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.

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		Additional information	
	CAS / EC / Index / REACH no	Classification (EC) 1272/2008 (CLP)	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 of H- and EUH-phrases, if not already mentioned in section 2.2: 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 could 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.

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

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; Alcali 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/m³	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/m³
2	**pentafluoroethane**			**354-33-6** **206-557-8**	
	inhalative	Long term (chronic)	systemic	16444	mg/m³
3	**norflurane**			**811-97-2** **212-377-0**	
	inhalative	Long term (chronic)	systemic	13936	mg/m³

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/m³
2	**pentafluoroethane**			**354-33-6** **206-557-8**	
	inhalative	Long term (chronic)	systemic	1753	mg/m³
3	**norflurane**			**811-97-2** **212-377-0**	
	inhalative	Long term (chronic)	systemic	2476	mg/m³

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

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

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/m³
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		

Kinematic viscosity

Not applicable

Particle characteristics
No data available

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**
LC50	>	800000		ppmV
Duration of exposure		4		h
State of aggregation	Gas			
Species	rat			
Method	OECD 403			
Source	ECHA			

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	**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	**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.		

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.	
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

Endocrine disrupting properties
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

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
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			
Product Name			
R404a			
Evaluation	The product is expected to biodegrade and is not expected to persist for long periods in an aquatic environment.		

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		

Physico-chemical eliminability
Product Name
R404a
Not applicable

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

Mobility in soil	
Product Name	
R404a	
Comments	Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.5 Results of PBT and vPvB assessment

Results of PBT and vPvB assessment	
Product Name	
R404a	
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

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 "Dispoal 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 UN number or ID number

ADR/RID/ADN	UN3337
IMDG	UN3337
ICAO-TI / IATA	UN3337

14.2 UN proper shipping name

ADR/RID/ADN	REFRIGERANT GAS R 404A
IMDG	REFRIGERANT GAS R 404A
ICAO-TI / IATA	Refrigerant gas R 404A

14.3 Transport hazard class(es)

ADR/RID/ADN - Class	2
Label	2.2
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	-

14.5 Environmental hazards

EmS	F-C, S-V

14.6 Special precautions for user

No data available.

14.7 Maritime transport in bulk according to IMO instruments

Not relevant

14.8 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.

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.

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.

Alterations/supplements:
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