

R452A

A-Gas (Australia) Pty Ltd

Chemwatch: 5185-74

Version No: 6.1.1.1

Safety Data Sheet according to WHS and ADG requirements

Chemwatch Hazard Alert Code: 1

Issue Date: 01/11/2019

Print Date: 21/09/2020

L.GHS.AUS.EN

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

Product Identifier

| | |
|-------------------------------|--|
| Product name | R452A |
| Synonyms | Not Available |
| Proper shipping name | REFRIGERANT GAS, N.O.S. (contains R125, R32 and R1234yf) |
| Other means of identification | Not Available |

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

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|--------------------------|--|
| Relevant identified uses | Refrigerant. For industrial use only. For research use only. The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation. |
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Details of the supplier of the safety data sheet

| | |
|-------------------------|--|
| Registered company name | A-Gas (Australia) Pty Ltd |
| Address | 9-11 Oxford Rd, Laverton North Victoria 3026 Australia |
| Telephone | 93689208 |
| Fax | Not Available |
| Website | Not Available |
| Email | Not Available |

Emergency telephone number


| | |
|-----------------------------------|-------------------------|
| Association / Organisation | TOLL CHEMICAL LOGISTICS |
| Emergency telephone numbers | 1800024973 |
| Other emergency telephone numbers | Not Available |

SECTION 2 Hazards identification

Classification of the substance or mixture

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|-------------------------------|---|
| Poisons Schedule | Not Applicable |
| Classification ^[1] | Gas under Pressure (Liquefied gas) |
| Legend: | 1. Classified by Chemwatch; 2. Classification drawn from HCIS; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI |

Label elements

| | |
|---------------------|---|
| Hazard pictogram(s) |  |
| Signal word | Warning |

Hazard statement(s)

| | |
|--------|---|
| H280 | Contains gas under pressure; may explode if heated. |
| AUH044 | Risk of explosion if heated under confinement. |

Precautionary statement(s) General

| | |
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| P101 | If medical advice is needed, have product container or label at hand. |
| P102 | Keep out of reach of children. |
| P103 | Read label before use. |

Precautionary statement(s) Prevention

Not Applicable

Precautionary statement(s) Response

Not Applicable

Precautionary statement(s) Storage

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|-----------|--|
| P410+P403 | Protect from sunlight. Store in a well-ventilated place. |
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Precautionary statement(s) Disposal

Not Applicable

SECTION 3 Composition / information on ingredients

Substances

See section below for composition of Mixtures

Mixtures

| CAS No | %[weight] | Name |
|----------|-----------|-------------------------|
| 354-33-6 | 59 | R125 |
| 754-12-1 | 30 | R1234yf |
| 75-10-5 | 11 | R32 |

SECTION 4 First aid measures

Description of first aid measures

| | |
|--------------|---|
| Eye Contact | <ul style="list-style-type: none">▸ If product comes in contact with eyes remove the patient from gas source or contaminated area.▸ Take the patient to the nearest eye wash, shower or other source of clean water.▸ Open the eyelid(s) wide to allow the material to evaporate.▸ Gently rinse the affected eye(s) with clean, cool water for at least 15 minutes. Have the patient lie or sit down and tilt the head back. Hold the eyelid(s) open and pour water slowly over the eyeball(s) at the inner corners, letting the water run out of the outer corners.▸ The patient may be in great pain and wish to keep the eyes closed. It is important that the material is rinsed from the eyes to prevent further damage.▸ Ensure that the patient looks up, and side to side as the eye is rinsed in order to better reach all parts of the eye(s)▸ Transport to hospital or doctor.▸ Even when no pain persists and vision is good, a doctor should examine the eye as delayed damage may occur.▸ If the patient cannot tolerate light, protect the eyes with a clean, loosely tied bandage.▸ Ensure verbal communication and physical contact with the patient. <p>DO NOT allow the patient to rub the eyes</p> <p>DO NOT allow the patient to tightly shut the eyes</p> <p>DO NOT introduce oil or ointment into the eye(s) without medical advice</p> <p>DO NOT use hot or tepid water.</p> |
| Skin Contact | <p>If skin or hair contact occurs:</p> <ul style="list-style-type: none">▸ Flush skin and hair with running water (and soap if available).▸ Seek medical attention in event of irritation. <p>In case of cold burns (frost-bite):</p> <ul style="list-style-type: none">▸ Move casualty into warmth before thawing the affected part; if feet are affected carry if possible▸ Bathe the affected area immediately in luke-warm water (not more than 35 deg C) for 10 to 15 minutes, immersing if possible and without rubbing▸ DO NOT apply hot water or radiant heat.▸ Apply a clean, dry, light dressing of "fluffed-up" dry gauze bandage▸ If a limb is involved, raise and support this to reduce swelling▸ If an adult is involved and where intense pain occurs provide pain killers such as paracetamol▸ Transport to hospital, or doctor▸ Subsequent blackening of the exposed tissue indicates potential of necrosis, which may require amputation. |
| Inhalation | <ul style="list-style-type: none">▸ Following exposure to gas, remove the patient from the gas source or contaminated area.▸ NOTE: Personal Protective Equipment (PPE), including positive pressure self-contained breathing apparatus may be required to assure the safety of the rescuer.▸ Prostheses such as false teeth, which may block the airway, should be removed, where possible, prior to initiating first aid procedures.▸ If the patient is not breathing spontaneously, administer rescue breathing.▸ If the patient does not have a pulse, administer CPR.▸ If medical oxygen and appropriately trained personnel are available, administer 100% oxygen.▸ Summon an emergency ambulance. If an ambulance is not available, contact a physician, hospital, or Poison Control Centre for further |

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| | <p>instruction.</p> <ul style="list-style-type: none"> ▸ Keep the patient warm, comfortable and at rest while awaiting medical care. ▸ MONITOR THE BREATHING AND PULSE, CONTINUOUSLY. ▸ Administer rescue breathing (preferably with a demand-valve resuscitator, bag-valve mask-device, or pocket mask as trained) or CPR if necessary. |
| Ingestion | <ul style="list-style-type: none"> ▸ Not considered a normal route of entry. ▸ For advice, contact a Poisons Information Centre or a doctor. ▸ Avoid giving milk or oils. ▸ Avoid giving alcohol. |

Indication of any immediate medical attention and special treatment needed

for intoxication due to Freons/ Halons;

A: Emergency and Supportive Measures

- Maintain an open airway and assist ventilation if necessary
- Treat coma and arrhythmias if they occur. Avoid (adrenaline) epinephrine or other sympathomimetic amines that may precipitate ventricular arrhythmias. Tachyarrhythmias caused by increased myocardial sensitisation may be treated with propranolol, 1-2 mg IV or esmolol 25-100 microgm/kg/min IV.
- Monitor the ECG for 4-6 hours

B: Specific drugs and antidotes:

- There is no specific antidote

C: Decontamination

- Inhalation; remove victim from exposure, and give supplemental oxygen if available.
- Ingestion; (a) Prehospital: Administer activated charcoal, if available. **DO NOT** induce vomiting because of rapid absorption and the risk of abrupt onset CNS depression. (b) Hospital: Administer activated charcoal, although the efficacy of charcoal is unknown. Perform gastric lavage only if the ingestion was very large and recent (less than 30 minutes)

D: Enhanced elimination:

- There is no documented efficacy for diuresis, haemodialysis, haemoperfusion, or repeat-dose charcoal.

POISONING and DRUG OVERDOSE, Californian Poison Control System Ed. Kent R Olson; 3rd Edition

- Do not administer sympathomimetic drugs unless absolutely necessary as material may increase myocardial irritability.
- No specific antidote.
- Because rapid absorption may occur through lungs if aspirated and cause systematic effects, the decision of whether to induce vomiting or not should be made by an attending physician.
- If lavage is performed, suggest endotracheal and/or esophageal control.
- Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach.
- Treatment based on judgment of the physician in response to reactions of the patient

For frost-bite caused by liquefied petroleum gas:

- If part has not thawed, place in warm water bath (41-46 C) for 15-20 minutes, until the skin turns pink or red.
- Analgesia may be necessary while thawing.
- If there has been a massive exposure, the general body temperature must be depressed, and the patient must be immediately rewarmed by whole-body immersion, in a bath at the above temperature.
- Shock may occur during rewarming.
- Administer tetanus toxoid booster after hospitalization.
- Prophylactic antibiotics may be useful.
- The patient may require anticoagulants and oxygen.

[Shell Australia 22/12/87]

For gas exposures:

BASIC TREATMENT

- Establish a patent airway with suction where necessary.
- Watch for signs of respiratory insufficiency and assist ventilation as necessary.
- Administer oxygen by non-rebreather mask at 10 to 15 l/min.
- Monitor and treat, where necessary, for pulmonary oedema .
- Monitor and treat, where necessary, for shock.
- Anticipate seizures.

ADVANCED TREATMENT

- Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has occurred.
- Positive-pressure ventilation using a bag-valve mask might be of use.
- Monitor and treat, where necessary, for arrhythmias.
- Start an IV D5W TKO. If signs of hypovolaemia are present use lactated Ringers solution. Fluid overload might create complications.
- Drug therapy should be considered for pulmonary oedema.
- Hypotension with signs of hypovolaemia requires the cautious administration of fluids. Fluid overload might create complications.
- Treat seizures with diazepam.
- Proparacaine hydrochloride should be used to assist eye irrigation.

BRONSTEIN, A.C. and CURRANCE, P.L.

EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994

SECTION 5 Firefighting measures

Extinguishing media

SMALL FIRE: Use extinguishing agent suitable for type of surrounding fire.

LARGE FIRE: Cool cylinder.
DO NOT direct water at source of leak or venting safety devices as icing may occur.

Special hazards arising from the substrate or mixture

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| Fire Incompatibility | ▸ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result |
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Advice for firefighters

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| Fire Fighting | <div>-----</div> <div>GENERAL</div> <div>-----</div> <div>▸ Alert Fire Brigade and tell them location and nature of hazard.</div> <div>▸ Wear breathing apparatus and protective gloves.</div> <div>▸ Fight fire from a safe distance, with adequate cover.</div> <div>▸ Use water delivered as a fine spray to control fire and cool adjacent area.</div> |
| Fire/Explosion Hazard | <div>▸ Containers may explode when heated - Ruptured cylinders may rocket</div> <div>▸ Fire exposed containers may vent contents through pressure relief devices.</div> <div>▸ High concentrations of gas may cause asphyxiation without warning.</div> <div>▸ May decompose explosively when heated or involved in fire.</div> <div>▸ Contact with gas may cause burns, severe injury and/ or frostbite.</div> <div>Decomposition may produce toxic fumes of:</div> <div>carbon monoxide (CO)</div> <div>carbon dioxide (CO2)</div> <div>hydrogen fluoride</div> <div>other pyrolysis products typical of burning organic material.</div> <div>Contains low boiling substance: Closed containers may rupture due to pressure buildup under fire conditions.</div> |
| HAZCHEM | 2TE |

SECTION 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

See section 8

Environmental precautions

See section 12

Methods and material for containment and cleaning up

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| Minor Spills | <div>▸ Avoid breathing vapour and any contact with liquid or gas. Protective equipment including respirator should be used.</div> <div>▸ DO NOT enter confined spaces where gas may have accumulated.</div> <div>▸ Increase ventilation.</div> |
| Major Spills | <div>▸ Clear area of all unprotected personnel and move upwind.</div> <div>▸ Alert Emergency Authority and advise them of the location and nature of hazard.</div> <div>▸ Wear breathing apparatus and protective gloves.</div> <div>▸ Prevent by any means available, spillage from entering drains and water-courses.</div> <div>▸ Remove leaking cylinders to a safe place.</div> <div>▸ Fit vent pipes. Release pressure under safe, controlled conditions</div> <div>▸ Burn issuing gas at vent pipes.</div> <div>▸ DO NOT exert excessive pressure on valve; DO NOT attempt to operate damaged valve.</div> |

Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 Handling and storage

Precautions for safe handling

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| Safe handling | <div>·Consider use in closed pressurised systems, fitted with temperature, pressure and safety relief valves which are vented for safe dispersal. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature</div> <div>·The tubing network design connecting gas cylinders to the delivery system should include appropriate pressure indicators and vacuum or suction lines.</div> <div>·Fully-welded types of pressure gauges, where the bourdon tube sensing element is welded to the gauge body, are recommended.</div> <div>·Before connecting gas cylinders, ensure manifold is mechanically secure and does not containing another gas.</div> <div>▸ DO NOT transfer gas from one cylinder to another.</div> |
| Other information | <div>Storage temperature: <52 deg.c></div> <div>▸ Cylinders should be stored in a purpose-built compound with good ventilation, preferably in the open.</div> <div>▸ Such compounds should be sited and built in accordance with statutory requirements.</div> <div>▸ The storage compound should be kept clear and access restricted to authorised personnel only.</div> <div>▸ Cylinders stored in the open should be protected against rust and extremes of weather.</div> |

Conditions for safe storage, including any incompatibilities

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| Suitable container | ▸ DO NOT use aluminium or galvanised containers |
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| | <ul style="list-style-type: none">▸ Cylinder:▸ Ensure the use of equipment rated for cylinder pressure.▸ Ensure the use of compatible materials of construction.▸ Valve protection cap to be in place until cylinder is secured, connected.▸ Cylinder must be properly secured either in use or in storage. |
| Storage incompatibility | <p>As a general rule, hydrofluorocarbons tend to be flammable unless they contain more fluorine atoms than hydrogen atoms.</p> <p>Haloalkanes:</p> <ul style="list-style-type: none">▸ are highly reactive:some of the more lightly substituted lower members are highly flammable; the more highly substituted may be used as fire suppressants, not always with the anticipated results.▸ may react with the lighter divalent metals to produce more reactive compounds analogous to Grignard reagents.▸ may produce explosive compounds following prolonged contact with metallic or other azides▸ may react on contact with potassium or its alloys - although apparently stable on contact with a wide rage of halocarbons, reaction products may be shock-sensitive and may explode with great violence on light impact; severity generally increases with the degree of halocarbon substitution and potassium-sodium alloys give extremely sensitive mixtures . <p>BREThERICK L.: Handbook of Reactive Chemical Hazards</p> <ul style="list-style-type: none">▸ react with metal halides and active metals, eg. sodium (Na), potassium (K), lithium (Li),calcium (Ca), zinc (Zn), powdered aluminium (Al) and aluminium alloys, magnesium (Mg) and magnesium alloys.▸ Haloalkenes are highly reactive.▸ Some of the more lightly substituted lower members are highly flammable; many members of the group are peroxidisable and polymerisable.▸ Avoid reaction or contact with potassium or its alloys - although apparently stable on contact with a wide rage of halocarbons, reaction products may be shock-sensitive and may explode with great violence on light impact. Severity generally increases with the degree of halocarbon substitution and potassium-sodium alloys give extremely sensitive mixtures.▸ Compressed gases may contain a large amount of kinetic energy over and above that potentially available from the energy of reaction produced by the gas in chemical reaction with other substances |

SECTION 8 Exposure controls / personal protection

Control parameters

Occupational Exposure Limits (OEL)

INGREDIENT DATA

Not Available


Emergency Limits

| Ingredient | Material name | TEEL-1 | TEEL-2 | TEEL-3 |
|------------|---|-----------|---------------|--------------|
| R1234yf | HFO-1234yf; 2,3,3,3-Tetrafluoropropene | 2,200 ppm | Not Available | 1.40E+05 ppm |
| R32 | Methylene fluoride; (Difluoromethane; HFC-32) | 3,000 ppm | 6,500 ppm | 39,000 ppm |

| Ingredient | Original IDLH | Revised IDLH |
|------------|---------------|---------------|
| R125 | Not Available | Not Available |
| R1234yf | Not Available | Not Available |
| R32 | Not Available | Not Available |

MATERIAL DATA

Exposure controls

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|----------------------------------|--|
| Appropriate engineering controls | <p>Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.</p> <p>The basic types of engineering controls are:</p> <p>Process controls which involve changing the way a job activity or process is done to reduce the risk.</p> <p>Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.</p> |
| Personal protection |  |
| Eye and face protection | <ul style="list-style-type: none">▸ Chemical goggles.▸ Full face shield may be required for supplementary but never for primary protection of eyes.▸ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. |
| Skin protection | See Hand protection below |
| Hands/feet protection | <ul style="list-style-type: none">▸ When handling sealed and suitably insulated cylinders wear cloth or leather gloves.▸ Insulated gloves: <p>NOTE: Insulated gloves should be loose fitting so that may be removed quickly if liquid is spilled upon them. Insulated gloves are not made to permit hands to be placed in the liquid; they provide only short-term protection from accidental contact with the liquid.</p> |
| Body protection | See Other protection below |

Other protection

- ▶ Protective overalls, closely fitted at neck and wrist.
- ▶ Eye-wash unit.
- ▶ Ensure availability of lifeline in confined spaces.
- ▶ Staff should be trained in all aspects of rescue work.

Respiratory protection

Type AX Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

| Required minimum protection factor | Maximum gas/vapour concentration present in air p.p.m. (by volume) | Half-face Respirator | Full-Face Respirator |
|------------------------------------|--|----------------------|----------------------|
| up to 10 | 1000 | AX-AUS / Class1 | - |
| up to 50 | 1000 | - | AX-AUS / Class 1 |
| up to 50 | 5000 | Airline * | - |
| up to 100 | 5000 | - | AX-2 |
| up to 100 | 10000 | - | AX-3 |
| 100+ | | | Airline** |

* - Continuous Flow ** - Continuous-flow or positive pressure demand

A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO₂), G = Agricultural chemicals, K = Ammonia(NH₃), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- ▶ Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- ▶ The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
- ▶ Cartridge performance is affected by humidity. Cartridges should be changed after 2 hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used
- ▶ Positive pressure, full face, air-supplied breathing apparatus should be used for work in enclosed spaces if a leak is suspected or the primary containment is to be opened (e.g. for a cylinder change)
- ▶ Air-supplied breathing apparatus is required where release of gas from primary containment is either suspected or demonstrated.

SECTION 9 Physical and chemical properties**Information on basic physical and chemical properties**

| Appearance | Clear, colourless liquefied gas with a slight ether-like odour. | | |
|--|---|---|-----------------|
| Physical state | Liquified Gas | Relative density (Water = 1) | 1.13 @ 25 deg.C |
| Odour | Not Available | Partition coefficient n-octanol / water | Not Available |
| Odour threshold | Not Available | Auto-ignition temperature (°C) | Not Available |
| pH (as supplied) | Neutral | Decomposition temperature | Not Available |
| Melting point / freezing point (°C) | Not Available | Viscosity (cSt) | Not Available |
| Initial boiling point and boiling range (°C) | <-47 | Molecular weight (g/mol) | Not Applicable |
| Flash point (°C) | Not Applicable | Taste | Not Available |
| Evaporation rate | >1 (CCL4=1) | Explosive properties | Not Available |
| Flammability | Not Applicable | Oxidising properties | Not Available |
| Upper Explosive Limit (%) | Not Applicable | Surface Tension (dyn/cm or mN/m) | Not Available |
| Lower Explosive Limit (%) | Not Applicable | Volatile Component (%vol) | Not Available |
| Vapour pressure (kPa) | 1315.9 @ 25 deg.C | Gas group | Not Available |
| Solubility in water | Not Available | pH as a solution (1%) | Not Available |
| Vapour density (Air = 1) | 3.64 @ 25 deg.C | VOC g/L | Not Available |

SECTION 10 Stability and reactivity

| Reactivity | See section 7 |
|--------------------|--|
| Chemical stability | <ul style="list-style-type: none"> ▶ Unstable in the presence of incompatible materials. ▶ Product is considered stable. ▶ Hazardous polymerisation will not occur. ▶ Extremely high temperatures. |

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|---|---------------|
| Possibility of hazardous reactions | See section 7 |
| Conditions to avoid | See section 7 |
| Incompatible materials | See section 7 |
| Hazardous decomposition products | See section 5 |

SECTION 11 Toxicological information

Information on toxicological effects

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|---------------------|--|
| Inhaled | <p>The material is not thought to produce respiratory irritation (as classified by EC Directives using animal models). Nevertheless inhalation, of the material, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.</p> <p>Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo.</p> <p>Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.</p> <p>Exposure to high concentrations of fluorocarbons may produce cardiac arrhythmias or cardiac arrest due sensitisation of the heart to adrenalin or noradrenalin. Deaths associated with exposures to fluorocarbons (specifically halogenated aliphatics) have occurred in occupational settings and in inhalation of bronchodilator drugs.</p> <p>Bronchospasm consistently occurs in human subjects inhaling fluorocarbons. At a measured concentration of 1700 ppm of one of the commercially available aerosols there is a biphasic change in ventilatory capacity, the first reduction occurring within a few minutes and the second delayed up to 30 minutes.</p> <p>Common, generalised symptoms associated with non-toxic gas inhalation include :</p> <ul style="list-style-type: none"> ▸ central nervous system effects such as headache, confusion, dizziness, progressive stupor, coma and seizures; ▸ respiratory system complications may include tachypnoea and dyspnoea; ▸ cardiovascular effects may include circulatory collapse and arrhythmias; ▸ gastrointestinal effects may also be present and may include mucous membrane irritation and nausea and vomiting. <p>Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved.</p> <p>Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin)</p> <p>Material is highly volatile and may quickly form a concentrated atmosphere in confined or unventilated areas. The vapour may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure.</p> <p>The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.</p> |
| Ingestion | <p>Not normally a hazard due to physical form of product.</p> <p>Considered an unlikely route of entry in commercial/industrial environments</p> |
| Skin Contact | <p>The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.</p> <p>Repeated exposure may cause skin cracking, flaking or drying following normal handling and use.</p> <p>In common with other halogenated aliphatics, fluorocarbons may cause dermal problems due to a tendency to remove natural oils from the skin causing irritation and the development of dry, sensitive skin. They do not appear to be appreciably absorbed.</p> <p>Open cuts, abraded or irritated skin should not be exposed to this material</p> <p>Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.</p> <p>Vapourising liquid causes rapid cooling and contact may cause cold burns, frostbite, even through normal gloves. Frozen skin tissues are painless and appear waxy and yellow. Signs and symptoms of frost-bite may include "pins and needles", paleness followed by numbness, a hardening and stiffening of the skin, a progression of colour changes in the affected area, (first white, then mottled and blue and eventually black; on recovery, red, hot, painful and blistered).</p> |
| Eye | <p>Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn).</p> <p>Direct contact with the eye may not cause irritation because of the extreme volatility of the gas; however concentrated atmospheres may produce irritation after brief exposures..</p> |
| Chronic | <p>On the basis, primarily, of animal experiments, concern has been expressed by at least one classification body that the material may produce carcinogenic or mutagenic effects; in respect of the available information, however, there presently exists inadequate data for making a satisfactory assessment.</p> <p>Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.</p> <p>Halogenated oxiranes may arise following epoxidation of haloalkenes.</p> <p>The metabolism of haloethylenes by microsomal oxidation leading to epoxide formation across the double bond has been proposed. The resulting oxiranes are highly reactive and may covalently bind to nucleic acids leading to mutations and possible cancers A measure of such potential carcinogenicity is the development of significant preneoplastic foci in livers of treated rats.</p> <p>The carcinogenicity of halogenated oxiranes may lie in the reactivity of an epoxide intermediate.</p> <p>Principal route of occupational exposure to the gas is by inhalation.</p> <p>It is generally accepted that the fluorocarbons are less toxic than the corresponding halogenated aliphatic based on chlorine. Repeated inhalation exposure to the fluorocarbon FC-11 does not produce pathologic lesions of the liver and other visceral organs in experimental</p> |

| | | |
|----------------|---|-------------------|
| | animals. There has been conjecture in non-scientific publications that fluorocarbons may cause leukemia, cancer, sterility and birth defects; these have not been verified by current research. The high incidence of cancer, spontaneous abortion and congenital anomalies amongst hospital personnel, repeatedly exposed to fluorine-containing general anaesthetics, has caused some scientists to call for a lowering of the fluorocarbon exposure standard to 5 ppm since some are mutagens. | |
| R452A | TOXICITY | IRRITATION |
| | Not Available | Not Available |
| R125 | TOXICITY | IRRITATION |
| | Inhalation (rat) LC50: 2910 mg/l/4H ^[2] | Not Available |
| R1234yf | TOXICITY | IRRITATION |
| | Not Available | Not Available |
| R32 | TOXICITY | IRRITATION |
| | Inhalation (rat) LC50: >759132.84 mg/l/4h*) ^[2] | Not Available |
| | Inhalation (rat) LC50: 1890 mg/l/4H ^[2] | |
| | Oral (rat) LD50: 1890 mg/kg ^[2] | |
| Legend: | 1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2. * Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances | |

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|---------|---|
| R125 | Cardiac sensitisation threshold limit >245400 mg/m3 Anaesthetic effects threshold limit 490800 mg/m3 * DuPont SDS |
| R1234YF | <p>Mutagenicity : Did not cause genetic damage in animals. Did not cause genetic damage in cultured mammalian cells. Experiments showed mutagenic effects in cultured bacterial cells. Reproductive toxicity : Animal testing showed no reproductive toxicity. Teratogenicity : Animal testing showed effects on embryo-fetal development at levels equal to or above those causing maternal toxicity. * Vendor For similar product, 1,3,3,3-tetrafluoropropene HFO-1234ze is not likely to accumulate in the bodies of humans or animals HFO-1234ze is practically non-toxic. Short-term exposures at levels higher than 10% have not induced cardiac sensitization to adrenalin nor induced serious toxic effects. Rats and rabbits did not exhibit any serious toxic, developmental or reproductive effects even with exposures to high levels of HFO-1234ze. Based on a series of mutagenicity and genomics studies, the cancer risk for HFO-1234ze is LOW</p> <p>The fluoroalkenes vary widely in acute inhalation toxicity. Those, such as perfluoroisobutylene, PFIB, the most highly toxic member, attacks the pulmonary epithelium of rats eventuating in edema and death after a delay of about one day. Other fluoroalkenes, such as hexafluoropropylene (HFP) or chlorotrifluoroethylene (CTFE), also cause pulmonary injury but at lower concentrations produce concentration dependent changes in the renal concentrating mechanism of the rat. Changes in the CNS of rats and rabbits have also been reported for CTFE.</p> <p>Disinfection by products (DBPs) re formed when disinfectants such as chlorine, chloramine, and ozone react with organic and inorganic matter in water. The observations that some DBPs such as trihalomethanes (THMs), di-/trichloroacetic acids, and 3-chloro-4-(dichloromethyl)-5-hydroxy-2(5H)-furanone (MX) are carcinogenic in animal studies have raised public concern over the possible adverse health effects of DBPs. To date, several hundred DBPs have been identified.</p> <p>Numerous haloalkanes and haloalkenes have been tested for carcinogenic and mutagenic activities. n general, the genotoxic potential is dependent on the nature, number, and position of halogen(s) and the molecular size of the compound.</p> |

| | | | |
|-----------------------------------|---|--------------------------|---|
| Acute Toxicity | ✗ | Carcinogenicity | ✗ |
| Skin Irritation/Corrosion | ✗ | Reproductivity | ✗ |
| Serious Eye Damage/Irritation | ✗ | STOT - Single Exposure | ✗ |
| Respiratory or Skin sensitisation | ✗ | STOT - Repeated Exposure | ✗ |
| Mutagenicity | ✗ | Aspiration Hazard | ✗ |

Legend: ✗ – Data either not available or does not fill the criteria for classification
 ✔ – Data available to make classification

SECTION 12 Ecological information

Toxicity

| | | | | | |
|-------|-----------------|---------------------------|-------------------------------|---------------|---------------|
| R452A | Endpoint | Test Duration (hr) | Species | Value | Source |
| | Not Available | Not Available | Not Available | Not Available | Not Available |
| R125 | Endpoint | Test Duration (hr) | Species | Value | Source |
| | LC50 | 96 | Fish | >81.8mg/L | 2 |
| | EC50 | 48 | Crustacea | >97.9mg/L | 2 |
| | EC50 | 72 | Algae or other aquatic plants | >114mg/L | 2 |
| | NOEC | 96 | Fish | 10mg/L | 2 |

| R1234yf | Endpoint | Test Duration (hr) | Species | Value | Source |
|---|----------|--------------------|-------------------------------|-----------|--------|
| | LC50 | 96 | Fish | 33mg/L | 2 |
| | EC50 | 48 | Crustacea | 65mg/L | 2 |
| | EC50 | 72 | Algae or other aquatic plants | >2.5mg/L | 2 |
| | NOEC | 72 | Algae or other aquatic plants | >=2.5mg/L | 2 |
| R32 | Endpoint | Test Duration (hr) | Species | Value | Source |
| | LC50 | 96 | Fish | 1-507mg/L | 2 |
| | EC50 | 48 | Crustacea | 1-573mg/L | 2 |
| | EC50 | 96 | Algae or other aquatic plants | 1-888mg/L | 2 |
| | NOEC | 96 | Fish | 10mg/L | 2 |
| Legend: <i>Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data</i> | | | | | |

In addition to carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O), the greenhouse gases mentioned in the Kyoto Protocol include synthetic substances that share the common feature of being highly persistent in the atmosphere and exhibiting very high specific radiative forcing (radiative forcing is the change in the balance between radiation coming into the atmosphere and radiation out; a positive radiative forcing tends on average to warm the surface of the earth). These synthetic substances include hydrocarbons that are partially fluorinated (HCFs) or totally fluorinated (PFCs) as well as sulfur hexafluoride (SF6).

The greenhouse potential of these substances, expressed as multiples of that of CO2, are within the range of 140 to 11,700 for HFCs, from 6500 to 9,200 for PFCs and 23,900 for SF6. Once emitted into the atmosphere, these substances have an impact on the environment for decades, centuries, or in certain instances, for thousands of years.

DO NOT discharge into sewer or waterways.

Persistence and degradability

| Ingredient | Persistence: Water/Soil | Persistence: Air |
|------------|-------------------------|------------------|
| R125 | HIGH | HIGH |
| R1234yf | HIGH | HIGH |
| R32 | LOW | LOW |

Bioaccumulative potential

| Ingredient | Bioaccumulation |
|------------|-----------------------|
| R125 | LOW (LogKOW = 1.5472) |
| R1234yf | LOW (LogKOW = 2.1485) |
| R32 | LOW (LogKOW = 0.2) |

Mobility in soil

| Ingredient | Mobility |
|------------|-------------------|
| R125 | LOW (KOC = 154.4) |
| R1234yf | LOW (KOC = 154.4) |
| R32 | LOW (KOC = 23.74) |

SECTION 13 Disposal considerations

Waste treatment methods

| | |
|------------------------------|---|
| Product / Packaging disposal | <ul style="list-style-type: none"> ▶ Evaporate residue at an approved site. ▶ Return empty containers to supplier. If containers are marked non-returnable establish means of disposal with manufacturer prior to purchase. ▶ Ensure damaged or non-returnable cylinders are gas-free before disposal. |
|------------------------------|---|

SECTION 14 Transport information

Labels Required

| | |
|------------------|---|
| |  |
| Marine Pollutant | NO |
| HAZCHEM | 2TE |

Land transport (ADG)

| | | |
|------------------------------|--|----------------|
| UN number | 1078 | |
| UN proper shipping name | REFRIGERANT GAS, N.O.S. (contains R125, R32 and R1234yf) | |
| Transport hazard class(es) | Class | 2.2 |
| | Subrisk | Not Applicable |
| Packing group | Not Applicable | |
| Environmental hazard | Not Applicable | |
| Special precautions for user | Special provisions | 274 |
| | Limited quantity | 120 ml |

Air transport (ICAO-IATA / DGR)

| | | |
|------------------------------|--|----------------|
| UN number | 1078 | |
| UN proper shipping name | Refrigerant gas, n.o.s. * (contains R125, R32 and R1234yf) | |
| Transport hazard class(es) | ICAO/IATA Class | 2.2 |
| | ICAO / IATA Subrisk | Not Applicable |
| | ERG Code | 2L |
| Packing group | Not Applicable | |
| Environmental hazard | Not Applicable | |
| Special precautions for user | Special provisions | Not Applicable |
| | Cargo Only Packing Instructions | 200 |
| | Cargo Only Maximum Qty / Pack | 150 kg |
| | Passenger and Cargo Packing Instructions | 200 |
| | Passenger and Cargo Maximum Qty / Pack | 75 kg |
| | Passenger and Cargo Limited Quantity Packing Instructions | Forbidden |
| | Passenger and Cargo Limited Maximum Qty / Pack | Forbidden |

Sea transport (IMDG-Code / GGVSee)

| | | |
|------------------------------|--|----------------|
| UN number | 1078 | |
| UN proper shipping name | REFRIGERANT GAS, N.O.S. (contains R125, R32 and R1234yf) | |
| Transport hazard class(es) | IMDG Class | 2.2 |
| | IMDG Subrisk | Not Applicable |
| Packing group | Not Applicable | |
| Environmental hazard | Not Applicable | |
| Special precautions for user | EMS Number | F-C , S-V |
| | Special provisions | 274 |
| | Limited Quantities | 120 mL |

Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

SECTION 15 Regulatory information

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

- R125 is found on the following regulatory lists

Australian Inventory of Industrial Chemicals (AIIC)
- R1234yf is found on the following regulatory lists

Australian Inventory of Industrial Chemicals (AIIC)
- R32 is found on the following regulatory lists

Australian Inventory of Industrial Chemicals (AIIC)

National Inventory Status

| National Inventory | Status |
|-------------------------------|--|
| Australia - AIIC | Yes |
| Australia Non-Industrial Use | No (R125; R1234yf; R32) |
| Canada - DSL | Yes |
| Canada - NDSL | No (R125; R1234yf; R32) |
| China - IECSC | No (R1234yf; R32) |
| Europe - EINEC / ELINCS / NLP | No (R1234yf) |
| Japan - ENCS | Yes |
| Korea - KECI | Yes |
| New Zealand - NZIoC | Yes |
| Philippines - PICCS | No (R1234yf) |
| USA - TSCA | Yes |
| Taiwan - TCSI | Yes |
| Mexico - INSQ | No (R1234yf) |
| Vietnam - NCI | Yes |
| Russia - ARIPS | No (R1234yf) |
| Legend: | <i>Yes = All CAS declared ingredients are on the inventory</i> <i>No = One or more of the CAS listed ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)</i> |

SECTION 16 Other information

| | |
|---------------|------------|
| Revision Date | 01/11/2019 |
| Initial Date | 04/08/2015 |

SDS Version Summary

| Version | Issue Date | Sections Updated |
|---------|------------|--|
| 5.1.1.1 | 06/08/2019 | Name |
| 6.1.1.1 | 01/11/2019 | One-off system update. NOTE: This may or may not change the GHS classification |

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

Definitions and abbreviations

- PC—TWA: Permissible Concentration-Time Weighted Average
- PC—STEL: Permissible Concentration-Short Term Exposure Limit
- IARC: International Agency for Research on Cancer
- ACGIH: American Conference of Governmental Industrial Hygienists
- STEL: Short Term Exposure Limit
- TEEL: Temporary Emergency Exposure Limit.
- IDLH: Immediately Dangerous to Life or Health Concentrations
- OSF: Odour Safety Factor
- NOAEL :No Observed Adverse Effect Level
- LOAEL: Lowest Observed Adverse Effect Level
- TLV: Threshold Limit Value
- LOD: Limit Of Detection
- OTV: Odour Threshold Value
- BCF: BioConcentration Factors
- BEI: Biological Exposure Index

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