

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006



Opteon™ YF (R-1234yf) Refrigerant

Version 12.0 Revision Date: 18.08.2020 SDS Number: 1335654-00032 Date of last issue: 17.04.2020
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 : Opteon™ YF (R-1234yf) Refrigerant
SDS-Identcode : 130000043292
REACH Registration Number : 01-0000019665-61-0001
Substance name : 2,3,3,3-Tetrafluoropropene
EC-No. : 468-710-7

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

Use of the Substance/Mixture : For professional and industrial installation and use only., Heat transfer fluids, Refrigerant, Use in road vehicles (according to ISO 13043), power driven vehicles such as trucks., (excluding buses), Use in heavy duty off-road machinery and equipment (agricultural tractors, construction equipment, forestry and mining)., Formulation of preparations, For further information see Annex - Exposure scenario.

Recommended restrictions on use : Open evaporation applications., Direct use of the substance by consumers., Consumer filling of mobile air conditioning units.

1.3 Details of the supplier of the safety data sheet

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

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

Telefax : +31-78-6163737

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

1.4 Emergency telephone number

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

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Flammable gases, Category 1B H221: Flammable gas.
Gases under pressure, Liquefied gas H280: Contains gas under pressure; may explode if

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heated.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :



Signal word : Danger

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

Precautionary statements : **Prevention:**
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Response:
P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 In case of leakage, eliminate all ignition sources.
Storage:
P410 + P403 Protect from sunlight. Store in a well-ventilated place.

2.3 Other hazards

- || This substance is not considered to be persistent, bioaccumulating and toxic (PBT).
 - || This substance is not considered to be very persistent and very bioaccumulating (vPvB).
- Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
- Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects.
- Rapid evaporation of the product may cause frostbite.
- May displace oxygen and cause rapid suffocation.

SECTION 3: Composition/information on ingredients

3.1 Substances

Substance name : 2,3,3,3-Tetrafluoropropene
EC-No. : 468-710-7

Components

Chemical name	CAS-No. EC-No.	Concentration (% w/w)
2,3,3,3-Tetrafluoropropene	754-12-1 468-710-7	>= 99.5 - <= 100

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SECTION 4: First aid measures

4.1 Description of first aid measures

- General advice : In the case of accident or if you feel unwell, seek medical advice immediately.
When symptoms persist or in all cases of doubt seek medical advice.
- Protection of first-aiders : No special precautions are necessary for first aid responders.
- If inhaled : If inhaled, remove to fresh air.
Get medical attention if symptoms occur.
- In case of skin contact : Thaw frosted parts with lukewarm water. Do not rub affected area.
Get medical attention immediately.
- In case of eye contact : Get medical attention immediately.
- If swallowed : Ingestion is not considered a potential route of exposure.

4.2 Most important symptoms and effects, both acute and delayed

- Symptoms : May cause cardiac arrhythmia.
- Other symptoms potentially related to misuse or inhalation abuse are
Cardiac sensitisation
Anaesthetic effects
Light-headedness
Dizziness
confusion
Lack of coordination
Drowsiness
Unconsciousness
- Risks : Contact with liquid or refrigerated gas can cause cold burns and frostbite.

4.3 Indication of any immediate medical attention and special treatment needed

- Treatment : Because of possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, that may be used in situations of emergency life support should be used with special caution.
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SECTION 5: Firefighting measures

5.1 Extinguishing media

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

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Unsuitable extinguishing media : None known.

5.2 Special hazards arising from the substance or mixture

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

Hazardous combustion products : Hydrogen fluoride
Fluorine compounds
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.
Fight fire remotely due to the risk of explosion.
Use water spray to cool unopened containers.
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
Remove undamaged containers from fire area if it is safe to do so.
Evacuate area.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal precautions : Evacuate personnel to safe areas.
Only trained personnel should re-enter the area.
Remove all sources of ignition.
Avoid skin contact with leaking liquid (danger of frostbite).
Ventilate the area.
Follow safe handling advice (see section 7) and personal protective equipment recommendations (see section 8).

6.2 Environmental precautions

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

6.3 Methods and material for containment and cleaning up

Methods for cleaning up : Ventilate the area.
Non-sparking tools should be used.
Suppress (knock down) gases/vapours/mists with a water spray jet.

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

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 preventative device in piping. Close valve after each use and when empty. |
| Local/Total ventilation | : | If sufficient ventilation is unavailable, use with local exhaust ventilation.
If advised by assessment of the local exposure potential, use only in an area equipped with explosion-proof exhaust ventilation. |
| Advice on safe handling | : | Avoid breathing gas.
Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment
Keep container tightly closed.
Wear cold insulating gloves/ face shield/ eye protection.
Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point.
Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.
Prevent backflow into the gas tank.
Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems.
Close valve after each use and when empty. Do NOT change or force fit connections.
Prevent the intrusion of water into the gas tank.
Never attempt to lift cylinder by its cap.
Do not drag, slide or roll cylinders.
Use a suitable hand truck for cylinder movement.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Take precautionary measures against static discharges.
Take care to prevent spills, waste and minimize release to the environment. |
| 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. |

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7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers : Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Separate full containers from empty containers. Do not store near combustible materials. Avoid area where salt or other corrosive materials are present. Keep in properly labelled containers. Keep tightly closed. Keep in a cool, well-ventilated place. Keep away from direct sunlight. Store in accordance with the particular national regulations. Keep away from heat and sources of ignition.

Advice on common storage : Do not store with the following product types:
Self-reactive substances and mixtures
Organic peroxides
Oxidizing agents
Flammable liquids
Flammable solids
Pyrophoric liquids
Pyrophoric solids
Self-heating substances and mixtures
Substances and mixtures, which in contact with water, emit flammable gases
Explosives
Acutely toxic substances and mixtures
Substances and mixtures with chronic toxicity

Storage period : > 10 yr

Recommended storage temperature : < 52 °C

Further information on storage stability : The product has an indefinite shelf life when stored properly.

7.3 Specific end use(s)

Specific use(s) : No data available

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

|| Contains no substances with occupational exposure limit values.

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

Substance name	End Use	Exposure routes	Potential health effects	Value
2,3,3,3-Tetrafluoropropene	Workers	Inhalation	Long-term systemic effects	950 mg/m ³

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

Substance name	Environmental Compartment	Value
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2,3,3,3-Tetrafluoropropene	Fresh water	0.1 mg/l
	Intermittent use/release	1 mg/l
	Fresh water sediment	1.77 mg/kg dry weight (d.w.)
	Soil	1.54 mg/kg dry weight (d.w.)
	Marine water	0.01 mg/l
	Marine sediment	0.178 mg/kg dry weight (d.w.)

8.2 Exposure controls

Engineering measures

Minimize workplace exposure concentrations.

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

If advised by assessment of the local exposure potential, use only in an area equipped with explosion-proof exhaust ventilation.

Personal protective equipment

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

Hand protection
Material : Low temperature resistant gloves

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

Skin and body protection : Wear the following personal protective equipment:
If assessment demonstrates that there is a risk of explosive atmospheres or flash fires, use flame retardant antistatic protective clothing.

Respiratory protection : If adequate local exhaust ventilation is not available or exposure assessment demonstrates exposures outside the recommended guidelines, use respiratory protection.
Equipment should conform to BS EN 14387

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

Protective measures : Wear cold insulating gloves/ face shield/ eye protection.

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SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance	:	Liquefied gas
Colour	:	colourless, clear
Odour	:	slight, ether-like
Odour Threshold	:	No data available
pH	:	No data available
Melting point/freezing point	:	-152.2 °C
Initial boiling point and boiling range	:	-29 °C
Flash point	:	Not applicable
Evaporation rate	:	Not applicable
Flammability (solid, gas)	:	Flammable
Burning rate	:	15 mm/s
Upper explosion limit / Upper flammability limit	:	Upper flammability limit 12.3 %(V) Method: ASTM E681
Lower explosion limit / Lower flammability limit	:	Lower flammability limit 6.2 %(V) Method: ASTM E681
Vapour pressure	:	5,800 hPa (20 °C)
Relative vapour density	:	4 (Air = 1.0)
Density	:	0.0048 g/cm ³ (20 °C) Vapour density
Solubility(ies) Water solubility	:	0.1982 g/l (24 °C)
Partition coefficient: n-octanol/water	:	log Pow: 2 (25 °C)
Auto-ignition temperature	:	405 °C
Decomposition temperature	:	No data available
Viscosity	:	

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Viscosity, kinematic	:	Not applicable
Explosive properties	:	Not explosive
Oxidizing properties	:	The substance or mixture is not classified as oxidizing.

9.2 Other information

Minimum ignition energy	:	5 - 10 J
Particle size	:	Not applicable
Self-ignition	:	The substance or mixture is not classified as pyrophoric.

SECTION 10: Stability and reactivity

10.1 Reactivity

Not classified as a reactivity hazard.

10.2 Chemical stability

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

10.3 Possibility of hazardous reactions

Hazardous reactions	:	Vapours may form flammable mixture with air Can react with strong oxidizing agents. Flammable gas.
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10.4 Conditions to avoid

Conditions to avoid	:	Heat, flames and sparks.
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10.5 Incompatible materials

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

No hazardous decomposition products are known.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

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

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

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

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

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

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

Skin corrosion/irritation

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

Result : No skin irritation

Serious eye damage/eye irritation

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

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:

2,3,3,3-Tetrafluoropropene:

Exposure routes : Skin contact
Result : negative

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Germ cell mutagenicity

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

Genotoxicity in vitro	: Test Type: Bacterial reverse mutation assay (AMES) Method: OECD Test Guideline 471 Result: positive	
	Test Type: Chromosome aberration test in vitro Method: OECD Test Guideline 473 Result: negative	
	Genotoxicity in vivo	: Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Mouse Application Route: inhalation (gas) Method: OECD Test Guideline 474 Result: negative
	Test Type: In vivo mammalian alkaline comet assay Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 489 Result: negative	
Germ cell mutagenicity- Assessment	Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 474 Result: negative	
	: 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	: Weight of evidence does not support classification as a carcinogen

Reproductive toxicity

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

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Effects on fertility	: Test Type: Two-generation reproduction toxicity study Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 416 Result: negative
Effects on foetal development	: Test Type: Prenatal development toxicity study (teratogenicity) Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 414 Result: negative
Reproductive toxicity - Assessment	: Weight of evidence does not support classification for reproductive toxicity, No effects on or via lactation

STOT - single exposure

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

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

STOT - repeated exposure

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

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

Repeated dose toxicity

Components:

2,3,3,3-Tetrafluoropropene:

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

Aspiration toxicity

Not classified based on available information.

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Components:

2,3,3,3-Tetrafluoropropene:

|| No aspiration toxicity classification

SECTION 12: Ecological information

12.1 Toxicity

Components:

2,3,3,3-Tetrafluoropropene:

|| Toxicity to fish : 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 (Water flea)): > 100 mg/l
Exposure time: 48 h
Method: OECD Test Guideline 202

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

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

12.2 Persistence and degradability

Components:

2,3,3,3-Tetrafluoropropene:

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

12.3 Bioaccumulative potential

Components:

2,3,3,3-Tetrafluoropropene:

|| Bioaccumulation : Remarks: Bioaccumulation is unlikely.

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

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

Product:

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Assessment : This substance is not considered to be persistent, bioaccumulating and toxic (PBT).. This substance is not considered to be very persistent and very bioaccumulating (vPvB)..

12.6 Other adverse effects

Global warming potential

The Fifth Assessment Report of the United Nations Intergovernmental Panel on Climate Change (IPCC)

Product:

100-year global warming potential: < 1

SECTION 13: Disposal considerations

13.1 Waste treatment methods

- Product : Dispose of in accordance with local regulations. According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user, preferably in discussion with the waste disposal authorities.
- Contaminated packaging : Empty containers should be taken to an approved waste handling site for recycling or disposal. Empty pressure vessels should be returned to the supplier. Empty containers retain residue and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury and/or death. If not otherwise specified: Dispose of as unused product.

SECTION 14: Transport information

14.1 UN number

- ADN : UN 3161
- ADR : UN 3161
- RID : UN 3161
- IMDG : UN 3161
- IATA (Cargo) : UN 3161
- IATA (Passenger) : UN 3161
Not permitted for transport

14.2 UN proper shipping name

- ADN : LIQUEFIED GAS, FLAMMABLE, N.O.S.
(2,3,3,3-Tetrafluoropropene)
- ADR : LIQUEFIED GAS, FLAMMABLE, N.O.S.
(2,3,3,3-Tetrafluoropropene)

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RID : LIQUEFIED GAS, FLAMMABLE, N.O.S.
(2,3,3,3-Tetrafluoropropene)

IMDG : LIQUEFIED GAS, FLAMMABLE, N.O.S.
(2,3,3,3-Tetrafluoropropene)

IATA (Cargo) : Liquefied gas, flammable, n.o.s.
(2,3,3,3-Tetrafluoropropene)

IATA (Passenger) : LIQUEFIED GAS, FLAMMABLE, N.O.S.
Not permitted for transport

14.3 Transport hazard class(es)

ADN : 2

ADR : 2

RID : 2

IMDG : 2.1

IATA (Cargo) : 2.1

IATA (Passenger) : Not permitted for transport

14.4 Packing group

ADN

Packing group : Not assigned by regulation

Classification Code : 2F

Hazard Identification Number : 23

Labels : 2.1

ADR

Packing group : Not assigned by regulation

Classification Code : 2F

Hazard Identification Number : 23

Labels : 2.1

Tunnel restriction code : (B/D)

RID

Packing group : Not assigned by regulation

Classification Code : 2F

Hazard Identification Number : 23

Labels : 2.1 ((13))

IMDG

Packing group : Not assigned by regulation

Labels : 2.1

EmS Code : F-D, S-U

IATA (Cargo)

Packing instruction (cargo aircraft) : 200

Packing group : Not assigned by regulation

Labels : Flammable Gas

IATA (Passenger) : Not permitted for transport

14.5 Environmental hazards

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ADN

Environmentally hazardous : no

ADR

Environmentally hazardous : no

RID

Environmentally hazardous : no

IMDG

Marine pollutant : no

14.6 Special precautions for user

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

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

Remarks : Not applicable for product as supplied.

SECTION 15: Regulatory information

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

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, preparations and articles (Annex XVII) : Conditions of restriction for the following entries should be considered: Number on list 40

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

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

Regulation (EC) No 1005/2009 on substances that 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 the Council concerning the export and import of dangerous chemicals : Not applicable

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.

P2	FLAMMABLE GASES	Quantity 1 10 t	Quantity 2 50 t
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Other regulations:

Take note of Directive 94/33/EC on the protection of young people at work or stricter national regulations, where applicable.

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15.2 Chemical safety assessment

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

SECTION 16: Other information

Other information : Opteon™ and any associated logos are trademarks or copyrights of The Chemours Company FC, LLC.
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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

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road; 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 - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - Substance of Very High Concern; TCSI - Taiwan Chemical Substance Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

Further information

Sources of key data used to : Internal technical data, data from raw material SDSs, OECD

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Version	Revision Date:	SDS Number:	Date of last issue: 17.04.2020
12.0	18.08.2020	1335654-00032	Date of first issue: 27.02.2017

compile the Safety Data Sheet

eChem Portal search results and European Chemicals Agency, <http://echa.europa.eu/>

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

GB / EN

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Annex: Exposure Scenarios

Table of Contents

Number	Title
ES 1	Industrial use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Heat transfer fluids - Refrigerants, coolants; (excluding buses).; Vehicles (AC1).; Machinery, mechanical appliances, electrical/electronic articles (AC2).
ES 2	professional use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Heat transfer fluids - Refrigerants, coolants.; Vehicles (AC1).; Machinery, mechanical appliances, electrical/electronic articles (AC2).
ES 3	Industrial use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Formulation of preparations; (excluding buses).; Heat transfer fluids (PC16).; Vehicles (AC1).; Machinery, mechanical appliances, electrical/electronic articles (AC2).

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ES 1: Industrial use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Heat transfer fluids - Refrigerants, coolants; (excluding buses).; Vehicles (AC1).; Machinery, mechanical appliances, electrical/electronic articles (AC2).

1.1. Title section

Exposure Scenario name	: Industrial use, Heat transfer fluids - Refrigerants, coolants
Structured Short Title	: Industrial use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Heat transfer fluids - Refrigerants, coolants; (excluding buses).; Vehicles (AC1).; Machinery, mechanical appliances, electrical/electronic articles (AC2).

Environment		
CS 1	Industrial use, Heat transfer fluids - Refrigerants, coolants, Closed systems	ERC7
Worker		
CS 2	Material transfers, Small scale, Dedicated facility	PROC9
CS 3	Material transfers, Dedicated facility	PROC8b

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: Industrial use of substances in closed systems (ERC7)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquefied gas Low global warming potential. Not biodegradable
Amount used (or contained in articles), frequency and duration of use/exposure	
Annual use rate (tonnes/year)	: 9000 tonnes/year
Release type	: Intermittent release
Emission days	: 200
EU	

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Technical and organisational conditions and measures	
Process designed to minimize releases to wastewater. Process designed to minimize releases to soil. Ensure that the valves of the cylinders are tightly closed and not leaking. Handle substance within a closed system. Transfer via enclosed lines. Clear transfer lines prior to de-coupling.	
Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres - ATEX 137. Technical measures/Precautions Flammability (gases) Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres - ATEX 95. Regular inspection and maintenance of equipment and machines	
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 generated as substance is a gas.
Other conditions affecting environmental exposure	
Under normal conditions of use, exposure would primarily occur when workers connect and disconnect the couplings.	

1.2.2. 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	: Liquefied gas
Amount used (or contained in articles), frequency and duration of use/exposure	
Amount per Shift	: 120 kg
Duration	: Exposure duration 20 min
Use frequency	: Intermittent release. 200 days per year
Duration	: Under normal operation exposure occurs only at ending of filling process (disconnection), estimated at 0.083 min (5 sec) per disconnecting process*1 processes/fill*30 fills/hr*8 hr/shift.

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Technical and organisational conditions and measures	
Ensure that the valves of the cylinders are tightly closed and not leaking. Handle substance within a closed system. Transfer via enclosed lines. Clear transfer lines prior to de-coupling.	
Local exhaust ventilation Inhalation - minimum efficiency of < 10 ppm	
Technical measures/Precautions Flammability (gases) Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres - ATEX 137. Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres - ATEX 95. ISO 13043:2011 - Road vehicles - Refrigerant systems used in mobile air conditioning systems (MAC) - Safety requirements SAE J639 - Safety Standards for Motor Vehicle Refrigerant Vapor Compressions Systems SAE J2845 - R-1234yf [HFO-1234yf] and R-744 Technician Training for Service and Containment of Refrigerants Used in Mobile A/C Systems Regular inspection and maintenance of equipment and machines Ensure operatives are trained to minimise exposures.	
Conditions and measures related to personal protection, hygiene and health evaluation	
Use eye protection to EN 166, designed to protect against liquid splashes. or ANSI Z87.1	
Wear suitable gloves tested to EN374. or US OSHA guidelines	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Indoor use
Room size	: 50 m ³
Temperature	: Assumes activities are at room temperature.
Ventilation rate per hour	: 3
Under normal conditions of use, exposure would primarily occur when workers connect and disconnect the couplings.	

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

Product (article) characteristics

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Covers concentrations up to 100 %	
Physical form of product	: Liquefied gas
Amount used (or contained in articles), frequency and duration of use/exposure	
Duration	: Exposure duration < 15 min
Use frequency	: Intermittent release. 200 days per year
Technical and organisational conditions and measures	
Ensure that the valves of the cylinders are tightly closed and not leaking. Handle substance within a closed system. Transfer via enclosed lines. Clear transfer lines prior to de-coupling.	
Technical measures/Precautions Flammability (gases) Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres - ATEX 137. Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres - ATEX 95. ISO 13043:2011 - Road vehicles - Refrigerant systems used in mobile air conditioning systems (MAC) - Safety requirements SAE J639 - Safety Standards for Motor Vehicle Refrigerant Vapor Compressions Systems SAE J2845 - R-1234yf [HFO-1234yf] and R-744 Technician Training for Service and Containment of Refrigerants Used in Mobile A/C Systems Regular inspection and maintenance of equipment and machines Ensure operatives are trained to minimise exposures.	
Conditions and measures related to personal protection, hygiene and health evaluation	
Use eye protection to EN 166, designed to protect against liquid splashes. or ANSI Z87.1	
Wear suitable gloves tested to EN374. or US OSHA guidelines	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Outdoor use
Under normal conditions of use, exposure would primarily occur when workers connect and disconnect the couplings.	

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1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure: Industrial use of substances in closed systems (ERC7)

Release route	Release rate	Release estimation method
Air	0.01	

Additional information on exposure estimation
The calculated exposure value is negligibly low.

1.3.2. 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	37 mg/m ³ (measured data)	0.039
inhalative	systemic	long-term	190 mg/m ³ (ECETOC TRA worker v3)	0.2

1.3.3. 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	37 mg/m ³ (measured data)	0.039
inhalative	systemic	long-term	50 mg/m ³ (ECETOC TRA worker v3)	0.05

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

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

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ES 2: professional use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Heat transfer fluids - Refrigerants, coolants.; Vehicles (AC1).; Machinery, mechanical appliances, electrical/electronic articles (AC2).

2.1. Title section

Exposure Scenario name	: professional use, Heat transfer fluids - Refrigerants, coolants
Structured Short Title	: professional use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Heat transfer fluids - Refrigerants, coolants.; Vehicles (AC1).; Machinery, mechanical appliances, electrical/electronic articles (AC2).

Environment		
CS 1	professional use, Refrigerants, Closed systems	ERC9b
Worker		
CS 2	Material transfers, Non-dedicated facility	PROC8a
CS 3	Professional truck driver	PROC1
CS 4	Professional Heavy Duty Off-Road Vehicle driver	PROC1

2.2. Conditions of use affecting exposure

2.2.1. Control of environmental exposure: Widespread use of functional fluid (outdoor) (ERC9b)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquefied gas Low global warming potential. Not biodegradable
Amount used (or contained in articles), frequency and duration of use/exposure	
Annual use rate (tonnes/year)	: 4000 tonnes/year
Release type	: Intermittent release
Emission days	: 200
EU	
Technical and organisational conditions and measures	

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Process designed to minimize releases to wastewater. Process designed to minimize releases to soil. Ensure that the valves of the cylinders are tightly closed and not leaking. Handle substance within a closed system. Transfer via enclosed lines. Clear transfer lines prior to de-coupling.	
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 generated as substance is a gas.
Other conditions affecting environmental exposure	
Under normal conditions of use, exposure would primarily occur when workers connect and disconnect the couplings.	

2.2.2. Control of worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquefied gas
Amount used (or contained in articles), frequency and duration of use/exposure	
Mobile air conditioning equipment	: 500 g/event
Stationary air conditioning equipment	: 300000 g/event
Duration	: Mobile A/C: ~1 minute/ 8-hour shift (0.083 minutes (5 seconds) per connecting process *2 connecting processes per vacuuming/re-charging procedure *1 servicing event per hour *8 hours per shift)
Duration	: Stationary Equipment: ~< 1 minute/8-hour shift (0.083 minutes (5 seconds) per connecting process *2 connecting processes per vacuuming/ re-charging procedure *up to 4 servicing events per 8-hour shift)
Use frequency	: Intermittent release. 200 days per year
Technical and organisational conditions and measures	
Ensure that the valves of the cylinders are tightly closed and not leaking. Handle substance within a closed system. Transfer via enclosed lines.	

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Clear transfer lines prior to de-coupling.
Technical measures/Precautions Flammability (gases) Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres - ATEX 137. Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres - ATEX 95. ISO 13043:2011 - Road vehicles - Refrigerant systems used in mobile air conditioning systems (MAC) - Safety requirements SAE J639 - Safety Standards for Motor Vehicle Refrigerant Vapor Compressions Systems SAE J2845 - R-1234yf [HFO-1234yf] and R-744 Technician Training for Service and Containment of Refrigerants Used in Mobile A/C Systems EN 378: Refrigerating systems and heat pumps. Safety and environmental requirements. Regular inspection and maintenance of equipment and machines Ensure operatives are trained to minimise exposures.
Conditions and measures related to personal protection, hygiene and health evaluation
Use eye protection to EN 166, designed to protect against liquid splashes. or ANSI Z87.1
Wear suitable gloves tested to EN374. or US OSHA guidelines
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use
Under normal conditions of use, exposure would primarily occur when workers connect and disconnect the couplings.

2.2.3. 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 : Liquefied gas
Amount used (or contained in articles), frequency and duration of use/exposure
Release rate to cabin: : < 20 g/year
Use frequency : Covers frequency up to: 20 h/day
Use frequency : 250 days per year
Technical and organisational conditions and measures

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Technical measures/Precautions Flammability (gases) Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres - ATEX 137. Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres - ATEX 95. ISO 13043:2011 - Road vehicles - Refrigerant systems used in mobile air conditioning systems (MAC) - Safety requirements SAE J639 - Safety Standards for Motor Vehicle Refrigerant Vapor Compressions Systems SAE J2845 - R-1234yf [HFO-1234yf] and R-744 Technician Training for Service and Containment of Refrigerants Used in Mobile A/C Systems SAE J1503 - Performance Test for Air-Conditioned, Heated, and Ventilated Off-Road Self-Propelled Work Machines. ISO 10263-4 - Earth-moving machinery - Part 4: Heating, ventilation and air conditioning (HVAC) test method and performance ISO 14269-2 - Tractors and self-propelled machines for agriculture and forestry -- Operator enclosure environment -- Part 2: Heating, ventilation and air-conditioning test method and performance	
Other conditions affecting workers exposure	
Indoor or outdoor use	: Indoor use
Room size	: > 3.3 m ³
Temperature	: Assumes activities are at room temperature.
Ventilation rate per hour	: 4.5

2.2.4. 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	: Liquefied gas
Amount used (or contained in articles), frequency and duration of use/exposure	
Release rate to cabin:	: < 20 g/year
Use frequency	: Covers frequency up to: 8 h/day
Use frequency	: 250 days per year
Technical and organisational conditions and measures	
Technical measures/Precautions Flammability (gases) Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive	

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atmospheres - ATEX 137.
Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres - ATEX 95.
ISO 13043:2011 - Road vehicles - Refrigerant systems used in mobile air conditioning systems (MAC) - Safety requirements
SAE J639 - Safety Standards for Motor Vehicle Refrigerant Vapor Compressions Systems
SAE J2845 - R-1234yf [HFO-1234yf] and R-744 Technician Training for Service and Containment of Refrigerants Used in Mobile A/C Systems
SAE J1503 - Performance Test for Air-Conditioned, Heated, and Ventilated Off-Road Self-Propelled Work Machines.
ISO 10263-4 - Earth-moving machinery - Part 4: Heating, ventilation and air conditioning (HVAC) test method and performance
ISO 14269-2 - Tractors and self-propelled machines for agriculture and forestry -- Operator enclosure environment -- Part 2: Heating, ventilation and air-conditioning test method and performance

Other conditions affecting workers exposure

Indoor or outdoor use	: Indoor use
Room size	: > 1.6 m ³
Temperature	: Assumes activities are at room temperature.
Ventilation rate per hour	: 27

2.3. Exposure estimation and reference to its source

2.3.1. Environmental release and exposure: Widespread use of functional fluid (outdoor) (ERC9b)

Release route	Release rate	Release estimation method
Air	0.064	

Additional information on exposure estimation

The calculated exposure value is negligibly low.

2.3.2. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	255 mg/m ³ (measured data)	0.27
inhalative	systemic	long-term	5.1 mg/m ³ (measured data)	0.005

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inhalative	systemic	long-term	240 mg/m ³ (ECETOC TRA worker v3)	0.25
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2.3.3. 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	0.2 mg/m ³ (Consexpo v4.1)	< 0.001

2.3.4. 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	0.14 mg/m ³ (Consexpo v4.1)	< 0.001

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

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ES 3: Industrial use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Formulation of preparations; (excluding buses).; Heat transfer fluids (PC16).; Vehicles (AC1).; Machinery, mechanical appliances, electrical/electronic articles (AC2).

3.1. Title section

Exposure Scenario name	: Industrial use, Formulation of preparations
Structured Short Title	: Industrial use; General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment (SU17); Formulation of preparations; (excluding buses).; Heat transfer fluids (PC16).; Vehicles (AC1).; Machinery, mechanical appliances, electrical/electronic articles (AC2).

Environment		
CS 1	Formulation of preparations	ERC2
Worker		
CS 2	Batch process, Closed systems	PROC3

3.2. Conditions of use affecting exposure

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

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquefied gas Low global warming potential. Not biodegradable
Amount used (or contained in articles), frequency and duration of use/exposure	
Annual use rate (tonnes/year)	: 5000 tonnes/year
Daily amount	: 25000 kg/day
Release type	: Intermittent release
Emission days	: 200
EU	

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Technical and organisational conditions and measures	
Process designed to minimize releases to wastewater. Process designed to minimize releases to soil. Ensure that the valves of the cylinders are tightly closed and not leaking. Handle substance within a closed system. Transfer via enclosed lines. Clear transfer lines prior to de-coupling.	
Technical measures/Precautions Flammability (gases) Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres - ATEX 137. Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres - ATEX 95. Regular inspection and maintenance of equipment and machines	
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 generated as substance is a gas.
Other conditions affecting environmental exposure	
Under normal conditions of use, exposure would primarily occur when workers connect and disconnect the couplings.	

3.2.2. Control of worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquefied gas
Amount used (or contained in articles), frequency and duration of use/exposure	
Amount per Shift	: 2500 kg
Duration	: Exposure duration < 15 min
Use frequency	: Intermittent release. 200 days per year
Technical and organisational conditions and measures	

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Ensure that the valves of the cylinders are tightly closed and not leaking.
Handle substance within a closed system.
Transfer via enclosed lines.
Clear transfer lines prior to de-coupling.

Directive 1999/92/EC of the European Parliament and of the Council of 16 December 1999 on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres - ATEX 137.
Technical measures/Precautions
Flammability (gases)
Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres - ATEX 95.
EN 378: Refrigerating systems and heat pumps. Safety and environmental requirements.
Regular inspection and maintenance of equipment and machines
Ensure operatives are trained to minimise exposures.

Conditions and measures related to personal protection, hygiene and health evaluation

Use eye protection to EN 166, designed to protect against liquid splashes.
or
ANSI Z87.1

Wear suitable gloves tested to EN374.
or
US OSHA guidelines

Other conditions affecting workers exposure

Indoor or outdoor use : Outdoor use

Temperature : Assumes activities are at room temperature.

Under normal conditions of use, exposure would primarily occur when workers connect and disconnect the couplings.

3.3. Exposure estimation and reference to its source

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

Release route	Release rate	Release estimation method
Air	0.003	

Additional information on exposure estimation

The calculated exposure value is negligibly low.

3.3.2. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006



Opteon™ YF (R-1234yf) Refrigerant

Version 12.0 Revision Date: 18.08.2020 SDS Number: 1335654-00032 Date of last issue: 17.04.2020
Date of first issue: 27.02.2017

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	17 mg/m ³ (ECETOC TRA worker v3)	0.018

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.