pressure regulator when connecting a cylinder to systems or pipes with lower pressures (<3000 psig). Close the valve after each use and after emptying. DO NOT change or force connections. Prevent water from entering the gas container. Never attempt to lift the cylinder by its cap. Do not drag, slide or roll cylinders. Use a suitable manual skid for moving cylinders.

Keep away from heat and sources of ignition. Avoid the build-up of electrostatic charges.
Take care to avoid spills and waste and minimise release into the environment.

Hygiene measures : If exposure to chemicals is likely during normal use, provide eye wash stations and safety showers near the workplace. Do not
eat, drink, or smoke during use. Wash contaminated clothing before reuse.

7.2 Conditions for safe storage, including any incompatibilities

Technical requirements for warehouses and containers : Cylinders must be stored upright and securely fastened to prevent them from falling or being knocked over. Separate full containers from empty containers. Do not store near combustible materials. Avoid areas where salt or other corrosive materials are present. Store in properly labelled containers.
Keep in a cool, well-ventilated place. Keep away from direct sunlight. Store in accordance with specific national regulations.

Guidelines for joint storage : Do not store with the following types of products: Substances and mixtures that react spontaneously Organic peroxides
Oxidisers
Flammable liquids
Flammable solids
Pyrophoric liquids
Pyrophoric solids
Substances and mixtures that undergo spontaneous heating
Substances and mixtures which, in contact with water, emit flammable gases
Explosives
Highly toxic mixtures and substances. Very
toxic mixtures and substances.
Mixtures and substances with chronic toxicity.

Storage time : > 10
to

Recommended storage temperature : < 52 °C

Further information on stability during the census
: If stored correctly, the product has an indefinite shelf life.

7.3 Specific end uses

Specific uses : No data available

SECTION 8. Exposure controls/personal protection

8.1 Control parameters

Does not contain substances with occupational exposure limit values.

Derived no-effect level (DNEL) according to Regulation (EC) No. 1907/2006:

Name of substance	End use	Route of exposure	Potential health effects	Value
Pentafluoroethane	Workers	Inhalation	Long term - systemic effects	16444 mg/m³
	Consumers	Inhalation	Long term - systemic effects	1753 mg/m³
2,3,3,3-Tetrafluoropropene	Workers	Inhalation	Long term - systemic effects	950 mg/m³
Difluoromethane	Workers	Inhalation	Long term - systemic effects	7035 mg/m³
	Consumers	Inhalation	Long term - systemic effects	750 mg/m³

Predicted no-effect concentration (PNEC) according to Regulation (EC) No. 1907/2006:

Substance name	Environmental Compartment	Value
Pentafluoroethane	Freshwater	0.1 mg/l
	Fresh water - intermittent	1 mg/l
	Freshwater sediment	0.6 mg/kg dry weight (d.w.)
2,3,3,3-Tetrafluoropropene	Freshwater	0.1 mg/l
	Release/discontinuous use	1 mg/l
	Freshwater sediment	1.77 mg/kg dry weight (d.w.)
	Soil	1.54 mg/kg dry weight (d.w.)
	Seawater	0.01 mg/l
	Marine sediment	0.178 mg/kg dry weight (d.w.)
Difluoromethane	Freshwater	0.142 mg/l
	Release/discontinuous use	1.42 mg/l
	Freshwater sediment	0.534 mg/kg dry weight (d.w.)

8.2 Exposure controls

Engineering measures

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

Personal protection

Eye protection : Wear the following personal protective equipment:
Chemical-resistant safety goggles must be worn.
Face shield
The equipment must comply with UNE EN 166

Hand protection
Material : Low-temperature resistant gloves

Remarks : Choose protective gloves for chemical substances taking into account the quantity and concentration of the hazardous substances to be handled in the workplace. It is recommended to check with the manufacturer of the above-mentioned protective gloves whether they have the necessary resistance for applications with special chemical substances. Wash your hands before breaks and after finishing work. The break time
has not been determined for this product. Change gloves frequently!

Skin and body protection body : Wash skin after all contact with the product.

Respiratory protection : If adequate local exhaust ventilation is not available or exposure assessment shows exposures exceeding recommended guidelines, use respiratory protection.
The equipment must comply with UNE EN 14387

Filter type : Organic gas and low boiling point vapour (AX)

Protective measures : Wear gloves that insulate against the cold/goggles/mask.

SECTION 9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	:	Liquefied gas
Colour	:	Clear, colourless
Odour	:	light, similar to ether
Odour threshold	:	No data available
Melting point/freezing point freezing point	:	No data available
Initial boiling point and boiling range	:	< -47.00 °C
Flammability (solid, gas)	:	Will not burn
Upper explosion limit / Flammability limits :	:	Upper flammability limits Method: ASTM E681 None.

Lower explosion limits / Lower flammability limits	:	Lower flammability limits Method: ASTM E681 None.
Flash point	:	Not applicable
Auto-ignition temperature ignition	:	No data available
Decomposition temperature :	:	No data available
pH	:	No data available
Viscosity Solubility Viscosity, kinematic	:	Not applicable
Partition coefficient n-octanol/water	:	No data available
Vapour pressure	:	13,159 hPa (25 °C)
Relative density	:	1.13 (25 °C)
Relative vapour density	:	3.64 (Air = 1.0)
Particle characteristics Particle size	:	Not applicable

9.2 Other data

Explosive	:	Non-explosive
Oxidising properties	:	The substance or mixture is not classified as an oxidiser.
Evaporation rate	:	> 1 (CCL4=1.0)

SECTION 10. Stability and reactivity

10.1 Reactivity

Not classified as a reactivity hazard.

10.2 Chemical stability

Stable when used as directed. Follow precautionary recommendations and avoid incompatible conditions and materials.

10.3 Possibility of hazardous reactions

Hazardous reactions : May react with strong oxidising agents.

10.4 Conditions to avoid

Conditions to be avoided : 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 may become combustible in the presence of an ignition source. This substance may also become combustible in an oxygen-enriched environment (oxygen concentrations higher than those in air). Whether a mixture containing air and this substance, or this substance in an oxygen-enriched environment, can become combustible depends on the relationship between 1) temperature, 2) pressure, and 3) the proportion of oxygen in the mixture. In general, this substance should not be mixed with air at pressures 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 detection testing or other purposes.
Heat, flames and sparks.

10.5 Incompatible materials

Materials to avoid : Avoid contamination (e.g. with rust, dust or ash), danger of decomposition!
Incompatible with acids and bases.
Incompatible with oxidising agents. Oxygen
Peroxides
Peroxide compounds
Metal powders

10.6 Hazardous decomposition products

No dangerous decomposition products are known.

SECTION 11. Toxicological information

11.1 Information on hazard classes defined in Regulation (EC) No 1272/2008

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

Acute toxicity

Not classified based on available information.

Components:

Pentafluoroethane:

Acute inhalation toxicity : LC50 (Rat): > 800,000 ppm
Exposure time: 4 h Atmosphere
test: gas
Method: OECD Test Guideline 403

No observed adverse effect concentration (dog): 75,000 ppm
Observations: Cardiac sensitisation

Cardiac sensitisation threshold (dog): 368.159 mg/m³ Observations: Cardiac sensitisation

2,3,3,3-Tetrafluoropropene:

Acute inhalation toxicity : LC50 (Rat): > 405,800 ppm
Exposure time: 4 h Atmosphere
test: gas
Method: OECD Test Guideline 403

No observed adverse effect concentration (dog): 120,000 ppm
Atmosphere test: gas Observations:
Cardiac sensitisation

Concentration with few adverse effects observed (Dog): > 120,000 ppm
Atmosphere test: gas Observations:
Cardiac sensitisation

Cardiac sensitisation threshold (dog): > 559,509 mg/m³
Atmosphere test: gas
Remarks: Cardiac sensitisation

Difluoromethane:

Acute oral toxicity : Assessment: The substance or mixture does not exhibit acute oral toxicity
.

Acute inhalation toxicity : LC50 (Rat): > 520,000 ppm
Exposure time: 4 h Atmosphere
test: gas
Method: OECD Test Guideline 403

No observed adverse effect concentration (dog): 350,000 ppm
Atmosphere test: gas Observations:
Cardiac sensitisation

Concentration with few adverse effects observed (dog): > 350,000 ppm
Atmosphere test: gas Observations:
Cardiac sensitisation

Cardiac sensitisation threshold (dog): > 735,000 mg/m³

Atmosphere test: gas Observations:
Cardiac sensitisation

Acute skin toxicity : Assessment: The substance or mixture does not present any acute toxicity
acutely toxic to the skin

Skin corrosion or irritation

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

Result : Does not irritate the skin

Difluoromethane:

Result : Does not irritate the skin

Serious eye damage or irritation

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

Result : Does not irritate the eyes

Difluoromethane:

Result : Does not irritate the eyes

Respiratory or skin sensitisation Skin sensitisation

Not classified based on available information.

Respiratory sensitisation

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

Route of exposure : Skin contact
Result : Negative

Difluoromethane:

Route of exposure : Skin contact
Result : Negative

Route of exposure : Inhalation
Result : Negative

Germ cell mutagenicity

Not classified based on available information.

Components:

Pentafluoroethane:

In vitro genotoxicity	:	Test type: Reverse mutation test in bacteria (AMES) Method: OECD Test Guideline 471 Result: negative
		Test type: In vitro mammalian cell gene mutation assay Result: negative Observations: Based on data from similar materials
		Test Type: In vitro Chromosomal Aberration Test Method: OECD Test Guideline 473 Result: negative
In vivo genotoxicity	:	Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Mouse Route of administration: inhalation (gas) Method: OECD Test Guideline 474 Result: negative

2,3,3,3-Tetrafluoropropene:

In vitro genotoxicity	:	Test type: Reverse mutation test in bacteria (AMES) Method: OECD Test Guideline 471 Result: positive
		Test Type: In vitro Chromosome Aberration Test Method: OECD Test Guideline 473 Result: negative
In vivo genotoxicity	:	Test type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Mouse Route of administration: inhalation (gas) Method: OECD Test Guideline 474 Result: negative
		Test Type: In vivo mammalian alkaline comet assay Species: Rat Route of Administration: Inhalation (gas) Method: OECD Test Guideline 489 Result: negative
		Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Rat

Route of application: inhalation (gas)
Method: OECD Test Guideline 474 Result: negative

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

Difluoromethane:

In vitro genotoxicity : Test type: Reverse mutation test in bacteria (AMES)
Method: OECD Test Guideline 471 Result: negative

Test type: In vitro chromosomal aberration test Method: OECD Test Guideline 473
Result: Negative

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

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

Carcinogenicity

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

Result : Negative

Carcinogenicity - Assessment : The weight of evidence does not support classification as carcinogenic.
:

Difluoromethane:

Carcinogenicity - Assessment : The weight of evidence does not support classification as carcinogenic.
:

Reproductive toxicity

Not classified based on available information.

Components:

Pentafluoroethane:

Effects on fertility : Test type: One-generation reproductive toxicity study
Species: Rat

Route of application: inhalation (vapour)
Result: negative
Remarks: Based on data from similar materials

Effects on foetal development : Type of test: Embryonic and foetal development Species: Rat
Route of administration: inhalation (gas)
Method: OECD Test Guideline 414 Result: negative

2,3,3,3-Tetrafluoropropene:

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

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

Reproductive toxicity - Assessment : The weight of evidence does not support classification as reproductive toxicity. No effects on or via lactation

Difluoromethane:

Effects on fertility : Species: Mouse
Route of administration: Inhalation
Result: negative
Observations: Based on data from similar materials

Effects on foetal development : Type of Test: Repeated dose toxicity study combined with developmental and reproductive toxicity screening
Species: Rat
Route of Administration: Inhalation (gas)
Method: OECD Test Guideline 414 Result: negative

Test Type: Repeated dose toxicity study combined with developmental and reproductive toxicity screening
Species: Rabbit
Route of administration: inhalation (gas)
Method: OECD Test Guideline 414 Result: negative

Reproductive toxicity - Assessment : The weight of evidence does not support classification as reproductive toxicity

Specific target organ toxicity (STOT) – single exposure

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

Route of exposure	:	inhalation (gas)
Assessment	:	No significant health effects were observed in animals at concentrations of 20,000 ppmV/4h or less

Difluoromethane:

Route of exposure	:	inhalation (gas)
Assessment	:	No significant health effects were observed in animals at concentrations of 20,000 ppmV/4h or less.

Specific target organ toxicity (STOT) – repeated exposure

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

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

Difluoromethane:

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

Repeated dose toxicity

Components:

Pentafluoroethane:

Species	:	Rat
NOAEL	:	≥ 50,000 ppm
Route of administration	:	inhalation (gas)
Exposure time	:	13 weeks
Method	:	OECD Test Guideline 413

2,3,3,3-Tetrafluoropropene:

Species	:	Rat, male and female
NOAEL	:	50,000 ppm
LOAEL	:	>50,000 ppm
Route of administration	:	inhalation (gas)
Exposure time	:	13 weeks
Method	:	OECD Test Guideline 413

Difluoromethane:

Species	:	Rat, males and females
NOAEL	:	49,100 ppm
LOAEL	:	> 49,100 ppm
Route of administration	:	inhalation (gas)
Exposure time	:	13 weeks
Method	:	OECD Test Guideline 413

Aspiration toxicity

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

No aspiration toxicity classification

Difluoromethane:

No aspiration toxicity classification

11.2 Information on other hazards

Endocrine disrupting properties

Product:

Assessment	:	The substance/mixture does not contain components that have endocrine-disrupting properties in accordance with Article 57(f) of REACH or Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

SECTION 12. Ecological information

12.1 Toxicity

Components:

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 (large water flea)): > 100 mg/l Exposure time: 48 h Remarks: Based on data from similar materials
Toxicity to algae/aquatic plants	:	EC50r (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

2,3,3,3-Tetrafluoropropene:

Fish toxicity	:	LC50 (Cyprinus carpio (Carp)): > 197 mg/l Exposure time: 96 h Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (large water flea)): > 100 mg/l Exposure time: 48 hours 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 days Method: OECD Test Guideline 201

Difluoromethane:

Toxicity to fish	:	LC50 (Fish): 1,507 mg/l Exposure time: 96 hours Method: ECOSAR (Ecological Structure Activity Relationships)
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia): 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:

Pentafluoroethane:

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

2,3,3,3-Tetrafluoropropene:

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

Difluoromethane:

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

12.3 Bioaccumulation potential

Components:

Pentafluoroethane:

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

2,3,3,3-Tetrafluoropropene:

Bioaccumulation : Observations: Bioaccumulation is unlikely.

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

Difluoromethane:

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

12.4 Mobility in soil

No data available

12.5 Results of PBT and mPmB assessment

Product:

Assessment : This substance/mixture does not contain components that are considered to be persistent bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Endocrine-disrupting properties

Product:

Assessment : The substance/mixture does not contain components that have endocrine-disrupting properties in accordance with Article 57(f) of REACH or Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

12.7 Other adverse effects

Global warming potential

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

Product:
Global warming potential in 100 years: 2,140

SECTION 13. Disposal considerations

13.1 Methods for waste treatment

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

Contaminated packaging : Empty containers must be taken to an approved waste management site for recycling or disposal.
Empty pressure vessels should be returned to the supplier.
Unless otherwise specified: dispose of as if it were an unused product.

SECTION 14. Transport information

14.1 UN number or ID number

ADN : UN 1078

ADR : UN 1078

RID : UN 1078

IMDG : UN 1078

IATA : UN 1078

14.2 United Nations official transport designation

ADN : REFRIGERANT GAS, N.E.P.
(Pentafluoroethane, 2,3,3,3-Tetrafluoropropene)

ADR : REFRIGERANT GAS, N.O.S.
(Pentafluoroethane, 2,3,3,3-Tetrafluoropropene)

RID : REFRIGERANT GAS, N.O.S.
(Pentafluoroethane, 2,3,3,3-Tetrafluoropropene)

IMDG : REFRIGERANT GAS, N.O.S.
(Pentafluoroethane, 2,3,3,3-Tetrafluoropropene)

IATA	:	Refrigerant gas, n.o.s. (Pentafluoroethane, 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 Packaging group

ADN

Packaging group	:	Not assigned by regulation
Classification code	:	2A
Hazard identification number	:	20
Labels	:	2.2

ADR

Packaging group	:	Not assigned by the regulation
Classification code	:	2A
Hazard identification number	:	20
Labels	:	2.2
Tunnel restriction code	:	(C/E)

RID

Packaging group	:	Not assigned by the regulation
Classification code	:	2A
Hazard identification number	:	20
Labels	:	2.2 ((13))

IMDG

Packing group	:	Not assigned by the regulation
Labels	:	2.2
EmS Code	:	F-C, S-V

IATA (Cargo)

Packing instructions (cargo plane)	:	200
Packing group	:	Not assigned by regulation
Labels	:	Non-flammable, non-toxic Gas

IATA (Passenger)

Packaging instructions (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 users

The transport classification(s) listed are for informational purposes only and are based solely on the properties of the unpackaged material described in this Safety Data Sheet. Transport classifications may vary depending on the mode of transport, the size of the container/packaging, and variations in regional or country regulations.

14.7 Maritime bulk transport in accordance with IMO instruments

Remarks : Not applicable to the product supplied.

SECTION 15. Regulatory information

15.1 Safety, health and environmental regulations and legislation specific to the substance or mixture

REACH - Restrictions on the manufacture, marketing and use of certain substances, mixtures and dangerous articles (Annex XVII)	:	Not applicable
REACH - List of candidate substances of very high concern special concern for its Authorisation (Article 59).	:	Not applicable
Regulation (EC) No 1005/2009 on substances that deplete the ozone layer	:	Not applicable
Regulation (EU) 2019/1021 on persistent organic pollutants (recast)	:	Not applicable
Regulation (EC) No 649/2012 of the European Parliament and of the Council concerning the export and import of dangerous chemicals	:	Not applicable
REACH - List of substances subject to authorisation (Annex XIV)	:	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 all associated logos are trademarks or registered trademarks of The Chemours Company FC, LLC. Chemours™ and the Chemours logo are trademarks of The Chemours Company.
Read Chemours safety instructions before use.
For additional information, please contact your local Chemours office or official Chemours distributors.

Items that have been changed from the previous version are marked in the body of this document by two vertical lines.
by two vertical lines.

Full text of the H Statements

H221 : Flammable gas.
H280 : Contains gas under pressure; danger of explosion if heated.

Full text of other abbreviations

Flam. Gas : Flammable gases
Press. Gas : Pressurised gases

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - Agreement concerning the International Carriage of Dangerous Goods by Road; AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for Testing and Materials; bw - Body weight; CLP - Classification, Labelling and Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogenic, Mutagenic or Reproductive Toxicant; DIN - 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 - Load rate associated with x% response; EmS - Emergency procedure; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonised 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 - Mean Inhibitory Concentration; ICAO - International Civil Aviation Organisation; IECSC - Inventory of Chemical Substances in China; IMDG - International Maritime Dangerous Goods Code; IMO - International Maritime Organisation; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardisation; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal concentration for 50% of a test population; LD50 - Lethal dose for 50% of a test population (Median lethal dose); MARPOL - International Convention for the Prevention of Pollution from Ships;
n.o.s. - N.E.P.: Not otherwise specified; NO(A)EC - No observable (adverse) effect concentration; NO(A)EL - No observable (adverse) effect level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organisation for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - In-

Philippine 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; TECI - Thailand Existing Chemical Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very persistent and very bioaccumulative

Other data

Sources of the main data used to prepare the sheet	:	Internal technical data, SDS data for raw materials, search results from the OECD eChem Portal and the European Chemicals Agency, http://echa.europa.eu/

Mixture classification:		**Classification procedure:**
Press. Gas Liquefied gas	H280	Based on product assessment or data

The information provided in this safety data sheet has been compiled with the utmost care and reflects our knowledge of the subject matter at the date of publication. This information serves only as a guideline for safe handling, use, processing, storage, transport, disposal and spillage and cannot be considered as a guarantee or quality standard of any kind. The information provided relates only to the specific material identified at the top of this SDS and may not be valid when the material in the SDS is used in conjunction with any other material or process, unless specified in the text. Users of the material should review the information and recommendations in the specific context in which it will be handled, used, processed and stored, and should even assess the suitability of the material in the SDS for the user's final product, if applicable.

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