

Solstice® yf Refrigerant (R-1234yf)

Version 3.9

Revision Date 09.04.2015

Supersedes 2

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Product name : Solstice® yf Refrigerant (R-1234yf)
Type of product : Substance
Remarks : SDS according to Art. 31 of Regulation (EC) 1907/2006.
Chemical Name : 2,3,3,3-Tetrafluoroprop-1-ene
EC-No. : 468-710-7
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 : none
Short title of exposure scenarios : Industrial Use, Heat Transfer Fluids – Refrigerants, Coolants
Professional Use, Heat Transfer Fluids – Refrigerants, Coolants
Formulation of preparations

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.
101 Columbia Road
Morristown, NJ 07962-1057
USA

1.4. Emergency telephone number

Emergency telephone number : (32) 16 391 209 (Mon-Fri, 9.00-17.00h)
3887 (ChemTrec)
+1-303-389-1414 (Medical) +1-703-527-

2. HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

REGULATION (EC) No 1272/2008

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Flammable gases 1
H220 Extremely flammable gas.
Gases under pressure Press. Gas
H280 Contains gas under pressure; may explode if heated.

DIRECTIVES 67/548/EEC or 1999/45/EC

F+ Extremely flammable
R12 Extremely flammable.

2.2. Label elements

REGULATION (EC) No 1272/2008

Hazard pictograms	:		
Signal word	:	Danger	
Hazard statements	:	H220 H280	Extremely flammable gas. Contains gas under pressure; may explode if heated.
Precautionary statements	:	P281 P210 P260 P308 + P313 P410 + P403	Use personal protective equipment as required. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Do not breathe dust/ fume/ gas/ mist/ vapours/ spray. IF exposed or concerned: Get medical advice/ attention. Protect from sunlight. Store in a well- ventilated place.

DIRECTIVES 67/548/EEC or 1999/45/EC

Symbol(s)	:		
R-phrases(s)	:	R12	Extremely flammable.
S-phrases(s)	:	S 9 S16	Keep container in a well-ventilated place. Keep away from sources of ignition - No smoking.

2.3. Other hazards

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Potential health effects

- Skin : Rapid evaporation of the liquid may cause frostbite.
- Eyes : May irritate eyes.
- Ingestion : Unlikely route of exposure.
- Inhalation : Gas reduces oxygen available for breathing.
Causes asphyxiation in high concentrations. The victim will not realize that he/she is suffocating.
- Chronic Exposure : None known.
- Further information : Warning! Container under pressure.

Potential environmental effects

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

Type of product : Substance

Chemical characterization

Chemical Name : 2,3,3,3-Tetrafluoroprop-1-ene

CAS-No. : 754-12-1

EC-No. : 468-710-7

Registration number : 01-0000019665-61

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

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

- General advice : First aider needs to protect himself. 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

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- 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.

5. FIREFIGHTING MEASURES

5.1. Extinguishing media

- Suitable extinguishing media : Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

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

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

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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.
Additional advice : 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.

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 data available :

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Occupational exposure limits:

Components	Basis	Value type	Control parameters	Exceeding Factor	Form of exposure	Remarks
2,3,3,3-Tetrafluoroprop-1-ene	WEEL	TWA	500 ppm			We are not aware of any national exposure limit.

TWA - Time weighted average

DNEL/ PNEC-Values

No DNEL-data available.

No PNEC data available.

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.

Environmental exposure controls

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

Engineering measures

Highly effective exhaust ventilation

Personal protective equipment

Respiratory protection : Remarks: 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

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Skin and body protection : Wear suitable protective equipment.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Form	: compressed liquefied gas
Colour	: colourless
Odour	: slight, original odour
molecular weight	: 114 g/mol
Melting point/range	: no data available
Boiling point/boiling range	: -29,4 °C
Flash point	: Not applicable
Flammability (solid, gas)	: Extremely flammable gas. Method: Flammability (gases)
Auto-ignition temperature	: 405 °C
Lower explosion limit	: 6,2 %(V) lower flammability limit
Upper explosion limit	: 12,3 %(V) 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
pH	: no data available
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

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Relative vapour density : 4
Evaporation rate : not determined

10. STABILITY AND REACTIVITY

10.1. Reactivity

Stable under normal conditions.

10.2. Chemical stability

no data available

10.3. Possibility of hazardous reactions

Hazardous polymerisation does not occur.
Note: Stable under normal conditions.

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

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)

11. TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Acute oral toxicity : Not applicable
Acute dermal toxicity : Not applicable
Acute inhalation toxicity : LC50

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	Species: Rat Value: > 400000 ppm Exposure time: 4 h
Skin irritation	: slight irritation
Eye irritation	: slight irritation
Sensitisation	: Cardiac sensitization Species: dogs Result: No effects observed for exposures up to 12% (120,189 ppm).
Repeated dose toxicity	: Species: Rat Application Route: Inhalation Exposure time: 2 Weeks NOEL : 50000 ppm : Species: Rat Application Route: Inhalation Exposure time: 4 Weeks NOAEL : 50000 ppm : Species: Rat Application Route: Inhalation Exposure time: 13 Weeks NOAEL : 50000 ppm : Species: Rabbit, male Application Route: Inhalation Exposure time: 28 d NOEL : 500 ppm : Species: Rabbit, female Application Route: Inhalation Exposure time: 28 d NOEL : 1000 ppm : Species: Mini-pig Application Route: Inhalation Exposure time: 28 d NOAEL : 10000 ppm Note: highest exposure tested
Genotoxicity in vitro	: Test Method: Ames test Result: 20% and higher, positive in TA 100 and e. coli WP2 uvrA, negative in TA98, TA100, and TA1535.

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- Genotoxicity in vivo
- : Test Method: Chromosome aberration test in vitro
Cell type: Human lymphocytes
Result: negative
Note: Dose 760,000 ppm
 - : Test Method: Chromosome aberration test in vitro
Cell type: Chinese Hamster Lung Cells
Result: negative
 - : Species: Mouse
Cell type: Micronucleus
Dose: up to 200,000 ppm (4 hour)
Result: negative
 - : Test Method: Unscheduled DNA synthesis
Dose: up to 50,000 ppm (4 weeks)
Result: negative
 - : Species: Rat
Cell type: Micronucleus
Dose: up to 50,000 ppm (4 weeks)
Result: negative
- Reproductive Toxicity/Fertility
- : Species: Rat
Application Route: Inhalation exposure
Exposure time: Two-generation reproductive toxicity
NOAEL,parent: 50,000 ppm
NOAEL,F1: 50,000 ppm
NOAEL,F2: 50,000 ppm
- Teratogenicity and developmental toxicity
- : Species: Rat
Dose: NOAEL (No observed adverse effect level) - 50,000 ppm
 - : Species: Rabbit
Dose: NOAEL (No observed adverse effect level) - 4,000 ppm

12. ECOLOGICAL INFORMATION

12.1. Toxicity

- Toxicity to fish
- : LC50
Species: Cyprinus carpio (Carp)
Value: > 197 mg/l
Exposure time: 96 h

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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

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.

12.3. Bioaccumulative potential

no data available

12.4. Mobility in soil

no data available

12.5. Results of PBT and vPvB assessment

no data available

12.6. Other adverse effects

Additional ecological information : An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

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

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For personal protection see section 8.

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

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

15. REGULATORY INFORMATION

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

Other inventory information

US. Toxic Substances : On TSCA Inventory
Control Act
Australia. Industrial : Not in compliance with the inventory
Chemical (Notification and
Assessment) Act
Canada. Canadian : All components of this product are on the Canadian DSL.
Environmental Protection
Act (CEPA). Domestic
Substances List (DSL)
Japan. Kashin-Hou Law : On the inventory, or in compliance with the inventory
List

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Korea. Toxic Chemical : On the inventory, or in compliance with the inventory
Control Law (TCCL) List
Philippines. The Toxic : Not in compliance with the inventory
Substances and Hazardous
and Nuclear Waste Control
Act
China. Inventory of Existing : Not in compliance with the inventory
Chemical Substances
New Zealand. Inventory of : Not in compliance with the inventory
Chemicals (NZIoC), as
published by ERMA New
Zealand

15.2 Chemical safety assessment

Chemical safety : A Chemical Safety Assessment has been carried out.
assessment

16. OTHER INFORMATION

Further information

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

Abbreviations:

EC European Community
CAS Chemical Abstracts Service

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.

This information should not constitute a guarantee for any specific product properties.
