

**Trade name:** R-448A

**Current version :** 2.0.0, issued: 26.06.2024

**Replaced version:** 1.0.0, issued: 14.12.2023

**Region:**  
GER

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

### 1.1 Product identifier

**Trade name**

**R-448A**

### 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**

No data available.

### 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)**

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, 4 and 5 of Annex I to CLP.

### 2.2 Label elements

**Labelling according to Regulation (EC) No 1272/2008 (CLP Regulation)**

**Hazard pictograms**



GHS04

**Signal word**

Warning

**Hazard statement(s)**

H280

Contains gas under pressure; may explode if heated.

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P410+P403 Protect from sunlight. Store in a well-ventilated place.

**Supplemental label elements**

Contains fluorinated greenhouse gases (HFKW-32, HFKW-125, HFKW-134a, HFKW-1234yf, HFKW-1234ze)

**2.3 Other hazards**

High vapour concentrations can cause headaches, dizziness, drowsiness, nausea and even unconsciousness. May cause arrhythmia.

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**

Not applicable. The product is not a substance.

**3.2 Mixtures****Hazardous ingredients**

No	Substance name		Additional information	
	CAS / EC / Index / REACH no	Classification (EC) 1272/2008 (CLP)	Concentration	%
1	<b>pentafluoroethane</b>			
	354-33-6 206-557-8 - 01-2119485636-25	Press. Gas liq.; H280	>= 25,00 - < 50,00	Vol%
2	<b>difluoromethane</b>			
	75-10-5 200-839-4 - 01-2119471312-47	Flam. Gas 1A; H220 Press. Gas liq.; H280	>= 25,00 - < 50,00	Vol%
3	<b>norflurane</b>			
	811-97-2 212-377-0 - 01-2119459374-33	Press. Gas liq.; H280	>= 10,00 - < 25,00	Vol%
4	<b>2,3,3,3-tetrafluoroprop-1-ene</b>			
	754-12-1 468-710-7 - 01-0000019665-61	Flam. Gas 1A; H220 Press. Gas liq.; H280	>= 10,00 - < 25,00	Vol%
5	<b>1,3,3,3-Tetrafluoropropene, (1E)-</b>			
	1645-83-6 471-480-0 - 01-0000019758-54	Press. Gas liq.; H280	>= 5,00 - < 10,00	Vol%

Full Text for all H-phrases and EUH-phrases: pls. see section 16

**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**

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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**

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.

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

The following symptoms may occur: respiratory arrest. Drowsiness; Unconsciousness; cardiac arrhythmia; Dizziness; headaches; 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. Do not administer adrenaline or derivatives.

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

Extinguishing measures to suit surroundings. recommended: alcohol resistant foam, CO<sub>2</sub>, powders, water spray/mist

**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); Carbonyl fluoride; fluorine compounds; Liquefied gas: Spilled liquid can cause cold burns. This gas is heavier than air and may accumulate in low areas. The product is not flammable.

**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.

**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.

**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.

**Advice on protection against fire and explosion**

The product is not combustible. 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. Can form a combustible mixture with air at superatmospheric pressure.

**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 < 50 °C

**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**

Substances to be avoided, see section 10.

**Storage Class according TRGS 510**

2A Gases (except aerosol dispensers and lighters)

**7.3 Specific end use(s)**

No data available.

**SECTION 8: Exposure controls/personal protection****8.1 Control parameters****Occupational exposure limit values**

No	Substance name	CAS no.	EC no.
1	<b>norflurane</b>	<b>811-97-2</b>	<b>212-377-0</b>
	<b>TRGS 900</b>		
	Norfluran		
	WEL long-term (8-hr TWA reference period)	4200	mg/m <sup>3</sup> 1000 ml/m <sup>3</sup>
	Ceiling Limit	8(II)	
	Notes	Y	
2	<b>2,3,3,3-tetrafluoroprop-1-ene</b>	<b>754-12-1</b>	<b>468-710-7</b>
	<b>TRGS 900</b>		
	2,3,3,3-Tetrafluorpropen		
	WEL long-term (8-hr TWA reference period)	950	mg/m <sup>3</sup> 200 ml/m <sup>3</sup>
	Ceiling Limit	2 (II)	
	Notes	Y	
3	<b>1,3,3,3-Tetrafluoropropene, (1E)-</b>	<b>1645-83-6</b>	<b>471-480-0</b>

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<b>TRGS 900</b>				
trans-1,3,3,3-Tetrafluorpropen				
WEL long-term (8-hr TWA reference period)	4700	mg/m <sup>3</sup>	1000	ml/m <sup>3</sup>
Ceiling Limit	2 (II)			
Notes	Y			

**Biological limit values**

No	Substance name			
1	<b>pentafluoroethane</b>			
<b>TRGS 903</b>				
Fluorwasserstoff und anorganische Fluorverbindungen (Fluoride)				
	parameter	Fluorid		
	Value	7,0	mg/g Kreatinin	
	sample material	U		
	Sampling moment	b		
<b>TRGS 903</b>				
Fluorwasserstoff und anorganische Fluorverbindungen (Fluoride)				
	parameter	Fluorid		
	Value	4,0	mg/g Kreatinin	
	sample material	U		
	Sampling moment	d		

**DNEL, DMEL and PNEC values****DNEL values (worker)**

No	Substance name			CAS / EC no	
	Route of exposure	Exposure time	Effect	Value	
1	<b>pentafluoroethane</b>			<b>354-33-6</b> <b>206-557-8</b>	
	inhalative	Long term (chronic)	systemic	16444	mg/m <sup>3</sup>
2	<b>difluoromethane</b>			<b>75-10-5</b> <b>200-839-4</b>	
	inhalative	Long term (chronic)	systemic	7035	mg/m <sup>3</sup>
3	<b>norflurane</b>			<b>811-97-2</b> <b>212-377-0</b>	
	inhalative	Long term (chronic)	systemic	13936	mg/m <sup>3</sup>
4	<b>2,3,3,3-tetrafluoroprop-1-ene</b>			<b>754-12-1</b> <b>468-710-7</b>	
	inhalative	Long term (chronic)	systemic	950	mg/m <sup>3</sup>
5	<b>1,3,3,3-Tetrafluoropropene, (1E)-</b>			<b>1645-83-6</b> <b>471-480-0</b>	
	inhalative	Long term (chronic)	systemic	3902	mg/m <sup>3</sup>

**DNEL value (consumer)**

No	Substance name			CAS / EC no	
	Route of exposure	Exposure time	Effect	Value	
1	<b>pentafluoroethane</b>			<b>354-33-6</b> <b>206-557-8</b>	
	inhalative	Long term (chronic)	systemic	1753	mg/m <sup>3</sup>
2	<b>difluoromethane</b>			<b>75-10-5</b> <b>200-839-4</b>	
	inhalative	Long term (chronic)	systemic	750	mg/m <sup>3</sup>
3	<b>norflurane</b>			<b>811-97-2</b> <b>212-377-0</b>	
	inhalative	Long term (chronic)	systemic	2476	mg/m <sup>3</sup>
4	<b>2,3,3,3-tetrafluoroprop-1-ene</b>			<b>754-12-1</b> <b>468-710-7</b>	
	inhalative	Long term (chronic)	systemic	186400	mg/m <sup>3</sup>

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5	1,3,3,3-Tetrafluoropropene, (1E)-			1645-83-6 471-480-0
	inhalative	Long term (chronic)	systemic	830 mg/m <sup>3</sup>

**PNEC values**

No	Substance name	CAS / EC no	
	ecological compartment	Type	Value
1	pentafluoroethane		354-33-6 206-557-8
	water	fresh water	0,1 mg/L
	water	fresh water sediment	0,6 mg/kg dry weight
2	difluoromethane		75-10-5 200-839-4
	water	fresh water	0,142 mg/L
	water	Aqua intermittent	1,42 mg/L
	water	fresh water sediment	0,543 mg/kg dry weight
3	norflurane		811-97-2 212-377-0
	water	fresh water	0,1 mg/L
	water	marine water	0,01 mg/L
	water	fresh water sediment	0,75 mg/kg dry weight
	sewage treatment plant	-	73 mg/L
4	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
5	1,3,3,3-Tetrafluoropropene, (1E)-		1645-83-6 471-480-0
	water	fresh water	0,1 mg/L
	water	Aqua intermittent	1 mg/L

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

Ensure adequate ventilation, local exhaust at the work station if necessary. If these are not sufficient to maintain concentrations of particulates and solvent vapour below the OEL, suitable respiratory protection must be worn.

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

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

**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.

Appropriate Material                      Leather

**Other**

Chemical-resistant work clothes. 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</b>	
liquified gas	
<b>Colour</b>	
colourless	
<b>Odour</b>	
slightly like ether	
<b>pH value</b>	
Source	supplier
Comments	neutral
<b>Boiling point / boiling range</b>	
Value	-45,9 - -39,8 °C
Source	supplier
<b>Melting point/freezing point</b>	
No data available	
<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	628 °C
Source	supplier
<b>Explosive properties</b>	
The product is not explosive. Formation of explosive/highly flammable air-vapour mixtures is possible during/after use.	
<b>Flammability</b>	
The product is non-flammable.	
<b>Lower explosion limit</b>	
No data available	
<b>Upper explosion limit</b>	
No data available	
<b>Vapour pressure</b>	
Value	1120 kPa
Reference temperature	21,1 °C
Source	supplier
Value	2588 kPa
Reference temperature	54,4 °C
Source	supplier
<b>Relative vapour density</b>	
Value	2,98
Source	supplier
Comments	Air = 1

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<b>Relative density</b>
No data available

<b>Density</b>	
Value	1,11 g/cm <sup>3</sup>

<b>Solubility</b>
No data available

Partition coefficient n-octanol/water (log value)			
No	Substance name	CAS no.	EC no.
1	pentafluoroethane	354-33-6	206-557-8
	log Pow	1,48	
	Reference temperature	25	°C
	with reference to		
	Method	pH 6.34	
	Source	OECD 107	
		ECHA	
2	difluoromethane	75-10-5	200-839-4
	log Pow	0,21	
	Reference temperature	25	°C
	with reference to		
	Method	pH 6,1	
	Source	OECD 107	
		ECHA	
3	norflurane	811-97-2	212-377-0
	log Pow	1,06	
	Reference temperature	25	°C
	with reference to		
	Method	pH 6.0	
	Source	OECD 107	
		ECHA	
4	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
	log Pow	appr. 2	
	Reference temperature	25	°C
	with reference to		
	Method	pH 7	
	Source	OECD 117	
		ECHA	
5	1,3,3,3-Tetrafluoropropene, (1E)-	1645-83-6	471-480-0
	log Pow	1,6	
	Reference temperature	25	°C
	with reference to		
	Method	pH 7	
	Source	OECD 117	
		ECHA	

<b>Kinematic viscosity</b>
No data available

<b>Particle characteristics</b>
No data available

## 9.2 Other information

<b>Other information</b>
No data available.

## SECTION 10: Stability and reactivity

### 10.1 Reactivity

Dangerous reactions are not expected if the product is handled according to its intended use.

### 10.2 Chemical stability

Stable under recommended storage and handling conditions (See section 7).

### 10.3 Possibility of hazardous reactions



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Stable under recommended storage and handling conditions (See section 7). Hazardous polymerization will not occur under normal conditions.

**10.4 Conditions to avoid**

Temperatures > 50°C. Heat, naked flames and other ignition sources.

**10.5 Incompatible materials**

strong oxidizing agents; Metal as powder

**10.6 Hazardous decomposition products**

None, if handled according to intended use. 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	>	405800	ppmV
Duration of exposure		4	h
State of aggregation	Gas		
Species	rat		
Method	OECD 403		
Source	ECHA		
2	1,3,3,3-Tetrafluoropropene, (1E)-	1645-83-6	471-480-0
LC50	>	207000	ppmV
Duration of exposure		4	h
State of aggregation	Gas		
Species	rat		
Method	OECD 403		
Source	ECHA		

Skin corrosion/irritation			
No	Substance name	CAS no.	EC no.
1	1,3,3,3-Tetrafluoropropene, (1E)-	1645-83-6	471-480-0
Species	rabbit		
Method	OECD 404		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		

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	pentafluoroethane	354-33-6	206-557-8
Type of examination	in vitro gene mutation study in bacteria		
Species	Salmonella typhimurium / Escherichia coli		
Method	OECD 471		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		
Type of examination	In vitro Mammalian Chromosomal Aberration Test		
Species	Chinese hamster Ovary (CHO)		

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Method	OECD 473
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
Route of exposure	inhalational
Type of examination	Mammalian Erythrocyte Micronucleus Test, In vivo
Species	mouse
Method	OECD 474
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
<b>2</b>	<b>difluoromethane</b> <b>75-10-5</b> <b>200-839-4</b>
Type of examination	in vitro gene mutation study in bacteria
Species	Salmonella typhimurium / Escherichia coli
Method	OECD 471
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
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.
<b>3</b>	<b>norflurane</b> <b>811-97-2</b> <b>212-377-0</b>
Type of examination	Genotoxicity in vitro
Species	Salmonella typhimurium
Method	OECD 471
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
Type of examination	Genotoxicity in vitro
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	Genotoxicity in vivo
Species	mouse
Method	EPA
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
<b>4</b>	<b>2,3,3,3-tetrafluoroprop-1-ene</b> <b>754-12-1</b> <b>468-710-7</b>
Type of examination	Genotoxicity in vitro
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
Type of examination	Genotoxicity in vivo
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
<b>5</b>	<b>1,3,3,3-Tetrafluoropropene, (1E)-</b> <b>1645-83-6</b> <b>471-480-0</b>
Type of examination	Genotoxicity in vitro
Species	Human Lymphocyte
Method	OECD 473
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
Type of examination	Genotoxicity in vivo
Species	mouse
Method	OECD 474
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
<b>Reproduction toxicity</b>	
<b>No</b>	<b>Substance name</b> <b>CAS no.</b> <b>EC no.</b>
<b>1</b>	<b>norflurane</b> <b>811-97-2</b> <b>212-377-0</b>
Route of exposure	inhalational

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Species	mouse
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
<b>2</b>	<b>2,3,3,3-tetrafluoroprop-1-ene</b> <b>754-12-1</b> <b>468-710-7</b>
Type of examination	2 generation study
Method	OECD 416
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
Type of examination	Prenatal Developmental Toxicity Study
Method	OECD 414
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.

Carcinogenicity			
No	Substance name	CAS no.	EC no.
1	norflurane	811-97-2	212-377-0
Route of exposure		inhalational	
Species	rat		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		

STOT - single exposure	
No data available	

STOT - repeated exposure			
No	Substance name	CAS no.	EC no.
1	pentafluoroethane	354-33-6	206-557-8
Route of exposure		inhalational	
Species	rat		
Method	OECD 413		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		
<b>2</b>	<b>difluoromethane</b>	<b>75-10-5</b>	<b>200-839-4</b>
Route of exposure		inhalational	
Species	rat		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		
<b>3</b>	<b>norflurane</b>	<b>811-97-2</b>	<b>212-377-0</b>
Route of exposure		inhalational	
Species	rat		
Method	OECD 453		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		
<b>4</b>	<b>2,3,3,3-tetrafluoroprop-1-ene</b>	<b>754-12-1</b>	<b>468-710-7</b>
Route of exposure		inhalational	
Species	rat		
Method	OECD 413		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		
<b>5</b>	<b>1,3,3,3-Tetrafluoropropene, (1E)-</b>	<b>1645-83-6</b>	<b>471-480-0</b>
Route of exposure		inhalational	
Species	rat		
Method	OECD 413		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		

Aspiration hazard	
No data available	

## 11.2 Information on other hazards

Trade name: R-448A

Current version : 2.0.0, issued: 26.06.2024

Replaced version: 1.0.0, issued: 14.12.2023

Region:  
GER**Endocrine disrupting properties**

No data available.

**Other information**

No data available.

**SECTION 12: Ecological information****12.1 Toxicity**

<b>Toxicity to fish (acute)</b>			
No	Substance name	CAS no.	EC no.
1	<b>norflurane</b>	<b>811-97-2</b>	<b>212-377-0</b>
LC50		450	mg/l
Duration of exposure		96	h
Species	Salmo gairdneri		
Method	EU C.1		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		
2	<b>2,3,3,3-tetrafluoroprop-1-ene</b>	<b>754-12-1</b>	<b>468-710-7</b>
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.		
3	<b>1,3,3,3-Tetrafluoropropene, (1E)-</b>	<b>1645-83-6</b>	<b>471-480-0</b>
LC50	>	117	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	<b>norflurane</b>	<b>811-97-2</b>	<b>212-377-0</b>
EC50		980	mg/l
Duration of exposure		48	h
Species	Daphnia magna		
Method	EU C.2		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		
2	<b>2,3,3,3-tetrafluoroprop-1-ene</b>	<b>754-12-1</b>	<b>468-710-7</b>
EC50	>	83	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.		
3	<b>1,3,3,3-Tetrafluoropropene, (1E)-</b>	<b>1645-83-6</b>	<b>471-480-0</b>
EC50	>	160	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

Trade name: R-448A

Current version : 2.0.0, issued: 26.06.2024

Replaced version: 1.0.0, issued: 14.12.2023

Region:  
GER

<b>Toxicity to algae (acute)</b>			
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		
2	1,3,3,3-Tetrafluoropropene, (1E)-	1645-83-6	471-480-0
EC50	>	170	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.		
<b>Toxicity to algae (chronic)</b>			
No data available			
<b>Bacteria toxicity</b>			
No data available			

**12.2 Persistence and degradability**

<b>Biodegradability</b>			
No	Substance name	CAS no.	EC no.
1	pentafluoroethane	354-33-6	206-557-8
Type	aerobic biodegradation		
Value	appr.	5	%
Duration		28	d
Method	Closed Bottle Test (OECD 301D)		
Source	ECHA		
Evaluation	not readily biodegradable		
2	difluoromethane	75-10-5	200-839-4
Type	aerobic biodegradation		
Value		5	%
Duration		28	d
Method	OECD 301 D		
Source	ECHA		
Evaluation	not readily biodegradable		
3	norflurane	811-97-2	212-377-0
Type	aerobic biodegradation		
Value	appr.	3	%
Duration		28	d
Method	OECD 301 D		
Source	ECHA		
Evaluation	not readily biodegradable		
4	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
Type	aerobic biodegradation		
Value	<	5	%
Duration		28	d
Method	OECD 301 F		
Source	ECHA		
Evaluation	not readily biodegradable		
5	1,3,3,3-Tetrafluoropropene, (1E)-	1645-83-6	471-480-0
Type	aerobic biodegradation		
Value		0	%
Duration		28	d
Method	OECD 301 D		
Source	ECHA		
Evaluation	not readily biodegradable		

Trade name: R-448A

Current version : 2.0.0, issued: 26.06.2024

Replaced version: 1.0.0, issued: 14.12.2023

Region:  
GER**12.3 Bioaccumulative potential**

Partition coefficient n-octanol/water (log value)			
No	Substance name	CAS no.	EC no.
1	pentafluoroethane	354-33-6	206-557-8
	log Pow	1,48	
	Reference temperature	25	°C
	with reference to		
	Method	pH 6.34	
	Source	OECD 107	
		ECHA	
2	difluoromethane	75-10-5	200-839-4
	log Pow	0,21	
	Reference temperature	25	°C
	with reference to		
	Method	pH 6,1	
	Source	OECD 107	
		ECHA	
3	norflurane	811-97-2	212-377-0
	log Pow	1,06	
	Reference temperature	25	°C
	with reference to		
	Method	pH 6.0	
	Source	OECD 107	
		ECHA	
4	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
	log Pow	appr. 2	
	Reference temperature	25	°C
	with reference to		
	Method	pH 7	
	Source	OECD 117	
		ECHA	
5	1,3,3,3-Tetrafluoropropene, (1E)-	1645-83-6	471-480-0
	log Pow	1,6	
	Reference temperature	25	°C
	with reference to		
	Method	pH 7	
	Source	OECD 117	
		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**

No data available.

**12.7 Other adverse effects**

Other adverse effects
Contains fluorinated greenhouse gases. global warming potential within a 100 year period: 1386

**12.8 Other information**

Other information
Do not discharge product unmonitored into the environment.

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

dispose of in accordance with local regulation.

Trade name: R-448A

Current version : 2.0.0, issued: 26.06.2024

Replaced version: 1.0.0, issued: 14.12.2023

Region:  
GER

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**

Compressed gas packaging under pressure. Do not open by force. Do not heat above 50°C. Dispose of compressed gas packagings only if completely discharged. Do not burn empty compressed gas packagings. Do not pierce, cut or weld uncleaned containers.

**SECTION 14: Transport information****14.1 UN number or ID number**

ADR/RID/ADN	UN3163
IMDG	UN3163
ICAO-TI / IATA	UN3163

**14.2 UN proper shipping name**

ADR/RID/ADN Technical name	LIQUEFIED GAS, N.O.S. pentafluoroethane difluoromethane
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IMDG Technical name	LIQUEFIED GAS, N.O.S. pentafluoroethane difluoromethane
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ICAO-TI / IATA Technical name	Liquefied gas, n.o.s. pentafluoroethane difluoromethane
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**14.3 Transport hazard class(es)**

ADR/RID/ADN - Class	2
Label	2.2 RID: (+13)
Classification code	2A
Tunnel restriction code	C/E
Hazard identification no.	20

IMDG - Class	2.2
Label	2.2

ICAO-TI / IATA - Class	2.2
Label	2.2

**14.4 Packing group**

Not classified as dangerous in the meaning of transport regulations.

**14.5 Environmental hazards**

EmS	F-C, S-V
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**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)**

According to the data available and/or specifications supplied by upstream suppliers, this product does not contain any substances considered as substances requiring authorisation as listed on Annex XIV of the REACH regulation (EC) 1907/2006.

