



## A-Gas R407F

A-Gas (Singapore) PTE LTD

Chemwatch: 30-2053

Version No: 2.1.1.1

Material Safety Data Sheet according to NOHSC and ADG requirements

Chemwatch Hazard Alert Code: 2

Issue Date: 01/01/2013

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Initial Date: Not Available

S.Local.AUS.EN

### SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

#### Product Identifier

Product name	A-Gas R407F
Chemical Name	Not Applicable
Synonyms	Not Available
Proper shipping name	LIQUEFIED GAS, N.O.S. (contains tetrafluoroethane,difluoromethane and pentafluoroethane)
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

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

Relevant identified uses	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. , Refrigerant.
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#### Details of the supplier of the safety data sheet

Registered company name	A-Gas (Singapore) PTE LTD
Address	360 Orchard Road, #10-05, Int'l Building 238869 Singapore
Telephone	65 6836 0065
Fax	65 6836 6521
Website	www.agas.com
Email	Not Available

#### Emergency telephone number

Association / Organisation	Not Available
Emergency telephone numbers	65 6836 0065
Other emergency telephone numbers	65 6836 0065

#### CHEMWATCH EMERGENCY RESPONSE

Primary Number	Alternative Number 1	Alternative Number 2
1800 039 008	+612 9186 1132	Not Available

Once connected and if the message is not in your preferred language then please dial 01

### SECTION 2 HAZARDS IDENTIFICATION

#### Classification of the substance or mixture

DANGEROUS GOODS. NON-HAZARDOUS SUBSTANCE. According to NOHSC Criteria, and ADG Code.

#### CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	2	
Body Contact	2	
Reactivity	1	
Chronic	2	

0 = Minimum  
1 = Low  
2 = Moderate  
3 = High  
4 = Extreme

Poisons Schedule	None
Risk Phrases [1]	<b>R44</b> Risk of explosion if heated under confinement. <b>R4</b> Forms very sensitive explosive metallic compounds.

**Legend:** 1. Classified by Chemwatch; 2. Classification drawn from HSIS ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI

**GHS Classification** [1] Gas under Pressure (Compressed gas)

**Legend:** 1. Classified by Chemwatch; 2. Classification drawn from HSIS ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI

#### Label elements

GHS label elements



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): Prevention

Not Applicable

#### Precautionary statement(s): Response

Not Applicable

#### Precautionary statement(s): Storage

**P410+P403** Protect from sunlight. Store in a well-ventilated place.

#### Precautionary statement(s): Disposal

Not Applicable

#### Label elements

Relevant risk statements are found in section 2

Indication(s) of danger

Not Applicable

#### SAFETY ADVICE

**S03** Keep in a cool place.

**S15** Keep away from heat.

**S56** Dispose of this material and its container at hazardous or special waste collection point.

#### Other hazards

May produce discomfort of the respiratory system and skin\*.

Inhalation may produce health damage\*.

Cumulative effects may result following exposure\*.

Vapours potentially cause drowsiness and dizziness\*.

Repeated exposure potentially causes skin dryness and cracking\*.

### SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

#### Substances

See section below for composition of Mixtures

#### Mixtures

CAS No	%[weight]	Name
811-97-2	25-50	<a href="#">tetrafluoroethane</a>
75-10-5	25-50	<a href="#">difluoromethane</a>
354-33-6	25-50	<a href="#">pentafluoroethane</a>

### SECTION 4 FIRST AID MEASURES

#### Description of first aid measures

Eye Contact

- ▶ 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)

	<ul style="list-style-type: none"> <li>▶ Transport to hospital or doctor.</li> <li>▶ Even when no pain persists and vision is good, a doctor should examine the eye as delayed damage may occur.</li> <li>▶ If the patient cannot tolerate light, protect the eyes with a clean, loosely tied bandage.</li> <li>▶ Ensure verbal communication and physical contact with the patient.</li> </ul> <p><b>DO NOT</b> allow the patient to rub the eyes  <b>DO NOT</b> allow the patient to tightly shut the eyes  <b>DO NOT</b> introduce oil or ointment into the eye(s) without medical advice  <b>DO NOT</b> use hot or tepid water.</p>
<b>Skin Contact</b>	<p>If skin contact occurs:</p> <ul style="list-style-type: none"> <li>▶ Immediately remove all contaminated clothing, including footwear.</li> <li>▶ Flush skin and hair with running water (and soap if available).</li> <li>▶ Seek medical attention in event of irritation.</li> </ul>
<b>Inhalation</b>	<ul style="list-style-type: none"> <li>▶ Following exposure to gas, remove the patient from the gas source or contaminated area.</li> <li>▶ NOTE: Personal Protective Equipment (PPE), including positive pressure self-contained breathing apparatus may be required to assure the safety of the rescuer.</li> <li>▶ Prostheses such as false teeth, which may block the airway, should be removed, where possible, prior to initiating first aid procedures.</li> <li>▶ If the patient is not breathing spontaneously, administer rescue breathing.</li> <li>▶ If the patient does not have a pulse, administer CPR.</li> <li>▶ If medical oxygen and appropriately trained personnel are available, administer 100% oxygen.</li> <li>▶ Summon an emergency ambulance. If an ambulance is not available, contact a physician, hospital, or Poison Control Centre for further instruction.</li> <li>▶ Keep the patient warm, comfortable and at rest while awaiting medical care.</li> <li>▶ <b>MONITOR THE BREATHING AND PULSE, CONTINUOUSLY.</b></li> <li>▶ Administer rescue breathing (preferably with a demand-valve resuscitator, bag-valve mask-device, or pocket mask as trained) or CPR if necessary.</li> </ul>
<b>Ingestion</b>	<ul style="list-style-type: none"> <li>▶ Not considered a normal route of entry.</li> <li>▶ For advice, contact a Poisons Information Centre or a doctor.</li> <li>▶ Avoid giving milk or oils.</li> <li>▶ Avoid giving alcohol.</li> <li>▶ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.</li> </ul>

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

	<p>for intoxication due to Freons/ Halons;</p> <p>A: Emergency and Supportive Measures</p> <ul style="list-style-type: none"> <li>▶ Maintain an open airway and assist ventilation if necessary</li> <li>▶ 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.</li> <li>▶ Monitor the ECG for 4-6 hours</li> </ul> <p>B: Specific drugs and antidotes:</p> <ul style="list-style-type: none"> <li>▶ There is no specific antidote</li> </ul> <p>C: Decontamination</p> <ul style="list-style-type: none"> <li>▶ Inhalation; remove victim from exposure, and give supplemental oxygen if available.</li> <li>▶ Ingestion; (a) Prehospital: Administer activated charcoal, if available. <b>DO NOT</b> 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)</li> </ul> <p>D: Enhanced elimination:</p> <ul style="list-style-type: none"> <li>▶ There is no documented efficacy for diuresis, haemodialysis, haemoperfusion, or repeat-dose charcoal.</li> </ul> <p><i>POISONING and DRUG OVERDOSE, Californian Poison Control System Ed. Kent R Olson; 3rd Edition</i></p> <ul style="list-style-type: none"> <li>▶ Do not administer sympathomimetic drugs unless absolutely necessary as material may increase myocardial irritability.</li> <li>▶ No specific antidote.</li> <li>▶ 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.</li> <li>▶ If lavage is performed, suggest endotracheal and/or esophageal control.</li> <li>▶ Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach.</li> <li>▶ Treatment based on judgment of the physician in response to reactions of the patient</li> </ul> <p>For frost-bite caused by liquefied petroleum gas:</p> <ul style="list-style-type: none"> <li>▶ If part has not thawed, place in warm water bath (41-46 C) for 15-20 minutes, until the skin turns pink or red.</li> <li>▶ Analgesia may be necessary while thawing.</li> <li>▶ 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.</li> <li>▶ Shock may occur during rewarming.</li> <li>▶ Administer tetanus toxoid booster after hospitalization.</li> <li>▶ Prophylactic antibiotics may be useful.</li> <li>▶ The patient may require anticoagulants and oxygen.</li> </ul> <p>[Shell Australia 22/12/87]  for gas exposures:</p> <p>-----</p> <p><b>BASIC TREATMENT</b></p> <p>-----</p> <ul style="list-style-type: none"> <li>▶ Establish a patent airway with suction where necessary.</li> <li>▶ Watch for signs of respiratory insufficiency and assist ventilation as necessary.</li> <li>▶ Administer oxygen by non-rebreather mask at 10 to 15 l/min.</li> <li>▶ Monitor and treat, where necessary, for pulmonary oedema .</li> <li>▶ Monitor and treat, where necessary, for shock.</li> <li>▶ Anticipate seizures.</li> </ul> <p>-----</p> <p><b>ADVANCED TREATMENT</b></p> <p>-----</p> <ul style="list-style-type: none"> <li>▶ Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has occurred.</li> <li>▶ Positive-pressure ventilation using a bag-valve mask might be of use.</li> <li>▶ Monitor and treat, where necessary, for arrhythmias.</li> </ul>
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- ▶ 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

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 or 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).

## SECTION 5 FIREFIGHTING MEASURES

### Extinguishing media

**SMALL FIRE:** Use extinguishing agent suitable for type of surrounding fire.  
**LARGE FIRE:** Cool cylinder.

### 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

### Advice for firefighters

#### Fire Fighting

GENERAL

- ▶ Alert Fire Brigade and tell them location and nature of hazard.

#### Fire/Explosion Hazard

- ▶ 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.

## SECTION 6 ACCIDENTAL RELEASE MEASURES

### Personal precautions, protective equipment and emergency procedures

#### Minor Spills

- ▶ 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.**

#### Major Spills

- ▶ 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.

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

## SECTION 7 HANDLING AND STORAGE

### Precautions for safe handling

#### Safe handling

- ▶ Consider use in closed pressurised systems, fitted with temperature, pressure and safety relief valves which are vented for safe dispersal.
- ▶ 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 contain another gas.

#### Other information

- ▶ 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

- ▶ **DO NOT use aluminium or galvanised containers**
- ▶ Cylinder:
- ▶ Ensure the use of equipment rated for cylinder pressure.

#### Storage incompatibility

As a general rule, hydrofluorocarbons tend to be flammable unless they contain more fluorine atoms than hydrogen atoms.

Haloalkanes:

- ▶ 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.

### PACKAGE MATERIAL INCOMPATIBILITIES

## 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	tetrafluoroethane	1,1,1,2-Tetrafluoroethane	4240 (mg/m3) / 1000 (ppm)	Not Available	Not Available	Not Available

## EMERGENCY LIMITS

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
tetrafluoroethane	1000(ppm)	8000(ppm)	13000(ppm)	27000(ppm)
difluoromethane	1000(ppm)	3000(ppm)	200000(ppm)	350000(ppm)

Ingredient	Original IDLH	Revised IDLH
A-Gas R407F	Not Available	Not Available

## Exposure controls

<b>Appropriate engineering controls</b>	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. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk.
<b>Personal protection</b>	
<b>Eye and face protection</b>	<ul style="list-style-type: none"> <li>▶ Safety glasses with side shields.</li> <li>▶ Chemical goggles.</li> <li>▶ 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.</li> </ul>
<b>Skin protection</b>	See Hand protection below
<b>Hand protection</b>	▶ When handling sealed and suitably insulated cylinders wear cloth or leather gloves.
<b>Body protection</b>	See Other protection below
<b>Other protection</b>	<ul style="list-style-type: none"> <li>▶ Protective overalls, closely fitted at neck and wrist.</li> <li>▶ Eye-wash unit.</li> <li>▶ Ensure availability of lifeline in confined spaces.</li> <li>▶ Staff should be trained in all aspects of rescue work.</li> </ul>
<b>Thermal hazards</b>	

## Recommended material(s)

## GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:

"Forsberg Clothing Performance Index".

The effect(s) of the following substance(s) are taken into account in the A-Gas R407F Not Available

Material	CPI

\* CPI - Chemwatch Performance Index

A: Best Selection

B: Satisfactory; may degrade after 4 hours continuous immersion

C: Poor to Dangerous Choice for other than short term immersion

## 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)

## SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

## Information on basic physical and chemical properties

<b>Appearance</b>	Clear, colourless liquefied gas with ether-like odour; insoluble in water.		
<b>Physical state</b>	Compressed Gas	<b>Relative density (Water = 1)</b>	Not Available
<b>Odour</b>	Not Available	<b>Partition coefficient n-octanol / water</b>	Not Available

<b>Odour threshold</b>	Not Available	<b>Auto-ignition temperature (°C)</b>	Not Applicable
<b>pH (as supplied)</b>	Not Applicable	<b>Decomposition temperature</b>	Not Applicable
<b>Melting point / freezing point (°C)</b>	Not Available	<b>Viscosity (cSt)</b>	Not Applicable
<b>Initial boiling point and boiling range (°C)</b>	-45.5	<b>Molecular weight (g/mol)</b>	Not Applicable
<b>Flash point (°C)</b>	Not Available	<b>Taste</b>	Not Available
<b>Evaporation rate</b>	Not Available	<b>Explosive properties</b>	Not Available
<b>Flammability</b>	Not Available	<b>Oxidising properties</b>	Not Available
<b>Upper Explosive Limit (%)</b>	Not Available	<b>Surface Tension (dyn/cm or mN/m)</b>	Not Available
<b>Lower Explosive Limit (%)</b>	Not Available	<b>Volatile Component (%vol)</b>	Not Available
<b>Vapour pressure (kPa)</b>	2.4621 @ 54.4C	<b>Gas group</b>	Not Available
<b>Solubility in water (g/L)</b>	Immiscible	<b>pH as a solution(1%)</b>	Not Applicable
<b>Vapour density (Air = 1)</b>	Not Available	<b>VOC g/L</b>	

## SECTION 10 STABILITY AND REACTIVITY

<b>Reactivity</b>	See section 7
<b>Chemical stability</b>	<ul style="list-style-type: none"> <li>▶ Presence of incompatible materials.</li> <li>▶ Product is considered stable.</li> <li>▶ Hazardous polymerisation will not occur.</li> <li>▶ Extremely high temperatures.</li> </ul>
<b>Possibility of hazardous reactions</b>	See section 7
<b>Conditions to avoid</b>	See section 7
<b>Incompatible materials</b>	See section 7
<b>Hazardous decomposition products</b>	See section 5

## SECTION 11 TOXICOLOGICAL INFORMATION

### Information on toxicological effects

<b>Inhaled</b>	<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.</p>
<b>Ingestion</b>	<p>Not normally a hazard due to physical form of product.</p> <p>Considered an unlikely route of entry in commercial/industrial environments</p>
<b>Skin Contact</b>	<p>Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions.</p> <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).</p>
<b>Eye</b>	<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>
<b>Chronic</b>	<p>Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.</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 animals.</p>

<b>A-Gas R407F</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Not Available	Not Available
<b>tetrafluoroethane</b>	<b>TOXICITY</b>	<b>IRRITATION</b>
	Inhalation (Mouse) LC50: 1700000 mg/m <sup>3</sup> /2h	
	Inhalation (Rat) LC50: >60% vol 4 h *	
	Inhalation (Rat) LC50: >80% vol 15 mins *	
	Inhalation (Rat) LC50: 1500000 mg/m <sup>3</sup> /4h	
Not Available	Not Available	

difluoromethane	TOXICITY	IRRITATION
	Inhalation (rat) LC50: >760000 ppm/4h *	(DuPont)
Not Available	Not Available	

pentafluoroethane	TOXICITY	IRRITATION
	Inhalation (rat) LC50: >709000 ppm/4h *	Nil reported * [
Inhalation (Rat) LC50: 800000 ppm/4h*		
Not Available	Not Available	

Not available. Refer to individual constituents.

<b>TETRAFLUOROETHANE</b>	* 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.
<b>PENTAFLUOROETHANE</b>	Cardiac sensitisation threshold limit >245400 mg/m3 Anaesthetic effects threshold limit 490800 mg/m3 * DuPont SDS

<b>Acute Toxicity</b>	☹	<b>Carcinogenicity</b>	☹
<b>Skin Irritation/Corrosion</b>	☹	<b>Reproductivity</b>	☹
<b>Serious Eye Damage/Irritation</b>	☹	<b>STOT - Single Exposure</b>	☹
<b>Respiratory or Skin sensitisation</b>	☹	<b>STOT - Repeated Exposure</b>	☹
<b>Mutagenicity</b>	☹	<b>Aspiration Hazard</b>	☹

## CMR STATUS

## SECTION 12 ECOLOGICAL INFORMATION

### Toxicity

In addition to carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), 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 (SF<sub>6</sub>).

The greenhouse potential of these substances, expressed as multiples of that of CO<sub>2</sub>, are within the range of 140 to 11,700 for HFCs, from 6500 to 9,200 for PFCs and 23,900 for SF<sub>6</sub>. Once emitted into the atmosphere, these substances have an impact on the environment for decades, centuries, or in certain instances, for thousands of years.

### Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

### Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

### Mobility in soil

Ingredient	Mobility
Not Available	Not Available


## SECTION 13 DISPOSAL CONSIDERATIONS

### Waste treatment methods

<b>Product / Packaging disposal</b>	<ul style="list-style-type: none"> <li>▶ Evaporate residue at an approved site.</li> <li>▶ Return empty containers to supplier. If containers are marked non-returnable establish means of disposal with manufacturer prior to purchase.</li> <li>▶ Ensure damaged or non-returnable cylinders are gas-free before disposal.</li> </ul>
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## SECTION 14 TRANSPORT INFORMATION

### Labels Required

	
<b>Marine Pollutant</b>	NO
<b>HAZCHEM</b>	2TE

## Land transport (ADG)

UN number	3163
Packing group	Not Available
UN proper shipping name	LIQUEFIED GAS, N.O.S. (contains tetrafluoroethane,difluoromethane and pentafluoroethane)
Environmental hazard	No relevant data
Transport hazard class(es)	Class : 2.2 Subrisk :
Special precautions for user	Special provisions : 274 limited quantity : 120 ml

## Air transport (ICAO-IATA / DGR)

UN number	3163
Packing group	Not Available
UN proper shipping name	Liquefied gas, n.o.s. * (contains tetrafluoroethane,difluoromethane and pentafluoroethane)
Environmental hazard	No relevant data
Transport hazard class(es)	ICAO/IATA Class : 2.2 ICAO / IATA Subrisk : ERG Code : 2L
Special precautions for user	Special provisions : 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 Maximum Qty / Pack : Forbidden

## Sea transport (IMDG-Code / GGVSee)

UN number	3163
Packing group	Not Available
UN proper shipping name	LIQUEFIED GAS, N.O.S. (contains tetrafluoroethane,difluoromethane and pentafluoroethane)
Environmental hazard	No relevant data
Transport hazard class(es)	IMDG Class : 2.2 IMDG Subrisk :
Special precautions for user	EMS Number : F-C,S-V Special provisions : 274 Limited Quantities : 120 ml

## SECTION 15 REGULATORY INFORMATION

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

<p><b>tetrafluoroethane(811-97-2) is found on the following regulatory lists</b></p>	<p>"International Maritime Dangerous Goods Requirements (IMDG Code)","International Maritime Dangerous Goods Requirements (IMDG Code) - Substance Index","Australia Exposure Standards","Australia Dangerous Goods Code (ADG Code) - List of Emergency Action Codes","United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (English)","OECD List of High Production Volume (HPV) Chemicals","Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm (Aquatic habitat)","Australia Customs (Prohibited Exports) Regulations 1958 - Schedule 15 Ozone depleting substances - Part 9 HFCs","Sigma-AldrichTransport Information","Australia Dangerous Goods Code (ADG Code) - Packing Instruction - Liquefied and Dissolved Gases","United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (Spanish)","Australia High Volume Industrial Chemical List (HVICL)","International Air Transport Association (IATA) Dangerous Goods Regulations","Australia Hazardous Substances Information System - Consolidated Lists","Regulations concerning the International Carriage of Dangerous Goods by Rail - Table A: Dangerous Goods List - RID 2013 (English)","Australia Dangerous Goods Code (ADG Code) - Dangerous Goods List","Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (AQUA/1 to 6 - non-pesticide anthropogenic organics)"</p>
<p><b>difluoromethane(75-10-5) is found on the following regulatory lists</b></p>	<p>"International Council of Chemical Associations (ICCA) - High Production Volume List","International Maritime Dangerous Goods Requirements (IMDG Code)","Australia - Victoria Occupational Health and Safety Regulations - Schedule 9: Materials at Major Hazard Facilities (And Their Threshold Quantity) Table 2","International Maritime Dangerous Goods Requirements (IMDG Code) - Substance Index","Australia Dangerous Goods Code (ADG Code) - List of Emergency Action Codes","United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (English)","OECD List of High Production Volume (HPV) Chemicals","International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft","Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm (Aquatic habitat)","Australia Customs (Prohibited Exports) Regulations 1958 - Schedule 15 Ozone depleting substances - Part 9 HFCs","Sigma-AldrichTransport</p>



	Information", "United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (Spanish)", "Australia Dangerous Goods Code (ADG Code) - Packing Instruction - Liquefied and Dissolved Gases", "International Air Transport Association (IATA) Dangerous Goods Regulations", "Regulations concerning the International Carriage of Dangerous Goods by Rail - Table A: Dangerous Goods List - RID 2013 (English)", "Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (AQUA/1 to 6 - non-pesticide anthropogenic organics)", "Australia Dangerous Goods Code (ADG Code) - Dangerous Goods List"
pentafluoroethane(354-33-6) is found on the following regulatory lists	"International Council of Chemical Associations (ICCA) - High Production Volume List", "International Maritime Dangerous Goods Requirements (IMDG Code)", "International Maritime Dangerous Goods Requirements (IMDG Code) - Substance Index", "Australia Dangerous Goods Code (ADG Code) - List of Emergency Action Codes", "United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (English)", "OECD List of High Production Volume (HPV) Chemicals", "Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm (Aquatic habitat)", "Australia Customs (Prohibited Exports) Regulations 1958 - Schedule 15 Ozone depleting substances - Part 9 HFCs", "Australia Dangerous Goods Code (ADG Code) - Packing Instruction - Liquefied and Dissolved Gases", "United Nations Recommendations on the Transport of Dangerous Goods Model Regulations (Spanish)", "International Air Transport Association (IATA) Dangerous Goods Regulations", "Regulations concerning the International Carriage of Dangerous Goods by Rail - Table A: Dangerous Goods List - RID 2013 (English)", "Australia Dangerous Goods Code (ADG Code) - Dangerous Goods List", "Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (AQUA/1 to 6 - non-pesticide anthropogenic organics)"

## SECTION 16 OTHER INFORMATION

### 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.

A list of reference resources used to assist the committee may be found at:

[www.chemwatch.net/references](http://www.chemwatch.net/references)

The (M)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.

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