

**Solstice® ZE Refrigerant (R-1234ze(E))**

000000016095

Version 1.0

Revision Date 20.03.2023

**SECTION 1: Identification of the substance/mixture and of the company/undertaking**

**1.1. Product identifier**

Product name : Solstice® ZE Refrigerant (R-1234ze(E))  
SDS-number : 000000016095  
Type of product : Substance  
Remarks : SDS according to Art. 31 of Regulation (EC) 1907/2006.  
Chemical name : trans-1,3,3,3-Tetrafluoroprop-1-ene  
CAS-No. : 29118-24-9  
REACH Registration Number : 01-0000019758-54

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

Use of the Substance/Mixture : Refrigerant  
Uses advised against : none

**1.3. Details of the supplier of the safety data sheet**

Company : Honeywell Advanced Limited      Honeywell International, Inc.  
Riverview House,Harvey's      115 Tabor Road  
Quay Apartments      Morris Plains, NJ 07950-2546  
V94 R3DE Limerick      USA  
Ireland  
Telephone : (353) 1 903 9302  
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

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**SECTION 2: Hazards identification**

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

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

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 : Warning

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

Precautionary statements : P410 + P403 Protect from sunlight. Store in a well-ventilated place.

Special labelling of certain products: : Contains fluorinated greenhouse gases.

**2.3. Other hazards**

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
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trans-1,3,3,3-Tetrafluoroprop-1-ene	29118-24-9 01-0000019758-54 471-480-0	Press. Gas ; H280	100 %	
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**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. Keep warm and in a quiet place.  
Show this safety data sheet to the doctor in attendance. Take off all contaminated clothing immediately.

*Inhalation:*

If inhaled, remove to fresh air. Get medical attention if irritation develops and persists.

*Skin contact:*

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 if irritation develops or persists.

*Eye contact:*

Immediately flush eye(s) with plenty of water. Call a physician immediately.

*Ingestion:*

Ingestion is unlikely because of the physical properties and is not expected to be hazardous. As this product is a gas, refer to the inhalation section.

**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**

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No data available

See Section 11 for more detailed information on health effects and symptoms.

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**SECTION 5: Firefighting measures**

**5.1. Extinguishing media**

*Suitable extinguishing media:*

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

Water mist

Dry powder

Foam

Carbon dioxide (CO<sub>2</sub>)

**5.2. Special hazards arising from the substance or mixture**

Contents under pressure.

Heating will cause pressure rise with risk of bursting

Cool closed containers exposed to fire with water spray.

Product is not combustible under normal conditions.

However, this material can ignite when mixed with air under pressure and exposed to strong ignition sources.

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.

Some risk may be expected of corrosive and toxic decomposition products.

Fire may cause evolution of:

Hydrogen fluoride

Carbon oxides

Carbonyl halides

Halogenated compounds

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**5.3. Advice for firefighters**

Wear full protective clothing and self-contained breathing apparatus.  
Exposure to decomposition products may be a hazard to health.  
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. In the event of fire, cool tanks with water spray.

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**SECTION 6: Accidental release measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

Provide adequate ventilation. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Avoid skin contact with leaking liquid (danger of frostbite). Use personal protective equipment. Keep people away from and upwind of spill/leak.

**6.2. Environmental precautions**

Prevent further leakage or spillage if safe to do so. The product evaporates readily. Prevent spreading over a wide area (e.g. by containment or oil barriers).

**6.3. Methods and materials for containment and cleaning up**

Do not direct water spray at the point of leakage.  
Allow to evaporate.

**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:*

Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use. Exhaust ventilation at the object is necessary.

*Advice on protection against fire and explosion:*

Do not spray on a naked flame or any incandescent material. Keep away from direct sunlight. Fire or intense heat may cause violent rupture of packages. Vapours may form explosive mixtures with air. The product is not easily combustible.

*Hygiene measures:*

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Avoid breathing vapours, mist or gas. Keep working clothes separately.

**7.2. Conditions for safe storage, including any incompatibilities**

*Further information on storage conditions:*

Keep containers tightly closed in a cool, well-ventilated place. Keep only in the original container at temperature not exceeding 50°C Keep away from direct sunlight.

*Advice on common storage:*

Do not store together with: Oxidizing agents

**7.3. Specific end use(s)**

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
trans-1,3,3,3-Tetrafluoroprop-1-ene	HONEYWELL TWA	800 ppm		We are not aware of any national exposure limit.

TWA - Time weighted average

**DNEL/ PNEC-Values**

Component	End-use/impact	Exposure duration	Value	Exposure routes	Remarks
trans-1,3,3,3-Tetrafluoroprop-1-ene	Workers / Long-term systemic effects		3902 mg/m <sup>3</sup>	Inhalation	
trans-1,3,3,3-Tetrafluoroprop-1-ene	Consumers / Long-term systemic effects		830 mg/m <sup>3</sup>	Inhalation	

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Component	Environmental compartment / Value	Remarks
trans-1,3,3,3-Tetrafluoroprop-1-ene	Fresh water: 0,1 mg/l	Assessment factor: 1000

**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.

The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Avoid inhalation of vapour or mist.

**Engineering measures**

Local exhaust

**Personal protective equipment**

*Respiratory protection:*

In case of insufficient ventilation wear suitable respiratory equipment.

Self-contained breathing apparatus (EN 133)

*Hand protection:*

Protective gloves against cold  
(EN 511)

Gloves must be inspected prior to use.

Replace when worn.

*Eye protection:*

Goggles

*Skin and body protection:*

Wear suitable protective equipment.

Protective footwear

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**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**

Physical state	:	gaseous
Colour	:	colourless
Odour	:	slight ether-like
Boiling point/boiling range	:	-19 °C
Flammability	:	does not ignite Method: Flammability (gases)
Upper explosion limit	:	No LEL and UEL was assigned at standard testing conditions, 20°C. Exhibits flame limits at temperatures in excess of 28° C.
Lower explosion limit	:	No LEL and UEL was assigned at standard testing conditions, 20°C. Exhibits flame limits at temperatures in excess of 28° C.
Flash point	:	Not applicable
Decomposition temperature	:	Hazardous decomposition products formed under fire conditions. To avoid thermal decomposition, do not overheat.
pH	:	neutral
Auto-ignition temperature	:	368 °C
Viscosity, kinematic	:	No data available
Water solubility	:	0,373 g/l
Partition coefficient: n-	:	log Pow 1,6



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octanol/water

Vapour pressure : 4.271 hPa  
at 20 °C

Vapour pressure : 11.152 hPa  
at 54,4 °C

Density : 1,17 g/cm<sup>3</sup>  
at 21,1 °C

Relative vapour density : 4  
(Air = 1.0)

**9.2 Other Information**

Oxidizing properties : The substance or mixture is not classified as oxidizing.

Evaporation rate : No data available

Viscosity, dynamic : No data available

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**SECTION 10: Stability and reactivity**

**10.1. Reactivity**

Stable under normal conditions.

**10.2. Chemical stability**

Hazardous decomposition products formed under fire conditions.  
To avoid thermal decomposition, do not overheat.

**10.3. Possibility of hazardous reactions**

Hazardous polymerisation does not occur.

**10.4. Conditions to avoid**

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Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C.  
Can form a combustible mixture with air at pressures above atmospheric pressure.

**10.5. Incompatible materials**

Reactions with alkali metals.

**10.6. Hazardous decomposition products**

Halogenated compounds  
Carbon oxides  
Hydrogen fluoride  
Carbonyl halides

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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:*

No data available  
study technically not feasible

*Acute inhalation toxicity:*

LC0  
Species: Rat  
Value: > 207000 ppm  
Exposure time: 4 h  
Method: OECD Test Guideline 403

*Skin irritation:*

Species: Rabbit  
Result: No skin irritation  
Method: OECD Test Guideline 404

*Eye irritation:*

No data available  
study technically not feasible

*Respiratory or skin sensitisation:*

Species: human

# SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

**Honeywell**

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Result: Does not cause skin sensitisation.

### *Repeated dose toxicity:*

Species: Rat

Application Route: Inhalation

Exposure time: 90 d

NOEL: 5000

Method: OECD Test Guideline 413

Note: Subchronic toxicity

### *Carcinogenicity:*

Note: No data available

### *Germ cell mutagenicity:*

Test Method: Chromosome aberration test in vitro

Cell type: Human lymphocytes

Result: negative

Method: OECD Test Guideline 473

Test Method: Ames test

Result: negative

Test Method: Mutagenicity (in vivo mammalian bone-marrow cytogenetic test, chromosomal analysis)

Species: Mouse

Cell type: Micronucleus

Application Route: Inhalation

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: NOEL: > 20.000 ppm

General Toxicity F1: NOEL: > 20.000 ppm

Method: OECD Test Guideline 414

Species: Rat

Route of Application: Inhalation

General Toxicity Maternal: NOEC: 15.000 ppm

Developmental Toxicity: NOAEC: 15.000 ppm

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*Aspiration hazard:*  
No data available

**11.2. Information on other hazards**

Endocrine disrupting properties  
No data available

*Other information:*  
Cardiac Sensitization (dog): No effects

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**SECTION 12: Ecological information**

**12.1. Toxicity**

*Toxicity to fish:*  
LC0  
static test  
Species: Cyprinus carpio (Carp)  
Value: > 117 mg/l  
Exposure time: 96 h  
Method: OECD Test Guideline 203

*Toxicity to aquatic plants:*  
NOEC  
Growth rate  
Species: Algae  
Value: > 170 mg/l  
Exposure time: 72 h  
Method: OECD Test Guideline 201

NOEC  
Biomass  
Species: Algae  
Value: > 170 mg/l  
Exposure time: 72 h  
Method: OECD Test Guideline 201

*Toxicity to aquatic invertebrates:*  
EC50  
static test  
Species: Daphnia magna (Water flea)

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Value: > 160 mg/l  
Exposure time: 48 h  
Method: OECD Test Guideline 202

**12.2. Persistence and degradability**

*Biodegradability:*  
aerobic  
Result: Not readily biodegradable.

**12.3. Bioaccumulative potential**

No bioaccumulation is to be expected (log Pow <= 4).

**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. Endocrine disrupting properties**

No data available

**12.7. Other adverse effects**

No data available

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**SECTION 13: Disposal considerations**

**13.1. Waste treatment methods**

*Product:*  
Dispose according to legal requirements. Contact manufacturer.

*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

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For personal protection see section 8.

**SECTION 14: Transport information**

**14.1 UN number**

ADR/RID:3163

IMDG:3163

IATA:3163

**14.2 UN proper shipping name**

ADR/RID:LIQUEFIED GAS, N.O.S.(TRANS-1,3,3,3-TETRAFLUOROPROP-1-ENE)

IMDG:LIQUEFIED GAS, N.O.S.(TRANS-1,3,3,3-TETRAFLUOROPROP-1-ENE)

IATA:Liquefied gas, n.o.s.(trans-1,3,3,3-Tetrafluoroprop-1-ene)

**14.3 Transport hazard class(es)**

ADR/RID: 2.2

IMDG: 2.2

IATA: 2.2

**14.4 Packaging group**

**14.5 Environmental hazards**

ADR/RID:no

Marine pollutant: no

**14.6 Special precautions for user**

No data available

**14.7 Maritime transport in bulk according to IMO instruments**

No data available

**SECTION 15: Regulatory information**

**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

Basis	Value	Remarks
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 $\geq 0.1\%$ (w/w).
Regulation (EC) No. 1907/2006, Annex XIV		Not listed

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Regulation (EC) No. 1907/2006, Annex XVII		Not listed
Regulation (EU) No 517/2014 Annex II		Listed

**Poison Control Center**

Country	Phone Number
Austria	+4314064343
Belgium	070 245245
Bulgaria	(+)35929154233
Croatia	(+3851)23-48-342
Cyprus	+357 2240 5611
Czech Republic	+420224919293; +420224915402
Denmark	82121212
Estonia	16662; (+372)6269390
Finland	9471977
France	+33(0)145425959
Greece	+30 210 779 3777
Hungary	(+36-80)201-199
Iceland	5432222
Ireland	+353(1)8092166
Italy	0382 24444
Germany	Berlin : 030/19240
	Bonn : 0228/19240
	Erfurt : 0361/730730
	Freiburg : 0761/19240
	Göttingen : 0551/19240
	Homburg : 06841/19240
Mainz : 06131/19240	

Country	Phone Number
Liechtenstein	+41 442515151
Lithuania	+370532362052
Luxembourg	070245245; (+352)80002-5500
Malta	+356 2395 2000
Netherlands	030-2748888
Norway	22591300
Poland	+48 42 25 38 400
Portugal	800250250
Romania	+40 21 318 3606
Slovakia (NTIC)	+421 2 54 774 166
Slovenia	+386 1 400 6051
Spain	+34915620420
Sweden	112 (begär Giftinformation); +46104566786
Switzerland	145
United Kingdom	(+44) 844 892 0111

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	Munich : 089/19240
Latvia	+37167042473

**Other inventory information**

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

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. In accordance to the article 14(4) of the REACH regulation (EC) No. 1907/2006, exposure estimation and risk characterization is not required.



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**SECTION 16: Other information**

**Text of H-statements referred to under heading 3**

trans-1,3,3,3- Tetrafluoroprop-1-ene : 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  
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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