

R409A

A-Gas (U.S. Headquarters)

Chemwatch Hazard Alert Code: 1

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	Not Available
Proper shipping name	Liquefied gas, n.o.s. (contains F-22 HCFC22 and R142b)
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 manufacturers directions.
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Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

Registered company name	A-Gas (U.S. Headquarters)
Address	1100 Haskins Rd OH 43402 United States
Telephone	14198678990
Fax	1-419-867-3279
Website	www.agasamericas.com
Email	tammy.myers@agas.com

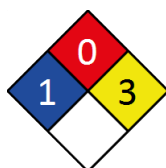
Emergency phone number

Association / Organisation	A-Gas (U.S. Headquarters)
Emergency telephone numbers	1-800-633-8253
Other emergency telephone numbers	International 1-801-629-0667

SECTION 2 HAZARD(S) IDENTIFICATION

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)

Classification	Simple Asphyxiant, Gas under Pressure (Compressed gas), Eye Irritation Category 2B, Chronic Aquatic Hazard Category 1, Hazardous to the Ozone Layer Category 1
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Label elements

Hazard pictogram(s)	
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SIGNAL WORD **WARNING**

Hazard statement(s)

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

Hazard(s) not otherwise classified

Not Applicable

Precautionary statement(s) Prevention

P273	Avoid release to the environment.
P264	Wash all exposed external body areas thoroughly after handling.

Precautionary statement(s) Response

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

Precautionary statement(s) Storage

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

P501	Dispose of contents/container in accordance with local regulations.
P502	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>
2837-89-0	25	<u>R124</u>
75-68-3	15	<u>R142b</u>

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 DO NOT allow the patient to tightly shut the eyes DO NOT introduce oil or ointment into the eye(s) without medical advice DO NOT use hot or tepid water.</p>
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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.
Inhalation	<ul style="list-style-type: none"> ▶ Following exposure to gas, remove the patient from the gas source or contaminated area. ▶ NOTE: Personal Protective Equipment (PPE), including positive pressure self-contained breathing apparatus may be required to assure the safety of the rescuer. ▶ Prostheses such as false teeth, which may block the airway, should be removed, where possible, prior to initiating first aid procedures. ▶ If the patient is not breathing spontaneously, administer rescue breathing. ▶ If the patient does not have a pulse, administer CPR. ▶ If medical oxygen and appropriately trained personnel are available, administer 100% oxygen. ▶ Summon an emergency ambulance. If an ambulance is not available, contact a physician, hospital, or Poison Control Centre for further 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. ▶ For advice, contact a Poisons Information Centre or a doctor. ▶ Avoid giving milk or oils. ▶ Avoid giving alcohol.

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

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

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.

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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

Fire Incompatibility	<ul style="list-style-type: none"> ▶ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result
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Special protective equipment and precautions for fire-fighters

Fire Fighting	<p>----- GENERAL -----</p> <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:</p> <p>carbon monoxide (CO) carbon dioxide (CO₂) hydrogen chloride phosgene 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>

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"> ▶ Vented gas is more dense than air and may collect in pits, basements.
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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	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.
Storage incompatibility	<ul style="list-style-type: none"> ▶ Avoid reaction with oxidising agents ▶ Avoid magnesium, aluminium and their alloys, brass and steel. <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 range 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>BRETHERRICK 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.

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

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

Appropriate engineering controls	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.
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	<p>The basic types of engineering controls are:</p> <p>Process controls which involve changing the way a job activity or process is done to reduce the risk.</p> <p>Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.</p>
Personal protection	
Eye and face protection	<ul style="list-style-type: none"> ▶ Safety glasses with side shields. ▶ Chemical goggles. ▶ 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.
Body protection	See Other protection below
Other protection	<ul style="list-style-type: none"> ▶ 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. ▶ 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

Full face respirator with supplied air.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES**Information on basic physical and chemical properties**

Appearance	Colourless liquefied gas with a slightly ethereal odour; partly mixes with water.		
Physical state	Compressed Gas	Relative density (Water = 1)	1.221 @ 25 deg.C
Odour	Not Available	Partition coefficient n-octanol / water	Not Available
Odour threshold	Not Available	Auto-ignition temperature (°C)	Not Applicable
pH (as supplied)	7	Decomposition temperature	96
Melting point / freezing point (°C)	Not Available	Viscosity (cSt)	0.198 mPa.s @ 25 deg.C
Initial boiling point and boiling range (°C)	-34	Molecular weight (g/mol)	Not Applicable
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	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"> ▶ Unstable in the presence of incompatible materials. ▶ Product is considered stable. ▶ Hazardous polymerisation will not occur. ▶ Presence of elevated temperatures.
Possibility of hazardous reactions	See section 7

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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 to 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	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.
Eye	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.
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 Not Available	IRRITATION Not Available
F-22 HCFC22	TOXICITY Inhalation (rat) LC50: 2.1850040625 mg/l/15Md ^[2]	IRRITATION Not Available
R124	TOXICITY Inhalation (rat) LC50: 35584.351875 mg/l/15md ^[2]	IRRITATION Not Available
R142b	TOXICITY Inhalation (rat) LC50: 2050 mg/l/4h ^[2]	IRRITATION Not Available
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	

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: NOT classifiable as to its carcinogenicity to humans. Evidence of carcinogenicity may be inadequate or limited in animal testing.

R142B	<p>for chlorodifluoroethane (syn 1-chloro-1,1-difluoroethane):</p> <p>Acute toxicity 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.</p> <p>Repeat dose toxicity: 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).</p> <p>Inhalation (Mouse) LC50: 1758000 mg/m³/2h Nil reported - *(Toxicity data for approx. 45% gas, 55% air)</p>
F-22 HCFC22 & R124 & R142B	<p>Chlorofluorocarbons may enter the human organism by inhalation, ingestion, or dermal contact. Inhalation is the most common and important route of entry, and exhalation is the most significant route of elimination from the body. Controlled studies with volunteer subjects and experimental animals have provided substantial data from exposures to a number of the chlorofluorocarbons. CFCs and HCFCs are known to sensitise the heart to adrenalin-induced arrhythmias.</p> <p>Disinfection by products (DBPs) re formed when disinfectants such as chlorine, chloramine, and ozone react with organic and inorganic matter in water. The observations that some DBPs such as trihalomethanes (THMs), di-/trichloroacetic acids, and 3-chloro-4-(dichloromethyl)-5-hydroxy-2(5H)-furanone (MX) are carcinogenic in animal studies have raised public concern over the possible adverse health effects of DBPs. To date, several hundred DBPs have been identified.</p> <p>Numerous haloalkanes and haloalkenes have been tested for carcinogenic and mutagenic activities.</p>
R124 & R142B	<p>For dichlorotrifluoroethane (HCFC -123) and dichloropentafluoropropane (HCFC-225)</p> <p>Prolonged inhalation of high concentrations of HCFC-123 vapour may cause temporary nervous system depression with anesthetic effects such as dizziness, headache, confusion, incoordination, and loss of consciousness. With gross overexposure (greater than 20% concentration), a temporary alteration of the heart's electrical activity with irregular pulse, palpitations, or inadequate circulation may occur. Similar effects are observed in overexposure to CFC-11. Inhalation may cause liver effects with extended high-level exposures.</p>

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

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

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	R409A	Not Available	Not Available	Not Available	Not Available
F-22 HCFC22	LC50	96	Fish	94.877mg/L	3
	EC50	48	Crustacea	433mg/L	2
	EC50	96	Algae or other aquatic plants	250mg/L	2
R124	LC50	96	Fish	29.326mg/L	3
	EC50	96	Algae or other aquatic plants	90.149mg/L	3
R142b	LC50	96	Fish	15.691mg/L	3
	EC50	48	Crustacea	160mg/L	2
	EC50	96	Algae or other aquatic plants	45.071mg/L	3
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, Henrys law constant (H) from 15 to 36 kPa.m³/mol. | Result: considerable volatility. | Conditions: ambient temperature/calculated value (R 22/R

Continued...

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. | Degradations products: carbon dioxide/hydrochloric 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
R124	HIGH	HIGH
R142b	HIGH	HIGH

Bioaccumulative potential

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

Mobility in soil

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



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	

Land transport (DOT)

UN number	3163
UN proper shipping name	Liquefied gas, n.o.s. (contains F-22 HCFC22 and R142b)
Transport hazard class(es)	Class : 2.2
	Subrisk : Not Applicable

Air transport (ICAO-IATA / DGR)

UN number	3163	
UN proper shipping name	Liquefied gas, n.o.s. * (contains F-22 HCFC22 and R142b)	
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. (contains F-22 HCFC22 and R142b)	
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**

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 - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values
International Air Transport Association (IATA) Dangerous Goods Regulations	US ACGIH Threshold Limit Values (TLV)
International Maritime Dangerous Goods Requirements (IMDG Code)	US ACGIH Threshold Limit Values (TLV) - Carcinogens
United Nations Recommendations on the Transport of Dangerous Goods Model Regulations	US CWA (Clean Water Act) - Toxic Pollutants
US - Alaska Limits for Air Contaminants	US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides
US - California Permissible Exposure Limits for Chemical Contaminants	US Department of Transportation (DOT), Hazardous Material Table
US - Hawaii Air Contaminant Limits	US DOE Temporary Emergency Exposure Limits (TEELs)
US - Massachusetts - Right To Know Listed Chemicals	US EPCRA Section 313 Chemical List
US - Michigan Exposure Limits for Air Contaminants	US NIOSH Recommended Exposure Limits (RELs)
US - Minnesota Permissible Exposure Limits (PELs)	US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide
US - Pennsylvania - Hazardous Substance List	US Postal Service (USPS) Numerical Listing of Proper Shipping Names by Identification (ID) Number
US - Rhode Island Hazardous Substance List	US Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne Contaminants
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	US TSCA Chemical Substance Inventory - Interim List of Active Substances
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	US TSCA New Chemical Exposure Limits (NCEL)
US - Washington Permissible exposure limits of air contaminants	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

International Air Transport Association (IATA) Dangerous Goods Regulations	US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide
International Maritime Dangerous Goods Requirements (IMDG Code)	US Postal Service (USPS) Numerical Listing of Proper Shipping Names by Identification (ID) Number
United Nations Recommendations on the Transport of Dangerous Goods Model Regulations	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US AIHA Workplace Environmental Exposure Levels (WEELs)	US Toxicology Excellence for Risk Assessment (TERA) Workplace Environmental Exposure Levels (WEEL)
US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides	US TSCA Chemical Substance Inventory - Interim List of Active Substances
US Department of Transportation (DOT), Hazardous Material Table	US TSCA New Chemical Exposure Limits (NCEL)
US DOE Temporary Emergency Exposure Limits (TEELs)	US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements
US EPCRA Section 313 Chemical List	

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

International Air Transport Association (IATA) Dangerous Goods Regulations	US DOE Temporary Emergency Exposure Limits (TEELs)
International Maritime Dangerous Goods Requirements (IMDG Code)	US EPCRA Section 313 Chemical List
United Nations Recommendations on the Transport of Dangerous Goods Model Regulations	US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide
US - Massachusetts - Right To Know Listed Chemicals	US Postal Service (USPS) Numerical Listing of Proper Shipping Names by Identification (ID) Number
US - Pennsylvania - Hazardous Substance List	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values	US Toxicology Excellence for Risk Assessment (TERA) Workplace Environmental Exposure Levels (WEEL)
US AIHA Workplace Environmental Exposure Levels (WEELs)	US TSCA Chemical Substance Inventory - Interim List of Active Substances
US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides	US TSCA New Chemical Exposure Limits (NCEL)
US Department of Transportation (DOT), Hazardous Material Table	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

R409A

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
Hazards Not Otherwise Classified	No

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

None Reported

State Regulations

US. CALIFORNIA PROPOSITION 65

None Reported

National Inventory Status

National Inventory	Status
Australia - AICS	Yes
Canada - DSL	Yes
Canada - NDSL	No (R124; R142b; F-22 HCFC22)
China - IECSC	Yes
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	No (R124)
Russia - ARIPS	Yes
Thailand - TECl	No (R142b)
Legend:	Yes = All CAS declared ingredients are on the inventory No = 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

Revision Date	04/09/2018
Initial Date	19/01/2007

SDS Version Summary

Version	Issue Date	Sections Updated
4.1.1.1	09/09/2013	Storage (storage incompatibility)
5.1.1.1	04/09/2018	Ingredients

Other information

Ingredients with multiple cas numbers

Continued...

Name	CAS No
F-22 HCFC22	75-45-6, 73666-77-0, 134191-96-1
R124	2837-89-0, 63938-10-3
R142b	75-68-3, 65762-25-6

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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