according to Regulation (EC) No. 1907/2006, as amended



## Solstice® yf Refrigerant (R-1234yf)

00000011078

Version 12.10 Revision Date 20.12.2024 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 : n

Number

: no data available

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

Use of the : Refrigerant

Substance/Mixture

Short title of exposure

Uses advised against : Direct evaporation applications

scenarios Professional Use, Heat Transfer Fluids – Refrigerants,

Coolants

Formulation of preparations

Use, service life, and waste stage environmental exposure

Industrial Use, Heat Transfer Fluids - Refrigerants, Coolants

1.3. Details of the supplier of the safety data sheet

Company : Honeywell Advanced Limited Honeywell International, Inc.

One Spencer Dock, North Wall 115 Tabor Road

Quay Morris Plains, NJ 07950-2546

Dublin 1 USA

Ireland

Telephone : +353 1 447 9350

For further information, : SafetyDataSheet@Honeywell.com

please contact:

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#### 1.4. Emergency telephone number

Emergency telephone : +1-703-527-3887 (ChemTrec-Transport)

number +1-303-389-1414 (Medical)

Poison Control Center:

United Kingdom: (+44) 844 892 0111

#### **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

H221 Hazard statements 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.

Leaking gas fire: Do not extinguish, P377 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.

according to Regulation (EC) No. 1907/2006, as amended



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Special labelling of certain

: Contains fluorinated greenhouse gases.

products:

#### 2.3. Other hazards

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Rapid evaporation of the liquid may cause frostbite. This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher. The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

## **SECTION 3: Composition/information on ingredients**

#### 3.1. Substances

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. Mixtures

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.

according to Regulation (EC) No. 1907/2006, as amended



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#### 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.

according to Regulation (EC) No. 1907/2006, as amended



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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.

### 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)

### 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 >= 19.5%.

### 6.2. Environmental precautions

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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:

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)

according to Regulation (EC) No. 1907/2006, as amended



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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		

WEEL - US Workplace Environmental Exposure Level

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	
2,3,3,3-Tetrafluoroprop-1- ene	Workers / Acute systemic effects		186400 mg/m3	Inhalation	
2,3,3,3-Tetrafluoroprop-1- ene	Consumers / Acute systemic effects		186400 mg/m3	Inhalation	

Component	Environmental compartment /	Remarks
		i

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	Value	
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: 1,51 mg/kg	
2,3,3,3-Tetrafluoroprop-1-ene	Marine sediment: 0,151 mg/kg	
2,3,3,3-Tetrafluoroprop-1-ene	Soil: 1,49 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

(a) Physical state : gaseous

(b) Colour : colourless

(c) Odour : slight, original odour

(d) Melting point/freezing

point

: Not applicable, as this product is a gas.

(e) Boiling point/boiling

range

: -29,4 °C

(f) Flammability : Flammable gas.

Method: Flammability (gases)

(g) Lower and upper

explosion limit

: 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

(h) Flash point : Not applicable, as this product is a gas.

(i) Auto-ignition

temperature

405 °C

(j) Decomposition

on : Stable under normal conditions.

temperature

(k) pH : Not applicable, as this product is a gas.

(I) Viscosity, kinematic : Not applicable, as this product is a gas.

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(m) Solubility(ies) : Water solubility:

198,2 mg/l at 24 °C

Method: 92/69/EEC, A.6

(n) Partition coefficient: n-

octanol/water

: log Pow 2,15

Method: 92/69/EEC, A.8

(o) Vapour pressure : 6.067 hPa

at 21,1 °C

14.203 hPa at 54,4 °C

(p) Density and / or relative :

density

1,1 g/cm3

at 25 °C

(q) Relative vapour density : 4

(r) Particle characteristics : No data available

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

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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.

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 hazard classes as defined in Regulation (EC) No 1272/2008

#### (a) Acute toxicity

Acute oral toxicity:
Not applicable
study technically not feasible

Acute dermal toxicity:
Not applicable
study technically not feasible

Acute inhalation toxicity:

LC50

Species: Rat

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Value: > 400000 ppm Exposure time: 4 h

Method: OECD Test Guideline 403

Acute toxicity (other routes of administration):

No data available

## (b) Skin corrosion/irritation:

Not applicable

study technically not feasible

## (c) Serious eye damage/eye irritation:

Not applicable

study technically not feasible

### (d) Respiratory or skin sensitisation:

Route of exposure: Dermal

Not applicable, as this product is a gas.

study technically not feasible

## (e) 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

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Species: Rat

Cell type: Micronucleus

Dose: up to 50,000 ppm (4 weeks) Method: OECD Test Guideline 474

Result: negative

## (f) Carcinogenicity:

Species: Rat

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

available data.

## (g) 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)

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

(h) STOT-single exposure:

No data available

## (i) STOT - repeated exposure:

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

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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

Note: highest exposure tested

### (j) 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:

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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

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

Substance is not persistent, bioaccumulative, and toxic (PBT). Substance is not very persistent and very bioaccumulative (vPvB).

#### 12.6. Endocrine disrupting properties

No data available

according to Regulation (EC) No. 1907/2006, as amended



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## 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

Regulation No. 1013/2006

For personal protection see section 8.

### **SECTION 14: Transport information**

#### 14.1 UN number or ID 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

No data available

14.5 Environmental hazards

ADR/RID:no Marine pollutant: no

14.6 Special precautions for user

IMDG Code segregation group according chapter 3.1.4.4: NONE,

14.7 Maritime transport in bulk according to IMO instruments

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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 Listed in Regulation : P2: Flammable gases	Quantity: 10 t Quantity: 50 t	
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 ≥ 0.1 % (w/w).
Regulation (EC) No. 1907/2006, Annex XIV		Not listed
Regulation (EC) No. 1907/2006, Annex XVII Number in Regulation: 40		Listed
Regulation (EU) 2019/1021 on persistent organic pollutants (recast) EU POPS		Not listed
Regulation (EC) No 1005/2009 EU ODS		Not listed

Global warming potential:

4

## Other inventory information

USA. List of Active Substances on the Toxic Substances Control Act (TSCA) Chemical Substances Inventory, as amended On TSCA Inventory

Australia. Inventory of Industrial Chemicals (AIIC), as amended

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On the inventory, or in compliance with the inventory

Canada. Domestic Substances List (DSL), as amended 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

Taiwan Chemical Substance Inventory (TCSI)

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- : H280 Contains gas under pressure; may explode if heated.

ene 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:

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EC European Community
CAS Chemical Abstracts Service
DNEL Derived no effect level
PNEC Predicted no effect level
vPvB Very persistent and very biaccumulative substance
PBT Persistent, bioaccmulative 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.