

GPS Safety Summary

Substance Name:

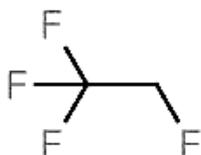
1,1,1,2-Tetrafluoroethane

1. General Statement

1,1,1,2-Tetrafluoroethane (Forane® 134a) is a gas which is mainly used in the refrigeration and air conditioning industry.

2. Chemical Identity

Names:	HFC-134a; Norflurane; 1,1,1,2-tetrafluoroethane
Brand name:	Forane® 134a
Chemical name (IUPAC):	1,1,1,2-tetrafluoroethane
CAS number:	811-97-2
EC number:	212-377-0
Molecular formula:	C ₂ H ₂ F ₄
Structure:	



3. Use and applications

1,1,1,2-Tetrafluoroethane is an HFC gas broadly used in refrigeration industry (domestic refrigeration, commercial refrigeration, food processing & cold storage, transport & industrial refrigeration) and air conditioning (automotive, building and large systems). It is also used as an aerosol propellant in various applications and as blowing agent in foam industry.

4. Physical / Chemical properties

1,1,1,2-Tetrafluoroethane is a non-flammable gas with the following physicochemical properties:

Property	Value
Physical state	Gas at 20°C and 1013 hPa
Form	Liquefied gas (under pressure)
Colour	Colourless
Odour	Slightly ether-like
Molecular weight	102.0 g/mol
Density	1206 kg/m ³ at 25°C (for liquid)

Vapour pressure	0.574 MPa at 20°C
Freezing / boiling points	-108°C / -26°C at 1013 hPa
Flash point	Not applicable
Flammability	Non-flammable gas
Self-ignition temperature	>743°C at 1013 hPa
Explosive / oxidizing properties	Not expected based on structure
Water solubility	1 g/L at 25°C
Octanol-water partition coefficient (Log K _{ow})	1.06 at 25°C

5. Health Effects

1,1,1,2-Tetrafluoroethane is rapidly absorbed through the lungs and is rapidly eliminated from the body by exhalation. Only minor amounts are metabolically transformed in the body.

Effect Assessment	Result
Acute Toxicity Oral / inhalation / dermal	Very low inhalation toxicity in animals. At extremely high vapour concentrations, it shows some anaesthetic-like effects and can act as an asphyxiant; may cause effects on heart function (cardiac arrhythmia). Dermal and oral: not relevant for a gas.
Irritation / corrosion Skin / eye / respiratory tract	The gas is not irritating to the skin, eyes or respiratory tract. Frostbite can result from contact with liquefied gas.
Sensitisation	Inhalation: no data. Dermal: not sensitizing in animals.
Toxicity after repeated exposure Oral / inhalation / dermal	Studies of prolonged inhalation in animals showed no specific chronic toxic effects. Dermal and oral: not relevant for a gas.
Genotoxicity / Mutagenicity	Not expected to cause genetic effects based on available test data, <i>in vitro</i> and in animals.
Carcinogenicity	No carcinogenic effects relevant to humans were noted in rats after oral and inhalation exposure for up to two years.
Reproductive / Developmental Toxicity	No effects on male or female fertility, conception, fetal development, and does not cause malformations in the foetus.

6. Environmental Effects

1,1,1,2-Tetrafluoroethane is of low toxicity to fish and aquatic invertebrates. Based on data on a related fluorocarbon, its toxicity to algae is also low.

As it is a gas, any emitted 1,1,1,2-Tetrafluoroethane will quickly partition to the atmosphere, where it takes decades to photolyse. It will not partition significantly to soil or sediment due to its estimated moderate adsorption coefficient (log K_{oc} = 1.5). It is not expected to bioaccumulate in the food chain based on its low lipophilicity (log K_{ow} = 1.06).

1,1,1,2-Tetrafluoroethane is a greenhouse gas, *i.e.*, it contributes to global warming. It is not ozone-depleting.

Effect Assessment	Result
Aquatic Toxicity	<i>Acute</i> : not toxic <i>Chronic</i> : no data

Fate and behaviour	Result
Degradation/Persistence	Non-degradable. Does not persist in water/soil/sediment.
Bioaccumulation potential	Not expected to bioaccumulate significantly.
PBT / vPvB conclusion	Not considered to be PBT* or vPvB**.

*: Persistent, Bioaccumulative and Toxic (PBT)

** : very Persistent and very Bioaccumulative (vPvB)

7. Exposure

7.1 Human health

In accordance with the REACH Regulation, no exposure scenario is required in the absence of classification for human health.

Consumers:

Consumers may inhale some minor amounts of 1,1,1,2-Tetrafluoroethane when used as an aerosol propellant. For the major use in refrigeration/air conditioning equipment, consumers are not directly exposed to 1,1,1,2-Tetrafluoroethane since they are not supposed to open the closed receptacles containing it.

In view of its major use in closed systems and low bioaccumulation potential, indirect exposure to 1,1,1,2-Tetrafluoroethane via the environment is negligible.

Workers:

Procedures, controls, collective and personal risk management measures are in place, which limit the occupational exposure during the manufacture and use of the substance. Workers who might accidentally come into contact with the substance should follow the safety measures recommended in the Safety Data Sheet.

Risks are controlled when activities are carried out under conditions recommended in the Safety Data Sheet (see Chap. 8).

— *Major use in refrigeration/air conditioning:*

1,1,1,2-Tetrafluoroethane is industrially manufactured and used (including formulation) in closed systems in a continuous or batch process, minimizing the occupational exposure potential. The final use consists in inclusion in closed receptacles in refrigeration/air conditioning equipment. Workers may be exposed during cleaning, maintenance, transfer, sampling and analysis.

Professionals installing, servicing and maintaining equipment containing 1,1,1,2-Tetrafluoroethane in closed systems may also be exposed to small amounts. They are specialised personnel meeting specific qualifications and trained to avoid exposure.

— *Other occupational uses:*

1,1,1,2-Tetrafluoroethane is also industrially and professionally used as an aerosol propellant. These uses may involve some well-controlled inhalation exposure.

7.2 Environment

In accordance with the REACH Regulation, no exposure scenario is required in the absence of classification for the environment.

In accordance with EU Regulation EC 842/2006 on certain fluorinated greenhouse gases, procedures, controls and risk management measures are in place, which strictly limit the environmental exposure and specifically the emissions to the atmosphere.

– *Major use in refrigeration/air conditioning:*

Industrial manufacture and use (including formulation) takes place in closed systems in a continuous or batch process, minimizing release to the atmosphere.

Professional work on equipment containing 1,1,1,2-Tetrafluoroethane may involve release to the atmosphere. Due to its physicochemical properties (see section 6), any emitted 1,1,1,2-Tetrafluoroethane will stay in the atmosphere.

– *Other uses:*

When used as an aerosol propellant, 1,1,1,2-Tetrafluoroethane is released to the atmosphere.

8. Risk Management recommendations

In accordance with the REACH Regulation, no risk assessment is required in the absence of classification for human health and the environment.

Human health measures	
Organizational	Collect the latest available Safety Data Sheet. Implement good basic standards of occupational hygiene. Ensure operatives are well informed of the hazards. Handle and store according to the indications of the Safety Data Sheet.
Engineering controls	Keep away from open flames/hot surfaces. No smoking. Eliminate all ignition sources. Store protected from sunlight, in a well-ventilated place. Provide appropriate local exhaust ventilation at points of emission. Ensure that eye- and handwash stations and safety showers are close to workstation locations.
Protection	Eye/Face protection: Safety glasses with side-shields
	Skin protection: Protective clothing (cotton)
	Hand protection: Leather gloves
	Respiratory protection: Respirator if ventilation is insufficient
Environment protective measures	
Do not release into the environment.	

9. Regulatory Information / Classification and Labelling

9.1 Regulatory Information

This substance has notably been addressed in the following European Regulations:

- EU Regulation EC 1907/2006 (REACH): the substance has been registered
- EU Regulation EC 842/2006 on certain fluorinated greenhouse gases: the substance is listed under the name HFC-134a.
- US EPA IRIS (Integrated Risk Information System).

9.2 Classification and labelling

Under GHS, substances are classified according to their physical, health, and environmental hazards. The hazards are communicated via specific labels and the SDS. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers and emergency responders) can better understand the hazards of the chemicals in use. Substances registered for REACH are classified according to CLP (EC) 1272/2008, implementation of the GHS in the European Union.

Classification	
Gases under pressure: Category Liquefied Gas.	
Signal word	
Attention	
Pictogram	
GHS04: Gas cylinder	
Hazard statement	
H280: Contains gas under pressure; may explode if heated.	
Additional classification according to Globally Harmonized System (GHS)	
None.	

10. Contact Information within Company

For further information on this substance or product safety summary in general, please contact:

- **ICCA portal where the GPS Safety Summary is posted:**
<http://www.icca-chem.org/en/Home/ICCA-initiatives/global-product-strategy/>

11. Date of Issues / Revision

- Date of issue: 2013/01/30
- Date of revision:

12. Disclaimer

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