

**Solstice® yf Refrigerant (R-1234yf)****000000011078**

Version 3.0

Revision Date 08/06/2015

Print Date 11/17/2015

**SECTION 1. PRODUCT AND COMPANY IDENTIFICATION**

Product name : Solstice® yf Refrigerant (R-1234yf)

Number : 000000011078

Product Use Description : Refrigerant

Manufacturer or supplier's details : Honeywell International Inc.  
115 Tabor Road  
Morris Plains, NJ 07950-2546

For more information call : 800-522-8001  
+1-973-455-6300  
(Monday-Friday, 9:00am-5:00pm)

**In case of emergency call : Medical: 1-800-498-5701 or +1-303-389-1414**  
: **Transportation (CHEMTREC): 1-800-424-9300 or +1-703-527-3887**  
:  
: (24 hours/day, 7 days/week)

**SECTION 2. HAZARDS IDENTIFICATION****Emergency Overview**

Form : Liquefied gas

Color : clear

Odor : slight

**Classification of the substance or mixture**

Classification of the substance or mixture : Flammable gases, Category 1  
Gases under pressure, Liquefied gas  
Simple Asphyxiant

**GHS Label elements, including precautionary statements**

Symbol(s) :



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- Signal word : Danger
- Hazard statements : Extremely flammable gas.  
Contains gas under pressure; may explode if heated.  
May displace oxygen and cause rapid suffocation.
- Precautionary statements : **Prevention:**  
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- Response:**  
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.  
Eliminate all ignition sources if safe to do so.
- Storage:**  
Protect from sunlight. Store in a well-ventilated place.
- Hazards not otherwise classified : May cause eye and skin irritation.  
May cause frostbite.

**Carcinogenicity**

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP, IARC, or OSHA.

**SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS**

Chemical nature : Substance

Chemical Name	CAS-No.	Concentration
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	100.00 %

**SECTION 4. FIRST AID MEASURES**

- General advice : First aider needs to protect himself. Take off all contaminated clothing immediately.
- Inhalation : Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Use oxygen as required, provided a qualified operator is present. Call a physician.

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- Skin contact : After contact with skin, wash immediately with plenty of water. Rapid evaporation of the liquid may cause frostbite. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with a clean, soft cloth or similar covering. Call a physician. Wash contaminated clothing before re-use.
- Eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In case of frostbite water should be lukewarm, not hot. Call a physician.
- Ingestion : Unlikely route of exposure. As this product is a gas, refer to the inhalation section. Do not induce vomiting without medical advice. If conscious, drink plenty of water. Never give anything by mouth to an unconscious person. Call a physician immediately.

**Notes to physician**

- Treatment : Treat frost-bitten areas as needed. Treat symptomatically.

**SECTION 5. FIREFIGHTING MEASURES**

- Suitable extinguishing media : In case of fire, allow gas to burn if flow cannot be shut off immediately.  
Apply water from a safe distance to cool container and protect surrounding area.  
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
- Specific hazards during firefighting : 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/flashback 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>)
- Special protective equipment : In the event of fire and/or explosion do not breathe fumes.

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for firefighters

Wear self-contained breathing apparatus and protective suit.  
No unprotected exposed skin areas.

Further information

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

**SECTION 6. ACCIDENTAL RELEASE MEASURES**

Personal precautions

: 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.  
Avoid accumulation of vapours in low areas.  
Unprotected personnel should not return until air has been tested and determined safe.  
Ensure that the oxygen content is  $\geq 19.5\%$ .

Environmental precautions

: Prevent further leakage or spillage if safe to do so.  
The product evaporates readily.  
Discharge into the environment must be avoided.

Methods for cleaning up

: Use explosion-proof equipment.  
No sparking tools should be used.  
Ventilate the area.  
Allow to evaporate.

**SECTION 7. HANDLING AND STORAGE****Handling**

Handling

: Handle with care.  
Wear personal protective equipment.  
Do not breathe vapour.  
Avoid contact with skin, eyes and clothing.  
Use only in well-ventilated areas.  
Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C.  
Follow all standard safety precautions for handling and use of

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compressed gas cylinders.  
 Use authorized cylinders only.  
 Protect cylinders from physical damage.  
 Do not puncture or drop cylinders, expose them to open flame or excessive heat.  
 Do not remove screw cap until immediately ready for use.  
 Always replace cap after use.

Advice on protection against fire and explosion : Container hazardous when empty.  
 Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits.  
 Keep product and empty container away from heat and sources of ignition.  
 Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.  
 Take measures to prevent the build up of electrostatic charge. Electrical equipment should be protected to the appropriate standard.  
 Use explosion-proof equipment.  
 No sparking tools should be used.  
 No smoking.

**Storage**

Requirements for storage areas and containers : Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use.  
 Keep containers tightly closed in a dry, cool and well-ventilated place.  
 Keep away from heat and sources of ignition.  
 Storage rooms must be properly ventilated.  
 Ensure adequate ventilation, especially in confined areas.  
 Protect cylinders from physical damage.  
 Store away from incompatible substances.  
 Store in original container.

**SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

Protective measures : Ensure that eyewash stations and safety showers are close to the workstation location.  
 Do not breathe vapour.  
 Avoid contact with skin, eyes and clothing.

Engineering measures : Use with local exhaust ventilation.

Eye protection : Safety goggles

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- Hand protection : Protective gloves  
Gloves must be inspected prior to use.  
Replace when worn.
- Skin and body protection : Avoid skin contact with leaking liquid (danger of frostbite).  
Wear suitable protective equipment.
- Respiratory protection : No personal respiratory protective equipment normally required.  
When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.  
Use NIOSH approved respiratory protection.
- Hygiene measures : Handle in accordance with good industrial hygiene and safety practice.  
Ensure adequate ventilation, especially in confined areas.  
When using do not eat, drink or smoke.  
Remove and wash contaminated clothing before re-use.  
Keep working clothes separately.  
Do not breathe vapour.  
Avoid contact with skin, eyes and clothing.

**Exposure Guidelines**

Components	CAS-No.	Value	Control parameters	Update	Basis
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	TWA : Time weighted average	(500 ppm)	2009	WEEL:US. OARS. WEELs Workplace Environmental Exposure Level Guide

2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	TWA : Time weighted average	(500 ppm)	03 15 2010	Honeywell:Limit established by Honeywell International Inc.
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2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	STEL : Short term exposure limit	(1,500 ppm)	03 15 2010	Honeywell:Limit established by Honeywell International Inc.
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**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

Physical state : Liquefied gas

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Color	:	clear
Odor	:	slight
pH	:	Note: Not applicable, as this product is a gas.
Melting point/range	:	Note: Not applicable, as this product is a gas.
Boiling point/boiling range	:	-29.4 °C
Flash point	:	Note: Not applicable, as this product is a gas.
Evaporation rate	:	Note: Not applicable, as this product is a gas.
lower flammability limit	:	6.2 %(V) Method: ASTM E681-04
upper flammability limit	:	12.3 %(V) Method: ASTM E681-04
Vapor pressure	:	6,067 hPa at 21.1 °C(70.0 °F) 14,203 hPa at 54.4 °C(129.9 °F)
Vapor density	:	4 Note: (Air = 1.0)
Density	:	1.1 g/cm <sup>3</sup> at 25 °C
Specific gravity	:	Note: Not applicable
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
Ignition temperature	:	405 °C

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Method: Auto-ignition temperature

Viscosity, dynamic	: Note: Not applicable, as this product is a gas.
Viscosity, kinematic	: Note: Not applicable, as this product is a gas.
Particle size	: Note: Not applicable
Oxidizing properties	: Not applicable: Not expected to have oxidizing properties based on theoretical evaluation
Molecular weight	: 114 g/mol
Surface tension	: Note: Not applicable

**SECTION 10. STABILITY AND REACTIVITY**

Chemical stability	: Stable under normal conditions.
Possibility of hazardous reactions	: Hazardous polymerisation does not occur.
Conditions to avoid	: Keep away from heat and sources of ignition. Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Decomposes under high temperature. Some risk may be expected of corrosive and toxic decomposition products.

Incompatible materials to avoid	: <b>Alkali metals</b> <b>Oxidizers (e.g. peroxide residues present in insufficiently cured rubbers)</b> <b>Finely divided aluminium</b> <b>Finely divided magnesium</b> <b>Zinc</b>
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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**

Acute inhalation toxicity : LC50: > 400000 ppm  
Exposure time: 4 h  
Species: Rat  
Method: OECD Test Guideline 403

Skin irritation : Note: Not applicable Study technically not feasible.

Eye irritation : Note: Not applicable Study technically not feasible.

Sensitisation : **Dermal**  
Note: **Not applicable, as this product is a gas. Study technically not feasible.**

Repeated dose toxicity : Species: Rat  
Application Route: Inhalation  
Exposure time: 2 Weeks  
No-observed-effect level: 50000 ppm  
Method: OECD Test Guideline 412

: Species: Rat  
Application Route: Inhalation  
Exposure time: 4 Weeks  
NOAEL (No observed adverse effect level): 50000 ppm  
Method: OECD Test Guideline 412

: Species: Rat  
Application Route: Inhalation  
Exposure time: 13 Weeks  
NOAEL (No observed adverse effect level): 50000 ppm  
Method: OECD Test Guideline 413

: Species: **Rabbit, male**  
Application Route: **Inhalation**  
Exposure time: **28 d**  
**No-observed-effect level: 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**

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Exposure time: 28 d  
 No-observed-effect level: 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 (No observed adverse effect level): 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.  
 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
- Genotoxicity in vivo : Species: Mouse  
 Cell type: Micronucleus  
 Dose: up to 200,000 ppm (4 hour)  
 Method: OECD Test Guideline 474  
 Result: negative
- Genotoxicity in vivo : Test Method: Unscheduled DNA synthesis  
 Dose: up to 50,000 ppm (4 weeks)  
 Method: OECD Test Guideline 486  
 Result: negative
- Genotoxicity in vivo : Species: Rat  
 Cell type: Micronucleus  
 Dose: up to 50,000 ppm (4 weeks)  
 Method: OECD Test Guideline 474  
 Result: negative

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

- Reproductive toxicity : Test Method: Two-generation study  
 Species: Rat  
 Application Route: Inhalation

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NOAEL, parent: 50,000 ppm  
NOAEL, F1: 50,000 ppm  
Method: OECD Test Guideline 416

Aspiration toxicity : Not applicable, as this product is a gas. Study technically not feasible.

Teratogenicity : Species: Rat Application Route: inhalation (gas)

General Toxicity Maternal - No observed adverse effect level:  
50,000 ppm  
Developmental Toxicity - No observed adverse effect level:  
50,000 ppm  
Method: OECD Test Guideline 414

: Species: Rabbit Application Route: inhalation (gas)

General Toxicity Maternal - Lowest observed adverse effect  
concentration: 2,500 ppm  
Embryo-fetal toxicity - No observed adverse effect  
concentration: 4,000 ppm  
Method: OECD Test Guideline 414  
Note: Embryo-fetal toxicity observed at maternally toxic  
concentrations

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

**SECTION 12. ECOLOGICAL INFORMATION****Ecotoxicity effects**

Toxicity to fish : LC50: > 197 mg/l  
Exposure time: 96 h  
Species: Cyprinus carpio (Carp)  
Method: OECD Test Guideline 203  
Note: No demonstrable toxic effect in saturated solution.

Toxicity to daphnia and other aquatic invertebrates : EC50: > 83 mg/l  
Exposure time: 48 h  
Species: Daphnia magna (Water flea)  
Method: OECD Test Guideline 202

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Toxicity to algae : EC50: > 100 mg/l  
 Species: Scenedesmus capricornutum (fresh water algae)  
 Method: OECD Test Guideline 201

**Elimination information (persistence and degradability)**

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

Surface tension : Note: Not applicable

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

**Further information on ecology****Ecotoxicology Assessment**

Results of 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).

**SECTION 13. DISPOSAL CONSIDERATIONS**

Disposal methods : Observe all Federal, State, and Local Environmental regulations.

**SECTION 14. TRANSPORT INFORMATION**

**DOT** UN/ID No. : UN 3161  
 Proper shipping name : LIQUEFIED GAS, FLAMMABLE, N.O.S.  
 ( R-1234yf)  
 Class : 2.1  
 Packing group  
 Hazard Labels : 2.1

**IATA** UN/ID No. : UN 3161  
 Description of the goods : LIQUEFIED GAS, FLAMMABLE, N.O.S.  
 ( R-1234yf)  
 Class : 2.1  
 Hazard Labels : 2.1  
 Packing instruction (cargo aircraft) : 200

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<b>IMDG</b>	UN/ID No.	:	UN 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****Inventories**

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
TSCA 12B	:	US. Toxic Substances Control Act (TSCA) Section 12(b) Export Notification (40 CFR 707, Subpt D)

2,3,3,3-Tetrafluoroprop-1-ene 754-12-1

**National regulatory information**

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US. Toxic Substances Control Act (TSCA) Section 5(a)(2) Final Significant New Use Rules (SNURs) (40 CFR 721, Subpt E)	:	Issued.
	:	2,3,3,3-Tetrafluoroprop-1-ene 754-12-1
<b>SARA 302 Components</b>	:	No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.
<b>SARA 313 Components</b>	:	This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.
<b>SARA 311/312 Hazards</b>	:	Fire Hazard Acute Health Hazard Sudden Release of Pressure Hazard
<b>California Prop. 65</b>	:	This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.
<b>New Jersey RTK</b>	:	2,3,3,3-Tetrafluoroprop-1-ene 754-12-1
<b>Pennsylvania RTK</b>	:	2,3,3,3-Tetrafluoroprop-1-ene 754-12-1
<b>WHMIS Classification</b>	:	B1: Flammable gas A: Compressed Gas This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

**SECTION 16. OTHER INFORMATION**

	<b>HMIS III</b>	<b>NFPA</b>
Health hazard	: 0	2
Flammability	: 2	2
Physical Hazard	: 2	
Instability	:	0

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Hazard rating and rating systems (e.g. HMIS® III, NFPA): This information is intended solely for the use of individuals trained in the particular system.

**Further information**

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.

Changes since the last version are highlighted in the margin. This version replaces all previous versions.

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Prepared by Honeywell Performance Materials and Technologies Product Stewardship Group