

## Material Safety Data Sheet

**Honeywell****Solstice™ yf Refrigerant (R-1234yf)****000000011078**

Version 1

Revision Date 04/10/2012

Print Date 09/10/2012

**SECTION 1. PRODUCT AND COMPANY IDENTIFICATION**

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

MSDS Number : 000000011078

Product Use Description : Refrigerant

Company : Honeywell International, Inc.  
101 Columbia Road  
Morristown, NJ 07962-1057

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 +1-651-523-0309**  
: **Transportation: 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

Hazard Summary : Warning! Container under pressure. Flammable gas. Gas reduces oxygen available for breathing. Causes asphyxiation in high concentrations. The victim will not realize that he/she is suffocating. Excessive exposure may cause central nervous system effects including drowsiness and dizziness. May cause skin irritation. May cause eye irritation. May cause respiratory tract irritation. Do not breathe vapour. Avoid contact with skin, eyes and clothing. At higher temperatures, (>250 C), decomposition products may include hydrofluoric acid (HF) and carbonyl halides. The ACGIH Threshold Limit Values (2007) for Hydrogen Fluoride are TLV-TWA 0.5 ppm and Ceiling Exposure Limit 2 ppm.

**Potential Health Effects**

Skin : Avoid skin contact with leaking liquid (danger of frostbite).  
May cause frostbite.  
May cause skin irritation.

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- Eyes : May cause frostbite.  
May irritate eyes.
- Ingestion : Unlikely route of exposure.  
Effects due to ingestion may include:  
Gastrointestinal discomfort
- Inhalation : May cause respiratory tract irritation.  
Gas reduces oxygen available for breathing.  
Causes asphyxiation in high concentrations. The victim will not realize that he/she is suffocating.  
Excessive exposure may cause central nervous system effects including drowsiness and dizziness.
- Chronic Exposure : None known.

**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.
- 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

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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/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>)

**Special protective equipment for firefighters**

: In the event of fire and/or explosion do not breathe fumes.  
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.

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**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 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.

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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

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

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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-Tetrafluoropropane	754-12-1	TWA : time weighted average	(500 ppm)	2009	WEEL:US. Workplace Environmental Exposure Level (WEEL) Guides

		TWA : time weighted average	(500 ppm)	03 15 2010	Honeywell:Limit established by Honeywell International Inc.
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		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

Colour : clear

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Odour	: slight
pH	: Note: no data available
Boiling point/boiling range	: -29.4 °C
Flash point	: Note: not applicable
Evaporation rate	: Note: not determined
lower flammability limit	: 6 %(V)
upper flammability limit	: 12.3 %(V)
Vapour pressure	: 6,067 hPa at 21.1 °C(70.0 °F)  14,203 hPa at 54.4 °C(129.9 °F)
Vapour density	: 4 Note: (Air = 1.0)
Density	: 1.1 g/cm3 at 25 °C
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 Method: Autoignition temperature
Molecular Weight	: 114 g/mol

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**SECTION 10. STABILITY AND REACTIVITY**

- 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.
- Materials to avoid : Strong oxidizing agents  
Finely divided aluminium  
Magnesium  
Zinc
- 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>)
- Hazardous reactions : Hazardous polymerisation does not occur.  
Stable under normal conditions.

**SECTION 11. TOXICOLOGICAL INFORMATION**

- Acute inhalation toxicity : LC50: > 400000 ppm  
Exposure time: 4 h  
Species: rat
- 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  
Note: NOEL - 50,000 ppm



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	: Species: rat Application Route: Inhalation Exposure time: 4 Weeks Note: NOAEL (No observed adverse effect level) - 50,000 ppm
	: Species: rat Application Route: Inhalation Exposure time: 13 Weeks Note: NOAEL (No observed adverse effect level) - 50,000 ppm
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.
	: 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
Genotoxicity in vivo	: Species: mouse Cell type: Micronucleus Dose: up to 200,000 ppm (4 hour) Result: negative
Genotoxicity in vivo	: Test Method: Unscheduled DNA synthesis Dose: up to 50,000 ppm (4 week) Result: negative
Genotoxicity in vivo	: Species: rat Cell type: Micronucleus Dose: up to 50,000 ppm (4 week) 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
Teratogenicity	: Species: rat Dose: NOAEL (No observed adverse effect level) - 50,000 ppm

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: Species: rabbit  
 Dose: NOAEL (No observed adverse effect level) - 4,000 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 : EC50: > 83 mg/l  
 aquatic invertebrates. Exposure time: 48 h  
 Species: Daphnia magna (Water flea)  
 Method: OECD Test Guideline 202

Toxicity to algae : EC50: > 100 mg/l  
 Species: Scenedesmus capricornutum (fresh water algae)

**Elimination information (persistence and degradability)**

Biodegradability : Result: Not readily biodegradable.

**Further information on ecology****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

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<b>IATA</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
	Packing instruction (cargo aircraft)	: 200
<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
	Marine pollutant	: no

**SECTION 15. REGULATORY INFORMATION****Inventories**

US. Toxic Substances Control Act	: On TSCA Inventory
Australia. Industrial Chemical (Notification and Assessment) Act	: Not in compliance with the inventory
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL). (Can. Gaz. Part II, Vol. 144)	: 2,3,3,3-Tetrafluoroprop-1-ene 754-12-1 : All components of this product are on the Canadian DSL list.
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	: 2,3,3,3-Tetrafluoroprop-1-ene 754-12-1 : Not in compliance with the inventory

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New Zealand. Inventory of  
Chemicals (NZIoC), as  
published by ERMA New  
Zealand

: 2,3,3,3-Tetrafluoroprop-1-ene 754-12-1  
: Not in compliance with the inventory

TSCA 12B

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

US. Toxic Substances  
Control Act (TSCA) Section  
5(a)(2) Final Significant  
New Use Rules (SNURs)  
(40 CFR 721, Subpt E)

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

**SARA 302 Components**

: SARA 302: No chemicals in this material are subject to the  
reporting requirements of SARA Title III, Section 302.

**SARA 313 Components**

: SARA 313: 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.

**SARA 311/312 Hazards**

: Fire Hazard  
Acute Health Hazard  
Sudden Release of Pressure Hazard

**California Prop. 65**

: This product does not contain any chemicals known to State of  
California to cause cancer, birth defects, or any other  
reproductive harm.

**New Jersey RTK**

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

**Pennsylvania RTK**

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

**WHMIS Classification**

: B1: Flammable gas  
A: Compressed Gas

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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	: 1	2
Flammability	: 4	4
Physical Hazard	: 0	
Instability	:	0

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.

Previous Issue Date: 04/18/2011

Prepared by: Honeywell Performance Materials and Technologies Product Stewardship Group