NAF P-III (NAF P-III)

Wormald

Chemwatch Hazard Alert Code: **2**

Chemwatch: **8087-97**
Version No: **5.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **21/12/2016**
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L.GHS.AUS.EN

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

Product Identifier

Product name	NAF P-III (NAF P-III)
Synonyms	
Proper shipping name	LIQUEFIED GAS, N.O.S. (contains 2,2-dichloro-1,1,1-trifluoroethane)
Other means of identification	Not Available

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

Relevant identified uses	The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation. Fire protection agent for use in hand held fire extinguishers.

Details of the supplier of the safety data sheet

Registered company name	Wormald
Address	Unit 2, 2-8 South Street Rydalmere NSW 2116 Australia
Telephone	133 166
Fax	Not Available
Website	www.wormald.com.au
Email	admin@wormaldaus.com.au

Emergency telephone number

Association / Organisation	Wormald
Emergency telephone numbers	133 166
Other emergency telephone numbers	000

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

Poisons Schedule	Not Applicable
Classification [1]	Gas under Pressure (Liquefied gas), Skin Sensitizer Category 1, Carcinogenicity Category 2, Lactation Effects, Specific target organ toxicity - repeated exposure Category 2, Acute Aquatic Hazard Category 1, Chronic Aquatic Hazard Category 1, Hazardous to the Ozone Layer Category 1
Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HSIS ; 3. Classification drawn from EC Directive 1272/2008 - Annex VI*

Label elements

GHS label elements	

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SIGNAL WORD	WARNING

Hazard statement(s)

H280	Contains gas under pressure; may explode if heated.
H317	May cause an allergic skin reaction.
H351	Suspected of causing cancer.
H362	May cause harm to breast-fed children.
H373	May cause damage to organs through prolonged or repeated exposure.
H410	Very toxic to aquatic life with long lasting effects.
H420	Harms public health and the environment by destroying ozone in the upper atmosphere.
AUH044	Risk of explosion if heated under confinement

Precautionary statement(s) Prevention

P201	Obtain special instructions before use.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P263	Avoid contact during pregnancy/while nursing.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P281	Use personal protective equipment as required.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.

Precautionary statement(s) Response

P308+P313	IF exposed or concerned: Get medical advice/attention.
P363	Wash contaminated clothing before reuse.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.
P314	Get medical advice/attention if you feel unwell.
P333+P313	If skin irritation or rash occurs: Get medical advice/attention.
P391	Collect spillage.

Precautionary statement(s) Storage

P405	Store locked up.
P410+P403	Protect from sunlight. Store in a well-ventilated place.

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
306-83-2	55	2,2-dichloro-1,1,1-trifluoroethane
2837-89-0	31	chlorotetrafluoroethane
811-97-2	10	1,1,1,2-tetrafluoroethane
5989-27-5	4	d-limonene

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	▸ If product comes in contact with eyes remove the patient from gas source or contaminated area.

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	▸ 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. **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.
Skin Contact	If skin contact occurs: ▸ 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	▸ 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	▸ Not considered a normal route of entry. ▸ Avoid giving milk or oils. ▸ Avoid giving alcohol. ▸ 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.

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.

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- 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.

BRONSTEIN, A.C. and CURRANCE, P.L.
EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

SMALL FIRE: Use extinguishing agent suitable for type of surrounding fire.
LARGE FIRE: Cool cylinder.
DO NOT direct water at source of leak or venting safety devices as icing may occur.

Special hazards arising from the substrate or mixture

Fire Incompatibility	‣ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

Advice for firefighters

Fire Fighting	--- GENERAL --- ‣ 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. ‣ **DO NOT** approach cylinders suspected to be hot. ‣ Cool fire exposed cylinders with water spray from a protected location. ‣ If safe to do so, remove cylinders from path of fire.
Fire/Explosion Hazard	‣ Containers may explode when heated - Ruptured cylinders may rocket ‣ Fire exposed containers may vent contents through pressure relief devices. ‣ High concentrations of gas may cause asphyxiation without warning. ‣ May decompose explosively when heated or involved in fire. ‣ Contact with gas may cause burns, severe injury and/ or frostbite. ‣ Non combustible. ‣ Not considered a significant fire risk, however containers may burn. Decomposition may produce toxic fumes of: , carbon dioxide (CO2) , hydrogen chloride , phosgene , hydrogen fluoride , other pyrolysis products typical of burning organic material. **Contains low boiling substance:** Closed containers may rupture due to pressure buildup under fire conditions.

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HAZCHEM	Not Applicable

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	▸ Vented gas is more dense than air and may collect in pits, basements. ▸ Clean up all spills immediately. ▸ Avoid breathing vapours/ aerosols/ or dusts and avoid contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite. ▸ Place in a suitable, labelled container for waste disposal.
Major Spills	▸ Clear area of all unprotected personnel and move upwind. ▸ Alert Emergency Authority and advise them of the location and nature of hazard. ▸ Wear breathing apparatus and protective gloves. ▸ Prevent by any means available, spillage from entering drains and water-courses. ▸ Consider evacuation. ▸ Increase ventilation. ▸ No smoking or naked lights within area.

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

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	**Contains low boiling substance:** Storage in sealed containers may result in pressure buildup causing violent rupture of containers not rated appropriately. ▸ Check for bulging containers. ▸ Vent periodically ▸ Always release caps or seals slowly to ensure slow dissipation of vapours · Consider use in closed pressurised systems, fitted with temperature, pressure and safety relief valves which are vented for safe dispersal. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature · The tubing network design connecting gas cylinders to the delivery system should include appropriate pressure indicators and vacuum or suction lines. · Fully-welded types of pressure gauges, where the bourdon tube sensing element is welded to the gauge body, are recommended. · Before connecting gas cylinders, ensure manifold is mechanically secure and does not containing another gas. Before disconnecting gas cylinder, isolate supply line segment proximal to cylinder, remove trapped gas in supply line with aid of vacuum pump · When connecting or replacing cylinders take care to avoid airborne particulates violently ejected when system pressurises. · Consider the use of doubly-contained piping; diaphragm or bellows sealed, soft seat valves; backflow prevention devices; flash arrestors; and flow monitoring or limiting devices. Gas cabinets, with appropriate exhaust treatment, are recommended, as is automatic monitoring of the secondary enclosures and work areas for release. Use in closed pressurised systems fitted with temperature and pressure safety relief valves which are vented to allow safe dispersal.
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. ▸ Cylinders in storage should be properly secured to prevent toppling or rolling. ▸ Cylinder valves should be closed when not in use. ▸ Where cylinders are fitted with valve protection this should be in place and properly secured.

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Cylinder: ▸ Ensure the use of equipment rated for cylinder pressure. ▸ Ensure the use of compatible materials of construction. ▸ Valve protection cap to be in place until cylinder is secured, connected. ▸ Cylinder must be properly secured either in use or in storage.

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	▸ 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.
Storage incompatibility	Haloalkanes: ▸ are highly reactive:some of the more lightly substituted lower members are highly flammable; the more highly substituted may be used as fire suppressants, not always with the anticipated results. ▸ may react with the lighter divalent metals to produce more reactive compounds analogous to Grignard reagents. ▸ may produce explosive compounds following prolonged contact with metallic or other azides ▸ may react on contact with potassium or its alloys - although apparently stable on contact with a wide rage of halocarbons, reaction products may be shock-sensitive and may explode with great violence on light impact; severity generally increases with the degree of halocarbon substitution and potassium-sodium alloys give extremely sensitive mixtures . BRETHERICK L.: Handbook of Reactive Chemical Hazards ▸ 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. ▸ may react with brass and steel. ▸ may react explosively with strong oxidisers ▸ may degrade rubber, and plastics such as methacrylate polymers, polyethylene and polystyrene, paint and coatings ▸ Avoid reaction with oxidising agents

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Australia Exposure Standards	1,1,1,2-tetrafluoroethane	1,1,1,2-Tetrafluoroethane	4240 mg/m3 / 1000 ppm	Not Available	Not Available	Not Available

EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
2,2-dichloro-1,1,1-trifluoroethane	HCFC-123; (Dichloro-1,1,1-trifluoroethane, 2,2-)	150 ppm	Not Available	Not Available
chlorotetrafluoroethane	Chloro-1,1,1,2-tetrafluoroethane, 2-	Not Available	Not Available	Not Available
1,1,1,2-tetrafluoroethane	HFC 134a; (Tetrafluoroethane, 1,1,1,2-)	Not Available	Not Available	Not Available
d-limonene	Limonene, d-	15 ppm	67 ppm	170 ppm

Ingredient	Original IDLH	Revised IDLH
2,2-dichloro-1,1,1-trifluoroethane	Not Available	Not Available
chlorotetrafluoroethane	Not Available	Not Available
1,1,1,2-tetrafluoroethane	Not Available	Not Available
d-limonene	Not Available	Not Available

MATERIAL DATA

None assigned. Refer to individual constituents.

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. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. 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. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use. Employers may need to use multiple types of controls to prevent employee overexposure.
Personal protection	

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Eye and face protection	▸ 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. 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. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable.
Skin protection	See Hand protection below
Hands/feet protection	▸ When handling sealed and suitably insulated cylinders wear cloth or leather gloves. **NOTE:** ▸ The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact. ▸ Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.
Body protection	See Other protection below
Other protection	▸ 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. ▸ Rescue gear: Two sets of SCBA breathing apparatus Rescue Harness, lines etc.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
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Material	CPI
NITRILE	C
PVA	C
VITON	C

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Respiratory protection

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

Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Required minimum protection factor	Maximum gas/vapour concentration present in air p.p.m. (by volume)	Half-face Respirator	Full-Face Respirator
up to 10	1000	AX-AUS / Class1 P3	-
up to 50	1000	-	AX-AUS / Class 1 P3
up to 50	5000	Airline *	-
up to 100	5000	-	AX-2 P3
up to 100	10000	-	AX-3 P3
100+			Airline**

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

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	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 an 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). Dangerous for the ozone layer. |Colourless liquefied compressed gas with a citrus odour; not soluble in water.|Contents under pressure. Material remains liquid only when under pressure.|Sudden release of pressure or leakage may result in vapourisation with|generation of large volume of gas.

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Physical state	Liquified Gas	**Relative density (Water = 1)**	1.36
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 Applicable
Initial boiling point and boiling range (°C)	-1.9	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Non Flammable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Non Flammable	**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)**	Not Available
Vapour pressure (kPa)	221 @20C	**Gas group**	Not Available
Solubility in water (g/L)	Immiscible	**pH as a solution (1%)**	Not Applicable
Vapour density (Air = 1)	5.0	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	▸ Unstable in the presence of incompatible materials. ▸ Product is considered stable. ▸ 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	Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual. Limited evidence or practical experience suggests that the material may produce irritation of the respiratory system, in a significant number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system. Common, generalised symptoms associated with non-toxic gas inhalation include : ▸ central nervous system effects such as headache, confusion, dizziness, progressive stupor, coma and seizures; ▸ respiratory system complications may include tachypnoea and dyspnoea; ▸ cardiovascular effects may include circulatory collapse and arrhythmias; ▸ gastrointestinal effects may also be present and may include mucous membrane irritation and nausea and vomiting. Material is highly volatile and may quickly form a concentrated atmosphere in confined or unventilated areas. The vapour may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure. Symptoms of asphyxia (suffocation) may include headache, dizziness, shortness of breath, muscular weakness, drowsiness and ringing in the ears. If the asphyxia is allowed to progress, there may be nausea and vomiting, further physical weakness and unconsciousness and, finally, convulsions, coma and death. Significant concentrations of the non-toxic gas reduce the

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	oxygen level in the air. As the amount of oxygen is reduced from 21 to 14 volume %, the pulse rate accelerates and the rate and volume of breathing increase. The ability to maintain attention and think clearly is diminished and muscular coordination is somewhat disturbed. As oxygen decreases from 14-10% judgement becomes faulty; severe injuries may cause no pain. Muscular exertion leads to rapid fatigue. Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo. 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. 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. Most subjects developed bradycardia (reduced pulse rate). Bradycardia is encountered in dogs when administration is limited to upper respiratory tract (oropharyngeal and nasal areas). Cardiac arrhythmias can be experimentally induced in animals (species dependency is pronounced with dogs and monkeys requiring lesser amounts of fluorocarbon FC-11 than rats or mice). 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. 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.
Ingestion	Not normally a hazard due to physical form of product. Considered an unlikely route of entry in commercial/industrial environments Accidental ingestion of the material may be damaging to the health of the individual. 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) Five healthy male volunteers receiving a single oral dose of 20 grams d-limonene all developed transient proteinuria, a non-bloody diarrhoea and tenesmus. The results of other functional tests of the liver, kidney and pancreas were normal [Igimi, et al, 1976]. d-Limonene causes abnormal bone formation following oral administration in animals. A human fatality has been reported following ingestion of a dose estimated to be 35 to 350 gm/kg d-limonene.
Skin Contact	Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis. 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. The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling the epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis. Application of d-limonene produced moderate irritation to both intact and abraded skin. High purity d-limonene does not cause significant allergic reaction in guinea pigs; d-limonene, exposed to air for 2-months, sensitised the animals and it is surmised that allergenic compounds are formed after prolonged air contact. In human patch testing, weak or moderate reactions (erythema, swelling) have been observed. Positive eczematous responses to purified limonene were observed in 5 of 16 previously sensitised to oil of turpentine. In one study, a 39-year old male immersed one hand in a jar of solvent, ensuring that inhalation exposure was minimal. After only few minutes of exposure, the subject experienced painful itching and burning. Itching decreased after the exposure but burning continued for 10 minutes.
Eye	Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn).
Chronic	Principal route of occupational exposure to the gas is by inhalation. Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems. On the basis, primarily, of animal experiments, concern has been expressed that the material may produce carcinogenic or mutagenic effects; in respect of the available information, however, there presently exists inadequate data for making a satisfactory assessment. Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals. 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

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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.

Hydroperoxides of d-limonene are potent contact allergens when studied in guinea pigs. They may result when d-limonene is unstabilised against oxidation, or upon prolonged standing at room temperature and/ or upon exposure to light, or when stabiliser levels diminish. The two major hydroperoxides in auto-oxidised d-limonene, are cis- and trans- limonene-2-hydroperoxide (2-hydroperoxy-p-mentha-6,8-diene). In photo-oxidised d-limonene, they represent a minor fraction. Hydroperoxides may bind to proteins of the skin to make antigens either via a radical mechanism or after reactions to give epoxides. The cross-reactivity between the epoxide limonene-1,2-oxide, a potent contact allergen, and the hydroperoxides is NOT significant, indicating different mechanisms of sensitisation.

d-Limonene was considered to be weakly carcinogenic for the mouse fore-stomach epithelium, but not tumour producing. Sensitisation may result in allergic dermatitis responses including rash, itching, hives or swelling of extremities.

NAF P-III (NAF P-III)	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
2,2-dichloro-1,1,1-trifluoroethane	**TOXICITY**	**IRRITATION**
	dermal (rat) LD50: >2000 mg/kg[1]	Not Available
	Inhalation (rat) LC50: 225.7 mg/L/4hr[2]	
	Inhalation (rat) LC50: 32000 ppm/4h*[2]	
chlorotetrafluoroethane	**TOXICITY**	**IRRITATION**
	Inhalation (rat) LC50: 570000 ppm15m[2]	Not Available
1,1,1,2-tetrafluoroethane	**TOXICITY**	**IRRITATION**
	Inhalation (rat) LC50: 1500 mg/L/4hr[2]	Not Available
d-limonene	**TOXICITY**	**IRRITATION**
	Dermal (rabbit) LD50: >5000 mg/kg[2]	Skin (rabbit): 500mg/24h moderate
	Oral (rat) LD50: >2000 mg/kg[1]	
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*	

2,2-DICHLORO-1,1,1-TRIFLUOROETHANE

NOTE: The compound is non-irritating to skin and does not act as a skin sensitiser in experimental animals. [Du Pont]* No data exist on the oral and dermal toxicity of HCFC-123 in humans. Studies in animals show that HCFC-123 has low acute oral toxicity (ALD of approximately 9000 mg/kg in rats) and low dermal toxicity (LD50 > 2000 mg/kg in rats and rabbits). In rats and hamsters, the acute inhalation LC50 (four hour) for HCFC-123 is low, 28,000?53,000 ppm (175?330 mg/L). In a single acute inhalation study carried out in guinea pigs, hepatotoxicity was seen at the lowest test level of 1000 ppm (6.25 mg/L) HCFC-123. Similar lesions were described in the same study with the HCFC-123 analogue, halothane. Such lesions were reported as reversible (by one week post-exposure) in other studies on halothane exposed guinea pigs. Halothane is associated with both fatal (rare) and non-fatal hepatitis in humans. Similarities in metabolism, immunotoxicology and hepatic lesions between halothane and HCFC-123 in rats and guinea pigs support the possibility that acute exposure to high levels of HCFC-123 may elicit a similar toxicological profile to halothane in humans. Acute reversible CNS effects have been reported in humans and animals following inhalation of HCFC-123. Exposure levels were not categorised in cases of human poisoning. No CNS effects were seen at 2500 ppm (15.6 mg/L) HCFC-123 in a behavioural study in rats. CFCs and HCFCs are known to sensitise the heart to adrenalin-induced arrhythmias. HCFC-123 caused cardiac sensitisation in dogs exposed to levels around 20,000 ppm (125 mg/L), whereas no effects were seen at 10,000 ppm (62.5 mg/L). Although no data were available on cardiac sensitisation effects for HCFC-123 in humans, such effects have been documented following exposure to other CFCs, including CFC-12, where sensitisation was reported at 10,000 ppm. In humans, liver toxicity, cardiac sensitisation and CNS depression are likely to be the critical effects following acute exposure to HCFC-123, although asphyxiation may also occur at very high levels. Tests in rabbits and guinea pigs indicate that HCFC-123 is not a skin irritant. 12,64 HCFC-123 was a slight eye irritant in rabbits. A study on skin sensitisation of HCFC-123, carried out in guinea pigs, was considered negative under the conditions of the study. It is possible that the doses used may not have been sufficiently high to elicit a sensitisation response. However, sensitisation has not been reported in other structural analogues of HCFC-123. There are no reports of adverse effects in humans following repeated or prolonged exposure to HCFC-123. In humans, repeated exposure to other CFCs and HCFCs have been associated with haematological effects, neurological disorders, liver damage, reproductive effects and coronary heart disease. neurotoxicity at the highest exposure (inhalation) level of 5000 ppm. A NOAEL for CNS (anaesthetic) effects in rats and Human liver toxicity has been well documented for structural analogues of HCFC-123 including halothane, which has a similar metabolic, immunological and hepatotoxic profile to HCFC-123 in animal studies. Adverse hepatic effects were seen in rats, guinea-pigs and dogs following repeated exposure (inhalation) to HCFC-123. The types of lesions observed varied between species and with duration of study. Generally, the lesions

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	observed were hepatocyte enlargement and vacuolation (at 300 ppm) with necrosis and fatty change (at and above 1000 ppm). Such lesions were reported as reversible (30 days post-exposure) in a single 90-day study in rats exposed to 500?5000 ppm HCFC-123 and were not significantly increased at 300 ppm after 12 months in the two-year inhalation study. The NOAEL reported for hepatic effects in rats (28 weeks exposure in a t
1,1,1,2-TETRAFLUOROETHANE	Disinfection by products (DBPs) re formed when disinfectants such as chlorine, chloramine, and ozone react with organic and inorganic matter in water. The observations that some DBPs such as trihalomethanes (THMs), di-/trichloroacetic acids, and 3-chloro-4-(dichloromethyl)-5-hydroxy-2(5H)-furanone (MX) are carcinogenic in animal studies have raised public concern over the possible adverse health effects of DBPs. To date, several hundred DBPs have been identified. Numerous haloalkanes and haloalkenes have been tested for carcinogenic and mutagenic activities. n general, the genotoxic potential is dependent on the nature, number, and position of halogen(s) and the molecular size of the compound. Short-chain monohalogenated (excluding fluorine) alkanes and alkenes are potential direct-acting alkylating agents, particularly if the halogen is at the terminal end of the carbon chain or at an allylic position. Dihalogenated alkanes are also potential alkylating or cross-linking agents (either directly or after GSH conjugation),particularly if they are vicinally substituted (e.g., 1,2-dihaloalkane) or substituted at the two terminal ends of a short to medium-size (e.g., 2-7) alkyl moiety (i.e., alpha, omega-dihaloalkane). * with added oxygen - ZhongHao New Chemical Materials MSDS Excessive concentration can have a narcotic effect; inhalation of high concentrations of decomposition products can cause lung oedema.
D-LIMONENE	The following information refers to contact allergens as a group and may not be specific to this product. Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested. d-Limonene is readily absorbed by inhalation and ingestion. Dermal absorption is reported to be lower than by the inhalation route. d-Limonene is rapidly distributed to different tissues in the body, readily metabolised and eliminated primarily through the urine. Limonene exhibits low acute toxicity by all three routes in animals. Limonene is a skin irritant in both experimental animals and humans. Limited data are available on the potential to cause eye and respiratory irritation. Autooxidised products of d-limonene have the potential to be skin sensitisers. Adverse reactions to fragrances in perfumes and in fragranced cosmetic products include allergic contact dermatitis, irritant contact dermatitis, photosensitivity, immediate contact reactions (contact urticaria), and pigmented contact dermatitis. Airborne and connubial contact dermatitis occur. Intolerance to perfumes, by inhalation, may occur if the perfume contains a sensitising principal. Symptoms may vary from general illness, coughing, phlegm, wheezing, chest-tightness, headache, exertional dyspnoea, acute respiratory illness, hayfever, and other respiratory diseases (including asthma). Perfumes can induce hyper-reactivity of the respiratory tract without producing an IgE-mediated allergy or demonstrable respiratory obstruction. This was shown by placebo-controlled challenges of nine patients to "perfume mix". The same patients were also subject to perfume provocation, with or without a carbon filter mask, to ascertain whether breathing through a filter with active carbon would prevent symptoms. Fragrance allergens act as haptens, i.e. low molecular weight chemicals that are immunogenic only when attached to a carrier protein. However, not all sensitising fragrance chemicals are directly reactive, but require previous activation. A **prehapten** is a chemical that itself is non- or low-sensitising, but that is transformed into a hapten outside the skin by simple chemical transformation (air oxidation, photoactivation) and without the requirement of specific enzymatic systems. In the case of prehaptens, it is possible to prevent activation outside the body to a certain extent by different measures, e.g. prevention of air exposure during handling and storage of the ingredients and the final product, and by the addition of suitable antioxidants. When antioxidants are used, care should be taken that they will not be activated themselves and thereby form new sensitisers. **Prehaptens** Most terpenes with oxidisable allylic positions can be expected to autoxidise on air exposure due to their inherent properties. Depending on the stability of the oxidation products that are formed, a difference in the sensitisation potency of the oxidised terpenes can be seen Autoxidation is a free radical chain reaction in which hydrogen atom abstraction in combination with addition of oxygen forms peroxyl radicals. 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. A member or analogue of a group of of aliphatic and aromatic terpene hydrocarbons generally considered as safe (GRAS) based, in part, on their self-limiting properties as flavouring substances in food; their rapid absorption, metabolic detoxication, and excretion in humans and other animals; their low level of flavour use; the wide margins of safety between the conservative estimates of intake and the no-observed-adverse effect levels determined from subchronic and chronic studies and the lack of significant genotoxic potential. Consumers are exposed to aliphatic and terpene hydrocarbons from a variety of ingested and environmental source. Quantitative natural occurrence data for 17 aliphatic terpene hydrocarbons in the group demonstrate that their consumption occurs predominantly as natural components of traditional food . Oral LD50 values have been reported for 16 of the 17 substances in this group. LD50 values range from 1590 to greater than 8000 mg/kg bw in rats, and 2000 to greater than 13,360 mg/kg bw in mice. These values indicate that aliphatic and aromatic hydrocarbons exhibit low acute oral toxicity. Although members of this group have been shown to exhibit renal carcinogenic potential in the male F344N/rat, the mechanism leading to these findings is known and strongly indicates that the nephropathy associated with monoterpene hydrocarbons have no significance for human risk.

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	Tumorigenic by RTECS criteria

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 required to make classification available*
⊘ *– Data Not Available to make classification*

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

Ingredient	Endpoint	Test Duration (hr)	Species	Value	Source
2,2-dichloro-1,1,1-trifluoroethane	LC50	96	Fish	19.516mg/L	3
2,2-dichloro-1,1,1-trifluoroethane	EC50	48	Crustacea	17mg/L	5
2,2-dichloro-1,1,1-trifluoroethane	EC50	96	Algae or other aquatic plants	53.709mg/L	3
2,2-dichloro-1,1,1-trifluoroethane	EC50	384	Crustacea	4.700mg/L	3
2,2-dichloro-1,1,1-trifluoroethane	NOEC	48	Crustacea	<2.24mg/L	2
chlorotetrafluoroethane	LC50	96	Fish	29.326mg/L	3
chlorotetrafluoroethane	EC50	96	Algae or other aquatic plants	90.149mg/L	3
chlorotetrafluoroethane	EC50	384	Crustacea	7.012mg/L	3
1,1,1,2-tetrafluoroethane	LC50	96	Fish	29.671mg/L	3
1,1,1,2-tetrafluoroethane	EC50	48	Crustacea	980mg/L	5
1,1,1,2-tetrafluoroethane	EC50	96	Algae or other aquatic plants	97.260mg/L	3
1,1,1,2-tetrafluoroethane	EC50	384	Crustacea	7.065mg/L	3
1,1,1,2-tetrafluoroethane	NOEC	72	Algae or other aquatic plants	ca.13.2mg/L	2
d-limonene	LC50	96	Fish	0.199mg/L	3
d-limonene	EC50	48	Crustacea	0.421mg/L	2
d-limonene	EC50	96	Algae or other aquatic plants	0.212mg/L	3
d-limonene	EC50	384	Crustacea	0.051mg/L	3
d-limonene	NOEC	72	Algae or other aquatic plants	2.62mg/L	2
Legend:	*Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 - 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*				

Drinking Water Standards: hydrocarbon total: 10 ug/l (UK max.).
Toxic to aquatic organisms.
Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.
Wastes resulting from use of the product must be disposed of on site or at approved waste sites.
May cause long-term adverse effects in the aquatic environment.
DO NOT discharge into sewer or waterways.

Persistence and degradability

Continued...

Ingredient	Persistence: Water/Soil	Persistence: Air
2,2-dichloro-1,1,1-trifluoroethane	HIGH	HIGH
chlorotetrafluoroethane	HIGH	HIGH
1,1,1,2-tetrafluoroethane	HIGH	HIGH
d-limonene	HIGH	HIGH

Bioaccumulative potential

Ingredient	Bioaccumulation
2,2-dichloro-1,1,1-trifluoroethane	LOW (LogKOW = 2.1738)
chlorotetrafluoroethane	LOW (LogKOW = 1.8605)
1,1,1,2-tetrafluoroethane	LOW (LogKOW = 1.68)
d-limonene	HIGH (LogKOW = 4.8275)

Mobility in soil

Ingredient	Mobility
2,2-dichloro-1,1,1-trifluoroethane	LOW (KOC = 154.4)
chlorotetrafluoroethane	LOW (KOC = 154.4)
1,1,1,2-tetrafluoroethane	LOW (KOC = 96.63)
d-limonene	LOW (KOC = 1324)

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ 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.

SECTION 14 TRANSPORT INFORMATION

Labels Required

	
Marine Pollutant	
HAZCHEM	Not Applicable

Land transport (ADG)

UN number	3163
UN proper shipping name	LIQUEFIED GAS, N.O.S. (contains 2,2-dichloro-1,1,1-trifluoroethane)
Transport hazard class(es)	Class: 2.2 Subrisk: Not Applicable
Packing group	Not Applicable
Environmental hazard	Not Applicable

Continued...

Special precautions for user	Special provisions	274
	Limited quantity	120 ml

Air transport (ICAO-IATA / DGR)

UN number	3163	
UN proper shipping name	Liquefied gas, n.o.s. * (contains 2,2-dichloro-1,1,1-trifluoroethane)	
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 2,2-dichloro-1,1,1-trifluoroethane)	
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

2,2-DICHLORO-1,1,1-TRIFLUOROETHANE(306-83-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS

Australia Hazardous Substances Information System - Consolidated Lists
Australia Inventory of Chemical Substances (AICS)

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

Australia Inventory of Chemical Substances (AICS)

1,1,1,2-TETRAFLUOROETHANE(811-97-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS

Australia Exposure Standards
Australia Inventory of Chemical Substances (AICS)
Australia Hazardous Substances Information System - Consolidated Lists

D-LIMONENE(5989-27-5) IS FOUND ON THE FOLLOWING REGULATORY LISTS

Australia Hazardous Substances Information System - Consolidated Lists
International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs
Australia Inventory of Chemical Substances (AICS)

Continued...

National Inventory	Status
Australia - AICS	Y
Canada - DSL	Y
Canada - NDSL	N (2,2-dichloro-1,1,1-trifluoroethane; chlorotetrafluoroethane; 1,1,1,2-tetrafluoroethane; d-limonene)
China - IECSC	Y
Europe - EINEC / ELINCS / NLP	Y
Japan - ENCS	Y
Korea - KECI	Y
New Zealand - NZIoC	Y
Philippines - PICCS	Y
USA - TSCA	Y
Legend:	*Y = All ingredients are on the inventory* *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

Other information

Ingredients with multiple cas numbers

Name	CAS No
chlorotetrafluoroethane	2837-89-0, 63938-10-3
d-limonene	5989-27-5, 138-86-3

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.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net

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