

Solstice® yf Refrigerant (R-1234yf)

000000011078

Version 12.2

Revision Date 05.02.2021

Supersedes 11

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
REACH Registration Number : no data available

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 International Inc. Honeywell International, Inc.
115 Tabor Road 115 Tabor Road
07950-2546 Morris Plains Morris Plains, NJ 07950-2546
USA USA

Telephone :
For further information, please contact: : PMTEU Product Stewardship:
SafetyDataSheet@Honeywell.com

1.4. Emergency telephone number

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Emergency telephone : +1-703-527-3887 (ChemTrec-Transport)
number : +1-303-389-1414 (Medical)
Country based Poison : see chapter 15.1
Control Center

SECTION 2: Hazards identification


2.1. Classification of the substance or mixture

REGULATION (EC) No 1272/2008

Flammable gases Category 1B
H221 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 : H221 Flammable gas.
H280 Contains gas under pressure; may explode if heated.

Precautionary statements : P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 In case of leakage, eliminate all ignition sources.
P410 + P403 Protect from sunlight. Store in a well-ventilated place.

Special labelling of certain products: : Contains fluorinated greenhouse gases.

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2.3. Other hazards

Warning! Container under pressure. Gas reduces oxygen available for breathing.

SECTION 3: Composition/information on ingredients

3.1. Substance

Chemical name	CAS-No. Index-No. REACH Registration Number EC-No.	Classification 1272/2008	Concentration	Remarks
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1 468-710-7	Press. Gas Liquefied gas; H280 Flam. Gas 1B; H221	100 %	

3.2. Mixture

Not applicable

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:

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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.

SECTION 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

Flammable gas.

Contents under pressure.

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

Vapors may travel to areas away from work site before igniting/flashing back to vapor source.

Fire or intense heat may cause violent rupture of packages.

Cool closed containers exposed to fire with water spray.

Do not allow run-off from fire fighting to enter drains or water courses.

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

Hydrogen fluoride

Carbonyl halides

Carbon monoxide

Carbon dioxide (CO₂)

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5.3. Advice for firefighters

Wear full protective clothing and self-contained breathing apparatus.
Evacuate personnel to safe areas. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Immediately evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Wear personal protective equipment. Unprotected persons must be kept away. Wear self-contained breathing apparatus and protective suit. Eliminate all ignition sources if safe to do so. Avoid skin contact with leaking liquid (danger of frostbite). Ventilate the area. Vapors may travel to areas away from work site before igniting/flashing back to vapor source. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Ensure that the oxygen content is $\geq 19.5\%$.

6.2. Environmental precautions

The product evaporates readily. Prevent product from entering drains.

6.3. Methods and materials for containment and cleaning up

Use explosion-proof equipment.
No sparking tools should be used.
Ventilate the area.
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.

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:

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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	
2,3,3,3-Tetrafluoroprop-1-ene	Consumers / Long-term systemic effects		113,1 mg/m3	Inhalation	

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2,3,3,3-Tetrafluoroprop-1-ene	Consumers / Acute systemic effects		186400 mg/m ³	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, 511; 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.

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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

Physical state	:	gaseous
Colour	:	colourless
Odour	:	slight, original odour
molecular weight	:	114 g/mol
Melting point/range	:	Not applicable, as this product is a gas.
Boiling point/boiling range	:	-29,4 °C
Flammability	:	Extremely flammable gas. Method: Flammability (gases)
Upper explosion limit	:	12,3 %(V) Method: ASTM E681-04 Upper flammability limit
Lower explosion limit	:	6,2 %(V) Method: ASTM E681-04 Lower flammability limit
Flash point	:	Not applicable, as this product is a gas.
pH	:	Not applicable, as this product is a gas.
Auto-ignition temperature	:	405 °C
Viscosity, kinematic	:	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

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Vapour pressure : 6.067 hPa
at 21,1 °C

Vapour pressure : 14.203 hPa
at 54,4 °C

Density : 1,1 g/cm³
at 25 °C

Relative vapour density : 4

Particle characteristics : Particle size:
Not applicable

9.2 Other Information

Oxidizing properties : Not applicable: Not expected to have oxidizing properties
based on theoretical evaluation

Evaporation rate : Not applicable, as this product is a gas.

Viscosity, dynamic : Not applicable, as this product is a gas.

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

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Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.
Heat, flames and sparks.
Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C.

10.5. Incompatible materials

Alkali metals
Oxidizers (e.g. peroxide residues present in insufficiently cured rubbers)
Finely divided metal powders such as aluminum, magnesium, or zinc.

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
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:

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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
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
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
Method: OECD Test Guideline 412

Note: There are no observed toxicological effects, which result in classification as a specific target organ toxicant.

Species: Mini-pig
Application Route: Inhalation
Exposure time: 28 d
NOAEL: 10000 ppm

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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:

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

Test Type: Two-generation study

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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)

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-foetal toxicity: NOAEC: 4.000 ppm

Remarks: Embryo-fetal toxicity observed at maternally toxic concentrations

Aspiration hazard:

Not applicable, as this product is a gas.

11.2. Information on other hazards

Endocrine disrupting properties

No data available

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

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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

Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

12.4. Mobility in soil

No data available

12.5. Results of PBT and vPvB 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. Endocrine disrupting properties

No data available

12.7. 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

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Regulation No. 1013/2006

For personal protection see section 8.

SECTION 14: Transport information

14.1 UN number

ADR/RID:3161

IMDG:3161

IATA:3161

14.2 UN proper shipping name

ADR/RID:LIQUEFIED GAS, FLAMMABLE, N.O.S.(R-1234yf)

IMDG:LIQUEFIED GAS, FLAMMABLE, N.O.S.(R-1234yf)

IATA:Liquefied gas, flammable, n.o.s.(R-1234yf)

14.3 Transport hazard class(es)

ADR/RID: 2.1

IMDG: 2.1

IATA: 2.1

14.4 Packaging group

14.5 Environmental hazards

ADR/RID:no

Marine pollutant: no

14.6 Special precautions for user

No data available

14.7 Maritime transport in bulk according to IMO instruments

No data available

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	Quantity: 50.000 kg Quantity: 200.000 kg	Annex I, Part 2: 18. Liquefied flammable gases, Category 1 or 2
Substances of very high concern (SVHC)		This product does not contain substances of very high concern according to Regulation (EC) No Article 57 above the respective regulatory 1907/2006 (REACH), concentration limit of $\geq 0.1\%$ (w/w).

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Poison Control Center

Country	Phone Number
Austria	+4314064343
Belgium	070 245245
Bulgaria	(+35929154233
Croatia	(+3851)23-48-342
Cyprus	+357 2240 5611
Czech Republic	+420224919293; +420224915402
Denmark	82121212
Estonia	16662; (+372)6269390
Finland	9471977
France	+33(0)145425959
Greece	+30 210 779 3777
Hungary	(+36-80)201-199
Iceland	5432222
Ireland	+353(1)8092166
Italy	0382 24444
Germany	Berlin : 030/19240
	Bonn : 0228/19240
	Erfurt : 0361/730730
	Freiburg : 0761/19240
	Göttingen : 0551/19240
	Homburg : 06841/19240
	Mainz : 06131/19240
Munich : 089/19240	
Latvia	+37167042473

Country	Phone Number
Liechtenstein	+41 442515151
Lithuania	+370532362052
Luxembourg	070245245; (+352)80002-5500
Malta	+356 2395 2000
Netherlands	030-2748888
Norway	22591300
Poland	+48 42 25 38 400
Portugal	808250143
Romania	+40 21 318 3606
Slovakia (NTIC)	+421 2 54 774 166
Slovenia	+386 1 400 6051
Spain	+34915620420
Sweden	112 (begär Giftnformation); +46104566786
Switzerland	145
United Kingdom	(+44) 844 892 0111

Other inventory information

US. Toxic Substances Control Act
On TSCA Inventory

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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. Existing Chemicals Inventory (KECI)
On the inventory, or in compliance with the inventory

Philippines. Inventory of Chemicals and Chemical Substances (PICCS)
On the inventory, or in compliance with the inventory

China. Inventory of Existing Chemical Substances (IECSC)
On the inventory, or in compliance with the inventory

New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand
On the inventory, or in compliance with the inventory

15.2 Chemical safety assessment

A Chemical Safety Assessment has been carried out.

SECTION 16: Other information

Text of H-statements referred to under heading 3

2,3,3,3-Tetrafluoroprop-1-ene : H280 Contains gas under pressure; may explode if heated.
H221 Flammable gas.

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 biaccumulative substance

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according to Regulation (EC) No. 1907/2006

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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.

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