

Solstice® 513A

000000022892

Version 1.1

Issuing date 01/02/2020

Revision Date 09/16/2022

Print Date 11/07/2023

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING**Product information**

Trade name : Solstice® 513A

Number : 000000022892

Recommended use of the chemical and restrictions on use : Refrigerant

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

For further information, please contact: : 800-522-8001
+1-973-455-6300
(Monday-Friday, 9:00am-5:00pm)
In China: 021-28942149

**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
In China: 4001-204937 or +86 532-83889090**

2. HAZARDS IDENTIFICATION

Emergency Overview	: Contains gas under pressure; may explode if heated. Harmful to aquatic life.
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Classification of the substance or mixture

Classification of the substance or mixture : Gases under pressure, Liquefied gas
Short-term (acute) aquatic hazard, Category 3

GHS Label elements, including precautionary statements

Symbol(s)

:



Signal word

: Warning

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- Hazard statements : Contains gas under pressure; may explode if heated.
Harmful to aquatic life.
- Precautionary statements : **Prevention:**
Avoid release to the environment.
- Storage:**
Protect from sunlight. Store in a well-ventilated place.
- Disposal:**
Dispose of contents/ container to an approved waste disposal plant.
- Other hazards which do not result in classification : May cause cardiac arrhythmia.
May cause frostbite.
May cause eye and skin irritation.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Mixture

Chemical name	CAS-No.	Concentration
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1	56.00 %
2,3,3,3-Tetrafluoroprop-1-ene		
1,1,1,2-Tetrafluoroethane	811-97-2	44.00 %
1,1,1,2-Tetrafluoroethane		

4. FIRST AID MEASURES

- Inhalation : Move to fresh air.
If breathing is irregular or stopped, administer artificial respiration.
Use oxygen as required, provided a qualified operator is present.
Call a physician.
Do not give drugs from adrenaline-ephedrine group.
- Skin contact : After contact with skin, wash immediately with plenty of water.
If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with

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- a clean, soft cloth or similar covering.
If symptoms persist, call a physician.
- 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.
If symptoms persist, 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.
Call a physician immediately.
- Notes to physician : Because of the possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, should be used with special caution and only in situations of emergency life support. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.
Treat frost-bitten areas as needed.

5. FIREFIGHTING MEASURES

- Suitable extinguishing media : The product is not flammable.
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
- Specific hazards during firefighting : Contents under pressure.
This product is not flammable at ambient temperatures and atmospheric pressure.
However, this material can ignite when mixed with air under pressure and exposed to strong ignition sources.
Container may rupture on heating.
Cool closed containers exposed to fire with water spray.
Do not allow run-off from fire fighting to enter drains or water courses.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
In case of fire hazardous decomposition products may be produced such as:
Hydrogen halides
Hydrogen fluoride
Carbon monoxide
Carbon dioxide (CO₂)
Carbonyl halides

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- 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 : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

6. ACCIDENTAL RELEASE MEASURES

- 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. Remove all sources of ignition. Avoid skin contact with leaking liquid (danger of frostbite). Ventilate the area. After release, disperses into the air. 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.
- Methods and materials for containment and cleaning up : Ventilate the area.

7. HANDLING AND STORAGE**Handling**

- Precautions for safe handling : Handle with care. Avoid inhalation of vapour or mist. Do not get in eyes, on skin, or on clothing. Wear personal protective equipment. 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.

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Protect cylinders from physical damage.
Do not puncture or drop cylinders, expose them to open flame or excessive heat.
Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.
Do not remove screw cap until immediately ready for use.
Always replace cap after use.

Advice on protection against fire and explosion : The product is not flammable.
Can form a combustible mixture with air at pressures above atmospheric pressure.

Storage

Conditions for safe storage, including any incompatibilities : 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.
Storage rooms must be properly ventilated.
Ensure adequate ventilation, especially in confined areas.
Protect cylinders from physical damage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION**Components with workplace control parameters**

Components	CAS-No.	Value	Control parameters	Update	Basis
2,3,3,3-Tetrafluoropro p-1-ene 2,3,3,3-Tetrafluoropro p-1-ene	754-12-1	TWA : Time weighted average	(500 ppm)	03 15 2010	Honeywell:Limit established by Honeywell International Inc.
		STEL : Short term exposure limit	(1,500 ppm)	03 15 2010	Honeywell:Limit established by Honeywell International Inc.

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		TWA : Time weighted average	(500 ppm)	2009	WEEL:US. OARS. WEELs Workplace Environmental Exposure Level Guide, as amended
1,1,1,2-Tetrafluoroethane 1,1,1,2-Tetrafluoroethane	811-97-2	TWA : Time weighted average	(1,000 ppm)		Honeywell:Limit established by Honeywell International Inc.
		TWA : Time weighted average	4,240 mg/m3 (1,000 ppm)	2007	WEEL:US. OARS. WEELs Workplace Environmental Exposure Level Guide, as amended

Appropriate engineering controls

General room ventilation is adequate for storage and handling.

Perform filling operations only at stations with exhaust ventilation facilities.

Individual protection measures, such as personal protective equipment

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment.
Wear a positive-pressure supplied-air respirator.
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.
For rescue and maintenance work in storage tanks use self-contained breathing apparatus.

Hand protection : Leather gloves
In case of contact through splashing:
Protective gloves
Neoprene gloves
Polyvinyl alcohol or nitrile- butyl-rubber gloves

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Eye protection	: Wear as appropriate: Safety glasses with side-shields If splashes are likely to occur, wear: Goggles or face shield, giving complete protection to eyes
Skin and body protection	: Avoid skin contact with leaking liquid (danger of frostbite). Wear cold insulating gloves/ face shield/ eye protection.
Hygiene measures	: Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation, especially in confined areas. Avoid contact with skin, eyes and clothing. Remove and wash contaminated clothing before re-use. Keep working clothes separately.
Protective measures	: Do not breathe vapour. Avoid contact with skin, eyes and clothing. Ensure that eyewash stations and safety showers are close to the workstation location.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state	: Liquefied gas
Colour	: clear colourless
Odour	: slight ether-like
Odour Threshold	: Note: No data available
pH	: Note: Not applicable
Melting point/range	: Note: No data available
Boiling point/boiling range	: -29.2 °C
Flash point	: Note: Not applicable
Flammability	: The product is not flammable.
Lower explosion limit	: Note: None

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Upper explosion limit	: Note: None
Vapour pressure	: 0.637 MPa at 21.1 °C(70.0 °F)
Vapour density	: 3.83 Note: (Air = 1.0)
Density	: 1.15 g/cm ³ at 21.1 °C
Water solubility	: Note: No data available
Partition coefficient: n-octanol/water	: Note: No data available
Ignition temperature	: Note: No data available
Auto-ignition temperature	: > 750 °C
Decomposition temperature	: > 250 °C Note: To avoid thermal decomposition, do not overheat.
Viscosity, dynamic	: Note: No data available
Viscosity, kinematic	: Note: No data available

10. STABILITY AND REACTIVITY

Chemical stability	: Stable under normal conditions.
Possibility of hazardous reactions	: Hazardous polymerisation does not occur.
Conditions to avoid	: Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C. Decomposes under high temperature. Some risk may be expected of corrosive and toxic decomposition products. Can form a combustible mixture with air at pressures above atmospheric pressure. Do not mix with oxygen or air above atmospheric pressure.

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Incompatible materials to avoid	: Potassium Calcium Powdered metals Finely divided aluminium Finely divided magnesium Zinc
Hazardous decomposition products	: Halogenated compounds Hydrogen fluoride Carbonyl halides Carbon oxides

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure	: Inhalation, Eye contact, Skin contact
Acute oral toxicity	: Note: Not applicable study technically not feasible
Acute inhalation toxicity	: LC50: > 500000 ppm Exposure time: 4 h Species: Rat Test substance: 1,1,1,2-tetrafluoroethane (HFC-134a)
Acute dermal toxicity	: Note: No data available
Skin corrosion/irritation	: Note: Not applicable study technically not feasible
Serious eye damage/eye irritation	: Note: Not applicable study technically not feasible
Skin sensitisation 2,3,3,3-Tetrafluoroprop-1-ene	: Note: Not applicable, as this product is a gas. study technically not feasible
Respiratory sensitisation 1,1,1,2-Tetrafluoroethane	: Cardiac sensitization Species: dogs Note: No-observed-effect level 50 000 ppm Lowest observed effect level 75 000 ppm
Repeated dose toxicity 2,3,3,3-Tetrafluoroprop-1-	: Species: Rat 9/16

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ene

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
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)
No-observed-effect level: 1000 ppm
Method: OECD Test Guideline 412
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
highest exposure tested

1,1,1,2-Tetrafluoroethane : Species: Rat
NOEL: 40000 ppm

Germ cell mutagenicity
2,3,3,3-Tetrafluoroprop-1- : Test Method: Ames test

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ene Result: positive negative

1,1,1,2-Tetrafluoroethane : Note: In vitro tests did not show mutagenic effects

: Test Method: Chromosome aberration test in vitro
Cell type: Human lymphocytes
Result: negative
Method: OECD Test Guideline 473
Note: Dose 760,000 ppm

Germ cell mutagenicity
2,3,3,3-Tetrafluoroprop-1-ene

: 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

Carcinogenicity
2,3,3,3-Tetrafluoroprop-1-ene

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

Reproductive toxicity
2,3,3,3-Tetrafluoroprop-1-ene

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

: 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

Specific target organ toxicity : Note :No data available
- single exposure

Specific target organ toxicity : Note :No data available
- repeated exposure

Aspiration toxicity : No data available

Further information : Note: Rapid evaporation of the liquid may cause frostbite.
Vapours are heavier than air and can cause suffocation by
reducing oxygen available for breathing. Handle in
accordance with good industrial hygiene and safety practice.

12. ECOLOGICAL INFORMATION**Aquatic and ecotoxicity**

Toxicity to fish : LC50: 10 - 100 mg/l
Species: not specified
Test substance: 2,3,3,3-Tetrafluoroprop-1-ene
Method: The guidelines for the testing of chemicals 203: fish
acute toxicity test

Toxicity to daphnia and other aquatic invertebrates
2,3,3,3-Tetrafluoroprop-1-ene : EC50: > 83 mg/l
Exposure time: 48 h
Species: Daphnia magna (Water flea)
Method: OECD Test Guideline 202

Toxicity to algae
2,3,3,3-Tetrafluoroprop-1-ene : EC50: > 100 mg/l
Species: Scenedesmus capricornutum (fresh water algae)
Method: OECD Test Guideline 201

Persistence and degradability

Biodegradability
2,3,3,3-Tetrafluoroprop-1-ene : Result: Not readily biodegradable.
Method: OECD Test Guideline 301F

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Bioaccumulative potential

Bioaccumulation
2,3,3,3-Tetrafluoroprop-1-ene : Note: Due to the distribution coefficient n-octanol/water, accumulation in organisms is not expected.

Mobility in soil

Mobility : Note: No data available

Other adverse effects

Additional ecological information : Accumulation in aquatic organisms is unlikely.

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).

13. DISPOSAL CONSIDERATIONS

CN HW China. National Catalogue of Hazardous Wastes : Hazardous waste

Disposal methods : In accordance with local and national regulations.

14. TRANSPORT INFORMATION**CNDG**

UN/ID No. : UN 3163

Description of the goods : LIQUEFIED GAS, N.O.S.

(R-1234yf, 1,1,1,2-TETRAFLUOROETHANE)

Class : 2.2

Labels : 2.2

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IATA

UN/ID No. : UN 3163
Description of the goods : Liquefied gas, n.o.s.
(R-1234yf, 1,1,1,2-Tetrafluoroethane)
Class : 2.2
Labels : 2.2
Packing instruction (cargo aircraft) : 200
Packing instruction (passenger aircraft) : 200

IMDG

UN/ID No. : UN 3163
Description of the goods : LIQUEFIED GAS, N.O.S.
(R-1234yf, 1,1,1,2-TETRAFLUOROETHANE)
Class : 2.2
Labels : 2.2
EmS Number 1 : F-C
EmS Number 2 : S-V
Marine pollutant : no

15. REGULATORY INFORMATION**National regulatory information**

: Refer to the following regulations: Dangerous Chemicals Management Ordinance, the State Council Order No. 591; GB16483-2008 MSDS content and order of items; GB-T 17519-2013 Material Safety Data Sheet written rules; GB12268-2012 Name List of dangerous goods; GB6944-2012 and the name of dangerous goods classification number; GB13690-2009 chemical formula for risk classification and General; GBZ 2.1-2019 workplace hazards Part 1 occupational exposure limit chemical hazards; GB30000.2~29-2013 classification of chemicals, warning labels and warning statements of safety norms

Other international regulations

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Notification status

US. Toxic Substances
Control Act : On TSCA Inventory

Australia. Inventory of
Industrial Chemicals (AIIC),
as amended : 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) : Not in compliance with the inventory

China. Inventory of Existing
Chemical Substances
(IECSC) : On the inventory, or in compliance with the inventory, or has
been registered as new substance

New Zealand. Inventory of
Chemicals (NZIoC), as
published by ERMA New
Zealand : Not in compliance with the inventory

Taiwan Chemical Substance
Inventory (TCSI) : On the inventory, or in compliance with the inventory

16. OTHER INFORMATION

	HMIS III	NFPA
Health hazard	: 1	2
Flammability	: 1	1
Physical Hazard	: 0	
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