

# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version 8.1      Revision Date: 03/26/2019      SDS Number: 1335696-00043      Date of last issue: 11/19/2018  
Date of first issue: 02/27/2017

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### SECTION 1. IDENTIFICATION

Product name : Opteon™ YF (R-1234yf) Refrigerant

SDS-Identcode : 130000043292

#### Manufacturer or supplier's details

Company name of supplier : The Chemours Company FC, LLC

Address : 1007 Market Street  
Wilmington, DE 19899 United States of America (USA)

Telephone : 1-844-773-CHEM (outside the U.S. 1-302-773-1000)

Emergency telephone : Medical emergency: 1-866-595-1473 (outside the U.S. 1-302-773-2000) ; Transport emergency: +1-800-424-9300 (outside the U.S. +1-703-527-3887)

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

Recommended use : Heat transfer fluids  
Refrigerant  
Formulation of preparations

Restrictions on use : For professional and industrial installation and use only.

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### SECTION 2. HAZARDS IDENTIFICATION



#### GHS classification in accordance with 29 CFR 1910.1200

Flammable gases : Category 1

Gases under pressure : Liquefied gas

Simple Asphyxiant

#### GHS label elements

Hazard pictograms :  

Signal Word : Danger

Hazard Statements : H220 Extremely flammable gas.  
H280 Contains gas under pressure; may explode if heated.  
May displace oxygen and cause rapid suffocation.

Precautionary Statements : **Prevention:**  
P210 Keep away from heat/sparks/open flames/hot surfaces.  
No smoking.

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### Response:

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

P381 Eliminate all ignition sources if safe to do so.

### Storage:

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

### Other hazards

Vapors 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

Substance / Mixture : Substance  
Substance name : 2,3,3,3-Tetrafluoropropene  
CAS-No. : 754-12-1

### Components

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

\* Voluntarily-disclosed non-hazardous substance

## SECTION 4. FIRST AID MEASURES

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

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.

Most important symptoms and effects, both acute and delayed : May cause cardiac arrhythmia.  
Other symptoms potentially related to misuse or inhalation abuse are  
Cardiac sensitization  
Anaesthetic effects  
Light-headedness

# SAFETY DATA SHEET



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Version 8.1      Revision Date: 03/26/2019      SDS Number: 1335696-00043      Date of last issue: 11/19/2018  
Date of first issue: 02/27/2017

---

Dizziness  
confusion  
Lack of coordination  
Drowsiness  
Unconsciousness  
Contact with liquid or refrigerated gas can cause cold burns and frostbite.

Protection of first-aiders : No special precautions are necessary for first aid responders.

Notes to physician : Treat symptomatically and supportively.

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### SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : Water spray  
Alcohol-resistant foam  
Carbon dioxide (CO<sub>2</sub>)  
Dry chemical

Unsuitable extinguishing media : None known.

Specific hazards during fire fighting : Vapors 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

Specific extinguishing methods : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.  
Fight fire remotely due to the risk of explosion.  
Use water spray to cool unopened containers.  
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.  
Remove undamaged containers from fire area if it is safe to do so.  
Evacuate area.

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

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### SECTION 6. ACCIDENTAL RELEASE MEASURES

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

# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version 8.1      Revision Date: 03/26/2019      SDS Number: 1335696-00043      Date of last issue: 11/19/2018  
Date of first issue: 02/27/2017

---

- equipment recommendations.
- Environmental precautions : Prevent further leakage or spillage if safe to do so.  
Retain and dispose of contaminated wash water.
- Methods and materials for containment and cleaning up : Ventilate the area.  
Non-sparking tools should be used.  
Suppress (knock down) gases/vapors/mists with a water spray jet.  
Local or national regulations may apply to releases and disposal of this material, as well as those materials and items employed in the cleanup of releases. You will need to determine which regulations are applicable.  
Sections 13 and 15 of this SDS provide information regarding certain local or national requirements.
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### SECTION 7. HANDLING AND STORAGE

- Technical measures : Use equipment rated for cylinder pressure. Use a backflow preventative device in piping. Close valve after each use and when empty.
- Local/Total ventilation : Use with local exhaust ventilation.  
Use only in an area equipped with explosion-proof exhaust ventilation if advised by assessment of the local exposure potential
- 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 and sources of ignition.  
Take precautionary measures against static discharges.  
Take care to prevent spills, waste and minimize release to the environment.
- Conditions for safe storage : Cylinders should be stored upright and firmly secured to prevent falling or being knocked over.
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# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version 8.1      Revision Date: 03/26/2019      SDS Number: 1335696-00043      Date of last issue: 11/19/2018  
Date of first issue: 02/27/2017

---

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 labeled 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.

Materials to avoid : 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

Recommended storage temperature : < 126 °F / < 52 °C

Storage period : > 10 y

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

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### SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

#### Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
2,3,3,3-Tetrafluoropropene	754-12-1	TWA	500 ppm	US WEEL

**Engineering measures** : Minimize workplace exposure concentrations.  
Use only in an area equipped with explosion-proof exhaust ventilation if advised by assessment of the local exposure potential  
Use with local exhaust ventilation.

#### Personal protective equipment

Respiratory protection : General and local exhaust ventilation is recommended to maintain vapor exposures below recommended limits. Where concentrations are above recommended limits or are unknown, appropriate respiratory protection should be worn.

# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 11/19/2018
8.1	03/26/2019	1335696-00043	Date of first issue: 02/27/2017

---

Follow OSHA respirator regulations (29 CFR 1910.134) and use NIOSH/MSHA approved respirators. Protection provided by air purifying respirators against exposure to any hazardous chemical is limited. Use a positive pressure air supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstance where air purifying respirators may not provide adequate protection.

- Hand protection  
Material : Low temperature resistant gloves
- Remarks : Choose gloves to protect hands against chemicals depending on the concentration 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!
- Eye protection : Wear the following personal protective equipment:  
Chemical resistant goggles must be worn.  
Face-shield
- Skin and body protection : Wear the following personal protective equipment:  
Flame retardant antistatic protective clothing, unless assessment demonstrates that the risk of explosive atmospheres or flash fires is low.
- Protective measures : Wear cold insulating gloves/ face shield/ eye protection.
- Hygiene measures : Ensure that eye flushing systems and safety showers are located close to the working place.  
When using do not eat, drink or smoke.  
Wash contaminated clothing before re-use.
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### SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

- Appearance : Liquefied gas
- Color : colorless
- Odor : slight, ether-like
- Odor Threshold : No data available
- pH : No data available
- Melting point/freezing point : -242.0 °F / -152.2 °C
- Initial boiling point and boiling range : -20.9 °F / -29.4 °C

# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version 8.1      Revision Date: 03/26/2019      SDS Number: 1335696-00043      Date of last issue: 11/19/2018  
Date of first issue: 02/27/2017

---

Flash point : Not applicable

Evaporation rate : Not applicable

Flammability (solid, gas) : Flammable

Burning rate : 15 mm/s

Self-ignition : The substance or mixture is not classified as pyrophoric.

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

Vapor pressure : 5,800 hPa (68 °F / 20 °C)

Relative vapor density : 4  
(Air = 1.0)

Density : 0.0048 g/cm<sup>3</sup> (68 °F / 20 °C)  
Vapor density

Solubility(ies)  
Water solubility : 0.1982 g/l (75 °F / 24 °C)

Partition coefficient: n-octanol/water : log Pow: 2 (77 °F / 25 °C)

Autoignition temperature : 761 °F / 405 °C

Decomposition temperature : No data available

Viscosity  
Viscosity, kinematic : Not applicable

Explosive properties : Not explosive

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

Minimum ignition energy : 5 - 10 J

Particle size : Not applicable

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### SECTION 10. STABILITY AND REACTIVITY

Reactivity : Not classified as a reactivity hazard.

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

# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version 8.1      Revision Date: 03/26/2019      SDS Number: 1335696-00043      Date of last issue: 11/19/2018  
Date of first issue: 02/27/2017

---

Possibility of hazardous reactions : Vapors may form flammable mixture with air  
Can react with strong oxidizing agents.  
Flammable gas.

Conditions to avoid : Heat, flames and sparks.

Incompatible materials : Oxidizing agents

Hazardous decomposition products : No hazardous decomposition products are known.

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### SECTION 11. TOXICOLOGICAL INFORMATION

#### Information on likely routes of exposure

Inhalation  
Skin contact  
Eye contact

#### Acute toxicity

Not classified based on available information.

#### Components:

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

Acute inhalation toxicity : LC50 (Rat): > 405000 ppm  
Exposure time: 4 h  
Test atmosphere: gas

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

No observed adverse effect concentration (Dog): 120000 ppm  
Test atmosphere: gas  
Symptoms: Cardiac sensitization

Cardiac sensitisation threshold limit (Dog): > 559,509 mg/m<sup>3</sup>  
Test atmosphere: gas  
Symptoms: Cardiac sensitization

#### Skin corrosion/irritation

Not classified based on available information.

#### Components:

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

Species : Not tested on animals  
Result : No skin irritation

#### Serious eye damage/eye irritation

Not classified based on available information.



# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version 8.1      Revision Date: 03/26/2019      SDS Number: 1335696-00043      Date of last issue: 11/19/2018  
Date of first issue: 02/27/2017

---

### Components:

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

Species : Not tested on animals  
Result : No eye irritation

### **Respiratory or skin sensitization**

#### **Skin sensitization**

Not classified based on available information.

#### **Respiratory sensitization**

Not classified based on available information.

### Components:

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

Routes of exposure : Skin contact  
Species : Not tested on animals  
Result : negative

### **Germ cell mutagenicity**

Not classified based on available information.

### Components:

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

Germ cell mutagenicity - Assessment : 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:**

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

**IARC** No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

**OSHA** No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

**NTP** No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

### **Reproductive toxicity**

Not classified based on available information.

### Components:

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

# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version 8.1      Revision Date: 03/26/2019      SDS Number: 1335696-00043      Date of last issue: 11/19/2018  
Date of first issue: 02/27/2017

---

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

### STOT-single exposure

Not classified based on available information.

### STOT-repeated exposure

Not classified based on available information.

### Components:

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

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  
NOAEL : 50000 ppm  
LOAEL : >50000 ppm  
Application Route : inhalation (gas)  
Exposure time : 90 d  
Method : OECD Test Guideline 413  
Remarks : No significant adverse effects were reported

### Aspiration toxicity

Not classified based on available information.

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## SECTION 12. ECOLOGICAL INFORMATION

### Ecotoxicity

### Components:

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

Toxicity to fish : LC50 (Cyprinus carpio (Carp)): > 197 mg/l  
Exposure time: 96 h

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

Toxicity to algae/aquatic plants : NOEC (algae): > 100 mg/l  
Exposure time: 72 h

### Persistence and degradability

### Components:

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

Biodegradability : Result: Not readily biodegradable.

# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version 8.1      Revision Date: 03/26/2019      SDS Number: 1335696-00043      Date of last issue: 11/19/2018  
Date of first issue: 02/27/2017

---

Method: OECD Test Guideline 301F

### Bioaccumulative potential

#### Components:

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

Bioaccumulation : Remarks: No bioaccumulation is to be expected (log Pow <= 4).

#### **Mobility in soil**

No data available

#### **Other adverse effects**

#### Product:

Results of PBT and vPvB 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).

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## SECTION 13. DISPOSAL CONSIDERATIONS

### **Disposal methods**

Waste from residues : Dispose of in accordance with local regulations.

Contaminated packaging : Empty containers should be taken to an approved waste handling site for recycling or disposal. Empty pressure vessels should be returned to the supplier. Empty containers retain residue and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury and/or death.  
If not otherwise specified: Dispose of as unused product.

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## SECTION 14. TRANSPORT INFORMATION

### **International Regulations**

#### **UNRTDG**

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

#### **IATA-DGR**

UN/ID No. : UN 3161  
Proper shipping name : Liquefied gas, flammable, n.o.s.

---

# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version 8.1      Revision Date: 03/26/2019      SDS Number: 1335696-00043      Date of last issue: 11/19/2018  
Date of first issue: 02/27/2017

---

(2,3,3,3-Tetrafluoropropene)  
Class : 2.1  
Packing group : Not assigned by regulation  
Labels : Flammable Gas  
Packing instruction (cargo aircraft) : 200  
Packing instruction (passenger aircraft) : Not permitted for transport

### IMDG-Code

UN number : UN 3161  
Proper shipping name : LIQUEFIED GAS, FLAMMABLE, N.O.S.  
(2,3,3,3-Tetrafluoropropene)  
Class : 2.1  
Packing group : Not assigned by regulation  
Labels : 2.1  
EmS Code : F-D, S-U  
Marine pollutant : no

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

Not applicable for product as supplied.

### Domestic regulation

#### 49 CFR

UN/ID/NA number : UN 3161  
Proper shipping name : Liquefied gas, flammable, n.o.s.  
(2,3,3,3-Tetrafluoropropene)  
Class : 2.1  
Packing group : Not assigned by regulation  
Labels : FLAMMABLE GAS  
ERG Code : 115  
Marine pollutant : no

### 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.

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## SECTION 15. REGULATORY INFORMATION

### EPCRA - Emergency Planning and Community Right-to-Know

#### CERCLA Reportable Quantity

This material does not contain any components with a CERCLA RQ.

#### SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

#### SARA 302 Extremely Hazardous Substances Threshold Planning Quantity

This material does not contain any components with a section 302 EHS TPQ.

**SARA 311/312 Hazards** : Flammable (gases, aerosols, liquids, or solids)  
Gases under pressure  
Simple Asphyxiant

# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version 8.1      Revision Date: 03/26/2019      SDS Number: 1335696-00043      Date of last issue: 11/19/2018  
Date of first issue: 02/27/2017

**SARA 313** : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

### US State Regulations

#### Pennsylvania Right To Know

2,3,3,3-Tetrafluoropropene

754-12-1

#### Additional regulatory information

2,3,3,3-Tetrafluoropropene      754-12-1

The United States Environmental Protection Agency (USEPA) has established a Significant New Use Rule (SNUR) for one of the components in this product.

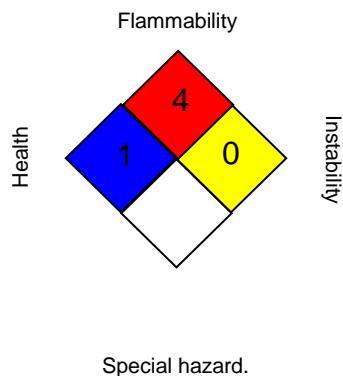
See 40 CFR § 721.10182

This material contains one or more substances which requires export notification under TSCA Section 12(b) and 40 CFR Part 707 Subpart D:

## SECTION 16. OTHER INFORMATION

### Further information

#### NFPA 704:



#### HMIS® IV:

<b>HEALTH</b>	/	0
<b>FLAMMABILITY</b>		4
<b>PHYSICAL HAZARD</b>		3

HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. The "\*" represents a chronic hazard, while the "/" represents the absence of a chronic hazard.

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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.

All chemical substances in this material are included on or exempted from listing on the TSCA Inventory of Chemical Substances.

### Full text of other abbreviations

US WEEL : USA. Workplace Environmental Exposure Levels (WEEL)  
US WEEL / TWA : 8-hr TWA

AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation,

# SAFETY DATA SHEET



## Opteon™ YF (R-1234yf) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 11/19/2018
8.1	03/26/2019	1335696-00043	Date of first issue: 02/27/2017

---

and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; 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; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

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

Revision Date : 03/26/2019

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.

US / Z8