

Solstice® yf Refrigerant (R-1234yf)

Version 9.0

Revision Date 22.02.2016

Supersedes 8

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

1.1. Product identifier

Product name : Solstice® yf Refrigerant (R-1234yf)
SDS-number : 000000011078
Type of product : Substance
Remarks : SDS according to Art. 31 of Regulation (EC) 1907/2006.
Chemical Name : 2,3,3,3-Tetrafluoroprop-1-ene
CAS-No. : 754-12-1
Registration number : 01-0000019665-61

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

Use of the Substance/Mixture : Refrigerant
Uses advised against : Consumer use
Short title of exposure scenarios : Industrial Use, Heat Transfer Fluids – Refrigerants, Coolants
Professional Use, Heat Transfer Fluids – Refrigerants, Coolants
Formulation of preparations
Use, service life, and waste stage environmental exposure

1.3. Details of the supplier of the safety data sheet

Company : Honeywell Fluorine Products Europe B.V.
Laarderhoogtweg 18
1101 EA Amsterdam
Netherlands
Telephone : (31) 020 5656911
Telefax : (31) 020 5656600
For further information, please contact: : PMTEU Product Stewardship:
SafetyDataSheet@Honeywell.com
Honeywell International, Inc.
115 Tabor Road
Morris Plains, NJ 07950-2546
USA

1.4. Emergency telephone number

Emergency telephone number : +1-703-527-3887 (ChemTrec-Transport)
+1-303-389-1414 (Medical)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

REGULATION (EC) No 1272/2008

Flammable gases Category 1

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

2.2. Label elements**REGULATION (EC) No 1272/2008**

Hazard pictograms	:	
Signal word	:	Danger
Hazard statements	:	H220 Extremely flammable gas. H280 Contains gas under pressure; may explode if heated.
Precautionary statements	:	P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking. P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely. P381 Eliminate all ignition sources if safe to do so. P410 + P403 Protect from sunlight. Store in a well-ventilated place.

2.3. Other hazards

Warning! Container under pressure.

SECTION 3: Composition/information on ingredients**3.1. Substance**

Chemical Name	CAS-No. Index-No. Registration number EC-No.	Classification 1272/2008	Concentration	Remarks
2,3,3,3-Tetrafluoroprop-1-ene (Active ingredient)	754-12-1 01-0000019665-61 468-710-7	Flam. Gas 1; H220 Press. Gas ; H280	100	1*

1* - For specific concentration limits see Annexes of 1272/2008

3.2. Mixture

Not applicable

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Occupational Exposure Limit(s), if available, are listed in Section 8.
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:

First aider needs to protect himself. Move out of dangerous area. Take off all contaminated clothing immediately.

Inhalation:

When inhaled remove to fresh air and seek medical aid. If breathing is irregular or stopped, administer artificial respiration. If unconscious place in recovery position and seek medical advice.

Skin contact:

Rapid evaporation of the liquid may cause frostbite. In case of contact with liquid, thaw frosted parts with water, then remove clothing carefully. Wash with plenty of water. Wash contaminated clothing before re-use. Consult a physician.

Eye contact:

Protect unharmed eye. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Call a physician immediately.

Ingestion:

Ingestion is unlikely because of the physical properties and is not expected to be hazardous.

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

no data available

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

Adrenaline derivatives are contra-indicated. Treat symptomatically.

See Section 11 for more detailed information on health effects and symptoms.

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SECTION 5: Firefighting measures**5.1. Extinguishing media***Suitable extinguishing media:*

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Extinguishing media which shall not be used for safety reasons:

High volume water jet

5.2. Special hazards arising from the substance or mixture

Extremely flammable.

Some risk may be expected of corrosive and toxic decomposition products.

In case of fire hazardous decomposition products may be produced such as:

Carbon monoxide

Hydrogen halides

Carbonyl halides

Pyrolysis products containing fluoride

Cool closed containers exposed to fire with water spray.

Heating will cause pressure rise with risk of bursting and subsequent explosion

5.3. Advice for firefighters

Wear full protective clothing and self-contained breathing apparatus.

In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.

SECTION 6: Accidental release measures**6.1. Personal precautions, protective equipment and emergency procedures**

Wear full protective clothing and self-contained breathing apparatus. Keep people away from and upwind of spill/leak. Ventilate the area.

6.2. Environmental precautions

The product evaporates readily. Prevent product from entering drains.

6.3. Methods and materials for containment and cleaning up

Use low-sparking handtools and explosion-proof electrical equipment

Allow to evaporate.

Inform the responsible authorities in case of gas leakage, or of entry into waterways, soil or drains.

Pay attention to the spreading of gases especially at ground level (heavier than air) and to the direction of the wind.

6.4. Reference to other sections

For personal protection see section 8.

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SECTION 7: Handling and storage

7.1. Precautions for safe handling

Advice on safe handling:

Exhaust ventilation at the object is necessary. Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use. Use suitably rated equipment.

Advice on protection against fire and explosion:

Keep product and empty container away from heat and sources of ignition. Fire or intense heat may cause violent rupture of packages. Use suitably rated equipment.

Hygiene measures:

Provide adequate ventilation. Do not smoke. When using do not eat or drink.

7.2. Conditions for safe storage, including any incompatibilities

Further information on storage conditions:

Keep containers tightly closed in a cool, well-ventilated place. Containers should be protected against falling down. Protect from warmth. Keep away from direct sunlight. Keep only in the original container at temperature not exceeding 50°C

7.3. Specific end use(s)

no additional data available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits:

Components	Basis / Value type	Value / Form of exposure	Exceeding Factor	Remarks
2,3,3,3-Tetrafluoroprop-1-ene	WEEL TWA	500 ppm		
2,3,3,3-Tetrafluoroprop-1-ene	HONEYWELL TWA	500 ppm		

TWA - Time weighted average

DNEL/ PNEC-Values

Component	End-use / Impact	Exposure duration	Value	Exposure routes	Remarks
2,3,3,3-Tetrafluoroprop-1-ene	Workers / Long-term systemic effects		950 mg/m3	Inhalation	

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Component	Environmental compartment / Value	Remarks
2,3,3,3-Tetrafluoroprop-1-ene	Fresh water: > 0,1 mg/l	
2,3,3,3-Tetrafluoroprop-1-ene	Marine water: > 0,01 mg/l	
2,3,3,3-Tetrafluoroprop-1-ene	Fresh water sediment: > 1,77 mg/kg	
2,3,3,3-Tetrafluoroprop-1-ene	Marine sediment: > 0,178 mg/kg	
2,3,3,3-Tetrafluoroprop-1-ene	Soil: > 1,54 mg/kg	

8.2. Exposure controls

Occupational exposure controls

The Personal Protective Equipment must be in accordance with EN standards:respirator EN 136, 140, 149; safety glasses EN 166; protective suit: EN 340, 463, 468, 943-1, 943-2; gloves EN 374, safety shoes EN-ISO 20345.

Engineering measures

Highly effective exhaust ventilation

Personal protective equipment

Respiratory protection:

In case of insufficient ventilation wear suitable respiratory equipment.

Self-contained breathing apparatus (EN 133)

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Hand protection:

Protective gloves against cold
(EN 511)

Eye protection:

Safety goggles

Skin and body protection:

Wear suitable protective equipment.

Environmental exposure controls

Handle in accordance with local environmental regulations and good industrial practices.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Form : compressed liquefied gas

Colour : colourless

Odour : slight, original odour

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molecular weight	:	114 g/mol
Melting point/range	:	Not applicable, as this product is a gas.
Boiling point/boiling range	:	-29,4 °C
Flash point	:	Not applicable, as this product is a gas.
Flammability (solid, gas)	:	Extremely flammable gas. Method: Flammability (gases)
Auto-ignition temperature	:	405 °C
Oxidizing properties	:	Not applicable: Not expected to have oxidizing properties based on theoretical evaluation
Lower explosion limit	:	6,2 %(V) Method: ASTM E681-04 lower flammability limit
Upper explosion limit	:	12,3 %(V) Method: ASTM E681-04 upper flammability limit
Vapour pressure	:	6.067 hPa at 21,1 °C
Vapour pressure	:	14.203 hPa at 54,4 °C
Density	:	1,1 g/cm ³ at 25 °C
Viscosity, dynamic	:	Not applicable, as this product is a gas.
Viscosity, kinematic	:	Not applicable, as this product is a gas.
pH	:	Not applicable, as this product is a gas.
Water solubility	:	198,2 mg/l at 24 °C Method: 92/69/EEC, A.6
Partition coefficient: n-octanol/water	:	log Pow 2,15 Method: 92/69/EEC, A.8
Relative vapour density	:	4
Evaporation rate	:	Not applicable, as this product is a gas.

9.2 Other Information

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no additional data available

SECTION 10: Stability and reactivity**10.1. Reactivity**

Stable under normal conditions.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Hazardous polymerisation does not occur.

10.4. Conditions to avoid

Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.
Heat, flames and sparks.

10.5. Incompatible materials

Reactions with alkali metals.

Reactions with light metals.

Zinc

Magnesium

Oxidizers (e.g. peroxide residues present in insufficiently cured rubbers)

10.6. Hazardous decomposition products

In case of fire hazardous decomposition products may be produced such as:

Hydrogen fluoride

Carbonyl halides

Carbon monoxide

Carbon dioxide (CO₂)

SECTION 11: Toxicological information**11.1. Information on toxicological effects**

Acute oral toxicity:

Not applicable

Study technically not feasible.

Acute dermal toxicity:

Not applicable

Study technically not feasible.

Acute inhalation toxicity:

LC50

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Species: Rat
Value: > 400000 ppm
Exposure time: 4 h
Method: OECD Test Guideline 403

Skin irritation:
Not applicable
Study technically not feasible.

Eye irritation:
Not applicable
Study technically not feasible.

Respiratory or skin sensitisation:
Route of exposure: Dermal
Not applicable, as this product is a gas.
Study technically not feasible.

Repeated dose toxicity:
Species: Rat
Application Route: Inhalation
Exposure time: 2 Weeks
NOEL: 50000 ppm
Method: OECD Test Guideline 412

Species: Rat
Application Route: Inhalation
Exposure time: 4 Weeks
NOAEL: 50000 ppm
Method: OECD Test Guideline 412

Species: Rat
Application Route: Inhalation
Exposure time: 13 Weeks
NOAEL: 50000 ppm
Method: OECD Test Guideline 413

Species: Rabbit, male
Application Route: Inhalation
Exposure time: 28 d
NOEL: 500 ppm
Method: OECD Test Guideline 412
Note: There are no observed toxicological effects, which result in classification as a specific target organ toxicant.

Species: Rabbit, female
Application Route: Inhalation
Exposure time: 28 d
NOEL: 1000 ppm
Method: OECD Test Guideline 412
Note: There are no observed toxicological effects, which result in classification as a specific target organ toxicant.

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Species: Mini-pig
Application Route: Inhalation
Exposure time: 28 d
NOAEL: 10000 ppm
Note: highest exposure tested

Carcinogenicity:

Species: Rat
Note: Not classified as a human carcinogen. Substance not expected to be a carcinogen based on available data.

Germ cell mutagenicity:

Test Method: Ames test
Result: 20% and higher, positive in TA 100 and e. coli WP2 uvrA, negative in TA98, TA100, and TA1535.
Method: OECD Test Guideline 471

Test Method: Chromosome aberration test in vitro
Cell type: Human lymphocytes
Result: negative
Method: OECD Test Guideline 473
Note: Dose 760,000 ppm

Species: Mouse
Cell type: Micronucleus
Dose: up to 200,000 ppm (4 hour)
Method: OECD Test Guideline 474
Result: negative

Test Method: Unscheduled DNA synthesis
Dose: up to 50,000 ppm (4 weeks)
Method: OECD Test Guideline 486
Result: negative

Species: Rat
Cell type: Micronucleus
Dose: up to 50,000 ppm (4 weeks)
Method: OECD Test Guideline 474
Result: negative

Reproductive toxicity:

Test Type: Two-generation study
Method: OECD Test Guideline 416
Species: Rat
Route of Application: Inhalation
General Toxicity - Parent: NOAEC: 50.000 ppm
General Toxicity F1: NOAEC: 50.000 ppm

Method: OECD Test Guideline 414
Species: Rat
Route of Application: inhalation (gas)

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General Toxicity Maternal: NOAEL: 50.000 ppm
Developmental Toxicity: NOAEL: 50.000 ppm

Method: OECD Test Guideline 414

Species: Rabbit

Route of Application: inhalation (gas)

General Toxicity Maternal: LOAEC: 2.500 ppm

Embryo-fetal toxicity: NOAEC: 4.000 ppm

Remarks: Embryo-fetal toxicity observed at maternally toxic concentrations

Aspiration hazard:

Not applicable, as this product is a gas.

Other information:

Cardiac Sensitization (dog): No effects for exposures up to 12% (120,189 ppm)

SECTION 12: Ecological information

12.1. Toxicity

Toxicity to fish:

LC50

Species: Cyprinus carpio (Carp)

Value: > 197 mg/l

Exposure time: 96 h

Method: OECD Test Guideline 203

No demonstrable toxic effect in saturated solution.

Toxicity to aquatic plants:

EC50

Species: Scenedesmus capricornutum (fresh water algae)

Value: > 100 mg/l

Method: OECD Test Guideline 201

Toxicity to aquatic invertebrates:

EC50

Species: Daphnia magna (Water flea)

Value: > 83 mg/l

Exposure time: 48 h

Method: OECD Test Guideline 202

12.2. Persistence and degradability

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

12.3. Bioaccumulative potential

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no data available

12.4. Mobility in soil

no data available

12.5. Results of PBT and vPvB assessment

Results PBT Assessment : This substance is not considered to be persistent, bioaccumulating and toxic (PBT).
This substance is not considered to be very persistent and very bioaccumulating (vPvB).

12.6. Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product:

Dispose according to legal requirements.

Packaging:

Legal requirements are to be considered in regard of reuse or disposal of used packaging materials

Further information:

Provisions relating to waste:
EC Directive 2006/12/EC; 2008/98/EEC
Regulation No. 1013/2006

For personal protection see section 8.

SECTION 14: Transport information

ADR/RID

UN Number : 3161
Description of the goods : LIQUEFIED GAS, FLAMMABLE, N.O.S.
(R-1234yf)
Class : 2
Classification Code : 2F
Hazard Identification : 23
Number
ADR/RID-Labels : 2.1
Environmentally hazardous : no

IATA

UN Number : 3161
Description of the goods : Liquefied gas, flammable, n.o.s.
(R-1234yf)
Class : 2.1
Hazard Labels : 2.1

IMDG

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UN Number : 3161
Description of the goods : LIQUEFIED GAS, FLAMMABLE, N.O.S.
(R-1234yf)
Class : 2.1
Hazard Labels : 2.1
EmS Number : F-D, S-U
Marine pollutant : no

SECTION 15: Regulatory information

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

Basis	Value	Remarks
Directive 2012/18/EC SEVESO III	Amount 1: 50.000 kg Amount 2: 200.000 kg	Annex I, Part 2: 18. Liquefied flammable gases, Category 1 or 2

Other inventory information

US. Toxic Substances Control Act
On TSCA Inventory

Australia. Industrial Chemical (Notification and Assessment) Act
On the inventory, or in compliance with the inventory

Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL)
All components of this product are on the Canadian DSL

Japan. Kashin-Hou Law List
On the inventory, or in compliance with the inventory

Korea. Toxic Chemical Control Law (TCCL) List
On the inventory, or in compliance with the inventory

Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act
Not in compliance with the inventory

China. Inventory of Existing Chemical Substances
Not in compliance with the inventory

New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand
Not in compliance with the inventory

15.2 Chemical safety assessment

A Chemical Safety Assessment has been carried out.

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SECTION 16: Other information**Text of H-statements referred to under heading 3**

2,3,3,3-Tetrafluoroprop-1-ene : H220 Extremely flammable gas.
H280 Contains gas under pressure; may explode if heated.

Further information

All directives and regulations refer to amended versions.
Vertical lines in the left hand margin indicate a relevant amendment from the previous version.

Abbreviations:

EC European Community
CAS Chemical Abstracts Service
DNEL Derived no effect level
PNEC Predicted no effect level
vPvB Very persistent and very bioaccumulative substance
PBT Persistent, bioaccumulative und toxic substance

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. Final determination of suitability of any material is the sole responsibility of the user.

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