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

1.1 Product identifier

Trade name/designation R 513A

Art-Nr(n). 0091

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

* **Use of the substance/mixture**
Refrigerant

1.3 Details of the supplier of the safety data sheet

Supplier
GHC Gerling, Holz & Co. Handels GmbH
Ruhrstraße 113
D-22761 Hamburg
Telephone +49 40 853 123 0
E-mail hamburg@ghc.de
Website www.ghc.com

Department responsible for information:
GHC Gerling, Holz & Co. Handels GmbH
Telephone +49 40 853 123 0

E-mail (competent person):
msds@ghc.de

* 1.4 Emergency telephone number

EN: Poison Information Center Mainz +49 6131 19240

* SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 [CLP]	Classification procedure
Press. Gas (Liq.), 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]

Hazard pictograms

GHS04

Signal word
Warning

Hazard statements
H280 Contains gas under pressure; may explode if heated.

Precautionary statements
P403 Store in a well-ventilated place.

* **Supplemental hazard information**
EIGA0357 Asphyxiant in high concentrations.
EIGA0787 Contains fluorinated greenhouse gases.
Please return container with residual pressure.
Withdrawal out of the liquid phase only.

*** 2.3 Other hazards**

*** Adverse human health effects and symptoms**
Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.
The inhalation of gas / vapour in high concentrations may cause cardiac arrhythmia.
Contact with liquid may cause cold burns/frostbite.

*** Other adverse effects**
The substance/mixture 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.

*** Results of PBT and vPvB assessment**
The substance/mixture does not contain components meeting the PBT/vPvB criteria of the Reach Regulation, Annex XIII, at levels of 0.1% or higher.

* SECTION 3: Composition / information on ingredients

3.1 Substances

not applicable

* 3.2 Mixtures

Hazardous ingredients

CAS No.	EC No.	Substance name	Concentration	Classification according to Regulation (EC) No 1272/2008 [CLP]	SCL/ M/ ATE
754-12-1	468-710-7	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	55 - 57 weight-%	Flam. Gas 1B; H221 Press. Gas (Liq.); H280	ATE(inhalation gas): > 405000 ppm
811-97-2	212-377-0	1,1,1,2-Tetrafluoroethane (R 134a)	43 - 45 weight-%	Press. Gas (Liq.); H280	

REACH No.	Substance name
01-0000019665-61	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)
01-2119459374-33	1,1,1,2-Tetrafluoroethane (R 134a)

*** Remark**
The text of the H-and EUH-phrases is shown in section 16.

* SECTION 4: First aid measures

* 4.1 Description of first aid measures

General information
Remove contaminated, saturated clothing immediately.
In the event of persistent symptoms obtain medical treatment.
First aider: Pay attention to self-protection!

Following inhalation
Remove casualty to fresh air and keep warm and at rest.
In case of respiratory standstill give artificial respiration by respiratory bag (Ambu bag) or respirator. Obtain medical assistance.

Following skin contact
In case of skin contact rinse with warm water.
In case of frostbite, wash with plenty of water; do not remove clothing.
In case of frostbite rinse with lukewarm (not hot) water for at least 15 minutes. Do not remove clothing frozen to the skin.
Thaw with lukewarm water. Apply a sterile dressing. Obtain medical assistance.

*** After eye contact**
Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical assistance.

Following ingestion
Ingestion is not considered a potential route of exposure.

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

*** Symptoms**
The following symptoms may occur in case of strong exposition:
Unconsciousness
Cardiac arrhythmias
Dizziness
Nausea
Headache

*** Effects**
Long-term inhaling of separation products may cause pulmonary oedema.

4.3 Indication of any immediate medical attention and special treatment needed

Notes for the doctor
Treat symptomatically. Antidotal dispensation.
Do not apply drugs of the adrenaline ephedrine group.

* SECTION 5: Firefighting measures

*** 5.1 Extinguishing media**

*** Suitable extinguishing media**
The product itself does not burn. The product itself does not burn. Match extinguishing measures to surrounding fire.
Extinguishing powder
Water spray jet
alcohol resistant foam
Carbon dioxide (CO_2)

Unsuitable extinguishing media
Full water jet

5.2 Special hazards arising from the substance or mixture

Hazardous combustion products
In case of fire formation of dangerous gases possible.
Carbon monoxide
Carbon dioxide (CO_2)
Hydrogen fluoride
Carbonyl fluoride

*** 5.3 Advice for firefighters**

*** Special protective equipment for firefighters**
Wear a self-contained breathing apparatus and chemical protective clothing.

*** Additional information**
If possible, shut off gas valves and move containers to a safe location.
Use water spray jet to protect personnel and to cool endangered containers.
Exposure to fire may cause rupture / explosion of the containers.
Dispose of fire residues and contaminated extinguishing water in accordance with local, official regulations.

* SECTION 6: Accidental release measures

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

*** For non-emergency personnel**
Use personal protection equipment.
Leave the danger area.
Keep people away and stay on the upwind side.

For emergency responders
Personal protection by wearing close-fitting protective clothing and breathing apparatus.
Pay attention to extension of gas especially at ground (heavier than air) and in direction of the wind.
Remove persons to safety.

*** 6.2 Environmental precautions**

If possible, stop flow of product.
Do not allow to enter into soil/subsoil.
Do not allow to enter into surface water or drains.

*** 6.3 Methods and material for containment and cleaning up**

*** For containment**
If necessary, secure leaky pressure receptacles using a salvage container.
Prevent the liquid from spreading over a wide area (set up barriers, cover sewage systems).
Limit expansion of the gas (water spray jet).

*** For cleaning up**
Leave to vapourize.
Provide adequate ventilation.

*** 6.4 Reference to other sections**

Disposal: see section 13
Personal protection equipment: see section 8

* SECTION 7: Handling and storage

*** 7.1 Precautions for safe handling**

*** Protective measures**
Use only in well-ventilated areas.
Transfer and handle product only in closed systems.
Usual measures for fire prevention.
Containers' temperature should not be increased above 50 °C.
The working pressure in the receptacle must not exceed the saturation vapour pressure of the pure product resulting at a temperature of 50 °C.
Prevent cylinders from falling over.
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 backflow into the container.
Entering 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.

*** Advices on general occupational hygiene**
When using do not eat, drink, smoke, sniff.
Wash hands before breaks and after work.
Remove contaminated clothing and protective equipment before entering eating areas.

*** 7.2 Conditions for safe storage, including any incompatibilities**

*** Requirements for storage rooms and vessels**
All regulations and local requirements for the storage of containers have to be respected.
Keep container tightly closed and in a well-ventilated place.
Containers' temperature should not be increased above 50 °C.
Prevent cylinders from falling over.
Only use containers specifically approved for the substance/product.
Information on suitable materials for receptacles and valves see ISO 11114.

Storage class
2A Gases (except aerosol dispensers and lighters)

* **Materials to avoid**
Do not store together with explosives.
Do not store together with flammable liquids.
Do not store together with flammable solids.
Do not store together with pyrophoric and self-heating substances.
Do not store together with oxidizing liquids or oxidizing solids.
Do not store together with toxic liquids or toxic solids.
Do not store together with infectious substances.
Do not store together with radioactive material.
Do not store together with food or feed.

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

* **Recommendation**
Use in accordance with regulation (EU) No 517/2014 on fluorinated greenhouse gases.
An exposure scenario is not required.

* SECTION 8: Exposure controls/personal protection

* 8.1 Control parameters

* **DNEL worker**

CAS No.	Substance name	DNEL value	DNEL type	Remark
811-97-2	1,1,1,2-Tetrafluoroethane (R 134a)	13936 mg/m³	long-term inhalative (systemic)	Assessment factor 7.5, repeated dose toxicity.
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	950 mg/m³	long-term inhalative (systemic)	Assessment factor 1, repeated dose toxicity.
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	186400 mg/m³	acute inhalative (systemic)	Assessment factor 5

* **DNEL Consumer**

CAS No.	Substance name	DNEL value	DNEL type	Remark
811-97-2	1,1,1,2-Tetrafluoroethane (R 134a)	2476 mg/m³	long-term inhalative (systemic)	Assessment factor 15, repeated dose toxicity.
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	113.1 mg/m³	long-term inhalative (systemic)	Assessment factor 2, repeated dose toxicity.
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	186400 mg/m³	acute inhalative (systemic)	Assessment factor 5

* **PNEC**

CAS No.	Substance name	PNEC Value	PNEC type	Remark
811-97-2	1,1,1,2-Tetrafluoroethane (R 134a)	0.01 mg/L	aquatic, marine water	Assessment factor 10000, assessment factor.
811-97-2	1,1,1,2-Tetrafluoroethane (R 134a)	0.1 mg/L	aquatic, freshwater	Assessment factor 1000, assessment factor.
811-97-2	1,1,1,2-Tetrafluoroethane (R 134a)	0.75 mg/kg dw	sediment, freshwater	
811-97-2	1,1,1,2-Tetrafluoroethane (R 134a)	1 mg/L	aquatic, intermittent release	Assessment factor 100, assessment factor.
811-97-2	1,1,1,2-Tetrafluoroethane (R 134a)	73 mg/L	sewage treatment plant (STP)	Assessment factor 10, assessment factor.
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	0.01 mg/L	aquatic, marine water	Assessment factor 10000, assessment factor.
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	0.1 mg/L	aquatic, freshwater	Assessment factor 1000, assessment factor.
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	0.151 mg/kg dw	sediment, marine water	
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	1 mg/L	aquatic, intermittent release	Assessment factor 100
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	1.49 mg/kg	soil	
754-12-1	2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)	1.51 mg/kg dw	sediment, freshwater	

* **8.2 Exposure controls**

Appropriate engineering controls

Technical measures to prevent exposure
Transfer and handle only in enclosed systems.

* **Personal protection equipment**

Eye/face protection
Protective goggles according to EN 166, in case of increased risk add protective face shield.

* **Hand protection**
Safety gloves according to EN 388:
Chromate-free leather

Body protection:
Safety shoes with steel toecap.
Body covering work clothing or chemical resistant suit at increased risk.

Respiratory protection
Keep self contained breathing apparatus readily available for emergency use.
Respiratory protection necessary at:
high concentrations
Respiratory protection complying with EN 137.
Do not use any filter apparatus.
In case of rescue and maintenance activities in storage containers use environment-independent breathing apparatus because of risk of suffocation due to displacement of oxygen.

* **Thermal hazards**
Use cold-resistant protective equipment.

* **Environmental exposure controls**

* **Remark**
Prevent release to the environment.

* SECTION 9: Physical and chemical properties

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

Physical state
Gaseous / liquefied under pressure.

Colour
colourless

* **Odour**
faintly of ether

Safety relevant basis data

	Value	Method	Source, Remark
Odour threshold:			not determined
Melting point/freezing point			not applicable
Boiling point or initial boiling point and boiling range	-29.2 °C pressure 1013 hPa		
flammability			none
Lower and upper explosion limit			none
Flash point			not applicable
Auto-ignition temperature			not determined
Decomposition temperature			No decomposition if used as directed.
pH			not applicable
Viscosity			not applicable

	Value	Method	Source, Remark
Solubility(ies)	Water solubility		not determined
Partition coefficient n-octanol/water (log value)			not applicable
Vapour pressure	7063.6 hPa (25°C)		
Density and/or relative density			not applicable
Relative vapour density	3.83 (25°C)		air = 1
particle characteristics			not applicable

*** 9.2 Other information**

*** Information with regard to physical hazard classes**

*** Gases under pressure**

Safety characteristics

	Value	Method, Result	Source, Remark
Critical temperature	96.5 °C		

*** Other information**
Vapours are heavier than air.

* SECTION 10: Stability and reactivity

*** 10.1 Reactivity**

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.

*** 10.2 Chemical stability**

The mixture is chemically stable under recommended conditions of storage, use and temperature.

*** 10.3 Possibility of hazardous reactions**

Must not be mixed with air or oxygen.
Danger of fire and explosion with oxidants, alkali metals and earth alkali metals.

*** 10.4 Conditions to avoid**

Heat sources / heat - risk of bursting.
Ignition sources, open flames, glowing metal surfaces, etc.

*** 10.5 Incompatible materials**

Alkali metals
Alkaline earth metal
Powdered metals
Oxidising agent, strong

10.6 Hazardous decomposition products

When handled and stored appropriately, no dangerous decomposition products are known.

* SECTION 11: Toxicological information

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

*** Acute toxicity**

*** Animal data**

	Effective dose	Method,Evaluation	Source, Remark
Acute oral toxicity			Study technically not feasible.
Acute dermal toxicity			Study technically not feasible.

	Effective dose	Method,Evaluation	Source, Remark
Acute inhalation toxicity	CAS No.754-12-1 2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf) Acute inhalation toxicity (gas) LC50: > 405000 ppm Species Rat Exposure time 4 h	OECD 403	

* **Assessment/classification**
Based on available data, the classification criteria are not met.

* **Skin corrosion/irritation**

* **Other information**
Study technically not feasible.

* **Serious eye damage/irritation**

* **Other information**
Study technically not feasible.

* **Sensitisation to the respiratory tract**

* **Other information**
No data available

* **Skin sensitisation**

* **Other information**
Study technically not feasible.

* **Germ cell mutagenicity**

	Value	Method	Result / Evaluation	Remark
In vitro mutagenicity/genotoxicity		OECD 473	negative	Information concerns main component.
In vivo mutagenicity/genotoxicity		OECD 474	negative	Information concerns main component.

* **Assessment/classification**
Based on available data, the classification criteria are not met.

* **Carcinogenicity**

* **Assessment/classification**
No data available

* **Reproductive toxicity**

Animal data

	Value	Method	Result / Evaluation	Remark
Reproductive toxicity	inhalative NOAEC 50000 ppm Species Rat	OECD 416		Information concerns main component.

* **STOT-single exposure**

* **STOT SE 1 and 2**

* **Assessment/classification**
Based on available data, the classification criteria are not met.

* **STOT-repeated exposure**

* **Animal data**

	Effective dose	Method	Specific effects:	Organs affected:	Source, Remark
Inhalative specific target organ toxicity (repeated exposure)	NOAEL(C): > 50000 ppm Species Rat				Information concerns main component.

* **Assessment/classification**
Based on available data, the classification criteria are not met.

* **Aspiration hazard**

* **Assessment/classification**
Study technically not feasible.

11.2 Information on other hazards

Symptoms related to the physical, chemical and toxicological characteristics

* **Additional information**
The inhalation of gas / vapour in high concentrations may cause cardiac arrhythmia.
Inhalation causes narcotic effects/intoxication.

* **Other 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**

* **Aquatic toxicity**

	Effective dose	Method,Evaluation	Source, Remark
Acute (short-term) fish toxicity	LC50: > 197 mg/L Species Cyprinus carpio (Common Carp) Test duration 96 h	OECD 203	Information concerns main component.
Chronic (long-term) fish toxicity	not determined		
Acute (short-term) toxicity to crustacea	EC50 > 100 mg/L Species Daphnia magna (Big water flea) Test duration 48 h	OECD 202	Information concerns main component.
Chronic (long-term) toxicity to aquatic invertebrate	not determined		
Acute (short-term) toxicity to algae and cyanobacteria	EC50 > 100 mg/L Species Pseudokirchneriella subcapitata Test duration 72 h	OECD 201	Information concerns main component.
Chronic (long-term) toxicity to aquatic algae and cyanobacteria	not determined		
Toxicity to other aquatic plants/organisms	not determined		
Toxicity to microorganisms	not determined		

* **12.2 Persistence and degradability**

	Value	Method	Source, Remark
Biodegradation	Degradation rate < 5 % Test duration 28 d	OECD 301F/ ISO 9408/ EEC 92/69/V, C.4-D	CAS No.754-12-1 2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf)
Biodegradation	Degradation rate 3 % Test duration 28 d	OECD 301 D	CAS No.811-97-2 1,1,1,2-Tetrafluoroethane (R 134a)

* **Assessment/classification**
Not readily biodegradable (according to OECD criteria)

* **12.3 Bioaccumulative potential**

* **Assessment/classification**
Based on the n-octanol/water partition coefficients of the individual components of the mixture, accumulation in organisms is not expected.

* **12.4 Mobility in soil**

	Value	Distribution	Transport type	Method	Remark
Half-life time in soil	CAS No.811-97-2 1,1,1,2-Tetrafluoroethane (R 134a) 37.26 L/kg			KOC value	
Half-life time in soil	CAS No.754-12-1 2,3,3,3-Tetrafluoroprop-1-ene (R 1234yf) < 18			KOC value	

* **12.5 Results of PBT and vPvB assessment**

The substance/mixture does not contain components meeting the PBT/vPvB criteria of the Reach Regulation, Annex XIII, at levels of 0.1% or higher.

* **12.6 Endocrine disrupting properties**

	Effective dose	Method,Evaluation	Source, Remark
Endocrine disrupting properties			See section 2.3

* **12.7 Other adverse effects**

	Value	Method	Source, Remark
Ozone depletion potential (ODP):	0		
Global warming potential (GWP)	632		

* **Additional ecotoxicological information**

* **Additional information**
The product has not been tested. The data are derived from the individual components of the mixture.

* SECTION 13: Disposal considerations

* **13.1 Waste treatment methods**

Waste codes/waste designations according to EWC/AVV

Waste code product	Waste name
140601 *	chlorofluorocarbons, HCFC, HFC

* **Appropriate disposal / Product**
Waste disposal according to directive 2008/98/EC, covering waste and dangerous waste.
Prevent release to the environment. No disposal via the sewage.
Disposal according to local regulations.

Appropriate disposal / Package
Transportable pressure equipment (empty, residual pressure): Return to supplier / manufacturer.

* SECTION 14: Transport information

	Land transport (ADR/RID)	Sea transport (IMDG)	Air transport (ICAO-TI / IATA-DGR)
14.1 UN number or ID number	UN 1078	UN 1078	UN 1078
14.2 UN proper shipping name	REFRIGERANT GAS, N.O.S.	REFRIGERANT GAS, N.O.S.	Refrigerant gas, n.o.s.

	Land transport (ADR/RID)	Sea transport (IMDG)	Air transport (ICAO-TI / IATA-DGR)
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 Maritime transport in bulk according to IMO instruments

No carriage in bulk.

Land transport (ADR/RID)

UN number or ID number	UN 1078
UN proper shipping name	REFRIGERANT GAS, N.O.S.
Transport hazard class(es)	2.2
Hazard label(s)	2.2
Classification code	2A
Packing group	-
Environmental hazards	No
Limited quantity (LQ)	120 ml
Special provisions	274, 582, 662
Tunnel restriction code	C/E

* **Sea transport (IMDG)**

UN number or ID number	UN 1078
UN proper shipping name	REFRIGERANT GAS, N.O.S.
Transport hazard class(es)	2.2
Packing group	-
Environmental hazards	No
Limited quantity (LQ)	120 ml
Marine pollutant	No
EmS	F-C, S-V

Air transport (ICAO-TI / IATA-DGR)

UN number or ID number	UN 1078
UN proper shipping name	Refrigerant gas, n.o.s.
Transport hazard class(es)	2.2
Packing group	-
Environmental hazards	No

* SECTION 15: Regulatory information

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

*** EU legislation**

* **Restrictions of occupation**
Observe employment restrictions under the Maternity Protection Directive (92/85/EEC) for expectant or nursing mothers.
Observe restrictions to employment for juvenils according to the 'juvenile work protection guideline' (94/33/EC).

* **Other regulations (EU)**

* **To follow:**
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.
National and local regulations concerning chemicals shall be observed.

* **Directive 2010/75/EU on industrial emissions [Industrial Emissions Directive] VOC**
VOC-value ≥ 99 %

* **15.2 Chemical Safety Assessment**

* **National regulations**

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

* SECTION 16: Other information

Key literature references and sources for data
Information from our suppliers and data from the "GESTIS Substances Database" and the "Registered Substances" database of the European Chemicals Agency (ECHA) were used to create this safety data sheet.

* **Classification for mixtures and used evaluation method according to regulation (EC) No 1272/2008 [CLP]**
The mixture was classified by the manufacturer.

* **Additional 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.

Relevant H- and EUH-phrases (Number and full text)

H221	Flammable gas.
H280	Contains gas under pressure; may explode if heated.

Indication of changes
* Data changed compared with the previous version