R1234yf

Revision: 1
Revision date: July 2020

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

1.1 Product identifier

Product name	2,3,3,3-Tetrafluoropropene
REACH registration number	01-0000019665-61
CAS No.	754-12-1
EC No.	468-710-7

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

Product use	Refrigerant Industrial uses: Uses of substances as such or in preparations at industrial sites Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
Restricted use	Consumer uses: Private households (= general public = consumers)
Description	Gas

1.3 Details of the supplier of the safety data sheet

Company	Harp International Limited
Address	Gellihirion Industrial Estate Pontypridd Rhondda Cynon Taff CF37 5SX UK
Web	www.harpintl.com
Telephone	+44 (0) 1443 842 255
Fax	+44 (0) 1443 841 805
Email	harp@harpintl.com
Email of competent person	safety@harpintl.com

1.4 Emergency telephone number

Emergency telephone number	+44 (0) 1270 502 891 24 hours

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification – EC 1272/2008	Flam. Gas 1: H220; Compressed gas: H280

2.2 Label elements

Hazard pictograms	
Signal word	Danger
Hazard statement	H220 – Extremely flammable gas H280 – Contains gas under pressure; may explode if heated
Precautionary statement	P210 – Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. P377 – Leaking gas fire: Do not extinguish unless leak can be stopped safely P381 – Eliminate all ignition sources if safe to do so P410+P403 – Protect from sunlight. Store in a well-ventilated place.

2.3 Other hazards

Other hazards	Asphyxiant in high concentrations. Contact with liquid may cause cold burns/frostbite.

SECTION 3: Composition/information on ingredients

3.1 Substances

EC 1272/2008

Chemical name	CAS No.	EC No.	REACH registration number	Concentration (%w/w)	Classification
2,3,3,3-Tetrafluoropropene	754-12-1	468-710-7	01-0000019665-61	90-100%	Flam. Gas 1: H220 Compressed gas: H280

The purity of the substance in this section is used for classification only and does not represent the actual purity of the substance as supplied.

SECTION 4: First aid measures

4.1 Description of first aid measures

Inhalation	Move the exposed person to fresh air
Eye contact	Rinse immediately with plenty of water
Skin contact	Frostbite: treat as thermal burns
Ingestion	Ingestion is not considered a potential route of exposure

4.2 Most important symptoms and effects, both acute and delayed

Inhalation	Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Respiratory arrest.
Eye contact	Contact with liquefied gas can cause damage due to evaporative cooling
Skin contact	Contact with liquefied gas can cause damage due to evaporative cooling
Ingestion	Ingestion is not considered a potential route of exposure

4.3 Indication of any immediate medical attention and special treatment needed

Inhalation	If you feel unwell, seek medical advice
Eye contact	Seek medical attention if irritation or symptoms persist
Skin contact	Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
Ingestion	Ingestion is not considered a potential route of exposure

SECTION 5: Firefighting measures

5.1 Extinguishing media

	Use extinguishing media appropriate to the surrounding fire conditions

5.2 Special hazards arising from the substance or mixture

	Exposure to fire may cause containers to rupture/explode. If involved in a fire, toxic and/or corrosive fumes may be produced by thermal decomposition (gaseous hydrogen fluoride (HF), carbon oxides).

5.3 Advice for firefighters

	If possible, stop flow of product. In case of fire nearby, remove exposed containers. Do not extinguish a leaking gas flame unless absolutely necessary. Fight fire remotely due to explosion risk. Cool containers / tanks with water spray. Spontaneous/explosive re-ignition may occur. Wear self-contained breathing apparatus and protective clothing. EN 469:2005: Protective Clothing for fire-fighters.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

	Consider the risk of potentially explosive atmospheres. Evacuate personnel to a safe area. Ensure adequate ventilation of the working area. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Eliminate all sources of ignition. Vapours are heavier than air. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

6.2 Environmental precautions

	Prevent further leakage or spillage if safe to do so.

6.3 Methods and material for containment and clean up

	Recovery: Allow to evaporate. Keep area free from ignition sources until any spilled material has evaporated (ground free from frost).

6.4 Reference to other sections

	See section 8 Exposure controls / personal protection See section 13 Disposal considerations

SECTION 7: Handling and storage

7.1 Precautions for safe handling

	Only experienced and properly instructed persons should handle gases under pressure. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Take precautionary measures against static discharges. Ensure equipment is adequately earthed. Purge air from system before introducing gas. Assess the risk of potentially explosive atmosphere and the need for explosion-proof equipment. Protect containers from physical damage. Do not drag, roll, slide or drop. Never attempt to repair or modify container valves or safety relief devices. Close container valves after each use and when empty, even if still connected to equipment. Never use direct flame or electrical heating devices to raise the pressure of a container.

7.2 Conditions for safe storage, including any incompatibilities

	Segregate from oxidant gases and other oxidants in store. Keep container below 50°C. Keep container in a well-ventilated place. Keep away from sources of ignition – no smoking. Keep away from combustible material. All equipment in storage areas should be compatible with the risk of potentially explosive atmospheres. Containers should not be stored in conditions likely to encourage corrosion.
Suitable packaging	Stainless steel, steel.

7.3 Specific end use(s)

	See section 1.2 Relevant identified uses of the substance or mixture and uses advised against for further information.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters – exposure limit values

Exposure limit not assigned in EH40.

Population	Type	Exposure	Effects	Value
Workers	Derived no effect levels (DNEL)	Long term inhalation	Systemic	23000 mg/m^3

8.2 Exposure controls

Appropriate engineering controls	Consider work permit system e.g. for maintenance activities. Ensure adequate ventilation of the working area. Product to be handled in a closed system.
Individual protection measures	Wear protective clothing
Eye/face protection	Safety eyewear, goggles or face-shield to EN166 should be used to avoid exposure to liquid splashes.
Skin & body protection	Protective gloves against cold to EN511. Safety footwear to ISO 20345. Wear flame resistant/retardant clothing. Take precautionary measures against static discharges.
Respiratory protection	Wear suitable respiratory protection equipment when necessary
Thermal hazards	If there is a risk of contact with the liquid, all protective equipment should be suitable for extremely low temperatures.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance - Physical state	Gas
Appearance - Form	Liquefied gas
Colour	Colourless
Odour	Slight ethereal
Odour threshold	No data available
pH	No data available
Melting point	-152.2°C
Boiling point / range	-29.4°C
Flash point	Not applicable for gases and gas mixtures
Evaporation rate	Not applicable for gases and gas mixtures
Flammability (solid, gas)	6.2% (V) – 12.3% (V)
Vapour pressure	6.07 bar (21.1°C)
Vapour density	4 (air = 1)
Solubility(ies) **Water solubility**	198.2 mg/l (24°C)
Partition coefficient: n-octanol/water	2.15 log Pow
Auto-ignition temperature	405°C
Decomposition temperature	No data available
Viscosity **Viscosity, kinematic**	No data available
Critical temperature	No data available
Critical pressure	No data available

9.2 Other information

Molecular weight	114.04 g/mol

SECTION 10: Stability and reactivity

10.1 Reactivity

	Stable under normal conditions

10.2 Chemical stability

	Stable under normal conditions

10.3 Possibility of hazardous reactions

	Can form a potentially explosive atmosphere in air. May react violently with oxidants.

10.4 Conditions to avoid

	Keep away from heat and sources of ignition. Avoid contact with flames and red hot metallic surfaces.

10.5 Incompatible materials

	Air. Strong oxidizing agents. Moisture. Alkali metals. Alkaline earth metals.

10.6 Hazardous decomposition products

	Under normal conditions of storage and use, hazardous decomposition products should not be produced. If involved in a fire, the following toxic and/or corrosive fumes may be produced by thermal decomposition: Hydrogen fluoride, Carbonyl Fluoride, Carbon Monoxide.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity	Highly unlikely – but should this occur freeze burns will result
Skin corrosion/irritation	Ejection of liquefied gas: frostbite possible
Serious eye damage/irritation	Ejection of liquefied gas: frostbite possible
Respiratory or skin sensitisation	No data available
Germ cell mutagenicity	No data available
Carcinogenicity	No data available
Reproductive toxicity	No data available
STOT single exposure	No data available
STOT repeated exposure	No data available
Aspiration hazard	No data available
Repeated or prolonged exposure	No data available

SECTION 12: Ecological information

12.1 Toxicity

	No data available

12.2 Persistence and degradability

	Not applicable to gases and gas mixtures

12.3 Bioaccumulative potential

	This product is expected to biodegrade and is not expected to persist for long periods in the aquatic environment

12.4 Mobility in soil

	Because of its high volatility, this product is unlikely to cause ground or water pollution

12.5 Results of PBT and vPvB assessment

	Not classified as PBT or vPvB

12.6 Other adverse effects

	Contains fluorinated greenhouse gases. When discharged in large quantities may contribute to the greenhouse effect. Global warming potential: 4

SECTION 13: Disposal considerations

13.1 Waste treatment methods

	Avoid discharge to atmosphere. Do not discharge into any place where its accumulation could be dangerous. Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with flash back arrestor. Toxic and corrosive gases formed during combustion should be scrubbed before discharged to atmosphere. Dispose of in accordance with all local and national regulations. Dispose of container via supplier only. EWC code: 14 06 01* Chlorofluorocarbons, HCFC, HFC

SECTION 14: Transport information

Hazard pictograms

	

14.1 UN number

	UN 3161

14.2 UN proper shipping name

	LIQUEFIED GAS, FLAMMABLE, N.O.S.

14.3 Transport hazard class(es)

ADR/RID	
Class	2
Labels	2.1
Classification code	2F
Hazard No. (ADR)	23
Tunnel category	(B/D)
Emergency action code	2YE
IMDG	
Class	2.1
EmS No.	F-D, S-U
IATA	
Class	2.1
Packing instruction	-
Cargo	Forbidden
Passenger	Forbidden

14.4 Packing group

	P200

14.5 Environmental hazards

Environmental hazards	Not applicable
Marine pollutant	Not classified as a marine pollutant

14.6 Special precautions for user

	Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure container valves are closed, not leaking and caps in place. Ensure containers are firmly secured. Ensure compliance with applicable regulations.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

	Not applicable

SECTION 15: Regulatory information

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

Regulations	REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

15.2 Chemical safety assessment

	A CSA has not been carried out

SECTION 16: Other information

Other information

Text of Hazard Statements in Section 3	H220: Extremely flammable gas H280: Contains gas under pressure; may explode if heated.
Reference materials	HSE publication EH40/2005 Workplace exposure limits (latest edition)
Changes from previous versions	-

Further information

	The information supplied in this safety data sheet is designed only as guidance for the safe use, storage and handling of the product. This information is correct to the best of our knowledge and belief at the date of publication however no guarantee is made of its accuracy. This 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 other process. Material users should review the information and recommendations in the specific context of their intended manner of handling, use, processing and storage, including an assessment of the appropriateness of the material in the user's end product, if applicable.