

Honeywell Solstice® N40 Refrigerant (R-448A)

000000017419

Version 4.6

Revision Date 06.11.2025

Supersedes 3

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1. Product identifier**

Product name : Honeywell Solstice® N40 Refrigerant (R-448A)

SDS-number : 000000017419

Type of product : Mixture

Remarks : SDS according to Art. 31 of Regulation (EC) 1907/2006.
In accordance to the Article 14 (4) of the REACH Regulation (EC) No 1907/2006, exposure estimation and risk characterisation is not required.

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 : SOLSTICE ADVANCED MATERIALS IRELAND LIMITED
1st Floor, Liffey Trust Centre,
117-126 Sheriff Street Upper
D01 YC43 Dublin
Ireland

Solstice Advanced Materials
US, Inc.
115 Tabor Road
Morris Plains, NJ 07950-2546
USA

Telephone : +353 1 447 9350

For further information,
please contact: : SafetyDataSheet@solstice.com

1.4. Emergency telephone number

Emergency telephone number : +1-703-527-3887 (ChemTrec-Transport)
+1 303-739-1378 (Medical)
: Poison Control Center:
United Kingdom: (+44) 844 892 0111

SECTION 2: Hazards identification

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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

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Rapid evaporation of the liquid may cause frostbite. This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher. The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients**3.1. Substances**

Not applicable

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3.2. Mixtures

Chemical name	CAS-No. Index-No. EC-No.	Classification 1272/2008	Concentration	Remarks
Difluoromethane	75-10-5 200-839-4	Flam. Gas 1B; H221 Press. Gas ; H280	26 %	
Pentafluoroethane	354-33-6 206-557-8	Press. Gas ; H280	26 %	
Norflurane	811-97-2 212-377-0	Press. Gas ; H280	21 %	
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1 468-710-7	Press. Gas Liquefied gas; H280 Flam. Gas 1B; H221	20 %	
trans-1,3,3,3-Tetrafluoroprop-1-ene	29118-24-9 471-480-0	Press. Gas ; H280	7 %	

Remaining components of this product are non-hazardous and/or are present at concentrations below reportable limits.

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:

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First aider needs to protect himself. Move out of dangerous area. Take off all contaminated clothing immediately.

Inhalation:

Remove to fresh air. Artificial respiration and/or oxygen may be necessary. Call a physician immediately.

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. Consult a physician. Take off contaminated clothing and shoes immediately. Wash contaminated clothing before re-use.

Eye contact:

Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

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

Do not give adrenaline or similar drugs.

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:*

The product is not flammable.

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Extinguishing media which shall not be used for safety reasons:

High volume water jet

5.2. Special hazards arising from the substance or mixture

No data available

5.3. Advice for firefighters

Wear full protective clothing and self-contained breathing apparatus.

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. In the event of fire, cool tanks with water spray.

SECTION 6: Accidental release measures**6.1. Personal precautions, protective equipment and emergency procedures**Immediately contact emergency personnel. Wear personal protective equipment. Unprotected persons must be kept away. Ensure adequate ventilation. In case of insufficient ventilation wear suitable respiratory equipment. Ensure that the oxygen content is $\geq 19.5\%$.**6.2. Environmental precautions**

Prevent further leakage or spillage if safe to do so. The product evaporates readily.

6.3. Methods and materials for containment and cleaning up

Ventilate the area.

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:*

Open drum carefully as content may be under pressure. The product should only be used in areas from which all naked lights and other sources of ignition have been excluded. Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material. Do not use in areas without adequate ventilation. Contaminated equipment (brushes, rags) must be cleaned immediately with water.

Advice on protection against fire and explosion:

The product is not flammable. Can form a combustible mixture with air at pressures above atmospheric pressure.

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.

7.2. Conditions for safe storage, including any incompatibilities*Further information on storage conditions:*

Store in original container. Keep away from direct sunlight. Keep containers tightly closed in a cool, well-ventilated place.

7.3. Specific end use(s)

no additional data available

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SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits:

Components	Basis / Value type	Value / Form of exposure	Exceeding Factor	Remarks
Difluoromethane	HONEYWELL TWA	2.200 mg/m3 1.000 ppm		We are not aware of any national exposure limit.
Pentafluoroethane	HONEYWELL TWA	1.000 ppm		We are not aware of any national exposure limit.
Norflurane	HONEYWELL TWA	1.000 ppm		
Norflurane	EH40 WEL TWA	4.240 mg/m3 1.000 ppm		
2,3,3,3-Tetrafluoroprop-1-ene	WEEL TWA	500 ppm		
2,3,3,3-Tetrafluoroprop-1-ene	HONEYWELL TWA	500 ppm		
trans-1,3,3,3-Tetrafluoroprop-1-ene	HONEYWELL TWA	800 ppm		We are not aware of any national exposure limit.

HONEYWELL - Limit established by Solstice Advanced Materials
TWA - Time weighted average

DNEL/ PNEC-Values

Component	End-use/impact	Exposure duration	Value	Exposure routes	Remarks
Difluoromethane	Workers / Long-term systemic effects		7035 mg/m3	Inhalation	
Difluoromethane	Consumers / Long-term systemic effects		750 mg/m3	Inhalation	

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Pentafluoroethane	Workers / Long-term systemic effects		16444 mg/m3	Inhalation	
Pentafluoroethane	Consumers / Long-term systemic effects		1753 mg/m3	Inhalation	
Norflurane	Workers / Long-term systemic effects		13936 mg/m3	Inhalation	
Norflurane	Consumers / Long-term systemic effects		2476 mg/m3	Inhalation	
2,3,3,3-Tetrafluoroprop-1-ene	Workers / Long-term systemic effects		950 mg/m3	Inhalation	
2,3,3,3-Tetrafluoroprop-1-ene	Consumers / Long-term systemic effects		113,1 mg/m3	Inhalation	
2,3,3,3-Tetrafluoroprop-1-ene	Workers / Acute systemic effects		186400 mg/m3	Inhalation	
2,3,3,3-Tetrafluoroprop-1-ene	Consumers / Acute systemic effects		186400 mg/m3	Inhalation	
trans-1,3,3,3-Tetrafluoroprop-1-ene	Workers / Long-term systemic effects		3902 mg/m3	Inhalation	
trans-1,3,3,3-Tetrafluoroprop-1-ene	Consumers / Long-term systemic effects		830 mg/m3	Inhalation	

Component	Environmental compartment /	Remarks
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	Value	
Difluoromethane	Fresh water: 0,142 mg/l	Assessment factor: 1000
Difluoromethane	Fresh water sediment: 0,534 mg/kg dw	
Pentafluoroethane	Fresh water: 0,1 mg/l	Assessment factor: 1000
Pentafluoroethane	Fresh water sediment: 0,6 mg/kg dw	
Norflurane	Fresh water: 0,1 mg/l	Assessment factor: 1000
Norflurane	Marine water: 0,01 mg/l	Assessment factor: 10000
Norflurane	Fresh water sediment: 0,75 mg/kg	Assessment factor: 100
Norflurane	Sewage treatment plant: 73 mg/l	Assessment factor: 10
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: 1,51 mg/kg	
2,3,3,3-Tetrafluoroprop-1-ene	Marine sediment: 0,151 mg/kg	
2,3,3,3-Tetrafluoroprop-1-ene	Soil: 1,49 mg/kg	
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.

Personal protective equipment

Respiratory protection:

In case of insufficient ventilation wear suitable respiratory equipment.

Self-contained breathing apparatus (EN 133)

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Hand protection:

Protective gloves against cold
(EN 511)
Gloves must be inspected prior to use.
Replace when worn.

Eye protection:

Safety glasses with side-shields conforming to EN166
Face-shield

Skin and body protection:

Protective footwear

Environmental exposure controls

Handle in accordance with local environmental regulations and good industrial practices.

SECTION 9: Physical and chemical properties**9.1. Information on basic physical and chemical properties**

- | | | |
|----------------------------------|---|----------------------|
| (a) Physical state | : | gaseous |
| (b) Colour | : | colourless |
| (c) Odour | : | slight
ether-like |
| (d) Melting point/freezing point | : | No data available |
| (e) Boiling point/boiling range | : | No data available |
| (h) Flash point | : | Not applicable |
| (i) Auto-ignition temperature | : | 628 °C |
| (j) Decomposition temperature | : | 250 °C |
| (k) pH | : | neutral |

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(l) Viscosity, kinematic : No data available

(m) Solubility(ies) : Water solubility:
No data available

(n) Partition coefficient: n-
octanol/water : No data available

(o) Vapour pressure : 1.398 kPa
at 21,1 °C

(p) Density and / or relative
density : No data available

(q) Relative vapour density : No data available

(r) Particle characteristics : No data available

9.2 Other Information

Polymer characteristics : No data available

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

Evaporation rate : No data available

Viscosity, dynamic : No data available

SECTION 10: Stability and reactivity**10.1. Reactivity**

Stable under normal conditions.
Hazardous polymerisation does not occur.

10.2. Chemical stability

No data available

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10.3. Possibility of hazardous reactions

No data available

10.4. Conditions to avoid

Heating will cause pressure rise with risk of bursting
Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C.
Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.

10.5. Incompatible materials

oxidising substances
Possible incompatibility with alkali sensitive materials.
Powdered metals

10.6. Hazardous decomposition products

Halogenated compounds
Hydrogen fluoride
Carbonyl halides
Carbon oxides

SECTION 11: Toxicological information**11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008****(a) Acute toxicity**

Acute oral toxicity:
Not applicable

Acute dermal toxicity:
No data available

Acute inhalation toxicity:
LC50
Species: Rat
Value: > 520000 ppm
Exposure time: 4 h
Test substance: Difluoromethane (HFC-32)

LC50

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Species: Rat
Value: > 769000 ppm
Exposure time: 4 h
Test substance: Ethane, pentafluoro- (HFC-125)

LC50
Species: Rat
Value: > 500000 ppm
Exposure time: 4 h
Test substance: 1,1,1,2-tetrafluoroethane (HFC-134a)

LC50
Species: Rat
Value: > 400000 ppm
Exposure time: 4 h
Test substance: 2,3,3,3-Tetrafluoroprop-1-ene

Acute toxicity (other routes of administration):
No data available

(b) Skin corrosion/irritation:
No data available

(c) Serious eye damage/eye irritation:
No data available

(d) Respiratory or skin sensitisation:
No data available

(h) STOT-single exposure:
No data available

(i) STOT - repeated exposure:
No data available

(j) Aspiration hazard:
No data available

11.2. Information on other hazards

Endocrine disrupting properties
No data available

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Other information:

No data available

SECTION 12: Ecological information**12.1. Toxicity***Toxicity to fish:*

LC50

Species: Cyprinus carpio (Carp)

Value: > 197 mg/l

Exposure time: 96 h

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

Toxicity to aquatic plants:

EC50

Species: Scenedesmus capricornutum (fresh water algae)

Value: > 100 mg/l

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

Toxicity to aquatic invertebrates:

EC50

Species: Daphnia magna (Water flea)

Value: > 83 mg/l

Exposure time: 48 h

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

12.2. Persistence and degradability*Biodegradability:*

Result: Not readily biodegradable.

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

Biodegradability:

Biodegradation: 5 %

Result: Not readily biodegradable.

Test substance: Ethane, pentafluoro- (HFC-125)

12.3. Bioaccumulative potential

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No data available

12.4. Mobility in soil

No data available

12.5. Results of PBT and vPvB assessment

No data available

12.6. Endocrine disrupting properties

No data available

12.7. Other adverse effects

No data available

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**14.1 UN number or ID number**

ADR/RID:3163

IMDG:3163

IATA:3163

14.2 UN proper shipping name

ADR/RID:LIQUEFIED GAS, N.O.S.(PENTAFLUOROETHANE, DIFLUOROMETHANE, 1,1,1,2-TETRAFLUOROETHANE)

IMDG:LIQUEFIED GAS, N.O.S.(PENTAFLUOROETHANE,DIFLUOROMETHANE,1,1,1,2-TETRAFLUOROETHANE)

IATA:Liquefied gas, n.o.s.(Pentafluoroethane, Difluoromethane, 1,1,1,2-Tetrafluoroethane)

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14.3 Transport hazard class(es)

ADR/RID:2.2

IMDG: 2.2

IATA: 2.2

14.4 Packaging group

No data available

14.5 Environmental hazards

ADR/RID:no

Marine pollutant: no

14.6 Special precautions for user

IMDG Code segregation group according chapter 3.1.4.4 : NONE,

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 ≥ 0.1 % (w/w).

Global warming potential :

1.387

Other inventory information

USA. List of Active Substances on the Toxic Substances Control Act (TSCA) Chemical Substances Inventory, as amended

All substances listed as active on the TSCA inventory

Australian Inventory of Industrial Chemicals

All components are listed on the inventory, regulatory obligations/restrictions apply

Canada. Domestic Substances List (DSL), as amended

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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

Taiwan Chemical Substance Inventory (TCSI)

On the inventory, or in compliance with the inventory

15.2 Chemical safety assessment

A Chemical Safety Assessment has not been carried out.

SECTION 16: Other information**Text of H-statements referred to under heading 3**

Difluoromethane	:	H221	Flammable gas.
		H280	Contains gas under pressure; may explode if heated.
Pentafluoroethane	:	H280	Contains gas under pressure; may explode if heated.
Norflurane	:	H280	Contains gas under pressure; may explode if heated.
2,3,3,3-Tetrafluoroprop-1-ene	:	H280	Contains gas under pressure; may explode if heated.
		H221	Flammable gas.
trans-1,3,3,3-Tetrafluoroprop-1-ene	:	H280	Contains gas under pressure; may explode if heated.

Further information

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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.

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