



# R409A

A-Gas

Chemwatch Hazard Alert Code: 2

Chemwatch: 7633-08

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Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

L.GHS.USA.EN

## SECTION 1 IDENTIFICATION

### Product Identifier

|                               |                       |
|-------------------------------|-----------------------|
| Product name                  | R409A                 |
| Synonyms                      | R409A                 |
| Proper shipping name          | Liquefied gas, n.o.s. |
| Other means of identification | Not Available         |

### Recommended use of the chemical and restrictions on use

|                          |  |
|--------------------------|--|
| Relevant identified uses | Refrigerant. 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. Used according to manufacturer's directions. |
|--------------------------|--|

### Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

| Registered company name | A-Gas  | Rapid Recovery part of A-Gas Group                | A-Gas                                  |
|-------------------------|--|---|--|
| Address                 | 11050 South Highway 287 TX 76078 United States | 8932 WEST CACTUS ROAD ARIZONA 85381 United States | 1100 Haskins Rd OH 43402 United States |
| Telephone               | 817-636-2089                                   | 877-372-7732                                      | 14198678990                            |
| Fax                     | 817.636.9007                                   | 877-572-7732                                      | 1-419-867-3279                         |
| Website                 | www.agasamericas.com                           | www.raprec.com                                    | www.agasamericas.com                   |
| Email                   | tammy.myers@agas.com                           | ryan.olson@raprec.com                             | tammy.myers@agas.com                   |

|                         |   |
|-------------------------|---|
| Registered company name | A-Gas (Thailand) Limited  |
| Address                 | 68-68/6 S&B Tower, 7th Floor, Room 702, Pan Road, Silom, Bangrak Bangkok 10500 Thailand |
| Telephone               | +66 2 6378188   |
| Fax                     | +66 2 6378191   |
| Website                 | www.agas.com  |
| Email                   | info.th@agas.com  |

### Emergency phone number

| Association / Organisation        | Chemtrec       | PERS                         | PERS                         |
|-----------------------------------|----------------|------------------------------|------------------------------|
| Emergency telephone numbers       | 1-800-424-9300 | US 1-800-633-8253            | 1-800-633-8253               |
| Other emergency telephone numbers | Not Available  | International 1-801-629-0667 | International 1-801-629-0667 |

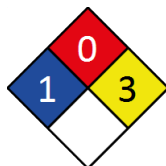
|                                   |                |
|-----------------------------------|----------------|
| Association / Organisation        | Chemwatch      |
| Emergency telephone numbers       | +800 2436 2255 |
| Other emergency telephone numbers | Not Available  |

## SECTION 2 HAZARD(S) IDENTIFICATION

Continued...

## Classification of the substance or mixture

### NFPA 704 diamond



Note: The hazard category numbers found in GHS classification in section 2 of this SDSs are NOT to be used to fill in the NFPA 704 diamond. Blue = Health Red = Fire Yellow = Reactivity White = Special (Oxidizer or water reactive substances)

|                       |   |
|-----------------------|---|
| <b>Classification</b> | Simple Asphyxiant, Gas under Pressure (Compressed gas), Eye Irritation Category 2B, Acute Aquatic Hazard Category 1, Chronic Aquatic Hazard Category 1, Hazardous to the Ozone Layer Category 1 |
|-----------------------|---|

### Label elements

|                            |  |
|----------------------------|--|
| <b>Hazard pictogram(s)</b> |  |
|----------------------------|--|

|                    |                |
|--------------------|----------------|
| <b>SIGNAL WORD</b> | <b>WARNING</b> |
|--------------------|----------------|

### Hazard statement(s)

|             |  |
|-------------|--|
| <b>H280</b> | Contains gas under pressure; may explode if heated.                                  |
| <b>H320</b> | Causes eye irritation.   |
| <b>H410</b> | Very toxic to aquatic life with long lasting effects.                                |
| <b>H420</b> | Harms public health and the environment by destroying ozone in the upper atmosphere. |
|             | May displace oxygen and cause rapid suffocation                                      |

### Hazard(s) not otherwise specified

Not Applicable

### Precautionary statement(s) Prevention

|             |   |
|-------------|---|
| <b>P273</b> | Avoid release to the environment.                               |
| <b>P264</b> | Wash all exposed external body areas thoroughly after handling. |

### Precautionary statement(s) Response

|                       |  |
|-----------------------|--|
| <b>P305+P351+P338</b> | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| <b>P337+P313</b>      | If eye irritation persists: Get medical advice/attention.  |
| <b>P391</b>           | Collect spillage.  |

### Precautionary statement(s) Storage

|                  |  |
|------------------|--|
| <b>P410+P403</b> | Protect from sunlight. Store in a well-ventilated place. |
|------------------|--|

### Precautionary statement(s) Disposal

|             |   |
|-------------|---|
| <b>P501</b> | Dispose of contents/container in accordance with local regulations.   |
| <b>P502</b> | Refer to manufacturer/supplier for information on recovery/recycling. |

## SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

### Substances

See section below for composition of Mixtures

### Mixtures

| CAS No    | %[weight] | Name               |
|-----------|-----------|--------------------|
| 75-45-6   | 60        | <u>F-22 HCFC22</u> |
| 75-68-3   | 15        | <u>R142b</u>       |
| 2837-89-0 | 25        | <u>R124</u>        |

## SECTION 4 FIRST-AID MEASURES

### Description of first aid measures

|                     |  |
|---------------------|--|
| <b>Eye Contact</b>  | <ul style="list-style-type: none"> <li>▶ If product comes in contact with eyes remove the patient from gas source or contaminated area.</li> <li>▶ Take the patient to the nearest eye wash, shower or other source of clean water.</li> <li>▶ Open the eyelid(s) wide to allow the material to evaporate.</li> <li>▶ 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.</li> <li>▶ 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.</li> <li>▶ 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)</li> <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<br/> <b>DO NOT</b> allow the patient to tightly shut the eyes<br/> <b>DO NOT</b> introduce oil or ointment into the eye(s) without medical advice<br/> <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> </ul>  |

### Most important symptoms and effects, both acute and delayed

See Section 11

### 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

Continued...

**DO NOT** administer sympathomimetic drugs as they may cause ventricular arrhythmias.

For gas exposures:

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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 FIRE-FIGHTING 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

|                             |  |
|-----------------------------|--|
| <b>Fire Incompatibility</b> | ▶ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result |
|-----------------------------|--|

### Special protective equipment and precautions for fire-fighters

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

## 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

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

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

## SECTION 7 HANDLING AND STORAGE

### Precautions for safe handling

|                          |   |
|--------------------------|---|
| <b>Safe handling</b>     | <ul style="list-style-type: none"> <li>▶ Vented gas is more dense than air and may collect in pits, basements.</li> </ul>   |
| <b>Other information</b> | <ul style="list-style-type: none"> <li>▶ Cylinders should be stored in a purpose-built compound with good ventilation, preferably in the open.</li> <li>▶ Such compounds should be sited and built in accordance with statutory requirements.</li> <li>▶ The storage compound should be kept clear and access restricted to authorised personnel only.</li> <li>▶ Cylinders stored in the open should be protected against rust and extremes of weather.</li> </ul> |

### Conditions for safe storage, including any incompatibilities

|                                |  |
|--------------------------------|--|
| <b>Suitable container</b>      | <p>Cylinder: Steel packaging   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.   Cylinder valve must be closed when not in use or when empty.   Segregate full from empty cylinders.   WARNING: Suckback into cylinder may result in rupture. Use back-flow preventive device in piping.</p>   |
| <b>Storage incompatibility</b> | <ul style="list-style-type: none"> <li>▶ Avoid reaction with oxidising agents</li> <li>▶ Avoid magnesium, aluminium and their alloys, brass and steel.</li> </ul> <p>Haloalkanes:</p> <ul style="list-style-type: none"> <li>▶ 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.</li> <li>▶ may react with the lighter divalent metals to produce more reactive compounds analogous to Grignard reagents.</li> <li>▶ may produce explosive compounds following prolonged contact with metallic or other azides</li> <li>▶ 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 .</li> </ul> <p>BREThERICK L.: Handbook of Reactive Chemical Hazards</p> <ul style="list-style-type: none"> <li>▶ 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.</li> </ul> |

## SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

### Control parameters

#### OCCUPATIONAL EXPOSURE LIMITS (OEL)

#### INGREDIENT DATA

| Source                                      | Ingredient            | Material name  | TWA                   | STEL                  | Peak          | Notes                                       |
|---|-----------------------|--|-----------------------|-----------------------|---------------|---|
| US NIOSH Recommended Exposure Limits (RELs) | chlorodifluoromethane | Difluorochloromethane, Fluorocarbon-22, Freon® 22, Genetron® 22, Monochlorodifluoromethane, Refrigerant 22 | 1000 ppm / 3500 mg/m3 | 4375 mg/m3 / 1250 ppm | Not Available | Not Available                               |
| US ACGIH Threshold Limit Values (TLV)       | chlorodifluoromethane | Chlorodifluoromethane  | 1000 ppm              | Not Available         | Not Available | TLV® Basis: CNS impair; asphyxia; card sens |

#### EMERGENCY LIMITS

| Ingredient | Material name | TEEL-1 | TEEL-2 | TEEL-3 |
|------------|---------------|--------|--------|--------|
|------------|---------------|--------|--------|--------|

Continued...

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|             |  |               |               |               |
|-------------|--|---------------|---------------|---------------|
| F-22 HCFC22 | Chlorodifluoromethane; (Freon 22; CFC 22)  | 1,250 ppm     | 2,400 ppm     | 14,000 ppm    |
| R142b       | Chloro-1,1-difluoroethane, 1-; (HCFC-142b) | Not Available | Not Available | Not Available |
| R124        | Chloro-1,1,1,2-tetrafluoroethane, 2-       | Not Available | Not Available | Not Available |

| Ingredient  | Original IDLH | Revised IDLH  |
|-------------|---------------|---------------|
| F-22 HCFC22 | Not Available | Not Available |
| R142b       | Not Available | Not Available |
| R124        | Not Available | Not Available |


## MATERIAL DATA

May act as a simple asphyxiants; these are gases which, when present in high concentrations, reduce the oxygen content in air below that required to support breathing, consciousness and life; loss of consciousness, with death by suffocation may rapidly occur in an oxygen deficient atmosphere.

**CARE:** Most simple asphyxiants are odourless or possess low odour and there is no warning on entry into an oxygen deficient atmosphere. If there is any doubt, oxygen content can be checked simply and quickly. It may not be appropriate to only recommend an exposure standard for simple asphyxiants rather it is essential that sufficient oxygen be maintained.

Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations. Present day expectations require that nearly every individual should be protected against even minor sensory irritation and exposure standards are established using uncertainty factors or safety factors of 5 to 10 or more. On occasion animal no-observable-effect-levels (NOEL) are used to determine these limits where human results are unavailable.

## Exposure controls

|   |   |
|---|---|
| <b>Appropriate engineering controls</b> | <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. 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> |
| <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>Hands/feet 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>▶ 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)</li> <li>▶ Air-supplied breathing apparatus is required where release of gas from primary containment is either suspected or demonstrated.</li> <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>                                  |

## SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

## Information on basic physical and chemical properties

|   |   |  |                        |
|---|---|--|------------------------|
| <b>Appearance</b>                                   | Colourless liquefied gas with a slightly ethereal odour; partly mixes with water. |  |                        |
| <b>Physical state</b>                               | Compressed Gas  | <b>Relative density (Water = 1)</b>            | 1.221 @ 25 deg.C       |
| <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>                             | 7   | <b>Decomposition temperature</b>               | 96                     |
| <b>Melting point / freezing point (°C)</b>          | Not Available   | <b>Viscosity (cSt)</b>                         | 0.198 mPa.s @ 25 deg.C |
| <b>Initial boiling point and boiling range (°C)</b> | -34   | <b>Molecular weight (g/mol)</b>                | Not Applicable         |

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|                           |                 |                                  |               |
|---------------------------|-----------------|----------------------------------|---------------|
| Flash point (°C)          | Not Applicable  | Taste                            | Not Available |
| Evaporation rate          | Not Available   | Explosive properties             | Not Available |
| Flammability              | Not Applicable  | Oxidising properties             | Not Available |
| Upper Explosive Limit (%) | 14.8            | Surface Tension (dyn/cm or mN/m) | Not Available |
| Lower Explosive Limit (%) | 9               | Volatile Component (%vol)        | 100           |
| Vapour pressure (kPa)     | 820 @ deg.C     | Gas group                        | Not Available |
| Solubility in water (g/L) | Partly Miscible | pH as a solution (1%)            | Not Available |
| Vapour density (Air = 1)  | >3              | VOC g/L                          | Not Available |

SECTION 10 STABILITY AND REACTIVITY

|                                    |  |
|------------------------------------|--|
| Reactivity                         | See section 7  |
| Chemical stability                 | <ul style="list-style-type: none"> <li>▶ Unstable in the presence of incompatible materials.</li> <li>▶ Product is considered stable.</li> <li>▶ Hazardous polymerisation will not occur.</li> <li>▶ Presence of elevated temperatures.</li> </ul> |
| 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>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>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> |
| 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>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>  |
| Eye          | <p>Limited evidence exists, or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals and/or is expected to produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.</p>  |
| Chronic      | <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. 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.</p>  |

|             |  |               |
|-------------|--|---------------|
| R409A       | TOXICITY   | IRRITATION    |
|             | Not Available  | Not Available |
| F-22 HCFC22 | TOXICITY   | IRRITATION    |
|             | Inhalation (rat) LC50: 2.1850040625 mg/l/15Md <sup>[2]</sup> | Not Available |

|                |  |               |
|----------------|--|---------------|
| R142b          | TOXICITY   | IRRITATION    |
|                | Inhalation (rat) LC50: 2050 mg/l/4h <sup>[2]</sup>   | Not Available |
| R124           | TOXICITY   | IRRITATION    |
|                | Inhalation (rat) LC50: 35584.351875 mg/l15md <sup>[2]</sup>  | Not Available |
| <b>Legend:</b> | 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 |               |

|             |   |
|-------------|---|
| R409A       | Acute toxicity . Oral route, LD 50, not applicable. . Dermal route, LD 50, not applicable. . Inhalation, LC 50, 6 hour(s), rat, > 40 % v/v air (R 142b). . Inhalation, LC 50, 4 hour(s), rat, 21.9 % v/v air (R 22). Irritation . Rabbit, slightly irritant (skin) (R 22). . Rabbit, slightly irritant (eyes) (R 22). Sensitisation . Guinea Pig, Non sensitising (skin) (R 22). Chronic toxicity . Inhalation, after a single exposure, dog, 2.6 % v/v air, cardiac sensitization following adrenergic stimulation (R 22/R 142b/R 124). . Inhalation, after prolonged exposure, rat, 5 % v/v air, no observed effect (R 142b/R 124). . No carcinogenic, teratogenic effects (R 142b/R 124). . Inhalation, rat, Target organ: eyes, 5 % v/v air, teratogenic effect (R 22). . No mutagenic effect (R 22/R 124). . In vitro, Ambiguous mutagenic effect (R 142b). . In vivo, no mutagenic effect (R 142b). . Inhalation, after prolonged exposure, rat, Target organ: salivary glands, 5 % v/v air, carcinogenic effect (R 22). . Inhalation, after prolonged exposure, mouse, no carcinogenic effect (R22).   |
| F-22 HCFC22 | The substance is classified by IARC as Group 3:<br><b>NOT</b> classifiable as to its carcinogenicity to humans.<br>Evidence of carcinogenicity may be inadequate or limited in animal testing.  |
| R142B       | Inhalation (Mouse) LC50: 1758000 mg/m3/2h Nil reported for chlorodifluoroethane (syn 1-chloro-1,1-difluoroethane):<br><b>Acute toxicity</b> of 1-chloro-1,1-difluoroethane is low (LC50/6h >1,640,000 mg/m3 (400,000 ppm) in rats). Inhalation of high concentrations induced signs of lung irritation and Central Nervous System depressing effects of anesthetic type in rats and cardiac sensitisation in dogs. Consequently, 1-chloro 1,1 -difluoroethane may be hazardous to humans in case of accidental exposure to high concentrations occurring in confined area where replacement of air by the gas could at the same time reduce oxygen in the atmosphere.<br><b>Repeat dose toxicity:</b> In repeated inhalation exposure studies, 1-chloro -1,1-difluoroethane did not induce specific chronic toxicity in rats and dogs exposed 6 h/d, 5 d/week during several months (no target organs identified ; the no observed adverse effects were higher than 41 000 mg/m3 (10,000 ppm) in dogs exposed during 3 months and higher than 82 000 mg/m3 (20,000 ppm) in rats exposed for their lifetime).<br>- *(Toxicity data for approx. 45% gas, 55% air) |
| R124        | 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.<br>Numerous haloalkanes and haloalkenes have been tested for carcinogenic and mutagenic activities.   |

|                                   |   |                          |   |
|-----------------------------------|---|--------------------------|---|
| 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 available but does not fill the criteria for classification  
✔ – Data available to make classification  
☒ – Data Not Available to make classification

## SECTION 12 ECOLOGICAL INFORMATION

### Toxicity

|             | ENDPOINT      | TEST DURATION (HR) | SPECIES       | VALUE         | SOURCE        |
|-------------|---------------|--------------------|---------------|---------------|---------------|
| R409A       | Not Available | Not Available      | Not Available | Not Available | Not Available |
| F-22 HCFC22 | LC50          | 96                 | Fish          | 777mg/L       | 2             |
| R142b       | LC50          | 96                 | Fish          | 220mg/L       | 2             |
|             | EC50          | 48                 | Crustacea     | =160mg/L      | 1             |

Continued...



|      | ENDPOINT      | TEST DURATION (HR) | SPECIES       | VALUE         | SOURCE        |
|------|---------------|--------------------|---------------|---------------|---------------|
| R124 | Not Available | Not Available      | Not Available | Not Available | Not Available |

**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*

#### DO NOT discharge into sewer or waterways.

[Acute ecotoxicity]. Fishes, *Poecilia reticulata*, LC 50, 96 hour(s), 220 mg/l (R 142b). | Crustaceans, *Daphnia magna*, EC 50, 48 hour(s), 160 mg/l (R 142b). | Chronic ecotoxicity | Result: no data. | Mobility | Air, Henry's law constant (H) from 15 to 36 kPa.m<sup>3</sup>/mol. | Result: considerable volatility. | Conditions: ambient temperature/calculated value (R 22/R 142b/R 124). | Water, evaporation, t (100%) = 3 day(s). | Conditions: 20 °C/saturated solution (R 22). | Water, evaporation, t 1/2 = 3 hour(s). | Conditions: calculated value from mathematical model/river (R 142b). | Soil/sediments, adsorption, log KOC from 1.25 to 1.76. | Conditions: calculated value (R 22). | Soil/sediments, adsorption, log KOC from 1.6 to 2. | Conditions: calculated value (R 142b/R 124). | Abiotic degradation | Air, indirect photo-oxidation, t 1/2 from 5 to 17 year(s). | Conditions: sensitiser: OH radicals. | Degradation's products: carbon dioxide/hydrochloric acid/fluorhydric acid/trifluoroacetic acid (R 22/R 142b/R 124). | Air, photolysis, ODP from 0.016 to 0.065. | Result: limited effect on stratospheric ozone. | Reference value for CFC 11: ODP = 1 (R 22/R 142b/R 124). | Air, greenhouse effect, GWP from 0.1 to 0.42. | Reference value for CFC 11: GWP = 1 (R 22/R 142b/R 124). | Water/soil, hydrolysis, t 1/2 from 25 to 40 year(s). | Result: non-significant hydrolysis. | Conditions: pH 8/25 °C (R 22). | Water/soil, hydrolysis, t 1/2 > 10000 year(s). | Result: non-significant hydrolysis. | Conditions: calculated value (R 142b). | Biotic degradation | Aerobic, test : ready biodegradability/closed bottle, degradation = 0%, 28 day(s). | Result: non-readily biodegradable (R 22). | Aerobic, test : ready biodegradability/modified STURM, degradation = 5%, 28 day(s). | Result: non-readily biodegradable (R 142b). | Aerobic, test : ready biodegradability/closed bottle, degradation from 1 to 2 %, 28 day(s). | Result: non-readily biodegradable (R 124). | Potential for bioaccumulation | Bioconcentration : log Po/w = 1.08. | Result: non-bioaccumulable (R 22). | Bioconcentration : Aquatic organisms, BCF = 42. | Result: non-bioaccumulable. | Conditions: calculated value (R 142b). | Bioconcentration : log Po/w from 1.9 to 2. | Result: weak bioaccumulation potential (R 124). | Comments | Product is persistent in air. | Product is not significantly hazardous for the aquatic environment as: | Considerable volatility. | Low bioaccumulation potential.

#### Persistence and degradability

| Ingredient  | Persistence: Water/Soil | Persistence: Air |
|-------------|-------------------------|------------------|
| F-22 HCFC22 | LOW                     | LOW              |
| R142b       | HIGH                    | HIGH             |
| R124        | HIGH                    | HIGH             |

#### Bioaccumulative potential

| Ingredient  | Bioaccumulation       |
|-------------|-----------------------|
| F-22 HCFC22 | LOW (LogKOW = 1.08)   |
| R142b       | LOW (LogKOW = 2.0526) |
| R124        | LOW (LogKOW = 1.8605) |

#### Mobility in soil

| Ingredient  | Mobility          |
|-------------|-------------------|
| F-22 HCFC22 | LOW (KOC = 23.74) |
| R142b       | LOW (KOC = 48.64) |
| R124        | LOW (KOC = 154.4) |


### SECTION 13 DISPOSAL CONSIDERATIONS

#### Waste treatment methods

|                              |   |
|------------------------------|---|
| Product / Packaging disposal | <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> |
|------------------------------|---|

### SECTION 14 TRANSPORT INFORMATION

#### Labels Required

|  |   |
|--|---|
|  |  |
|--|---|

Marine Pollutant



#### Land transport (DOT)

|                              |                           |                |
|------------------------------|---------------------------|----------------|
| UN number                    | 3163                      |                |
| UN proper shipping name      | Liquefied gas, n.o.s.     |                |
| Transport hazard class(es)   | Class                     | 2.2            |
|                              | Subrisk                   | Not Applicable |
| Packing group                | Not Applicable            |                |
| Environmental hazard         | Environmentally hazardous |                |
| Special precautions for user | Hazard Label              | 2.2            |
|                              | Special provisions        | T50            |

#### Air transport (ICAO-IATA / DGR)

|                              |   |                |
|------------------------------|---|----------------|
| UN number                    | 3163  |                |
| UN proper shipping name      | Liquefied gas, n.o.s. *                                   |                |
| Transport hazard class(es)   | ICAO/IATA Class   | 2.2            |
|                              | ICAO / IATA Subrisk                                       | Not Applicable |
|                              | ERG Code  | 2L             |
| Packing group                | Not Applicable  |                |
| Environmental hazard         | Environmentally hazardous                                 |                |
| 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                    | 3163                  |                |
| UN proper shipping name      | LIQUEFIED GAS, N.O.S. |                |
| Transport hazard class(es)   | IMDG Class            | 2.2            |
|                              | IMDG Subrisk          | Not Applicable |
| Packing group                | Not Applicable        |                |
| Environmental hazard         | Marine Pollutant      |                |
| 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

Continued...

**F-22 HCFC22(75-45-6) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs

US - Alaska Limits for Air Contaminants

US - California Permissible Exposure Limits for Chemical Contaminants

US - Hawaii Air Contaminant Limits

US - Massachusetts - Right To Know Listed Chemicals

US - Michigan Exposure Limits for Air Contaminants

US - Minnesota Permissible Exposure Limits (PELs)

US - Pennsylvania - Hazardous Substance List

US - Rhode Island Hazardous Substance List

US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants

US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants

US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants

US - Washington Permissible exposure limits of air contaminants

US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values

US ACGIH Threshold Limit Values (TLV)

US ACGIH Threshold Limit Values (TLV) - Carcinogens

US CWA (Clean Water Act) - Toxic Pollutants

US EPCRA Section 313 Chemical List

US NIOSH Recommended Exposure Limits (RELs)

US Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne Contaminants

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US TSCA Chemical Substance Inventory - Interim List of Active Substances

US TSCA New Chemical Exposure Limits (NCEL)

US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements

**R142B(75-68-3) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US - Hawaii Air Contaminant Limits

US - Massachusetts - Right To Know Listed Chemicals

US - Pennsylvania - Hazardous Substance List

US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values

US AIHA Workplace Environmental Exposure Levels (WEELs)

US EPCRA Section 313 Chemical List

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US TSCA Chemical Substance Inventory - Interim List of Active Substances

US TSCA New Chemical Exposure Limits (NCEL)

US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements

**R124(2837-89-0) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

US AIHA Workplace Environmental Exposure Levels (WEELs)

US EPCRA Section 313 Chemical List

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US TSCA Chemical Substance Inventory - Interim List of Active Substances

US TSCA New Chemical Exposure Limits (NCEL)

US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements

**Federal Regulations****Superfund Amendments and Reauthorization Act of 1986 (SARA)****SECTION 311/312 HAZARD CATEGORIES**

|  |     |
|--|-----|
| Flammable (Gases, Aerosols, Liquids, or Solids)              | No  |
| Gas under pressure   | Yes |
| Explosive  | No  |
| Self-heating   | No  |
| Pyrophoric (Liquid or Solid)                                 | No  |
| Pyrophoric Gas   | No  |
| Corrosive to metal   | No  |
| Oxidizer (Liquid, Solid or Gas)                              | No  |
| Organic Peroxide   | No  |
| Self-reactive  | No  |
| In contact with water emits flammable gas                    | No  |
| Combustible Dust   | No  |
| Carcinogenicity  | No  |
| Acute toxicity (any route of exposure)                       | No  |
| Reproductive toxicity  | No  |
| Skin Corrosion or Irritation                                 | No  |
| Respiratory or Skin Sensitization                            | No  |
| Serious eye damage or eye irritation                         | No  |
| Specific target organ toxicity (single or repeated exposure) | No  |
| Aspiration Hazard  | No  |
| Germ cell mutagenicity                                       | No  |
| Simple Asphyxiant  | Yes |

**US. EPA CERCLA HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES (40 CFR 302.4)**

Continued...

None Reported

## State Regulations

### US. CALIFORNIA PROPOSITION 65

None Reported

## National Inventory Status

| National Inventory            | Status   |
|-------------------------------|--|
| Australia - AICS              | Y  |
| Canada - DSL                  | Y  |
| Canada - NDSL                 | N (R124; R142b; F-22 HCFC22)   |
| China - IECSC                 | Y  |
| Europe - EINEC / ELINCS / NLP | Y  |
| Japan - ENCS                  | Y  |
| Korea - KECI                  | Y  |
| New Zealand - NZIoC           | Y  |
| Philippines - PICCS           | Y  |
| USA - TSCA                    | Y  |
| <b>Legend:</b>                | Y = All ingredients are on the inventory<br>N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets) |

## SECTION 16 OTHER INFORMATION

|                      |               |
|----------------------|---------------|
| <b>Revision Date</b> | 09/09/2013    |
| <b>Initial Date</b>  | Not Available |

### Other information

#### Ingredients with multiple cas numbers

| Name | CAS No                |
|------|-----------------------|
| R124 | 2837-89-0, 63938-10-3 |

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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