

Prepared in the format conforming to the Commission Regulation (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) (OJ of EU no L132 of 29 May 2015)

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

1.1 Product identifier

R 1234yf
TETRAFLUOROPROPENE (HFO-1234yf)

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

Identified uses: Refrigerant

Uses advised against: Not indentified.

1.3 Details of the supplier of the safety data sheet:

Supplier:

ENTALPIA EUROPE Sp. z o.o.

P.O.W 64a Str.

98-200 Sieradz, Poland

Tel.: + 48 668 628 739

E- mail address: l.baraniecki@entalpiaeuropa.eu

1.4 Emergency telephone number

+ 48 668 628 739 (Poland); from 9:00 to 16:00

Date of compilation: 2018.02.05

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Gas under pressure (liquefied gas) ((Press. Gas).

Contains gas under pressure; may explode if heated (H280).

Flammable gas, Hazard Category 1 (Flam. Gas 1).

Extremely flammable gas (H220).

Harmful effects on human health:

Gas heavier than air gathering in the lower parts of the rooms can lead to unconsciousness and suffocation due to local lack of oxygen. Inhalation of high concentration of gas may cause nausea, headache and dizziness, irregular work of the heart. Prolonged exposure to gas vapors may adversely affect the central nervous system. As with all liquefied gases, contact with rapidly evaporating liquid can cause burns (frostbite) of skin and eyes. During thermal decomposition hydrogen fluoride can be formed, which has a corrosive effect, causing damage to the skin, mucous membranes of the eyes and airways.

Environmental effects:

Under normal conditions, there is no risk to the environment. Liquefied gas is characterized by high volatility. It does not pose a risk to the ozone layer.

Adverse effects associated with physico-chemical properties:

Extremely flammable gas. When heating a closed container, there is a danger of increasing the pressure and bursting of the packaging.

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2.2 Label elements

Pictograms:



Signal Word: Danger

Hazard Statements:

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

H220 - Extremely flammable gas.

Precautionary Statements:

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.

P403 - Store in a well-ventilated place.

Additional labeling requirements: **The packaging shall be marked with a label containing the text “Contains fluorinated greenhouse gases”;**

HFO-1234yf (R1234yf) - quantity of gas expressed in kilograms and in CO₂ equivalent.

GWP (Greenhouse Warming Potential) = 4

2.3 Other hazards

The substance meets neither PBT nor vPvB criteria.

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substance

<u>Name</u>	<u>Index No</u>	<u>CAS No</u>	<u>EC No</u>	<u>% mass fraction</u>
2,3,3,3-tetrafluoropropene	-	754-12-1	468-710-7	≥ 99

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

Inhalation: Remove casualty from exposure site, place in reclining or sitting position, keep at rest and protect against heat loss. If necessary, call a physician. If breathing disorder occur, apply artificial respiration. If symptoms persists, consult a physician.

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- Eye contact: Rinse immediately with plenty of lukewarm water, best running water for at least 15 min. Remove contact lenses. To avoid cornea damage, don't use jet stream. Cover with a sterile dressing. Get medical attention immediately.
- Skin contact: Wash the frozen part of body with cold water to normalize the temperature. Take off contaminated clothes, jewelry, watches, etc. If clothing permanently adheres to the skin, do not take off. Warm up the frozen body parts slowly. Cover with a sterile dressing. Do not use ointments and creams. Note: contaminated clothes moisten with water before taking them off. It must be washed before re-use.
- Ingestion: Unlikely route of exposure. Don't provoke vomiting. Rinse mouth with water, give a large amount of water to drink. If necessary consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

Gas heavier than air gathering in the lower parts of the rooms can lead to unconsciousness and suffocation due to local lack of oxygen. Inhalation of high concentration of gas may cause nausea, headache and dizziness, irregular work of the heart. Prolonged exposure to gas vapors may adversely affect the central nervous system. As with all liquefied gases, contact with rapidly evaporating liquid can cause burns (frostbite) of skin and eyes. During thermal decomposition hydrogen fluoride can be formed, which has a corrosive effect, causing damage to the skin, mucous membranes of the eyes and airways.

4.3 Indication of any immediate medical attention and special treatment needed

No special recommendations. Apply symptomatic treatment.

SECTION 5: FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media:

Water- scattered currents, extinguishing powders, alcohol-resistant foam.

Unsuitable extinguishing media:

Carbon dioxide.

5.2 Special hazards arising from the substance or mixture

During fire, due to the thermal decomposition carbonyl fluoride, hydrogen fluoride, carbon oxide may form.

5.3 Advice for firefighters

Extremely flammable gas. When heating a closed container, there is a danger of increasing the pressure and bursting of the packaging. Containers exposed to fire cool from a safe distance with a dispersed stream of water. If possible, remove them from endangered area. Wear gas-tight protective suit and breathing apparatus independent of ambient air.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Under industrial conditions wear protective clothing made of natural fabrics (cotton), or synthetic fiber, heat-insulating safety gloves and safety goggles. Do not drink, eat and smoke during handling. Provide proper local and general ventilation. Remove sources of ignition (extinguish open fire, announce a ban of smoking and using sparking tools). People not involved in the removal of the disaster remove from the affected area. Avoid direct contact with the substance.

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- 6.2 Environmental precautions
Protect from releasing to sewage system, surface and ground water, soil.
- 6.3 Methods and materials for containment and cleaning up
Protect sewers. Damaged packaging place in replacement packaging. Dilute the vapors with dispersed stream of water. Remove sources of ignition (extinguish open fire, announce a ban of smoking and using sparking tools). Wash contaminated surface with water.
- 6.4 Reference to other sections
Remove according to the recommendations listed in section 13.

SECTION 7: HANDLING AND STORAGE

- 7.1 Precautions for safe handling
Protect cylinders against mechanical damage. Do not exceed the temperature of 50 ° C in the storage place. Only properly trained and experienced persons should work with liquefied gases. To transfer the cylinders, even for short distances, use a trolley (manual, electric, etc.) intended for transporting cylinders. Before connecting the operation container, ensure that the return flow from the system to the container is impossible. Keep away from sources of high temperature and sources of ignition. Do not use sparking tools, avoid electrostatic discharges. Avoid contact with skin and eyes. Do not eat, drink or smoke while handling. Wash hands during breaks and after work. Take off contaminated clothing and wash it before reusing.
- 7.2 Conditions for safe storage, including any incompatibilities
Containers should be stored in a specially adapted separated area (preferably in the open space). Stored containers should be systematically checked for general condition and tightness. Containers stored in the open area protect against corrosive effect and extreme atmospheric conditions. Containers should be stored in a vertical position and properly secured against falling over. The containers valves should be screwed down firmly and where appropriate, valve outlets should be covered by a nut or blanking plate. Caps or valve covers should be used. Keep containers in a place not at risk of fire and away from sources of heat and ignition. Protect against light, air and moisture. Do not exceed the temperature of 50 ° C in the storage place. In the storage area place signs of ban of smoking and use of open fire. Packaging material: steel. Do not use plastic packaging.
- 7.3 Specific end use(s)
No information about the applications other than those mentioned in subsection 1.2.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

- 8.1 Controls parameters
No EU exposure limits.

<u>Substance name</u>	<u>CAS No</u>	<u>Standard</u>	<u>Value</u>	<u>Unit</u>
2,3,3,3-tetrafluoropropene	754-12-1	MAK*	950	mg/m ³

*MAK - Maximale Arbeitsplatz-Konzentration (maximum workplace concentration; German occupational exposure limit).

DNEL_{worker} (inhalation, chronic toxicity, systemic effect): 455 mg/m³

PNEC_{fresh water}: 0.1 mg/l

PNEC_{marine water}: 0.01 mg/l

PNEC_{water – occasional release}: 1 mg/l

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8.2 Exposure controls

8.2.1 *Appropriate engineering controls*

Provide local and general ventilation at workplace. Suction holes for local ventilation at the working surface or below. Do not use close to high temperature sources and sources of ignition. In case of insufficient ventilation use respiratory protection.

8.2.2 *Individual protective measures such as personal protective equipment*

Respiratory protection: In case of breakdown or insufficient ventilation, wear respiratory protection with vapours brown filter with AX symbol.

Skin and hands protection: Under industrial conditions wear protective clothing made of natural fabrics (cotton), or synthetic fiber and heat-insulating safety gloves.

Eyes protection: Under industrial conditions wear safety goggles protecting against drops of liquid.

Occupational hygiene: General industrial hygiene rules apply. Don't allow exceeding occupational exposure levels. After finishing work remove contaminated clothes. Wash hands and face before work breaks. Wash entire body after finishing work. Do not drink, eat and smoke during work.

8.2.3 *Environmental exposure controls*

Prevent from draining to a municipal sewage system and watercourses.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- a) Appearance
Colourless gas under pressure (liquefied gas).
- b) Odour
Ether odour.
- c) Odour threshold
No data available.
- d) pH
Not determinable.
- e) Melting/freezing point
No data available.
- f) Initial boiling point and boiling range
- 29 °C
- g) Flash point
Not applicable.
- h) Evaporation rate
No data available.
- i) Flammability (solid, gas)
Extremely flammable gas.
- j) Upper/lower flammability or explosive limits
Lower explosive limit: 6,2 % vol.
Upper explosive limit: 12,3 % vol.
- k) Vapour pressure
5,8 bar at 25 °C
- l) Vapour density
4 (air = 1)
- m) Relative density
about 1.05 (water = 1)
- n) Solubility(ies)
In water: 198,2 mg/l.
- o) Partition coefficient: n-octanol/water

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- log Po/w = 2,85
- p) Auto-ignition temperature
485 °C
- q) Decomposition temperature
No data available.
- r) Viscosity
No data available.
- s) Explosive properties
Does not pose an explosive hazard.
- t) Oxidising properties
Due to the molecular structure, oxidising properties are not expected.

9.2 Other information

Gas heavier than air. It can accumulate in closed spaces, especially at or below ground level.

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity

No reactivity if stored and used as intended.

10.2 Chemical stability

Stable in standard conditions of storage and use.

10.3 Possibility of hazardous reactions

Extremely flammable substance; with air can form explosive mixtures.

10.4 Conditions to avoid

Contact with an open fire or source of ignition may cause inflammation and decomposition with the emission of toxic gases including hydrogen fluoride (HF) and carbon fluoroxide (COF₂).

10.5 Incompatible materials

Alkali metals, alkaline earth metals, magnesium powder, zinc, strong oxidants that can initiate product decomposition.

10.6 Hazardous decomposition products

Hydrogen fluoride, carbon fluoroxide.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity:

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

LC₅₀ – inhalation rat 405000 ppm (4h)

Skin corrosion/irritation:

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

Serious eye damage/irritation:

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

Respiratory or skin sensitisation:

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

Germ cell mutagenicity:

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

Carcinogenicity:

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

Reproductive toxicity:

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

STOT-single exposure:

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

STOT-repeated exposure:

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

Aspiration hazard:

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

Health effects of local exposure:

Respiratory tract:

It does not pose a health hazard by inhalation. In the case of inhalation of large amounts, the product may cause loss of consciousness and cardiological disorders associated with oxygen deficiency in the air. In extreme cases, suffocation may occur.

Skin and eyes:

In case of contact with liquefied gas, burns (frostbite) may occur.

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

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

<u>Dose</u>	<u>Value</u>	<u>Unit</u>
LC ₅₀ - fish (<i>Cyprinus carpio</i>)	> 197	mg/l (96h)
CE ₅₀ - invertebrates (<i>Daphnia magna</i>)	> 100	mg/l (24h)
CE ₅₀ - algae	> 100	mg/l (72h)

12.2 Persistence and degradability

Not readily biodegradable (< 5 % (28 days, OECD 301 F)).

12.3 Bioaccumulative potential

Bioaccumulation is not expected.

Partition coefficient octanol/water (logK_{ow}): No data available.

Bioconcentration factor (BCF): No data available.

12.4 Mobility in soil

Due to the low boiling point, the substance evaporates quickly into the atmosphere.

12.5 Results of PBT and vPvB assessment

The substance meets neither PBT nor vPvB criteria.

12.6 Other adverse effects

The substance is included in the list of fluorinated greenhouse gases.

Regulation (EU) No 517/2014 on fluorinated greenhouse gases

Annex II: OTHER FLUORINATED GREENHOUSE GASES SUBJECT TO REPORTING IN ACCORDANCE WITH ARTICLE 19

GWP (Greenhouse Warming Potential) = 1430.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Avoid release into the atmosphere. Do not empty the cylinder in places where gas could accumulate and pose danger. Follow manufacturer's or supplier's instructions regarding recovery or reuse

Wastes code:

16 05 04* Gases in pressure containers (including halons) containing dangerous substances.

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Special precautions:

Dispose product and packaging in a safe way. Care should be taken when operating empty containers that have not been thoroughly cleaned. Do not cut, weld or grind used containers unless they have been thoroughly cleaned.

SECTION 14: TRANSPORT INFORMATION

ADR/RID, IMDG, IATA

14.1 UN number

3161

14.2 UN proper shipping name

ADR, RID

LIQUEFIED GAS, FLAMMABLE, N.O.S.(Tetrafluoropropene)

IMDG

LIQUEFIED GAS, FLAMMABLE, N.O.S.(Tetrafluoropropene)

IATA (cargo)

LIQUEFIED GAS, FLAMMABLE, N.O.S.(Tetrafluoropropene)

14.3 Transport hazard class(es)

2.1

14.4 Packing group

-

14.5 Environmental hazards

The product is not hazardous to the environment according to the UN Model Regulations.

14.6 Special precautions for user

Avoid transporting vehicles where the load space is not separated from the driver's cab. Ensure that the driver knows the hazards posed by the load and procedures in case of an accident or an emergency situation. Ensure secure fixing of portable tanks before transporting containers with the product.

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable.

SECTION 15: REGULATORY INFORMATION

- 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
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 (OJ EU L396 of December 30 2006 with later amendments);
REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (OJ EU L353 of December, 31 2008, with later amendments ATP 1-9);
REGULATION (EU) No 517/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006 (OJ EU L150 of May, 20 2014);

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COMMISSION IMPLEMENTING REGULATION (EU) 2015/2068 of 17 November 2015 establishing, pursuant to Regulation (EU) No 517/2014 of the European Parliament and of the Council, the format of labels for products and equipment containing fluorinated greenhouse gases (OJ EU L301 of November, 18 2015).

15.2 Chemical safety assessment

Supplier has not assessed the chemical safety of the substance.

According to Article 4 of Regulation (EU) No 517/2014:

1. Operators of equipment that contains fluorinated greenhouse gases in quantities of 5 tonnes of CO₂ equivalent or more and not contained in foams shall ensure that the equipment is checked for leaks.
2. Hermetically sealed equipment that contains fluorinated greenhouse gases in quantities of less than 10 tonnes of CO₂ equivalent, shall not be subject to leak checks under this Article, provided the equipment is labelled as hermetically sealed.

SECTION 16: OTHER INFORMATION

This Safety Data Sheet was developed in the **Ignacy Mościcki' Industrial Chemistry Research Institute in Warsaw**.

The information contained in this safety data sheet describes the product exclusively from the safety requirements perspective. The user is responsible for setting up the conditions for safe use of the product and bears a sole responsibility for the consequences of its incorrect use.

The employer should provide:

- training of employees in terms of health risk, knowledge of the content of the safety data sheet, application of personal protective equipment.

Abbreviations:

vPvB	very Persistent, very Bioaccumulative substance.
PBT	Persistent, Bioaccumulative and Toxic substance.
LC ₅₀	Lethal concentration, median concentration where 50 % of test subjects dies.
EC ₅₀	The effective concentration of substance that causes 50% of the maximum response.
DNEL	Derived No-Effect Level.
PNEC	Predicted No Effect Concentration.
OECD	Organization for Economic Co-operation and Development.
BCF	Bioconcentration factor.
ADR	Agreement on Dangerous Goods by Road.
RID	Regulations Concerning the International Transport of Dangerous Goods by Rail.
IMDG	International Maritime Dangerous Goods Code.
IATA	International Air Transport Association.
CAS number	number assigned to a chemical substance in <i>Chemical Abstracts Service</i> Registry.
EC number	seven-digit number, an identifier of substances commercially available within the European Union listed in EC Inventory (EINECS – <i>European Inventory of Existing Chemical Substances</i> , ELINCS - <i>European List of Notified Chemical Substances</i> or „ <i>No-longer polymers</i> “ list).
UN number	United Nations number - the four-digit identification number of the UN Dangerous Goods list, derived from the UN Model Regulations, to which the individual material, mixture or article is classified.

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