SAFETY DATA SHEET

Refrigerant R-1234ze(E)

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identifier

Trade name:	Refrigerant R-1234ze(E)
Other names / Synonyms:	Solstice ZE Refrigerant (R-1234ze(E)
Other means of identification:	EC No.: 471-480-0 CAS No.: 29118-24-9

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

Relevant identified uses of the substance or mixture:	Refrigerant, Aerosol Propellant Restricted to professional and industrial use.
Uses advised against :	None

1.3. Details of the supplier of the safety data sheet

Company and address:	**National Refrigerants Limited** 4 Watling Close Sketchley Meadows Business Park LE10 3EZ Hinckley England +44 (0)1455 630 790 www.nationalref.com
Contact person:	sds@nationalref.com
Revision:	19/03/2026
SDS Version:	1.0

1.4. Emergency telephone number

Healthcare professionals: Dial 0344 892 0111 to reach The National Poisons Information Service (NPIS) (24 hour service)
General public:
England - Dial 111 to reach NHS 111 (24 hour service)
Scotland - Dial 111 to reach NHS 24 (24 hour service)
Wales - Dial 111 or 0845 4647 to reach NHS Direct (24 hour service)
See section 4 “First aid measures”.
Emergency Telephone: Carechem24 +44 (0)1865 407333

SECTION 2: HAZARDS IDENTIFICATION

Classified according to Regulation (EC) No. 1272/2008 (CLP) as retained and amended in UK law.

2.1. Classification of the substance or mixture

Press. Gas (Liq.) ; H280, Contains gas under pressure; may explode if heated.

2.2. Label elements

Hazard pictogram(s):

Signal word:	Warning
Hazard statement(s):	Contains gas under pressure; may explode if heated. (H280)
Precautionary statement(s):	
General:	Not applicable.
Prevention:	Not applicable.
Response:	Not applicable.
Storage:	Protect from sunlight. Store in a well-ventilated place. (P410+P403)
Disposal:	Not applicable.
Hazardous substances:	Contains no substances that need to be listed on the label.

Additional labelling:

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.

Additional warnings:	In the event of leaks, high concentrations of gases can quickly form. They can be toxic, asphyxiating, or explosive. This mixture/product does not contain any substances known to fulfil the criteria for PBT and vPvB classification. This product does not contain any substances considered to be endocrine disruptors in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100 or Commission Regulation (EU) 2023/707.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Product/substance	Identifiers	% w/w	Classification	Note
trans-1,3,3,3-tetrafluoroprop-1-ene	CAS No.: 29118-24-9 EC No.: 471-480-0 UK-REACH: Index No.:	100%	Press. Gas (Liq.) , H280	

3.2. Mixtures

Not applicable. This product is a substance.

See full text of H-phrases in section 16. Occupational exposure limits are listed in section 8, if these are available.

Other information

-

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General information: In the case of accident: Contact a doctor or casualty department – take the label or this safety data sheet. Contact a doctor if in doubt about the injured person's condition or if the symptoms persist. Never give an unconscious person water or other drink.

Inhalation: Upon breathing difficulties or irritation of the respiratory tract: Bring the person into fresh air and stay with him/her.

Skin contact: Exposure is not likely due to the physical state of the product (gas).

Eye contact: If in eyes: Flush eyes with water or saline water (20-30 °C) for at least 5 minutes. Remove contact lenses. Seek medical assistance and continue flushing during transport.

Ingestion: Exposure is not likely due to the physical state of the product (gas).

Burns: Rinse with water until pain stops then continue to rinse for 30 minutes.

4.2. Most important symptoms and effects, both acute and delayed

None known.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

Information to medics

Bring this safety data sheet or the label from this product.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media: Alcohol-resistant foam, carbon dioxide, powder, water mist.
Unsuitable extinguishing media: Waterjets should not be used, since they can spread the fire.

5.2. Special hazards arising from the substance or mixture

Contains gas under pressure; may explode if heated.
Given that it does not present a risk gas supplies shall be disrupted immediately. Removal of pressurized containers or attempting to cool with water shall be entrusted the fire brigade.
If the product is exposed to high temperatures, e.g. in the event of fire, dangerous decomposition compounds are produced. These are:
Halogenated compounds
Carbon oxides (CO / CO2)

5.3. Advice for firefighters

Wear self-contained breathing apparatus and protective clothing to prevent contact. Upon direct exposure contact The National Poisons Information Service (dial 111, 24 h service) in order to obtain further advice.
Hazchem Code: 2TE

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Accidental releases always pose a serious risk of fire or explosion.
Storages not yet ignited must be cooled by water mist. Remove flammable materials if conditions allow it. Ensure sufficient ventilation.
Disconnect the gas supply provided it does not present a risk. Avoid breathing fumes. Make sure to have a self-contained breathing apparatus available and ready-to-use in the event of an emergency.
Ensure adequate ventilation, especially in confined areas.

6.2. Environmental precautions

In the event of leakage to the surroundings, contact local environmental authorities.

6.3. Methods and material for containment and cleaning up

Disconnect the gas supply. Allow liquefied gas to evaporate and dilute into safe concentration levels in the surrounding atmosphere. If necessary control the dilution of the gas with a mist of water. Ventilate rooms in order to remove the gas.

6.4. Reference to other sections

See section 13 “Disposal considerations” on handling of waste.
See section 8 "Exposure controls/personal protection" for protective measures.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Smoking, drinking and consumption of food is not allowed in the work area.

See section 8 "Exposure controls/personal protection" for information on personal protection.

7.2. Conditions for safe storage, including any incompatibilities

Vapours may propagate along the floor. Prevent the forming of flammable or explosive vapour concentrations by applying sufficient ventilation. Do not use this product in close proximity to sources of ignition.
Protect electrical equipment in accordance with current standards. To divert static electricity during transmission, containers must be grounded and connected by wire with the receiving containers. Do not use spark-forming tools.
Pressurized gas packs (spray cans, aerosol cans) must be stored behind a wire mesh, which allows gases to escape and holds back packs flying around.

Recommended storage material:	Keep only in original packaging.
Storage conditions:	Dry, cool and well ventilated Protect from direct sunlight < 50°C
Incompatible materials:	Finely divided metals, alkali metals (sodium, potassium), alkaline earth metals (barium, magnesium), alloys containing more than 2% magnesium.

7.3. Specific end use(s)

This product should only be used for applications quoted in section 1.2.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

trans-1,3,3,3-tetrafluoroprop-1-ene
Long term exposure limit (8 hours) (ppm): 800

The Control of Substances Hazardous to Health Regulations 2002. SI 2002/2677 The Stationery Office 2002.
EH40/2005 Workplace exposure limits (Fourth Edition 2020).

DNEL

trans-1,3,3,3-tetrafluoroprop-1-ene

Duration:	Route of exposure:	DNEL:
Long term – Systemic effects - General population	Inhalation	830 mg/m³
Long term – Systemic effects - Workers	Inhalation	3,902 mg/m³

PNEC

trans-1,3,3,3-tetrafluoroprop-1-ene

Route of exposure:	Duration of Exposure:	PNEC:
Freshwater		0.117 mg/L
Freshwater sediment		1.25 mg/kg
Intermittent release (freshwater)		1.17 mg/L
Marine water		0.012 mg/L

Marine water sediment		0.125 mg/kg
Soil		0.755 mg/kg

8.2. Exposure controls

Compliance with the given occupational exposure limits values should be controlled on a regular basis.

General recommendations: Smoking, drinking and consumption of food is not allowed in the work area.

Exposure scenarios: There are no exposure scenarios implemented for this product.

Exposure limits: Professional users are subjected to the legally set maximum concentrations for occupational exposure. See occupational hygiene limit values above.

Appropriate technical measures: Adequate ventilation must be ensured for all gases. Where natural ventilation is not possible (cellar rooms), artificial ventilation must be installed. It is advantageous to store it in a lattice shed outdoors, as ventilation is no longer necessary in this case.

Hygiene measures: In between use of the product and at the end of the working day all exposed areas of the body must be washed thoroughly. Pay special attention to hands, forearms and face.

Measures to avoid environmental exposure: No special when used as intended.

Individual protection measures, such as personal protective equipment

Generally: Use only UKCA marked protective equipment.

Respiratory Equipment:

Type	Class	Colour	Standards	
Respiratory protection is not needed in the event of adequate ventilation.				
Self contained breathing apparatus			EN137, EN139	

Skin protection:

Recommended	Type/Category	Standards	
Dedicated work clothing should be worn. Wear a protective suit in the event of prolonged periods	-	-	

Recommended	Type/Category	Standards	
of work with the product.			
Safety shoes	II	EN ISO 20345 / EN ISO 20347	

Hand protection:

Material	Glove thickness (mm)	Breakthrough time (min.)	Standards	
Vinyl/PVC	-	-	EN388, EN511	

Eye protection:

Type	Standards	
Safety glasses with side shields.	EN166	
In the likelihood of direct or incidental exposure, use face protection.	EN166	

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical state: Gas
Liquefied Gas

Colour: Colourless

Odour / Odour threshold: Slight, ether-like

pH: Neutral

Density (g/cm^3): 1.17 (21.1 °C)

Relative density: Does not apply to gases.

Kinematic viscosity: No data available

Particle characteristics: No data available

Phase changes

Melting point/Freezing point (°C): Not applicable

Softening point/range (°C): Does not apply to gases.

Boiling point (°C): -19

Vapour pressure: 4.271 hPa (20 °C)

Relative vapour density: 4 (Air = 1.0)

Decomposition temperature (°C): No data available.

Data on fire and explosion hazards

Flash point (°C):	Not applicable
Flammability (°C):	No data available.
Auto-ignition temperature (°C):	368
Lower and upper explosion limit (% v/v):	No LEL and UEL was assigned at standard testing conditions, 20 degrees C. Exhibits flame limits at temperatures in excess at 28 degrees C

Solubility

Solubility in water:	0.373 g/l
n-octanol/water coefficient (LogKow):	1.6
Solubility in fat (g/L):	No data available.

9.2. Other information

Oxidizing properties:	No data available.
Other physical and chemical parameters:	No data available.

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity
No data available.

10.2. Chemical stability
The product is stable under the conditions, noted in section 7 “Handling and storage”.

10.3. Possibility of hazardous reactions
None known.

10.4. Conditions to avoid
Protect from sunlight and do not expose to temperatures exceeding 50 degrees C.
Extremes of temperature
Heating of cylinders, as this will cause pressure to rise with risk of bursting.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources.

10.5. Incompatible materials
Finely divided metals, alkali metals (sodium, potassium), alkaline earth metals (barium, magnesium), alloys containing more than 2% magnesium.

10.6. Hazardous decomposition products
Under normal conditions of storage and use, hazardous decomposition products should not be produced.
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 as retained and amended in UK law

Acute toxicity

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test method:	OECD 403
Species:	Rat
Route of exposure:	Inhalation
Test:	LC50 (4 hours)
Result:	> 207000 ppm

Based on available data, the classification criteria are not met.

Skin corrosion/irritation

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test method:	OECD 404
Species:	Rabbit
Result:	No adverse effect observed (Not irritating)

Based on available data, the classification criteria are not met.

Serious eye damage/irritation

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Other information:	No data available

Based on available data, the classification criteria are not met.

Respiratory sensitisation

Based on available data, the classification criteria are not met.

Skin sensitisation

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Species:	Human
Result:	No adverse effect observed (not sensitising)

Based on available data, the classification criteria are not met.

Germ cell mutagenicity

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test method:	OECD 473
Species:	Human, Cell type: Human Lymphocytes
Conclusion:	Negative

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test method:	
OECD Test Guideline 474 (in vivo mammalian bone-marrow cytogenetic test, chromosomal analysis)	
Species:	Mouse, Cell type: Micronucleus
Conclusion:	Negative

Based on available data, the classification criteria are not met.

Carcinogenicity

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Other information:	No data available

Based on available data, the classification criteria are not met.

Reproductive toxicity

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene

Test method:	OECD 416
Species:	Rat
Duration:	Two-generation reproductive toxicity
Test:	General Toxicity - Parent: NOEL:
Result:	>20,000 ppm

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test:	General Toxicity F1: NOEL:
Result:	>20,000 ppm

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test method:	OECD 414
Species:	Rat
Test:	General Toxicity - Maternal: NOEC:
Result:	15,000 ppm

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test:	Developmental Toxicity: NOAEC:
Result:	15,000 ppm

Based on available data, the classification criteria are not met.

STOT-single exposure

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Other information:	No data available

Based on available data, the classification criteria are not met.

STOT-repeated exposure

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test method:	OECD 413
Species:	Rat
Route of exposure:	Inhalation
Duration:	90 days
Test:	NOEL:
Result:	5000

Based on available data, the classification criteria are not met.

Aspiration hazard

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Other information:	No data available

Based on available data, the classification criteria are not met.

Symptoms related to the physical, chemical and toxicological characteristics

None known.

11.2. Information on other hazards

Endocrine disrupting properties

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Other information:	No data available

This mixture/product does not contain any substances known to have hormone-disrupting properties in relation to health.

Other information

None known.

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test method:	OECD 203
Species:	Fish, Cyprinus carpio
Compartment:	Freshwater
Duration:	96 hours
Test:	EC0
Result:	>117 mg/L

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test method:	OECD 201
Species:	Algae
Compartment:	Freshwater
Duration:	72 hours
Test:	NOEC
Result:	>170 mg/L

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test method:	OECD 201
Species:	Algae
Compartment:	Freshwater
Duration:	72 hours
Test:	NOEC: Biomas
Result:	>170 mg/L

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
Test method:	OECD 202
Species:	Daphnia, Daphnia magna
Compartment:	Freshwater
Duration:	48 hours
Test:	EC50
Result:	>160 mg/L

Based on available data, the classification criteria are not met.

12.2. Persistence and degradability

Based on available data, the classification criteria are not met.

12.3. Bioaccumulative potential

Product/substance	trans-1,3,3,3-tetrafluoroprop-1-ene
LogKow:	<= 4
Conclusion:	Bioaccumulation is not expected

12.4. Mobility in soil

No data available.

12.5. Results of PBT and vPvB assessment

This mixture/product does not contain any substances known to fulfil the criteria for PBT and vPvB classification.

12.6. Endocrine disrupting properties

Product/substance trans-1,3,3,3-tetrafluoroprop-1-ene
Other information: No data available

This mixture/product does not contain any substances considered to have endocrine-disrupting properties in relation to the environment.

12.7. Other adverse effects

-

Contains fluorinated greenhouse gases covered by the Kyoto Protocol.
GWP: 7 (CO_2=1)

SECTION 13: DISPOSAL CONSIDERATIONS

Waste treatment methods

Product is covered by the regulations on hazardous waste. (*)
Regulation (EU) No 1357/2014 of 18 December 2014 on waste as retained and amended in UK law.

EWC code

14 06 01* Chlorofluorocarbons, HCFC, HFC

Specific labelling

Contaminated packing

EWC code: 16 05 04*
Gases in pressure containers (including halons) containing dangerous substances

SECTION 14: TRANSPORT INFORMATION

	14.1 UN / ID	14.2 UN proper shipping name	14.3 Hazard class(es)	14.4 PG*	14.5 Env**	Other information:
ADR/ADN/RID	UN3163	LIQUEFIED GAS, N.O.S. (trans-1,3,3,3-tetrafluoroprop-1-ene)	Transport hazard class: 2 Label: 2.2 Classification code: 2A 	-	No	Limited quantities: 120 ml Tunnel restriction code: (C/E) See below for additional information.
IMDG	UN3163	LIQUEFIED GAS, N.O.S. (trans-1,3,3,3-tetrafluoroprop-1-ene)	Transport hazard class: 2 Label: 2.2 Classification code: 2A 	-	No	Limited quantities: 120 ml EmS: F-C S-V See below for additional information.
IATA	UN3163	LIQUEFIED GAS, N.O.S. (trans-1,3,3,3-tetrafluoroprop-1-ene)	Transport hazard class: 2 Label: 2.2 Classification code: 2A 	-	No	See below for additional information.

* Packing group
** Environmental hazards

Additional information

This product is within scope of the regulations of transport of dangerous goods.
ADR/ADN/RID / See Table A, section 3.2.1 for any information on special provisions, requirements, or warnings in connection with transport. See section 5.4.3, for instructions in writing regarding mitigation of damages in relation to incidents or accidents during transport.
IMDG / See section 3.2.1, for any information on special provisions, requirements, or warnings in connection with transport.
IATA / See Table 4.2 for any information on special provisions, requirements, or warnings in connection with transport.
Hazchem Code: 2TE

14.6. Special precautions for user

Not applicable.

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

Restrictions for application:	Restricted to professional users.
Demands for specific education:	No specific requirements.
Control of Major Accident Hazards (COMAH) - Categories / dangerous substances:	Not applicable.
Additional information:	Not applicable.
Sources:	Regulation (EU) No 1357/2014 of 18 December 2014 on waste as retained and amended in UK law. The Fluorinated Greenhouse Gases (Amendment) Regulations 2023 Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures (CLP) as retained and amended in UK law. Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) as retained and amended in UK law.

15.2. Chemical safety assessment

No

SECTION 16: OTHER INFORMATION

Full text of H-phrases as mentioned in section 3

H280, Contains gas under pressure; may explode if heated.

Abbreviations and acronyms

ADN = European Provisions concerning the International Carriage of Dangerous Goods by Inland Waterway
ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road
ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
CAS = Chemical Abstracts Service
CE = Conformité Européenne (European conformity)
CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
CSA = Chemical Safety Assessment
CSR = Chemical Safety Report
DMEL = Derived Minimal Effect Level
DNEL = Derived No Effect Level
EC = Effective concentration
ED = Effective dose
EINECS = European Inventory of Existing Commercial chemical Substances
EL = Effective Loading
ErC = Concentration associated with x% growth rate response
ES = Exposure Scenario
EUH statement = CLP-specific Hazard statement
EuPCS = European Product Categorisation System
EWC = European Waste Catalogue
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
GWP = Global warming potential
HP = Hazardous Property code
IARC = International Agency for Research on Cancer (IARC)
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IC = X maximum inhibitory concentration
IMDG = International Maritime Dangerous Goods
LC = Lethal concentration
LCLo = Value is the lowest concentration of a material in air reported to have caused the death of animals or humans
LD = Lethal dose
LOAEC = Lowest Observed Adverse Effect Concentration
LOAEL = Lowest Observed Adverse Effect Level
LOEC = Lowest Observed Effect Concentration
LogKow = logarithm of the n-octanol/water coefficient
LL = Lethal Loading
M = For multiplication factor
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
NOAEC = No Observed Adverse Effect Concentration
NOAEL = No Observed Adverse Effect Level
NOEC = No Observed Effect Concentration
NOELR = No Observable Effect Loading Rate
OECD = Organisation for Economic Co-operation and Development
PBT = Persistent, Bioaccumulative and Toxic

PNEC = Predicted No Effect Concentration
RID = The Regulations concerning the International Carriage of Dangerous Goods by Rail
RRN = REACH Registration Number
SCL = A specific concentration limit
SVHC = Substances of Very High Concern
STOT-RE = Specific Target Organ Toxicity - Repeated Exposure
STOT-SE = Specific Target Organ Toxicity - Single Exposure
TWA = Time weighted average
UN = United Nations
UVBC = Unknown or variable composition, complex reaction products or of biological materials
VOC = Volatile Organic Compound
vPvB = Very Persistent and Very Bioaccumulative

Additional information

The classification of the mixture in regard to physical hazards has been based on experimental data.

The safety data sheet is validated by

National Refrigerants Ltd

Other

A change (in proportion to the last essential change (first cipher in SDS version, see section 1)) is marked with a triangle.
The information in this safety data sheet applies only to this specific product (mentioned in section 1) and is not necessarily correct for use with other chemicals/products.
It is recommended to hand over this safety data sheet to the actual user of the product.
Information in this safety data sheet cannot be used as a product specification.
Country-language: GB-en