

A-GAS R403B

A-Gas (U.S. Headquarters)

Chemwatch: 7529-94

Version No: 4.1.1.1

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

Chemwatch Hazard Alert Code: 1

Issue Date: 04/12/2017

Print Date: 22/07/2019

L.GHS.USA.EN

SECTION 1 IDENTIFICATION

Product Identifier

Product name	A-GAS R403B
Synonyms	Not Available
Proper shipping name	Liquefied gas, n.o.s. (contains F-22 HCFC22, Propane and octafluoropropane)
Other means of identification	Not Available

Recommended use of the chemical and restrictions on use

Relevant identified uses	Refrigerant.
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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

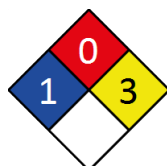
Emergency phone number

Association / Organisation	PERS
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 3, 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.
H412	Harmful 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.

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	56	<u>F-22 HCFC22</u>
76-19-7	39	<u>octafluoropropane</u>
74-98-6	5	<u>Propane</u>

SECTION 4 FIRST-AID MEASURES**Description of first aid measures**

Eye Contact	<p>If this product comes in contact with the eyes:</p> <ul style="list-style-type: none"> ▶ Immediately hold eyelids apart and flush the eye continuously with running water. ▶ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▶ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes. ▶ Transport to hospital or doctor without delay. ▶ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	<p>If skin or hair contact occurs:</p> <ul style="list-style-type: none"> ▶ Immediately flush body and clothes with large amounts of water, using safety shower if available. ▶ Quickly remove all contaminated clothing, including footwear. ▶ Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre. ▶ Transport to hospital, or doctor. <p>In case of cold burns (frost-bite):</p> <ul style="list-style-type: none"> ▶ Move casualty into warmth before thawing the affected part; if feet are affected carry if possible ▶ Bathe the affected area immediately in luke-warm water (not more than 35 deg C) for 10 to 15 minutes, immersing if possible and without rubbing

Continued...

	<ul style="list-style-type: none"> ▶ DO NOT apply hot water or radiant heat. ▶ Apply a clean, dry, light dressing of "fluffed-up" dry gauze bandage ▶ If a limb is involved, raise and support this to reduce swelling ▶ If an adult is involved and where intense pain occurs provide pain killers such as paracetamol ▶ Transport to hospital, or doctor ▶ Subsequent blackening of the exposed tissue indicates potential of necrosis, which may require amputation.
Inhalation	<ul style="list-style-type: none"> ▶ If fumes or combustion products are inhaled remove from contaminated area. ▶ Lay patient down. Keep warm and rested. ▶ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures. ▶ Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary. ▶ Transport to hospital, or doctor, without delay.
Ingestion	<p>Overexposure is unlikely in this form. Rinse mouth out with plenty of water.</p> <ul style="list-style-type: none"> ▶ For advice, contact a Poisons Information Centre or a doctor at once. ▶ Urgent hospital treatment is likely to be needed. ▶ If swallowed do NOT induce vomiting. ▶ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▶ Observe the patient carefully. ▶ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▶ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▶ Transport to hospital or doctor without delay.

Most important symptoms and effects, both acute and delayed

See Section 11

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

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

SECTION 5 FIRE-FIGHTING MEASURES

Extinguishing media

- ▶ There is no restriction on the type of extinguisher which may be used.

Special hazards arising from the substrate or mixture

Fire Incompatibility	Reacts violently with alkali metals, particularly metal powders, magnesium and magnesium alloys, zinc and zinc alloys, aluminium alloys (> 2% magnesium).
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Special protective equipment and precautions for fire-fighters

Fire Fighting	<p>Product is not combustible. No special firefighting procedures required. Use fire fighting procedures suitable for surrounding area.</p> <ul style="list-style-type: none"> ▶ Wear full body protective clothing with breathing apparatus. ▶ Prevent, by any means available, spillage from entering drains or water course.
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	<ul style="list-style-type: none"> ▶ Consider evacuation (or protect in place). <p>If safe to do so, remove containers from path of fire. DO NOT approach cylinders suspected to be hot. Cool fire exposed containers with water spray from a protected location.</p>
Fire/Explosion Hazard	<p>Non flammable gas Will not burn, but heat produces highly toxic fumes/vapours. Heating may cause expansion or decomposition leading to violent rupture of containers If involved in fire emits toxic fumes of:</p> <p>halogens carbon monoxide (CO) and carbon dioxide (CO₂)</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	<p>Clean up all spills immediately. No smoking, naked lights or ignition sources. Increase ventilation. Avoid breathing vapours and contact with skin and eyes.</p>
Major Spills	<p>Alert Fire Brigade and tell them location and nature of hazard. Clear area of personnel and move upwind</p> <ul style="list-style-type: none"> ▶ Wear full body protective clothing with breathing apparatus. ▶ Prevent, by any means available, spillage from entering drains or water courses. ▶ Consider evacuation (or protect in place). <p>No smoking, naked lights or ignition sources. Increase ventilation. Stop leak if safe to do so.</p> <ul style="list-style-type: none"> ▶ DO NOT exert excessive pressure on valve; DO NOT attempt to operate damaged valve. ▶ Remove leaking cylinders to a safe place if possible. ▶ Release pressure under safe, controlled conditions by opening the valve. <p>Collect recoverable product into labelled containers for recycling until atmosphere has been checked. Water spray or fog may be used to disperse vapour. If contamination of drains or waterways occurs, advise emergency services.</p>

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

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	<p>Contents under pressure</p> <ul style="list-style-type: none"> ▶ Handle and open container with care ▶ Obtain a work permit before attempting any repairs. ▶ Do not attempt repair work on lines, vessels under pressure. <p>Use in closed pressurised systems fitted with temperature and pressure safety relief valves which are vented to allow safe dispersal. Avoid breathing vapours and contact with skin and eyes</p> <ul style="list-style-type: none"> ▶ Avoid smoking, naked lights or ignition sources. ▶ Protect from heat. Keep cool. <p>Avoid sources of heat. Avoid physical damage to containers.</p> <ul style="list-style-type: none"> ▶ Wear personal protective equipment when handling <p>When handling, DO NOT eat, drink or smoke.</p> <p>Use in a well-ventilated area Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards, otherwise PPE is required until atmosphere has been checked. Wash hands with soap and water after handling. Use good occupational work practice. Observe manufacturer's storage and handling recommendations contained within this SDS.</p> <ul style="list-style-type: none"> ▶ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Other information	<p>Contents under pressure Store under cover</p> <ul style="list-style-type: none"> ▶ Outside or detached storage is preferred. <p>Store away from sources of heat or ignition / naked lights.</p>

Continued...

- ▶ Store in original containers.
 - ▶ Keep containers securely sealed.
 - ▶ Store in a cool, dry, well-ventilated area.
 - ▶ Store away from incompatible materials and foodstuff containers.
 - ▶ **DO NOT store in pits, depressions, basements or areas where vapours may be trapped**
- Cylinder temperature should not exceed 45 deg. C.

Conditions for safe storage, including any incompatibilities

Suitable container	<p>DO NOT repack. Use only containers as originally supplied by manufacturer</p> <ul style="list-style-type: none"> ▶ Check that containers are clearly labelled <p>Cylinder fitted with valve protector cap. Ensure the use of equipment rated for cylinder pressure. Ensure the use of compatible materials of construction. Cylinder valve must be closed when not in use or when empty.</p>
Storage incompatibility	<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>BREITHERICK 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. <p>Avoid reaction with alkali metals, particularly metal powders, magnesium and magnesium alloys, zinc and zinc alloys, aluminium alloys (> 2% magnesium).</p>

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
US NIOSH Recommended Exposure Limits (RELs)	propane	Bottled gas, Dimethyl methane, n-Propane, Propyl hydride	1000 ppm / 1800 mg/m3	Not Available	Not Available	Not Available
US ACGIH Threshold Limit Values (TLV)	propane	* Propane	Not Available	Not Available	Not Available	TLV® Basis: Asphyxia; See Appendix F: Minimal Oxygen Content
US OSHA Permissible Exposure Levels (PELs) - Table Z1	propane	Propane	1000 ppm / 1800 mg/m3	Not Available	Not Available	Not Available

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
Propane	Propane	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
F-22 HCFC22	Not Available	Not Available
octafluoropropane	Not Available	Not Available
Propane	2,100 ppm	Not Available

MATERIAL DATA

None assigned. Refer to individual constituents.

Exposed individuals are **NOT** reasonably expected to be warned, by smell, that the Exposure Standard is being exceeded.

Odour Safety Factor (OSF) is determined to fall into either Class C, D or E.

The Odour Safety Factor (OSF) is defined as:

OSF= Exposure Standard (TWA) ppm/ Odour Threshold Value (OTV) ppm

Classification into classes follows:

ClassOSF Description

A 550 Over 90% of exposed individuals are aware by smell that the Exposure Standard (TLV-TWA for example) is being reached, even when distracted by working activities

B 26-550As "A" for 50-90% of persons being distracted


1-26 As "A" for less than 50% of persons being distracted

D 0.18-1 10-50% of persons aware of being tested perceive by smell that the Exposure Standard is being reached

E <0.18 As "D" for less than 10% of persons aware of being tested

Odour Safety Factor(OSF) OSF=0.16 (PROPANE)

Exposure controls

Appropriate engineering controls	<p>Use in a well-ventilated area</p> <p>Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards, otherwise PPE is required.</p> <ul style="list-style-type: none"> ▶ If risk of overexposure exists, wear approved self contained breathing apparatus (SCBA). Correct fit is essential to obtain adequate protection.
Personal protection	
Eye and face protection	<ul style="list-style-type: none"> ▶ Chemical goggles ▶ Full face shield ▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available.
Skin protection	See Hand protection below
Hands/feet protection	Wear physical protective gloves, e.g. leather
Body protection	See Other protection below
Other protection	<p>No special equipment needed when handling small quantities</p> <ul style="list-style-type: none"> ▶ Ensure that there is ready access to eye wash unit <p>Operators should be trained in correct use.</p> <p>Ensure that there is ready access to breathing apparatus</p>

Respiratory protection

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

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

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

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

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

^ - Full-face

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

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	<p>Packed as liquid under pressure and remains liquid only under pressure. Sudden release of pressure or leakage may result in rapid vapourisation with generation of large volumes of gas.</p> <p>Clear, colourless gas with a slight ethereal odour; does not mix with water. Soluble in common organic solvents. Critical temperature: 90 deg.</p> <p>C. Critical pressure: 5091 kPa.</p>
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Physical state	Compressed Gas	Relative density (Water = 1)	1.156 @ 20 C
Odour	Not Available	Partition coefficient n-octanol / water	Not Available
Odour threshold	Not Available	Auto-ignition temperature (°C)	Not Available
pH (as supplied)	Not Applicable	Decomposition temperature	Not Available
Melting point / freezing point (°C)	Not Available	Viscosity (cSt)	Not Available
Initial boiling point and boiling range (°C)	-50.6	Molecular weight (g/mol)	Not Available
Flash point (°C)	Not Applicable	Taste	Not Available
Evaporation rate	Not Applicable	Explosive properties	Not Available
Flammability	Not Applicable	Oxidising properties	Not Available
Upper Explosive Limit (%)	Not Applicable	Surface Tension (dyn/cm or mN/m)	Not Available
Lower Explosive Limit (%)	Not Applicable	Volatile Component (%vol)	100
Vapour pressure (kPa)	1318 @ 25 C	Gas group	Not Available
Solubility in water	Immiscible	pH as a solution (1%)	Not Applicable
Vapour density (Air = 1)	5.61 @ -50.6 C	VOC g/L	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	<ul style="list-style-type: none"> ▸ Extremely high temperatures. Product is considered stable under normal handling conditions Stable under normal storage conditions Hazardous polymerisation will not occur.
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>The vapour is discomforting to the upper respiratory tract and lungs and may be harmful if inhaled</p> <p>Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved.</p> <p>Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin)</p> <p>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>
Ingestion	<p>Overexposure is unlikely in this form.</p> <p>Considered an unlikely route of entry in commercial/industrial environments</p> <p>The liquid is harmful if swallowed and is capable of causing severe cold burns</p> <p>Not normally a risk due to volatility of liquid.</p>

Skin Contact	<p>Vapourising liquid causes rapid cooling and contact may cause cold burns, frostbite, even through normal gloves. Frozen skin tissues are painless and appear waxy and yellow. Signs and symptoms of frost-bite may include "pins and needles", paleness followed by numbness, a hardening and stiffening of the skin, a progression of colour changes in the affected area, (first white, then mottled and blue and eventually black; on recovery, red, hot, painful and blistered).</p> <p>Avoid contact with liquid gas.</p> <p>Vapourising liquid causes frostbite even through normal gloves. Frozen skin tissues are painless and appear waxy and pale yellow.</p>
Eye	<p>The vapour is mildly discomforting to the eyes</p> <p>The liquid is discomforting and may cause severe cold burns and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated</p>
Chronic	<p>Principal routes of exposure are usually by for Petroleum Hydrocarbon Gases:</p> <p>In many cases, there is more than one potentially toxic constituent in a refinery gas. In those cases, the constituent that is most toxic for a particular endpoint in an individual refinery stream is used to characterize the endpoint hazard for that stream. The hazard potential for each mammalian endpoint for each of the petroleum hydrocarbon gases is dependent upon each petroleum hydrocarbon gas constituent endpoint toxicity values (LC50, LOAEL, etc.) and the relative concentration of the constituent present in that gas. It should also be noted that for an individual petroleum hydrocarbon gas, the constituent characterizing toxicity may be different for different mammalian endpoints, again, being dependent upon the concentration of the different constituents in each, distinct petroleum hydrocarbon gas.</p> <p>and skin contact / eye contact</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>

A-GAS R403B	TOXICITY	IRRITATION
	Not Available	Not Available
F-22 HCFC22	TOXICITY	IRRITATION
	Inhalation (rat) LC50: 2.1850040625 mg/l/15Md ^[2]	Not Available
octafluoropropane	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
		Skin: no adverse effect observed (not irritating) ^[1]
Propane	TOXICITY	IRRITATION
	Inhalation (rat) LC50: >49942.95 mg/l/15M ^[2]	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	

F-22 HCFC22	<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> <p>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.</p>
OCTAFLUOROPROPANE	<p>For perfluoropropane (PF3) and other aliphatic perfluoroalkanes (PFAs)</p> <p>Perfluoroalkanes (PFAs) are very stable. They are not oxidized even by ozone to any appreciable extent; their atmospheric half-life greater than 5000 y</p> <p>PFAs are chemically inert; included in this family is Teflon (a polymeric, high-molecular-weight PFA). The major concern from exposure to high concentrations of gaseous PFAs is their potential for cardiac toxicity. Cardiac effects are known to occur when humans or animals are exposed to high concentrations of other fluorinated hydrocarbons (FCs), including Freons FCs, such as chlorofluorocarbons, could induce</p>

cardiac arrhythmias by sensitising the heart to epinephrine.
For perfluorinated carbons (PFCs):
PFCs are inert fluids composed of a complex combination of organic compounds resulting from the distillation of electrochemically fluorinated (ECF) compounds. This class consists of branched, linear and cyclic perfluorinated hydrocarbons having carbon numbers predominantly in the range of C5-C18 and boiling in the range of approximately 25 C-255 C (77 F-491 F). Perfluorinated amine and ether compounds may also be present

Acute oral and inhalation toxicity tests with perfluoroalkanes show no toxicity at any dose tested, and even extremely high-dose intraperitoneal injection resulted in no lethality. In contrast, perfluoroalkenes (such as octafluorocyclopentene, perfluoroisobutylene, hexafluoropropene) have shown evidence of inhalation toxicity, in some cases, extreme.

The material may produce peroxisome proliferation. Peroxisomes are single, membrane limited, cytoplasmic organelles that are found in the cells of animals, plants, fungi and protozoa. Peroxisome proliferators include certain hypolipidaemic drugs, phthalate ester plasticisers, industrial solvents, herbicides, food flavours, leukotriene D4 antagonists and hormones. Numerous studies in rats and mice have demonstrated the hepatocarcinogenic effects of peroxisome proliferators, and these compounds have been unequivocally established as carcinogens.

OCTAFLUOROPROPANE & PROPANE
No significant acute toxicological data identified in literature search.

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

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

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

A-GAS R403B	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	Not Available	Not Available	Not Available	Not Available	Not Available
F-22 HCFC22	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	LC50	96	Fish	94.877mg/L	3
	EC50	48	Crustacea	433mg/L	2
octafluoropropane	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	LC50	96	Fish	4.860mg/L	3
	EC50	96	Algae or other aquatic plants	9.528mg/L	3
Propane	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	LC50	96	Fish	10.307mg/L	3
	EC50	96	Algae or other aquatic plants	7.71mg/L	2

Legend: Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data

Dangerous for the ozone layer.

Mobility: Product is volatile when in aqueous solution. Bioaccumulation: Product will not bioaccumulate.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
F-22 HCFC22	LOW	LOW
octafluoropropane	HIGH	HIGH
Propane	LOW	LOW

Bioaccumulative potential

Continued...

Ingredient	Bioaccumulation
F-22 HCFC22	LOW (LogKOW = 1.08)
octafluoropropane	LOW (LogKOW = 3.1211)
Propane	LOW (LogKOW = 2.36)

Mobility in soil

Ingredient	Mobility
F-22 HCFC22	LOW (KOC = 23.74)
octafluoropropane	LOW (KOC = 1038)
Propane	LOW (KOC = 23.74)


SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	Recycle wherever possible. Consult State Land Waste Management Authority for disposal. Ensure damaged or non-returnable cylinders are gas-free before disposal. Incinerate residue at an approved site. Return empty containers to supplier.
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SECTION 14 TRANSPORT INFORMATION

Labels Required

	
Marine Pollutant	NO

Land transport (DOT)

UN number	3163
UN proper shipping name	Liquefied gas, n.o.s. (contains F-22 HCFC22, Propane and octafluoropropane)
Transport hazard class(es)	Class : 2.2 Subrisk : Not Applicable
Packing group	Not Applicable
Environmental hazard	Not Applicable
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. * (contains F-22 HCFC22, Propane and octafluoropropane)
Transport hazard class(es)	ICAO/IATA Class : 2.2 ICAO / IATA Subrisk : Not Applicable ERG Code : 2L
Packing group	Not Applicable
Environmental hazard	Not Applicable
Special precautions for user	Special provisions : Not Applicable Cargo Only Packing Instructions : 200 Cargo Only Maximum Qty / Pack : 150 kg

Passenger and Cargo Packing Instructions	200
Passenger and Cargo Maximum Qty / Pack	75 kg
Passenger and Cargo Limited Quantity Packing Instructions	Forbidden
Passenger and Cargo Limited Maximum Qty / Pack	Forbidden

Sea transport (IMDG-Code / GGVSee)

UN number	3163	
UN proper shipping name	LIQUEFIED GAS, N.O.S. (contains F-22 HCFC22, Propane and octafluoropropane)	
Transport hazard class(es)	IMDG Class	2.2
	IMDG Subrisk	Not Applicable
Packing group	Not Applicable	
Environmental hazard	Not Applicable	
Special precautions for user	EMS Number	F-C, S-V
	Special provisions	274
	Limited Quantities	120 mL

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

Not Applicable

SECTION 15 REGULATORY INFORMATION**Safety, health and environmental regulations / legislation specific for the substance or mixture****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

OCTAFLUOROPROPANE(76-19-7) IS FOUND ON THE FOLLOWING REGULATORY LISTS

International Air Transport Association (IATA) Dangerous Goods Regulations	US Postal Service (USPS) Numerical Listing of Proper Shipping Names by Identification (ID) Number
International Maritime Dangerous Goods Requirements (IMDG Code)	US Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne Contaminants
United Nations Recommendations on the Transport of Dangerous Goods Model Regulations	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US Department of Transportation (DOT), Hazardous Material Table	US TSCA Chemical Substance Inventory - Interim List of Active Substances
US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide	

PROPANE(74-98-6) IS FOUND ON THE FOLLOWING REGULATORY LISTS

International Air Transport Association (IATA) Dangerous Goods Regulations	US - Washington Permissible exposure limits of air contaminants
International Maritime Dangerous Goods Requirements (IMDG Code)	US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants
United Nations Recommendations on the Transport of Dangerous Goods Model Regulations	US ACGIH Threshold Limit Values (Spanish)
US - Alaska Limits for Air Contaminants	US ACGIH Threshold Limit Values (TLV)
US - California Permissible Exposure Limits for Chemical Contaminants	US Department of Homeland Security (DHS) - Chemical Facility Anti-Terrorism Standards (CFATS) - Chemicals of Interest
US - Hawaii Air Contaminant Limits	US Department of Transportation (DOT), Hazardous Material Table
US - Idaho - Limits for Air Contaminants	US DOE Temporary Emergency Exposure Limits (TEELs)
US - Massachusetts - Right To Know Listed Chemicals	US DOT Coast Guard Bulk Hazardous Materials - List of Flammable and Combustible Bulk Liquid Cargoes
US - Michigan Exposure Limits for Air Contaminants	US NIOSH Recommended Exposure Limits (RELs)
US - Minnesota Permissible Exposure Limits (PELs)	US NIOSH Recommended Exposure Limits (RELs) (Spanish)
US - Oregon Permissible Exposure Limits (Z-1)	US OSHA Permissible Exposure Levels (PELs) - Table Z1
US - Pennsylvania - Hazardous Substance List	US OSHA Permissible Exposure Limits - Annotated Table Z-1 (Spanish)
US - Rhode Island Hazardous Substance List	US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	US Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne Contaminants
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	US TSCA Chemical Substance Inventory - Interim List of Active Substances

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
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
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Australia - AICS	Yes
Canada - DSL	Yes
Canada - NDSL	No (octafluoropropane; Propane; 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 (octafluoropropane)
Russia - ARIPS	Yes
Thailand - TECl	Yes
Legend:	<i>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)</i>

SECTION 16 OTHER INFORMATION

Revision Date	04/12/2017
Initial Date	28/06/2004

SDS Version Summary

Version	Issue Date	Sections Updated
4.1.1.1	04/12/2017	Classification

Other information

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

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

Definitions and abbreviations

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

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