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

1.1. Product identifier

Name of product R 448A
Art-Nr(n).: 0040

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

Identified uses

Sector of uses [SU]
SU22 - Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
SU3 - Industrial uses: Uses of substances as such or in preparations at industrial sites

Recommended intended purpose(s)
Refrigerant.

1.3. Details of the supplier of the safety data sheet

Manufacturer/distributor

S. Zukausko str. 11, Ramuciai, Kaunas district,

LT - 54464, Lithuania

Phone + 370 37 373248

Fax. + 370 37 373198

E-mail: info@brgroup.eu

www.brgroup.eu

1.4. Emergency telephone number

Emergency advice

The Poison Information Bureau

Siltnamiu str. 29, LT-2043 Vilnius

Phone +370 5 2362052;

Fax. +370 5 236 21 42,

E-mail.: info@tox.lt

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 [CLP/GHS]

Hazard classes and Hazard categories	Hazard Statements	Classification procedure

Liquef. Gas **H280**

Hazard statements for physical hazards
H280 **Contains gas under pressure; may explode if heated.**

2.2. Label elements
Labelling according to Regulation (EC) No 1272/2008 [CLP/GHS]

GHS04

Signal word
Warning

Hazard statements for physical hazards
H280 **Contains gas under pressure; may explode if heated.**

Precautionary Statements

Storage
P403 Store in a well-ventilated place.

Hazardous ingredients for labeling
1,1,1,2-Tetrafluoroethane (R 134a), 2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf), Difluoromethane (R 32), Pentafluoroethane (R 125), trans-1,3,3,3-Tetrafluoroprop-1-ene (R 1234ze)

Supplemental Hazard information (EU)

Health properties
Asphyxiant in high concentrations.

Environmental properties
Contains fluorinated greenhouse gases.

Special rules for supplemental label elements for certain mixtures
Withdrawal out of the liquid phase only.

2.3. Other hazards
Adverse human health effects and symptoms
Contact with liquid may cause cold burns/frostbite.
The inhalation of gas / vapour in high concentrations may cause cardiac arrhythmia.
Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects.

Information pertaining to special dangers for human and environment
Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

Results of PBT and vPvB assessment
The substances in this mixture do not meet the PBT/vPvB criteria of REACH, annex XIII.

SECTION 3: Composition/ information on ingredients

3.1. Substances
not applicable

3.2. Mixtures

Hazardous ingredients

CAS No	EC No	Name	[% weight]	Classification according to Regulation (EC) No 1272/2008 [CLP/GHS]
811-97-2	**212-377-0**	**1,1,1,2-Tetrafluoroethane (R 134a)**	**20 - 23**	**Liq. Gas, H280**
354-33-6	**206-557-8**	**Pentafluoroethane (R 125)**	**25,5 - 28**	**Liq. Gas, H280**
75-10-5	**200-839-4**	**Difluoromethane (R 32)**	**24 - 26,5**	**Flam.Gas1, H220 / Liq.Gas, H280**
754-12-1	**468-710-7**	**2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)**	**18 - 20,5**	**Flam. Gas 1, H220 / Liq. Gas, H280**
29118-24-9	**471-480-0**	**trans-1,3,3,3-Tetrafluoroprop-1-ene (R 1234ze)**	**5 - 7,5**	**Liq. Gas, H280**

REACH

CAS No	Name	REACH registration number
811-97-2	1,1,1,2-Tetrafluoroethane (R 134a)	01-2119459374-33
354-33-6	Pentafluoroethane (R 125)	01-2119485636-25

REACH (continued)

CAS No	Name	REACH registration number
75-10-5	**Difluoromethane (R 32)**	**01-2119471312-47**
754-12-1	**2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)**	**01-0000019665-61**
29118-24-9	**trans-1,3,3,3-Tetrafluoroprop-1-ene (R 1234ze)**	**01-0000019758-54**

Additional advice
The text of the H-phrases is shown in section 16.
Contains fluorinated greenhouse gases.

SECTION 4: First aid measures

4.1. Description of first aid measures

General information
Remove contaminated soaked clothing immediately.
Adhere to personal protective measures when giving first aid.
Seek medical advice immediately.

In case of inhalation
Remove the casualty into fresh air and keep him immobile.
Seek medical treatment immediately.
In case of respiratory standstill give artifical respiration by respiratory bag (Ambu bag) or respirator. Send for a doctor.

In case of skin contact
In case of contact with skin wash off with warm water.
In case of frostbite rinse with plenty of water. Don`t remove clothing.
In case of frostbite spray with lukewarm (not hot) water for at least 15 minutes. Do not remove clothing frozen to the skin. Thaw it with lukewarm water. Apply a sterile dressing. Obtain medical assistance.

In case of eye contact
Rinse cautiously with water for several minuts. Remove contact lenses, if present and easy to do. Continue rinsing.
Call for a doctor immediately.

In case of ingestion
Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

Physician's information / possible symptoms
The following symptoms may occur in case of strong exposition:
Cardiac arrhythmia (disordered cardiac rhythm).
Headache
Nausea
Dizziness
Contact with liquid may cause cold burns/frostbite.

Physician's information / possible dangers
Long-term inhaling of separation products may cause pulmonary oedema.

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

Treatment (Advice to doctor)
Treat symptoms.
Do not give any preparations of the adrenalin-ephedrine group.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media

Product does not burn, fire-extinguishing activities according to surrounding.

Unsuitable extinguishing media

Full water jet

5.2. Special hazards arising from the substance or mixture

In case of fire formation of dangerous gases possible.
Carbon monoxide (CO)
Hydrogen fluoride (HF)
Carbonyl fluoride.

5.3. Advice for firefighters

Special protective equipment for fire-fighters

Use breathing apparatus with independent air supply (isolated).
Wear full protective clothing.

Additional information

Cool endangered containers with water spray jet.
Exposure to fire may cause containers to rupture / explode.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

See chapter 8.
Evacuate area.

For emergency responders

Remove persons to safety.
Personal protection by wearing close-fitting protective clothing and breathing apparatus.
Keep people away and stay on the upwind side.

6.2. Environmental precautions

If possible, stop flow of product.
Do not discharge into the drains/surface waters/groundwater.
Prevent spread over a wide area (e.g. by containment or oil barriers).
Do not discharge into the subsoil/soil.

6.3. Methods and material for containment and cleaning up

Ensure adequate air ventilation.
Allow to vaporise.

6.4. Reference to other sections

Safe handling: see section 7
Disposal: see section 13
Personal protection equipment: see section 8

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Advice on safe handling

Use only in thoroughly ventilated areas.
Transfer and handle only in enclosed systems.
Containers' temperature may not be increased above 50 °C.
Do not heat with open flames.
The working pressure in the receptacle must not exceed the saturation vapour pressure of the pure product resulting at a temperature of 50 °C.
Provide good room ventilation even at ground level (vapours are heavier than air).
Prevent cylinders from falling over.
Avoid release to the environment.
Ensure valve protection device is correctly fitted.
Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
Open valve slowly to avoid pressure shock.
Do not allow backfeed into the container.
Suck back of water into the container must be prevented.
No water to valves, flanges and other fittings.
Purging of pipes and valves with inert gases - to avoid: water, solvents.

General protective measures

Do not inhale gases/vapours/aerosols.

Hygiene measures

At work do not eat, drink and smoke.

Advice on protection against fire and explosion

The product is not flammable in air under ambient conditions of temperature and pressure. When pressurised with air, oxygen or other oxidants, it may become flammable.
Pay attention to general rules of internal fire prevention.

7.2. Conditions for safe storage, including any incompatibilities

Requirements for storage rooms and vessels

Keep in closed original container.
Ventilate store-rooms thoroughly.
Use transportable pressure equipment.
Suitable materials: Normalised carbon steel, tempered alloy steel, aluminium alloys, austenitic stainless steels.
Valve: Suitable materials: Brass, copper alloys, carbon steels, aluminium alloys, austenitic stainless steels.

Advice on storage compatibility

Do not store with spontaneously flammable materials.
Do not store together with combustible liquids or combustible solids.
Do not store together with animal feedstuffs.
Do not store together with explosives.
Do not store together with infectious substances.
Do not store together with radioactive material.
Do not store together with toxic liquids or toxic solids.
Do not store together with food.
Do not store together with oxidizing liquids or oxidizing solids.

Further information on storage conditions

Store closed container at cool and aired place.
Store only in original container at temperature of 50 °C maximum (=122 °F).
Prevent cylinders from falling over.
Protect of heat.

7.3. Specific end use(s)
Recommendation(s) for intended use
See section 1.2
Use in accordance with regulation (EU) No 517/2014 on fluorinated greenhouse gases.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters
Ingredients with occupational exposure limits to be monitored

CAS No	Name	Code	[mg/m3]	[ppm]	Remark
811-97-2	1,1,1,2-Tetrafluoroethane (HFC 134a)	WEL, 8 hours	4240	1000	EH40, United Kingdom

DNEL-/PNEC-values
DNEL worker

CAS No	Substance name	Value	Code	Remark
29118-24-9	trans-1,3,3,3-Tetrafluoroprop-1-ene (R 1234ze)	3902 mg/m3	DNEL long-term inhalative (systemic)	Assessment factor 3, Extrapolation
354-33-6	Pentafluoroethane (R 125)	16444 mg/m3	DNEL long-term inhalative (systemic)	Assessment factor 7,5
75-10-5	Difluoromethane (R 32)	7035 mg/m3	DNEL long-term inhalative (systemic)	Assessment factor 7,5, Extrapolation
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	950 mg/m3	DNEL long-term inhalative (systemic)	
811-97-2	1,1,1,2-Tetrafluoroethane (R 134a)	13936 mg/m3	DNEL long-term inhalative (systemic)	Assessment factor 7,5

DNEL Consumer

CAS No	Substance name	Value	Code	Remark
29118-24-9	trans-1,3,3,3-Tetrafluoroprop-1-ene (R 1234ze)	830 mg/m3	DNEL long-term inhalative (systemic)	Assessment factor 5, Extrapolation
354-33-6	Pentafluoroethane (R 125)	1753 mg/m3	DNEL long-term inhalative (systemic)	Assessment factor 25
75-10-5	Difluoromethane (R 32)	750 mg/m3	DNEL long-term inhalative (systemic)	Assessment factor 25
811-97-2	1,1,1,2-Tetrafluoroethane (R 134a)	2476 mg/m3	DNEL long-term inhalative (systemic)	Assessment factor 15

PNEC

CAS No	Substance name	Value	Code	Remark
29118-24-9	trans-1,3,3,3-Tetrafluoroprop-1-ene (R 1234ze)	0,1 mg/l	PNEC aquatic, freshwater	Assessment factor 1000
		1 mg/l	PNEC aquatic, intermittent release	Assessment factor 100
354-33-6	Pentafluoroethane (R 125)	0,1 mg/l	PNEC aquatic, freshwater	Assessment factor 1000, Extrapolation
		1 mg/l	PNEC aquatic, intermittent release	Assessment factor 100, Extrapolation

DNEL-/PNEC-values (continued)

CAS No	Substance name	Value	Code	Remark
		0,6 mg/kg dw	PNEC sediment, freshwater	Extrapolation
75-10-5	Difluoromethane (R 32)	0,534 mg/kg dw	PNEC sediment, freshwater	Extrapolation
		0,142 mg/l	PNEC aquatic, freshwater	Assessment factor 1000
		1,42 mg/l	PNEC aquatic, intermittent release	Assessment factor 100
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	0,1 mg/l	PNEC aquatic, freshwater	
		1 mg/l	PNEC aquatic, intermittent release	
		1,77 mg/kg dw	PNEC sediment, freshwater	
		0,178 mg/kg dw	PNEC sediment, marine water	
		1,54 mg/kg dw	PNEC soil	
		0,01 mg/l	PNEC aquatic, marine water	
811-97-2	1,1,1,2-Tetrafluoroethane (R 134a)	0,75 mg/kg dw	PNEC sediment, freshwater	Extrapolation
		1 mg/l	PNEC aquatic, intermittent release	Assessment factor 100, Extrapolation
		0,1 mg/l	PNEC aquatic, freshwater	Assessment factor 1000, Extrapolation
		0,01 mg/l	PNEC aquatic, marine water	Assessment factor 10000, Extrapolation
		73 mg/l	PNEC sewage treatment plant (STP)	Assessment factor 10, Extrapolation

8.2. Exposure controls

Respiratory protection

Breathing apparatus in the event of high concentrations.
Keep self contained breathing apparatus readily available for emergency use.
Respiratory protection complying with EN 137.
In case of rescue and maintenance activities in storage containers use environment-independent breathing apparatus because of risk of suffocation by edging out of air oxygen

Hand protection

Low-temperature-resistant gloves
Leather gloves
Protective gloves complying with EN 374.

Eye protection

safety goggles, in case of increased risk add protective face shield
Safety goggles with side protection complying with EN 166.

Other protection measures
Safety shoes with steel toe.
Body covering work clothing, or chemical resistant suit at increased risk.

Limitation and surveillance of the environment
See chapter 7.

Appropriate engineering controls
Transfer and handle only in enclosed systems.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	Colour	Odour
Gaseous / liquefied under pressure.	colourless	ethereal

Odour threshold
not determined

Important health, safety and environmental information

	Value	Temperature	at	Method	Remark
pH value	not applicable				
boiling point	-46 °C		1013 hPa		
melting point	not determined				
Flash point	not applicable				
Vapourisation rate	not determined				
Flammable (solid)	not applicable				
Flammability (gas)					The mixture does not meet the criteria for classification as a flammable gas.
Ignition temperature	not applicable				
Self ignition temperature	not applicable				
Lower explosion limit	no				
Upper explosion limit	no				
Vapour pressure	12754 hPa	25 °C			

	Value	Temperature	at	Method	Remark
Relative density	1,1 g/cm3	25 °C			information concerns to liquid phase
Bulk density	not applicable				
Vapour density	2,98		1013 hPa		air = 1
Solubility in water	No data available				
Solubility/other	not determined				
Partition coefficient n-octanol/water (log P O/W)	No data available				
Decomposition temperature	not applicable				
Viscosity not determined	not determined				

Oxidising properties
no

Explosive properties
no

9.2. Other information
Vapours are heavier than air.

SECTION 10: Stability and reactivity

10.1. Reactivity
See section "Possibility of hazardous reactions".

10.2. Chemical stability
Stable under normal conditions.

10.3. Possibility of hazardous reactions
Reactions with oxidizing agents.
When pressurised with air, oxygen or other oxidants, the mixture may become flammable.

10.4. Conditions to avoid
Heat sources / heat - risk of bursting.
Avoid contact with open flames, glowing metal surfaces, etc..

10.5. Incompatible materials
Substances to avoid
Metals in powder form.
Metallic salts in powder form.
Strong oxidizing agents.
Alkali metals.

Earth alkali metals.

10.6. Hazardous decomposition products
Carbon monoxide
Fluorophosgene on contact open flame or glowing objects
Hydrogen fluoride

Thermal decomposition

Remark No decomposition if used as directed.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity/Irritation/Sensitization

	Value/Validation	Species	Method	Remark
LD50 acute oral	not applicable			
LD50 acute dermal	not applicable			
LC50 acute inhalation	> 405000 ppm (4 h)	rat		R-1234yf
Skin irritation	low irritant effect - not necessary to label	rabbit		R-134a
Eye irritation	low irritant - no labeling duty	rabbit eye		R-134a
Skin sensitization	non-sensitizing	Laboratory animals		R-134a
Sensitization respiratory system	non-sensitizing	Laboratory animals		R-134a

Subacute Toxicity - Carcinogenicity

	Value	Species	Method	Validation
Subchronic Toxicity	75000 ppm R-125	Dog		Cardiac sensitization.
Mutagenicity				No experimental information on genotoxicity in vivo available.
Reproduction-Toxicity				No indications of toxic effects were observed in reproduction studies in animals.
Carcinogenicity				The existing data do not justify a classification as a carcinogen.

Specific target organ toxicity (single exposure)
Substance or mixture is not classified in GHS-criteria as specific target organ toxic with single exposure.

Specific target organ toxicity (repeated exposure)
Substance or mixture is not classified in GHS-criteria as specific target organ toxic with repeated exposure.

Aspiration hazard
not applicable

Toxicity test (Additional information)
No indication of cancerogenic effects at humans available.

Experiences made from practice
May cause frostbite.
Gases have a suffocating effect.
Inhalation causes narcotic effect/intoxication.

Additional information
The product has not been tested. The information is derived from the properties of the individual components.

SECTION 12: Ecological information

12.1. Toxicity

Ecotoxicological effects

	Value	Species	Method	Validation
Fish	LC50 197 mg/l (96 h)	Cyprinus carpio		R-1234yf
Daphnia	EC50 > 83 mg/l (48 h)	Daphnia magna		R-1234yf
Algae	EC50 > 100 mg/l	Scenedesmus capricornutum (freshwater algae)		R-1234yf

12.2. Persistence and degradability

	Elimination rate	Method of analysis	Method	Validation
Physico-chemical degradability	not determined			
Biological degradability	3 % (28 d)		OECD 301 D	Not readily degradable (R-134a).

12.3. Bioaccumulative potential
Bioaccumulation improbable.
The product has not been tested. The information is derived from the properties of the individual components.

12.4. Mobility in soil
not determined
Adsorption in the soil is not likely.
The product has not been tested. The information is derived from the properties of the individual components.

12.5. Results of PBT and vPvB assessment
The substances in this mixture do not meet the PBT/vPvB criteria of REACH, annex XIII.

12.6. Other adverse effects
ODP: 0
GWP: 1387

General regulation
Use in accordance with regulation (EU) No 517/2014 on fluorinated greenhouse gases.
Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste code No.	**Name of waste**
14 06 01*	chlorofluorocarbons, HCFC, HFC

Wastes marked with an asterisk are considered to be hazardous waste pursuant to Directive 2008/98/EC on hazardous waste.

Recommendations for the product
Dispose of as hazardous waste.
Return to manufacturer.

Recommendations for packaging
Transportable pressure equipment (empty, residual pressure): Return to supplier / manufacturer.

General information
Operators of stationary equipment shall be responsible for putting in place arrangements for the proper recovery.

SECTION 14: Transport information

	ADR/RID	**IMDG**	**IATA-DGR**
14.1. UN number	1078	1078	1078
14.2. UN proper shipping name	REFRIGERANT GAS, N.O.S. (1,1,1,2-Tetrafluorethan, Pentafluorethan)	REFRIGERANT GAS, N.O.S. (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)	Refrigerant gas, n.o.s. (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)
14.3. Transport hazard class(es)	2.2	2.2	2.2
14.4. Packing group	-	-	-
14.5. Environmental hazards	No	No	No

14.6. Special precautions for user
The protective measures listed in Sections 6, 7 and 8 of the Safety Data Sheet have to be considered.

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
not applicable
No transport as bulk according IBC - Code.

Land and inland navigation transport ADR/RID
Hazard label(s) 2.2
tunnel restriction code C/E
Classification code 2A

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture
Other regulations (EU)
Regulation (EU) No 517/2014 on fluorinated greenhouse gases.
Regulation (EU) 2015/2068 establishing, pursuant to Regulation (EU) No 517/2014, the format of labels for products and equipment containing fluorinated greenhouse gases.
Regulation (EU) 2015/2067 establishing, pursuant to Regulation (EU) No 517/2014, ~ certification ~ as regards stationary refrigeration, air conditioning and heat pump equipment, and ~ containing fluorinated greenhouse gases.

VOC standard

VOC content	>=99 %	25 °C 12754 hPa

15.2. Chemical Safety Assessment

The protective measures listed in Sections 6, 7 and 8 of the Safety Data Sheet have to be considered.
Chemical safety assessments for substances in this mixture were carried out.

SECTION 16: Other information

Recommended uses and restrictions

Use in accordance with regulation (EU) No 517/2014 on fluorinated greenhouse gases.
National and local regulations concerning chemicals shall be observed.

Further information

The information contained herein is based on the state of our knowledge. It characterizes the product with regard to the appropriate safety precautions. It does not represent a guarantee of the properties of the product.

Sources of key data used

For the preparation of this safety data sheet, information from our suppliers as well as data from the "database of registered substances" of the European Chemicals Agency (ECHA) were used.

H220 Extremely flammable gas.
H280 Contains gas under pressure; may explode if heated.