DuPont™ Opteon® YF

Version 2.0

Revision Date 03/25/2015 Ref. 130000043292

This SDS adheres to the standards and regulatory requirements of the United States and may not meet the regulatory requirements in other countries.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	DuPont™ Opteon® YF
Tradename/Synonym	:	2,3,3,3-Tetrafluoropropene HFO-1234yf R-1234yf R-1234yf (2,3,3,3-tetrafluoroprop-1-ene) Opteon® YF
Product Use	:	Heat transfer fluids - Refrigerants, coolants, Formulation of preparations, For professional and industrial installation and use only.
Restrictions on use	:	Do not use product for anything outside of the above specified uses
Manufacturer/Supplier	:	DuPont 1007 Market Street Wilmington, DE 19898 United States of America
Product Information	:	+1-800-441-7515 (outside the U.S. +1-302-774-1000)
Medical Emergency	:	1-800-441-3637 (outside the U.S. 1-302-774-1139)
Transport Emergency	:	CHEMTREC: +1-800-424-9300 (outside the U.S. +1-703-527-3887)

SECTION 2. HAZARDS IDENTIFICATION

Product hazard category

Flammable gases	Category 1
Gases under pressure	Liquefied gas

Label content

Pictogram :

Signal word : Danger

Hazardous warnings : Extremely flammable gas.
Contains gas under pressure; may explode if heated.

Hazardous prevention measures : Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
Eliminate all ignition sources if safe to do so.
Protect from sunlight. Store in a well-ventilated place.

Other hazards

Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects., Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing., Rapid evaporation of the liquid may cause frostbite.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
2,3,3,3-Tetrafluoropropene	754-12-1	>=99.5%wt

SECTION 4. FIRST AID MEASURES

General advice	:	Never give anything by mouth to an unconscious person. When symptoms persist or in all cases of doubt seek medical advice.
Inhalation	:	Remove from exposure, lie down. Move to fresh air. Keep patient warm and at rest. Artificial respiration and/or oxygen may be necessary. Consult a physician.
Skin contact	:	Take off all contaminated clothing immediately. Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.
Eye contact	:	Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention.
Ingestion	:	Is not considered a potential route of exposure.
Most important symptoms/effects, acute and delayed	:	Contact with liquid or refrigerated gas can cause cold burns and frostbite.
Protection of first-aiders	:	If potential for exposure exists refer to Section 8 for specific personal protective equipment.
Notes to physician	:	Do not give adrenaline or similar drugs.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Water spray, Alcohol-resistant foam, Dry chemical, Carbon dioxide (CO2)
Unsuitable extinguishing media	:	No applicable data available.
Specific hazards	:	Vapours are heavier than air and may spread along floors. Vapours may form flammable mixture with air. Fire or intense heat may cause violent rupture of packages. Hazardous thermal decomposition products: Hydrogen fluoride Fluorinated compounds Carbon oxides

Special protective equipment for firefighters	:	In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment. Wear neoprene gloves during cleaning up work after a fire.
Further information	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Evacuate personnel to safe areas. Cool containers/tanks with water spray. Fire or intense heat may cause violent rupture of packages.

SECTION 6. ACCIDENTAL RELEASE MEASURES

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Safeguards (Personnel)	:	Evacuate personnel to safe areas. Ventilate the area. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Refer to protective measures listed in sections 7 and 8.
Environmental precautions	:	Should not be released into the environment. In accordance with local and national regulations.
Spill Cleanup	:	Evaporates.
Accidental Release Measures	:	No applicable data available.

SECTION 7. HANDLING AND STORAGE

Handling (Personnel)	:	Avoid breathing vapours or mist. Avoid contact with skin, eyes and clothing. Provide sufficient air exchange and/or exhaust in work rooms. For personal protection see section 8. Handle in accordance with good industrial hygiene and safety practice.
Handling (Physical Aspects)	:	Vapours are heavier than air and may spread along floors. Vapours may form flammable mixture with air. The product should only be used in areas from which all naked lights and effective sources of ignition have been excluded. Electrical equipment should be protected to the appropriate standard. May be ignited by open flame. Take measures to prevent the build up of electrostatic charge. Keep away from open flames, hot surfaces and effective sources of ignition. When using do not smoke.

Dust explosion class	:	No applicable data available.
Storage	:	Do not drag, slide or roll cylinders. Never attempt to lift cylinder by its cap. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Keep containers tightly closed in a cool, well-ventilated place. Store in original container. Protect from contamination. The product has an indefinite shelf life when stored properly.
Storage period	:	> 10 yr
Storage temperature	:	< 52 °C (< 126 °F)

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering controls	:	Ensure adequate ventilation, especially in confined areas. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Personal protective equipment		
Respiratory protection	:	For rescue and maintenance work in storage tanks use self-contained breathing apparatus. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Hand protection	:	Material: Heat insulating gloves Additional protection: Protective gloves complying with EN 374., or, US OSHA guidelines
Eye protection	:	Wear safety glasses or coverall chemical splash goggles. Eye protection complying with EN 166. or ANSI Z87.1 Additionally wear a face shield where the possibility exists for face contact due to splashing, spraying or airborne contact with this material.
Skin and body protection	:	Wear suitable protective equipment. Wear as appropriate: Flame retardant antistatic protective clothing.
Protective measures	:	When using do not smoke. Self-contained breathing apparatus (SCBA) is required if a large release occurs.

Exposure Guidelines

Exposure Limit Values

2,3,3,3-Tetrafluoropropene
No applicable data available.

This product does not contain any exposure limits that require disclosure according to OSHA Hazard Communication Standard 2012.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance		
Physical state	:	gaseous
Form	:	Liquefied gas
Color	:	colourless
Odor	:	slight, ether-like
Odor threshold	:	No applicable data available.
pH	:	neutral
Melting point/freezing point	:	Melting point -152.2 °C (-242.0 °F)
Boiling point/boiling range	:	Boiling point -29.4 °C (-20.9 °F)
Flash point	:	No applicable data available.
Evaporation rate	:	No applicable data available.
Flammability (solid, gas)	:	No applicable data available.
Upper explosion limit	:	12.3 vol% (21 °C) (1013 hPa) Method: ASTM E681
Lower explosion limit	:	6.2 vol% (21 °C)
Vapor pressure	:	5,917.2 hPa at 20 °C (68 °F)
Vapor density	:	4 (Air = 1.0)
Density	:	0.0048 g/cm3 at 20 °C (68 °F) at (1,013 hPa)

		Vapour density
Specific gravity (Relative density)	:	No applicable data available.
Water solubility	:	0.1982 g/l at 24 °C (75 °F)
Solubility(ies)	:	No applicable data available.
Partition coefficient: n-octanol/water	:	log Pow: 2 at 25 °C (77 °F) Method: High-performance liquid chromatography
Auto-ignition temperature	:	405 °C 1,013 hPa Method: Directive 67/548/EEC, Annex V, A.15. static test
Ignition temperature	:	Actual Auto ignition Temperature (AIT) can be affected by the concentration of vapours and oxygen, vapour/air contact time, pressure, volume, catalytic impurities, etc.
Decomposition temperature	:	No applicable data available.
Viscosity, kinematic	:	No applicable data available.
Viscosity	:	No applicable data available.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	No applicable data available.
Chemical stability	:	The product is chemically stable.
Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Vapours may form flammable mixture with air.
Conditions to avoid	:	Keep away from: Heat, flames and sparks. Do not spray on a naked flame or any incandescent material. Gas cylinder : Keep at temperature not exceeding 52°C. Pressurized container: Do not pierce or burn, even after use.
Incompatible materials	:	Strong bases Alkaline earth metals, finely divided metal powders, such as, Aluminium, Magnesium, Zinc, or, strong oxidizers
Hazardous decomposition	:	Hazardous thermal decomposition products may include:

products Hydrogen fluoride, Fluorinated compounds, Carbon oxides

SECTION 11. TOXICOLOGICAL INFORMATION

DuPont™ Opteon® YF

Further information	:	Cardiac sensitisation threshold limit : > 559509 mg/m3
Further information	:	Liquefied gas
Further information	:	Avoid skin contact with leaking liquid (danger of frostbite).

2,3,3,3-Tetrafluoropropene

Inhalation 4 h LC50	:	> 405000 ppm , Rat
Inhalation Low Observed Adverse Effect Concentration (LOAEC)	:	> 120000 ppm , Dog Cardiac sensitization
Inhalation No Observed Adverse Effect Concentration	:	120000 ppm , Dog Cardiac sensitization
Skin irritation	:	No skin irritation, Not tested on animals Not expected to cause skin irritation based on expert review of the properties of the substance.
Eye irritation	:	No eye irritation, Not tested on animals Not expected to cause eye irritation based on expert review of the properties of the substance.
Skin sensitization	:	Not tested on animals Not expected to cause sensitization based on expert review of the properties of the substance. There are no reports of human respiratory sensitization.
Repeated dose toxicity	:	Inhalation Rat - gas NOAEL: 233 mg/l, 50,000 ppm, No toxicologically significant effects were found. Inhalation Rabbit - gas

NOAEL: 2.33 mg/l, 500 ppm,
No toxicological effects warranting significant target organ toxicity classification were seen below the recommended guidance values for classification.

Inhalation
Mini-pig
-
gas
NOAEL: 50 mg/l, 10,000 ppm,
No toxicologically significant effects were found.

Carcinogenicity	:	Not classifiable as a human carcinogen. Sufficient data are available to conclude that the substance is not expected to be carcinogenic.
Mutagenicity	:	Animal testing did not show any mutagenic effects. Did not cause genetic damage in cultured mammalian cells. Experiments showed mutagenic effects in cultured bacterial cells.
Reproductive toxicity	:	No toxicity to reproduction Animal testing showed no reproductive toxicity.
Teratogenicity	:	Animal testing showed effects on embryo-fetal development at levels equal to or above those causing maternal toxicity.

Carcinogenicity

The carcinogenicity classifications for this product and/or its ingredients have been determined according to HazCom 2012, Appendix A.6. The classifications may differ from those listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or those found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition).

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, or OSHA, as a carcinogen.

SECTION 12. ECOLOGICAL INFORMATION

Aquatic Toxicity
2,3,3,3-Tetrafluoropropene

96 h LC50	:	Cyprinus carpio (Carp) > 197 mg/l

72 h NOEC	:	Algae > 100 mg/l
48 h EC50	:	Daphnia magna (Water flea) > 100 mg/l

Environmental Fate

DuPont™ Opteon® YF

Biodegradability aerobic	:	< 5 % OECD Test Guideline 301F According to the results of tests of biodegradability this product is not readily biodegradable.
Bioaccumulation	:	No bioaccumulation is to be expected (log Pow <= 4).

SECTION 13. DISPOSAL CONSIDERATIONS

Waste disposal methods - Product	:	Can be used after re-conditioning. In accordance with local and national regulations.
Contaminated packaging	:	Empty pressure vessels should be returned to the supplier.

SECTION 14. TRANSPORT INFORMATION

DOT	UN number	:	3161
	Proper shipping name	:	Liquefied gas, flammable, n.o.s. (2,3,3,3-Tetrafluoropropene)
	Class	:	2.1
	Labelling No.	:	2.1
IATA_C	UN number	:	3161
	Proper shipping name	:	Liquefied gas, flammable, n.o.s. (2,3,3,3-Tetrafluoropropene)
	Class	:	2.1
	Labelling No.	:	2.1
IMDG	UN number	:	3161
	Proper shipping name	:	LIQUEFIED GAS, FLAMMABLE, N.O.S. (2,3,3,3-Tetrafluoropropene)
	Class	:	2.1

Labelling No. : 2.1

ICAO / IATA cargo aircraft only

SECTION 15. REGULATORY INFORMATION

TSCA 5E	:	This material contains one or more substances which are subject to a TSCA Section 5 Consent Order or Significant New Use Rule (SNUR).
TSCA 12B		This material contains one or more substances which requires export notification under TSCA Section 12(b) and 40 CFR Part 707 Subpart D: The approved uses are: refrigerant in motor vehicle air conditioning systems. Processors and users of this substance must also comply with the applicable general SNUR requirements set forth in 40 CFR 721 subpart A, including export notification requirements if applicable (40 CFR 721.20), and the applicable record keeping requirements set forth at 40 CFR 721.125. Contact your local DuPont sales or technical representative for more information.
SARA 313 Regulated Chemical(s)	:	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.
California Prop. 65	:	Chemicals known to the State of California to cause cancer, birth defects or any other harm: none known

SECTION 16. OTHER INFORMATION

Before use read DuPont's safety information.
For further information contact the local DuPont office or DuPont's nominated distributors.

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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 given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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