

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

1/17

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1 Product identifier**

Product name: C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Trade name: R437A

Other Name: R437A, HFC-134a 78,5 % (w/w); HFC-125 19,5 % (w/w); R-600 1,4 % (w/w); R-601 0,6 % (w/w)

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

Identified uses: Industrial and professional. Perform risk assessment prior to use.
Refrigerant.

Uses advised against: Consumer use.

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

AS Eesti AGA
Pärnu mnt. 141
11314 TALLINN Estonia

Telephone: +3726504500

E-mail: aga@aga.ee

1.4 Emergency telephone number: Poison Information Centre: tel. 16662, (24h)

SECTION 2: Hazards identification**2.1 Classification of the substance or mixture**

Classification according to Regulation (EC) No 1272/2008 as amended.

Physical Hazards

Gases under pressure

Liquefied gas

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

2.2 Label Elements

Signal Words: Warning

Hazard Statement(s): H280: Contains gas under pressure; may explode if heated.

Precautionary Statements

Prevention: None.

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014
Last revised date: 23.11.2017

Version: 1.0

SDS No.: 000010022593
2/17

Response: None.

Storage: P403: Store in a well-ventilated place.

Disposal: None.

Supplemental label information

EIGA-0783: Contains fluorinated greenhouse gases
EIGA-As: Asphyxiant in high concentrations.

2.3 Other hazards: Contact with evaporating liquid may cause frostbite or freezing of skin.

SECTION 3: Composition/information on ingredients

3.2 Mixtures

| Chemical name | Chemical formula | Concentration | CAS-No. | EC No. | REACH Registration No. | Notes |
|-------------------|------------------|---------------|----------|-----------|------------------------|-------|
| Pentane | C5H12 | 8.624,4816PPM | 109-66-0 | 203-692-4 | 01-2119459286-30 | # |
| Butane | C4H10 | 2,4980% | 106-97-8 | 203-448-7 | 01-2119474691-32 | # |
| Pentafluoroethane | C2HF5 | 16,8495% | 354-33-6 | 206-557-8 | 01-2119485636-25 | |
| Norflurane | C2H2F4 | 79,7900% | 811-97-2 | 212-377-0 | 01-2119459374-33 | |

The concentrations of the components in the SDS header, product name on page one and in section 3.2 are in mol due to regulatory requirements.
All concentrations are nominal.

This substance has workplace exposure limit(s).

PBT: persistent, bioaccumulative and toxic substance.

vPvB: very persistent and very bioaccumulative substance.

Classification

| Chemical name | Classification | | Notes |
|-------------------|----------------|---|--------|
| Pentane | CLP: | Asp. Tox. 1;H304, STOT SE 3;H336, Aquatic Chronic 2;H411, Flam. Liq. 1;H224 | Note C |
| Butane | CLP: | Flam. Gas 1;H220, Press. Gas Liquef. Gas;H280 | |
| Pentafluoroethane | CLP: | Press. Gas Liquef. Gas;H280 | |
| Norflurane | CLP: | Press. Gas Liquef. Gas;H280 | |

CLP: Regulation No. 1272/2008.

Note C: Some organic substances may be marketed either in a specific isomeric form or as a mixture of several isomers. In this case the supplier must state on the label whether the substance is a specific isomer or a mixture of isomers.

The full text for all H-statements is displayed in section 16.

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

3/17

SECTION 4: First aid measures

General: In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

4.1 Description of first aid measures

Inhalation: In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

Eye contact: Rinse the eye with water immediately. Remove contact lenses, if present and easy to do. Continue rinsing. Flush thoroughly with water for at least 15 minutes. Get immediate medical assistance. If medical assistance is not immediately available, flush an additional 15 minutes.

Skin Contact: Contact with evaporating liquid may cause frostbite or freezing of skin.

Ingestion: Ingestion is not considered a potential route of exposure.

4.2 Most important symptoms and effects, both acute and delayed: Respiratory arrest. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.

4.3 Indication of any immediate medical attention and special treatment needed

Hazards: Respiratory arrest. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling.

Treatment: Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.

SECTION 5: Firefighting measures

General Fire Hazards: Heat may cause the containers to explode.

5.1 Extinguishing media

Suitable extinguishing media: Material will not burn. In case of fire in the surroundings: use appropriate extinguishing agent.

Unsuitable extinguishing media: None.

5.2 Special hazards arising from the substance or mixture: Fire or excessive heat may produce hazardous decomposition products.

Hazardous Combustion Products: If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: Carbon oxides fluorocarbons Hydrogen fluoride ; Carbonyl difluoride

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

4/17

5.3 Advice for firefighters

Special fire fighting procedures:

In case of fire: Stop leak if safe to do so. Continue water spray from protected position until container stays cool. Use extinguishants to contain the fire. Isolate the source of the fire or let it burn out.

Special protective equipment for fire-fighters:

Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Guideline: EN 469 Protective clothing for firefighters. Performance requirements for protective clothing for firefighting. EN 15090 Footwear for firefighters. EN 659 Protective gloves for firefighters. EN 443 Helmets for fire fighting in buildings and other structures. EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.

SECTION 6: Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures:**

Evacuate area. Provide adequate ventilation. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. EN 137 Respiratory protective devices - Self-contained open-circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.

6.2 Environmental Precautions:

Prevent further leakage or spillage if safe to do so.

6.3 Methods and material for containment and cleaning up:

Provide adequate ventilation.

6.4 Reference to other sections:

Refer to sections 8 and 13.

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

5/17

SECTION 7: Handling and storage:

- 7.1 Precautions for safe handling:** Only experienced and properly instructed persons should handle gases under pressure. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Refer to supplier's handling instructions. The substance must be handled in accordance with good industrial hygiene and safety procedures. Protect containers from physical damage; do not drag, roll, slide or drop. Do not remove or deface labels provided by the supplier for the identification of the container contents. When moving containers, even for short distances, use appropriate equipment eg. trolley, hand truck, fork truck etc. Secure cylinders in an upright position at all times, close all valves when not in use. Provide adequate ventilation. Suck back of water into the container must be prevented. Do not allow backfeed into the container. Avoid suckback of water, acid and alkalis. Keep container below 50°C in a well ventilated place. Observe all regulations and local requirements regarding storage of containers. When using do not eat, drink or smoke. Store in accordance with. Never use direct flame or electrical heating devices to raise the pressure of a container. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Damaged valves should be reported immediately to the supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Keep container valve outlets clean and free from contaminants particularly oil and water. If user experiences any difficulty operating container valve discontinue use and contact supplier. Never attempt to transfer gases from one container to another. Container valve guards or caps should be in place.
- 7.2 Conditions for safe storage, including any incompatibilities:** Containers should not be stored in conditions likely to encourage corrosion. Stored containers should be periodically checked for general conditions and leakage. Container valve guards or caps should be in place. Store containers in location free from fire risk and away from sources of heat and ignition. Keep away from combustible material.
- 7.3 Specific end use(s):** None.

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

6/17

SECTION 8: Exposure controls/personal protection

8.1 Control Parameters

Occupational Exposure Limits

| Chemical name | Type | Exposure Limit Values | Source |
|---------------|------|--------------------------------------|---|
| Butane | TWA | 800 ppm 1.500 mg/m ³ | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances. (Annex of Regulation No. 293 of 18 September 2001) (11 2011) |
| Pentane | TWA | 1.000 ppm 3.000 mg/m ³ | Estonia. OELs. Occupational Exposure Limits of Hazardous Substances. (Annex of Regulation No. 293 of 18 September 2001) (11 2011) |
| | TWA | 1.000 ppm 3.000 mg/m ³ | EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (12 2009) |

DNEL-Values

| Critical component | Type | Value | Remarks |
|--------------------|---|-------------------------|------------------------|
| Pentane | Worker - inhalative, long-term - systemic | 3000 mg/m ³ | - |
| | Worker - dermal, long-term - systemic | 432 mg/kg bw/day | - |
| Pentafluoroethane | Workers - Inhalation, Systemic, long-term | 16444 mg/m ³ | Repeated dose toxicity |
| Norflurane | Worker - inhalative, long-term - systemic | 13936 mg/m ³ | - |

PNEC-Values

| Critical component | Type | Value | Remarks |
|--------------------|------------------------------|------------|---------|
| Pentane | Aquatic (freshwater) | 230 µg/l | - |
| | Soil | 0,55 mg/kg | - |
| | Sediment (marine water) | 1,2 mg/kg | - |
| | Sewage treatment plant | 3600 µg/l | - |
| | Sediment (freshwater) | 1,2 mg/kg | - |
| | Aquatic (marine water) | 230 µg/l | - |
| | Aquatic (intermit. releases) | 880 µg/l | - |
| Pentafluoroethane | Aquatic (intermit. releases) | 1 mg/l | - |
| | Aquatic (freshwater) | 0,1 mg/l | - |
| | Sediment (freshwater) | 0,6 mg/kg | - |
| Norflurane | Aquatic (intermit. releases) | 1 mg/l | - |
| | Sediment (freshwater) | 0,75 mg/kg | - |
| | Sewage treatment plant | 73 mg/l | - |
| | Aquatic (freshwater) | 0,1 mg/l | - |
| | Aquatic (marine water) | 0,01 mg/l | - |

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014
Last revised date: 23.11.2017

Version: 1.0

SDS No.: 000010022593
7/17

8.2 Exposure controls

Appropriate engineering controls: Consider a work permit system e.g. for maintenance activities. Ensure adequate air ventilation. Oxygen detectors should be used when asphyxiating gases may be released. Provide adequate ventilation, including appropriate local extraction, to ensure that the defined occupational exposure limit is not exceeded. Systems under pressure should be regularly checked for leakages. Preferably use permanent leak tight connections (eg. welded pipes). Do not eat, drink or smoke when using the product.

Individual protection measures, such as personal protective equipment

General information: A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered. Keep self contained breathing apparatus readily available for emergency use. Personal protective equipment for the body should be selected based on the task being performed and the risks involved.

Eye/face protection: Safety eyewear, goggles or face-shield to EN166 should be used to avoid exposure to liquid splashes. Wear eye protection to EN 166 when using gases. Guideline: EN 166 Personal Eye Protection.

Skin protection

Hand Protection: Wear working gloves while handling containers
Guideline: EN 388 Protective gloves against mechanical risks.

Body protection: No special precautions.

Other: Wear safety shoes while handling containers
Guideline: ISO 20345 Personal protective equipment - Safety footwear.

Respiratory Protection: Not required.

Thermal hazards: No precautionary measures are necessary.

Hygiene measures: Specific risk management measures are not required beyond good industrial hygiene and safety procedures. Do not eat, drink or smoke when using the product.

Environmental exposure controls: For waste disposal, see section 13 of the SDS.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state: Gas
Form: Liquefied gas
Color: C4H10: Colorless
C2HF5: Colorless
C2H2F4: Colorless
C5H12: Colorless

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014
Last revised date: 23.11.2017

Version: 1.0

SDS No.: 000010022593
8/17

| | |
|--|--|
| Odor: | C4H10: Gasoline-like or natural gas odor C5H12: Gasoline-like odor C2HF5: faint ethereal C2H2F4: faint ethereal |
| Odor Threshold: | Odor threshold is subjective and is inadequate to warn of over exposure. |
| pH: | not applicable. |
| Melting Point: | No data available. |
| Boiling Point: | No data available. |
| Sublimation Point: | not applicable. |
| Critical Temp. (°C): | No data available. |
| Flash Point: | Not applicable to gases and gas mixtures. |
| Evaporation Rate: | Not applicable to gases and gas mixtures. |
| Flammability (solid, gas): | Non-Flammable Gas |
| Flammability Limit - Upper (%): | not applicable. |
| Flammability Limit - Lower (%): | not applicable. |
| Vapor pressure: | No reliable data available. |
| Vapor density (air=1): | 3,65 (calculated) (15 °C) |
| Relative density: | No data available. |
| Solubility(ies) | |
| Solubility in Water: | No data available. |
| Partition coefficient (n-octanol/water): | Not known. |
| Autoignition Temperature: | not applicable. |
| Decomposition Temperature: | Not known. |
| Viscosity | |
| Kinematic viscosity: | No data available. |
| Dynamic viscosity: | No data available. |
| Explosive properties: | Not applicable. |
| Oxidizing properties: | not applicable. |

9.2 Other information: Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

| | |
|--|---|
| 10.1 Reactivity: | No reactivity hazard other than the effects described in sub-section below. |
| 10.2 Chemical Stability: | Stable under normal conditions. |
| 10.3 Possibility of hazardous reactions: | None. |
| 10.4 Conditions to avoid: | Open flames and high energy ignition sources. The product is not flammable in air under ambient conditions of temperature and pressure. When pressurised with air or oxygen, the mixture may become flammable. Certain mixtures of HCFCs or HFCs with chlorine may become flammable or reactive under certain conditions. |

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

9/17

- 10.5 Incompatible Materials:** No reaction with any common materials in dry or wet conditions. Alkali metals. Alkali earth metals. Chemically-active metals (such as calcium, powdered aluminum, zinc, and magnesium)
- 10.6 Hazardous Decomposition Products:** Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

General information: None.

11.1 Information on toxicological effects**Acute toxicity - Oral
Product**

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

Component Information

Pentane

LD 50 (Rat): > 2.000 mg/kg Remarks: Experimental result, Key study

**Acute toxicity - Dermal
Product**

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

**Acute toxicity - Inhalation
Product**

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

Component Information

Pentane

LC 50 (Rat, 4 h): > 25,3 mg/l Remarks: Vapor Read-across based on grouping of substances (category approach), Key study

Repeated dose toxicity**Component Information**

Pentane

NOAEL (Rat, Inhalation): 30 mg/l Inhalation Read-across based on grouping of substances (category approach), Key study

Butane

NOAEL (Rat(Female, Male), Inhalation, >= 42 d): 16.000 ppm(m) Inhalation Experimental result, Key study

Pentafluoroethane

NOAEL (Rat(Female, Male), Inhalation, 13 Weeks): >= 50.000 ppm(m) Inhalation Experimental result, Key study

Norflurane

NOAEL (Rat(Male), Inhalation, 14 d): 100.000 ppm(m) Inhalation Experimental result, Supporting study

**Skin Corrosion/Irritation
Product**

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

Component Information

Pentane

in vivo (Rabbit): Not classified as an Irritant Experimental result, Key study

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

10/17

Serious Eye Damage/Eye Irritation**Product** Based on available data, the classification criteria are not met.**Component Information**

Pentane in vivo (Rabbit, 48 hrs): Not irritating OECD GHS

Respiratory or Skin Sensitization**Product** Based on available data, the classification criteria are not met.**Component Information****Germ Cell Mutagenicity****Product** Based on available data, the classification criteria are not met.**Carcinogenicity****Product** Based on available data, the classification criteria are not met.**Reproductive toxicity****Product** Based on available data, the classification criteria are not met.**Specific Target Organ Toxicity - Single Exposure****Product** Based on available data, the classification criteria are not met.**Specific Target Organ Toxicity - Repeated Exposure****Product** Based on available data, the classification criteria are not met.**Aspiration Hazard****Product** Not applicable to gases and gas mixtures..**Other Relevant Toxicity Information**Norflurane Cardiac sensitisation threshold limit
40000 ppm
Beagle (dog)NOAECCardiac sensitisation threshold limit
80000 ppm
Beagle (dog)LOAEC

Light hydrocarbons like this one have been associated with cardiac sensitization in abuse situations. Hypoxia or the injection of adrenaline-like substances enhances these effects. May produce irregular heart beat and nervous symptoms.

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

11/17

Pentafluoroethane Cardiac sensitisation threshold limit
100000 ppm
Beagle (dog)NOAEC

Cardiac sensitisation threshold limit
75000 ppm
Beagle (dog)LOAEC

Light hydrocarbons like this one have been associated with cardiac sensitization in abuse situations. Hypoxia or the injection of adrenaline-like substances enhances these effects. May produce irregular heart beat and nervous symptoms.

SECTION 12: Ecological information**12.1 Toxicity****Acute toxicity****Product**

No ecological damage caused by this product.

Acute toxicity - Fish**Component Information**

Pentane

LC 50 (Oncorhynchus mykiss, 96 h): 4,26 mg/l (Static renewal) Remarks: Experimental result, Supporting study

Butane

LC 50 (Various, 96 h): 147,54 mg/l (QSAR) Remarks: QSAR QSAR, Key study

Pentafluoroethane

LC 50 (Oncorhynchus mykiss, 96 h): 450 mg/l (semi-static) Remarks: Read-across from supporting substance (structural analogue or surrogate), Weight of Evidence study

Norflurane

LC 50 (Oncorhynchus mykiss, 96 h): 450 mg/l (semi-static) Remarks: Experimental result, Key study

Acute toxicity - Aquatic Invertebrates**Component Information**

Pentane

EC 50 (Daphnia magna, 48 h): 9,1 mg/l (Static) Remarks: Experimental result, Supporting study
EC 50 (Water flea (Daphnia magna), 48 h): 2.7 mmol/m³

Butane

LC 50 (Daphnid, 48 h): 14,22 mg/l (QSAR) Remarks: QSAR QSAR, Key study

Pentafluoroethane

EC 50 (Daphnia magna, 48 h): > 200 mg/l (Static) Remarks: Read-across from supporting substance (structural analogue or surrogate), Weight of Evidence study

Norflurane

EC 50 (Daphnia magna, 24 h): 960 mg/l (Static) Remarks: Experimental result, Key study

Chronic Toxicity - Aquatic Invertebrates**Component Information**

Pentane

NOAEL (Daphnia magna, 21 d): 10,76 mg/l (QSAR) QSAR QSAR, Key study

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

12/17

Pentafluoroethane EC 50 (16 d): 12 mg/l

Toxicity to Aquatic Plants**Component Information**Pentane EC 50 (Green algae (Selenastrum capricornutum), 72 h): 10,7 mg/l
NOEC (Green algae (Selenastrum capricornutum), 72 h): 2,04 mg/l

Butane LC50 (Alga, 72 h): 7,7 mg/l

Pentafluoroethane EC 50 (Green Algae, 72 h): 142 mg/l

12.2 Persistence and Degradability**Product**

Not applicable to gases and gas mixtures..

Photodegradation**Component Information**

Pentane Non-significant photolysis

Stability in water**Component Information**

Pentane 87 %Non-significant hydrolysis

12.3 Bioaccumulative potential**Product**

The subject product is expected to biodegrade and is not expected to persist for long periods in an aquatic environment.

Bioconcentration Factor (BCF)**Component Information**

Pentane Pimephales promelas, Bioconcentration Factor (BCF): 171 Aquatic sediment QSAR, Key study

12.4 Mobility in soil**Product**

Because of its high volatility, the product is unlikely to cause ground or water pollution.

Component Information

Pentane Henry's Law Constant: 7.010 MPa (25 °C)

Norflurane Henry's Law Constant: 8.580 MPa (25 °C)

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

Not classified as PBT or vPvB.

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

13/17

12.6 Other adverse effects:

Global Warming Potential

Global warming potential: 1.805,1
Contains fluorinated greenhouse gases When discharged in large quantities may contribute to the greenhouse effect. For GWP value of mixture and quantities, refer to container label.

Component Information

Pentane

EU. F-Gases Subject to Emission Limits/Reporting (Annexes I, II), Regulation 517/2014/EU on FGGs

- Global warming potential: 5 100-yr

Butane

EU. F-Gases Subject to Emission Limits/Reporting (Annexes I, II), Regulation 517/2014/EU on FGGs

- Global warming potential: 4 100-yr

Pentafluoroethane

EU. F-Gases Subject to Emission Limits/Reporting (Annexes I, II), Regulation 517/2014/EU on FGGs

- Global warming potential: 3500 Annex 1: Fluorinated greenhouse gases referred to in Point 1 of Article 2; Section 1:Hydrofluorocarbons (HFCs) and its mixtures

Norflurane

EU. F-Gases Subject to Emission Limits/Reporting (Annexes I, II), Regulation 517/2014/EU on FGGs

- Global warming potential: 1430 Annex 1: Fluorinated greenhouse gases referred to in Point 1 of Article 2; Section 1:Hydrofluorocarbons (HFCs) and its mixtures

SECTION 13: Disposal considerations

13.1 Waste treatment methods

General information:

Avoid discharges to atmosphere. Do not discharge into any place where its accumulation could be dangerous. Refer to manufacturer or supplier for information on recovery or recycling.

Disposal methods:

Refer to the EIGA code of practice (Doc.30 "Disposal of Gases", downloadable at <http://www.eiga.org>) for more guidance on suitable disposal methods. Dispose of container via supplier only. Discharge, treatment, or disposal may be subject to national, state, or local laws.

European Waste Codes

Container:

14 06 01*: chlorofluorocarbons, HCFC, HFC

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

14/17

SECTION 14: Transport information**ADR**

| | |
|------------------------------------|---|
| 14.1 UN Number: | UN 3163 |
| 14.2 UN Proper Shipping Name: | LIQUEFIED GAS, N.O.S.(1,1,1,2-Tetrafluoroethane, Pentafluoroethane) |
| 14.3 Transport Hazard Class(es) | |
| Class: | 2 |
| Label(s): | 2.2 |
| Hazard No. (ADR): | 20 |
| Tunnel restriction code: | (C/E) |
| 14.4 Packing Group: | - |
| 14.5 Environmental hazards: | not applicable |
| 14.6 Special precautions for user: | - |

RID

| | |
|------------------------------------|---|
| 14.1 UN Number: | UN 3163 |
| 14.2 UN Proper Shipping Name | LIQUEFIED GAS, N.O.S.(1,1,1,2-Tetrafluoroethane, Pentafluoroethane) |
| 14.3 Transport Hazard Class(es) | |
| Class: | 2 |
| Label(s): | 2.2 |
| 14.4 Packing Group: | - |
| 14.5 Environmental hazards: | not applicable |
| 14.6 Special precautions for user: | - |

IMDG

| | |
|------------------------------------|---|
| 14.1 UN Number: | UN 3163 |
| 14.2 UN Proper Shipping Name: | LIQUEFIED GAS, N.O.S.(1,1,1,2-Tetrafluoroethane, Pentafluoroethane) |
| 14.3 Transport Hazard Class(es) | |
| Class: | 2.2 |
| Label(s): | 2.2 |
| EmS No.: | F-C, S-V |
| 14.3 Packing Group: | - |
| 14.5 Environmental hazards: | not applicable |
| 14.6 Special precautions for user: | - |

IATA

| | |
|------------------------------------|---|
| 14.1 UN Number: | UN 3163 |
| 14.2 Proper Shipping Name: | Liquefied gas, n.o.s.(1,1,1,2-Tetrafluoroethane, Pentafluoroethane) |
| 14.3 Transport Hazard Class(es): | |
| Class: | 2.2 |
| Label(s): | 2.2 |
| 14.4 Packing Group: | - |
| 14.5 Environmental hazards: | not applicable |
| 14.6 Special precautions for user: | - |
| Other information | |
| Passenger and cargo aircraft: | Allowed. |
| Cargo aircraft only: | Allowed. |

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

15/17

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code: not applicable

Additional identification: Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers ensure that they are firmly secured. Ensure that the container valve is closed and not leaking. Container valve guards or caps should be in place. Ensure adequate air ventilation.

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 Annex XVII Substances subject to restriction on marketing and use:

| Chemical name | CAS-No. | Concentration |
|---------------|----------|---------------|
| Pentane | 109-66-0 | 0,1 - 1,0% |

Directive 92/85/EEC: on the safety and health of pregnant workers and workers who have recently given birth or are breast feeding.:

| Chemical name | CAS-No. | Concentration |
|---------------|----------|---------------|
| Pentane | 109-66-0 | 0,1 - 1,0% |

Directive 96/82/EC (Seveso III): on the control of major accident hazards involving dangerous substances:

| Chemical name | CAS-No. | Concentration |
|---------------|----------|---------------|
| Butane | 106-97-8 | 1,0 - 10% |
| Pentane | 109-66-0 | 0,1 - 1,0% |

Directive 98/24/EC on the protection of workers from the risks related to chemical agents at work:

| Chemical name | CAS-No. | Concentration |
|---------------|----------|---------------|
| Butane | 106-97-8 | 1,0 - 10% |
| Pentane | 109-66-0 | 0,1 - 1,0% |

National Regulations

Council Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work Directive 89/686/EEC on

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

16/17

personal protective equipment Only products that comply with the food regulations (EC) No. 1333/2008 and (EU) No. 231/2012 and are labelled as such may be used as food additives.

This Safety Data Sheet has been produced to comply with Regulation (EU) 2015/830.

15.2 Chemical safety assessment: No Chemical Safety Assessment has been carried out.

SECTION 16: Other information

Revision Information: Not relevant.

Key literature references and sources for data:

Various sources of data have been used in the compilation of this SDS, they include but are not exclusive to:

Agency for Toxic Substances and Diseases Registry (ATSDR)
(<http://www.atsdr.cdc.gov/>).

European Chemical Agency: Guidance on the Compilation of Safety Data Sheets.

European Chemical Agency: Information on Registered Substances

<http://apps.echa.europa.eu/registered/registered-sub.aspx#search>

European Industrial Gases Association (EIGA) Doc. 169 Classification and Labelling guide.

International Programme on Chemical Safety (<http://www.inchem.org/>)

ISO 10156:2010 Gases and gas mixtures - Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets.

Matheson Gas Data Book, 7th Edition.

National Institute for Standards and Technology (NIST) Standard Reference Database Number 69.

The ESIS (European chemical Substances 5 Information System) platform of the former European Chemicals Bureau (ECB) ESIS (<http://ecb.jrc.ec.europa.eu/esis/>).

The European Chemical Industry Council (CEFIC) ERICards.

United States of America's National Library of Medicine's toxicology data network TOXNET (<http://toxnet.nlm.nih.gov/index.html>)

Threshold Limit Values (TLV) from the American Conference of Governmental Industrial Hygienists (ACGIH).

Substance specific information from suppliers.

Details given in this document are believed to be correct at the time of publication.

Wording of the H-statements in section 2 and 3

| | |
|------|---|
| H224 | Extremely flammable liquid and vapor. |
| H280 | Contains gas under pressure; may explode if heated. |
| H304 | May be fatal if swallowed and enters airways. |
| H336 | May cause drowsiness or dizziness. |
| H411 | Toxic to aquatic life with long lasting effects. |

Training information: Users of breathing apparatus must be trained. The hazard of asphyxiation is often overlooked and must be stressed during operator training. Ensure operators understand the hazards.

Classification according to Regulation (EC) No 1272/2008 as amended.

Press. Gas Liq. Gas, H280

SAFETY DATA SHEET

C5H12 8624,4816 PPM;C4H10 2,4980 %;C2HF5 16,8495 %;C2H2F4 79,7900 %

Issue Date: 12.11.2014

Version: 1.0

SDS No.: 000010022593

Last revised date: 23.11.2017

17/17

Other information:

Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. Ensure adequate air ventilation. Ensure all national/local regulations are observed. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

Last revised date:

23.11.2017

Disclaimer:

This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.