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

1.1 Product identifier

Trade name

R417A

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 uses
Refrigerant

Uses advised against
Consumer use

1.3 Details of the supplier of the safety data sheet

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

Telephone no. +49 931 2093-220
Fax no. +49 931 2093-180
e-mail 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.

Precautionary statement(s)

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

Supplemental label elements
Contains fluorinated greenhouse gases (HFC-134a, HFC-125).

2.3 Other hazards

This product does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher. Vapours are heavier than air and can cause asphyxiation by displacing the oxygen in the air. Misuse or intentional inhalation can be fatal, as a result of effects on the heart, without alarming symptoms. Rapid evaporation of product may produce frostbite. May displace oxygen and cause rapid asphyxiation.

PBT assessment
The 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

Hazardous ingredients

No	Substance name		Additional information	
	CAS / EC / Index / REACH no	Classification (EC) 1272/2008 (CLP)	Concentration	%
1	**norflurane**			
	811-97-2 212-377-0 - 01-2119459374-33	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	**butane**		**pls. refer to footnote (1)**	
	106-97-8 203-448-7 601-004-00-0 -	Flam. Gas 1A; H220 Press. Gas liq.; H280 STOT SE 3; H336	< 5.00	Vol%

Full Text for all H-phrases and EUH-phrases: pls. see section 16
(1) Aberrant from/in addition to the classification set out in Annex VI, this substance is classified according to European Regulation (EC) No 1272/2008 (CLP), Article 4 (3), paragraph 2.

SECTION 4: First aid measures

4.1 Description of first aid measures

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

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

After skin contact
In case of contact with skin wash off immediately with soap and water. Rinse with much water in case of frostbites. Remove chlothes 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
Ingestion is not considered a possible route of exposure.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms
May cause cardiac arrhythmia. Other symptoms, possibly related to incorrect use or excessive inhalation are:
Inducing cardiac reactions
Narcotic effects
Drowsiness
Dizziness
Confusion
Lack of coordination
Drowsiness
Unconsciousness

Effects
Gas reduces oxygen available for breathing. Contact with liquid or refrigerated gas can cause cold burns and frostbite.

4.3 Indication of any immediate medical attention and special treatment needed
Treat symptomatically.

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: Hydrogen fluoride (HF); Carbon monoxide and carbon dioxide; 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). Remove persons to safety. Cordon and mark contaminated area. Use personal protective clothing. Do not breathe gas. Keep away from ignition sources. Avoid skin contact with leaking liquid (danger of frostbite!).

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

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

6.3 Methods and material for containment and cleaning up
Ensure adequate ventilation. Dispose of absorbed material in accordance with the regulations.

6.4 Reference to other sections

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

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Only qualified and trained persons are authorised to handle. Provide good ventilation at the work area (local exhaust ventilation, if necessary). To be used only according to instructions for use. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose containers heat or sources of ignition. In case of accidental release: danger due to low temperature of the liquid product. The product should only be used in areas from which all naked lights and other sources of ignition have been excluded. 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. Provide eye wash fountain in work area. 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.

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

Storage stability

Value	>	10	year(s)
Comments	When stored properly, the storage life is unlimited.		

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

Incompatible products
Do not store together with: self-reactive substances and mixtures; organic peroxides; oxidizing agents; inflammatory substances; pyrophoric substances; self-heating substances and mixtures; Substances and mixtures which, in contact with water, emit flammable gases; explosives; toxic substances and mixtures

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
2	**butane**	**106-97-8**		**203-448-7**	
	List of approved workplace exposure limits (WELs) / EH40				
	Butane				
	WEL short-term (15 min reference period)	1810	mg/m³	750	ppm
	WEL long-term (8-hr TWA reference period)	1450	mg/m³	600	ppm

	Comments	Carc, (only applies if Butane contains more than 0.1% of buta-1,3-diene)

DNEL, DMEL and PNEC values

DNEL values (worker)

No	Substance name			CAS / EC no	
	Route of exposure	Exposure time	Effect	Value	
1	**norflurane**			**811-97-2 212-377-0**	
	inhalative	Long term (chronic)	systemic	13936	mg/m³
2	**pentafluoroethane**			**354-33-6 206-557-8**	
	inhalative	Long term (chronic)	systemic	16444	mg/m³

DNEL value (consumer)

No	Substance name			CAS / EC no	
	Route of exposure	Exposure time	Effect	Value	
1	**norflurane**			**811-97-2 212-377-0**	
	inhalative	Long term (chronic)	systemic	2476	mg/m³
2	**pentafluoroethane**			**354-33-6 206-557-8**	
	inhalative	Long term (chronic)	systemic	1753	mg/m³

PNEC values

No	Substance name		CAS / EC no	
	ecological compartment	Type	Value	
1	**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
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

8.2 Exposure controls

Appropriate engineering controls
Ensure adequate ventilation, local exhaust at the work station if necessary.

Personal protective equipment

Respiratory protection
In case of insufficient ventilation or long-term effect use breathing apparatus. Danger of suffocation due to high concentrations in breathing air. Type organic gases and vapours of low boilers (AX)

Eye / face protection
Tightly fitting safety glasses (EN 166).

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

Other
Chemical-resistant work clothes. Protective shoes.

Environmental exposure controls
Avoid release into sewage and environment.

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
No data available

Boiling point / boiling range	
Value	-39.1 °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

Oxidising properties
not fire-propagating

Explosive properties
not explosive

Flammability	
The product is not combustible.	
Source	supplier

Lower explosion limit	
none	
Method	ASTM E 681
Source	supplier

Upper explosion limit	
none	
Method	ASTM E 681
Source	supplier

Vapour pressure		
Value	9.835	hPa
Reference temperature	25	°C
Source	supplier	

Relative vapour density

Value	3.8
Source	supplier
Comments	Air = 1

Evaporation rate
Not applicable
Source: supplier

Relative density
No data available

Density		
Value	1.2	g/cm³
Source	supplier	
Comments	as liquid	

Solubility
No data available

Partition coefficient n-octanol/water (log value)

No	**Substance name**	**CAS no.**	**EC no.**
1	**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		
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
Source: supplier

Particle characteristics
Not applicable

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
No hazardous reaction when handled and stored according to provisions. Reacts with strong oxidizing agents.

10.4 Conditions to avoid
Temperatures > 50°C. Heat, naked flames and other ignition sources.

10.5 Incompatible materials
Oxidizing agents

10.6 Hazardous decomposition products

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

SECTION 11: Toxicological information

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute oral toxicity
No data available

Acute dermal toxicity
No data available

Acute inhalational toxicity
No data available

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	**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.

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	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.		

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	**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.		
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

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	**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.		

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.		

Toxicity to Daphnia (chronic)
No data available

Toxicity to algae (acute)
No data available

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	**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			
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	**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			
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

Other adverse effects
Global warming potential within 100 years: 2346

12.8 Other information

Other information
Do not discharge product unmonitored into the environment.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

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

Packaging
Take empty containers to an approved waste disposal facility for recovery or disposal.
Return empty pressure vessels to the supplier.

SECTION 14: Transport information

14.1 Transport ADR/RID/ADN

Class	2
Classification code	2A
Hazard identification no.	20
UN number	UN1078
Proper shipping name	REFRIGERANT GAS, N.O.S.
Technical name	norflurane pentafluoroethane
Tunnel restriction code	C/E
Label	2.2 RID:(+13)

14.2 Transport IMDG

Class	2.2
UN number	UN1078
Proper shipping name	REFRIGERANT GAS, N.O.S.
Technical name	norflurane pentafluoroethane
EmS	F-C, S-V
Label	2.2

14.3 Transport ICAO-TI / IATA

Class	2.2
UN number	UN1078
Proper shipping name	Refrigerant gas, n.o.s.
Technical name	norflurane pentafluoroethane
Label	2.2

14.4 Other information

No data available.

14.5 Environmental hazards

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

14.6 Special precautions for user

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

14.7 Maritime transport in bulk according to IMO instruments

Not relevant

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU regulations

Regulation (EC) No 1907/2006 (REACH) Annex XIV (List of substances subject to authorisation)
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 517/2014 on fluorinated greenhouse gases Adhere to the national sanitary and occupational safety regulations when using this product.

15.2 Chemical safety assessment

A chemical safety assessment has 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.
H336	May cause drowsiness or dizziness.

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.

Prod-ID 790885