

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

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

1.1 Product identifier

Trade name	:	Vertrel™ XF specialty fluid
SDS-Identcode	:	130000000559
REACH Registration Number	:	01-2119446695-28-0000
Substance name	:	Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane
Index-No.	:	602-100-00-5
EC-No.	:	420-640-8

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

Use of the Substance/Mixture	:	Packaging, Formulation [mixing] of preparations and/ or re-packaging (excluding alloys), Solvent, Solvents for aerosol, Cleaning agent, Heat transfer fluids, Solvent recovery
Recommended restrictions on use	:	Do not use or resell Chemours™ materials in medical applications involving implantation in the human body or contact with internal body fluids or tissues unless agreed to by Seller in a written agreement covering such use. For further information, please contact your Chemours representative.

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

+(353)-19014670 (CHEMTREC - Recommended) ; +353-(01) 809 2166 (Poison Information Center of Ireland)

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Long-term (chronic) aquatic hazard, Category 3 H412: Harmful to aquatic life with long lasting effects.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard statements : H412 Harmful to aquatic life with long lasting effects.

Precautionary statements : **Prevention:**
P273 Avoid release to the environment.

Additional Labelling

|| Contains fluorinated greenhouse gases. (HFC-43-10 mee)

2.3 Other hazards

This substance/mixture contains no components considered to be either 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 considered to have endocrine disrupting properties according to REACH Article 57(f) 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 considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

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.

SECTION 3: Composition/information on ingredients

3.1 Substances

Substance name : Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

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SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

Components

Chemical name	CAS-No. EC-No.	Concentration (%) w/w)	M-Factor, SCL, ATE
Reaction mass of (3R,4R)- 1,1,1,2,2,3,4,5,5,5- decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5- decafluoropentane	138495-42-8 420-640-8	>= 90 - <= 100	

SECTION 4: First aid measures

4.1 Description of first aid measures

- 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 : Wash with water and soap as a precaution.
Get medical attention if symptoms occur.
- In case of eye contact : Flush eyes with water as a precaution.
Get medical attention if irritation develops and persists.
- If swallowed : If swallowed, DO NOT induce vomiting.
Get medical attention if symptoms occur.
Rinse mouth thoroughly with water.

4.2 Most important symptoms and effects, both acute and delayed

- Symptoms : May cause cardiac arrhythmia.
- Inhalation may provoke the following symptoms:
Dizziness

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 : Water spray
Alcohol-resistant foam
Carbon dioxide (CO₂)
Dry chemical

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Unsuitable extinguishing media : None known.

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.

Hazardous combustion products : Hydrogen fluoride
carbonyl fluoride
Carbon oxides

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.
Use water spray to cool unopened containers.
Remove undamaged containers from fire area if it is safe to do so.
Evacuate area.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions : 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.
Prevent spreading over a wide area (e.g. by containment or oil barriers).
Retain and dispose of contaminated wash water.
Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for cleaning up : Soak up with inert absorbent material.
For large spills, provide dyking or other appropriate containment to keep material from spreading. If dyked material can be pumped, store recovered material in appropriate container.
Clean up remaining materials from spill with suitable absorbent.
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 deter-

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

mine which regulations are applicable.
Sections 13 and 15 of this SDS provide information regarding
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 | : | See Engineering measures under EXPOSURE CONTROLS/PERSONAL PROTECTION section. |
| Local/Total ventilation | : | Use only with adequate ventilation. |
| Advice on safe handling | : | Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment
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 | : | Do not expose drums to direct heat or temperature above 46°C (115°F) to avoid pressurizing and possibly distorting the drums. Material should not be dispensed by pouring from pail/drum shipping containers containing 5 gallons or more. The use of a drum pump is recommended for dispensing from pail/drum shipping containers with 5 gallons or more, except for smaller containers where adequate ventilation can be used to manage the exposure. Keep in properly labelled containers. Store in accordance with the particular national regulations. |
| Advice on common storage | : | No special restrictions on storage with other products. |
| Recommended storage temperature | : | < 46 °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 |
|-----------------|---|-------------------|

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure Limits

Components	CAS-No.	Value type (Form of exposure)	Control parameters	Basis
Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)-1,1,1,2,2,3,4,5,5,5-decafluoropentane	138495-42-8	TWA	225 ppm 2,320 mg/m ³	WEEL
		STEL	700 ppm 7,217 mg/m ³	WEEL

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

Substance name	End Use	Exposure routes	Potential health effects	Value
Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)-1,1,1,2,2,3,4,5,5,5-decafluoropentane	Workers	Inhalation	Long-term systemic effects	2072 mg/m ³
	Workers	Inhalation	Acute systemic effects	2072 mg/m ³
	Consumers	Inhalation	Long-term systemic effects	1546 mg/m ³
	Consumers	Ingestion	Long-term systemic effects	37 mg/kg bw/day
	Consumers	Inhalation	Acute systemic effects	1546 mg/m ³

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

Substance name	Environmental Compartment	Value
Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)-1,1,1,2,2,3,4,5,5,5-decafluoropentane	Fresh water	0.0344 mg/l
	Freshwater - intermittent	0.106 mg/l
	Marine water	0.0034 mg/l
	Marine sediment	0.175 mg/kg dry weight (d.w.)
	Fresh water sediment	1.75 mg/kg dry

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

		weight (d.w.)
	Soil	0.215 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/face protection : Wear the following personal protective equipment:
Safety glasses
Equipment should conform to I.S. EN 166

Hand protection
Material : Viton®
Glove thickness : 0.7 mm
Wearing time : 120 min

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!

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 I.S. EN 14387

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

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state : liquid

Colour : colourless

Odour : slight, ether-like

Odour Threshold : No data available

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Melting point/freezing point	: -83.7 °C
Initial boiling point and boiling range	: 53.75 °C (1,013 hPa)
Flammability (solid, gas)	: Not applicable
Flammability (liquids)	: No data available
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.
Flash point	: Method: ASTM D 56, Tag closed cup does not flash
Auto-ignition temperature	: No data available
Decomposition temperature	: No data available
pH	: No data available
Viscosity	
Viscosity, dynamic	: 6.7 mPa.s (25 °C)
Viscosity, kinematic	: No data available
Solubility(ies)	
Water solubility	: 0.126 g/l (20 °C)
Partition coefficient: n-octanol/water	: log Pow: 2.7 (24 °C)
Vapour pressure	: 313 hPa (25 °C)
Density	: 1.60 g/cm³ (20 °C)

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Relative vapour density : 8.7

Particle characteristics
Particle size : Not applicable

9.2 Other information

Explosives : Not explosive

Oxidizing properties : The substance or mixture is not classified as oxidizing.

Evaporation rate : No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

Not classified as a reactivity hazard.

10.2 Chemical stability

Stable under normal conditions.

10.3 Possibility of hazardous reactions

Hazardous reactions : None known.

10.4 Conditions to avoid

Conditions to avoid : None known.

10.5 Incompatible materials

Materials to avoid : None.

10.6 Hazardous decomposition products

No hazardous decomposition products are known.

SECTION 11: Toxicological information

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

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

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Acute toxicity

Not classified based on available information.

Components:

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:

Acute oral toxicity : LD50 (Rat): > 5,000 mg/kg
Method: OECD Test Guideline 401

Acute inhalation toxicity : LC50 (Rat): 114.428 mg/l
Exposure time: 4 h
Test atmosphere: vapour
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 5000 ppm
Test atmosphere: gas
Method: Cardiac sensitisation study

Lowest observed adverse effect concentration (Dog): > 5000 ppm
Test atmosphere: gas
Method: Cardiac sensitisation study

Cardiac sensitisation threshold limit (Dog): > 51,544 mg/m3
Test atmosphere: gas
Method: Cardiac sensitisation study

Acute dermal toxicity : LD50 (Rabbit): > 5,000 mg/kg
Method: OECD Test Guideline 402

Skin corrosion/irritation

Not classified based on available information.

Components:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

Species : Rabbit
Method : OECD Test Guideline 404
Result : No skin irritation

Serious eye damage/eye irritation

Not classified based on available information.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Components:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

Species	: Rabbit
Method	: OECD Test Guideline 405
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:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

Test Type	: Buehler Test
Exposure routes	: Skin contact
Species	: Guinea pig
Method	: OECD Test Guideline 406
Result	: negative

Exposure routes	: Inhalation
Result	: negative

Germ cell mutagenicity

Not classified based on available information.

Components:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

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
	Method: OECD Test Guideline 476
	Result: negative

Genotoxicity in vivo	: Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
	Species: Rat
	Application Route: inhalation (vapour)

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

	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:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

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

Reproductive toxicity

Not classified based on available information.

Components:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

Effects on fertility	: Test Type: One-generation reproduction toxicity study Species: Rat Application Route: inhalation (vapour) Method: OECD Test Guideline 415 Result: negative
Effects on foetal development	: Test Type: Prenatal development toxicity study (teratogenicity) Species: Rat Application Route: inhalation (vapour) Method: OECD Test Guideline 414 Result: negative
Reproductive toxicity - Assessment	: Weight of evidence does not support classification for reproductive toxicity

STOT - single exposure

Not classified based on available information.

Components:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

Exposure routes	: Ingestion
Assessment	: No significant health effects observed in animals at concentra-

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

|| tions of 2000 mg/kg bw or less

|| Exposure routes : Skin contact
|| Assessment : No significant health effects observed in animals at concentrations of 2000 mg/kg bw or less

|| Exposure routes : inhalation (vapour)
|| Assessment : No significant health effects observed in animals at concentrations of 20 mg/l/4h or less

STOT - repeated exposure

Not classified based on available information.

Components:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

|| Exposure routes : inhalation (vapour)
|| Assessment : No significant health effects observed in animals at concentrations of 1 mg/l/6h/d or less.

Repeated dose toxicity

Components:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

|| Species : Rat, male and female
|| NOAEL : 15.463 mg/l
|| LOAEL : 20.618 mg/l
|| Application Route : inhalation (vapour)
|| Exposure time : 90 Days
|| Method : OECD Test Guideline 413

Aspiration toxicity

Not classified based on available information.

Components:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

|| No aspiration toxicity classification

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

11.2 Information on other hazards

Endocrine disrupting properties

Product:

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

Experience with human exposure

Product:

Inhalation : Symptoms: Effects of breathing high concentrations of vapour may include:, Tiredness, Drowsiness, Central nervous system depression, Convulsions, Cardiac arrhythmias

Symptoms: Adverse effects from repeated inhalation may include, Central nervous system depression

Skin contact : Symptoms: Prolonged skin contact may defat the skin and produce dermatitis.

Ingestion : Symptoms: Aspiration may cause pulmonary oedema and pneumonitis.

SECTION 12: Ecological information

12.1 Toxicity

Components:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

Toxicity to fish : LC50 (Danio rerio (zebra fish)): 13 mg/l
Exposure time: 96 h
Method: OECD Test Guideline 203

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 10.6 mg/l
Exposure time: 48 h
Method: OECD Test Guideline 202

Toxicity to algae/aquatic plants : EC50 (Selenastrum capricornutum (green algae)): > 120 mg/l
Exposure time: 72 h
Method: OECD Test Guideline 201

NOEC (Scenedesmus capricornutum (fresh water algae)): 120 mg/l
Exposure time: 72 h

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

	Method: OECD Test Guideline 201
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	: NOEC: 1.72 mg/l Exposure time: 21 d Species: Daphnia magna (Water flea) Method: OECD Test Guideline 211

12.2 Persistence and degradability

Components:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

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

12.3 Bioaccumulative potential

Components:

Reaction mass of (3R,4R)-1,1,1,2,2,3,4,5,5,5-decafluoropentane and (3S,4S)- 1,1,1,2,2,3,4,5,5,5-decafluoropentane

:

Bioaccumulation	: Remarks: Bioaccumulation is unlikely.
Partition coefficient: n-octanol/water	: log Pow: 2.4 (24 °C)

12.4 Mobility in soil

Product:

Distribution among environmental compartments	: Koc: 217.78
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12.5 Results of PBT and vPvB assessment

Product:

Assessment	: This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.
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12.6 Endocrine disrupting properties

Product:

Assessment	: The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation
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SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

(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:

100-year global warming potential: 1,640

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.
Do not dispose of waste into sewer. |
| Contaminated packaging | : Empty containers should be taken to an approved waste han-
dling site for recycling or disposal.
If not otherwise specified: Dispose of as unused product. |

SECTION 14: Transport information

14.1 UN number or ID number

- | | |
|------|-------------------------------------|
| ADN | : Not regulated as a dangerous good |
| ADR | : Not regulated as a dangerous good |
| RID | : Not regulated as a dangerous good |
| IMDG | : Not regulated as a dangerous good |
| IATA | : Not regulated as a dangerous good |

14.2 UN proper shipping name

- | | |
|------|-------------------------------------|
| ADN | : Not regulated as a dangerous good |
| ADR | : Not regulated as a dangerous good |
| RID | : Not regulated as a dangerous good |
| IMDG | : Not regulated as a dangerous good |
| IATA | : Not regulated as a dangerous good |

14.3 Transport hazard class(es)

- | | |
|-----|-------------------------------------|
| ADN | : Not regulated as a dangerous good |
| ADR | : Not regulated as a dangerous good |

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0	Revision Date: 13.09.2023	SDS Number: 1326706-00034	Date of last issue: 27.06.2023 Date of first issue: 27.02.2017
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RID	: Not regulated as a dangerous good
IMDG	: Not regulated as a dangerous good
IATA	: Not regulated as a dangerous good

14.4 Packing group

ADN	: Not regulated as a dangerous good
ADR	: Not regulated as a dangerous good
RID	: Not regulated as a dangerous good
IMDG	: Not regulated as a dangerous good
IATA (Cargo)	: Not regulated as a dangerous good
IATA (Passenger)	: Not regulated as a dangerous good

14.5 Environmental hazards

Not regulated as a dangerous good

14.6 Special precautions for user

Not applicable

14.7 Maritime transport in bulk according to IMO instruments

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, mixtures and articles (Annex XVII)	: Conditions of restriction for the following entries should be considered: Number on list 3
--	---

	Substance(s) or mixture(s) are listed here according to their appearance in the regulation, irrespective of their use/purpose or the conditions of the restriction. Please refer to the conditions in corresponding Regulation to determine whether an entry is applicable to the placing on the market or not.
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REACH - Candidate List of Substances of Very High Concern for Authorisation (Article 59).	: Not applicable
---	------------------

Regulation (EC) No 1005/2009 on substances that deplete the ozone layer	: Not applicable
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Regulation (EU) 2019/1021 on persistent organic pollutants (recast)	: Not applicable
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Regulation (EC) No 649/2012 of the European Parliament	: Not applicable
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SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

ment and the Council concerning the export and import
of dangerous chemicals

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

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

A Chemical Safety Assessment has been carried out for this substance.

SECTION 16: Other information

Other information : Vertrel™ and any associated logos are trademarks or copy-
rights 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 other abbreviations

WEEL	: Workplace Environmental Exposure Levels (WEEL)
WEEL / STEL	: Short term exposure limit
WEEL / TWA	: 8-hr TWA

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 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 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 - Interna-

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

tional 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; TECL - Thailand Existing Chemicals 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/>

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

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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SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Annex: Exposure Scenarios

Table of Contents

Number	Title
ES1	Industrial use; (Re)packing of substances and mixtures.; Heat transfer fluids (PC16).
ES2	Industrial use; Manufacture of plastics products, including compounding and conversion (SU12); Solvent.; Polymer preparations and compounds (PC32).
ES3	Industrial use; Manufacture of computer, electronic and optical products, electrical equipment (SU16).; Health services (SU20); Carrier fluid.; Aerosol propellants.; Adhesives, sealants (PC1).; Lubricants, greases, release products (PC24).; Pharmaceuticals (PC29).; Semiconductors (PC33).
ES4	professional use; Manufacture of computer, electronic and optical products, electrical equipment (SU16); Cleaning.; Washing and cleaning products (PC35).
ES5	professional use; Manufacture of computer, electronic and optical products, electrical equipment (SU16); Heat transfer agents.; Heat transfer fluids (PC16).
ES6	Industrial use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Solvent recovery.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

ES 1: Industrial use; (Re)packing of substances and mixtures.; Heat transfer fluids (PC16).

1.1. Title section

Exposure Scenario name	: Industrial, Formulation & (re)packing of substances and mixtures
Structured Short Title	: Industrial use; (Re)packing of substances and mixtures.; Heat transfer fluids (PC16).

Environment		
CS 1	(Re)packing of substances and mixtures	ERC2
Worker		
CS 2	Closed systems, Material transfers	PROC1
CS 3	Closed systems, Material transfers, Equipment maintenance	PROC2
CS 4	Material transfers, Dedicated facility	PROC8b
CS 5	Mixing operations	PROC5
CS 6	(Re)packing of substances and mixtures, Drum and small package filling	PROC9
CS 7	Laboratory activities	PROC15

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: Formulation into mixture (ERC2)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Annual site tonnage	: 160 tonnes/year
Daily amount per site	: 3.2 tonnes/day
Emission days	: 50
Technical and organisational conditions and measures	

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Use in closed process
Process designed to minimize releases to air.
Process designed to minimize releases to wastewater.

Conditions and measures related to sewage treatment plant

STP type : No sewage treatment plant

Conditions and measures related to treatment of waste (including article waste)

Waste treatment : No waste from process

Other conditions affecting environmental exposure

Local freshwater dilution factor : 10

Local marine water dilution factor : 100

Release fraction to air from process

Worst case assumption 10 %

Release fraction to wastewater from process

Worst case assumption < 0.5 kg/day

1.2.2. Control of worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Product (article) characteristics

Covers concentrations up to 100 %

Physical form of product : Liquid

Amount used (or contained in articles), frequency and duration of use/exposure

Use frequency : Covers use up to 1 h/day

Technical and organisational conditions and measures

Use in closed process

Ensure operatives are trained to minimise exposures.

Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.

Other conditions affecting workers exposure

Indoor or outdoor use : Outdoor use

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

1.2.3. Control of worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers use up to 1 h/day
Technical and organisational conditions and measures	
Use in closed process	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Outdoor use

1.2.4. Control of worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers use up to 15 min/day
Technical and organisational conditions and measures	
Use in closed process	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Outdoor use

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

1.2.5. Control of worker exposure: Mixing or blending in batch processes (PROC5)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers use up to 15 min/day
Technical and organisational conditions and measures	
Use in closed process	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Indoor use

1.2.6. Control of worker exposure: Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC9)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers use up to 4 h/day
Technical and organisational conditions and measures	
Local exhaust ventilation	
Use in closed process	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	
Other conditions affecting workers exposure	

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Indoor or outdoor use	:	Indoor use
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1.2.7. Control of worker exposure: Use as laboratory reagent (PROC15)

Product (article) characteristics
Covers concentrations up to 100 %
Physical form of product : Liquid
Amount used (or contained in articles), frequency and duration of use/exposure
Use frequency : Covers use up to 1 h/day
Technical and organisational conditions and measures
Use high-performance fume cupboard. Inhalation - minimum efficiency of 80 %
Use in closed process
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure: Formulation into mixture (ERC2)

Protection Target	Exposure estimate	RCR
Freshwater	0.025 mg/L (ECETOC TRA)	0.7
Marine water	0.0025 mg/L (ECETOC TRA)	0.7
Freshwater sediment	0.589 mg/kg dry weight (ECETOC TRA)	0.3
Marine sediment	0.0589 mg/kg dry weight (ECETOC TRA)	0.3
Agricultural soil	0.0276 mg/kg dry weight (ECETOC TRA)	0.1
Grassland	0.0276 mg/kg dry weight (ECETOC TRA)	0.1

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

1.3.2. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0.02 mg/m ³ (ECETOC TRA worker v2.0)	< 0.001

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

1.3.3. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	74 mg/m ³ (ECETOC TRA worker v2.0)	0.036

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

1.3.4. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	110 mg/m ³ (ECETOC TRA worker v2.0)	0.053

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

1.3.5. Worker exposure: Mixing or blending in batch processes (PROC5)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	260 mg/m ³	0.125

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

			(ECETOC TRA worker v2.0)	
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Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

1.3.6. Worker exposure: Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC9)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	130 mg/m ³ (ECETOC TRA worker v2.0)	0.063

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

1.3.7. Worker exposure: Use as laboratory reagent (PROC15)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	22 mg/m ³ (ECETOC TRA worker v2.0)	0.011

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

1.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

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SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

ES 2: Industrial use; Manufacture of plastics products, including compounding and conversion (SU12); Solvent.; Polymer preparations and compounds (PC32).

2.1. Title section

Exposure Scenario name	: Industrial, Solvent
Structured Short Title	: Industrial use; Manufacture of plastics products, including compounding and conversion (SU12); Solvent.; Polymer preparations and compounds (PC32).

Environment		
CS 1	Solvent	ERC4
Worker		
CS 2	Closed systems, Material transfers	PROC1
CS 3	Closed systems, Material transfers, Equipment maintenance	PROC2
CS 4	Material transfers, Dedicated facility	PROC8b

2.2. Conditions of use affecting exposure

2.2.1. Control of environmental exposure: Use of non-reactive processing aid at industrial site (no inclusion into or onto article) (ERC4)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Annual site tonnage	: 30 tonnes/year
Daily amount per site	: 1.5 tonnes/day
Emission days	: 20
Technical and organisational conditions and measures	
Use in closed process Process designed to minimize releases to air. Process designed to minimize releases to wastewater.	

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Conditions and measures related to sewage treatment plant	
STP type	: No sewage treatment plant
Conditions and measures related to treatment of waste (including article waste)	
Waste treatment	: No waste from process
Other conditions affecting environmental exposure	
Local freshwater dilution factor	: 10
Local marine water dilution factor	: 100
Release fraction to air from process Worst case assumption 50 %	
Release fraction to wastewater from process Worst case assumption < 0.5 kg/day	

2.2.2. Control of worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers use up to 1 h/day
Technical and organisational conditions and measures	
Use in closed process	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Indoor use

2.2.3. Control of worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers use up to 1 h/day
Technical and organisational conditions and measures	
Use in closed process	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Indoor use

2.2.4. Control of worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers use up to 15 min/day
Technical and organisational conditions and measures	
Use in closed process	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Indoor use

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

2.3. Exposure estimation and reference to its source

2.3.1. Environmental release and exposure: Use of non-reactive processing aid at industrial site (no inclusion into or onto article) (ERC4)

Protection Target	Exposure estimate	RCR
Freshwater	0.025 mg/L (ECETOC TRA)	0.7
Marine water	0.0025 mg/L (ECETOC TRA)	0.7
Freshwater sediment	0.589 mg/kg dry weight (ECETOC TRA)	0.3
Marine sediment	0.0589 mg/kg dry weight (ECETOC TRA)	0.3
Agricultural soil	0.0258 mg/kg dry weight (ECETOC TRA)	0.1
Grassland	0.0258 mg/kg dry weight (ECETOC TRA)	0.1

2.3.2. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0.02 mg/m ³ (ECETOC TRA worker v2.0)	< 0.001

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

2.3.3. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	110 mg/m ³ (ECETOC TRA worker v2.0)	0.053

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

2.3.4. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	160 mg/m ³ (ECETOC TRA worker v2.0)	0.077

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

2.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

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SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

ES 3: Industrial use; Manufacture of computer, electronic and optical products, electrical equipment (SU16).; Health services (SU20); Carrier fluid.; Aerosol propellants.; Adhesives, sealants (PC1).; Lubricants, greases, release products (PC24).; Pharmaceuticals (PC29).; Semiconductors (PC33).

3.1. Title section

Exposure Scenario name	: Industrial, Carrier fluid, Aerosol propellants
Structured Short Title	: Industrial use; Manufacture of computer, electronic and optical products, electrical equipment (SU16).; Health services (SU20); Carrier fluid.; Aerosol propellants.; Adhesives, sealants (PC1).; Lubricants, greases, release products (PC24).; Pharmaceuticals (PC29).; Semiconductors (PC33).

Environment		
CS 1	Carrier fluid, Aerosol propellants	ERC4
Worker		
CS 2	Closed systems, Material transfers	PROC1
CS 3	Closed systems, Material transfers, Equipment maintenance	PROC2
CS 4	Material transfers, Dedicated facility	PROC8b
CS 5	Dipping	PROC13
CS 6	Spraying	PROC7

3.2. Conditions of use affecting exposure

3.2.1. Control of environmental exposure: Use of non-reactive processing aid at industrial site (no inclusion into or onto article) (ERC4)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Annual site tonnage	: 15 tonnes/year
Daily amount per site	: 0.75 tonnes/day
Emission days	: 20

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Technical and organisational conditions and measures	
Use in closed process Process designed to minimize releases to air. Process designed to minimize releases to wastewater.	
Use vapour recovery units when necessary. Condensation Air - minimum efficiency of 50 %	
Conditions and measures related to sewage treatment plant	
STP type	: No sewage treatment plant
Conditions and measures related to treatment of waste (including article waste)	
Waste treatment	: No waste from process
Other conditions affecting environmental exposure	
Local freshwater dilution factor	: 10
Local marine water dilution factor	: 100
Release fraction to air from process Worst case assumption 50 %	
Release fraction to wastewater from process Worst case assumption < 0.5 kg/day	

3.2.2. Control of worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers use up to 1 h/day
Technical and organisational conditions and measures	
Use in closed process	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Other conditions affecting workers exposure

Indoor or outdoor use : Indoor use

3.2.3. Control of worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Product (article) characteristics

Covers concentrations up to 100 %

Physical form of product : Liquid

Amount used (or contained in articles), frequency and duration of use/exposure

Use frequency : Covers use up to 1 h/day

Technical and organisational conditions and measures

Use in closed process

Ensure operatives are trained to minimise exposures.
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.

Other conditions affecting workers exposure

Indoor or outdoor use : Indoor use

3.2.4. Control of worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Product (article) characteristics

Covers concentrations up to 100 %

Physical form of product : Liquid

Amount used (or contained in articles), frequency and duration of use/exposure

Use frequency : Avoid using product more than 15 min/day

Technical and organisational conditions and measures

Use in closed process

Ensure operatives are trained to minimise exposures.
Supervision in place to check that the risk management measures in place are being used correctly and

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

operation conditions followed.

Other conditions affecting workers exposure

Indoor or outdoor use : Indoor use

3.2.5. Control of worker exposure: Treatment of articles by dipping and pouring (PROC13)

Product (article) characteristics

Covers concentrations up to 100 %

Physical form of product : Liquid

Amount used (or contained in articles), frequency and duration of use/exposure

Use frequency : Covers frequency up to: 4 h/day

Technical and organisational conditions and measures

Use in closed process

Ensure operatives are trained to minimise exposures.
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.

Use high-performance fume cupboard.
Inhalation - minimum efficiency of 95 %

Other conditions affecting workers exposure

Indoor or outdoor use : Indoor use

3.2.6. Control of worker exposure: Industrial spraying (PROC7)

Product (article) characteristics

Covers concentrations up to 100 %

Physical form of product : Liquid

Amount used (or contained in articles), frequency and duration of use/exposure

Use frequency : Covers frequency up to: 4 h/day

Technical and organisational conditions and measures

Use in closed process

Ensure operatives are trained to minimise exposures.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.

Use high-performance fume cupboard.
Inhalation - minimum efficiency of 95 %

Other conditions affecting workers exposure

Indoor or outdoor use : Indoor use

3.3. Exposure estimation and reference to its source

3.3.1. Environmental release and exposure: Use of non-reactive processing aid at industrial site (no inclusion into or onto article) (ERC4)

Protection Target	Exposure estimate	RCR
Freshwater	0.025 mg/L (ECETOC TRA)	0.7
Marine water	0.0025 mg/L (ECETOC TRA)	0.7
Freshwater sediment	0.589 mg/kg dry weight (ECETOC TRA)	0.3
Marine sediment	0.0589 mg/kg dry weight (ECETOC TRA)	0.3
Agricultural soil	0.0129 mg/kg dry weight (ECETOC TRA)	0.06
Grassland	0.0129 mg/kg dry weight (ECETOC TRA)	0.06

3.3.2. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0.02 mg/m ³ (ECETOC TRA worker v2.0)	< 0.001

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

3.3.3. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	110 mg/m ³ (ECETOC TRA worker v2.0)	0.053

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

3.3.4. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	160 mg/m ³ (ECETOC TRA worker v2.0)	0.077

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

3.3.5. Worker exposure: Treatment of articles by dipping and pouring (PROC13)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	80 mg/m ³ (ECETOC TRA worker v2.0)	0.039

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

3.3.6. Worker exposure: Industrial spraying (PROC7)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	160 mg/m ³ (ECETOC TRA worker v2.0)	0.077

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

3.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

For further information, please contact sds-support@chemours.com.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

ES 4: professional use; Manufacture of computer, electronic and optical products, electrical equipment (SU16); Cleaning.; Washing and cleaning products (PC35).

4.1. Title section

Exposure Scenario name	: Professional, Cleaning agent
Structured Short Title	: professional use; Manufacture of computer, electronic and optical products, electrical equipment (SU16); Cleaning.; Washing and cleaning products (PC35).

Environment		
CS 1	Cleaning agent	ERC8a
Worker		
CS 2	Cleaning agent	PROC13

4.2. Conditions of use affecting exposure

4.2.1. Control of environmental exposure: Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor) (ERC8a)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Annual amount for wide disperse uses	: 100 tonnes/year
Daily amount per site	: 0.05 kg/day
Emission days	: 365
Technical and organisational conditions and measures	
Use in closed process Process designed to minimize releases to air. Process designed to minimize releases to wastewater.	
Use vapour recovery units when necessary. Condensation Air - minimum efficiency of 90 %	

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Conditions and measures related to sewage treatment plant	
STP type	: No sewage treatment plant
Conditions and measures related to treatment of waste (including article waste)	
Waste treatment	: No waste from process
Other conditions affecting environmental exposure	
Local freshwater dilution factor	: 10
Local marine water dilution factor	: 100
Release fraction to air from process Region 27 kg/day	
Release fraction to wastewater from process Region 22 kg/day	

4.2.2. Control of worker exposure: Treatment of articles by dipping and pouring (PROC13)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers frequency up to: 4 h/day
Technical and organisational conditions and measures	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	
Vapour recovery system Ensure operatives are trained to minimise exposures. Inhalation - minimum efficiency of 90 %	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Indoor use

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

4.3. Exposure estimation and reference to its source

4.3.1. Environmental release and exposure: Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor) (ERC8a)

Protection Target	Exposure estimate	RCR
Freshwater	0.00275 mg/L (ECETOC TRA)	0.08
Marine water	0.000275 mg/L (ECETOC TRA)	0.08
Freshwater sediment	0.0648 mg/kg dry weight (ECETOC TRA)	0.04
Marine sediment	0.00648 mg/kg dry weight (ECETOC TRA)	0.04
Agricultural soil	< 0.0000001 mg/kg dry weight (ECETOC TRA)	< 0.001
Grassland	< 0.0000001 mg/kg dry weight (ECETOC TRA)	< 0.001

4.3.2. Worker exposure: Treatment of articles by dipping and pouring (PROC13)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	160 mg/m ³ (ECETOC TRA worker v2.0)	0.077

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

4.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

For further information, please contact sds-support@chemours.com.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

ES 5: professional use; Manufacture of computer, electronic and optical products, electrical equipment (SU16); Heat transfer agents.; Heat transfer fluids (PC16).

5.1. Title section

Exposure Scenario name	: Professional, Heat transfer agents
Structured Short Title	: professional use; Manufacture of computer, electronic and optical products, electrical equipment (SU16); Heat transfer agents.; Heat transfer fluids (PC16).

Environment		
CS 1	Heat transfer fluids	ERC9a, ESVOC SpERC 9.13b.v1
Worker		
CS 2	Heat transfer fluids	PROC20

5.2. Conditions of use affecting exposure

5.2.1. Control of environmental exposure: Widespread use of functional fluid (indoor) (ERC9a) / ESVOC SpERC 9.13b.v1

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Annual amount for wide disperse uses	: 15 tonnes/year
Daily amount per site	: 0.0021 kg/day
Emission days	: 365
Technical and organisational conditions and measures	
Use in closed process Process designed to minimize releases to air. Process designed to minimize releases to wastewater.	
When not in use, keep containers tightly closed.	

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Conditions and measures related to sewage treatment plant	
STP type	: No sewage treatment plant
Conditions and measures related to treatment of waste (including article waste)	
Waste treatment	: Solvent recovery
Other conditions affecting environmental exposure	
Local freshwater dilution factor	: 10
Local marine water dilution factor	: 100

5.2.2. Control of worker exposure: Use of functional fluids in small devices (PROC20)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers frequency up to: 4 h/day
Technical and organisational conditions and measures	
When not in use, keep containers tightly closed.	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Indoor use

5.3. Exposure estimation and reference to its source

5.3.1. Environmental release and exposure: Widespread use of functional fluid (indoor) (ERC9a) / ESVOC SpERC 9.13b.v1

Protection Target	Exposure estimate	RCR
Freshwater	0.0000148 mg/L (ECETOC TRA)	< 0.001
Marine water	< 0.0000016 mg/L (ECETOC TRA)	< 0.001
Freshwater sediment	0.000348 mg/kg dry weight	< 0.001

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

	(ECETOC TRA)	
Marine sediment	0.0000369 mg/kg dry weight (ECETOC TRA)	< 0.001
Agricultural soil	< 0.0000002 mg/kg dry weight (ECETOC TRA)	< 0.001
Grassland	0.000377 mg/kg dry weight (ECETOC TRA)	0.002

5.3.2. Worker exposure: Use of functional fluids in small devices (PROC20)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	320 mg/m ³ (ECETOC TRA worker v2.0)	0.154

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

5.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

For further information, please contact sds-support@chemours.com.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

ES 6: Industrial use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Solvent recovery.

6.1. Title section

Exposure Scenario name	: Industrial, Solvent recovery
Structured Short Title	: Industrial use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Solvent recovery.

Environment		
CS 1	Solvent recovery	ERC4
Worker		
CS 2	Closed systems, Material transfers	PROC1
CS 3	Closed systems, Material transfers, Equipment maintenance	PROC2
CS 4	Material transfers, Dedicated facility	PROC8b

6.2. Conditions of use affecting exposure

6.2.1. Control of environmental exposure: Use of non-reactive processing aid at industrial site (no inclusion into or onto article) (ERC4)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Annual amount per site	: 15 tonnes/year
Daily amount per site	: 750 kg/day
Emission days	: 20
Technical and organisational conditions and measures	
Use in closed process Process designed to minimize releases to air. Process designed to minimize releases to wastewater.	

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Conditions and measures related to sewage treatment plant	
STP type	: No sewage treatment plant
Conditions and measures related to treatment of waste (including article waste)	
Waste treatment	: No waste from process
Other conditions affecting environmental exposure	
Local freshwater dilution factor	: 10
Local marine water dilution factor	: 100
Release fraction to air from process Worst case assumption 50 %	
Release fraction to wastewater from process Worst case assumption < 0.5 kg/day	

6.2.2. Control of worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers use up to 1 h/day
Technical and organisational conditions and measures	
Use in closed process	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Indoor use

6.2.3. Control of worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version	Revision Date:	SDS Number:	Date of last issue: 27.06.2023
9.0	13.09.2023	1326706-00034	Date of first issue: 27.02.2017

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Covers use up to 1 h/day
Technical and organisational conditions and measures	
Use in closed process	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Indoor use

6.2.4. Control of worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid
Amount used (or contained in articles), frequency and duration of use/exposure	
Use frequency	: Avoid using product more than 15 min/day
Technical and organisational conditions and measures	
Use in closed process	
Ensure operatives are trained to minimise exposures. Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Indoor use

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

6.3. Exposure estimation and reference to its source

6.3.1. Environmental release and exposure: Use of non-reactive processing aid at industrial site (no inclusion into or onto article) (ERC4)

Protection Target	Exposure estimate	RCR
Freshwater	0.025 mg/L (ECETOC TRA)	0.7
Marine water	0.0025 mg/L (ECETOC TRA)	0.7
Freshwater sediment	0.589 mg/kg dry weight (ECETOC TRA)	0.3
Marine sediment	0.0589 mg/kg dry weight (ECETOC TRA)	0.3
Agricultural soil	0.0129 mg/kg dry weight (ECETOC TRA)	0.06
Grassland	0.0129 mg/kg dry weight (ECETOC TRA)	0.06

6.3.2. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0.02 mg/m ³ (ECETOC TRA worker v2.0)	< 0.001

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

6.3.3. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	110 mg/m ³ (ECETOC TRA worker v2.0)	0.053

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006, as amended by
Commission Regulation (EU) 2020/878



Vertrel™ XF specialty fluid

Version 9.0 Revision Date: 13.09.2023 SDS Number: 1326706-00034 Date of last issue: 27.06.2023
Date of first issue: 27.02.2017

6.3.4. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	160 mg/m ³ (ECETOC TRA worker v2.0)	0.077

Additional information on exposure estimation

Dermal exposure is considered to be not relevant.

6.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

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