**SECTION 1: IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY/UNDERTAKING**

<table>
<thead>
<tr>
<th>1.1 Product identifier</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product name</strong></td>
<td>R744 - Carbon dioxide</td>
</tr>
<tr>
<td><strong>Chemical name</strong></td>
<td>CO2</td>
</tr>
<tr>
<td><strong>formula</strong></td>
<td>CAS: 124-38-9</td>
</tr>
<tr>
<td><strong>CAS reg.nro</strong></td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1.2 Relevant identified uses of the substance</th>
<th></th>
</tr>
</thead>
</table>
| **Identified uses**                          | Industrial and professional use. Perform risk assessment prior to use.  
Refrigerant. Aerosol propellant. Transfilling gas or liquid, usage as a fuel.  
Using gas alone or in mixtures for the calibration of analysis equipment.  
Formulation of mixtures with gas in pressure receptacles.  |
| **Use advised against**                      | Consumer use.  |

<table>
<thead>
<tr>
<th>1.3 Details of the supplier of the safety data sheet</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Darment Oy</strong></td>
<td></td>
</tr>
<tr>
<td><strong>VAT</strong></td>
<td>FI09368266</td>
</tr>
<tr>
<td><strong>Address</strong></td>
<td>Ruosilantie 18</td>
</tr>
<tr>
<td><strong>Postal code and city</strong></td>
<td>00390 HELSINKI</td>
</tr>
<tr>
<td><strong>Telephone</strong></td>
<td>+358 20 5588 250</td>
</tr>
<tr>
<td><strong>E-mail</strong></td>
<td><a href="mailto:info@darment.fi">info@darment.fi</a></td>
</tr>
<tr>
<td><strong>www-site</strong></td>
<td><a href="http://www.darment.eu">www.darment.eu</a></td>
</tr>
</tbody>
</table>

Emergency telephone numbers in Finland  
tel. 112  
tes. **0800 147 111**, HUS Poison Information Center (free calls), tel. **09 471 977**, open 24 h/day.

**SECTION 2: HAZARDS IDENTIFICATION**

<table>
<thead>
<tr>
<th>2.1 Classification of the substance or mixture</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Classification accordint to Regulation (EU) N:o 1272/2008 as amended.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Physical Hazards</strong></td>
<td></td>
</tr>
<tr>
<td>Gases under pressure - Liquefied gas</td>
<td></td>
</tr>
<tr>
<td>H280: Contains gas under pressure; may explode if heated.</td>
<td></td>
</tr>
</tbody>
</table>
2.2 Label Elements

<table>
<thead>
<tr>
<th>Warning label</th>
<th>Signal Words: Warning</th>
<th>Hazard Statement/s:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>H280, Contains gas under pressure; may explode if heated.</td>
</tr>
</tbody>
</table>

**Precautionary Statements**

Prevention: P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.  
Response: P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. P381: Eliminate all ignition sources if safe to do so.  
Storage: 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

#### 3.1-3.2 Substances and Mixtures (**)  

<table>
<thead>
<tr>
<th>Chemical name, trade name</th>
<th>CAS No, EC-No, REACH Reg. No</th>
<th>Concentration</th>
<th>Purity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co2 - Carbon Dioxide</td>
<td>CAS: 124-38-9 EC: 204-696-9</td>
<td>100%</td>
<td>Press. Gas, Liquefied Gas, H280</td>
</tr>
</tbody>
</table>

All concentrations are nominal. Classification, CLP Regulation No. 1272/2008.

### SECTION 4: FIRST AID MEASURES

#### 4.1 Description of first aid measures

**Inhalation:** In high concentrations may cause asphyxiation. Symptoms may include loss of mobility or 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 or emergency number. Apply artificial respiration if breathing stopped.

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

**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.
**Ingestion:** Ingestion is not considered a potential route of exposure. But in case of ingestion, seek medical advice immediately and show the safety data sheet for this product.

### 4.2 Most important symptoms an effects, acute and delayed

Respiratory arrest. Contact with liquefied gas can cause damage (frostbite) due to rapid evaporative cooling. G. Loss of coordination. In low concentrations may cause narcotic effects - dizziness, headache, unconsciousness, nausea and vomiting.

### 4.3 Indication of any immediate medical attention and special treatment needed

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

**Treatment:** Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention. Or call to emergency number and ask advice.

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**SECTION 5: FIREFIGHTING MEASURES**

**General fire hazard:**
Heat may cause the containers to explode.

### 5.1 Extinguishing media

**Suitable extinguishing media:** In case of fire in the surroundings: use appropriate extinguishing agent like water spray, fog, dry powder or foam. **Unsuitable Extinguishing media:** Carbon dioxide, water jet.

### 5.2 Special hazards arising from the substance or mixture

May explode in a fire.

### 5.3 Advice for firefighters

**Special fire fighting procedures:** In case of fire stop leak if safe to do so. Continue spraying water from protected position until container stays cool. Use extinguishant. Isolate the source of the fire or let it burn out.

Follow the internal emergency plan and general accident and emergency guidelines.

Depending on the intensity of the fire, it may be necessary to wear full protective clothing and self-contained breathing apparatus. Safety equipment and first aid equipment must be available at the minimum level.

**Firefighters** must wear standard protective equipment: a fire-resistant jacket, a helmet with a face shield, gloves and rubber boots even in an enclosed area with an oxygen device.

**Instructions:** EN 469 Protective clothing for firefighters. Requirements and test methods for fire rating. EN 15090 Safety footwear for firefighters. EN 659 Protective gloves for firefighters. EN 443 Helmets for fire fighting in houses and others constructions. Standard EN 137 Compressed air breathing apparatus - Portable open circuit compressed air devices - Requirements, testing, marking.
SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipments and emergency procedures

Evacuate area and provide good ventilation. Consider the risk of explosion - eliminate all ignition sources if safe to do so. Monitor the concentration of the released product. Prevent the substance 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. Standard 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 if it is safe to do so.

6.3 Methods and material for containment and cleaning up

Provide adequate ventilation. Eliminate ignition sources.

6.4 References to other sections

Refer to sections 8 and 13.
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.
- Containers, which contain or have contained flammable or explosive substances, must not be inerted with liquid carbon dioxide.
- Assess the risk of a potentially explosive atmosphere and the need for suitable equipment i.e. explosion-proof.
- Take precautionary measures against static discharges.
- Keep away from ignition sources (including static discharges).
- Provide electrical earthing of equipment and electrical equipment usable in explosive atmospheres.
- Use only non-sparking tools.
- Ensure the complete system is checked for leaks before use.
- 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 e.g. 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 alkalies.
- 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.
- Observe all legal and local requirements for the storage of cylinders / containers.
- 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 contaminates 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.

A reduction of about 5 bar in the pressure of liquid carbon dioxide can form solid CO2, which can clog protective equipment, piping and form dry ice in tanks.

Containers containing or having contained a flammable or explosive substance shall not be inerted with liquid carbon dioxide.

7.2 Conditions for safe storage including any incompatibilities

- All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere.
- Segregate from oxidant gases and other oxidants being stored.
- 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.
SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

<table>
<thead>
<tr>
<th>Critical component</th>
<th>Type</th>
<th>Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co2 - Carbon dioxide</td>
<td>TWA</td>
<td>5,000 ppm 9,000 mg/m³</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8 H</td>
<td>5,000 ppm 9,000 mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

PNEC Values

<table>
<thead>
<tr>
<th>Critical component</th>
<th>Type</th>
<th>Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co2 - Carbon dioxide</td>
<td>Aquatic (freshwater)</td>
<td>- mg/l</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aquatic (intermit.releases)</td>
<td>- mg/l</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sediment (freshwater)</td>
<td>- mg/kg dry weight (d.w.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Soil</td>
<td>- mg/kg (d.w.)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aquatic (marine water)</td>
<td>- mg/l</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sediment (marine)</td>
<td>- mg/kg (d.w.)</td>
<td></td>
</tr>
</tbody>
</table>

No data available.

8.2 Exposure controls

Appropriate engineering controls

- Consider a work permit system e.g. for maintenance activities.
- Ensure adequate ventilation including exhaust ventilation to ensure that the specified exposure limit value is not exceeded.
- Systems under pressure should be regularly checked for leakages.
- Keep concentrations well below lower explosion limits.
- Product to be handled in a closed system.
- Only use permanent leak tight installations.
- Gas detectors should be used when quantities of flammable gases or vapours may be released.
- Take precautionary measures against static discharges.
- Do not eat, drink or smoke when using the product.

Individual protection measures like 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 and face protection: To avoid exposure to liquid splashes, safety glasses, eye protection or face shields should be used in accordance with EN 166. (Instructions: EN 166 Personal Eye Protection.)

Hand protection: Wear working gloves while handling containers. (Guidelines: EN 388 Protective gloves against mechanical risks)

Body protection: Wear fire/flame resistant/retardant clothing. (Guidelines: EN 943 Protective clothing against liquid and gaseous chemicals, including liquid aerosols and solid particles.)

Respiratory protection: Not required.


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: Waste disposal, see sec. 13.

### SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance, physical state, form and color</td>
<td>Gas, liquefied gas, colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless; subjective, insufficient to warn of exposure. (use CO2 detectors!)</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>Subjective and inadequate to warn of over exposure.</td>
</tr>
<tr>
<td>pH</td>
<td>3,7 101 kPa (1 atm); 3,2 2370 kPa (23,4 atm)</td>
</tr>
<tr>
<td>Melting point</td>
<td>-56°C</td>
</tr>
<tr>
<td>Boiling point</td>
<td>-78,50°C</td>
</tr>
<tr>
<td>Critical temperature (°C)</td>
<td>31°C</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not applicable to gases and gas mixtures.</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Not applicable to gases and gas mixtures.</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Material is not flammable.</td>
</tr>
<tr>
<td>Flammability limit upper / lower</td>
<td>No data available.</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>45,1 bar (10°C)</td>
</tr>
<tr>
<td>Vapor density (air=1)</td>
<td>1,52 (21°C)</td>
</tr>
<tr>
<td>Relative density</td>
<td>1,512 (-56,6°C)</td>
</tr>
<tr>
<td>Solubility (ies), 25°C</td>
<td>2,9 mg/l</td>
</tr>
<tr>
<td>Partition coefficient, n-oktanol/water</td>
<td>0,83</td>
</tr>
<tr>
<td>Autoignition temperature (°C )</td>
<td>No data available.</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available.</td>
</tr>
</tbody>
</table>
Viscosity, kinematic / dynamic: No data available.
Explosive properties: Not applicable.
Oxidizing properties: Not applicable.

9.2 Other information

Gas/vapour is heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity

See 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

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

10.5 Incompatible materials

Does not react with common materials in dry or humid conditions.

10.6 Hazardous decomposition products

Under normal conditions of storage and use hazardous decomposition products should not be produced.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

General information: None.
Acute toxicity / Oral
Product: Based on the available data, the classification criteria are not met.

Acute toxicity / Dermal
Product: Based on the available data, the classification criteria are not met.

Acute toxicity / Inhalation
Product: Based on the available data, the classification criteria are not met.

Skin corrosion / Irritation
Product: Based on the available data, the classification criteria are not met.

Serious eye damage / Eye irritation
Product: Based on the available data, the classification criteria are not met.

Respiratory or skin sensitization
Product: Based on the available data, the classification criteria are not met.

Germ cell mutagenicity
Product: Based on the available data, the classification criteria are not met.

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

Reproductive toxicity
Product: Based on the available data, the classification criteria are not met.

Specific target organ toxicity – single exposure
Product: Based on the available data, the classification criteria are not met.

Specific target organ toxicity – repeated exposure
Product: Based on the available data, the classification criteria are not met.

Aspiration hazard
Product: Based on the available data, the classification criteria are not met.
### Other Relevant Toxicity Information

- 

### SECTION 12: ECOLOGICAL INFORMATION

#### 12.1 Toxicity

<table>
<thead>
<tr>
<th>Hazardous ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
</tr>
</tbody>
</table>

No ecological damage caused by this product.

#### 12.2 Persistence and degradability

Product: Not applicable to gases and gas mixtures.

#### 12.3 Bioaccumulative potential

Product: This product is expected to biodegrade and is not expected to persist for long periods in an aquatic environment. N.A.

#### 12.4 Mobility in soil

Because of its high volatility, the product is unlikely to cause groundwater pollution.

#### 12.5 Results of PBT and vPvB

Not classified as PBT or vPvB.

#### 12.6 Other adverse effects

Global Warming Potential: 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.
SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Recover is possible. In so doing, comply with the local and national regulations currently in force. General information: Do not discharge into any place where its accumulation could be dangerous. Consult supplier for specific recommendations. Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with flash back arrestor.

Disposal methods

Refer to the EIGA code of practice (Doc.30 "Disposal of Gases", 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:

SECTION 14: TRANSPORT INFORMATION, ADR 2015 ja RID 2015, IMDG 37-14, IATA/ICAO 2015

14.1 UN Number

UN 1013

14.2 UN proper shipping name

Carbon dioxide - gas R744

14.3 Transport hazard class

2 (IMDG 2.1), Labels 2.2, Hazard nr (ADF) 20, EmS No: F-C, S-V

14.4 Packing Group

-

14.5 Environmental hazards

Not applicable.

14.6 Special Precautions fo Users

Passenger and cargo aircraft: Allowed.
Cargo aircraft only: Allowed.

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

National regulations:
- 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.

EU Regulations
- Directive 96/61/EC: concerning integrated pollution prevention and control (IPPC): Article 15, European Pollution Emission Registry (EPER)

Other legislation:
- Chemicals Act 599/2013
- Chemical Regulation 675/1993
- Security seal for the cover and danger symbol for the visually impaired 414/2011
- Regulation on the names of substances 5/2010, amendment 1123/2010
- Government Decree on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and varnishes and vehicle refinishing products 837/2005.
- Government Decree on the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain activities and installations 435/2001, as amended
- Waste Act 646/2011
- Concentrations known as harmful 268/2014

15.2 Chemical safety assessment

The supplier has not performed a chemical safety assessment.
SECTION 16: OTHER INFORMATION

Revision information -
Data sources of this SDS

Safety Data Sheet provided by the manufacturer.

Legislation on hazardous chemicals valid at the time of writing.

European Chemicals Agency, Information on registered substances.

International Programme on Chemical Safety.

WWW-SOURCES
echa.europa.eu
eiga.org
esis.jrc.ec.europa.eu
eur-lex.europa.eu
atsdr.cc.gov
www.ericards.net

Rating methods of classification

Precautionary, Wording of the H-statements in section 2 and 3
H280 Contains gas under pressure; may explode if heated.

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

Training information
It is recommended that persons handling the product have minimum training in the prevention and protection of work-related hazards. This makes it easier to understand and interpret the safety data sheet and product labels. Users of breathing apparatus must be trained. Ensure all operators understand the flammability hazard.

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. Ensure equipment is adequately earthed. 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.ASHRAE: A2L
Disclaimer:
This information is provided without warranty. The data is trusted to be flawless. This information should be used to make an independent determination of the practices that protect workers and the environment.

The information contained in this MSDS is based on sources, scientific and technical knowledge, existing national and EU legislation.

The release is intended to serve the safe use of the product. We do not know or control the working methods or conditions of the users of the product. The user is always ultimately responsible for taking measures to ensure compliance with the regulations in force in the handling, storage, use and disposal of chemicals.

In this context, it is noted that the information provided in the SDS also helps employers to fulfill their obligations under Directive 98/24 / EU10 on the protection of the health and safety of workers from the risks related to chemical agents at work.

On the basis of the safety data sheet, users should be able to take the necessary measures in the field of health and safety to ensure safety and protect the environment.

The Safety Data Sheet is provided for in Article 31 of REACH Regulation (EU) No 1907/2006 and in Annex II to the Regulation.