SAFETY DATA SHEET
according to the OSHA Hazard Communication Standard

Opteon™ XL20 (R-454C) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 03/05/2025
14.0	05/27/2025	1354857-00060	Date of first issue: 02/27/2017

SECTION 1. IDENTIFICATION

Product name : Opteon™ XL20 (R-454C) Refrigerant

Product code : D15444728

SDS-Identcode : 130000143547

Manufacturer or supplier's details

Company name of supplier : The Chemours Company FC, LLC

Address : 1007 Market Street
Wilmington, DE 19801 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 : Refrigerant

Restrictions on use : For professional and industrial installation and use only., Do not use product for anything outside of the above specified uses

SECTION 2. HAZARDS IDENTIFICATION

GHS classification in accordance with the OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable gases : Category 1B

Gases under pressure : Liquefied gas

Simple Asphyxiant

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.

GHS label elements

Hazard pictograms :

Signal Word : Danger

Hazard Statements : H221 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 flame and hot surfaces. 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.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Components

Chemical name	CAS No./Unique ID	Concentration (% w/w)	Trade secret
2,3,3,3-Tetrafluoropropene#	754-12-1*	78.5	-
Difluoromethane#	75-10-5*	21.5	-

Voluntarily-disclosed substance
* Indicates that the identifier is a CAS No.

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.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.
Get medical attention immediately.

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 Dizziness confusion Lack of coordination Drowsiness Unconsciousness Gas reduces oxygen available for breathing. Contact with liquid or refrigerated gas can cause cold burns and frostbite. May displace oxygen and cause rapid suffocation.
Protection of first-aiders	:	No special precautions are necessary for first aid responders.
Notes to physician	:	Because of possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, that may be used in situations of emergency life support should be used with special caution.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Water spray Alcohol-resistant foam Carbon dioxide (CO2) 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 carbonyl fluoride
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.

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 (see section 7) and personal protective equipment recommendations (see section 8).

Environmental precautions : Avoid release to the environment.
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.

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 : 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. Prevent backflow into the gas tank. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. 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.
Conditions for safe storage	:	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 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 Very acutely toxic substances and mixtures 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.

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
Difluoromethane	75-10-5	TWA	1,000 ppm	US WEEL

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

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. 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	:	Impervious 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: If assessment demonstrates that there is a risk of explosive atmospheres or flash fires, use flame retardant antistatic protective clothing.
Protective measures	:	Wear cold insulating gloves/ face shield/ eye protection.
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.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Liquefied gas
Color	:	clear, colorless
Odor	:	slight, ether-like
Odor Threshold	:	No data available
pH	:	No data available
Melting point/freezing point	:	No data available
Initial boiling point and boiling range	:	-50.6 °F / -45.9 °C
Flash point	:	Not applicable
Evaporation rate	:	> 1 (CCL4=1.0)
Flammability (solid, gas)	:	Flammable
Upper explosion limit / Upper flammability limit	:	Upper flammability limit 15.7 %(V) Method: ASTM E681
Lower explosion limit / Lower flammability limit	:	Lower flammability limit 7.7 %(V) Method: ASTM E681

Vapor pressure	:	11,691 hPa (77 °F / 25 °C)
Relative vapor density	:	3.2 (Air = 1.0)
Relative density	:	0.99 (77 °F / 25 °C)
Solubility(ies) Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	Not applicable
Autoignition temperature	:	831 °F / 444 °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.
Particle characteristics Particle size	:	Not applicable
Hot Surface Ignition Temperature (HSIT)	:	> 1472 °F / > 800 °C Measurement method: ASTM D 8211

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.
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	:	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

Hazardous decomposition products : No hazardous decomposition products are known.

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): > 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 sensitization Lowest observed adverse effect concentration (Dog): > 120000 ppm Test atmosphere: gas Remarks: Cardiac sensitization Cardiac sensitisation threshold limit (Dog): > 559,509 mg/m³ Test atmosphere: gas Remarks: Cardiac sensitization

Difluoromethane:

Acute oral toxicity	:	Assessment: The substance or mixture has no acute oral toxicity
Acute inhalation toxicity	:	LC50 (Rat): > 520000 ppm Exposure time: 4 h Test atmosphere: gas Method: OECD Test Guideline 403 No observed adverse effect concentration (Dog): 350000 ppm Test atmosphere: gas Remarks: Cardiac sensitization Lowest observed adverse effect concentration (Dog): > 350000 ppm Test atmosphere: gas Remarks: Cardiac sensitization

		Cardiac sensitisation threshold limit (Dog): > 735,000 mg/m³ Test atmosphere: gas Remarks: Cardiac sensitization
Acute dermal toxicity	:	Assessment: The substance or mixture has no acute dermal toxicity

Skin corrosion/irritation

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

Result	:	No skin irritation

Difluoromethane:

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

Difluoromethane:

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
Result	:	negative

Difluoromethane:

Routes of exposure	:	Skin contact
Result	:	negative

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 Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 474 Result: negative
Germ cell mutagenicity - Assessment	:	Weight of evidence does not support classification as a germ cell mutagen.

Difluoromethane:

Genotoxicity in vitro	:	Test Type: Bacterial reverse mutation assay (AMES) Method: OECD Test Guideline 471 Result: negative 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
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:

Result	:	negative
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:

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 fetal 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

Difluoromethane:

Effects on fertility	:	Species: Mouse Application Route: Inhalation Result: negative Remarks: Based on data from similar materials
Effects on fetal development	:	Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 414 Result: negative

		Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test Species: Rabbit Application Route: inhalation (gas) Method: OECD Test Guideline 414 Result: negative
Reproductive toxicity - Assessment	:	Weight of evidence does not support classification for reproductive toxicity

STOT-single exposure

May displace oxygen and cause rapid suffocation.

Components:

2,3,3,3-Tetrafluoropropene:

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

Difluoromethane:

Routes of exposure	:	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:

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

Difluoromethane:

Routes of exposure	:	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

Difluoromethane:

Species	:	Rat, male and female
NOAEL	:	49100 ppm
LOAEL	:	> 49100 ppm
Application Route	:	inhalation (gas)
Exposure time	:	13 Weeks
Method	:	OECD Test Guideline 413

Aspiration toxicity

Not classified based on available information.

Components:

2,3,3,3-Tetrafluoropropene:

No aspiration toxicity classification

Difluoromethane:

No aspiration toxicity classification

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 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

Difluoromethane:

Toxicity to fish	:	LC50 (Fish): 1,507 mg/l Exposure time: 96 h Method: ECOSAR (Ecological Structure Activity Relationships)

Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia): 652 mg/l Exposure time: 48 h Method: ECOSAR (Ecological Structure Activity Relationships)
Toxicity to algae/aquatic plants	:	EC50 (green algae): 142 mg/l Exposure time: 96 h Method: ECOSAR (Ecological Structure Activity Relationships)

Persistence and degradability

Components:

2,3,3,3-Tetrafluoropropene:

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

Difluoromethane:

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

Bioaccumulative potential

Components:

2,3,3,3-Tetrafluoropropene:

Bioaccumulation	:	Remarks: Bioaccumulation is unlikely.
Partition coefficient: n-octanol/water	:	log Pow: 2 (77 °F / 25 °C)

Difluoromethane:

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

Mobility in soil

No data available

Other adverse effects

No data available

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.

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, Difluoromethane)
Class	:	2.1
Packing group	:	Not assigned by regulation
Labels	:	2.1
Environmentally hazardous	:	no

IATA-DGR

UN/ID No.	:	UN 3161
Proper shipping name	:	Liquefied gas, flammable, n.o.s. (2,3,3,3-Tetrafluoropropene, Difluoromethane)
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, Difluoromethane)
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 IMO instruments

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, Difluoromethane)
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.

SECTION 15. REGULATORY INFORMATION

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

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
Difluoromethane	75-10-5

California List of Hazardous Substances

Difluoromethane	75-10-5

International Regulations

Montreal Protocol : Difluoromethane

Additional regulatory information

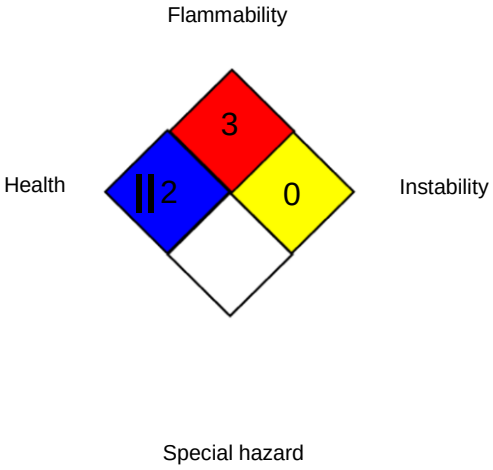
2,3,3,3-Tetrafluoropropene 754-12-1

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:

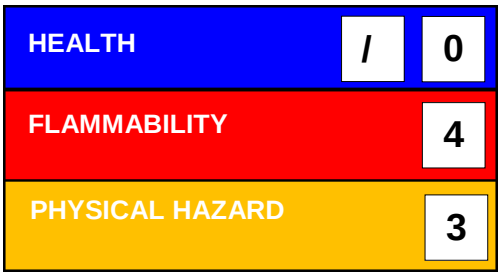
SECTION 16. OTHER INFORMATION

Further information

NFPA 704:



HMIS® IV:



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.

Full text of other abbreviations

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

AIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, 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 sub-

stance; 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; TECI - Thailand Existing Chemicals 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	:	05/27/2025

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

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

US / Z8