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

Product name    R365mfc/227ea (87:13)

REACH registration numbers
1,1,1,3,3-Pentafluorobutane 01-0000017653-68
1,1,1,2,3,3,3-Heptafluoropropane 01-2119485489-18

Company    Harp International Ltd
Gellihirion Industrial Estate
Pontypridd
Rhomnda 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    Foaming agents

2. Hazards identification

GHS Classification

Regulation (EC) No. 1272/2008, as amended    Not classified as hazardous
EC Directive 67/548/EEC or 1999/45/EC, as amended    Classified as hazardous, R-phrase R30

Label Elements

Hazardous components    1,1,1,3,3-Pentafluorobutane (R365)
Signal word(s)    Not applicable
Hazard pictogram(s)    Not applicable
Hazard statement(s)    EUH209 Can become highly flammable in use
Precautionary statement(s)    Not applicable

3. Composition / information on ingredients

Concentration

<table>
<thead>
<tr>
<th>Substance name</th>
<th>CAS No.</th>
<th>EC No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,1,3,3-Pentafluorobutane</td>
<td>406-58-6</td>
<td>430-250-1</td>
<td>&gt;=86%</td>
</tr>
<tr>
<td>1,1,1,2,3,3,3-Heptafluoropropane</td>
<td>431-89-0</td>
<td>207-079-2</td>
<td>&lt;=14%</td>
</tr>
</tbody>
</table>

Hazardous components according to Regulation (EC) 1272/2008 as amended

<table>
<thead>
<tr>
<th>Substance name</th>
<th>Hazard class</th>
<th>Hazard category</th>
<th>H Phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,1,3,3-Pentafluorobutane</td>
<td>Flammable liquids</td>
<td>Category 2</td>
<td>H225</td>
</tr>
<tr>
<td>1,1,1,2,3,3,3-Heptafluoropropane</td>
<td>Gases under pressure</td>
<td>Liquefied gas</td>
<td>H280</td>
</tr>
</tbody>
</table>
Hazardous components according to European Directive 67/548/EEC, as amended

<table>
<thead>
<tr>
<th>Substance name</th>
<th>Classification</th>
<th>Hazard category</th>
<th>R-phrase(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,1,3,3-Pentafluorobutane</td>
<td>F</td>
<td>Highly flammable</td>
<td>R11</td>
</tr>
</tbody>
</table>

4. First aid measures

Description of first aid measures

Inhalation

Remove to fresh air. Oxygen or artificial respiration if needed. If symptoms persist, call a physician.

Skin contact

Wash off with soap and warm water. If symptoms persist, call a physician.

Eye contact

Immediately irrigate with eyewash solution or clean water, holding the eyelids apart for at least 10 minutes. Obtain immediate medical attention.

Ingestion

Clean mouth with water and drink plenty of water afterwards. If symptoms persist, call a physician.

Most important symptoms/effects, acute and delayed

Inhalation

Symptoms: narcosis. In case of higher concentrations: asphyxia.

Skin contact

Prolonged skin contact may defat the skin and produce dermatitis.

Eye contact

Slight irritation

Ingestion

Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

Indication of any immediate medical attention and specialist treatment needed

Immediate medical attention is not required

When symptoms persist or in all cases of doubt seek medical advice

5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media

Powder, foam, AFFF, Carbon dioxide (CO₂)

Unsuitable extinguishing media

Water may be ineffective.

Specific hazards arising from the substance or mixture

The product is not flammable.

Vapours are heavier than air and may spread along floors

Risk of ignition

Vapours may form explosive mixtures with air

Hazardous decomposition products formed under fire conditions.

Advice for Fire-Fighters

Wear self-contained breathing apparatus and protective suit

Full protective flameproof clothing

Wear chemical resistant oversuit

Special protective actions for fire-fighters

In case of fire, use water spray

Keep product and empty container away from heat and sources of ignition

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel

Prevent further leakage or spillage if safe to do so

Keep away from incompatible products
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Advice for emergency responders
- Evacuate personnel to safe areas
- Keep people away from and upwind of spill/leak
- Remove all sources of ignition
- Wear self-contained breathing apparatus and protective suit
- Cover the spreading liquid with foam in order to slow down the evaporation
- Ventilate area

Environmental precautions
- Should not be released into the environment
- If the product contaminates rivers and lakes or drains inform respective authorities

Methods and materials for containment and cleaning up
- Dam up
- Soak up with inert absorbent material
- Prevent product from entering drains
- Keep in properly labelled containers
- Keep in suitable closed containers for disposal

Reference to other sections
- Refer to protective measures listed in sections 7 and 8.

7. Handling and storage

Precautions for safe handling
- Use in closed system
- Use only in well-ventilated areas
- Keep away from heat and sources of ignition
- Heating can release vapours which can be ignited
- To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded
- When transferring from one container to another apply earthing measures and use conductive hose material
- Preferably transfer by pump or gravity
- Do not use sparking tools
- Keep away from incompatible products

Conditions for storage, including incompatibilities

Storage
- Store in the original container
- Keep container closed
- Keep in a cool, well-ventilated place
- Keep in a bunded area
- Keep away from incompatible products
- Keep away from heat/sparks/open flames/hot surfaces. No smoking.
- Ensure all equipment is electrically grounded before beginning transfer operations
- Take measures to prevent the build-up of electrostatic charge

Packing material
- Suitable material – steel drum

Specific use(s)
- For further information, please contact supplier.

8. Exposure controls / personal protection

Control parameters
Exposure limit values

<table>
<thead>
<tr>
<th>Substance</th>
<th>Harp acceptable exposure limit</th>
<th>EH40 workplace exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1,1,3,3-Pentafluorobutane</td>
<td>TWA = 1000 ppm</td>
<td>Not listed</td>
</tr>
<tr>
<td>1,1,1,2,3,3,3-Heptafluoropropane</td>
<td>TWA = 1000 ppm</td>
<td>Not listed</td>
</tr>
</tbody>
</table>
### Other information on limit values

**Predicted no effect concentration**

<table>
<thead>
<tr>
<th>Environment</th>
<th>Concentration</th>
<th>Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh water</td>
<td>1.2 mg/l</td>
<td>1,1,1,3,3-pentafluorobutane</td>
</tr>
<tr>
<td>Marine water</td>
<td>0.12 mg/l</td>
<td>1,1,1,3,3-pentafluorobutane</td>
</tr>
<tr>
<td>Marine sediment</td>
<td>0.737 mg/kg</td>
<td>1,1,1,3,3-pentafluorobutane</td>
</tr>
<tr>
<td>Fresh water sediment</td>
<td>7.37 mg/kg</td>
<td>1,1,1,3,3-pentafluorobutane</td>
</tr>
<tr>
<td>Soil</td>
<td>0.823 mg/kg</td>
<td>1,1,1,3,3-pentafluorobutane</td>
</tr>
<tr>
<td>Sewage treatment plants</td>
<td>5.95 mg/l</td>
<td>1,1,1,3,3-pentafluorobutane</td>
</tr>
<tr>
<td>Fresh water</td>
<td>0.1 mg/l</td>
<td>1,1,1,2,3,3,3-heptafluoropropane</td>
</tr>
<tr>
<td>Fresh water sediment</td>
<td>1.3 mg/kg</td>
<td>1,1,1,2,3,3,3-heptafluoropropane</td>
</tr>
<tr>
<td>Sewage treatment plants</td>
<td>1.73 mg/l</td>
<td>1,1,1,2,3,3,3-heptafluoropropane</td>
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</tbody>
</table>

**Derived no effect level / Derived minimal effect level**

<table>
<thead>
<tr>
<th>Category</th>
<th>Exposure</th>
<th>Concentration</th>
<th>Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers Dermal</td>
<td>Chronic</td>
<td>9940 mg/kg</td>
<td>1,1,1,3,3-pentafluorobutane</td>
</tr>
<tr>
<td></td>
<td>Systemic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workers Inhalation</td>
<td>Chronic</td>
<td>4053 mg/m³</td>
<td>1,1,1,3,3-pentafluorobutane</td>
</tr>
<tr>
<td></td>
<td>Systemic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumers Oral</td>
<td>Chronic</td>
<td>3 mg/kg</td>
<td>1,1,1,3,3-pentafluorobutane</td>
</tr>
<tr>
<td></td>
<td>Systemic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumers Inhalation</td>
<td>Chronic</td>
<td>605 mg/m³</td>
<td>1,1,1,3,3-pentafluorobutane</td>
</tr>
<tr>
<td>Consumers Dermal</td>
<td>Chronic</td>
<td>2982 mg/kg</td>
<td>1,1,1,3,3-pentafluorobutane</td>
</tr>
<tr>
<td>Consumers Inhalation</td>
<td>Chronic</td>
<td>6533 mg/m³</td>
<td>1,1,1,2,3,3,3-heptafluoropropane</td>
</tr>
</tbody>
</table>

### Exposure controls

**Appropriate engineering controls**

- Ensure adequate exhaust ventilation at machinery
- Apply technical measures to comply with the occupational exposure limits

**Individual protection measure**

**Respiratory protection**

- In case of insufficient ventilation, wear suitable respiratory equipment
- When workers are facing concentrations above the exposure limit they must use appropriate certified respirators
- Self-contained breathing apparatus (EN 133)
- Respirator with a vapour filter (EN 141)

**Hand protection**

- Wear suitable gloves
- Take note of the information given by the producer concerning permeability and break through times and of special workplace conditions (mechanical strain, duration of contact)
- Suitable material: Neoprene

**Eye protection**

- Chemical resistant goggles must be worn
- If splashes are likely to occur wear tight fitting safety goggles, face shield

**Skin and body protection**

- Flame resistant clothing
- If splashes are likely to occur, wear: apron, boots, Neoprene

**Hygiene measures**

- Use only in an area equipped with a safety shower
- Eye wash bottles or eye wash stations in compliance with applicable standards
- When using do not eat, drink or smoke
- Wash hands before breaks and at the end of the work day
- Handle in accordance with good industrial hygiene and safety practice

**Environmental exposure controls**

- Dispose of rinse water in accordance with local and national regulations.
9. Physical and chemical properties

General information
- Appearance: Volatile, liquid
- Colour: Colourless
- Odour: Ether-like

Important health, safety and environmental information
- pH: 6; at 1.7 g/l
- pKa: No data available
- Melting point/freezing point: No data available
- Boiling point/boiling range: 24°C
- Flash point: Does not flash, the product is not flammable (DIN 51755 Part 1)
- Evaporation rate: No data
- Flammability (solid, gas): Not applicable
- Flammability: The product is not flammable. Can become highly flammable in use.
- Explosive properties: Not explosive
- Vapour pressure: 930 hPa at 20°C
- Vapour density: 6.5
- Relative density: 1.29
- Bulk density: Not applicable
- Solubility: 5 g/l at 20°C, water
- Solubility/qualitative: Miscible with most organic solvents
- Partition coefficient: n-octanol/water log Pow: 1.6
- Auto-ignition temperature: 580°C
- Decomposition temperature: >=200°C
- Viscosity: 0.4 mPa.s, at 25°C

Other information
- Remarks: No data available

10. Stability and reactivity


Chemical stability: Stable under recommended storage conditions

Possibility of hazardous reactions: Strong oxidizers, alkali metals and alkaline earth metals may cause fires or explosions.

Conditions to avoid: Heat

Materials to avoid: Light and/or alkaline metals, powdered metals, alkaline earth metals.

Hazardous decomposition products: Gaseous hydrogen fluoride (HF), carbon monoxide

11. Toxicological information

Acute toxicity
- Acute oral toxicity: LD50, rat, >2,000 mg/kg (1,1,1,3,3-pentafluorobutane)
- Acute inhalation toxicity: LC50, 4 h, >100000 ppm (1,1,1,3,3-pentafluorobutane)
- Acute dermal toxicity: No data available

Skin corrosion: Rabbit, no skin irritation (1,1,1,3,3-pentafluorobutane)

Serious eye damage/eye irritation: Rabbit, no eye irritation (1,1,1,3,3-pentafluorobutane)

Sensitisation: Guinea pig, did not cause sensitization on laboratory animals (1,1,1,3,3-pentafluorobutane)
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Mutagenicity
In vitro tests did not show mutagenic effects (1,1,1,3,3-pentafluorobutane)
In vivo tests did not show mutagenic effects (1,1,1,3,3-pentafluorobutane)

Carcinogenicity
No data available

Toxicity for reproduction
Effect on fertility, 29,971ppm, NOAEC, (1,1,1,3,3-pentafluorobutane)
Developmental toxicity, 29,971ppm, NOAEC, (1,1,1,3,3-pentafluorobutane)

Specific target organ toxicity – single exposure
Inhalation, dogs, 75100ppm, remarks: LOAEL, cardiac sensitization following adrenergic stimulation (1,1,1,3,3-pentafluorobutane)

Repeated dose toxicity
Inhalation, after a single exposure, dog, >=7.5%, NOEL, cardiac sensitization following adrenergic stimulation, (1,1,1,3,3-pentafluorobutane)

Other information
No data available

12. Ecological information

Toxicity

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>LC50</th>
<th>96 h</th>
<th>&gt;200 mg/l</th>
<th>1,1,1,3,3-pentafluorobutane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishes</td>
<td>Brachydanio rerio</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fishes</td>
<td>Pimephales promelas</td>
<td>NOEC</td>
<td>30 days</td>
<td>Ca. 38.2mg/l</td>
<td></td>
</tr>
<tr>
<td>Crustaceans</td>
<td>Daphnia magna</td>
<td>NOEC</td>
<td>48 h</td>
<td>&gt;200 mg/l</td>
<td></td>
</tr>
<tr>
<td>Algae</td>
<td>Selenastrum capricornutum</td>
<td>NOEC</td>
<td>72 h</td>
<td>13.2 mg/l</td>
<td></td>
</tr>
<tr>
<td>Terrestrial plants</td>
<td>NOEC</td>
<td></td>
<td></td>
<td>&gt;=6 g/m³</td>
<td></td>
</tr>
</tbody>
</table>

Persistence and degradability

Abiotic degradation
Air, indirect photo-oxidation, t ½ ca. 10.8 y (1,1,1,3,3-pentafluorobutane)
Water/soil, hydrolysis. Result: not significant
Water, photolysis. Result: not significant

Biodegradation
Aerobic, tested according to ready biodegradability/MITI, 2% after 28 d. Result: not readily biodegradable (1,1,1,3,3-pentafluorobutane)

Bioaccumulative potential
Bioaccumulative potential: log Pow 1.61. Result: does not bioaccumulate (1,1,1,3,3-pentafluorobutane)

Mobility in soil
Soil/sediments, adsorption, KOC: ca. 9. Conditions: calculated value (1,1,1,3,3-pentafluorobutane)
Air, Henry’s law constant (H), ca. 3.8kPa.m³/mol. Conditions: 20°C / calculated value, considerable volatility (1,1,1,3,3-pentafluorobutane)

Results of PBT and vPvB assessment
This mixture contains no substance considered to be persistent, bioaccumulating or toxic (PBT). (1,1,1,3,3-pentafluorobutane)
This mixture contains no substance considered to be very persistent or very bioaccumulating (vPvB). (1,1,1,3,3-pentafluorobutane)

Other adverse effects
Ozone depletion potential = 0.
Result = no effect on stratospheric ozone
Ozone depletion potential; ODP; (R11 = 1) (1,1,1,3,3-pentafluorobutane; 1,1,1,2,3,3,3-heptafluoropropane)
Global Warming Potential = 1110
Reference value for carbon dioxide: GWP = 1, GWP (ITH 100 y), source IPCC (International Panel on Climate Change) (1,1,1,3,3-pentafluorobutane; 1,1,1,2,3,3,3-heptafluoropropane)
13. Disposal considerations

Waste disposal methods
In accordance with local and national regulations
Refer to manufacturer/supplier for information on recovery/recycling
The incinerator must be equipped with a system for the neutralisation or recovery of HF.

Contaminated packaging
Where possible recycling is preferred to disposal or incineration.

14. Transport information

International transport regulations

Sea (IMO/IMDG) Not regulated
Air (ICAO/IATA) Not regulated
European Road/Rail (ADR/RID) Not regulated
Inland waterway transport Not regulated

15. Regulatory information

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

- EH40/2005 Workplace Exposure Limits, as amended through 1, 10, 2007 (WEL’s) published by the Health and Safety Executive (HSE). Issued under the Control of Substances Hazardous to Health Regulations, as amended

Notification status

<table>
<thead>
<tr>
<th>Inventory information</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Inventory of Chemical Substances (AICS)</td>
<td>In compliance with inventory</td>
</tr>
<tr>
<td>Canadian Domestic Substances List (DSL)</td>
<td>In compliance with inventory</td>
</tr>
<tr>
<td>Inventory of Existing Chemical Substances (China) (IECS)</td>
<td>In compliance with inventory</td>
</tr>
<tr>
<td>Japanese Existing and New Chemical Substances (MITI List) (ENCS)</td>
<td>In compliance with inventory</td>
</tr>
<tr>
<td>New Zealand Inventory of Chemicals (NZIOC)</td>
<td>One or more components not listed on inventory</td>
</tr>
<tr>
<td>Toxic Substance Control Act List (TSCA)</td>
<td>In compliance with inventory</td>
</tr>
<tr>
<td>EU List of Existing Chemical Substances (EINECS)</td>
<td>In compliance with inventory</td>
</tr>
<tr>
<td>Korean Existing Chemicals Inventory (KECI (KR))</td>
<td>In compliance with inventory</td>
</tr>
<tr>
<td>Philippine Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>One or more components not listed on inventory</td>
</tr>
</tbody>
</table>

Chemical Safety Assessment
A chemical safety assessment has been carried out for this substance (1,1,1,3,3-pentafluorobutane)
16. Other information

Full text of H-Statements referred to under section 3
H225 Highly flammable liquid and vapour
H280 Contains gas under pressure; may explode if heated

Full text of R-phrases referred to under sections 2 and 3
Full text of R-phrases referred to under section 2
R30 Can become highly flammable in use

Full text of R-phrases referred to under section 3
R11 Highly flammable

Other information

Update
This data sheet contains changes from the previous version in sections 8, 12 & 15.

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

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