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

1.1. Product identifier
Isobutane (R600a)
REACH Registration Number: 01-2119485395-27-XXXX

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

Use of the substance/mixture
Coolants for household appliances with low filling quantities.

Uses advised against
Only use for the intended purpose. In case of doubt please contact our responsible department.

1.3. Details of the supplier of the safety data sheet
Company name: Arthur Friedrichs Kältemittel GmbH
Street: Bei den Kämpen 22
Place: D-21220 Seevetal
Telephone: +49 (0)41 85 / 70 01-0
Telefax: +49 (0)41 85 / 70 01-22
Contact person: Abteilung Technik
E-mail: service@afk-hh.de
Internet: www.afk-hh.de

1.4. Emergency telephone number:
Poison Control Center (Mayence, GER):
+49 (0)6131-19240 (24h - de, en)
Emergency Action: In the event of a medical enquiry involving this product, please contact your doctor or local hospital accident and emergency department or the NHS enquiry service.

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture
Regulation (EC) No. 1272/2008
Hazard categories:
Flammable gas: Flam. Gas 1
Gases under pressure: Compressed gas

Hazard Statements:
Extremely flammable gas.
Contains gas under pressure; may explode if heated.

2.2. Label elements
Regulation (EC) No. 1272/2008
Signal word: Danger
Pictograms:

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

P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260 Do not breathe Gas.
P280 Wear Protection gloves, Eye protection.
P284 In case of inadequate ventilation wear respiratory protection.
P308+P313 IF exposed or concerned: Get medical advice/attention.
P410+P403 Protect from sunlight. Store in a well-ventilated place.

2.3. Other hazards

In case of insufficient ventilation and/or through use, explosive/highly flammable mixtures may develop. The vapour of the product is heavier than air and may accumulate below ground level, in pits, channels and basements in higher concentration.

As the gases are only slightly toxic, the emphasis is on burns in contact with escaping liquid gas. Inhalation of high concentrations of gases can have health impairing effects due to the reduced oxygen content. Suffocating in high concentrations.

This substance does not meet the criteria for classification as PBT or vPvB. An environmental hazard cannot be ruled out in case of improper handling or disposal.

SECTION 3: Composition/information on ingredients

3.1. Substances

Sum formula: C4H10
Molecular weight: 58,12 g/mol

Hazardous components

<table>
<thead>
<tr>
<th>CAS No</th>
<th>Chemical name</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-28-5</td>
<td>Isobutane</td>
<td>&gt;=95 %</td>
</tr>
<tr>
<td>200-857-2</td>
<td>601-004-00-0</td>
<td>01-2119485395-27-XXXX</td>
</tr>
<tr>
<td>106-97-8</td>
<td>Butane</td>
<td>&lt;=3 %</td>
</tr>
<tr>
<td>203-448-7</td>
<td>601-004-00-0</td>
<td>01-2119474691-32-XXXX</td>
</tr>
<tr>
<td>74-98-6</td>
<td>Propane</td>
<td>&lt;=2 %</td>
</tr>
<tr>
<td>200-827-9</td>
<td>601-003-00-5</td>
<td>01-2119486944-21-XXXX</td>
</tr>
</tbody>
</table>

Full text of H and EUH statements: see section 16.
**SECTION 4: First aid measures**

4.1. Description of first aid measures

**General information**
First aider: Pay attention to self-protection!

**After inhalation**
Move victim to fresh air. Put victim at rest and keep warm. Call a physician immediately. In case of irregular breathing or respiratory arrest, perform artificial respiration.

**After contact with skin**
Wash with plenty of water. Change contaminated clothing. In the event of cold damage due to contact with liquid gas, cut open and carefully remove clothing. Leave clothing stuck to the skin for the moment. Rinse the cold-damaged areas with warm (not hot) water. Do not move (no rubbing). Sterile covering, protect against further heat loss. Call a physician immediately.

**After contact with eyes**
Rinse immediately carefully and thoroughly with eye-bath or water. In case of frostbite due to direct contact with liquid gas escaping from the pressure container, firstly leave any contact lenses worn. Consult an ophthalmologist.

**After ingestion**
Not considered as a possible means of exposure.

4.2. Most important symptoms and effects, both acute and delayed
Frostbite and burns through contact with liquefied product. On inhalation of the concentrated gas: oxygen deficiency. Misuse or intentional inhalation can be fatal as a result of effects on the heart, without alarming symptoms.

Symptoms in the event of large scale exposure: unconsciousness, difficulty in breathing, agitation, headache, nausea, drowsiness, dizziness. disordered cardiac rhythm.

4.3. Indication of any immediate medical attention and special treatment needed
Treat symptomatically. To supervise the blood circulation. Do not give adrenaline or other stimulants.
SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media
- Co-ordinate fire-fighting measures to the fire surroundings.

Unsuitable extinguishing media
- Wasservollstrahl.

5.2. Special hazards arising from the substance or mixture

Extremely flammable. Vapours may form explosive mixtures with air. Heating causes rise in pressure with risk of bursting. In case of fire may be liberated: Carbon monoxide Carbon dioxide (CO2).

5.3. Advice for firefighters

In case of fire: Wear self-contained breathing apparatus. Full protective suit. Fight fire from a distance due to the risk of explosion.

Additional information
Use water spray jet to protect personnel and to cool endangered containers.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures


6.2. Environmental precautions

Do not allow uncontrolled discharge of product into the environment. If possible, stop the escape of gas. Remove all sources of ignition. Do not allow to enter into surface water or drains. Do not allow to enter into soil/subsoil.

6.3. Methods and material for containment and cleaning up

Ventilate affected area. Use only non-sparking tools.

6.4. Reference to other sections

Personal protection equipment: see section 8
Handling and storage: see section 7
For waste disposal see section 13.
SECTION 7: Handling and storage

7.1. Precautions for safe handling

Advice on safe handling
Use only in well-ventilated areas. Transfer and handle product only in closed systems. Take precautionary measures against static discharges. Ground and bond container and receiving equipment. Use only antistatically equipped (spark-free) tools. Protect pressurised gas bottles against overturning. The ventilation protection equipment, valve closing nut or the valve plug (if applicable) must be mounted correctly. Open valves slowly to avoid pressure surges. Prevent backflow into the gas container. No water in the gas container, allow access to valves, flange and other parts of equipment.

Advice on protection against fire and explosion
Combustible. Keep away from sources of ignition - No smoking. Take precautionary measures against static discharges. Vapours may form explosive mixtures with air.

7.2. Conditions for safe storage, including any incompatibilities

Requirements for storage rooms and vessels
Keep container tightly closed. Keep in a cool, well-ventilated place. Keep away from sources of ignition - No smoking. Avoid heating. Protect against direct sunlight.

Advice on storage compatibility
Do not store together with: self-igniting, flammable, explosive, infectious, radioactive, toxic, oxidising substances

Further information on storage conditions
Protect pressurised gas bottles against overturning. The ventilation protection equipment, valve closing nut or the valve plug (if applicable) must be mounted correctly.
Storage temperature: <50°C

7.3. Specific end use(s)

Coolants for household appliances with low filling quantities.
SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Exposure limits (EH40)

<table>
<thead>
<tr>
<th>CAS No</th>
<th>Substance</th>
<th>ppm</th>
<th>mg/m³</th>
<th>fibres/ml</th>
<th>Category</th>
<th>Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>106-97-8</td>
<td>Butane</td>
<td>600</td>
<td>1450</td>
<td></td>
<td>TWA (8 h)</td>
<td>WEL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>750</td>
<td>1810</td>
<td></td>
<td>STEL (15 min)</td>
<td>WEL</td>
</tr>
</tbody>
</table>

8.2. Exposure controls

- **Appropriate engineering controls**
  - Provide adequate ventilation as well as local exhaust at critical locations. If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn.
  - Transfer and handle product only in closed systems.

- **Protective and hygiene measures**
  - Change contaminated clothing. Wash hands before breaks and after work. When using do not eat or drink. When using do not smoke.

- **Eye/face protection**
  - Tight fitting safety glasses with side shields. Wear additional facial protection if facial contact with this substance is possible through splashing, spraying or material in the air.

- **Hand protection**
  - Use leather gloves to protect against injuries in handling compressed gas cylinders and against frostbite from rapidly expanding gas.

- **Skin protection**
  - Safety boots with steel toecap. Work clothing covering the entire body.

- **Respiratory protection**
  - Only required in exceptional situations, e.g. in case of inadvertent release of substances, for maintenance work in storage containers or in case of fire: Protective respiration apparatus not using surrounding air (breathing apparatus) (DIN EN 133).
9.1. Information on basic physical and chemical properties

Physical state: gaseous, pressure liquefied
Colour: colourless
Odour: characteristic

Test method
pH-Value: not applicable

Changes in the physical state
Melting point: -138.3 °C
Initial boiling point and boiling range: -11.73 °C
Sublimation point: No data available
Softening point: No data available
Flash point: -81 °C

Flammability
Solid: not applicable
Gas: Extremely flammable.

Explosive properties
In case of insufficient ventilation and/or through use, explosive/highly flammable mixtures may develop.

Lower explosion limits: 1.8 vol. %
Upper explosion limits: 8.5 vol. %
Ignition temperature: No data available

Auto-ignition temperature
Solid: not applicable
Gas: 460 °C

Decomposition temperature: No data available

Oxidizing properties
No data available

Vapour pressure: 3100 hPa
(at 20 °C)
Density (at 20 °C): 0.56 g/cm³
Bulk density: not applicable
Water solubility: <0.1 g/L
Solubility in other solvents
No data available

Partition coefficient:
No data available

Viscosity / dynamic:
No data available

Vapour density:
No data available

Evaporation rate:
not determined

9.2. Other information
No further information available.

SECTION 10: Stability and reactivity

10.1. Reactivity
No dangerous reactivity under regular conditions.

10.2. Chemical stability
The product is stable under regular conditions.

10.3. Possibility of hazardous reactions
Formation of explosive gas mixtures with air. Heating causes rise in pressure with risk of bursting.

10.4. Conditions to avoid
Avoid having contact with excessive heat, open flames, sparks or sources of ignition. Avoid exposure to light.
Take precautionary measures against static discharges.

10.5. Incompatible materials
Oxidizing agents.

10.6. Hazardous decomposition products
Carbon monoxide Carbon dioxide.
SECTION 11: Toxicological information

11.1. Information on toxicological effects

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

<table>
<thead>
<tr>
<th>CAS No</th>
<th>Chemical name</th>
<th>Exposure route</th>
<th>Dose</th>
<th>Species</th>
<th>Source</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>106-97-8</td>
<td>Butane</td>
<td>inhalative (4 h) gas</td>
<td>LC50 ppm</td>
<td>273000</td>
<td>Rat</td>
<td>GESTIS</td>
</tr>
</tbody>
</table>

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

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

Carcinogenic/mutagenic/toxic effects for reproduction
Based on available data, the classification criteria are not met.

STOT-single exposure
Based on available data, the classification criteria are not met.

STOT-repeated exposure
Based on available data, the classification criteria are not met.

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

Further information
Can cause frostbite. Suffocating in high concentrations. Inhalation causes narcotic effects/intoxication.
SECTION 12: Ecological information

12.1. Toxicity
No data available.

<table>
<thead>
<tr>
<th>CAS No</th>
<th>Chemical name</th>
<th>Aquatic toxicity</th>
<th>Dose</th>
<th>[h]</th>
<th>[d] Species</th>
<th>Source</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-28-5</td>
<td>Isobutane</td>
<td>Acute fish toxicity</td>
<td>LC50</td>
<td>27.98</td>
<td>96 h fish</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acute algae toxicity</td>
<td>ErC50</td>
<td>7.71</td>
<td>96 h algae</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability
No data available.

12.3. Bioaccumulative potential
No data available.

Partition coefficient n-octanol/water

<table>
<thead>
<tr>
<th>CAS No</th>
<th>Chemical name</th>
<th>Log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>75-28-5</td>
<td>Isobutane</td>
<td>2.8</td>
</tr>
<tr>
<td>106-97-8</td>
<td>Butane</td>
<td>2.89</td>
</tr>
<tr>
<td>74-98-6</td>
<td>Propane</td>
<td>2.36</td>
</tr>
</tbody>
</table>

12.4. Mobility in soil
No data available.

12.5. Results of PBT and vPvB assessment
This substance does not meet the criteria for classification as PBT or vPvB.

12.6. Other adverse effects
Global Warming potential (GWP): 3

Further information
An environmental hazard cannot be ruled out in case of improper handling or disposal. Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Advice on disposal
Dispose of waste according to applicable legislation.

Waste disposal number of waste from residues/unused products
160504 WASTES NOT OTHERWISE SPECIFIED IN THE LIST; gases in pressure containers and discarded chemicals; gases in pressure containers (including halons) containing hazardous substances; hazardous waste

Contaminated packaging
Transportable pressure equipment (empty, residual pressure): return to the supplier/manufacturer.
SECTION 14: Transport information

Land transport (ADR/RID)

14.1. UN number: UN 1965
14.2. UN proper shipping name: HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (Isobutane, Propane, Butane)
14.3. Transport hazard class(es): 2
14.4. Packing group: -
Hazard label: 2.1

Classification code: 2F
Special Provisions: 274 583 652 660 662
Limited quantity: 0
Excepted quantity: E0
Transport category: 2
Hazard No: 23
Tunnel restriction code: B/D

Inland waterways transport (ADN)

14.1. UN number: UN 1965
14.2. UN proper shipping name: HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (Isobutane, Propane, Butane)
14.3. Transport hazard class(es): 2
14.4. Packing group: -
Hazard label: 2.1

Classification code: 2F
Special Provisions: 274 583 660 662
Limited quantity: 0
Excepted quantity: E0
Marine transport (IMDG)

14.1. UN number: UN 1965
14.2. UN proper shipping name: HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (isobutane, propane, butane)
14.3. Transport hazard class(es): 2.1
14.4. Packing group: -
Hazard label: 2.1

Special Provisions: 274
Limited quantity: 0
Excepted quantity: E0
EmS: F-D, S-U

Air transport (ICAO-TI/IATA-DGR)

14.1. UN number: UN 1965
14.2. UN proper shipping name: HYDROCARBON GAS MIXTURE, LIQUEFIED, N.O.S. (isobutane, propane, butane)
14.3. Transport hazard class(es): 2.1
14.4. Packing group: -
Hazard label: 2.1

Special Provisions: A1
Limited quantity Passenger: Forbidden
Passenger LQ: Forbidden
Excepted quantity: E0
IATA-packing instructions - Passenger: Forbidden
IATA-max. quantity - Passenger: Forbidden
IATA-packing instructions - Cargo: 200
IATA-max. quantity - Cargo: 150 kg

14.5. Environmental hazards
ENVIRONMENTALLY HAZARDOUS: no

14.6. Special precautions for user

Follow the information given in the safety datasheet.
Prior to transport: Secure container. Ensure cylinder valve is closed and not leaking. The valve outlet cap nut or plug (where provided) is correctly fitted. The valve protection device (where provided) is correctly fitted. Provide adequate ventilation.

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

not applicable
SECTION 15: Regulatory information

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

EU regulatory information
Restrictions on use (REACH, annex XVII):
- Entry 29: Isobutane; Butane
2004/42/EC (VOC): 100 % (560 g/l)

Additional information
- Regulation (EC) No. 648/2004 (Detergents regulation): not applicable
- Regulation (EC) No. 1005/2009 on substances that lead to the depletion of the ozone layer: not applicable
- Regulation (EC) No 850/2004 on persistent organic pollutants: not applicable
- Regulation (EC) No 689/2008 of the European Parliament and of the Council concerning the export and import of dangerous chemicals: This mix contains no chemicals that are subject to the export notification procedures (annex 1).
- This mixture contains the following substances of very high concern (SVHC) which are included in the Candidate List according to Article 59 of REACH: none
- This mixture contains the following substances of very high concern (SVHC) which are subject to authorisation according to Annex XIV of REACH: none

National regulatory information
Employment restrictions:
- Observe restrictions to employment for juvenils according to the 'juvenile work protection guideline' (94/33/EC). Observe employment restrictions under the Maternity Protection Directive (92/85/EEC) for expectant or nursing mothers. Observe employment restrictions for women of child-bearing age.

Water contaminating class (D):
- - not water contaminating

Additional information
- TRGS 510 "Lagerung von Gefahrstoffen in ortsbeweglichen Behältern"
- BGR 500 "Betreiben von Arbeitsmitteln" - Kapitel 2.33 "Anlagen für den Umgang mit Gasen"
- BGV D34 "Verwendung von Flüssiggas"

15.2. Chemical safety assessment
For this substance a chemical safety assessment has been carried out.
SECTION 16: Other information

Changes
This data sheet contains changes from the previous version in section(s): 2, 12, 16.
Version 1.00 - 09.08.2013 - first creation
Version 1.01 - 24.01.2017 - General update
Version 1.02 - 02.05.2017 - changes in section 2
Version 1.03 - 15.05.2017 - changes in section 2

Abbreviations and acronyms
ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
CAS: Chemical Abstracts Service
DIN: Norm of the Deutsche Institut für Normung (German Institute for Standardization)
EC: Effective Concentration
EG: European Community (Europäische Gemeinschaft)
EN: European Norm
IATA: International Air Transport Association
IBC Code: International Code for the Construction and Equipment of ships carrying Dangerous Chemicals in Bulk
ICAO: International Civil Aviation Organization
IMDG: International Maritime Code for Dangerous Goods
ISO: Norm of the International Standards Organization
CLP: Classification, Labeling, Packaging
IUCLID: International Uniform Chemical Information Database
LC: Lethal concentration
LD: Lethal dose
log Kow: Octanol/water partition coefficient
MARPOL: Maritime Pollution Convention = Convention for the Prevention of Maritime Pollution from Ships
OECD: Organisation for Economic Co-operation and Development
PBT: Persistent, bio-cumulative, toxic
RID: Regulation Concerning the International Transport of Dangerous Goods by Rail
TRGS: Technische Regeln für Gefahrstoffe
UN: United Nations
VOC: Volatile Organic Compounds
vPvB: very persistent and very bio-cumulative
VwVwS: Administrative Regulation for Water Pollutants
WGK: German Water Hazard Class
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
EINECS: European Inventory of Existing Commercial Chemical Substances
ELINCS: European List of Notified Chemical Substances
DNEL: Derived No Effect Level
PNEC: Predicted No Effect Concentration
TLV: Threshold Limiting Value
STOT: Specific Target Organ Toxicity
Isobutane (R600a)

Revision date: 15.05.2017

Relevant H and EUH statements (number and full text)

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

Further Information

The information given in this safety data sheet is to describe the product's safety regulations. It is not for guaranteeing certain characteristics and is based on today's knowledge. The safety data sheet was generated upon information of pre-suppliers by:

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www.reacheck.eu