SAFETY DATA SHEET

Used Refrigerants and Refrigerant Blends NF

Version	Revision Date:	SDS Number:	Date of last issue: 08/30/2021
5.1	04/05/2022	1340452-00034	Date of first issue: 02/27/2017

SECTION 1. IDENTIFICATION

Product name : Used Refrigerants and Refrigerant Blends NF

SDS-Identcode : 130000120029

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 industrial use only.

SECTION 2. HAZARDS IDENTIFICATION

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

Gases under pressure : Liquefied gas

Specific target organ toxicity - single exposure : Category 3

Simple Asphyxiant

GHS label elements

Hazard pictograms :

Signal Word : Warning

Hazard Statements : H280 Contains gas under pressure; may explode if heated.
H336 May cause drowsiness or dizziness.
May displace oxygen and cause rapid suffocation.

Precautionary Statements :

Prevention:

P261 Avoid breathing gas.
P271 Use only outdoors or in a well-ventilated area.

Response:

P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a doctor if you feel unwell.

Storage:

P405 Store locked up.
P410 + P403 Protect from sunlight. Store in a well-ventilated place.

Disposal:

P501 Dispose of contents and container to an approved waste disposal plant.

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 : Mixture

Components

Chemical name	CAS-No.	Concentration (% w/w)
Carbon dioxide	124-38-9	<= 20
Pentafluoroethane#	354-33-6	<= 70
Butane	106-97-8	<= 5
Propane	74-98-6	<= 5
Isobutane	75-28-5	<= 5
1-Chloro-1,1-difluoroethane	75-68-3	<= 100
Difluoromethane#	75-10-5	<= 50
Chloropentafluoroethane	76-15-3	<= 60
2,3,3,3-Tetrafluoropropene#	754-12-1	<= 56
1,1,1,2-Tetrafluoroethane#	811-97-2	<= 100
Chlorodifluoromethane	75-45-6	<= 100
(Z)-1,1,1,4,4,4-Hexafluoro-2-butene#	692-49-9	<= 100
Poly[oxy(methyl-1,2-ethanediyl)],α-butyl-ω-hydroxy-	9003-13-8	<= 30
Cryofluorane	76-14-2	<= 60
Dichlorodifluoromethane	75-71-8	<= 60
Trichlorofluoromethane	75-69-4	<= 60
1,1,2-Trichlorotrifluoroethane	76-13-1	<= 60
1,1-Difluoroethane	75-37-6	<= 30
1,1,1,3,3,3-Hexafluoropropane	690-39-1	<= 100
1,1,1-Trifluoroethane#	420-46-2	<= 55
2,2-Dichloro-1,1,1-trifluoroethane	306-83-2	<= 100
1-Chloro-1,2,2,2-tetrafluoroethane	2837-89-0	<= 100
Trans-Dichloroethylene	156-60-5	<= 100
(E)-1,1,1,4,4,4-Hexafluoro-2-butene	66711-86-2	<= 100
Pentane	109-66-0	<= 1

Isopentane	78-78-4	<= 1

Voluntarily-disclosed 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. 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. In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
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 May cause drowsiness or dizziness. Gas reduces oxygen available for breathing. Contact with liquid or refrigerated gas can cause cold burns and frostbite.
Protection of first-aiders	:	First Aid responders should pay attention to self-protection, and use the recommended personal protective equipment when the potential for exposure exists (see section 8).
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	:	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	:	Fluorine compounds Carbon oxides Hydrogen fluoride carbonyl fluoride Chlorine compounds
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. Remove undamaged containers from fire area if it is safe to do so. Evacuate area.
Special protective equipment for fire-fighters	:	In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Evacuate personnel to safe areas. Stop gas leak if it is safe to do so. Avoid skin contact with leaking liquid (danger of frostbite). Ventilate the area. Use personal protective equipment. 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. 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.
Advice on safe handling	:	Do not get on skin or clothing. Avoid breathing gas. Do not swallow. Avoid contact with eyes. Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment 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. 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. Store locked up. Keep in a cool, well-ventilated place. Keep away from direct sunlight. Store in accordance with the particular national regulations.
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.

Keep away from direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Carbon dioxide	124-38-9	TWA	5,000 ppm	ACGIH
		STEL	30,000 ppm	ACGIH
		TWA	5,000 ppm 9,000 mg/m³	NIOSH REL
		ST	30,000 ppm 54,000 mg/m³	NIOSH REL
		TWA	5,000 ppm 9,000 mg/m³	OSHA Z-1
Pentafluoroethane	354-33-6	TWA	1,000 ppm	US WEEL
Butane	106-97-8	TWA	800 ppm 1,900 mg/m³	NIOSH REL
		STEL	1,000 ppm	ACGIH
Propane	74-98-6	TWA	1,000 ppm 1,800 mg/m³	NIOSH REL
		TWA	1,000 ppm 1,800 mg/m³	OSHA Z-1
Isobutane	75-28-5	TWA	800 ppm 1,900 mg/m³	NIOSH REL
		STEL	1,000 ppm	ACGIH
1-Chloro-1,1-difluoroethane	75-68-3	TWA	1,000 ppm	US WEEL
Difluoromethane	75-10-5	TWA	1,000 ppm	US WEEL
Chloropentafluoroethane	76-15-3	TWA	1,000 ppm	ACGIH
		TWA	1,000 ppm 6,320 mg/m³	NIOSH REL
2,3,3,3-Tetrafluoropropene	754-12-1	TWA	500 ppm	US WEEL
1,1,1,2-Tetrafluoroethane	811-97-2	TWA	1,000 ppm	US WEEL
Chlorodifluoromethane	75-45-6	TWA	1,000 ppm	ACGIH
		TWA	1,000 ppm 3,500 mg/m³	NIOSH REL
		ST	1,250 ppm	NIOSH REL

			4,375 mg/m³	
(Z)-1,1,1,4,4,4-Hexafluoro-2-butene	692-49-9	TWA	500 ppm 3,350 mg/m³	US WEEL
Cryofluorane	76-14-2	TWA	1,000 ppm	ACGIH
		TWA	1,000 ppm 7,000 mg/m³	NIOSH REL
		TWA	1,000 ppm 7,000 mg/m³	OSHA Z-1
Dichlorodifluoromethane	75-71-8	TWA	1,000 ppm	ACGIH
		TWA	1,000 ppm 4,950 mg/m³	NIOSH REL
		TWA	1,000 ppm 4,950 mg/m³	OSHA Z-1
Trichlorofluoromethane	75-69-4	C	1,000 ppm	ACGIH
		C	1,000 ppm 5,600 mg/m³	NIOSH REL
		TWA	1,000 ppm 5,600 mg/m³	OSHA Z-1
1,1,2-Trichlorotrifluoroethane	76-13-1	TWA	1,000 ppm	ACGIH
		STEL	1,250 ppm	ACGIH
		TWA	1,000 ppm 7,600 mg/m³	NIOSH REL
		ST	1,250 ppm 9,500 mg/m³	NIOSH REL
		TWA	1,000 ppm 7,600 mg/m³	OSHA Z-1
1,1-Difluoroethane	75-37-6	TWA	1,000 ppm	US WEEL
1,1,1,3,3,3-Hexafluoropropane	690-39-1	TWA	1,000 ppm	US WEEL
1,1,1-Trifluoroethane	420-46-2	TWA	1,000 ppm	US WEEL
2,2-Dichloro-1,1,1-trifluoroethane	306-83-2	TWA	50 ppm	US WEEL
1-Chloro-1,2,2,2-tetrafluoroethane	2837-89-0	TWA	1,000 ppm	US WEEL
Trans-Dichloroethylene	156-60-5	TWA	200 ppm	ACGIH
(E)-1,1,1,4,4,4-Hexafluoro-2-butene	66711-86-2	TWA	400 ppm 2,680 mg/m³	US WEEL
Pentane	109-66-0	C	610 ppm 1,800 mg/m³	NIOSH REL
		TWA	120 ppm 350 mg/m³	NIOSH REL
		TWA	1,000 ppm 2,950 mg/m³	OSHA Z-1
		TWA	1,000 ppm	ACGIH
Isopentane	78-78-4	TWA	1,000 ppm	ACGIH

Engineering measures : Minimize workplace exposure concentrations.
If sufficient ventilation is unavailable, use with local exhaust ventilation.
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. 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	:	Chemical-resistant gloves
Remarks	:	Choose gloves to protect hands against chemicals depending on the concentration specific to place of work. Breakthrough time is not determined for the product. Change gloves often! For special applications, we recommend clarifying the resistance to chemicals of the aforementioned protective gloves with the glove manufacturer. Take note that the product is extremely cold, which may impact the selection of hand protection. Wash hands before breaks and at the end of workday.
Eye protection	:	Wear the following personal protective equipment: Chemical resistant goggles must be worn. Face-shield
Skin and body protection	:	Skin should be washed after contact.
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, light yellow
Odor	:	slight
Odor Threshold	:	No data available
pH	:	No data available

Melting point/freezing point	:	No data available
Initial boiling point and boiling range	:	No data available
Flash point	:	Not applicable
Evaporation rate	:	Not applicable
Flammability (solid, gas)	:	No data available
Upper explosion limit / Upper flammability limit	:	No data available
Lower explosion limit / Lower flammability limit	:	No data available
Vapor pressure	:	No data available
Relative vapor density	:	No data available
Relative density	:	No data available
Solubility(ies)		
Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	Not applicable
Autoignition temperature	:	No data available
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 size	:	Not applicable

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	:	Can react with strong oxidizing agents.

Conditions to avoid	:	This substance is not flammable in air at temperatures up to 100 °C (212 °F) at atmospheric pressure. However, mixtures of this substance with high concentrations of air at elevated pressure and/or temperature can become combustible in the presence of an ignition source. This substance can also become combustible in an oxygen enriched environment (oxygen concentrations greater than that in air). Whether a mixture containing this substance and air, or this substance in an oxygen enriched atmosphere become combustible depends on the inter-relationship of 1) the temperature 2) the pressure, and 3) the proportion of oxygen in the mixture. In general, this substance should not be allowed to exist with air above atmospheric pressure or at high temperatures; or in an oxygen enriched environment. For example this substance should NOT be mixed with air under pressure for leak testing or other purposes. Heat, flames and sparks.
Incompatible materials	:	Oxidizing agents
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.

Product:

Acute oral toxicity	:	Acute toxicity estimate: > 5,000 mg/kg Method: Calculation method
Acute inhalation toxicity	:	Acute toxicity estimate: > 20000 ppm Exposure time: 4 h Test atmosphere: gas Method: Calculation method

Components:

Carbon dioxide:

Acute inhalation toxicity	:	LC50 (Rat): 40000 - 50000 ppm Exposure time: 30 min Test atmosphere: vapor

Pentafluoroethane:

Acute inhalation toxicity	:	LC50 (Rat): > 800000 ppm Exposure time: 4 h Test atmosphere: gas

Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 75000 ppm
Remarks: Cardiac sensitization

Cardiac sensitisation threshold limit (Dog): 368.159 mg/m³
Remarks: Cardiac sensitization

Butane:

Acute inhalation toxicity : LC50 (Rat): 570000 ppm
Exposure time: 15 min
Test atmosphere: gas
Remarks: Based on data from similar materials

Propane:

Acute inhalation toxicity : LC50 (Rat): > 800000 ppm
Exposure time: 15 min
Test atmosphere: gas

Isobutane:

Acute inhalation toxicity : LC50 (Rat): 570000 ppm
Exposure time: 15 min
Test atmosphere: gas

1-Chloro-1,1-difluoroethane:

Acute inhalation toxicity : LC50 (Rat): > 400000 ppm
Exposure time: 6 h
Test atmosphere: gas

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

Chloropentafluoroethane:

Acute inhalation toxicity : LC50 (Rat): > 760000 ppm
Exposure time: 4 h
Test atmosphere: gas

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

1,1,1,2-Tetrafluoroethane:

Acute oral toxicity : Assessment: The substance or mixture has no acute oral toxicity

Acute inhalation toxicity : LC50 (Rat): > 567000 ppm
Exposure time: 4 h
Test atmosphere: gas
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 40000 ppm
Test atmosphere: gas
Remarks: Cardiac sensitization

Lowest observed adverse effect concentration (Dog): 80000 ppm
Test atmosphere: gas
Symptoms: May cause cardiac arrhythmia.

Cardiac sensitisation threshold limit (Dog): 334,000 mg/m³
Test atmosphere: gas
Symptoms: May cause cardiac arrhythmia.

Acute dermal toxicity : Assessment: The substance or mixture has no acute dermal toxicity

Chlorodifluoromethane:

Acute inhalation toxicity : LC50 (Mouse): > 150000 ppm
Exposure time: 4 h
Test atmosphere: gas
Method: Expert judgment

No observed adverse effect concentration (Dog): 25000 ppm
Test atmosphere: gas

Lowest observed adverse effect concentration (Dog): 50000 ppm
Test atmosphere: gas

Cardiac sensitisation threshold limit (Dog): 175,000 mg/m³
Test atmosphere: gas

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

Acute inhalation toxicity : LC50 (Rat): > 690.413 mg/l
Exposure time: 4 h
Test atmosphere: vapor
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 12500 ppm
Test atmosphere: gas

Lowest observed adverse effect concentration (Dog): 25000 ppm
Test atmosphere: gas

Cardiac sensitisation threshold limit (Dog): 1,677,740 mg/m³
Test atmosphere: gas

Poly[oxy(methyl-1,2-ethanediyl)],α-butyl-ω-hydroxy-:

Acute oral toxicity : LD50 (Rat, female): > 300 - < 2,000 mg/kg
Method: OECD Test Guideline 423

Acute dermal toxicity : LD50 (Rat): > 2,000 mg/kg
Method: OECD Test Guideline 402
Assessment: The substance or mixture has no acute dermal toxicity

Cryofluorane:

Acute inhalation toxicity : LC50 (Rat): > 424000 ppm
Exposure time: 4 h
Test atmosphere: gas

Lowest observed adverse effect concentration (Dog): 25000 ppm
Symptoms: Cardiac sensitization

Cardiac sensitisation threshold limit (Dog): 175,000 mg/m³
Symptoms: Cardiac sensitization

Dichlorodifluoromethane:

Acute inhalation toxicity : LC50 (Rat): 1200000 ppm
Exposure time: 4 h
Test atmosphere: gas

Lowest observed adverse effect concentration: 25000 ppm
Test atmosphere: gas
Symptoms: Cardiac sensitization

Trichlorofluoromethane:

Acute oral toxicity : LD50 (Rat): > 11,000 mg/kg

Acute inhalation toxicity : LC50 (Rat): > 65680 ppm
Exposure time: 4 h
Test atmosphere: gas

No observed adverse effect concentration (Dog): 1000 ppm
Test atmosphere: gas
Symptoms: Cardiac sensitization

Lowest observed adverse effect concentration (Dog): 5000 ppm
Test atmosphere: gas
Symptoms: Cardiac sensitization

Cardiac sensitisation threshold limit (Dog): 5.62 mg/m³
Test atmosphere: gas
Symptoms: Cardiac sensitization

Acute dermal toxicity : LD50 (Rabbit): > 9,300 mg/kg

1,1,2-Trichlorotrifluoroethane:

Acute oral toxicity : LD50 (Rat): > 5,000 mg/kg

Acute inhalation toxicity : No observed adverse effect concentration (Humans): 500 ppm
Exposure time: 14 Days
Test atmosphere: gas
Remarks: Cardiac sensitization

LC50 (Rat): 408 mg/l
Exposure time: 4 h
Test atmosphere: vapor

1,1-Difluoroethane:

Acute inhalation toxicity : LC50 (Rat): > 437500 ppm
Exposure time: 4 h
Test atmosphere: gas

No observed adverse effect concentration (Dog): 50000 ppm
Test atmosphere: gas
Symptoms: Cardiac sensitization

Lowest observed adverse effect concentration (Dog): 150000

ppm
Test atmosphere: gas
Symptoms: Cardiac sensitization

Cardiac sensitisation threshold limit (Dog): 405,000 mg/m³
Test atmosphere: gas
Symptoms: Cardiac sensitization

1,1,1,3,3,3-Hexafluoropropane:

Acute inhalation toxicity : LC50 (Rat): > 457000 ppm
Exposure time: 4 h
Test atmosphere: gas
Method: OECD Test Guideline 403

No observed adverse effect concentration (Dog): 100000 ppm
Test atmosphere: gas
Remarks: Cardiac sensitization

Lowest observed adverse effect concentration (Dog): 150000 ppm
Test atmosphere: gas
Symptoms: May cause cardiac arrhythmia.

Cardiac sensitisation threshold limit (Dog): 930,000 mg/m³
Test atmosphere: gas
Symptoms: May cause cardiac arrhythmia.

1,1,1-Trifluoroethane:

Acute inhalation toxicity : LC0 (Rat): > 591000 ppm
Exposure time: 4 h
Test atmosphere: gas

2,2-Dichloro-1,1,1-trifluoroethane:

Acute oral toxicity : LD50 (Rat): 9,000 mg/kg
Method: OECD Test Guideline 401

Acute inhalation toxicity : LC50 (Rat): 32000 ppm
Exposure time: 4 h
Test atmosphere: gas

Lowest observed adverse effect concentration (Dog): 20000 ppm
Symptoms: Cardiac sensitization

No observed adverse effect concentration (Dog): 10000 ppm
Symptoms: Cardiac sensitization

Cardiac sensitisation threshold limit (Dog): 124,000 mg/m³
Symptoms: Cardiac sensitization

Acute dermal toxicity : LD50 (Rabbit): > 2,000 mg/kg
Assessment: The substance or mixture has no acute dermal toxicity

1-Chloro-1,2,2,2-tetrafluoroethane:

Acute inhalation toxicity : LC50 (Rat): > 230000 ppm
Exposure time: 4 h
Test atmosphere: gas

Lowest observed adverse effect concentration (Dog): 25000 ppm
Test atmosphere: gas
Symptoms: Cardiac sensitization

No observed adverse effect concentration (Dog): 10000 ppm
Test atmosphere: gas
Symptoms: Cardiac sensitization

Cardiac sensitisation threshold limit (Dog): 140,000 mg/m³
Test atmosphere: gas
Symptoms: Cardiac sensitization

Trans-Dichloroethylene:

Acute oral toxicity : LD50 (Rat): 7,902 mg/kg
Method: OECD Test Guideline 420

Acute inhalation toxicity : LC50 (Rat): 95.5 mg/l
Exposure time: 4 h
Test atmosphere: vapor
Method: OECD Test Guideline 403

Lowest observed adverse effect concentration (Dog): 250000 ppm
Test atmosphere: gas

Cardiac sensitisation threshold limit (Dog): 991,309 mg/m³
Test atmosphere: gas

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

(E)-1,1,1,4,4,4-Hexafluoro-2-butene:

Acute inhalation toxicity : LC50 (Rat): > 25400 ppm
Exposure time: 4 h
Test atmosphere: gas
Method: OECD Test Guideline 403
Assessment: The substance or mixture has no acute inhalation toxicity

No observed adverse effect concentration (Dog): 70000 ppm
Test atmosphere: gas

Pentane:

Acute oral toxicity : LD50 (Rat): > 2,000 mg/kg
Method: OECD Test Guideline 401

Assessment: The substance or mixture has no acute oral toxicity

Acute inhalation toxicity : LC50 (Rat): > 20 mg/l
Exposure time: 4 h
Test atmosphere: vapor
Method: OECD Test Guideline 403
Remarks: Based on data from similar materials

Isopentane:

Acute oral toxicity : LD50 (Rat): > 2,000 mg/kg
Method: OECD Test Guideline 401
Assessment: The substance or mixture has no acute oral toxicity
Remarks: Based on data from similar materials

Acute inhalation toxicity : LC50 (Rat): > 20 mg/l
Exposure time: 4 h
Test atmosphere: vapor
Method: OECD Test Guideline 403
Remarks: Based on data from similar materials

Skin corrosion/irritation

Not classified based on available information.

Components:

Difluoromethane:

Result : No skin irritation

2,3,3,3-Tetrafluoropropene:

Result : No skin irritation

1,1,1,2-Tetrafluoroethane:

Result : No skin irritation

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

Result : No skin irritation

Poly[oxy(methyl-1,2-ethanediyl)],α-butyl-ω-hydroxy-:

Species : reconstructed human epidermis (RhE)
Method : Regulation (EC) No. 440/2008, Annex, B.40
Result : Skin irritation

Dichlorodifluoromethane:

Species : Guinea pig
Result : No skin irritation

1,1,2-Trichlorotrifluoroethane:

Species : Rabbit
Result : No skin irritation

1,1,1,3,3,3-Hexafluoropropane:

Result : No skin irritation

2,2-Dichloro-1,1,1-trifluoroethane:

Species : Rabbit
Result : No skin irritation

Trans-Dichloroethylene:

Species : Rabbit
Method : OECD Test Guideline 404
Result : Mild skin irritation

Pentane:

Species : Rabbit
Result : No skin irritation

Assessment : Repeated exposure may cause skin dryness or cracking.

Isopentane:

Species : Rabbit
Result : No skin irritation
Remarks : Based on data from similar materials

Assessment : Repeated exposure may cause skin dryness or cracking.

Serious eye damage/eye irritation

Not classified based on available information.

Components:

Difluoromethane:

Result : No eye irritation

2,3,3,3-Tetrafluoropropene:

Result : No eye irritation

1,1,1,2-Tetrafluoroethane:

Result : No eye irritation

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

Result : No eye irritation

Poly[oxy(methyl-1,2-ethanediyl)],α-butyl-ω-hydroxy-:

Result : Irritation to eyes, reversing within 21 days

Dichlorodifluoromethane:

Species	:	Rabbit
Result	:	No eye irritation

1,1,2-Trichlorotrifluoroethane:

Species	:	Rabbit
Result	:	No eye irritation

1,1,1,3,3,3-Hexafluoropropane:

Result	:	No eye irritation

2,2-Dichloro-1,1,1-trifluoroethane:

Species	:	Rabbit
Result	:	No eye irritation

Trans-Dichloroethylene:

Species	:	Rabbit
Result	:	Irritation to eyes, reversing within 7 days
Method	:	OECD Test Guideline 405

Pentane:

Species	:	Rabbit
Result	:	No eye irritation
Method	:	OECD Test Guideline 405

Isopentane:

Species	:	Rabbit
Result	:	No eye irritation
Method	:	OECD Test Guideline 405
Remarks	:	Based on data from similar materials

Respiratory or skin sensitization

Skin sensitization

Not classified based on available information.

Respiratory sensitization

Not classified based on available information.

Components:

Difluoromethane:

Routes of exposure	:	Skin contact
Result	:	negative

2,3,3,3-Tetrafluoropropene:

Routes of exposure	:	Skin contact
Result	:	negative

1,1,1,2-Tetrafluoroethane:

Routes of exposure	:	Skin contact
Result	:	negative
Routes of exposure	:	Inhalation
Species	:	Rat
Result	:	negative
Routes of exposure	:	Inhalation
Species	:	Humans
Result	:	negative

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

Routes of exposure	:	Skin contact
Result	:	negative

1,1,2-Trichlorotrifluoroethane:

Test Type	:	Maximization Test
Routes of exposure	:	Skin contact
Species	:	Guinea pig
Result	:	negative

1,1-Difluoroethane:

Species	:	Rat
Result	:	negative

1,1,1,3,3,3-Hexafluoropropane:

Routes of exposure	:	Skin contact
Result	:	negative
Routes of exposure	:	Inhalation
Result	:	negative

2,2-Dichloro-1,1,1-trifluoroethane:

Routes of exposure	:	Skin contact
Species	:	Guinea pig
Result	:	negative
Result	:	negative

1-Chloro-1,2,2,2-tetrafluoroethane:

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

Pentane:

Test Type	:	Maximization Test
Routes of exposure	:	Skin contact
Species	:	Guinea pig
Result	:	negative

Isopentane:

Test Type	:	Maximization Test
Routes of exposure	:	Skin contact
Species	:	Guinea pig
Result	:	negative

Germ cell mutagenicity

Not classified based on available information.

Components:

Pentafluoroethane:

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

Test Type: In vitro mammalian cell gene mutation test
Result: negative
Remarks: Based on data from similar materials

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

Butane:

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: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 474
Result: negative
Remarks: Based on data from similar materials

Propane:

Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)
Result: negative
Remarks: Based on data from similar materials

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
Species: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 474
Result: negative
Remarks: Based on data from similar materials

Isobutane:

Genotoxicity in vitro : Test Type: Chromosome aberration test in vitro
Method: OECD Test Guideline 473
Result: negative
Remarks: Based on data from similar materials

Test Type: Bacterial reverse mutation assay (AMES)
Result: negative
Remarks: Based on data from similar materials

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
Species: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 474
Result: negative
Remarks: Based on data from similar materials

1-Chloro-1,1-difluoroethane:

Genotoxicity in vitro : Test Type: In vitro mammalian cell gene mutation test
Result: negative

Genotoxicity in vivo : Test Type: Rodent dominant lethal test (germ cell) (in vivo)
Species: Rat
Application Route: inhalation (gas)
Result: negative

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.

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.

1,1,1,2-Tetrafluoroethane:

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

Test Type: Unscheduled DNA synthesis (UDS) test with mammalian liver cells in vivo
Species: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 486
Result: negative

Germ cell mutagenicity - Assessment : Weight of evidence does not support classification as a germ cell mutagen.

Chlorodifluoromethane:

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

Test Type: In vitro mammalian cell gene mutation test
Method: OECD Test Guideline 476
Result: negative

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
Species: 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.

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

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

Test Type: In vitro mammalian cell gene mutation test
Method: OECD Test Guideline 476
Result: negative

Genotoxicity in vivo : Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay)
Species: Rat
Application Route: inhalation (vapor)
Method: OECD Test Guideline 474
Result: negative

Germ cell mutagenicity - Assessment : Weight of evidence does not support classification as a germ cell mutagen.

Poly[oxy(methyl-1,2-ethanediyl)],α-butyl-ω-hydroxy-:

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

Test Type: In vitro mammalian cell gene mutation test
Method: OECD Test Guideline 476
Result: negative

Test Type: Chromosome aberration test in vitro
Method: OECD Test Guideline 473
Result: negative

Cryofluorane:

Germ cell mutagenicity - Assessment : Weight of evidence does not support classification as a germ cell mutagen.

Dichlorodifluoromethane:

Germ cell mutagenicity - Assessment : Weight of evidence does not support classification as a germ cell mutagen.

Trichlorofluoromethane:

Germ cell mutagenicity - Assessment : Weight of evidence does not support classification as a germ cell mutagen.

1,1,2-Trichlorotrifluoroethane:

Genotoxicity in vitro : Test Type: Bacterial reverse mutation assay (AMES)
Result: negative

1,1-Difluoroethane:

Germ cell mutagenicity - Assessment : Weight of evidence does not support classification as a germ cell mutagen.

1,1,1,3,3,3-Hexafluoropropane:

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 - : Weight of evidence does not support classification as a germ

Assessment		cell mutagen.

1,1,1-Trifluoroethane:

Genotoxicity in vitro	:	Test Type: Bacterial reverse mutation assay (AMES) Method: OECD Test Guideline 471 Result: negative Test Type: Chromosome aberration test in vitro Result: negative Test Type: In vitro mammalian cell gene mutation test Result: negative Remarks: Based on data from similar materials
Genotoxicity in vivo	:	Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Mouse Application Route: inhalation (gas) Result: negative

2,2-Dichloro-1,1,1-trifluoroethane:

Germ cell mutagenicity - Assessment	:	Weight of evidence does not support classification as a germ cell mutagen.

1-Chloro-1,2,2,2-tetrafluoroethane:

Germ cell mutagenicity - Assessment	:	Weight of evidence does not support classification as a germ cell mutagen.

Trans-Dichloroethylene:

Genotoxicity in vitro	:	Test Type: Bacterial reverse mutation assay (AMES) Method: OECD Test Guideline 471 Result: negative Test Type: In vitro mammalian cell gene mutation test Method: OECD Test Guideline 476 Result: negative 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: Ingestion Method: OECD Test Guideline 474 Result: negative
Germ cell mutagenicity - Assessment	:	Weight of evidence does not support classification as a germ cell mutagen.

(E)-1,1,1,4,4,4-Hexafluoro-2-butene:

Genotoxicity in vitro	:	Test Type: Bacterial reverse mutation assay (AMES) Method: OECD Test Guideline 471 Result: negative Test Type: In vitro mammalian cell gene mutation test Method: OECD Test Guideline 476 Result: negative
Genotoxicity in vivo	:	Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Rat Application Route: Inhalation Method: OECD Test Guideline 474 Result: negative
Germ cell mutagenicity - Assessment	:	Weight of evidence does not support classification as a germ cell mutagen.

Pentane:

Genotoxicity in vitro	:	Test Type: Chromosome aberration test in vitro Method: Directive 67/548/EEC, Annex V, B.10. Result: negative Test Type: Bacterial reverse mutation assay (AMES) Result: negative
Genotoxicity in vivo	:	Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Rat Application Route: inhalation (vapor) Method: Directive 67/548/EEC, Annex V, B.12. Result: negative

Isopentane:

Genotoxicity in vitro	:	Test Type: Bacterial reverse mutation assay (AMES) Result: negative Test Type: Chromosome aberration test in vitro Method: Directive 67/548/EEC, Annex V, B.10. Result: negative Remarks: Based on data from similar materials
Genotoxicity in vivo	:	Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Rat Application Route: inhalation (vapor) Method: Directive 67/548/EEC, Annex V, B.12. Result: negative Remarks: Based on data from similar materials

Carcinogenicity

Not classified based on available information.

Components:

1-Chloro-1,1-difluoroethane:

Species	:	Rat
Application Route	:	inhalation (gas)
Exposure time	:	104 weeks
Result	:	negative

2,3,3,3-Tetrafluoropropene:

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

1,1,1,2-Tetrafluoroethane:

Species	:	Rat
Application Route	:	inhalation (gas)
Exposure time	:	2 Years
Method	:	OECD Test Guideline 453
Result	:	negative
Carcinogenicity - Assessment	:	Weight of evidence does not support classification as a carcinogen

Chlorodifluoromethane:

Species	:	Mouse
Application Route	:	inhalation (gas)
Exposure time	:	581 days
Result	:	negative
Remarks	:	The mechanism or mode of action is not relevant in humans.
Carcinogenicity - Assessment	:	Weight of evidence does not support classification as a carcinogen

Cryofluorane:

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

Dichlorodifluoromethane:

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

Trichlorofluoromethane:

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

1,1-Difluoroethane:

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

1,1,1-Trifluoroethane:

Species	:	Rat
Application Route	:	Ingestion
Exposure time	:	72 weeks
Result	:	negative

2,2-Dichloro-1,1,1-trifluoroethane:

Carcinogenicity - Assessment	:	Weight of evidence does not support classification as a carcinogen, Based on data from similar materials

1-Chloro-1,2,2,2-tetrafluoroethane:

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:

Pentafluoroethane:

Effects on fertility	:	Test Type: One-generation reproduction toxicity study Species: Rat Application Route: inhalation (vapor) Result: negative Remarks: Based on data from similar materials
Effects on fetal development	:	Test Type: Embryo-fetal development Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 414 Result: negative

Butane:

Effects on fertility	:	Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test Species: Rat Application Route: inhalation (gas) Method: OECD Test Guideline 422 Result: negative
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 422
Result: negative

Propane:

Effects on fertility : Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test
Species: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 422
Result: negative

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 422
Result: negative

Isobutane:

Effects on fertility : Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test
Species: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 422
Result: negative

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 422
Result: negative

1-Chloro-1,1-difluoroethane:

Effects on fetal development : Test Type: Embryo-fetal development
Species: Rat
Application Route: inhalation (gas)
Result: negative

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

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

1,1,1,2-Tetrafluoroethane:

Effects on fertility : Species: Mouse
Application Route: Inhalation
Result: negative

Effects on fetal development : 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

Chlorodifluoromethane:

Effects on fertility : Species: Mouse
Application Route: Inhalation
Result: negative

Effects on fetal development : Test Type: Prenatal development toxicity study (teratogenicity)
Species: Rat
Application Route: Inhalation
Method: OECD Test Guideline 414
Result: negative

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

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

Effects on fertility : Test Type: Two-generation reproduction toxicity study
Species: Rat
Application Route: inhalation (vapor)
Method: OECD Test Guideline 416
Result: negative

Effects on fetal development : Test Type: Embryo-fetal development
Species: Rat
Application Route: inhalation (vapor)
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

Poly[oxy(methyl-1,2-ethanediyl)],α-butyl-ω-hydroxy-:

Effects on fertility : Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test
Species: Rat
Application Route: Ingestion
Method: OECD Test Guideline 422
Result: negative

Effects on fetal development : Test Type: Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test
Species: Rat
Application Route: Ingestion
Method: OECD Test Guideline 422
Result: negative

Cryofluorane:

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

1,1-Difluoroethane:

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

1,1,1,3,3,3-Hexafluoropropane:

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

1,1,1-Trifluoroethane:

Effects on fertility : Test Type: Three-generation reproduction toxicity study
Species: Rat
Application Route: inhalation (gas)
Result: negative
Remarks: Based on data from similar materials

Effects on fetal development : Test Type: Embryo-fetal development
Species: Rat
Application Route: inhalation (gas)
Method: OECD Test Guideline 414
Result: negative

2,2-Dichloro-1,1,1-trifluoroethane:

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

Trans-Dichloroethylene:

Effects on fetal development : Test Type: Embryo-fetal development
Species: Rat
Application Route: Inhalation
Method: OECD Test Guideline 414
Result: negative

(E)-1,1,1,4,4,4-Hexafluoro-2-butene:

Effects on fetal development : Test Type: Embryo-fetal development
Species: Rat
Application Route: Inhalation
Method: OECD Test Guideline 414
Result: negative

Pentane:

Effects on fertility : Test Type: Two-generation reproduction toxicity study
Species: Rat
Application Route: inhalation (vapor)
Result: negative
Remarks: Based on data from similar materials

Effects on fetal development : Test Type: Embryo-fetal development
Species: Rat
Application Route: Ingestion
Method: OECD Test Guideline 414
Result: negative

Isopentane:

Effects on fertility : Test Type: Two-generation reproduction toxicity study
Species: Rat
Application Route: inhalation (vapor)
Result: negative

Remarks: Based on data from similar materials

Effects on fetal development : Test Type: Embryo-fetal development
Species: Rat
Application Route: Ingestion
Method: OECD Test Guideline 414
Result: negative
Remarks: Based on data from similar materials

STOT-single exposure

May cause drowsiness or dizziness.

Components:

Butane:

Assessment : May cause drowsiness or dizziness.
Remarks : Based on data from similar materials

Propane:

Assessment : May cause drowsiness or dizziness.

Isobutane:

Assessment : May cause drowsiness or dizziness.

Difluoromethane:

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

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

1,1,1,2-Tetrafluoroethane:

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

Chlorodifluoromethane:

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

Cryofluorane:

Assessment : May cause drowsiness or dizziness.

1,1,2-Trichlorotrifluoroethane:

Assessment : May cause drowsiness or dizziness.

1,1,1,3,3,3-Hexafluoropropane:

Assessment : May cause drowsiness or dizziness.

2,2-Dichloro-1,1,1-trifluoroethane:

Assessment : May cause drowsiness or dizziness.

Trans-Dichloroethylene:

Assessment : May cause drowsiness or dizziness.

Pentane:

Assessment : May cause drowsiness or dizziness.

Isopentane:

Assessment : May cause drowsiness or dizziness.

STOT-repeated exposure

Not classified based on available information.

Components:

Difluoromethane:

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

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.

1,1,1,2-Tetrafluoroethane:

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

Chlorodifluoromethane:

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

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

Routes of exposure : inhalation (vapor)
Assessment : No significant health effects observed in animals at concentrations of 1 mg/l/6h/d or less.

Cryofluorane:

Assessment : No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

Dichlorodifluoromethane:

Assessment : No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

Trichlorofluoromethane:

Assessment : No significant health effects observed in animals at concentrations of 100 mg/kg bw or less.

1,1-Difluoroethane:

Assessment : No significant health effects observed in animals at concentrations of 1 mg/l/6h/d or less.

1,1,1,3,3,3-Hexafluoropropane:

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

2,2-Dichloro-1,1,1-trifluoroethane:

Assessment : No significant health effects observed in animals at concentrations of 1 mg/l/6h/d or less.

1-Chloro-1,2,2,2-tetrafluoroethane:

Assessment : No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

Trans-Dichloroethylene:

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

Routes of exposure : Ingestion
Assessment : No significant health effects observed in animals at concentrations of 100 mg/kg bw or less.

(E)-1,1,1,4,4,4-Hexafluoro-2-butene:

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

Repeated dose toxicity

Components:

Pentafluoroethane:

Species	:	Rat
NOAEL	:	>= 50000 ppm
Application Route	:	inhalation (gas)
Exposure time	:	13 Weeks
Method	:	OECD Test Guideline 413

Butane:

Species	:	Rat
NOAEL	:	>= 9000 ppm
Application Route	:	inhalation (gas)
Exposure time	:	6 Weeks
Method	:	OECD Test Guideline 422

Propane:

Species	:	Rat
NOAEL	:	7.214 mg/l
Application Route	:	inhalation (gas)
Exposure time	:	6 Weeks
Method	:	OECD Test Guideline 422

Isobutane:

Species	:	Rat
NOAEL	:	>= 9000 ppm
Application Route	:	inhalation (gas)
Exposure time	:	6 Weeks
Method	:	OECD Test Guideline 422

1-Chloro-1,1-difluoroethane:

Species	:	Rat
NOAEL	:	> 20000 ppm
Application Route	:	inhalation (gas)
Exposure time	:	104 Weeks

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

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

1,1,1,2-Tetrafluoroethane:

Species : Rat, male and female
NOAEL : 50000 ppm
LOAEL : >50000 ppm
Application Route : inhalation (gas)
Exposure time : 2 y
Method : OECD Test Guideline 453

Chlorodifluoromethane:

Species : Mouse, male and female
NOAEL : 10000 ppm
LOAEL : 50000 ppm
Application Route : inhalation (gas)
Exposure time : 581 d

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

Species : Rat, male and female
NOAEL : 33.5 mg/l
LOAEL : 50.3 mg/l
Application Route : inhalation (vapor)
Exposure time : 90 d
Method : OECD Test Guideline 413

Poly[oxy(methyl-1,2-ethanediyl)],α-butyl-ω-hydroxy-:

Species : Rat
NOAEL : 100 mg/kg
LOAEL : 500 mg/kg
Application Route : Ingestion
Exposure time : 28 - 54 Days
Method : OECD Test Guideline 422

Cryofluorane:

Species : Dog
NOAEL : 250 mg/kg
LOAEL : > 250 mg/kg
Application Route : Ingestion
Exposure time : 90 d
Remarks : No significant adverse effects were reported

Species : Rat
NOAEL : 10000 ppm
LOAEL : >10000 ppm
Application Route : inhalation (gas)
Exposure time : 60 d
Remarks : No significant adverse effects were reported

Dichlorodifluoromethane:

Species	:	Rat
NOAEL	:	800 ppm
LOAEL	:	>800 ppm
Application Route	:	inhalation (gas)
Exposure time	:	90 d
Remarks	:	No significant adverse effects were reported

Species	:	Rat
NOAEL	:	150 mg/kg
LOAEL	:	> 150 mg/kg
Application Route	:	Ingestion
Exposure time	:	2 y
Remarks	:	No significant adverse effects were reported

Trichlorofluoromethane:

NOAEL	:	> 450 mg/kg
LOAEL	:	> 450 mg/kg
Application Route	:	Ingestion
Exposure time	:	90 d
Remarks	:	No significant adverse effects were reported

NOAEL	:	4000 ppm
LOAEL	:	>4000 ppm
Application Route	:	Inhalation
Exposure time	:	28 d
Remarks	:	No significant adverse effects were reported

1,1-Difluoroethane:

Species	:	Rat
NOAEL	:	67.485 mg/l
Application Route	:	inhalation (vapor)
Exposure time	:	104 Weeks
Remarks	:	No significant adverse effects were reported

1,1,1,3,3,3-Hexafluoropropane:

Species	:	Rat, male and female
NOAEL	:	20000 ppm
LOAEL	:	50000 ppm
Application Route	:	inhalation (gas)
Exposure time	:	90 Days
Method	:	OECD Test Guideline 413

1,1,1-Trifluoroethane:

Species	:	Rat
NOAEL	:	> 40000 ppm
Application Route	:	inhalation (gas)
Exposure time	:	13 Weeks
Method	:	OECD Test Guideline 413

2,2-Dichloro-1,1,1-trifluoroethane:

Species	:	Rat
NOAEL	:	3.13 mg/l
LOAEL	:	6.3 mg/l
Application Route	:	inhalation (vapor)
Exposure time	:	70 d
Remarks	:	No significant adverse effects were reported

1-Chloro-1,2,2,2-tetrafluoroethane:

Species	:	Rat
NOAEL	:	5000 ppm
LOAEL	:	15000 ppm
Application Route	:	inhalation (gas)
Exposure time	:	90 d
Method	:	OECD Test Guideline 413
Remarks	:	No significant adverse effects were reported

Trans-Dichloroethylene:

Species	:	Rat, male and female
NOAEL	:	4000 ppm
LOAEL	:	> 4000 ppm
Application Route	:	Inhalation
Exposure time	:	90 Days
Method	:	OECD Test Guideline 413

Species	:	Rat, male and female
NOAEL	:	3,210 mg/kg
LOAEL	:	> 3,210 mg/kg
Application Route	:	Ingestion
Exposure time	:	98 Days
Method	:	OECD Test Guideline 408

(E)-1,1,1,4,4,4-Hexafluoro-2-butene:

Species	:	Rat, male and female
NOAEL	:	7551 ppm
Application Route	:	Inhalation
Exposure time	:	90 Days
Method	:	OECD Test Guideline 412

Pentane:

Species	:	Rat
NOAEL	:	> 6700 ppm
Application Route	:	inhalation (gas)
Exposure time	:	13 Weeks
Method	:	OECD Test Guideline 413

Isopentane:

Species	:	Rat
NOAEL	:	> 250 ppm
Application Route	:	inhalation (gas)
Exposure time	:	13 Weeks

Method : OECD Test Guideline 413
Remarks : Based on data from similar materials

Aspiration toxicity

Not classified based on available information.

Components:

Difluoromethane:

No aspiration toxicity classification

2,3,3,3-Tetrafluoropropene:

No aspiration toxicity classification

1,1,1,2-Tetrafluoroethane:

No aspiration toxicity classification

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

No aspiration toxicity classification

1,1,2-Trichlorotrifluoroethane:

The substance or mixture is known to cause human aspiration toxicity hazards or has to be regarded as if it causes a human aspiration toxicity hazard.

1,1,1,3,3,3-Hexafluoropropane:

No aspiration toxicity classification

Pentane:

The substance or mixture is known to cause human aspiration toxicity hazards or has to be regarded as if it causes a human aspiration toxicity hazard.

Isopentane:

The substance or mixture is known to cause human aspiration toxicity hazards or has to be regarded as if it causes a human aspiration toxicity hazard.

Further information

Components:

(E)-1,1,1,4,4,4-Hexafluoro-2-butene:

Remarks : EPA has identified reproductive toxicity and specific target organ toxicity as hazards for this chemical.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Components:

Carbon dioxide:

Toxicity to fish	:	NOEC (Lepomis macrochirus (Bluegill sunfish)): > 100 mg/l Exposure time: 96 h Remarks: Based on data from similar materials
Toxicity to daphnia and other aquatic invertebrates	:	NOEC (Daphnia magna (Water flea)): > 100 mg/l Exposure time: 48 h Remarks: Based on data from similar materials

Pentafluoroethane:

Toxicity to fish	:	LC50 (Oncorhynchus mykiss (rainbow trout)): > 100 mg/l Exposure time: 96 h Remarks: Based on data from similar materials
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): > 100 mg/l Exposure time: 48 h Remarks: Based on data from similar materials
Toxicity to algae/aquatic plants	:	ErC50 (Pseudokirchneriella subcapitata (green algae)): > 100 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 Remarks: Based on data from similar materials NOEC (Pseudokirchneriella subcapitata (green algae)): > 1 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 Remarks: Based on data from similar materials

1-Chloro-1,1-difluoroethane:

Toxicity to fish	:	LC50 (Poecilia reticulata (guppy)): 220 mg/l Exposure time: 96 h Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 160 mg/l Exposure time: 48 h Method: OECD Test Guideline 202
Toxicity to algae/aquatic plants	:	ErC50 (Pseudokirchneriella subcapitata (green algae)): 96.6 mg/l Exposure time: 96 h Remarks: Based on data from similar materials

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)

Chloropentafluoroethane:

Ecotoxicology Assessment

Acute aquatic toxicity : Toxic effects cannot be excluded

Chronic aquatic toxicity : Toxic effects cannot be excluded

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

1,1,1,2-Tetrafluoroethane:

Toxicity to fish : LC50 (Oncorhynchus mykiss (rainbow trout)): 450 mg/l
Exposure time: 96 h
Method: Regulation (EC) No. 440/2008, Annex, C.1

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 980 mg/l
Exposure time: 48 h
Method: Regulation (EC) No. 440/2008, Annex, C.2

Toxicity to algae/aquatic plants : ErC50 (green algae): > 100 mg/l
Exposure time: 96 h
Remarks: Based on data from similar materials

Chlorodifluoromethane:

Toxicity to fish	:	LC50 (Danio rerio (zebra fish)): 777 mg/l Exposure time: 96 h Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 433 mg/l Exposure time: 48 h Method: OECD Test Guideline 202
Toxicity to algae/aquatic plants	:	EC50 (algae): 377.6 mg/l Exposure time: 72 h Method: ECOSAR (Ecological Structure Activity Relationships)

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

Toxicity to fish	:	LC50 (Oryzias latipes (Japanese medaka)): 76.1 mg/l Exposure time: 96 h Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 22.5 mg/l Exposure time: 48 h Method: OECD Test Guideline 202
Toxicity to algae/aquatic plants	:	ErC50 (Pseudokirchneriella subcapitata (green algae)): > 23.7 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 NOEC (Pseudokirchneriella subcapitata (green algae)): 6.92 mg/l Exposure time: 72 h Method: OECD Test Guideline 201
Toxicity to fish (Chronic toxicity)	:	NOEC (Gobiocypris rarus (rare gudgeon)): 10 mg/l Exposure time: 32 d Method: OECD Test Guideline 210
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	NOEC (Daphnia magna (Water flea)): 10 mg/l Exposure time: 21 d Method: OECD Test Guideline 211

Poly[oxy(methyl-1,2-ethanediyl)],α-butyl-ω-hydroxy-:

Toxicity to fish	:	LC50 (Poecilia reticulata (guppy)): > 100 mg/l Exposure time: 96 h Method: OECD Test Guideline 203 Remarks: Based on data from similar materials
Toxicity to daphnia and other aquatic invertebrates	:	EL50 (Daphnia magna (Water flea)): > 100 mg/l Test substance: Water Accommodated Fraction Method: OECD Test Guideline 202 Remarks: Based on data from similar materials
Toxicity to algae/aquatic plants	:	EL50 (Pseudokirchneriella subcapitata (green algae)): 333 mg/l Exposure time: 72 h

Test substance: Water Accommodated Fraction

EL10 (Pseudokirchneriella subcapitata (green algae)): 93.7 mg/l
Exposure time: 72 h
Test substance: Water Accommodated Fraction

Toxicity to microorganisms : EC50 (activated sludge): > 1,000 mg/l
Exposure time: 10 min
Method: OECD Test Guideline 209

Cryofluorane:

Toxicity to fish : LC50 (Fish): 21.5 mg/l
Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia): 24.4 mg/l
Exposure time: 48 h

Toxicity to algae/aquatic plants : EC50 (algae): 16 mg/l
Exposure time: 96 h

Ecotoxicology Assessment

Acute aquatic toxicity : Harmful to aquatic life.

Chronic aquatic toxicity : This product has no known ecotoxicological effects.

Dichlorodifluoromethane:

Toxicity to fish : LC50 (Oryzias latipes (Orange-red killifish)): 67 mg/l
Exposure time: 48 h

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 95 mg/l
Exposure time: 48 h

Ecotoxicology Assessment

Acute aquatic toxicity : Harmful to aquatic life.

Chronic aquatic toxicity : This product has no known ecotoxicological effects.

Trichlorofluoromethane:

Toxicity to fish : LC50 (Oncorhynchus mykiss (rainbow trout)): 190 mg/l
Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 130 mg/l
Exposure time: 48 h

1,1,2-Trichlorotrifluoroethane:

Toxicity to fish : LC50 (Danio rerio (zebra fish)): 7 mg/l
Exposure time: 96 h
Method: DIN 38412

Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 71 mg/l Exposure time: 48 h

1,1-Difluoroethane:

Toxicity to fish	:	LC50 (Fish): 295.78 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia): 146.7 mg/l Exposure time: 48 h
Toxicity to algae/aquatic plants	:	EC50 (algae): 47.76 mg/l Exposure time: 96 h

Ecotoxicology Assessment

Acute aquatic toxicity	:	Harmful to aquatic life.
Chronic aquatic toxicity	:	This product has no known ecotoxicological effects.

1,1,1,3,3,3-Hexafluoropropane:

Toxicity to fish	:	LC50 (Danio rerio (zebra fish)): 292 mg/l Exposure time: 96 h Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 299 mg/l Exposure time: 48 h Method: OECD Test Guideline 202
Toxicity to algae/aquatic plants	:	ErC50 (Pseudokirchneriella subcapitata (green algae)): > 186 mg/l Exposure time: 96 h Method: OECD Test Guideline 201 NOEC (Pseudokirchneriella subcapitata (green algae)): > 186 mg/l Exposure time: 3 d Method: OECD Test Guideline 201

1,1,1-Trifluoroethane:

Toxicity to fish	:	LC50 (Oncorhynchus mykiss (rainbow trout)): > 100 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	:	EC0 (Pseudokirchneriella subcapitata (green algae)): > 44 mg/l Exposure time: 96 h Method: OECD Test Guideline 201 Remarks: Based on data from similar materials

Toxicity to microorganisms : EC0 (Pseudomonas putida): > 730 mg/l
Exposure time: 6 h

2,2-Dichloro-1,1,1-trifluoroethane:

Toxicity to fish : LC50 (Oncorhynchus mykiss (rainbow trout)): 55.5 mg/l
Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 17.3 mg/l
Exposure time: 48 h

Toxicity to algae/aquatic plants : ErC50 (Pseudokirchneriella subcapitata (green algae)): 96.6 mg/l
Exposure time: 96 h

EbC50 (Pseudokirchneriella subcapitata (green algae)): 67.8 mg/l
Exposure time: 96 h

1-Chloro-1,2,2,2-tetrafluoroethane:

Ecotoxicology Assessment

Acute aquatic toxicity : No toxicity at the limit of solubility.

Chronic aquatic toxicity : No toxicity at the limit of solubility.

Trans-Dichloroethylene:

Toxicity to fish : LC50 (Lepomis macrochirus (Bluegill sunfish)): 135 mg/l
Exposure time: 96 h
Remarks: Based on data from similar materials

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 220 mg/l
Exposure time: 48 h
Method: EPA-660/3-75-009

Toxicity to algae/aquatic plants : EbC50 (Pseudokirchneriella subcapitata (green algae)): 36.36 mg/l
Exposure time: 48 h
Method: OECD Test Guideline 201

(E)-1,1,1,4,4,4-Hexafluoro-2-butene:

Toxicity to fish : LC50 (Gobiocypris rarus (rare gudgeon)): 1.78 mg/l
Exposure time: 96 h
Method: OECD Test Guideline 203

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): 92.9 mg/l
Exposure time: 48 h
Method: OECD Test Guideline 202

Toxicity to algae/aquatic plants : EC50 (Pseudokirchneriella subcapitata (green algae)): > 14.4 mg/l
Exposure time: 72 h
Method: OECD Test Guideline 201

Toxicity to fish (Chronic toxicity)	:	NOEC (Gobiocypris rarus (rare gudgeon)): 0.131 mg/l Method: OECD Test Guideline 210

Pentane:

Toxicity to fish	:	LC50 (Oncorhynchus mykiss (rainbow trout)): 4.26 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 2.7 mg/l Exposure time: 48 h
Toxicity to algae/aquatic plants	:	ErC50 (Scenedesmus capricornutum (fresh water algae)): 10.7 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 NOEC (Scenedesmus capricornutum (fresh water algae)): 2.04 mg/l Exposure time: 72 h Method: OECD Test Guideline 201

Ecotoxicology Assessment

Chronic aquatic toxicity	:	Toxic to aquatic life with long lasting effects. Remarks: Based on harmonised classification in EU regulation 1272/2008, Annex VI

Isopentane:

Toxicity to fish	:	LC50 (Oncorhynchus mykiss (rainbow trout)): > 1 - 10 mg/l Exposure time: 96 h Remarks: Based on data from similar materials
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 2.3 mg/l Exposure time: 48 h
Toxicity to algae/aquatic plants	:	NOEC (Scenedesmus capricornutum (fresh water algae)): > 1 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 Remarks: Based on data from similar materials ErC50 (Scenedesmus capricornutum (fresh water algae)): > 10 - 100 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 Remarks: Based on data from similar materials

Persistence and degradability

Components:

Pentafluoroethane:

Biodegradability	:	Result: Not readily biodegradable.

Biodegradation: 5 %
Exposure time: 28 d
Method: OECD Test Guideline 301D

Butane:

Biodegradability : Result: Readily biodegradable.
Remarks: Based on data from similar materials

Propane:

Biodegradability : Result: Readily biodegradable.
Remarks: Based on data from similar materials

Isobutane:

Biodegradability : Result: Readily biodegradable.
Remarks: Based on data from similar materials

1-Chloro-1,1-difluoroethane:

Biodegradability : Result: Not readily biodegradable.
Biodegradation: 5.6 %
Exposure time: 28 d
Method: OECD Test Guideline 301B

Difluoromethane:

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

2,3,3,3-Tetrafluoropropene:

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

1,1,1,2-Tetrafluoroethane:

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

Chlorodifluoromethane:

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

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

Biodegradability : Result: Not readily biodegradable.
Method: OECD Test Guideline 302C

Poly[oxy(methyl-1,2-ethanediyl)],α-butyl-ω-hydroxy-:

Biodegradability : Result: Readily biodegradable.
Method: OECD Test Guideline 301F
Remarks: Based on data from similar materials

Cryofluorane:

Biodegradability : Result: Not readily biodegradable.

1,1,2-Trichlorotrifluoroethane:

Biodegradability : Result: Not readily biodegradable.
Biodegradation: < 10 %
Exposure time: 27 d

1,1-Difluoroethane:

Biodegradability : Result: Not readily biodegradable.

1,1,1,3,3,3-Hexafluoropropane:

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

1,1,1-Trifluoroethane:

Biodegradability : Result: Not inherently biodegradable.
Biodegradation: 3 %
Exposure time: 28 d
Remarks: Based on data from similar materials

2,2-Dichloro-1,1,1-trifluoroethane:

Biodegradability : Result: Not readily biodegradable.
Biodegradation: 24 %
Exposure time: 28 d

Trans-Dichloroethylene:

Biodegradability : Result: not rapidly degradable
Method: OECD Test Guideline 301D

(E)-1,1,1,4,4,4-Hexafluoro-2-butene:

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

Pentane:

Biodegradability : Result: Readily biodegradable.
Biodegradation: 87 %
Exposure time: 28 d

Isopentane:

Biodegradability : Result: Readily biodegradable.
Biodegradation: 71.43 %
Exposure time: 28 d
Method: OECD Test Guideline 301F

Bioaccumulative potential

Components:

Carbon dioxide:

Partition coefficient: n-octanol/water : log Pow: 0.83

Pentafluoroethane:

Partition coefficient: n-octanol/water : Pow: 1.48
Method: OECD Test Guideline 107

Butane:

Partition coefficient: n-octanol/water : log Pow: 2.89

Propane:

Partition coefficient: n-octanol/water : log Pow: 2.36

Isobutane:

Partition coefficient: n-octanol/water : log Pow: 2.8

Difluoromethane:

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

2,3,3,3-Tetrafluoropropene:

Bioaccumulation : Remarks: Bioaccumulation is unlikely.

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

1,1,1,2-Tetrafluoroethane:

Bioaccumulation : Remarks: Bioaccumulation is unlikely.

Partition coefficient: n-octanol/water : log Pow: 1.06

Chlorodifluoromethane:

Partition coefficient: n-octanol/water : log Pow: 1.13 (77 °F / 25 °C)

(Z)-1,1,1,4,4,4-Hexafluoro-2-butene:

Partition coefficient: n-octanol/water : log Pow: 2.3

Poly[oxy(methyl-1,2-ethanediyl)],α-butyl-ω-hydroxy-:

Partition coefficient: n-octanol/water : log Pow: > 1.18 - 4.37
Method: OECD Test Guideline 117

Cryofluorane:

Bioaccumulation : Remarks: Bioaccumulation is unlikely.

Dichlorodifluoromethane:

Bioaccumulation : Bioconcentration factor (BCF): < 10

Trichlorofluoromethane:

Partition coefficient: n-octanol/water : log Pow: 2.53

1,1,2-Trichlorotrifluoroethane:

Partition coefficient: n-octanol/water : log Pow: 3.16

1,1-Difluoroethane:

Partition coefficient: n-octanol/water : log Pow: -0.125

1,1,1,3,3,3-Hexafluoropropane:

Partition coefficient: n-octanol/water : log Pow: 1.12 (68 °F / 20 °C)

1,1,1-Trifluoroethane:

Partition coefficient: n-octanol/water : log Pow: 1.06 - < 1.35
Remarks: Based on data from similar materials

2,2-Dichloro-1,1,1-trifluoroethane:

Bioaccumulation : Bioconcentration factor (BCF): 33

1-Chloro-1,2,2,2-tetrafluoroethane:

Partition coefficient: n-octanol/water : log Pow: 1.67

Trans-Dichloroethylene:

Partition coefficient: n-octanol/water : log Pow: 2.06

(E)-1,1,1,4,4,4-Hexafluoro-2-butene:

Partition coefficient: n-octanol/water : log Pow: 2.5

Pentane:

Partition coefficient: n-octanol/water : log Pow: 3.45

Isopentane:

Partition coefficient: n-octanol/water : log Pow: 4

Mobility in soil

No data available

Other adverse effects

Components:

1-Chloro-1,1-difluoroethane:

Ozone-Depletion Potential : 0.065
Where a range of ODPs is indicated, the highest value in that range shall be used for the purposes of the Protocol. The ODPs listed as a single value have been determined from calculations based on laboratory measurements. Those listed as a range are based on estimates and are less certain. The range pertains to an isomeric group. The upper value is the estimate of the ODP of the isomer with the highest ODP, and the lower value is the estimate of the ODP of the isomer with the lowest ODP.
Regulation: UNEP - Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer (Update: 2016-11-23)
Group: Annex C - Group I: HCFCs (consumption and production)

0.065
Includes all isomers of the substance, regardless of whether the isomer is explicitly listed on its own.
Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class II Substances (Update: 2014-10-28)

0.008 - 0.07
Includes all isomers of the substance, regardless of whether the isomer is explicitly listed on its own.
Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class II Substances (Update: 2014-10-28)

Chloropentafluoroethane:

Ozone-Depletion Potential : 0.6
These ozone depleting potentials are estimates based on existing knowledge and will be reviewed and revised periodically
Regulation: UNEP - Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer (Update: 2016-11-23)

Group: Annex A - Group I: Chlorofluorocarbons

0.6
Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances (Update: 2007-07-01)
Group: Group I

Chlorodifluoromethane:

Ozone-Depletion Potential : 0.055
Where a range of ODPs is indicated, the highest value in that range shall be used for the purposes of the Protocol. The ODPs listed as a single value have been determined from calculations based on laboratory measurements. Those listed as a range are based on estimates and are less certain. The range pertains to an isomeric group. The upper value is the estimate of the ODP of the isomer with the highest ODP, and the lower value is the estimate of the ODP of the isomer with the lowest ODP.
Regulation: UNEP - Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer (Update: 2016-11-23)
Group: Annex C - Group I: HCFCs (consumption and production)

0.055
Includes all isomers of the substance, regardless of whether the isomer is explicitly listed on its own.
Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class II Substances (Update: 2014-10-28)

Cryofluorane:

Ozone-Depletion Potential : 1
Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances (Update: 2007-07-01)
Group: Group I

1
These ozone depleting potentials are estimates based on existing knowledge and will be reviewed and revised periodically
Regulation: UNEP - Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer (Update: 2016-11-23)
Group: Annex A - Group I: Chlorofluorocarbons

Dichlorodifluoromethane:

Ozone-Depletion Potential : 1
These ozone depleting potentials are estimates based on existing knowledge and will be reviewed and revised periodically

Regulation: UNEP - Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer (Update: 2016-11-23)
Group: Annex A - Group I: Chlorofluorocarbons

1
Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances (Update: 2007-07-01)
Group: Group I

Trichlorofluoromethane:

Ozone-Depletion Potential : 1
These ozone depleting potentials are estimates based on existing knowledge and will be reviewed and revised periodically
Regulation: UNEP - Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer (Update: 2016-11-23)
Group: Annex A - Group I: Chlorofluorocarbons

1
Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances (Update: 2007-07-01)
Group: Group I

Additional ecological information : Dangerous for the ozone layer.

1,1,2-Trichlorotrifluoroethane:

Ozone-Depletion Potential : 0.8
Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class I Substances (Update: 2008-07-01)
Group: Group I

0.8
These ozone depleting potentials are estimates based on existing knowledge and will be reviewed and revised periodically
Regulation: UNEP - Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer (Update: 2016-11-23)
Group: Annex A - Group I: Chlorofluorocarbons

2,2-Dichloro-1,1,1-trifluoroethane:

Ozone-Depletion Potential : 0.02
Where a range of ODPs is indicated, the highest value in that range shall be used for the purposes of the Protocol. The ODPs listed as a single value have been determined from calculations based on laboratory measurements. Those listed as a range are based on estimates and are less certain. The

range pertains to an isomeric group. The upper value is the estimate of the ODP of the isomer with the highest ODP, and the lower value is the estimate of the ODP of the isomer with the lowest ODP.
Regulation: UNEP - Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer (Update: 2016-11-23)
Group: Annex C - Group I: HCFCs (consumption and production)

0.02
Includes all isomers of the substance, regardless of whether the isomer is explicitly listed on its own.
Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class II Substances (Update: 2007-07-01)

1-Chloro-1,2,2,2-tetrafluoroethane:

Ozone-Depletion Potential : 0.022
Where a range of ODPs is indicated, the highest value in that range shall be used for the purposes of the Protocol. The ODPs listed as a single value have been determined from calculations based on laboratory measurements. Those listed as a range are based on estimates and are less certain. The range pertains to an isomeric group. The upper value is the estimate of the ODP of the isomer with the highest ODP, and the lower value is the estimate of the ODP of the isomer with the lowest ODP.
Regulation: UNEP - Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer (Update: 2016-11-23)
Group: Annex C - Group I: HCFCs (consumption and production)

0.022
Includes all isomers of the substance, regardless of whether the isomer is explicitly listed on its own.
Regulation: 40 CFR Protection of Environment; Part 82 Protection of Stratospheric Ozone - CAA Section 602 Class II Substances (Update: 2007-07-01)

Additional ecological information : 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.
If not otherwise specified: Dispose of as unused product.

SECTION 14. TRANSPORT INFORMATION

International Regulations

UNRTDG

UN number	:	UN 1078
Proper shipping name	:	REFRIGERANT GAS, N.O.S. (Carbon dioxide, Pentafluoroethane)
Class	:	2.2
Packing group	:	Not assigned by regulation
Labels	:	2.2

IATA-DGR

UN/ID No.	:	UN 1078
Proper shipping name	:	Refrigerant gas, n.o.s. (Carbon dioxide, Pentafluoroethane)
Class	:	2.2
Packing group	:	Not assigned by regulation
Labels	:	Non-flammable, non-toxic Gas
Packing instruction (cargo aircraft)	:	200
Packing instruction (passenger aircraft)	:	200

IMDG-Code

UN number	:	UN 1078
Proper shipping name	:	REFRIGERANT GAS, N.O.S. (Carbon dioxide, Pentafluoroethane)
Class	:	2.2
Packing group	:	Not assigned by regulation
Labels	:	2.2
EmS Code	:	F-C, S-V
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 1078
Proper shipping name	:	Refrigerant gases, n.o.s. (Carbon dioxide, Pentafluoroethane)
Class	:	2.2
Packing group	:	Not assigned by regulation
Labels	:	NON-FLAMMABLE GAS
ERG Code	:	126
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

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Trans-Dichloroethylene	156-60-5	1000	66666

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 : Gases under pressure
Simple Asphyxiant
Specific target organ toxicity (single or repeated exposure)

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

1-Chloro-1,1-difluoroethane	75-68-3	<= 100 %
Chloropentafluoroethane	76-15-3	<= 60 %
Chlorodifluoromethane	75-45-6	<= 100 %
1-Chloro-1,2,2,2-tetrafluoroethane	2837-89-0	<= 100 %
2,2-Dichloro-1,1,1-trifluoroethane	306-83-2	<= 100 %
1,1,2-Trichlorotrifluoroethane	76-13-1	<= 60 %
Trichlorofluoromethane	75-69-4	<= 60 %
Dichlorodifluoromethane	75-71-8	<= 60 %
Chlorotrifluoromethane	75-72-9	<= 60 %
Cryofluorane	76-14-2	<= 60 %

US State Regulations

Pennsylvania Right To Know

Carbon dioxide	124-38-9
Pentafluoroethane	354-33-6
Trifluoromethane	75-46-7
1-Chloro-1,1-difluoroethane	75-68-3
Isobutane	75-28-5
Butane	106-97-8
Propane	74-98-6
Difluoromethane	75-10-5
Chloropentafluoroethane	76-15-3
2,3,3,3-Tetrafluoropropene	754-12-1
1,1,1,2-Tetrafluoroethane	811-97-2
1,1,1,2,3,3,3-Heptafluoropropane	431-89-0
Chlorodifluoromethane	75-45-6
1,1,2-Trichlorotrifluoroethane	76-13-1
Chlorotrifluoromethane	75-72-9
Trans-Dichloroethylene	156-60-5
Dichlorodifluoromethane	75-71-8
Trichlorofluoromethane	75-69-4
Isopentane	78-78-4
Pentane	109-66-0

California List of Hazardous Substances

Carbon dioxide	124-38-9
Trifluoromethane	75-46-7
Butane	106-97-8
Difluoromethane	75-10-5
Chloropentafluoroethane	76-15-3
Chlorodifluoromethane	75-45-6
Carbon tetrafluoride	75-73-0
1,1,2-Trichlorotrifluoroethane	76-13-1
Chlorotrifluoromethane	75-72-9
Trans-Dichloroethylene	156-60-5
Dichlorodifluoromethane	75-71-8
Trichlorofluoromethane	75-69-4
Cryofluorane	76-14-2
Pentane	109-66-0

California Permissible Exposure Limits for Chemical Contaminants

Carbon dioxide	124-38-9
Butane	106-97-8
Propane	74-98-6
Chloropentafluoroethane	76-15-3
Chlorodifluoromethane	75-45-6
Carbon tetrafluoride	75-73-0
1,1,2-Trichlorotrifluoroethane	76-13-1
Dichlorodifluoromethane	75-71-8
Trichlorofluoromethane	75-69-4
Cryofluorane	76-14-2
Pentane	109-66-0

International Regulations

Montreal Protocol : Pentafluoroethane
Trifluoromethane
Difluoromethane
1,1,1,2-Tetrafluoroethane
1,1,1,2,3,3,3-Heptafluoropropane

Chloropentafluoroethane
Chlorodifluoromethane
1-Chloro-1,2,2,2-tetrafluoroethane
2,2-Dichloro-1,1,1-trifluoroethane
1,1,1-Trifluoroethane
1,1,1,3,3,3-Hexafluoropropane
1,1-Difluoroethane
1-Chloro-1,1-difluoroethane
1,1,2-Trichlorotrifluoroethane
Trichlorofluoromethane
Dichlorodifluoromethane
Chlorotrifluoromethane
Cryofluorane

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:

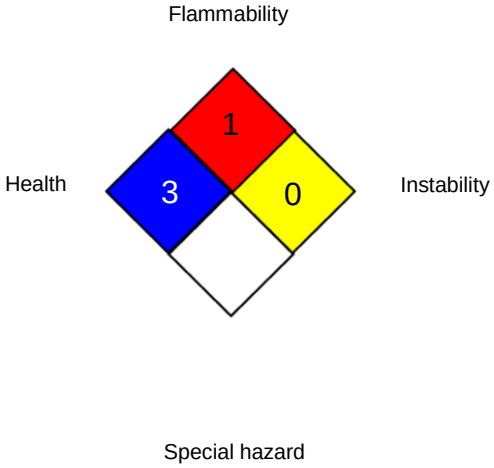
(Z)-1,1,1,4,4,4-Hexafluoro-2-butene 692-49-9
The United States Environmental Protection Agency (USEPA) has established a Significant New Use Rule (SNUR) for one of the components in this product.
See 40 CFR § 721.10830
This material contains one or more substances which requires export notification under TSCA Section 12(b) and 40 CFR Part 707 Subpart D:

(E)-1,1,1,4,4,4-Hexafluoro-2-butene 66711-86-2
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 § 721.10907
This material contains one or more substances which requires export notification under TSCA Section 12(b) and 40 CFR Part 707 Subpart D:

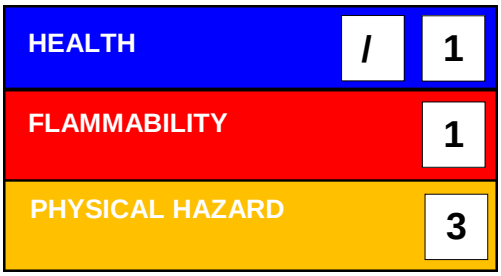
SECTION 16. OTHER INFORMATION

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.

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

ACGIH	:	USA. ACGIH Threshold Limit Values (TLV)
NIOSH REL	:	USA. NIOSH Recommended Exposure Limits
OSHA Z-1	:	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
US WEEL	:	USA. Workplace Environmental Exposure Levels (WEEL)
ACGIH / TWA	:	8-hour, time-weighted average
ACGIH / STEL	:	Short-term exposure limit
ACGIH / C	:	Ceiling limit
NIOSH REL / TWA	:	Time-weighted average concentration for up to a 10-hour workday during a 40-hour workweek
NIOSH REL / ST	:	STEL - 15-minute TWA exposure that should not be exceeded at any time during a workday
NIOSH REL / C	:	Ceiling value not be exceeded at any time.
OSHA Z-1 / TWA	:	8-hour time weighted average
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 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; 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	:	04/05/2022

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

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