

Trade name: R-448A

Current version : 2.1.0, issued: 04.08.2025

Replaced version: 2.0.1, issued: 15.07.2025

Region:
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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 kaeltemittel@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.

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	pentafluoroethane		
	354-33-6 206-557-8 - 01-2119485636-25	Press. Gas liq.; H280	>= 25,00 - < 50,00 Vol%
2	difluoromethane		
	75-10-5 200-839-4 - 01-2119471312-47	Flam. Gas 1A; H220 Press. Gas liq.; H280	>= 25,00 - < 50,00 Vol%
3	norflurane		
	811-97-2 212-377-0 - 01-2119459374-33	Press. Gas liq.; H280	>= 10,00 - < 25,00 Vol%
4	2,3,3,3-tetrafluoroprop-1-ene		
	754-12-1 468-710-7 - 01-0000019665-61	Flam. Gas 1A; H220 Press. Gas liq.; H280	>= 10,00 - < 25,00 Vol%
5	1,3,3,3-Tetrafluoropropene, (1E)-		
	1645-83-6 471-480-0 - 01-0000019758-54	Press. Gas liq.; H280	>= 5,00 - < 10,00 Vol%

Full text of H- and EUH-phrases, if not already mentioned in section 2.2: 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, CO₂, 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.

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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	norflurane	811-97-2	212-377-0
	TRGS 900		
	Norfluran		
	WEL long-term (8-hr TWA reference period)	4200	mg/m ³ 1000 ml/m ³
	Ceiling Limit	8(II)	
	Notes	Y	
2	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
	TRGS 900		
	2,3,3,3-Tetrafluorpropen		
	WEL long-term (8-hr TWA reference period)	950	mg/m ³ 200 ml/m ³
	Ceiling Limit	2 (II)	
	Notes	Y	
3	1,3,3,3-Tetrafluoropropene, (1E)-	1645-83-6	471-480-0

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

Biological limit values

No	Substance name	
1	pentafluoroethane	
	TRGS 903	
	Fluorwasserstoff und anorganische Fluorverbindungen (Fluoride)	
	parameter	Fluorid
	Value	7,0 mg/g Kreatinin
	sample material	U
	Sampling moment	b
	TRGS 903	
	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	pentafluoroethane			354-33-6 206-557-8	
	inhalative	Long term (chronic)	systemic	16444	mg/m ³
2	difluoromethane			75-10-5 200-839-4	
	inhalative	Long term (chronic)	systemic	7035	mg/m ³
3	norflurane			811-97-2 212-377-0	
	inhalative	Long term (chronic)	systemic	13936	mg/m ³
4	2,3,3,3-tetrafluoroprop-1-ene			754-12-1 468-710-7	
	inhalative	Long term (chronic)	systemic	950	mg/m ³
5	1,3,3,3-Tetrafluoropropene, (1E)-			1645-83-6 471-480-0	
	inhalative	Long term (chronic)	systemic	3902	mg/m ³

DNEL value (consumer)

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

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

PNEC values

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**

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

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Relative density			
No data available			
Density			
Value	1,11 g/cm³		
Solubility			
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		pH 6.34	
Method		OECD 107	
Source		ECHA	
2	difluoromethane	75-10-5	200-839-4
log Pow		0,21	
Reference temperature		25	°C
with reference to		pH 6,1	
Method		OECD 107	
Source		ECHA	
3	norflurane	811-97-2	212-377-0
log Pow		1,06	
Reference temperature		25	°C
with reference to		pH 6.0	
Method		OECD 107	
Source		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		pH 7	
Method		OECD 117	
Source		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		pH 7	
Method		OECD 117	
Source		ECHA	
Kinematic viscosity			
No data available			
Particle characteristics			
No data available			

9.2 Other information

Other information
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	pentafluoroethane	354-33-6		206-557-8
LC50	>	800000	ppmV	
Duration of exposure		4	h	
State of aggregation	Gas			
Species	rat			
Method	OECD 403			
Source	ECHA			
2	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			
3	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

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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)
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.
2	difluoromethane
	75-10-5
	200-839-4
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.
3	norflurane
	811-97-2
	212-377-0
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.
4	2,3,3,3-tetrafluoroprop-1-ene
	754-12-1
	468-710-7
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.
5	1,3,3,3-Tetrafluoropropene, (1E)-
	1645-83-6
	471-480-0
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

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

Reproduction toxicity			
No	Substance name	CAS no.	EC no.
1	pentafluoroethane	354-33-6	206-557-8
Route of exposure		inhalational	
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.	
2	norflurane	811-97-2	212-377-0
Route of exposure		inhalational	
Species		mouse	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	
3	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
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.	
2	difluoromethane	75-10-5	200-839-4
Route of exposure		inhalational	
Species		rat	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	
3	norflurane	811-97-2	212-377-0
Route of exposure		inhalational	
Species		rat	
Method		OECD 453	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	
4	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
Route of exposure		inhalational	
Species		rat	

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Method	OECD 413
Source	ECHA
Evaluation/classification	Based on available data, the classification criteria are not met.
5	1,3,3,3-Tetrafluoropropene, (1E)-
	1645-83-6
	471-480-0
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

Endocrine disrupting properties

No data available

11.2 Information on other hazards**Other information**

No data available.

SECTION 12: Ecological information**12.1 Toxicity**

Toxicity to fish (acute)			
No	Substance name	CAS no.	EC no.
1	norflurane	811-97-2	212-377-0
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	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		
3	1,3,3,3-Tetrafluoropropene, (1E)-	1645-83-6	471-480-0
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	norflurane	811-97-2	212-377-0
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	2,3,3,3-tetrafluoroprop-1-ene	754-12-1	468-710-7
EC50	>	83	mg/l

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Duration of exposure	48	h
Species	Daphnia magna	
Method	OECD 202	
Source	ECHA	
3	1,3,3,3-Tetrafluoropropene, (1E)-	1645-83-6 471-480-0
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

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		
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.		

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	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		

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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		

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	pH 6.34		
Method	OECD 107		
Source	ECHA		
2	difluoromethane	75-10-5	200-839-4
log Pow		0,21	
Reference temperature		25	°C
with reference to	pH 6,1		
Method	OECD 107		
Source	ECHA		
3	norflurane	811-97-2	212-377-0
log Pow		1,06	
Reference temperature		25	°C
with reference to	pH 6.0		
Method	OECD 107		
Source	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	pH 7		
Method	OECD 117		
Source	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	pH 7		
Method	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	
Product Name	
R-448A	
PBT assessment	The product is not considered to be a PBT.
vPvB assessment	The product is not considered to be a vPvB.

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Region:
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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.

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	LIQUEFIED GAS, N.O.S.
Technical name	pentafluoroethane difluoromethane

IMDG	LIQUEFIED GAS, N.O.S.
Technical name	pentafluoroethane difluoromethane

ICAO-TI / IATA	Liquefied gas, n.o.s.
Technical name	pentafluoroethane difluoromethane

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

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

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Region:
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EmS

F-C, S-V

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.

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

According to available data and the information provided by preliminary suppliers, the product does not contain substances that are considered substances meeting the criteria for inclusion in annex XIV (List of Substances Subject to Authorisation) as laid down in Article 57 and article 59 of REACH (EC) 1907/2006.

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

According to the data available and/or specifications supplied by upstream suppliers, this product does not contain any substances subject to restriction as listed in Annex XVII of the REACH regulation (EC) 1907/2006.

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

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

Other regulations

REGULATION (EU) No 2024/573 on fluorinated greenhouse gases

Adhere to the national sanitary and occupational safety regulations when using this product.

National regulations**Water Hazard Class (Germany)**

Class

1

Source

Classification according to AwSV (Regulation on facilities for handling substances that are hazardous to water).

Other regulations

Take into account: TRGS 510 "Storage of hazardous substances in non-stationary containers"

15.2 Chemical safety assessment

Chemical safety assessments have been conducted for the substances in this mixture. For a mixture a chemical safety assessment according to (EC) 1907/2006 is not mandatory.

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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Full text of the H- and EUH- phrases drawn up in sections 2 and 3 (provided not already drawn up in these sections)

H220 Extremely flammable gas.

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.

This document is an English translation of the legally compliant safety data sheet of the region Germany. This document, including UFI and emergency telephone number, may only be used for placing on the market in the region Germany.

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