

**Safety Data Sheet according to Regulation (EC)  
No. 1907/2006 (REACH)**

Printed 10.01.2018  
revision 10.01.2018 (GB) Version 2.0  
**R 452B**  
0094

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

**1.1. Product identifier**

**Name of product** R 452B  
Art-Nr(n).: 0094

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

**Identified uses**

**Remark**

Restricted to professional users.

**Recommended intended purpose(s)**

Refrigerant.

**1.3. Details of the supplier of the safety data sheet**

**Manufacturer/distributor**

GHC Gerling, Holz & Co. Handels GmbH  
Ruhrstraße 113, D-22761 Hamburg  
Phone +49 40 853 123-0, Fax +49 40 853 123-66  
E-Mail hamburg@ghc.de  
Internet www.ghc.com

**Advice**

GHC Gerling, Holz & Co. Handels GmbH  
Phone +49 40 853 123-0  
Fax +49 40 853 123-66  
E-mail (competent person):  
msds@ghc.de

**1.4. Emergency telephone number**

**Emergency advice**

Giftinformationszentrum (Poison Control Centre) Mainz  
Phone +49 6131 19240

**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

**Flam. Gas 1**      **H220**

**Liquef. Gas**      **H280**

**Hazard statements for physical hazards**

**H220**      **Extremely flammable gas.**

**H280**      **Contains gas under pressure; may explode if heated.**

**2.2. Label elements**

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



GHS02



GHS04

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**Signal word**  
**Danger**

**Hazard statements for physical hazards**  
**H220** Extremely flammable gas.  
**H280** Contains gas under pressure; may explode if heated.

**Precautionary Statements**

**Prevention**

**P210** Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

**Response**

**P377** Leaking gas fire: Do not extinguish, unless leak can be stopped safely.  
**P381** Eliminate all ignition sources if safe to do so.

**Storage**

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

**Hazardous ingredients for labeling**

2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf), Difluoromethane (R 32), Pentafluoroethane (R 125)

**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.

Receptacle under pressure.

**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]
354-33-6	206-557-8	Pentafluoroethane (R 125)	7	Liq. Gas, H280
75-10-5	200-839-4	Difluoromethane (R 32)	67	Flam.Gas1, H220 / Liq.Gas, H280
754-12-1	468-710-7	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	26	Flam. Gas 1, H220 / Liq. Gas, H280

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**REACH**

CAS No	Name	REACH registration number
354-33-6	Pentafluoroethane (R 125)	01-2119485636-25
75-10-5	Difluoromethane (R 32)	01-2119471312-47
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	01-0000019665-61

**Additional advice**

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

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**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 artificial 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.  
Seek medical treatment immediately.

**In case of eye contact**

Rinse cautiously with water for several minutes. 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:

Unconsciousness  
Cardiac arrhythmia (disordered cardiac rhythm).  
Headache  
Nausea  
Confusion  
Dizziness  
Contact with liquid may cause cold burns/frostbite.

**Physician's information / possible dangers**

Long-term inhaling of separation products may cause pulmonary oedema.  
In case of strong exposition risk of cardiac rhythm disturbances.

**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.

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**SECTION 5: Firefighting measures**

**5.1. Extinguishing media**

**Suitable extinguishing media**

Alcohol-resistant foam  
Dry powder  
Carbon dioxide  
Water spray jet

**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.

Formation of explosive gas mixtures in air.

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.

Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

Fire residues and contaminated firefighting water must be disposed of in accordance with the local regulations.

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**SECTION 6: Accidental release measures**

**6.1. Personal precautions, protective equipment and emergency procedures**

**For non-emergency personnel**

See section 8.

Evacuate area.

Keep people away and stay on the upwind side.

**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).

Suppress gases/vapours/mists with water spray jet

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

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**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 combustible.  
Formation of explosive gas mixtures in air.  
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.  
Only use containers that are approved specifically for the substance/product.  
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.  
Other material details see ISO 11114.  
All regulations and local requirements for the storage of containers have to be respected.

**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**

Ensure valve protection device is correctly fitted.  
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.

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**Information on storage stability**

At appropriate storage unlimited stability.

**7.3. Specific end use(s)**

**Recommendation(s) for intended use**

Use in accordance with regulation (EU) No 517/2014 on fluorinated greenhouse gases.

**! SECTION 8: Exposure controls/personal protection**

**8.1. Control parameters**

**DNEL-/PNEC-values**

**DNEL worker**

CAS No	Substance name	Value	Code	Remark
354-33-6	Pentafluoroethane (R 125)	16444 mg/m <sup>3</sup>	DNEL long-term inhalative (systemic)	Assessment factor 7,5
75-10-5	Difluoromethane (R 32)	7035 mg/m <sup>3</sup>	DNEL long-term inhalative (systemic)	Assessment factor 7,5, Extrapolation
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	950 mg/m <sup>3</sup>	DNEL long-term inhalative (systemic)	repeated dose toxicity.

**DNEL Consumer**

CAS No	Substance name	Value	Code	Remark
354-33-6	Pentafluoroethane (R 125)	1753 mg/m <sup>3</sup>	DNEL long-term inhalative (systemic)	Assessment factor 25
75-10-5	Difluoromethane (R 32)	750 mg/m <sup>3</sup>	DNEL long-term inhalative (systemic)	Assessment factor 25

**PNEC**

CAS No	Substance name	Value	Code	Remark
354-33-6	Pentafluoroethane (R 125)	1 mg/l	PNEC aquatic, intermittent release	Assessment factor 100, Extrapolation
		0,6 mg/kg dw	PNEC sediment, freshwater	Extrapolation
		0,1 mg/l	PNEC aquatic, freshwater	Assessment factor 1000, 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)	1,35 mg/kg dw	PNEC sediment, freshwater	
		0,135 mg/kg dw	PNEC sediment, marine water	
		0,72 mg/kg	PNEC soil	
		0,33 mg/l	PNEC aquatic, intermittent release	

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**DNEL-/PNEC-values (continued)**

CAS No	Substance name	Value	Code	Remark
		0,025 mg/l	PNEC aquatic, marine water	Assessment factor 100, assessment factor.
		0,25 mg/l	PNEC aquatic, freshwater	Assessment factor 10, assessment factor.

**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**

Leather gloves  
Protective gloves complying with EN 374.  
Protective gloves against cold complying with EN 511.

**Eye protection**

Schutzbrille nach EN 166, bei erhöhter Gefährdung zusätzlich Gesichtsschutzschild.

**Other protection measures**

Safety shoes with steel toe.  
Body covering work clothing, or chemical resistant suit at increased risk complying with EN 14605.

**Thermal hazards**

Contact with the liquid phase may cause cold burns / frostbite.

**Appropriate engineering controls**

Transfer and handle only in enclosed systems.  
Industrial ventilation (local ventilation).

**SECTION 9: Physical and chemical properties**

**9.1. Information on basic physical and chemical properties**

<b>Appearance</b> Gaseous / liquefied under pressure.	<b>Colour</b> colourless	<b>Odour</b> ethereal
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**Odour threshold**

not determined

**Important health, safety and environmental information**

	Value	Temperature	at	Method	Remark
<b>pH value</b>	not applicable				
<b>Acid number</b>	not applicable				
<b>boiling point</b>	-51 °C		1013 hPa		

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	Value	Temperature	at	Method	Remark
<b>melting point</b>	not determined				
<b>Flash point</b>	not applicable				
<b>Vapourisation rate</b>	> 1 cm/s				CCI4=1
<b>Flammable (solid)</b>	not applicable				
<b>Flammability (gas)</b>					flammable.
<b>Ignition temperature</b>	not determined				
<b>Self ignition temperature</b>	not determined				
<b>Lower explosion limit</b>	12 Vol-%			ASTM E-681	
<b>Upper explosion limit</b>	23,3 Vol-%			ASTM E-681	
<b>Vapour pressure</b>	15987 hPa	25 °C			
<b>Relative density</b>	0,99 g/cm <sup>3</sup>	25 °C			
<b>Bulk density</b>	not applicable				
<b>Vapour density</b>	not determined				
<b>Solubility in water</b>	not determined				
<b>Solubility/other</b>	not determined				
<b>Partition coefficient n-octanol/water (log P O/W)</b>	not applicable				
<b>Decomposition temperature</b>	not determined				
<b>Viscosity</b>	not applicable				
<b>Oxidising properties</b>	no				
<b>Explosive properties</b>	no				



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**9.2. Other information**

Vapours are heavier than air.

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**SECTION 10: Stability and reactivity**

**10.1. Reactivity**

See section "Possibility of hazardous reactions".

**10.2. Chemical stability**

Stable under recommended conditions of use and storage (see section 7).

**10.3. Possibility of hazardous reactions**

May react violently with oxidants.

May form an explosive mixture with air.

Reactions with alkali metals.

Reactions with earth alkali metals.

Reactions with metals in powder form.

Reactions with metal salts in powder form.

Reactions with alkalies.

**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

Carbonyl fluoride

**Thermal decomposition**

Remark No decomposition if used as directed.

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**! SECTION 11: Toxicological information**

**11.1. Information on toxicological effects**

**Acute toxicity/Irritation/Sensitization**

	Value/Validation	Species	Method	Remark
<b>LD50 acute oral</b>	not applicable			
<b>LD50 acute dermal</b>	not applicable			

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	Value/Validation	Species	Method	Remark
<b>LC50 acute inhalation</b>	> 520000 ppm (4 h)	rat (male / female)	OECD 403	Information concerns to main component.
<b>Skin irritation</b>	low irritant effect - not necessary to label			R-1234yf
<b>Eye irritation</b>	low irritant - no labeling duty			R-1234yf
<b>Skin sensitization</b>	not determined			
<b>Sensitization respiratory system</b>	not determined			

**Subacute Toxicity - Carcinogenicity**

	Value	Species	Method	Validation
<b>Subchronic Toxicity</b>	NOAEL 49100 ppm (91 d) Inhalation Information concerns to main component.	Rat (male / female)	OECD 413-6 h/d, 5 d/w	No effects of toxicological significance.
<b>Mutagenicity</b>	NOAEL 150000 ppm (6 h) Inhalation. Information concerns to main component.	Mouse	OECD 474	No experimental information on genotoxicity in vitro available.
<b>Reproduction-Toxicity</b>	NOAEL 49600 ppm Inhalation. Information concerns to main component.	Rat (male / female)	TSCA 798 4420	No indications of toxic effects were observed in reproduction studies in animals.

**Carcinogenicity**

No indications of carcinogenic effects are available from long-term trials.

**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

**Experiences made from practice**

May cause frostbite.

The inhalation of gas / vapour in high concentrations may cause cardiac sensitization (dogs).

Gases have a suffocating effect.

Inhalation causes narcotic effect/intoxication.

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**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
<b>Fish</b>	LC50 1507 mg/l (96 h)	freshwater fish	QSAR	Information concerns to main component.
<b>Daphnia</b>	EC50 652 mg/l (48 h)	Daphnia magna	QSAR	Information concerns to main component.
<b>Algae</b>	EC50 142 mg/l (96 h)	Selenastrum capricornutum	QSAR	Information concerns to main component.

**12.2. Persistence and degradability**

	Elimination rate	Method of analysis	Method	Validation
<b>Physico-chemical degradability</b>	not determined			
<b>Biological degradability</b>	5 % (5 - 28 d) Data refer to the components of the mixture.		OECD 301 D	not readily degradable
<b>Degradability</b>	not determined			

**12.3. Bioaccumulative potential**

Does not bioaccumulate.

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

**12.4. Mobility in soil**

High mobility

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: 698,3

**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.**

14 06 01\*

**Name of waste**

chlorofluorocarbons, HCFC, HFC

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

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**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**

	<b>ADR/RID</b>	<b>IMDG</b>	<b>IATA-DGR</b>
<b>14.1. UN number</b>	3161	3161	3161
<b>14.2. UN proper shipping name</b>	LIQUEFIED GAS, FLAMMABLE, N.O.S. (Difluormethan, 2,3,3,3- Tetrafluorpropen, Pentafluorethan)	LIQUEFIED GAS, FLAMMABLE, N.O.S. (Difluoromethane, 2,3,3,3- Tetrafluorprop-1-ene, Pentafluoroethane)	Liquefied gas, flammable, n.o.s. (Difluoromethane, 2,3,3,3-Tetrafluorprop-1- ene, Pentafluoroethane)
<b>14.3. Transport hazard class(es)</b>	2.1	2.1	2.1
<b>14.4. Packing group</b>	-	-	-
<b>14.5. Environmental hazards</b>	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) 2.1  
tunnel restriction code B/D  
Classification code 2F

**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 (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), Annex XVII No 40.  
Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances.  
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 17010 hPa

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**Remark**

Information concerns to main component.

**15.2. Chemical Safety Assessment**

No chemical safety assessment has been carried out for this mixture.

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

An exposure scenario is not required.

Chemical safety assessments for substances in this mixture were carried out.

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**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.

Indication of changes: "!" = Data changed compared with the previous version. Previous version: 1.0

**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.