1. Identification of the substance / preparation and company / undertaking

Product name: R22
REACH registration number: 01-2119517587-31
Company: Harp International Ltd
Gellihirion Industrial Estate
Pontypridd
Rhondda Cynon Taff
CF37 5SX
Tel: +44 (0) 1443 842255
Fax: +44 (0) 1443 841805
Email: harp@harpintl.com

Emergency phone number: +44 (0) 1270 502891 (24 hour)

Use: Refrigerant

2. Hazards identification

Classification according to Directives 67/548/EEC (DSD) and 1999/45/EC (DPD):

- **R-phrases:**
  - R59 Dangerous for the ozone layer
- **S-phrases:**
  - S57 Use appropriate container to avoid environmental contamination
  - S59 Refer to manufacturer/supplier for information on recovery/recycling
  - S60 This material and its container must be disposed of as hazardous waste
  - S61 Avoid release to the environment. Refer to special instructions/safety data sheets

This classification complies with the requirement on classification and labelling according to the Directives 67/548/EEC (DSD) and 1999/45/EC (DPD).

Classification according to Regulation (EC) No. 1272/2008 (CLP):

- **Signal word:** Warning
- **H-statements:**
  - H280 Contains gas under pressure; may explode if heated.
  - H420 Harms public health and the environment by destroying ozone in the upper atmosphere
- **P-statements:**
  - P234 Keep only in original container
  - P273 Avoid release to the environment
  - P410 Protect from sunlight. Store in a well-ventilated place
  - P403 Refer to manufacturer/supplier information on recovery/recycling

This classification complies with the requirement on classification and labelling according to the Regulation (EC) No. 1272/2008 (CLP).

Other hazards:
Asphyxiation on inhalation of high concentration by oxygen deficiency, narcotic effects on inhalation of low concentration, frostbites or cryogenic burns on contact with liquefied gas.

Additional human and environmental hazard information:

**Potential adverse physiochemical effects:**
On heating release of toxic and corrosive pyrolysis products: hydrogen chloride HCl, hydrogen fluoride HF, carbon monoxide CO, carbonyl chloride COCl₂, carbonyl fluoride COF₂, chlorine Cl₂.
Potential adverse effects on humans and possible symptoms:
Exposure to liquid or concentrated vapour may cause skin, mucosa and eye irritation. Inhalations of high vapour concentrations may cause light-headedness, giddiness, disorientation, nausea, vomiting, narcosis, cardiac dysrhythmia, hypotension and death.

Potential adverse effects on the environment:
Ozone depleting potential (OPD): 0.055; global warming potential (GWP): 1900.

3. Composition / information on ingredients

Chemical characterisation:
Description: Pressurised gas, organic halide

Ingredient(s)

<table>
<thead>
<tr>
<th>EC Name</th>
<th>EC no.</th>
<th>CAS no.</th>
<th>Amount</th>
<th>EC classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorodifluoromethane*</td>
<td>200-871-9</td>
<td>75-45-6</td>
<td>&gt;99%</td>
<td>N; R59</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EC Name</th>
<th>EC no.</th>
<th>CAS no.</th>
<th>Amount</th>
<th>GHS classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorodifluoromethane*</td>
<td>200-871-9</td>
<td>75-45-6</td>
<td>&gt;99%</td>
<td>Compr. Gas; H280</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ozone 1; H420</td>
</tr>
</tbody>
</table>

*Other names:
R22, HCFC-22, monochlorodifluoromethane, Algeon 22, Algofrene 22, Frigen 22, Solkane 22.

Molecular formula: CHClF₂
Molecular mass: 86.47 g/mol
SMILES notation: C(F)(F)Cl
InChI: InChI=1/CHClF2/c2-1(3)4/h1H

For wordings of the R-phrases and H-statements see chapter 16.

4. First aid measures

Inhalation
Remove patient from exposure, keep warm and at rest. Administer oxygen if necessary. Apply artificial respiration if breathing has ceased or shows signs of failing. Obtain immediate medical attention.

Skin contact
Thaw affected areas with water. Remove contaminated clothing. Caution: clothing may adhere to the skin in the case of freeze burns. After contact with skin, wash immediately with plenty of warm water. If irritation or blistering occur obtain medical attention.

Eye contact
Immediately irrigate with eyewash solution or clean water, holding the eyelids apart for at least 10 minutes. Obtain immediate medical attention.
**Ingestion**
Ingestion is not considered a potential route of exposure.

**Medical advice**
Symptomatic treatment and supportive therapy as indicated. Adrenaline and similar sympathomimetic drugs should be avoided following exposure as cardiac arrhythmia may result with possible subsequent cardiac arrest.

---

**5. Fire-fighting measures**

**Suitable extinguishing agents**
No restriction. All known extinguishing means can be used: water spray, carbon dioxide, extinguishing foam or powder. Product itself doesn’t burn but packaging may be flammable. Extinguishing agents should be oriented to the fire surroundings.

**For safety reasons unsuitable extinguishing agents**
Water jet

**Specific hazards by-product, combustion products or formed gases**
Exposure to fire may cause containers to rupture/explode. Non flammable, but on heating release of toxic and corrosive fumes possible: hydrogen chloride HCl, hydrogen fluoride HF, carbon monoxide CO, carbonyl chloride COCl₂, carbonyl fluoride COF₂, chlorine Cl₂.

**Specific protective equipment on fire-fighting**
Use pressure air respirator at low aeration and in closed rooms. In extreme conditions a chemical protection suit might be necessary.

---

**6. Accidental release measures**

**Personal protection**
Evacuate area, wear protective equipment, especially self-contained breathing apparatus when entering area unless atmosphere has been proved to be safe (also see section 8). Ensure adequate air ventilation.

**Environmental protection**
Try to stop release. Prevent from entering sewers, basements and workpits, or any place where accumulation can be dangerous.

**Clean-up methods**
Ventilate area.

---

**7. Handling and storage**

**Information for safe handling**
Avoid release, inhalation of gas, contact with eyes, skin and clothes, long term or repeated exposure.

**Technical protection measures**
Ensure very good ventilation of the work room to maintain exposures within occupational exposure limits.

**Rules on handling**
Prevent suck-back of water and don’t allow back feed into the container. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt and refer to suppliers container handling instructions.
Fire and explosion protection
Product is not inflammable and explosive. Avoid naked flames and hot surfaces (pressurised gas bottle).

Storage group according to the VCI (Association of Chemical Industries) cumulative storage concept
2A: pressurised, liquefied and pressure dissolved gases

Storage conditions
Prevent containers / gas bottles from falling down. Keep container below 50°C in a well-ventilated place.

Packing materials
Packing materials are to be proved on resistance before use.

Storage requirements
Don’t store in gateways, passages, stairways, hallways open to the public, roofs, attics and workrooms. Label receptacles clearly and durably. Preferably store in original receptacles.

Cumulative storage
Only substances of similar properties should be cumulatively stored. Cumulative storage with the following substances is prohibited.
- Medicinal products, food and feeding stuffs including additives
- Infective, radioactive and explosive substances
- High reactive organic peroxides and other oxidising substances

Cumulative storage with the following substances may be allowed under special conditions.
- Flammable and non-flammable solids and liquids
- Low reactive organic peroxides and other substances of low reactivity
- Other pressurised, liquefied and pressure dissolved gases and aerosol packages

The substance should not be cumulatively stored with substances where dangerous chemical reactions are possible e.g. alkali metals.

8. Exposure controls / personal protection

Occupational exposure limits

<table>
<thead>
<tr>
<th>EC name</th>
<th>EC No.</th>
<th>CAS No.</th>
<th>Type of limit value</th>
<th>8 hr TWA</th>
<th>15 min short term exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorodifluoromethane</td>
<td>200-871-9</td>
<td>75-45-6</td>
<td>OEL (European Union)</td>
<td>1000 ppm</td>
<td>Not available</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3600 mg/m³</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AGW – TRGS 900 (Germany)</td>
<td>3600 mg/m³</td>
<td>Not available</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MAK - OEL (Austria)</td>
<td>500 ppm</td>
<td>1000 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1800 mg/m³</td>
<td>3600 mg/m³</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TWA (USA / NIOSH)</td>
<td>1000 ppm</td>
<td>1250 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3500 mg/m³</td>
<td>4375 mg/m³</td>
</tr>
</tbody>
</table>


PNEC values:

| PNEC (water): | 250 ug/l | PNEC (sediment): | 416 ug/kg | PNEC (soil) | 239 ug/kg |

Technical measures to avoid exposure
Preferably handle in closed containers. Provide very good ventilation of the workroom, local exhaust necessary to maintain exposures within occupational exposure limits.

Personal protection

**Body protection**
Regular work clothing is generally sufficient.

**Respiratory protection**
Required on release of the gaseous substance. Use half mask to EN 140 or full mask to EN 136 fitted with filter to EN 143-P1. Be aware of time limits. If concentrations are above limitations of filter devices, if oxygen concentrations are below 17% or if conditions are ambiguous, use self-contained respiratory protective devices.

**Eye Protection**
Sideward closed goggles to EN 166 are required.

**Hand protection**
Gloves should comply with specifications of EU directive 89/686/EEC and EN 374. For example, on full contact 0.3mm thick butyl rubber gloves should be worn.

**Foot protection**
Foot protection is required when handling gas containers

**Skin protection**
Skin protection products are not as effective as gloves. If gloves cannot be worn, apply a water insoluble skin protection substance to clean skin before the start of work and after each break. Before breaks and at the end of shift, clean skin with soap and water.

**Occupational hygiene**
Avoid breathing the gaseous substance. Remove contaminated clothing. Don’t smoke, eat and drink in the workplace.

9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Liquefied gas</td>
</tr>
<tr>
<td>Colour</td>
<td>Colourless</td>
</tr>
<tr>
<td>Odour</td>
<td>Ethereal; poor warning properties at low concentrations</td>
</tr>
<tr>
<td>pH value at 20°C</td>
<td>n/a</td>
</tr>
<tr>
<td>Melting point / range</td>
<td>-160°C</td>
</tr>
<tr>
<td>Boiling point / range</td>
<td>-40.8°C</td>
</tr>
<tr>
<td>Critical temperature</td>
<td>96.18°C</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Flammability</td>
<td>Not applicable (Not flammable)</td>
</tr>
<tr>
<td>Auto ignition temperature</td>
<td>632-635°C</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>Not explosive</td>
</tr>
<tr>
<td>Oxidising properties</td>
<td>Not oxidising</td>
</tr>
<tr>
<td>Vapour pressure at 20°C</td>
<td>9081 hPa</td>
</tr>
<tr>
<td>Gas density at 1 atm / 20°C</td>
<td>0.0036 kg/dm³</td>
</tr>
<tr>
<td>Fluid density at 9 atm / 20°C</td>
<td>1.210 kg/dm³</td>
</tr>
<tr>
<td>Water solubility at 20°C</td>
<td>3625 mg/l</td>
</tr>
<tr>
<td>Solubility</td>
<td>Soluble in ether, acetone, chloroform</td>
</tr>
<tr>
<td>Distribution coefficient n-octanol/water $P_{ow}$</td>
<td>1.13 (CSCL Japan 1992)</td>
</tr>
<tr>
<td>Dynamic viscosity at 10°C</td>
<td>0.22 mPa*s</td>
</tr>
<tr>
<td>Explosion limits (upper &amp; lower)</td>
<td>Not determined</td>
</tr>
</tbody>
</table>
10. Stability and reactivity

Reactivity
Not reactive under normal conditions of use and storage.

Conditions to be avoided
Stable under normal conditions. Avoid open flames, high temperatures, direct sun light.

Substances to be avoided
Alkali and earth alkali metals.

Dangerous decomposition products
Hydrogen chloride HCl, hydrogen fluoride HF, carbon monoxide CO, carbonyl chloride COCl₂, carbonyl fluoride COF₂, chlorine Cl₂.

Dangerous chemical reactions
Reacts violently with alkali and alkali earth metals. Catalytic decomposition in presence of powdery aluminium and zinc.

11. Toxicological information

Toxico-kinetics, metabolism and distribution
Main exposure path by inhalation, only small <2.7% but rapidly absorbed amounts. On 4 hour inhalation by volunteers of 320 resp. 1810 mg.m⁻³ a blood concentration proportional equilibrium is adjusted within one hour. The blood concentrations approached plateaus of 0.25 ug/l and 1.36 ug/ml. The absorbed amount was relatively rapid elimination by exhalation in a three phase kinetic with half-lives of 18 sec, 12 min and 2.6 h. A small amount was excreted unchanged by the kidneys. Based on fluoride measurements in urine only very low or no metabolism was deduced (0.1-1.06%). No bioaccumulation at all was observed by any study.

Acute effects (toxicological tests)

Acute toxicity:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Species</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC₅₀ inhal. / 4 h</td>
<td>220,000 ppm</td>
<td>rat</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>LC₅₀ inhal. / 2 h</td>
<td>390,540 ppm</td>
<td>mouse</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

As chlorodifluoromethane is a gas, skin and eye administrations are not feasible.

Corrosive and irritative effects

<table>
<thead>
<tr>
<th>Intake path</th>
<th>Result</th>
<th>Species</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belly skin</td>
<td>Redness/swelling</td>
<td>Rat</td>
<td>-</td>
<td>10-sec-spray application</td>
</tr>
<tr>
<td>Eye</td>
<td>Slight irritant</td>
<td>Rabbit (albino)</td>
<td>-</td>
<td>5-10-sec exposure to liquefied gas</td>
</tr>
<tr>
<td>Skin</td>
<td>Slight irritant</td>
<td>Rabbit</td>
<td>-</td>
<td>Polypropylene capsule of the liquefied gas</td>
</tr>
<tr>
<td>Respiratory tract</td>
<td>No effects</td>
<td>Animal/human</td>
<td>-</td>
<td>No indication or case study available</td>
</tr>
</tbody>
</table>

As chlorodifluoromethane is a gas, skin and eye administrations are not feasible. The information above is based on the liquefied gas.

Sensitisation
No evidence for skin and respiratory tract sensitising potential.

Subacute to chronic toxicity
On 5h/day-5d/week-83/94 weeks-exposure of mice to 1, 1000, 10000 and 50000ppm no effects on mortality, body weight gain, haematology, biochemistry or histopathology were found. On 5h/day-5d/week-117/131 week exposure of rats to 0, 1000, 10000 and 50000 ppm no clinical effects, and no effects on mortality, haematology or biochemistry were found. At the 50000 ppm level decrease in body weight gain in males, and increased liver, kidney, adrenal and pituitary weights in females were found. Histologically non-neoplastic lesions were observed. In this study the No Observed Effect Concentration (NOAEC) was ascertained to 10000ppm.
Carcinogenicity, mutagenicity and reproductive toxicity

**Mutagenicity**

- **Bacterial mutagenicity:** *Salmonella typhimurium* positive
- **Bacterial mutagenicity:** *Scgizosaccharomyces pombe/cerevisiae* negative
- **HGPRT mutation induction:** *Chinese hamster cells* negative
- **Unscheduled DNA synthesis:** *Human EUE cell line* negative

In-vivo studies on rats and mice showed no evidence of genotoxic activity.

**Carcinogenicity**

On 5h/day-5d/week-117/131 week-exposure of rats to 0, 1000, 10000 and 50000 ppm, a slight increase was found in the incidence of fibrosarcomas in male rats to 50000 ppm. The same exposures of mice to 50000 ppm showed no significant increase in the incidence of benign or malignant tumours. The studies with male rats demonstrated a No Observed Adverse Effect Concentration (NOAEC) of 1000 ppm.

**Reproductive toxicity**

Repeated dose studies showed no significant changes in gonadal organ weights and on histopathological examinations no effects in male and female reproductive organs were observed. Also determination of follicle stimulating hormone (FSH) and luteinising hormone (LH) in blood exhibited no significant difference between exposed and control animals.

In a rabbit terogenicity assay no significant effects on dams and litters were seen in the low (100 ppm) and high (5000 ppm) exposure level groups. Three rat teratogenicity studies on 100 ppm to 20000 ppm exposures showed no evidence of maternal or foetal toxicity. The No Observed Adverse Effect Concentration (NOAEC) for maternal and development toxicity were determined 10000 ppm (two of three studies) and 20000 ppm (third study).

In litters from rat dams exposed to 50000 ppm a significant increase of anophtalmia and combined anophtalmia/microphtalmia was observed. By this study the No Observed Adverse Effect Concentration (NOAEC) for rat development toxicity was considered 1000 ppm.

**Experience from practice**

Exposures were evaluated only for workers using chlorodifluoromethane as a refrigerant and as a chemical intermediate. In over 50 years of use only a few reports on adverse health effects due to accidental exposure to extremely high inhaled levels are known.

### 12. Ecological Information

**Aquatic toxicity**

No durably damaging effects expected as chlorodifluoromethane rapidly partitions from water into air.

**Effects on sewage plants**

Concentrations in water or in sludge considered negligible and no effect on microorganisms expected. No inhibition effects observed at 180 and 400 mg/l on 24 hr exposure.

**Water damaging effects**

<table>
<thead>
<tr>
<th></th>
<th>96h-LC&lt;sub&gt;50&lt;/sub&gt;</th>
<th>48h-EC&lt;sub&gt;50&lt;/sub&gt;</th>
<th>96h-EC&lt;sub&gt;50&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish</td>
<td><em>Brachydanio rerio</em></td>
<td><em>Daphnia magna</em></td>
<td>777 mg/l</td>
</tr>
<tr>
<td>Crustacean</td>
<td></td>
<td></td>
<td>433 mg/l</td>
</tr>
<tr>
<td>Algae</td>
<td></td>
<td></td>
<td>250 mg/l</td>
</tr>
</tbody>
</table>

*Predicted with the ECOSAR v0.99g program by read-across.

**Mobility**

Distribution on environmental compartments: \( \text{log} P_{o/w} = 1.13 \)
Persistence and degradability
Biotic degradation: Not rapidly biodegradable / 0% BOD after 28 days
Abiotic degradation: Degradation initiated by reaction with hydroxyl radicals OH in troposphere, atmospheric lifetime 12 years / half-life 8.3 years.

Bioaccumulative potential
No experimental Bioconcentration Factor (BCF) available. Estimation from the correlation equation

\[ 10 \log BCF_{\text{fish}} = 0.85 \times 10 \log P_{\text{o/w}} - 0.70 \]

using the distribution coefficient \( 10 \log P_{\text{o/w}} = 1.3 \) leads to BCF = 1.8 indicating that chlorodifluoromethane does not concentrate significantly in aquatic organisms.

Result of the PBT and vPvB evaluation
Not classified PBT or vPvB acc. the criteria of REACH Annex XIII.

Other adverse effects
Ozone depleting potential: 0.055 (CFCl\(_3\) = 1) Global warming potential: 1900 (CO\(_2\) = 1)

13. Disposal considerations

Disposal of residues and wastes of the product
Do not discharge into any place where accumulation could be dangerous. Contact supplier if guidance is required. Preferably return unused product to vendor for recycling or destruction.

EWC code 14 06 01* Chlorofluorocarbons, HCFC, HFC

Disposal of contaminated packaging
Return cylinders to vendor, disposable cylinder is to be disposed according to local regulations

EWC code 15 01 10* Packaging containing residues of or contaminated by dangerous substances

Disposal of completely empty packaging
Return cylinders to vendor.

EWC code 15 01 04 Metallic packaging

14. Transport information

Transport by road / rail (ADR/RID) and by inner water ways (AND/ADNR)

| UN number:   | 1018   | Packing group: | -        |
| Class:       | 2.2    | Hazard number: | 20       |
| Label:       | 2.2    | Packing instructions: | P200     |
| Proper shipping name: | Chlorodifluoromethane (R22) | Special prescriptions: | -        |
| Limited quantities: | LQ1 (120ml per inner package) |

Transport by sea (IMDG)

| UN number:   | 1018   | Packing group: | -        |
| Class:       | 2.2    | EmS:           | FC-SV    |
| Proper shipping name: | Chlorodifluoromethane (R22) | Marine pollutant: | No       |

Transport by air

| UN number:   | 1018   | Packing group: | -        |
| Class:       | 2.2    |                |          |
| Proper shipping name: | Chlorodifluoromethane (R22) |

Remarks
Transport regulations are cited according to the international guidelines and to the form applied in Europe. Differences to other countries are not considered.
15. Regulatory information

EU Guidelines

Chemical safety assessment according to EU Regulation No.1907/2006.
A chemical safety assessment (CSA) according to part 14, par.1 of Regulation (EC) No.1907/2006 (REACH) on chlorodifluoromethane is not available.

Classification and labelling according to Directive 67/548/EEC (DSD) & 1999/45/EC (DPD)
See section 2.

Classification and labelling according to Regulation (EC) No.1272/2008 (CLP)
See section 2.

Authorisation and/or use restrictions
Controlled substance according to Regulation (EC) No.1005/2009 on substances depleting the ozone layer (ODS). Manufacture, placing on the market and use is prohibited as of 01.01.2010, e.g. as cooling liquids and foaming agents. On maintenance and serving of existing equipment recycled chlorodifluoromethane may be used until 31.12.2014. Exceptions from prohibition are manufacture, placing on the market and use as feedstock for chemical synthesis and R&D purposes.

Further EU provisions
None

Information on Directive 1999/13/EC (VOC Directive) for limitation of VOC emissions
Chlorodifluormethane as a volatile organic compound comes under the provision of this Directive.

National Regulations
Classification and labelling
The product may be due to classification and labelling according to national regulations in each case.

Other regulation and guidances
The provisions of occupational, health, environment and consumer protection shall apply to the country where the chemical substance or mixture is placed on the market.

16. Other information

Wording of the R-phrases and H-statements from chapter 3
R59 Dangerous for the ozone layer
H280 Contains gas under pressure; may explode if heated
H420 Harms public health and the environment by destroying ozone in the upper atmosphere

Recommended restriction(s) of use

Amendment information
This data sheet contains changes from the previous version, CLP01 dated May 2011. Sections 2, 3, 8, 10 & 15 were updated.

Remarks
This datasheet was prepared in accordance with Regulation (EC) No. 1907/2006.

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