

**Trade name:** R-1234yf**Current version :** 2.0.0, issued: 11.05.2022**Replaced version:** 1.0.0, issued: 15.04.2021**Region:** GB**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1 Product identifier****Trade name****R-1234yf**

Substance name	2,3,3,3-tetrafluoroprop-1-ene
REACH registration no.	01-0000019665-61

**Identification numbers**

CAS no.	754-12-1
EC no.	468-710-7

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

Industrial Use  
Professional use  
Refrigerant

**Uses advised against**

Consumer use

**1.3 Details of the supplier of the safety data sheet****Address**

TEGA - Technische Gase und Gasetechnik GmbH  
Werner-von-Siemens-Straße 18  
97076 Würzburg

Telephone no.	+49 931 2093-220
Fax no.	+49 931 2093-180
e-mail	kaeltmittel@tega.de

**Advice on Safety Data Sheet**

sdb\_info@umco.de

**1.4 Emergency telephone number**

For medical advice (in German and English):  
+49 (0)551 192 40 (Giftinformationszentrum Nord)

**SECTION 2: Hazards identification****2.1 Classification of the substance or mixture****Classification in accordance with Regulation (EC) No 1272/2008 (CLP)**

Flam. Gas 1B; H221  
Press. Gas liq.; H280

**Classification information**

This product is assessed and classified using the methods and criteria below referred to in Article 9 of Regulation (EC) n° 1272/2008:

Physical hazards: determined through assessment data based on the methods or standards referred to in part 2 of Annex I to CLP

Health hazards and environmental hazards: determined through toxicological and ecotoxicological assessment data based on the methods or standards referred to in Part 3 and 4 of Annex I to CLP.

**2.2 Label elements****Labelling according to Regulation (EC) No 1272/2008 (CLP Regulation)****Product identifier**

754-12-1 (2,3,3,3-tetrafluoroprop-1-ene)

**Hazard pictograms**

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GHS02



GHS04

**Signal word**

Danger

**Hazard statement(s)**

H221 Flammable gas.  
H280 Contains gas under pressure; may explode if heated.

**Precautionary statement(s)**

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 In case of leakage, eliminate all ignition sources.  
P410+P403 Protect from sunlight. Store in a well-ventilated place.

**Supplemental label elements**

Contains fluorinated greenhouse gases: HFC-1234yf.

**2.3 Other hazards**

Misuse or intentional inhalation can be fatal, as a result of effects on the heart, without alarming symptoms. Rapid evaporation of product may produce frostbite. May displace oxygen and cause rapid asphyxiation.

**PBT assessment**

The product is not considered to be a PBT.

**vPvB assessment**

The product is not considered to be a vPvB.

**SECTION 3: Composition/information on ingredients****3.1 Substances****Chemical characterization**

Substance name 2,3,3,3-tetrafluoroprop-1-ene  
Formula C<sub>3</sub>H<sub>2</sub>F<sub>4</sub>  
Molecular weight 114

**Identification numbers**

CAS no. 754-12-1  
EC no. 468-710-7

**Other information**

Note	Specific concentration limits	M-factor (acute)	M-factor (chronic)
-	Flam. Gas 1A; H220: C >= 6.201% Flam. Gas 1B; H221: C >= 12.3%	-	-

**3.2 Mixtures**

Not applicable. The product is not a mixture.

**SECTION 4: First aid measures****4.1 Description of first aid measures****General information**

In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Remove affected person from danger area, lay him down. Seek medical advice immediately.

**After inhalation**

Remove affected persons from dangerous area by observing suitable respiratory protection measures. Ensure supply of fresh air. Irregular breathing/no breathing: artificial respiration. Call a doctor immediately.

**After skin contact**

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In case of contact with skin wash off immediately with soap and water. Rinse with much water in case of frostbites. Remove clothes only after unfreezing. Cover wounds with sterile dressing. Call a doctor immediately.

**After eye contact**

Remove contact lenses. Rinse eye thoroughly under running water keeping eyelids wide open and protecting the unaffected eye (at least 10 to 15 minutes). Seek medical assistance.

**After ingestion**

Rinse the mouth thoroughly with water. Do not induce vomiting. Never give anything by mouth to an unconscious person. Call a doctor.

**4.2 Most important symptoms and effects, both acute and delayed****Symptoms**

The following symptoms may occur: cardiac arrhythmia; anesthetic effect; Light-headedness; Dizziness; confusion; Unconsciousness; muscle incoordination; respiratory arrest. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.

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

Treat symptomatically and supportively.

**SECTION 5: Firefighting measures****5.1 Extinguishing media****Suitable extinguishing media**

Alcohol resistant foam, CO<sub>2</sub>, powders, water spray

**Unsuitable extinguishing media**

High power water jet

**5.2 Special hazards arising from the substance or mixture**

In the event of fire, the following can be released: Carbon monoxide and carbon dioxide; Hydrogen fluoride (HF); fluorine compounds; Exposure to heat may cause bursting of the vessels. Vapours can form a highly flammable mixture with air.

**5.3 Advice for firefighters**

Use self-contained breathing apparatus. Wear full protective suit. Containers close to fire should be transferred to a safe place. Cool closed containers exposed to fire with water. Pressure increase, bursting and explosion hazard during heating. Fire residues and contaminated firefighting water must be disposed of in accordance with the local regulations.

**SECTION 6: Accidental release measures****6.1 Personal precautions, protective equipment and emergency procedures****For non-emergency personnel**

Refer to protective measures listed in sections 7 and 8. Provide good room ventilation even at ground level (vapours are heavier than air). Do not breathe gas. Keep away from ignition sources. Use personal protective clothing. Cordon and mark contaminated area. Remove persons to safety. Avoid skin contact with leaking liquid (danger of frostbite!).

**For emergency responders**

No data available. Personal protective equipment (PPE) - see Section 8.

**6.2 Environmental precautions**

Avoid release in the environment. Suppress gases/vapours/mists with water spray jet.

**6.3 Methods and material for containment and cleaning up**

Ensure adequate ventilation. Dispose of absorbed material in accordance with the regulations.

**6.4 Reference to other sections**

Information regarding safe handling, see section 7. Information regarding personal protective measures, see section 8. Information regarding waste disposal, see section 13.

**SECTION 7: Handling and storage**

**7.1 Precautions for safe handling****Advice on safe handling**

Only qualified and trained persons are authorised to handle. Provide good ventilation at the work area (local exhaust ventilation, if necessary). To be used only according to instructions for use. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose containers heat or sources of ignition. In case of accidental release: danger due to low temperature of the liquid product. The product should only be used in areas from which all naked lights and other sources of ignition have been excluded. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use. Comply with the health and safety at work laws. Use explosion-proof apparatus and fittings.

**General protective and hygiene measures**

Wash hands before breaks and after work. Do not inhale gases. Do not eat, drink or smoke during work time. Keep away from foodstuffs and beverages. Have emergency shower available. Provide eye wash fountain in work area.

**Advice on protection against fire and explosion**

Isolate from sources of heat, sparks and open flame. Take precautionary measures against electrostatic loading (earthing necessary during loading operations). Electrical equipment should be protected to the appropriate standard. Vapours can form an explosive mixture with air.

**7.2 Conditions for safe storage, including any incompatibilities****Technical measures and storage conditions**

Keep container tightly closed in a cool, well-ventilated place, open and handle carefully. Protect from heat and direct sunlight.

**Recommended storage temperature**

Value < 52 °C

**Storage stability**

Value > 10 a  
Comments When stored properly, the storage life is unlimited.

**Requirements for storage rooms and vessels**

Containers which are opened must be carefully closed and kept upright to prevent leakage. Always keep in containers of same material as the original.

**Incompatible products**

Do not store together with: self-heating substances and mixtures; self-reactive substances and mixtures; flammable substances; oxidizing agents; pyrophoric substances; explosives; toxic substances and mixtures; organic peroxides

**7.3 Specific end use(s)**

No data available.

**SECTION 8: Exposure controls/personal protection****8.1 Control parameters****DNEL, DMEL and PNEC values****DNEL values (worker)**

No	Substance name			CAS / EC no
	Route of exposure	Exposure time	Effect	Value
1	2,3,3,3-tetrafluoroprop-1-ene			754-12-1 468-710-7
	inhalative	Long term (chronic)	systemic	950 mg/m <sup>3</sup>

**DNEL value (consumer)**

No	Substance name			CAS / EC no
	Route of exposure	Exposure time	Effect	Value
1	2,3,3,3-tetrafluoroprop-1-ene			754-12-1 468-710-7
	inhalative	Long term (chronic)	systemic	113.1 mg/m <sup>3</sup>
	inhalative	Short term (acut)	systemic	186400 mg/m <sup>3</sup>

**PNEC values**

No	Substance name		CAS / EC no	
	ecological compartment	Type	Value	
1	2,3,3,3-tetrafluoroprop-1-ene		754-12-1	
			468-710-7	
	water	fresh water	0.1	mg/L
	water	Aqua intermittent	1	mg/L
	water	marine water	0.01	mg/L
	water	fresh water sediment	1.51	mg/kg dry weight
	water	marine water sediment	0.151	mg/kg dry weight
	soil	-	1.49	mg/kg dry weight

**8.2 Exposure controls****Appropriate engineering controls**

Provide adequate ventilation. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction. If these are not sufficient to maintain concentrations of particulates and solvent vapour below the OEL (=Occupational Exposure Limit), suitable respiratory protection must be worn. Explosion-proof general and local exhaust ventilation.

**Personal protective equipment****Respiratory protection**

In case of insufficient ventilation or long-term effect use breathing apparatus. Danger of suffocation due to high concentrations in breathing air.

Respiratory filter (gas) : AX

**Eye / face protection**

Tightly fitting safety glasses (EN 166).

**Hand protection**

Low-temperature-resistant gloves (EN 511). Sufficient protection is given wearing suitable protective gloves checked according to i.e. EN 374, in the event of risk of skin contact with the product. Before use, the protective gloves should be tested in any case for its specific work-station suitability (i.e. mechanical resistance, product compatibility and antistatic properties). Adhere to the manufacturer's instructions and information relating to the use, storage, care and replacement of protective gloves. Protective gloves shall be replaced immediately when physically damaged or worn. Design operations thus to avoid permanent use of protective gloves.

**Other**

Chemical-resistant work clothes. Fire-resistant antistatic protective clothing. Protective shoes.

**Environmental exposure controls**

Information regarding waste disposal, see chapter 13.

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

<b>State of aggregation</b>	
gas	
<b>Form/Colour</b>	
liquified gas	
colourless, clear	
<b>Odour</b>	
slightly like ether	
<b>pH value</b>	
No data available	
<b>Boiling point / boiling range</b>	
Value	-29 °C

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Source	supplier		
<b>Melting point/freezing point</b>			
Value	-152.2 °C		
Source	supplier		
<b>Decomposition temperature</b>			
No data available			
<b>Flash point</b>			
Not applicable			
Source	supplier		
<b>Ignition temperature</b>			
No data available			
<b>Auto-ignition temperature</b>			
Value	405 °C		
Source	supplier		
<b>Oxidising properties</b>			
not oxidizing			
<b>Explosive properties</b>			
This product is not explosive. Formation of explosive / highly flammable vapour-air mixtures is possible through use.			
<b>Flammability</b>			
flammable			
Source	supplier		
<b>Lower explosion limit</b>			
Value	6.2	% vol	
Method	ASTM E 681		
Source	supplier		
<b>Upper explosion limit</b>			
Value	12.3	% vol	
Method	ASTM E 681		
Source	supplier		
<b>Vapour pressure</b>			
Value	5800	hPa	
Reference temperature	20	°C	
Source	supplier		
<b>Relative vapour density</b>			
Value	4		
Source	supplier		
Comments	Air = 1		
<b>Relative density</b>			
No data available			
<b>Density</b>			
Value	0.0048	g/cm <sup>3</sup>	
Reference temperature	20	°C	
Source	supplier		
Comments	Vapor density		
<b>Solubility in water</b>			
Value	0.1982	g/l	
Reference temperature	24	°C	
Source	supplier		
<b>Solubility</b>			

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No data available

**Partition coefficient n-octanol/water (log value)**

No	Substance name	CAS no.	EC no.
1	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
log Pow		appr.	2
Reference temperature with reference to Method			25 °C
Source		pH 7 OECD 117 ECHA	

**Kinematic viscosity**

Not applicable

Source supplier

**Solids content**

Not applicable

**Particle characteristics****9.2 Other information****Other information**

Minimum ignition energy: 5-10 J

Burning rate: 15 mm/s

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

This material is considered to be non-reactive under normal use conditions.

**10.2 Chemical stability**

The product is chemically stable under recommended conditions of storage, use and temperature.

**10.3 Possibility of hazardous reactions**

Reacts with strong oxidizing agents. Vapours can form a highly flammable mixture with air. Flammable gas.

**10.4 Conditions to avoid**

Heat, naked flames and other ignition sources. Temperatures &gt; 50°C.

**10.5 Incompatible materials**

Oxidizing agents; Acids; Bases; oxygen; Peroxides; Metal as powder; Avoid contamination (e.g. rust, dust, ash), risk of decomposition!

**10.6 Hazardous decomposition products**

None if stored, handled and transported properly. In case of fire: see section 5.

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

No data available

**Acute dermal toxicity**

No data available

**Acute inhalational toxicity**

No	Substance name	CAS no.	EC no.
1	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
LC50		>	405000 ppmV
Duration of exposure			4 h
State of aggregation		Gas	
Species		rat	

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Method	OECD 403
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.

**Skin corrosion/irritation**

No data available

**Serious eye damage/irritation**

No data available

**Respiratory or skin sensitisation**

No data available

**Germ cell mutagenicity**

No	Substance name	CAS no.	EC no.
1	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
Type of examination		In vitro Mammalian Chromosomal Aberration Test	
Species		Human Lymphocyte	
Method		OECD 473	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	
Route of exposure		inhalational	
Type of examination		In vivo mammalian somatic cell study: cytogenicity / erythrocyte micronucleus	
Species		rat	
Method		OECD 474	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	

**Reproduction toxicity**

No	Substance name	CAS no.	EC no.
1	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
Route of exposure		inhalational	
NOAEC		>	50000 ppm
Type of examination		2 generation study	
Species		rat	
Method		OECD 416	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	
Route of exposure		inhalational	
NOAEC		750	ppm
Type of examination		Prenatal Developmental Toxicity Study	
Species		rabbit	
Method		OECD 414	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	

**Carcinogenicity**

No data available

**STOT - single exposure**

No data available

**STOT - repeated exposure**

No	Substance name	CAS no.	EC no.
1	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
Route of exposure		inhalational	
NOAEC		>	50000 ppm
Species		rat	
Method		OECD 413	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	



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**Aspiration hazard**

No data available

**11.2 Information on other hazards****Endocrine disrupting properties**

Pursuant to REACH Article 57(f) or Commission Delegated Regulation (EU) 2017/2100 or Commission Delegated Regulation (EU) 2018/605, the product does not contain any endocrine disruptors in a concentration of 0.1% weight by weight and above.

**Other information**

No data available.

**SECTION 12: Ecological information****12.1 Toxicity****Toxicity to fish (acute)**

No	Substance name	CAS no.	EC no.
1	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
LC50	>	197	mg/l
Duration of exposure		96	h
Species	Cyprinus carpio		
Method	OECD 203		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		

**Toxicity to fish (chronic)**

No data available

**Toxicity to Daphnia (acute)**

No	Substance name	CAS no.	EC no.
1	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
EC50	>	100	mg/l
Duration of exposure		48	h
Species	Daphnia magna		
Method	OECD 202		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		

**Toxicity to Daphnia (chronic)**

No data available

**Toxicity to algae (acute)**

No	Substance name	CAS no.	EC no.
1	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
EC50	>	100	mg/l
Duration of exposure		72	h
Species	Pseudokirchneriella subcapitata		
Method	OECD 201		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		

**Toxicity to algae (chronic)**

No data available

**Bacteria toxicity**

No data available

**12.2 Persistence and degradability****Biodegradability**

No	Substance name	CAS no.	EC no.
1	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
Type	aerobic biodegradation		

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Value	<	5	%
Duration		28	d
Method	OECD 301 F		
Source	ECHA		
Evaluation	not readily biodegradable		

**12.3 Bioaccumulative potential**

Partition coefficient n-octanol/water (log value)			
No	Substance name	CAS no.	EC no.
1	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
log Pow	appr.	2	
Reference temperature with reference to		25	°C
Method	pH 7 OECD 117		
Source	ECHA		

**12.4 Mobility in soil**

No data available.

**12.5 Results of PBT and vPvB assessment**

Results of PBT and vPvB assessment	
PBT assessment	The product is not considered to be a PBT.
vPvB assessment	The product is not considered to be a vPvB.

**12.6 Endocrine disrupting properties**

Endocrine disrupting properties
For information on endocrine disrupting properties see section 11.

**12.7 Other adverse effects**

Other adverse effects
global warming potential within a 100 year period: < 1

**SECTION 13: Disposal considerations****13.1 Waste treatment methods****Product**

dispose of in accordance with local regulation.

Allocation of a waste code number, according to the European Waste Catalogue, should be carried out in agreement with the regional waste disposal company.

**Packaging**

Empty containers contain product residue and may be hazardous. Do not pressurize, cut, weld, braze, solder, drill, weld, or expose these containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury and/or death. Residues must be removed from packaging and when emptied completely disposed of in accordance with the regulations for waste removal. Incompletely emptied packaging must be disposed of in the form of disposal specified by the regional disposer.

**SECTION 14: Transport information****14.1 Transport ADR/RID/ADN**

Class	2
Classification code	2F
Hazard identification no.	23
UN number	UN3161
Proper shipping name	LIQUEFIED GAS, FLAMMABLE, N.O.S.
Technical name	2,3,3,3-tetrafluoroprop-1-ene
Tunnel restriction code	B/D
Label	2.1 RID: (+13)

**14.2 Transport IMDG**

Class	2.1
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UN number	UN3161
Proper shipping name	LIQUEFIED GAS, FLAMMABLE, N.O.S.
Technical name	2,3,3,3-tetrafluoroprop-1-ene
EmS	F-D, S-U
Label	2.1

**14.3 Transport ICAO-TI / IATA**

Class	2.1
UN number	UN3161
Proper shipping name	Liquefied gas, flammable, n.o.s.
Technical name	2,3,3,3-tetrafluoroprop-1-ene
Label	2.1

**14.4 Other information**

No data available.

**14.5 Environmental hazards**

Information on environmental hazards, if relevant, please see 14.1 - 14.3.

**14.6 Special precautions for user**

To be transported always in closed, upright and safe containers. Make sure that persons handling these containers are aware of the rules of conduct in case of incident or spillage.

**14.7 Maritime transport in bulk according to IMO instruments**

Not relevant

**SECTION 15: Regulatory information****15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture****EU regulations****Regulation (EC) No 1907/2006 (REACH) Annex XIV (List of substances subject to authorisation)**

In accordance with the REACH regulation (EC) 1907/2006, the product does not contain any substances that are considered as subject to listing in annex XIV, inventory of substances requiring authorisation.

**REACH candidate list of substances of very high concern (SVHC) for authorisation**

In accordance with article 57 and article 59 of the Reach regulation (EC) 1907/2006, this substance is not considered as subject to listing in annex XIV, inventory of substances requiring authorisation ("Authorization list").

**Regulation (EC) No 1907/2006 (REACH) Annex XVII: RESTRICTIONS ON THE MANUFACTURE, PLACING ON THE MARKET AND USE OF CERTAIN DANGEROUS SUBSTANCES, MIXTURES AND ARTICLES**

The substance is not subject to the provisions of annex XVII (restriction entries) of the Reach regulation (EC) 1907/2006.

**Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances**

This substance is not subject to Part 1 or 2 of Annex I

**Other regulations**REGULATION (EU) No 517/2014 on fluorinated greenhouse gases  
Adhere to the national sanitary and occupational safety regulations when using this product.**15.2 Chemical safety assessment**

A chemical safety assessment has been carried out for this substance.

**SECTION 16: Other information****Sources of key data used to compile the data sheet:**

Regulation (EC) No 1907/2006 (REACH), 1272/2008 (CLP) as amended in each case.

Directives 2000/39/EC, 2006/15/EC, 2009/161/EU, (EU) 2017/164.

National Threshold Limit Values of the corresponding countries as amended in each case.

Transport regulations according to ADR, RID, IMDG, IATA as amended in each case.

The data sources used to determine physical, toxic and ecotoxic data, are indicated directly in the corresponding section.

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**Creation of the safety data sheet**

UMCO GmbH

This information is based on our present knowledge and experience.

The safety data sheet describes products with a view to safety requirements.

It does not however, constitute a guarantee for any specific product properties and shall not establish a legally valid contractual relationship.

Alterations/supplements:

Alterations to the previous edition are marked in the left-hand margin.

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Prod-ID 775897