carbon dioxide (R744)

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

1.1. Product identifier
- carbon dioxide (R744)
- CAS No: 124-38-9
- EC No: 204-696-9

1.2. Relevant identified uses of the substance or mixture and uses advised against
- Use of the substance/mixture:
  - Reserved for industrial and professional use.
  - Coolant
- 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:
  - Gases under pressure: Liquefied gas
- Hazard Statements:
  - Contains gas under pressure; may explode if heated.

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

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

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

Contact with the liquid can cause cold burns / frostbite. 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.

SECTION 3: Composition/information on ingredients

3.1. Substances

Sum formula: CO2
Molecular weight: 44 g/mol

Hazardous components

<table>
<thead>
<tr>
<th>CAS No</th>
<th>Chemical name</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>124-38-9</td>
<td>carbon dioxide</td>
<td>100 %</td>
</tr>
<tr>
<td>204-696-9</td>
<td>Liquefied gas; H280</td>
<td></td>
</tr>
</tbody>
</table>

Full text of H and EUH statements: see section 16.

Further Information

The substance does not need registration in accordance with REACH, Annex IV and V.
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. In high concentration the gas may cause a suffocation. Victim may not be aware of asphyxiation. In contrast to substances with an exclusively suffocating effect, carbon dioxide can be a danger to life, even if normal oxygen concentrations (20 - 21%) are maintained. Carbon dioxide is physiologically effective, affects the circulation and respiratory system and has a stimulating effect on the production of carboxy - and methaemoglobin. High concentrations cause rapid circulatory insufficiency. Symptoms include headache, nausea and vomiting, which can lead to unconsciousness.

4.3. Indication of any immediate medical attention and special treatment needed
Treat symptomatically. To supervise the blood circulation.
SECTION 5: Firefighting measures

5.1. Extinguishing media

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

Unsuitable extinguishing media
- Wasservollstrahl.

5.2. Special hazards arising from the substance or mixture
- Not flammable. Heating causes rise in pressure with risk of bursting.

5.3. Advice for firefighters
- In case of fire: Wear self-contained breathing apparatus. Full protective suit.

Additional information
- Use water spray jet to protect personnel and to cool endangered containers. If possible, stop the escape of gas.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
- Provide adequate ventilation. If possible, stop the escape of gas.
- Clear the area. Keep away from unprotected people. Keep upwind.

6.2. Environmental precautions
- Do not allow uncontrolled discharge of product into the environment. If possible, stop the escape of gas.
- Danger of suffocation in case of accumulation in lowlying or closed rooms. Avoid introduction into sewage systems, water bodies, cellars or closed areas.

6.3. Methods and material for containment and cleaning up
- Ventilate affected area.

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. 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
Not flammable. Heating causes rise in pressure with risk of bursting.

Further information on handling
Always use a suitable device for transportation, even over short distances, such as cylinder trolley, forklift, crane etc.

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. Do not store under conditions that accelerate corrosion. Store upright. A valve protection ring should be present or the valve protection cap should be attached.

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)

Reserved for industrial and professional use.
Coolants for freezer cabinets and showcases in gastronomy, supermarkets, food processing, heat pumps, commercial refrigeration systems.
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>124-38-9</td>
<td>Carbon dioxide</td>
<td>5000</td>
<td>9150</td>
<td></td>
<td>TWA (8 h)</td>
<td>WEL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15000</td>
<td>27400</td>
<td></td>
<td>STEL (15 min)</td>
<td>WEL</td>
</tr>
</tbody>
</table>

8.2. Exposure controls

Appropriate engineering controls

The substance should only be handled in closed apparatus or systems. Provide adequate ventilation as well as local exhaustion at critical locations. Use detectors with alarm trigger if toxic quantities can be released.

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

Use framed 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. In case of increased risk, additionally Chemical resistant suit.

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).
SECCTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

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

Test method
pH-Value: not applicable

Changes in the physical state
Melting point: -78.5 °C
Initial boiling point and boiling range: -56.6 °C
Softening point: No data available
Flash point: not applicable

Flammability
Solid: not applicable
Gas: not applicable

Explosive properties
no explosive properties

Lower explosion limits: not applicable
Upper explosion limits: not applicable
Ignition temperature: not applicable

Auto-ignition temperature
Solid: not applicable
Gas: not applicable

Decomposition temperature: No data available

Oxidizing properties
no combustion-enhancing properties

Vapour pressure: 57300 hPa
(at 20 °C)
Density: 0.82 g/cm³
Bulk density: not applicable
Water solubility: 2 g/L
Solubility in other solvents

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Partition coefficient:</td>
<td>0,83</td>
</tr>
<tr>
<td>Viscosity / dynamic:</td>
<td>No data available</td>
</tr>
<tr>
<td>Vapour density:</td>
<td>1,52</td>
</tr>
<tr>
<td>Evaporation rate:</td>
<td>not determined</td>
</tr>
</tbody>
</table>

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

none known

10.4. Conditions to avoid

none known

10.5. Incompatible materials

none known (see ISO-11114)

10.6. Hazardous decomposition products

When used properly no hazardous products of decomposition are expected.
SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity
Based on available data, the classification criteria are not met.
In contrast to substances with an exclusively suffocating effect, carbon dioxide can be a danger to life, even if normal oxygen concentrations (20 - 21%) are maintained. Carbon dioxide is physiologically effective, affects the circulation and respiratory system and has a stimulating effect on the production of carboxy- and methaemoglobin. High concentrations cause rapid circulatory insufficiency. Symptoms include headache, nausea and vomiting, which can lead to unconsciousness.

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.
SECTION 12: Ecological information

12.1. Toxicity
No data available.

12.2. Persistence and degradability
No data available.

12.3. Bioaccumulative potential
No data available.

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): 1
Can contribute to the greenhouse effect if the escape is in high concentrations.

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.
Do not allow to escape into sewers, basements, working pits and similar places in which the accumulation of the gas could become dangerous. Can be released into the atmosphere in a well-ventilated place. Releasing large amounts into the atmosphere should be avoided.

Waste disposal number of waste from residues/unused products
160505 WASTES NOT OTHERWISE SPECIFIED IN THE LIST; gases in pressure containers and discarded chemicals; gases in pressure containers other than those mentioned in 16 05 04

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 1013
14.2. UN proper shipping name: CARBON DIOXIDE
14.3. Transport hazard class(es): 2
14.4. Packing group: -
Hazard label: 2.2

Classification code: 2A
Special Provisions: 584 653 662
Limited quantity: 120 mL
Excepted quantity: E1
Transport category: 3
Hazard No: 20
Tunnel restriction code: C/E

Inland waterways transport (ADN)

14.1. UN number: UN 1013
14.2. UN proper shipping name: CARBON DIOXIDE
14.3. Transport hazard class(es): 2
14.4. Packing group: -
Hazard label: 2.2

Classification code: 2A
Special Provisions: 584 653 662
Limited quantity: 120 mL
Excepted quantity: E1
Marine transport (IMDG)

14.1. UN number: UN 1013
14.2. UN proper shipping name: CARBON DIOXIDE
14.3. Transport hazard class(es): 2.2
14.4. Packing group: -
Hazard label: 2.2

Limited quantity: 120 mL
Excepted quantity: E1
EmS: F-C, S-V

Air transport (ICAO-TI/IATA-DGR)

14.1. UN number: UN 1013
14.2. UN proper shipping name: CARBON DIOXIDE
14.3. Transport hazard class(es): 2.2
14.4. Packing group: -
Hazard label: 2.2

Limited quantity Passenger: -
Passenger LQ: -
Excepted quantity: E1
IATA-packing instructions - Passenger: 200
IATA-max. quantity - Passenger: 75 kg
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 data sheet.
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
15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

**EU regulatory information**

**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.

**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 is not required.
SECTION 16: Other information

Changes

This data sheet contains changes from the previous version in section(s): 1,2,4,5,6,7,8,9,10,11,12,13,14,15,16.

Version 1.00 - 09.08.2013 - Creation
Version 1.01 - 17.11.2016 - General update
Version 1.02 - 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
carbon dioxide (R744)

Relevant H and EUH statements (number and full text)

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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