DuPont™ Opteon® XP40

Version 2.1 (replaces: Version 2.0)
Revision Date 11.09.2014 Ref. 130000133420

This Safety Data Sheet adheres to the standards and regulatory requirements of Great Britain and may not meet the regulatory requirements in other countries.

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name : DuPont™ Opteon® XP40

Synonyms : ASHRAE: R-449A

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

Use of the Substance/Mixture: Refrigerant
For professional and industrial installation and use only.

1.3. Details of the supplier of the safety data sheet

Company : Du Pont de Nemours (Nederland) B.V.
Baanhoekweg 22
NL-3313 LA Dordrecht
Netherlands

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

E-mail address : sds-support@che.dupont.com

1.4. Emergency telephone number

Emergency telephone number : +44 (0) 8456 006 640

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Gases under pressure, Liquefied gas: H280: Contains gas under pressure; may explode if heated.

Not a hazardous substance or mixture.

2.2. Label elements

Gas cylinder

Warning

H280 Contains gas under pressure; may explode if heated.

Special labelling of certain substances and mixtures	Kyoto: Contains fluorinated greenhouse gas covered by the Kyoto Protocol.,HFC-134a,HFC-32,HFC-125,
P410 + P403	Protect from sunlight. Store in a well-ventilated place.

2.3. Other hazards

This mixture contains no substance considered to be persistent, bioaccumulating and toxic (PBT).
This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB).
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
Rapid evaporation of the liquid may cause frostbite.
Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects.
May cause cardiac arrhythmia.

SECTION 3: Composition/information on ingredients

Chemical nature of the mixture : Fluorinated hydrocarbons

3.1. Substances

Not applicable

3.2. Mixtures

Registration number	Classification according to Directive 67/548/EEC	Classification according to Regulation (EU) 1272/2008 (CLP)	Concentration (% w/w)
1,1,1,2-Tetrafluoroethane (CAS-No.811-97-2) (EC-No.212-377-0)			
01-2119459374-33		Press. Gas Liquefied gas; H280	25.7 %
2,3,3,3-Tetrafluoropropene (CAS-No.754-12-1) (EC-No.468-710-7)			
01-0000019665-61	F+;R12	Flam. Gas 1; H220 Press. Gas Liquefied gas; H280	25.3 %
Pentafluoroethane (CAS-No.354-33-6) (EC-No.206-557-8)			
01-2119485636-25		Press. Gas Liquefied gas; H280	24.7 %
Difluoromethane (CAS-No.75-10-5) (EC-No.200-839-4)			
01-2119471312-47	F+;R12	Flam. Gas 1; H220 Press. Gas Liquefied gas; H280	24.3 %

The above products are REACH compliant; Registration number(s) may not be provided because substance(s) are exempted, not yet registered under REACH or are registered under another regulatory process (biocide uses, plant protection products), etc.

For the full text of the R-phrases mentioned in this Section, see Section 16.

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1. Description of first aid measures

General advice	:	If unconscious place in recovery position and seek medical advice. Never give anything by mouth to an unconscious person. If breathing is irregular or stopped, administer artificial respiration.
	:	First aider needs to protect himself.
	:	If symptoms persist, call a physician.
Inhalation	:	Remove from exposure, lie down. Move to fresh air. Keep patient warm and at rest. Artificial respiration and/or oxygen may be necessary. Consult a physician.
Skin contact	:	Take off contaminated clothing and shoes immediately. Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.
Eye contact	:	Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention.
Ingestion	:	Is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms	:	Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects., Other symptoms potentially related to misuse or inhalation abuse are:, Anaesthetic effects, Light-headedness, dizziness, confusion, incoordination, drowsiness, or unconsciousness, irregular heartbeat with a strange sensation in the chest, heart thumping, apprehension, feeling of fainting, dizziness or weakness
	:	Contact with liquid or refrigerated gas can cause cold burns and frostbite.
	:	Skin contact may provoke the following symptoms:, Irritation, Discomfort, itching, redness, or swelling.
	:	Eye contact may provoke the following symptoms:, Irritation, Tearing, redness, or discomfort.

4.3. Indication of any immediate medical attention and special treatment needed

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

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment., Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2. Special hazards arising from the substance or mixture

Specific hazards during firefighting	:	The product is not flammable.
	:	Pressure build-up. Fire or intense heat may cause violent rupture of packages.
	:	Hazardous combustion products:
	:	Hydrogen fluoride
	:	Fluorinated compounds
	:	Carbon oxides
	:	Exposure to decomposition products may be a hazard to health.

5.3. Advice for firefighters

Special protective equipment for firefighters	:	In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment. Wear neoprene gloves during cleaning up work after a fire.
Further information	:	Cool containers/tanks with water spray.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal precautions	:	Evacuate personnel to safe areas. Ventilate area, especially low or enclosed places where heavy vapours might collect. Refer to protective measures listed in sections 7 and 8.

6.2. Environmental precautions

Environmental precautions	:	Should not be released into the environment. In accordance with local and national regulations.

6.3. Methods and materials for containment and cleaning up

Methods for cleaning up	:	Evaporates.

6.4. Reference to other sections

For disposal instructions see section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Advice on safe handling	:	Vapours are heavier than air and may spread along floors. Avoid breathing vapours or mist. Avoid contact with skin, eyes and clothing. Provide sufficient air exchange and/or exhaust in work rooms. For personal protection see section 8.

Advice on protection against fire and explosion : The product is not flammable in air under ambient conditions of temperature and pressure. When pressurised with air or oxygen, the mixture may become flammable. Certain mixtures of HCFCs or HFCs with chlorine may become flammable or reactive under certain conditions.

7.2. Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers : Do not drag, slide or roll cylinders. Never attempt to lift cylinder by its cap. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Keep at temperature not exceeding 52°C. Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from contamination. Protect cylinders from damage. Keep away from direct sunlight. Store only in approved containers.

Advice on common storage : For further information see Section 10 of the safety data sheet.

7.3. Specific end use(s)

no data available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

If sub-section is empty then no values are applicable.

Components with workplace control parameters

Type Form of exposure	Control parameters	Update	Basis	Remarks

1,1,1,2-Tetrafluoroethane (CAS-No. 811-97-2)

TWA	4,240 mg/m3 1,000 ppm	2007	EH40 WEL	

8.2. Exposure controls

Engineering measures : Ensure adequate ventilation, especially in confined areas. Local exhaust should be used when large amounts are released.

Eye protection : Wear safety glasses or coverall chemical splash goggles. Eye protection complying with EN 166. or ANSI Z87.1 Additionally wear a face shield where the possibility exists for face contact due to splashing, spraying or airborne contact with this material.

Hand protection : Material: Leather gloves
The suitability for a specific workplace should be discussed with the producers of the protective gloves.

: Material: Low temperature resistant gloves

	:	Protective gloves complying with EN 374. or US OSHA guidelines
	:	Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. The choice of an appropriate glove does not only depend on its material but also on other quality features and is different from one producer to the other.
Skin and body protection	:	Wear suitable protective equipment. Wear as appropriate: impervious clothing
Protective measures	:	Self-contained breathing apparatus (SCBA) is required if a large release occurs. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.
Hygiene measures	:	Handle in accordance with good industrial hygiene and safety practice.
Respiratory protection	:	For rescue and maintenance work in storage tanks use self-contained breathing apparatus. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Respiratory protection complying with EN 137.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Form	: Liquefied gas
Colour	: clear
Odour	: slight, ether-like
Flammability (solid, gas)	: The product is not flammable.
Lower explosion limit/ lower flammability limit	: Method: ASTM E681, None.
Upper explosion limit/ upper flammability limit	: Method: ASTM E681, None.

9.2. Other information

no data available

SECTION 10: Stability and reactivity

10.1. Reactivity	:	Decomposes on heating.
10.2. Chemical stability	:	The product is chemically stable under recommended conditions of storage, use and temperature.

10.3. Possibility of hazardous reactions : Polymerization will not occur. Stable under recommended storage conditions.

10.4. Conditions to avoid : Avoid open flames and high temperatures. The product is not flammable in air under ambient conditions of temperature and pressure. When pressurised with air or oxygen, the mixture may become flammable. Certain mixtures of HCFCs or HFCs with chlorine may become flammable or reactive under certain conditions. Pressurized container: Do not pierce or burn, even after use. Keep at temperature not exceeding 52°C.

10.5. Incompatible materials : Strong bases

: Alkaline earth metals

: finely divided metal powders
such as
Aluminium
Magnesium
Zinc

: strong oxidizers

10.6. Hazardous decomposition products : Hazardous thermal decomposition products may include:
Hydrogen fluoride
Carbon oxides
Fluorocarbons
Carbonyl fluoride

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute inhalation toxicity

- 1,1,1,2-Tetrafluoroethane
  LC50 / 4 h Rat :> 567000 ppm

  No Observed Adverse Effect Concentration / Dog :40000 ppm
  Cardiac sensitization

  Low Observed Adverse Effect Concentration (LOAEC) / Dog :80000 ppm
  Cardiac sensitization

- 2,3,3,3-Tetrafluoropropene
  LC50 / 4 h Rat :> 405000 ppm

  Low Observed Adverse Effect Concentration (LOAEC) / Dog :> 120000 ppm
  Cardiac sensitization

  No Observed Adverse Effect Concentration / Dog :120000 ppm
  Cardiac sensitization

- Pentafluoroethane
  LC50 / 4 h Rat :> 800000 ppm

Method: OECD Test Guideline 403

No Observed Adverse Effect Concentration / Dog :100000 ppm
Cardiac sensitization

Low Observed Adverse Effect Concentration (LOAEC) / Dog :75000 ppm
Cardiac sensitization

- Difluoromethane
  LC50 / 4 h Rat :> 520000 ppm

  Low Observed Adverse Effect Concentration (LOAEC) / Dog :> 350000 ppm
  Cardiac sensitization

  No Observed Adverse Effect Concentration / Dog :350000 ppm
  Cardiac sensitization

Skin irritation

- 1,1,1,2-Tetrafluoroethane
  Rabbit
  Classification: Not classified as irritant
  Result: No skin irritation

- 2,3,3,3-Tetrafluoropropene
  Not tested on animals
  Classification: Not classified as irritant
  Result: No skin irritation
  Not expected to cause skin irritation based on expert review of the properties of the substance.

- Difluoromethane
  Not tested on animals
  Classification: Not classified as irritant
  Result: No skin irritation
  Not expected to cause skin irritation based on expert review of the properties of the substance.

Eye irritation

- 1,1,1,2-Tetrafluoroethane
  Rabbit
  Classification: Not classified as irritant
  Result: No eye irritation

- 2,3,3,3-Tetrafluoropropene
  Not tested on animals
  Classification: Not classified as irritant
  Result: No eye irritation
  Not expected to cause eye irritation based on expert review of the properties of the substance.

- Difluoromethane
  Not tested on animals
  Classification: Not classified as irritant
  Result: No eye irritation
  Not expected to cause eye irritation based on expert review of the properties of the substance.

Sensitisation

- 1,1,1,2-Tetrafluoroethane
  Guinea pig
  Classification: Does not cause skin sensitisation.
  Result: Does not cause skin sensitisation.

  Rat
  Classification: Does not cause respiratory sensitisation.
  Result: Does not cause respiratory sensitisation.

- 2,3,3,3-Tetrafluoropropene
  Not tested on animals
  Classification: Does not cause skin sensitisation.
  Not expected to cause sensitization based on expert review of the properties of the substance.

  There are no reports of human respiratory sensitization.

- Pentafluoroethane
  human
  Classification: Does not cause respiratory sensitisation.
  Result: Does not cause respiratory sensitisation.

- Difluoromethane
  Not tested on animals
  Result: Does not cause skin sensitisation.
  Not expected to cause sensitization based on expert review of the properties of the substance.

  There are no reports of human respiratory sensitization.

Repeated dose toxicity

- 1,1,1,2-Tetrafluoroethane
  Inhalation Rat
  No toxicologically significant effects were found.

- 2,3,3,3-Tetrafluoropropene
  Inhalation Rat
  NOAEL: 233 mg/l
  No toxicologically significant effects were found.

  Inhalation Rabbit
  NOAEL: 2.33 mg/l
  No toxicologically significant effects were found.

  Inhalation Mini-pig
  NOAEL: 50 mg/l
  No toxicologically significant effects were found.

- Pentafluoroethane
  Inhalation Rat
  No toxicologically significant effects were found.

- Difluoromethane
  Inhalation Rat
  No toxicologically significant effects were found.

Mutagenicity assessment

- 1,1,1,2-Tetrafluoroethane
  Animal testing did not show any mutagenic effects. Tests on bacterial or mammalian cell cultures did not show mutagenic effects.

- 2,3,3,3-Tetrafluoropropene
  Animal testing did not show any mutagenic effects. Did not cause genetic damage in cultured mammalian cells. Experiments showed mutagenic effects in cultured bacterial cells.

- Pentafluoroethane
  Animal testing did not show any mutagenic effects. Evidence suggests this substance does not cause genetic damage in cultured mammalian cells. Did not cause genetic damage in cultured bacterial cells.

- Difluoromethane
  Animal testing did not show any mutagenic effects. Tests on bacterial or mammalian cell cultures did not show mutagenic effects.

Carcinogenicity assessment

- 1,1,1,2-Tetrafluoroethane
  Not classifiable as a human carcinogen. Overall weight of evidence indicates that the substance is not carcinogenic.

- 2,3,3,3-Tetrafluoropropene
  Not classifiable as a human carcinogen. Sufficient data are available to conclude that the substance is not expected to be carcinogenic.

- Pentafluoroethane
  Not classifiable as a human carcinogen. Overall weight of evidence indicates that the substance is not carcinogenic.

Toxicity to reproduction assessment

- 1,1,1,2-Tetrafluoroethane
  No toxicity to reproduction No effects on or via lactation Animal testing showed no reproductive toxicity.

- 2,3,3,3-Tetrafluoropropene
  No toxicity to reproduction Animal testing showed no reproductive toxicity.

- Pentafluoroethane
  No toxicity to reproduction Animal testing showed no reproductive toxicity.

- Difluoromethane
  No toxicity to reproduction Animal testing showed no reproductive toxicity. Information given is based on data obtained from similar substances.

Assessment teratogenicity

- 1,1,1,2-Tetrafluoroethane

Animal testing showed no developmental toxicity.

- 2,3,3,3-Tetrafluoropropene
  Animal testing showed effects on embryo-fetal development at levels equal to or above those causing maternal toxicity.

- Pentafluoroethane
  Animal testing showed no developmental toxicity.

- Difluoromethane
  Animal testing showed no developmental toxicity.

Further information

Avoid skin contact with leaking liquid (danger of frostbite). May cause cardiac arrhythmia.

SECTION 12: Ecological information

12.1. Toxicity

Toxicity to fish

- 1,1,1,2-Tetrafluoroethane
  LC50 / 96 h / Oncorhynchus mykiss (rainbow trout): 450 mg/l

- 2,3,3,3-Tetrafluoropropene
  LC50 / 96 h / Cyprinus carpio (Carp): > 197 mg/l

- Pentafluoroethane
  LC50 / 96 h / Oncorhynchus mykiss (rainbow trout): 450 mg/l
  Information given is based on data obtained from similar substances.

- Difluoromethane
  LC50 / 96 h / Fish: 1,507 mg/l

Toxicity to aquatic plants

- 1,1,1,2-Tetrafluoroethane
  ErC50 / 96 h / Algae: 142 mg/l
  Information given is based on data obtained from similar substances.

  NOEC / 72 h / Pseudokirchneriella subcapitata (green algae): 13.2 mg/l
  Information given is based on data obtained from similar substances.

- 2,3,3,3-Tetrafluoropropene
  NOEC / 72 h / Algae: > 100 mg/l

- Pentafluoroethane
  ErC50 / 96 h / Algae: 142 mg/l
  Information given is based on data obtained from similar substances.

  NOEC / 72 h / Pseudokirchneriella subcapitata (green algae): 13.2 mg/l
  Information given is based on data obtained from similar substances.

- Difluoromethane
  EC50 / 96 h / Algae: 142 mg/l

Toxicity to aquatic invertebrates

- 1,1,1,2-Tetrafluoroethane
  EC50 / 48 h / Daphnia magna (Water flea): 980 mg/l

- 2,3,3,3-Tetrafluoropropene
  EC50 / 48 h / Daphnia magna (Water flea): > 100 mg/l

- Pentafluoroethane
  EC50 / 48 h / Daphnia magna (Water flea): 980 mg/l
  Information given is based on data obtained from similar substances.

- Difluoromethane
  EC50 / 48 h / Daphnia (water flea): 652 mg/l

Chronic toxicity to fish

- Difluoromethane
  NOEC / 30 d / Fish (unspecified species): 65.8 mg/l

12.2. Persistence and degradability

Biodegradability

- 1,1,1,2-Tetrafluoroethane
  Not biodegradable.

- Pentafluoroethane
  not rapidly biodegradable

- Difluoromethane
  / 28 d
  Biodegradation: 5 %
  Method: OECD Test Guideline 301D
  Not readily biodegradable.

12.3. Bioaccumulative potential

no data available

12.4. Mobility in soil

no data available

12.5. Results of PBT and vPvB assessment

PBT and vPvB assessment
This mixture contains no substance considered to be persistent, bioaccumulating and toxic (PBT). / This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB).

12.6. Other adverse effects

Ozone depletion potential

0

Global warming potential (GWP)

1397

Additional ecological information

IPCC - AR4 (Fourth Assessment Report of the Intergovernmental Panel on Climate Change) - 2007

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product	:	Can be used after re-conditioning. If re-conditioning is not practicable, dispose of in compliance with local regulations.
Contaminated packaging	:	Empty pressure vessels should be returned to the supplier. If recycling is not practicable, dispose of in compliance with local regulations.

SECTION 14: Transport information

ADR

14.1. UN number:	1078
14.2. UN proper shipping name:	REFRIGERANT GAS, N.O.S. (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)
14.3. Transport hazard class(es):	2
14.4. Packing group:	Not applicable
14.5. Environmental hazards:	For further information see Section 12.
14.6. Special precautions for user:	
Tunnel restriction code:	(C/E)

IATA_C

14.1. UN number:	1078
14.2. UN proper shipping name:	Refrigerant gas, n.o.s. (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)
14.3. Transport hazard class(es):	2.2
14.4. Packing group:	Not applicable
14.5. Environmental hazards :	For further information see Section 12.
14.6. Special precautions for user:	
no data available	

IMDG

14.1. UN number:	1078
14.2. UN proper shipping name:	REFRIGERANT GAS, N.O.S. (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)
14.3. Transport hazard class(es):	2.2
14.4. Packing group:	Not applicable
14.5. Environmental hazards :	For further information see Section 12.
14.6. Special precautions for user:	
no data available	

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

SECTION 15: Regulatory information

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

Other regulations : Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work.

15.2. Chemical Safety Assessment

Chemical Safety Assessments have been carried out for these substances.

SECTION 16: Other information

Text of R-phrases mentioned in Section 3

R12	Extremely flammable.

Full text of H-Statements referred to under section 3.

H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.

Abbreviations and acronyms

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE	Acute toxicity estimate
CAS-No.	Chemical Abstracts Service number
CLP	Classification, Labelling and Packaging
EbC50	Concentration at which 50% reduction of biomass is observed
EC50	Median effective concentration
EN	European Norm
EPA	Environmental Protection Agency
ErC50	Concentration at which a 50% inhibition of growth rate is observed
EyC50	Concentration at which 50 % inhibition of yield is observed
IATA_C	International Air Transport Association (Cargo)
IBC	International Bulk Chemical Code
ICAO	International Civil Aviation Organization
ISO	International Standard Organization
IMDG	International Maritime Dangerous Goods
LC50	Median Lethal Concentration
LD50	Median Lethal Dose
LOEC	Lowest Observed Effect Concentration
LOEL	Lowest observed effect level
MARPOL	International Convention for the Prevention of Marine Pollution from Ships
n.o.s.	Not Otherwise Specified
NOAEC	No Observed Adverse Effect Concentration
NOAEL	No observed adverse effect level
NOEC	No Observed Effect Concentration
NOEL	No Observed Effect Level
OECD	Organisation for Economic Co-operation and Development
OPPTS	Office of Prevention, Pesticides and Toxic Substances

PBT	Persistent, Bioaccumulative and Toxic
STEL	Short term exposure limit
TWA	Time Weighted Average (TWA):
vPvB	very Persistent and very Bioaccumulative

Further information

Before use read DuPont's safety information., For further information contact the local DuPont office or DuPont's nominated distributors., ® DuPont's registered trademark
Based on the physico-chemical hazard assessment of this mixture, it was decided to include inside the main body of the safety data sheet all the relevant information coming from the exposure scenario of the lead/priority substances. Please refer to the safety data sheet of the individual components for additional information on exposure scenario.

Significant change from previous version is denoted with a double bar.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The above information relates only to the specific material(s) designated herein and may not be valid for such material(s) used in combination with any other materials or in any process or if the material is altered or processed, unless specified in the text.