

Trade name: R404a

Current version : 4.0.0, issued: 24.10.2022

Replaced version: 3.0.0, issued: 12.04.2021

Region: GB

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

1.1 Product identifier

Trade name

R404a

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

Relevant identified uses of the substance or mixture

Refrigerant for professional use in ultra-low temperature freezers

Uses advised against

No data available.

1.3 Details of the supplier of the safety data sheet

Address

Eppendorf SE
Barkhausenweg 1
D-22339 Hamburg

Telephone no. +49 40 53801-0

Information provided by / telephone

email: certificates@eppendorf.com

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.

Precautionary statement(s)

P403 Store in a well-ventilated place.

Supplemental label elements

Contains fluorinated greenhouse gases covered by the Kyoto protocol.

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2.3 Other hazards

Liquefied gas: Spilled liquid can cause cold burns. This gas is heavier than air and may accumulate in low areas.

PBT assessment

The components of this product are not considered to be a PBT.

vPvB assessment

The components of this product are 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

Chemical characterization

Pressurised liquified gas

Hazardous ingredients

No	Substance name	Classification (EC) 1272/2008 (CLP)	Additional information	%
	CAS / EC / Index / REACH no		Concentration	
1	1,1,1-trifluoroethane			
	420-46-2 206-996-5 - 01-2119492869-13	Flam. Gas 1A; H220 Press. Gas liq.; H280	>= 50.00 - < 70.00	Vol%
2	pentafluoroethane			
	354-33-6 206-557-8 - 01-2119485636-25	Press. Gas liq.; H280	>= 25.00 - < 50.00	Vol%
3	norflurane			
	811-97-2 212-377-0 - 01-2119459374-33	Press. Gas; H280	< 5.00	Vol%

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

No	Note	Specific concentration limits	M-factor (acute)	M-factor (chronic)
1	-	Flam. Gas 1A; H220: C >= 7%	-	-

SECTION 4: First aid measures

4.1 Description of first aid measures

General information

Remove contaminated clothing and shoes immediately, and launder thoroughly before reusing. In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation.

After inhalation

Ensure supply of fresh air. Remove affected person from the immediate area. Irregular breathing/no breathing: artificial respiration. Take medical treatment.

After skin contact

In case of cold burns after contact with liquified gas: rinse with plenty of warm water (40°C approx.). If clothing is burnt onto the wound DO NOT pull off. Seek medical attention.

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). Get immediate ophthalmic treatment.

After ingestion

Do not induce vomiting. Call a doctor. Never give anything by mouth to an unconscious person.

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4.2 Most important symptoms and effects, both acute and delayed

Symptoms

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

No data available.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media

Product itself is non-combustible; adapt fire extinguishing measures to surrounding areas.

Unsuitable extinguishing media

High power water jet

5.2 Special hazards arising from the substance or mixture

In case of fire: danger of pressure build up, which could result in container rupture. In the event of fire, the following can be released: Carbon monoxide and carbon dioxide; Hydrogen fluoride (HF); Carbonyl fluoride; Fluorinated hydrocarbons; When pressurised with air or oxygen, the mixture may become flammable. Certain mixtures of HCFCs or HFCs with chlorine may become flammable or reactive under certain conditions.

5.3 Advice for firefighters

Use self-contained breathing apparatus. Cool endangered containers with water spray jet. Wear protective clothing.

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. Ensure adequate ventilation. Keep away from ignition sources.

For emergency responders

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

6.2 Environmental precautions

Do not discharge into the drains/surface waters/groundwater. Do not discharge into the subsoil/soil.

6.3 Methods and material for containment and cleaning up

Ventilate room.

6.4 Reference to other sections

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

Provide good ventilation at the work area (local exhaust ventilation, if necessary). If workplace exposure limits are exceeded, respiratory protection approved for this particular job must be worn. Risks inherent to handling the product must be minimised by applying the appropriate protective and preventive measures. Working processes should - so far as possible, according to the state of the art - be designed to rule out bodily contact or the release of hazardous substances.

General protective and hygiene measures

Do not eat, drink or smoke during work time. Keep away from foodstuffs and beverages. Avoid contact with eyes and skin. Remove soiled or soaked clothing immediately. Do not inhale vapours. Wash hands before breaks and after work. Provide eye wash fountain in work area. Have emergency shower available.

Advice on protection against fire and explosion

Isolate from sources of heat, sparks and open flame.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures and storage conditions

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Keep container tightly closed and dry in a cool, well-ventilated place. Store upright.

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: Acids; oxidizing agents; Magnesium; Zinc; Calcium; Aluminium powder; Alkali metals; Earth alkali metals

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
List of approved workplace exposure limits (WELs) / EH40			
1,1,1,2-Tetrafluoroethane (HFC134a)			
	WEL long-term (8-hr TWA reference period)	4240	mg/m ³ 1000 ppm

DNEL, DMEL and PNEC values

DNEL values (worker)

No	Substance name	CAS / EC no		
	Route of exposure	Exposure time	Effect	Value
1	1,1,1-trifluoroethane	420-46-2 206-996-5		
	inhalative	Long term (chronic)	systemic	38800 mg/m ³
2	pentafluoroethane	354-33-6 206-557-8		
	inhalative	Long term (chronic)	systemic	16444 mg/m ³
3	norflurane	811-97-2 212-377-0		
	inhalative	Long term (chronic)	systemic	13936 mg/m ³

DNEL value (consumer)

No	Substance name	CAS / EC no		
	Route of exposure	Exposure time	Effect	Value
1	1,1,1-trifluoroethane	420-46-2 206-996-5		
	inhalative	Long term (chronic)	systemic	10700 mg/m ³
2	pentafluoroethane	354-33-6 206-557-8		
	inhalative	Long term (chronic)	systemic	1753 mg/m ³
3	norflurane	811-97-2 212-377-0		
	inhalative	Long term (chronic)	systemic	2476 mg/m ³

PNEC values

No	Substance name	CAS / EC no	
	ecological compartment	Type	Value
1	1,1,1-trifluoroethane		420-46-2 206-996-5
	water	fresh water	350 µg/L
2	pentafluoroethane		354-33-6 206-557-8
	water	fresh water	0.1 mg/L
	water	fresh water sediment	0.6 mg/kg dry weight

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	water	Aqua intermittent	1	mg/L
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
	water	Aqua intermittent	1	mg/L
	sewage treatment plant	-	73	mg/L

8.2 Exposure controls

Appropriate engineering controls

Ensure adequate ventilation, local exhaust at the work station if necessary. Handle substance within a closed system

Personal protective equipment

Respiratory protection

If workplace exposure limits are exceeded, a respiration protection approved for this particular job must be worn. In case of aerosol and mist formation, take appropriate measures for breathing protection in the event workplace threshold values are not specified.

Eye / face protection

Safety glasses (EN 166)

Hand protection

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

Normal chemical work clothing.

Environmental exposure controls

No data available.

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	
ether-like	
pH value	
Not applicable	
Boiling point / boiling range	
Value	-46.5 - -45.7 °C
Reference pressure	1013 hPa
Melting point/freezing point	
not determined	
Sublimation point / sublimation range	
Not applicable	

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Decomposition temperature			
Value	728 °C		
Flash point			
Not applicable			
Ignition temperature			
not determined			
Auto-ignition temperature			
not determined			
Oxidising properties			
Not applicable			
Explosive properties			
Not applicable			
Flammability			
Not applicable			
Lower explosion limit			
none			
Method	ASTM E 681		
Upper explosion limit			
none			
Method	ASTM E 681		
Vapour pressure			
Value	12546	hPa	
Reference temperature	25	°C	
Relative vapour density			
Value	3.45		
Reference temperature	15 °C		
Comments	Air = 1		
Evaporation rate			
Value	>	1	g/h
Relative density			
No data available			
Density			
Value	5.39	kg/m ³	
Reference temperature	-45.8	°C	
Solubility in water			
Comments	slightly soluble		
Solubility			
not determined			
Partition coefficient n-octanol/water (log value)			
No	Substance name	CAS no.	EC no.
1	1,1,1-trifluoroethane	420-46-2	206-996-5
log Pow		1.06	
Reference temperature		20 °C	
Source		ECHA	
2	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	

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Kinematic viscosity

Not applicable

Particle characteristics

9.2 Other information

Other information

Critical temperature: 72 °C

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available.

10.2 Chemical stability

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

10.3 Possibility of hazardous reactions

Dangerous reactions are not to be expected when handling product according to its intended use.

10.4 Conditions to avoid

Heat, naked flames or other ignition sources, electrostatic charge and discharge, formation of vapours/aerosols.

10.5 Incompatible materials

Aluminium powder; calcium; Zinc; Magnesium; Oxidizing agents; Alkali metals; Earth alkali metals

10.6 Hazardous decomposition products

Fluorinated hydrocarbons

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	1,1,1-trifluoroethane	420-46-2	206-996-5
ATE	>	591000	ppmV
Duration of exposure		4	h
State of aggregation	Gas		
Species	rat		
Method	OECD 403		
Source	ECHA		
Evaluation/classification	Based on available data, the classification criteria are not met.		
2	pentafluoroethane	354-33-6	206-557-8
ATE	>	800000	ppmV
Duration of exposure		4	h
State of aggregation	Gas		
Species	rat		
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

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No data available

Germ cell mutagenicity

No	Substance name	CAS no.	EC no.
1	1,1,1-trifluoroethane	420-46-2	206-996-5
Type of examination		In vitro Mammalian Chromosomal Aberration Test	
Species		Human Lymphocyte	
Method		EPA OPPTS 870.5375	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	
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 gene mutation study in mammalian cells	
Species		Mouse lymphoma cells	
Method		OECD 490	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	
2	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)	
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.	

Reproduction toxicity

No data available

Carcinogenicity

No	Substance name	CAS no.	EC no.
1	1,1,1-trifluoroethane	420-46-2	206-996-5
Route of exposure		oral	
NOAEL		> 300	mg/kg bw/d
Duration of exposure		52	week/s
Type of examination		Toxicity study	
Species		rat	
Method		Value taken from the literature	
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	1,1,1-trifluoroethane	420-46-2	206-996-5
Route of exposure		inhalational	
Species		rat	
Method		OECD 413	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	

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2	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.	

Aspiration hazard
No data available

Delayed and immediate effects as well as chronic effects from short and long-term exposure
Product specific toxicological data are not available.

11.2 Information on other hazards

Endocrine disrupting properties
No data available.

Other information
No data available.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish (acute)			
No	Substance name	CAS no.	EC no.
1	1,1,1-trifluoroethane	420-46-2	206-996-5
LC50		>	40 mg/l
Duration of exposure			96 h
Species		Rainbow trout	
Method		OECD 203	
Source		ECHA	
Evaluation/classification		Based on available data, the classification criteria are not met.	
2	pentafluoroethane	354-33-6	206-557-8
LC50			109 mg/l
Duration of exposure			96 h
Species		Oncorhynchus mykiss	
Source		Manufacturer	
3	norflurane	811-97-2	212-377-0
LC50			450 mg/l
Duration of exposure			96 h
Species		Oncorhynchus mykiss	
Method		440/2008/EC C.1.	
Source		ECHA	

Toxicity to fish (chronic)
No data available

Toxicity to Daphnia (acute)			
No	Substance name	CAS no.	EC no.
1	1,1,1-trifluoroethane	420-46-2	206-996-5
EC50			300 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.	
2	pentafluoroethane	354-33-6	206-557-8
EC50		>	100 mg/l
Duration of exposure			48 h
Species		Daphnia magna	
Source		Manufacturer	
3	norflurane	811-97-2	212-377-0
EC50			980 mg/l

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Duration of exposure	48	h
Species	Daphnia magna	
Method	440/2008/EC C.2.	
Source	ECHA	

Toxicity to Daphnia (chronic)
No data available

Toxicity to algae (acute)			
No	Substance name	CAS no.	EC no.
1	pentafluoroethane	354-33-6	206-557-8
EC50		142	mg/l
Duration of exposure		72	h
Species	green alga		
Source	Manufacturer		

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	1,1,1-trifluoroethane	420-46-2	206-996-5
Type	aerobic biodegradation		
Method	QSAR		
Source	ECHA		
Evaluation	not readily biodegradable		
2	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		

12.3 Bioaccumulative potential

Partition coefficient n-octanol/water (log value)			
No	Substance name	CAS no.	EC no.
1	1,1,1-trifluoroethane	420-46-2	206-996-5
log Pow		1.06	
Reference temperature		20	°C
Source	ECHA		
2	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		

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 components of this product are not considered to be a PBT.
vPvB assessment	The components of this product are not considered to be a vPvB.

12.6 Endocrine disrupting properties

No data available.

12.7 Other adverse effects

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No data available.

12.8 Other information

Other information

Do not discharge product unmonitored into the environment.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste code 14 06 01* chlorofluorocarbons, HCFC, HFC

The listed waste code numbers, according to the European Waste Catalogue, are to be understood as a recommendation. A final decision must be made in agreement with the regional waste disposal company. Refer to the EIGA code of practice (Doc.30 "Disposal of Gases"; <http://www.eiga.org>). dispose of in accordance with local regulation.

Packaging

Contaminated packaging should be emptied as far as possible and after appropriate cleansing may be taken for reuse. Packaging that cannot be cleaned should be disposed of in agreement with the regional waste disposal company.

SECTION 14: Transport information

14.1 Transport ADR/RID/ADN

Class	2
Classification code	2A
Hazard identification no.	20
UN number	UN3337
Proper shipping name	REFRIGERANT GAS R 404A
Tunnel restriction code	C/E
Label	2.2

14.2 Transport IMDG

Class	2.2
UN number	UN3337
Proper shipping name	REFRIGERANT GAS R 404A
EmS	F-C, S-V
Label	2.2

14.3 Transport ICAO-TI / IATA

Class	2.2
UN number	UN3337
Proper shipping name	Refrigerant gas R 404A
Label	2.2

14.4 Other information

Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers ensure that they are firmly secured. Ensure that the container valve is closed and not leaking. Container valve guards or caps should be in place.

14.5 Environmental hazards

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

14.6 Special precautions for user

No data available.

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

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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.	
Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control)	
VOC content	> 99 %
Other regulations	
Adhere to the national sanitary and occupational safety regulations when using this product.	

15.2 Chemical safety assessment

A chemical safety assessment has not been carried out for this mixture.

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.

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

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These data are based on our present knowledge. However, they shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

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