

A-Gas R438A

A-Gas (Australia) Pty Ltd

Chemwatch: 22-9861

Version No: 8.1.1.1

Safety Data Sheet according to WHS and ADG requirements

Chemwatch Hazard Alert Code: 1

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L.GHS.AUS.EN

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

Product Identifier

Product name	A-Gas R438A
Synonyms	ISCEON(R); ISCEON MO99; MO99; Isceon
Proper shipping name	REFRIGERANT GAS, N.O.S. (contains R125, R601A (Isopentane), n-Butane, 99.95%, R32 and R-134A)
Other means of identification	Not Available

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

Relevant identified uses	Use according to manufacturer's directions. 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

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

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

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
75-10-5	8.5	R32
354-33-6	45	R125
811-97-2	44.2	R-134A
106-97-8.	1.7	n-Butane, 99.95%
78-78-4	0.6	R601A (Isopentane)

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 contact occurs:</p> <ul style="list-style-type: none">▸ Immediately remove all contaminated clothing, including footwear.▸ 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.

	<ul style="list-style-type: none">▸ 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 instruction.▸ 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.▸ Avoid giving milk or oils.▸ Avoid giving alcohol.▸ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.

Indication of any immediate medical attention and special treatment needed

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
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.

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

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

Fire Fighting	<div>GENERAL</div> <ul style="list-style-type: none">▸ Alert Fire Brigade and tell them location and nature of hazard.▸ Wear breathing apparatus and protective gloves.▸ Fight fire from a safe distance, with adequate cover.▸ Use water delivered as a fine spray to control fire and cool adjacent area.
Fire/Explosion Hazard	<ul style="list-style-type: none">▸ Containers may explode when heated - Ruptured cylinders may rocket▸ Fire exposed containers may vent contents through pressure relief devices.▸ High concentrations of gas may cause asphyxiation without warning.▸ May decompose explosively when heated or involved in fire.▸ Contact with gas may cause burns, severe injury and/ or frostbite. <p>Decomposition may produce toxic fumes of: carbon monoxide (CO) carbon dioxide (CO₂) hydrogen fluoride other pyrolysis products typical of burning organic material.</p> <p>Contains low boiling substance: Closed containers may rupture due to pressure buildup under fire conditions.</p>
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

Minor Spills	<ul style="list-style-type: none">▸ Avoid breathing vapour and any contact with liquid or gas. Protective equipment including respirator should be used.▸ DO NOT enter confined spaces where gas may have accumulated.▸ Increase ventilation.
Major Spills	<ul style="list-style-type: none">▸ Clear area of all unprotected personnel and move upwind.▸ Alert Emergency Authority and advise them of the location and nature of hazard.▸ Wear breathing apparatus and protective gloves.▸ Prevent by any means available, spillage from entering drains and water-courses.▸ Remove leaking cylinders to a safe place.▸ Fit vent pipes. Release pressure under safe, controlled conditions▸ Burn issuing gas at vent pipes.▸ DO NOT exert excessive pressure on valve; DO NOT attempt to operate damaged valve.

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

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling	<ul style="list-style-type: none">·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·The tubing network design connecting gas cylinders to the delivery system should include appropriate pressure indicators and vacuum or suction lines.·Fully-welded types of pressure gauges, where the bourdon tube sensing element is welded to the gauge body, are recommended.·Before connecting gas cylinders, ensure manifold is mechanically secure and does not containing another gas. <p>▸ DO NOT transfer gas from one cylinder to another.</p>
Other information	<ul style="list-style-type: none">▸ Cylinders should be stored in a purpose-built compound with good ventilation, preferably in the open.▸ Such compounds should be sited and built in accordance with statutory requirements.▸ The storage compound should be kept clear and access restricted to authorised personnel only.▸ Cylinders stored in the open should be protected against rust and extremes of weather.

Conditions for safe storage, including any incompatibilities

Suitable container	<ul style="list-style-type: none">▶ DO NOT use aluminium or galvanised containers▶ 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.▶ 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

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Australia Exposure Standards	R-134A	1,1,1,2-Tetrafluoroethane	1000 ppm / 4240 mg/m3	Not Available	Not Available	Not Available
Australia Exposure Standards	n-Butane, 99.95%	Butane	800 ppm / 1900 mg/m3	Not Available	Not Available	Not Available

Emergency Limits

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
R32	Methylene fluoride; (Difluoromethane; HFC-32)	3,000 ppm	6,500 ppm	39,000 ppm
R-134A	HFC 134a; (Tetrafluoroethane, 1,1,1,2-)	Not Available	Not Available	Not Available
n-Butane, 99.95%	Butane	Not Available	Not Available	Not Available
R601A (Isopentane)	Isopentane; (Ethyldimethylmethane; 2-Methylbutane)	3000* ppm	33000*** ppm	200000*** ppm

Ingredient	Original IDLH	Revised IDLH
R32	Not Available	Not Available
R125	Not Available	Not Available
R-134A	Not Available	Not Available
n-Butane, 99.95%	Not Available	1,600 ppm
R601A (Isopentane)	Not Available	Not Available

MATERIAL DATA

For butane:

Odour Threshold Value: 2591 ppm (recognition)





Butane in common with other homologues in the straight chain saturated aliphatic hydrocarbon series is not characterised by its toxicity but by its narcosis-inducing effects at high concentrations. The TLV is based on analogy with pentane by comparing their lower explosive limits in air. It is concluded that this limit will protect workers against the significant risk of drowsiness and other narcotic effects.

Odour Safety Factor(OSF)

OSF=0.22 (n-BUTANE)

Exposure controls

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>
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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	<ul style="list-style-type: none"> ▶ 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)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.

Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 5 x ES	Air-line*	AX-2	AX-PAPR-2 ^
up to 10 x ES	-	AX-3	-
10+ x ES	-	Air-line**	-

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

^ - Full-face

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	Colourless liquefied gas with slight ether-like odour; does not mix with water.		
Physical state	Liquefied Gas	Relative density (Water = 1)	1.14 @ 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)	Not Available	Decomposition temperature	Not Available
Melting point / freezing point (°C)	Not Available	Viscosity (cSt)	Not Available
Initial boiling point and boiling range (°C)	-43 @ atmospheric pressure	Molecular weight (g/mol)	Not Applicable
Flash point (°C)	Not Available	Taste	Not Available
Evaporation rate	Not Available	Explosive properties	Not Available
Flammability	Not Available	Oxidising properties	Not Available
Upper Explosive Limit (%)	Not Available	Surface Tension (dyn/cm or mN/m)	Not Available
Lower Explosive Limit (%)	Not Available	Volatile Component (%vol)	100
Vapour pressure (kPa)	1112.1 @ 25 deg.C	Gas group	Not Available

Solubility in water	Immiscible	pH as a solution (1%)	Not Available
Vapour density (Air = 1)	3.5 @ 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.
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

Inhaled	<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>Limited evidence or practical experience suggests that the material may produce irritation of the respiratory system, in a significant number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.</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>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>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>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>
Ingestion	<p>Overexposure is unlikely in this form.</p> <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>Repeated exposure may cause skin cracking, flaking or drying following normal handling and use.</p> <p>Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.</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>Vapourising liquid causes rapid cooling and contact may cause cold burns, frostbite, even through normal gloves. Frozen skin tissues are</p>

	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).	
Chronic	Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems. Principal route of occupational exposure to the gas is by inhalation. 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 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.	
A-Gas R438A	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]	
R125	TOXICITY	IRRITATION
	Inhalation (rat) LC50: 2910 mg/l/4h ^[2]	Not Available
R-134A	TOXICITY	IRRITATION
	Inhalation (mouse) LC50: 850 mg/l/2h ^[2]	Not Available
	Inhalation (rat) LC50: 1500 mg/l/4h ^[2]	
n-Butane, 99.95%	TOXICITY	IRRITATION
	Inhalation (rat) LC50: 658 mg/l/4h ^[2]	Not Available
R601A (Isopentane)	TOXICITY	IRRITATION
	270000 mg/kg ^[2]	Not Available
	Inhalation (mouse) LC50: 75 mg/l/2h ^[2]	
	Inhalation (rat) LC50: 280 mg/l/4h ^[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		

R125	Cardiac sensitisation threshold limit >245400 mg/m3 Anaesthetic effects threshold limit 490800 mg/m3 * DuPont SDS
R-134A	* with added oxygen - ZhongHao New Chemical Materials MSDS Excessive concentration can have a narcotic effect; inhalation of high concentrations of decomposition products can cause lung oedema. 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. 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.

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

A-Gas R438A	Endpoint	Test Duration (hr)	Species	Value	Source
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	Not Available	Not Available	Not Available	Not Available	Not Available
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
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
R-134A	Endpoint	Test Duration (hr)	Species	Value	Source
	LC50	96	Fish	450mg/L	2
	EC50	48	Crustacea	980mg/L	5
	EC50	72	Algae or other aquatic plants	>114mg/L	2
	NOEC	72	Algae or other aquatic plants	ca.13.2mg/L	2
n-Butane, 99.95%	Endpoint	Test Duration (hr)	Species	Value	Source
	LC50	96	Fish	24.11mg/L	2
	EC50	96	Algae or other aquatic plants	7.71mg/L	2
R601A (Isopentane)	Endpoint	Test Duration (hr)	Species	Value	Source
	LC50	96	Fish	4.26mg/L	2
	EC50	48	Crustacea	2.3mg/L	2
	EC50	72	Algae or other aquatic plants	1.26mg/L	2
	NOEL	72	Algae or other aquatic plants	5.62mg/L	2
Legend:	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				

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
R32	LOW	LOW
R125	HIGH	HIGH
R-134A	HIGH	HIGH
n-Butane, 99.95%	LOW	LOW
R601A (Isopentane)	HIGH	HIGH

Bioaccumulative potential

Ingredient	Bioaccumulation
R32	LOW (LogKOW = 0.2)
R125	LOW (LogKOW = 1.5472)
R-134A	LOW (LogKOW = 1.68)
n-Butane, 99.95%	LOW (LogKOW = 2.89)
R601A (Isopentane)	LOW (LogKOW = 2.7234)

Mobility in soil

Ingredient	Mobility
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Ingredient	Mobility
R32	LOW (KOC = 23.74)
R125	LOW (KOC = 154.4)
R-134A	LOW (KOC = 96.63)
n-Butane, 99.95%	LOW (KOC = 43.79)
R601A (Isopentane)	LOW (KOC = 67.7)

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.
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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, R601A (Isopentane), n-Butane, 99.95%, R32 and R-134A)		
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, R601A (Isopentane), n-Butane, 99.95%, R32 and R-134A)		
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
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UN proper shipping name	REFRIGERANT GAS, N.O.S. (contains R125, R601A (Isopentane), n-Butane, 99.95%, R32 and R-134A)	
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

R32 is found on the following regulatory lists	
Australian Inventory of Industrial Chemicals (AIIC)	
R125 is found on the following regulatory lists	
Australian Inventory of Industrial Chemicals (AIIC)	
R-134A is found on the following regulatory lists	
Australian Inventory of Industrial Chemicals (AIIC)	
n-Butane, 99.95% is found on the following regulatory lists	
Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals	Australian Inventory of Industrial Chemicals (AIIC)
Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 5	Chemical Footprint Project - Chemicals of High Concern List
R601A (Isopentane) is found on the following regulatory lists	
Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals	Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 5
Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 4	Australian Inventory of Industrial Chemicals (AIIC)

National Inventory Status

National Inventory	Status
Australia - AIIC	Yes
Australia Non-Industrial Use	No (R32; R125; R-134A; n-Butane, 99.95%; R601A (Isopentane))
Canada - DSL	Yes
Canada - NDSL	No (R32; R125; R-134A; n-Butane, 99.95%; R601A (Isopentane))
China - IECSC	No (R32)
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	Yes
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	Yes
USA - TSCA	Yes
Taiwan - TCSI	Yes
Mexico - INSQ	Yes
Vietnam - NCI	Yes
Russia - ARIPS	Yes
Legend:	Yes = All CAS declared ingredients are on the inventory 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)

SECTION 16 Other information

Revision Date	01/11/2019
Initial Date	10/02/2010

SDS Version Summary

Version	Issue Date	Sections Updated
7.1.1.1	23/07/2019	Ingredients, Name
8.1.1.1	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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TEL (+61 3) 9572 4700.