

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

**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 : 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  
Honeywell International, Inc.  
115 Tabor Road  
Morris Plains, NJ 07950-2546  
USA  
Telephone : (31) 020 5656911  
Telefax : (31) 020 5656600  
For further information, please contact: : PMTEU Product Stewardship:  
SafetyDataSheet@Honeywell.com

**1.4. Emergency telephone number**

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

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

**SECTION 2: Hazards identification**


**2.1. Classification of the substance or mixture**

**REGULATION (EC) No 1272/2008**

Flammable gases Category 1  
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. 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

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

2,3,3,3-Tetrafluoroprop-1-ene	754-12-1 01-0000019665-61 468-710-7	Flam. Gas 1; H220 Press. Gas ; H280	100 %	1*
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1\* - For specific concentration limits see Annexes of 1272/2008

**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:*

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.

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

### 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 (CO<sub>2</sub>)

#### 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

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.

# SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

**Honeywell**

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

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

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

**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/m <sup>3</sup>	Inhalation	

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.

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

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.

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**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
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

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

Vapour pressure	:	6.067 hPa at 21,1 °C
Vapour pressure	:	14.203 hPa at 54,4 °C
Density	:	1,1 g/cm <sup>3</sup> 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**

no additional data available

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**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 polymerization 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.



# SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

**Honeywell**

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

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 (CO<sub>2</sub>)

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## 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:*

Route of exposure: Dermal

Not applicable, as this product is a gas.

study technically not feasible

*Repeated dose toxicity:*

Species: Rat

# SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

**Honeywell**

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

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.

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

# SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

**Honeywell**

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

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)

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.

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

*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**

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. Other adverse effects**

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

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**

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

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

**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

**Poison Control Center**

Country	Phone Number
Austria	+4314064343
Belgium	070 245245
Bulgaria	(+)35929154233
Croatia	(+3851)23-48-342
Cyprus	no data available
Czech Republic	+420224919293; +420224915402
Denmark	82121212
Estonia	16662; (+372)6269390
Finland	9471977
France	+33(0)145425959
Greece	no data available
Hungary	(+36-80)201-199
Iceland	5432222
Ireland	+353(1)8092166
Italy	no data available
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	

Country	Phone Number
Latvia	+37167042473
Liechtenstein	no data available
Lithuania	+370532362052
Luxembourg	070245245; (+352)80002-5500
Malta	no data available
Netherlands	030-2748888
Norway	22591300
Poland	no data available
Portugal	808250143
Romania	no data available
Slovakia (NTIC)	+421 2 54 774 166
Slovenia	no data available
Spain	+34915620420
Sweden	112 (begär Gif tinformation);+46104566786
United Kingdom	no data available

# SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

**Honeywell**

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

### 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. Existing Chemicals Inventory (KECI)  
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

# SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

**Honeywell**

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

000000011078

Version 11.0

Revision Date 01.03.2018

Supersedes 10

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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.

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