

A-Gas Recovered Refrigerant Gas

A-Gas (A-Gas (Australia))

Chemwatch: 24-4145

Version No: 8.1

Safety Data Sheet (Conforms to Annex II of REACH (1907/2006) - Regulation 2020/878)

Chemwatch Hazard Alert Code: 1

Issue Date: 23/12/2022

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SECTION 1 Identification of the substance / mixture and of the company / undertaking

1.1. Product Identifier

Product name	A-Gas Recovered Refrigerant Gas
Chemical Name	Not Applicable
Synonyms	Mixtures of Chlorofluorocarbons; Hydrochlorofluorocarbons; Hydrofluorocarbons; Reclaim refrigerant; Pumpdown refrigerant
Proper shipping name	REFRIGERANT GAS, N.O.S., such as mixture F1, mixture F2 or mixture F3 (contains pentafluoroethane, trichlorofluoromethane, chlorodifluoromethane, 1,1-difluoroethane, dichlorodifluoromethane, iso-butane, propane, 1,1,1-trifluoroethane, octafluoropropane, 1-chloro-1,1-difluoroethane, difluoromethane, 1,1,1,2-tetrafluoroethane and 1-chloro-1,1,2,2-tetrafluoroethane)
Chemical formula	Not Applicable
Other means of identification	Not Available

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

Relevant identified uses	Refrigerant Industrial use only.
Uses advised against	No specific uses advised against are identified.

1.3. Details of the manufacturer or supplier of the safety data sheet

Registered company name	A-Gas (A-Gas (Australia))
Address	9-11 Oxford Road Laverton North VIC 3026 Australia
Telephone	+61 3 9368 9222
Fax	+61 3 9368 9233
Website	www.agas.com
Email	info.au@agas.com

1.4. Emergency telephone number

Association / Organisation	A-Gas (A-Gas (Australia))	CHEMWATCH EMERGENCY RESPONSE (24/7)
Emergency telephone number(s)	+61 1800737001	+43 800 281336
Other emergency telephone number(s)	Not Available	+61 3 9573 3188


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

SECTION 2 Hazards identification

2.1. Classification of the substance or mixture

Classification according to regulation (EC) No 1272/2008 [CLP] and amendments [1]	H280 - Gases Under Pressure (Liquefied Gas), H420 - Hazardous to the Ozone Layer Category 1
Legend:	1. Classified by Chemwatch; 2. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI

2.2. Label elements

Hazard pictogram(s)	
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Signal word	Warning
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Hazard statement(s)	
H280	Contains gas under pressure; may explode if heated.
H420	Harms public health and the environment by destroying ozone in the upper atmosphere.

Supplementary statement(s)	
EUH044	Risk of explosion if heated under confinement.
EUH059	Hazardous to ozone layer.

Precautionary statement(s) General	
P101	If medical advice is needed, have product container or label at hand.
P102	Keep out of reach of children.
P103	Read carefully and follow all instructions.

Precautionary statement(s) Prevention	
Not Applicable	

Precautionary statement(s) Response	
Not Applicable	

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

Precautionary statement(s) Disposal	
P502	Refer to manufacturer or supplier for information on recovery or recycling.

Material contains 1,1-difluoroethane, trichlorofluoromethane.

2.3. Other hazards	
propane	Listed in the Europe Regulation (EC) No 1907/2006 - Annex XVII (Restrictions may apply)
iso-butane	Listed in the Europe Regulation (EC) No 1907/2006 - Annex XVII (Restrictions may apply)

SECTION 3 Composition / information on ingredients

3.1.Substances	
See 'Composition on ingredients' in Section 3.2	

3.2.Mixtures					
1. CAS No 2.EC No 3.Index No 4.REACH No	% [weight]	Name	Classification according to regulation (EC) No 1272/2008 [CLP] and amendments	SCL / M-Factor	Nanoform Particle Characteristics
1. 75-45-6 2.200-871-9 3.Not Available 4.Not Available	NotSpec	<u>chlorodifluoromethane</u> *	Gases Under Pressure (Compressed Gas), Hazardous to the Ozone Layer Category 1; H280, H420, EUH044 ^[1]	SCL: Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
1. 811-97-2 2.212-377-0 3.Not Available	NotSpec	<u>1,1,1,2-tetrafluoroethane</u>	Gases Under Pressure (Liquefied Gas); H280, EUH044 ^[1]	SCL: Not Available	Not Available

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1. CAS No 2. EC No 3. Index No 4. REACH No	% [weight]	Name	Classification according to regulation (EC) No 1272/2008 [CLP] and amendments	SCL / M-Factor	Nanoform Particle Characteristics
4. Not Available				Acute M factor: Not Available Chronic M factor: Not Available	
1. 354-33-6 2. 206-557-8 3. Not Available 4. Not Available	NotSpec	<u>pentafluoroethane</u>	Gases Under Pressure (Liquefied Gas); H280, EUH044 ^[1]	SCL: Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
1. 75-10-5 2. 200-839-4 3. Not Available 4. Not Available	NotSpec	<u>difluoromethane</u>	Flammable gases, Hazard Category 1A; H220, EUH044 ^[1]	SCL: Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
1. 420-46-2 2. 206-996-5 3. Not Available 4. Not Available	NotSpec	<u>1,1,1-trifluoroethane</u>	Flammable gases, Hazard Category 1A; H220, EUH044 ^[1]	SCL: Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
1. 75-37-6 2. 200-866-1 3. Not Available 4. Not Available	NotSpec	<u>1,1-difluoroethane</u>	Flammable gases, Hazard Category 1A, Acute Toxicity (Oral) Category 4; H220, H302, EUH044 ^[1]	SCL: Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
1. 75-71-8 2. 200-893-9 3. Not Available 4. Not Available	NotSpec	<u>dichlorodifluoromethane</u>	Gases Under Pressure (Compressed Gas), Hazardous to the Ozone Layer Category 1; H280, H420, EUH044 ^[1]	SCL: Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
1. 75-69-4 2. 200-823-3 3. Not Available 4. Not Available	NotSpec	<u>trichlorofluoromethane</u>	Acute Toxicity (Oral and Dermal) Category 4, Skin Corrosion/Irritation Category 2, Serious Eye Damage/Eye Irritation Category 2, Acute Toxicity (Inhalation) Category 3, Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3, Hazardous to the Ozone Layer Category 1; H302+H312, H315, H319, H331, H335, H420 ^[1]	SCL: Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
1. 74-98-6 2. 200-827-9 3. 601-003-00-5 4. Not Available	NotSpec	<u>propane</u>	Flammable gases, Hazard Category 1, Gases Under Pressure; H220, H280 ^[2]	SCL: Not Available Acute M factor: Not Available	Not Available

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A-Gas Recovered Refrigerant Gas

1. CAS No 2. EC No 3. Index No 4. REACH No	% [weight]	Name	Classification according to regulation (EC) No 1272/2008 [CLP] and amendments	SCL / M-Factor	Nanoform Particle Characteristics
				Chronic M factor: Not Available	
1. 354-25-6 2. 206-552-0 3. Not Available 4. Not Available	NotSpec	<u>1-chloro-1,1,2,2-tetrafluoroethane</u>	Gases Under Pressure (Compressed Gas), Hazardous to the Aquatic Environment Long-Term Hazard Category 1; H280, H410, EUH044 [1]	SCL: Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
1. 75-28-5. 2. Not Available 3. Not Available 4. Not Available	NotSpec	<u>iso-butane</u>	Flammable gases, Hazard Category 1A, Gases Under Pressure (Liquefied Gas); H220, H280, EUH044 [1]	SCL: Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
1. 75-68-3 2. 200-891-8 3. Not Available 4. Not Available	NotSpec	<u>1-chloro-1,1-difluoroethane</u>	Flammable gases, Hazard Category 1A, Gases Under Pressure (Liquefied Gas), Hazardous to the Aquatic Environment Long-Term Hazard Category 3, Hazardous to the Ozone Layer Category 1; H220, H280, H412, H420, EUH044 [1]	SCL: Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
1. 76-19-7 2. 200-941-9 3. Not Available 4. Not Available	NotSpec	<u>octafluoropropane</u>	Gases Under Pressure (Liquefied Gas), Hazardous to the Aquatic Environment Long-Term Hazard Category 3; H280, H412, EUH044 [1]	SCL: Not Available Acute M factor: Not Available Chronic M factor: Not Available	Not Available
Legend: 1. Classified by Chemwatch; 2. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI; 3. Classification drawn from C&L; * EU IOELVs available; [e] Substance identified as having endocrine disrupting properties					

SECTION 4 First aid measures

4.1. Description of first aid measures

Eye Contact	<ul style="list-style-type: none"> ▶ If product comes in contact with eyes remove the patient from gas source or contaminated area. ▶ Take the patient to the nearest eye wash, shower or other source of clean water. ▶ Open the eyelid(s) wide to allow the material to evaporate. ▶ Gently rinse the affected eye(s) with clean, cool water for at least 15 minutes. Have the patient lie or sit down and tilt the head back. Hold the eyelid(s) open and pour water slowly over the eyeball(s) at the inner corners, letting the water run out of the outer corners. ▶ The patient may be in great pain and wish to keep the eyes closed. It is important that the material is rinsed from the eyes to prevent further damage. ▶ Ensure that the patient looks up, and side to side as the eye is rinsed in order to better reach all parts of the eye(s) ▶ Transport to hospital or doctor. ▶ Even when no pain persists and vision is good, a doctor should examine the eye as delayed damage may occur. ▶ If the patient cannot tolerate light, protect the eyes with a clean, loosely tied bandage. ▶ Ensure verbal communication and physical contact with the patient. <p>DO NOT allow the patient to rub the eyes DO NOT allow the patient to tightly shut the eyes DO NOT introduce oil or ointment into the eye(s) without medical advice DO NOT use hot or tepid water.</p>
Skin Contact	<p>If skin contact occurs:</p> <ul style="list-style-type: none"> ▶ Immediately remove all contaminated clothing, including footwear. ▶ Flush skin and hair with running water (and soap if available). ▶ Seek medical attention in event of irritation.

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	<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 ▶ 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"> ▶ Following exposure to gas, remove the patient from the gas source or contaminated area. ▶ NOTE: Personal Protective Equipment (PPE), including positive pressure self-contained breathing apparatus may be required to assure the safety of the rescuer. ▶ Prostheses such as false teeth, which may block the airway, should be removed, where possible, prior to initiating first aid procedures. ▶ If the patient is not breathing spontaneously, administer rescue breathing. ▶ If the patient does not have a pulse, administer CPR. ▶ If medical oxygen and appropriately trained personnel are available, administer 100% oxygen. ▶ Summon an emergency ambulance. If an ambulance is not available, contact a physician, hospital, or Poison Control Centre for further instruction. ▶ Keep the patient warm, comfortable and at rest while awaiting medical care. ▶ MONITOR THE BREATHING AND PULSE, CONTINUOUSLY. ▶ Administer rescue breathing (preferably with a demand-valve resuscitator, bag-valve mask-device, or pocket mask as trained) or CPR if necessary.
Ingestion	<ul style="list-style-type: none"> ▶ Not considered a normal route of entry.

4.2 Most important symptoms and effects, both acute and delayed

See Section 11

4.3. Indication of any immediate medical attention and special treatment needed

For frost-bite caused by liquefied petroleum gas:

- ▶ If part has not thawed, place in warm water bath (41-46 C) for 15-20 minutes, until the skin turns pink or red.
- ▶ Analgesia may be necessary while thawing.
- ▶ If there has been a massive exposure, the general body temperature must be depressed, and the patient must be immediately rewarmed by whole-body immersion, in a bath at the above temperature.
- ▶ Shock may occur during rewarming.
- ▶ Administer tetanus toxoid booster after hospitalization.
- ▶ Prophylactic antibiotics may be useful.
- ▶ The patient may require anticoagulants and oxygen.

[Shell Australia 22/12/87]

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

5.1. 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.

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5.2. Special hazards arising from the substrate or mixture

Fire Incompatibility	<ul style="list-style-type: none"> ▶ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result
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5.3. Advice for firefighters

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

SECTION 6 Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

See section 8

6.2. Environmental precautions

See section 12

6.3. Methods and material for containment and cleaning up

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

6.4. Reference to other sections

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

SECTION 7 Handling and storage

7.1. Precautions for safe handling

Safe handling	<ul style="list-style-type: none"> · 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 contain another gas. <ul style="list-style-type: none"> ▶ DO NOT transfer gas from one cylinder to another.
Fire and explosion protection	See section 5
Other information	<ul style="list-style-type: none"> ▶ 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.

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- ▶ 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.

7.2. Conditions for safe storage, including any incompatibilities

Suitable container	<ul style="list-style-type: none"> ▶ 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.
Storage incompatibility	<ul style="list-style-type: none"> ▶ Compressed gases may contain a large amount of kinetic energy over and above that potentially available from the energy of reaction produced by the gas in chemical reaction with other substances ▶ Avoid reaction with oxidising agents
Hazard categories in accordance with Regulation (EC) No 2012/18/EU (Seveso III)	Not Available
Qualifying quantity (tonnes) of dangerous substances as referred to in Article 3(10) for the application of	Not Available



X — Must not be stored together

O — May be stored together with specific preventions

+ — May be stored together

Note: Depending on other risk factors, compatibility assessment based on the table above may not be relevant to storage situations, particularly where large volumes of dangerous goods are stored and handled. Reference should be made to the Safety Data Sheets for each substance or article and risks assessed accordingly.

7.3. Specific end use(s)

See section 1.2

SECTION 8 Exposure controls / personal protection

8.1. Control parameters

Ingredient	DNELs Exposure Pattern Worker	PNECs Compartment
1,1,1,2-tetrafluoroethane	Inhalation 13936 mg/m ³ (Systemic, Chronic) Inhalation 2.476 mg/m ³ (Systemic, Chronic) *	0.1 mg/L (Water (Fresh)) 1 mg/L (Water - Intermittent release) 0.01 mg/L (Water (Marine)) 0.75 mg/kg sediment dw (Sediment (Fresh Water)) 73 mg/L (STP)
pentafluoroethane	Inhalation 16444 mg/m ³ (Systemic, Chronic) Inhalation 1.753 mg/m ³ (Systemic, Chronic) *	0.1 mg/L (Water (Fresh)) 1 mg/L (Water - Intermittent release) 0.6 mg/kg sediment dw (Sediment (Fresh Water))
difluoromethane	Inhalation 7035 mg/m ³ (Systemic, Chronic) Inhalation 0.75 mg/m ³ (Systemic, Chronic) *	0.142 mg/L (Water (Fresh)) 1.42 mg/L (Water - Intermittent release) 0.534 mg/kg sediment dw (Sediment (Fresh Water))
1,1,1-trifluoroethane	Inhalation 438.61 mg/m ³ (Systemic, Chronic) Inhalation 0.2193 mg/m ³ (Systemic, Chronic) *	0.35 mg/L (Water (Fresh))
1,1-difluoroethane	Inhalation 1085.98 mg/m ³ (Systemic, Chronic) Inhalation 0.27014 mg/m ³ (Systemic, Chronic) *	0.048 mg/L (Water (Fresh)) 0.48 mg/L (Water - Intermittent release) 0.005 mg/L (Water (Marine)) 0.19 mg/kg sediment dw (Sediment (Fresh Water)) 0.019 mg/kg sediment dw (Sediment (Marine)) 0.096 mg/kg soil dw (Soil) 4.726 mg/L (STP)
dichlorodifluoromethane	Inhalation 1657 mg/m ³ (Systemic, Chronic)	0.033 mg/L (Water (Fresh)) 0.003 mg/L (Water (Marine)) 0.36 mg/kg sediment dw (Sediment (Fresh Water)) 0.036 mg/kg sediment dw (Sediment (Marine))

* Values for General Population

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Occupational Exposure Limits (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
EU Consolidated List of Indicative Occupational Exposure Limit Values (IOELVs)	chlorodifluoromethane	Chlorodifluoromethane	1000 ppm / 3600 mg/m3	Not Available	Not Available	Not Available
Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)	chlorodifluoromethane	Monochlordifluormethan (R 22)	500 ppm / 1800 mg/m3	3600 mg/m3 / 1000 ppm	Not Available	Not Available
Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)	1,1,1,2-tetrafluoroethane	1,1,1,2-Tetrafluorethan	1000 ppm / 4200 mg/m3	16800 mg/m3 / 4000 ppm	Not Available	Not Available
Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)	dichlorodifluoromethane	Dichlordifluormethan (R 12)	1000 ppm / 5000 mg/m3	10000 mg/m3 / 2000 ppm	Not Available	Not Available
Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)	trichlorofluoromethane	Trichlorfluormethan (R 11)	1000 ppm / 5600 mg/m3	11200 mg/m3 / 2000 ppm	Not Available	Not Available
Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)	propane	Propan (R 290)	1000 ppm / 1800 mg/m3	3600 mg/m3 / 2000 ppm	Not Available	Not Available
Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)	iso-butane	Butan (beide Isomeren): Isobutan (R 600a)	800 ppm / 1900 mg/m3	3800 mg/m3 / 1600 ppm	Not Available	Not Available
Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)	1-chloro-1,1-difluoroethane	1-Chlor-1,1-difluorethan (R 142b)	1000 ppm / 4170 mg/m3	8340 mg/m3 / 2000 ppm	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
chlorodifluoromethane	Not Available	Not Available
1,1,1,2-tetrafluoroethane	Not Available	Not Available
pentafluoroethane	Not Available	Not Available
difluoromethane	Not Available	Not Available
1,1,1-trifluoroethane	Not Available	Not Available
1,1-difluoroethane	Not Available	Not Available
dichlorodifluoromethane	15,000 ppm	Not Available
trichlorofluoromethane	2,000 ppm	Not Available
propane	Not Available	Not Available
1-chloro-1,1,2,2-tetrafluoroethane	Not Available	Not Available
iso-butane	Not Available	Not Available
1-chloro-1,1-difluoroethane	Not Available	Not Available
octafluoropropane	Not Available	Not Available

Occupational Exposure Banding


Ingredient	Occupational Exposure Band Rating	Occupational Exposure Band Limit
1,1-difluoroethane	E	≤ 0.1 ppm
Notes:	Occupational exposure banding is a process of assigning chemicals into specific categories or bands based on a chemical's potency and the adverse health outcomes associated with exposure. The output of this process is an occupational exposure band (OEB), which corresponds to a range of exposure concentrations that are expected to protect worker health.	

MATERIAL DATA

8.2. Exposure controls

8.2.1. 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
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	<p>provide this high level of protection.</p> <p>The basic types of engineering controls are:</p> <p>Process controls which involve changing the way a job activity or process is done to reduce the risk.</p> <p>Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.</p>
8.2.2. Individual protection measures, such as personal protective equipment	
Eye and face protection	<ul style="list-style-type: none"> ▶ Chemical goggles. ▶ Full face shield may be required for supplementary but never for primary protection of eyes. ▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hands/feet protection	<ul style="list-style-type: none"> ▶ When handling sealed and suitably insulated cylinders wear cloth or leather gloves. ▶ Insulated gloves: ▶ NOTE: Insulated gloves should be loose fitting so that may be removed quickly if liquid is spilled upon them. Insulated gloves are not made to permit hands to be placed in the liquid; they provide only short-term protection from accidental contact with the liquid.
Body protection	See Other protection below
Other protection	<ul style="list-style-type: none"> ▶ Protective overalls, closely fitted at neck and wrist. ▶ Eye-wash unit. ▶ Ensure availability of lifeline in confined spaces. ▶ Staff should be trained in all aspects of rescue work.

Respiratory protection

Type AX-P 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*	AX-2 P2	AX-PAPR-2 P2 ^
up to 10 x ES	-	AX-3 P2	-
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)

- ▶ Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- ▶ The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
- ▶ Cartridge performance is affected by humidity. Cartridges should be changed after 2 hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used
- ▶ 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.

8.2.3. Environmental exposure controls

See section 12

SECTION 9 Physical and chemical properties**9.1. Information on basic physical and chemical properties**

Appearance	Liquefied gas.		
Physical state	Liquified Gas	Relative density (Water = 1)	Not Available
Odour	Not Available	Partition coefficient n-octanol / water	Not Available
Odour threshold	Not Available	Auto-ignition temperature (°C)	Not Available

Continued...

pH (as supplied)	Not Available	Decomposition temperature (°C)	Not Available
Melting point / freezing point (°C)	Not Available	Viscosity (cSt)	Not Available
Initial boiling point and boiling range (°C)	Not Available	Molecular weight (g/mol)	Not Applicable
Flash point (°C)	Not Available	Taste	Not Available
Evaporation rate	Not Available	Explosive properties	Not Available
Flammability	Not Available	Oxidising properties	Not Available
Upper Explosive Limit (%)	Not Available	Surface Tension (dyn/cm or mN/m)	Not Available
Lower Explosive Limit (%)	Not Available	Volatile Component (%vol)	Not Available
Vapour pressure (kPa)	Not Available	Gas group	Not Available
Solubility in water	Not Available	pH as a solution (1%)	Not Available
Vapour density (Air = 1)	Not Available	VOC g/L	Not Available
Heat of Combustion (kJ/g)	Not Available	Ignition Distance (cm)	Not Available
Flame Height (cm)	Not Available	Flame Duration (s)	Not Available
Enclosed Space Ignition Time Equivalent (s/m3)	Not Available	Enclosed Space Ignition Deflagration Density (g/m3)	Not Available
Nanoform Solubility	Not Available	Nanoform Particle Characteristics	Not Available
Particle Size	Not Available		

9.2. Other information

Not Available

SECTION 10 Stability and reactivity

10.1.Reactivity	See section 7.2
10.2. Chemical stability	<ul style="list-style-type: none">▶ Unstable in the presence of incompatible materials.▶ Product is considered stable.▶ Hazardous polymerisation will not occur.
10.3. Possibility of hazardous reactions	See section 7.2
10.4. Conditions to avoid	See section 7.2
10.5. Incompatible materials	See section 7.2
10.6. Hazardous decomposition products	See section 5.3

SECTION 11 Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

Inhaled	<p>Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.</p> <p>Limited evidence or practical experience suggests that the material may produce irritation of the respiratory system, in a significant number of individuals, following inhalation. 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.</p> <p>Common, generalised symptoms associated with non-toxic gas inhalation include :</p> <ul style="list-style-type: none">▶ 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.
Ingestion	<p>Accidental ingestion of the material may be damaging to the health of the individual.</p> <p>Not normally a hazard due to physical form of product.</p> <p>Considered an unlikely route of entry in commercial/industrial environments</p>
Skin Contact	<p>Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.</p> <p>Limited evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy</p>

Continued...

A-Gas Recovered Refrigerant Gas

	<p>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.</p> <p>Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.</p> <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>
Eye	Limited evidence exists, or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals and/or is expected to produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.
Chronic	Long-term exposure to the product is not thought to produce chronic effects adverse to health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course. Principal route of occupational exposure to the gas is by inhalation.

A-Gas Recovered Refrigerant Gas	TOXICITY	IRRITATION
	Not Available	Not Available
chlorodifluoromethane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: 220000 ppm4h ^[2]	Not Available
1,1,1,2-tetrafluoroethane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: 359453.102 ppm4h ^[2]	Eye: adverse effect observed (irritating) ^[1]
		Skin: adverse effect observed (irritating) ^[1]
		Skin: no adverse effect observed (not irritating) ^[1]
pentafluoroethane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: >709000 ppm4h ^[2]	Eye: no adverse effect observed (not irritating) ^[1]
		Skin: no adverse effect observed (not irritating) ^[1]
difluoromethane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: >760000 ppm4h ^[2]	Not Available
	Oral (Mouse) LD50: 1810 mg/kg ^[2]	
1,1,1-trifluoroethane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: >540000 ppm4h ^[2]	Not Available
1,1-difluoroethane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: >437500 ppm4h ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
	Oral (Rat) LD50: 484 mg/kg ^[2]	Skin: no adverse effect observed (not irritating) ^[1]
dichlorodifluoromethane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: >800000 ppm4h ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
	Oral (Rat) LD50: >1000 mg/kg ^[1]	Skin: no adverse effect observed (not irritating) ^[1]
trichlorofluoromethane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: 26200 ppm4h ^[2]	Not Available
	Oral (Rat) LD50: >15000 mg/kg ^[2]	
propane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: 364726.819 ppm4h ^[2]	Not Available
1-chloro-1,1,2,2-tetrafluoroethane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: 218559.496 ppm4h ^[2]	Not Available

A-Gas Recovered Refrigerant Gas

iso-butane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: >13023 ppm4h ^[1]	Not Available
1-chloro-1,1-difluoroethane	TOXICITY	IRRITATION
	Inhalation (Rat) LC50: 498731.343 ppm4h ^[2]	Not Available
octafluoropropane	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
	Inhalation (Rat) LC50: >4323.5 ppm4h ^[1]	Skin (Rodent - rabbit): 500uL - Mild
		Skin: no adverse effect observed (not irritating) ^[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

CHLORODIFLUOROMETHANE	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.
1,1,1,2-TETRAFLUOROETHANE	* 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.
PENTAFLUOROETHANE	Cardiac sensitisation threshold limit >245400 mg/m3 Anaesthetic effects threshold limit 490800 mg/m3 * DuPont SDS
1,1,1-TRIFLUOROETHANE	NOTE: Substance has been shown to be mutagenic in at least one assay, or belongs to a family of chemicals producing damage or change to cellular DNA.
1,1-DIFLUOROETHANE	For 1,1-difluoroethane: 1,1 -Difluoroethane is practically non-toxic following acute or chronic inhalation exposures. It is not a developmental or reproductive toxicant in rat studies and is negative for cancer in a two year rat inhalation study. It is not mutagenic in a <i>in vitro</i> bacterial reverse mutation assay and shows some weak clastogenicity in an <i>in vitro</i> human lymphocyte chromosome aberration test, but further evaluation of its ability to cause chromosome damage in and <i>in vivo</i> micronucleus test was negative. There is evidence that 1,1-difluoroethane can cause cardiac effects in some species, most notably heart arrhythmia in the dog.
TRICHLOROFLUOROMETHANE	Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia.
1-CHLORO-1,1,2,2-TETRAFLUOROETHANE	Inhalation (Guinea pig) LC: 1520000 mg/m3/2h Nil reported
1-CHLORO-1,1-DIFLUOROETHANE	Inhalation (Mouse) LC50: 1758000 mg/m3/2h Nil reported - *(Toxicity data for approx. 45% gas, 55% air) for chlorodifluoroethane (syn 1-chloro-1,1-difluoroethane): Acute toxicity of 1-chloro-1,1-difluoroethane is low (LC50/6h >1,640,000 mg/m3 (400,000 ppm) in rats). Inhalation of high concentrations induced signs of lung irritation and Central Nervous System depressing effects of anesthetic type in rats and cardiac sensitisation in dogs. Consequently, 1-chloro 1,1 -difluoroethane may be hazardous to humans in case of accidental exposure to high concentrations occurring in confined area where replacement of air by the gas could at the same time reduce oxygen in the atmosphere. Repeat dose toxicity: In repeated inhalation exposure studies, 1-chloro -1,1-difluoroethane did not induce specific chronic toxicity in rats and dogs exposed 6 h/d, 5 d/week during several months (no target organs identified ; the no observed adverse effects were higher than 41 000 mg/m3 (10,000 ppm) in dogs exposed during 3 months and higher than 82 000 mg/m3 (20,000 ppm) in rats exposed for their lifetime). Reproductive toxicity: 1-Chloro 1,1-difluoroethane did not induce adverse effect on fertility of male mice exposed up to 82 000 mg/m3 (20,000 ppm) (in a Dominant lethal assay) and did not induce male and female lesions of sexual organs in rats and dogs exposed for several months. Developmental toxicity: the gas did not induce teratogenic or embryo/foetotoxicity effect and no maternal toxicity in two inhalation developmental toxicity studies where rats were exposed during pregnancy up to 41000 mg/m3 (10,000 ppm). Carcinogenicity: There was no carcinogenic effect in rats exposed for their life time (6h/d, 5d/week at concentrations up to 82 000 mg/m3 (20,000 ppm)). Genotoxicity: In genotoxicity studies, 1-chloro-1,1-difluoroethane was mutagenic in vitro on bacteria (Ames test) and gave equivocal results in a cell neoplastic transformation assay. However, in <i>in vivo</i> mutagenicity studies it was inactive (in a Dominant lethal assay and in a Bone Marrow cytogenetic assay in rats exposed by inhalation during 15 and 13 weeks respectively).
OCTAFLUOROPROPANE	For perfluoropropane (PF3) and other aliphatic perfluoroalkanes (PFAs) Perfluoroalkanes (PFAs) are very stable. They are not oxidized even by ozone to any appreciable extent; their atmospheric half-life greater than 5000 y 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 cardiac arrhythmias by sensitising the heart to epinephrine.

Continued...

A-Gas Recovered Refrigerant Gas

	<p>For perfluorinated carbons (PFCs):</p> <p>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-Cl8 and boiling in the range of approximately 25 C-255 C (77 F-491 F). Perfluorinated amine and ether compounds may also be present</p> <p>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.</p>
CHLORODIFLUOROMETHANE & DICHLORODIFLUOROMETHANE & TRICHLOROFLUOROMETHANE & 1-CHLORO-1,1,2,2-TETRAFLUOROETHANE & 1-CHLORO-1,1-DIFLUOROETHANE	<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.</p> <p>CFCs and HCFCs are known to sensitise the heart to adrenalin-induced arrhythmias.</p> <p>CFCs:</p> <ul style="list-style-type: none"> · can be absorbed across the alveolar membrane, gastro- intestinal tract, or the skin; · are absorbed rapidly into the blood, following inhalation; · are absorbed into the blood at a decreasing rate as blood concentration increases; · once in the blood, are absorbed by various tissues; · will reach a stable blood level if exposure is sufficiently long, indicating an equilibrium between the air containing the chlorofluorocarbons and the blood; · are still absorbed by body tissue, after the initial blood level stabilization, and continue to enter the body. <p>Studies with animals indicate that chlorofluorocarbons are rapidly absorbed after inhalation and are distributed by blood into practically all tissues of the body. The highest concentrations are usually found in fatty or lipid-containing tissues.</p>
CHLORODIFLUOROMETHANE & 1-CHLORO-1,1,2,2-TETRAFLUOROETHANE & 1-CHLORO-1,1-DIFLUOROETHANE	<p>For dichlorotrifluoroethane (HCFC -123) and dichloropentafluoropropane (HCFC-225)</p> <p>Prolonged inhalation of high concentrations of HCFC-123 vapour may cause temporary nervous system depression with anesthetic effects such as dizziness, headache, confusion, incoordination, and loss of consciousness. With gross overexposure (greater than 20% concentration), a temporary alteration of the heart's electrical activity with irregular pulse, palpitations, or inadequate circulation may occur. Similar effects are observed in overexposure to CFC-11. Inhalation may cause liver effects with extended high-level exposures.</p>
CHLORODIFLUOROMETHANE & 1,1,1,2-TETRAFLUOROETHANE & DICHLORODIFLUOROMETHANE & TRICHLOROFLUOROMETHANE & 1-CHLORO-1,1,2,2-TETRAFLUOROETHANE & 1-CHLORO-1,1-DIFLUOROETHANE	<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. Numerous haloalkanes and haloalkenes have been tested for carcinogenic and mutagenic activities. In general, the genotoxic potential is dependent on the nature, number, and position of halogen(s) and the molecular size of the compound.</p>
PROPANE & OCTAFLUOROPROPANE	<p>No significant acute toxicological data identified in literature search.</p>

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

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

11.2 Information on other hazards

11.2.1. Endocrine disrupting properties

No evidence of endocrine disrupting properties were found in the current literature.

11.2.2. Other information

See Section 11.1

SECTION 12 Ecological information

12.1. Toxicity

Continued...

A-Gas Recovered Refrigerant Gas

A-Gas Recovered Refrigerant Gas	Endpoint	Test Duration (hr)	Species	Value	Source
	Not Available	Not Available	Not Available	Not Available	Not Available
chlorodifluoromethane	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	48h	Crustacea	433mg/l	2
	EC50	96h	Algae or other aquatic plants	250mg/l	2
	EC50(ECx)	96h	Algae or other aquatic plants	250mg/l	2
1,1,1,2-tetrafluoroethane	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	>114mg/l	2
	EC50	48h	Crustacea	980mg/L	5
	EC50	96h	Algae or other aquatic plants	142mg/l	2
	NOEC(ECx)	72h	Algae or other aquatic plants	~13.2mg/l	2
	LC50	96h	Fish	450mg/l	2
pentafluoroethane	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	>114mg/l	2
	EC50	48h	Crustacea	>97.9mg/l	2
	LC50	96h	Fish	>81.8mg/l	2
	NOEC(ECx)	96h	Fish	10mg/l	2
	EC50	96h	Algae or other aquatic plants	142mg/l	2
difluoromethane	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	>114mg/l	2
	EC50	48h	Crustacea	>97.9mg/l	2
	LC50	96h	Fish	>81.8mg/l	2
	EC50	96h	Algae or other aquatic plants	142mg/l	2
	NOEC(ECx)	96h	Fish	10mg/l	2
1,1,1-trifluoroethane	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	~71mg/l	2
	EC0(ECx)	96h	Algae or other aquatic plants	>44mg/l	2
1,1-difluoroethane	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	48h	Crustacea	146.695mg/l	2
	LC50	96h	Fish	291.31mg/l	2
	EC50	96h	Algae or other aquatic plants	47.755mg/l	2
	NOEC(ECx)	504h	Crustacea	0.214mg/l	2
dichlorodifluoromethane	Endpoint	Test Duration (hr)	Species	Value	Source
	BCF	1008h	Fish	<2.3-10	7
	EC50	72h	Algae or other aquatic plants	~67.216mg/l	2
	EC50	48h	Crustacea	49.6mg/l	2
	LC50	96h	Fish	71.35mg/l	2
	EC50	96h	Algae or other aquatic plants	32.56mg/l	2
	EC50(ECx)	96h	Algae or other aquatic plants	32.56mg/l	2
trichlorofluoromethane	Endpoint	Test Duration (hr)	Species	Value	Source
	BCF	1008h	Fish	9.6-17	7
	EC50	48h	Crustacea	130mg/l	1
	EC50(ECx)	48h	Crustacea	130mg/l	1
propane	Endpoint	Test Duration (hr)	Species	Value	Source
	Not Available	Not Available	Not Available	Not Available	Not Available
1-chloro-1,1,2,2-tetrafluoroethane	Endpoint	Test Duration (hr)	Species	Value	Source

Continued...

A-Gas Recovered Refrigerant Gas

	Not Available	Not Available	Not Available	Not Available	Not Available
iso-butane	Endpoint	Test Duration (hr)	Species	Value	Source
	LC50	96h	Fish	24.11mg/l	2
	EC50	96h	Algae or other aquatic plants	7.71mg/l	2
	EC50(ECx)	96h	Algae or other aquatic plants	7.71mg/l	2
1-chloro-1,1-difluoroethane	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	48h	Crustacea	160mg/l	1
	LC50	96h	Fish	220mg/l	2
	EC50	96h	Algae or other aquatic plants	67.8mg/l	2
	EC50(ECx)	96h	Algae or other aquatic plants	67.8mg/l	2
octafluoropropane	Endpoint	Test Duration (hr)	Species	Value	Source
	Not Available	Not Available	Not Available	Not Available	Not Available
Legend: Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 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					

On the basis of the available evidence concerning properties and predicted or observed environmental fate and behavior, the material may present a danger to the structure and/ or functioning of the stratospheric ozone layer.

DO NOT discharge into sewer or waterways.

12.2. Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
chlorodifluoromethane	LOW	LOW
1,1,1,2-tetrafluoroethane	HIGH	HIGH
pentafluoroethane	HIGH	HIGH
difluoromethane	LOW	LOW
1,1,1-trifluoroethane	HIGH	HIGH
1,1-difluoroethane	LOW	LOW
dichlorodifluoromethane	HIGH (Half-life = 360 days)	HIGH (Half-life = 882.5 days)
trichlorofluoromethane	HIGH (Half-life = 720 days)	HIGH (Half-life = 54166.67 days)
propane	LOW	LOW
1-chloro-1,1,2,2-tetrafluoroethane	HIGH	HIGH
iso-butane	HIGH	HIGH
1-chloro-1,1-difluoroethane	HIGH	HIGH
octafluoropropane	HIGH	HIGH

12.3. Bioaccumulative potential

Ingredient	Bioaccumulation
chlorodifluoromethane	LOW (LogKOW = 1.08)
1,1,1,2-tetrafluoroethane	LOW (LogKOW = 1.68)
pentafluoroethane	LOW (LogKOW = 1.5472)
difluoromethane	LOW (LogKOW = 0.2)
1,1,1-trifluoroethane	LOW (LogKOW = 1.7393)
1,1-difluoroethane	LOW (LogKOW = 0.75)
dichlorodifluoromethane	LOW (BCF = 10)
trichlorofluoromethane	LOW (BCF = 26)
propane	LOW (LogKOW = 2.36)
1-chloro-1,1,2,2-tetrafluoroethane	LOW (LogKOW = 1.8605)
iso-butane	LOW (BCF = 1.97)
1-chloro-1,1-difluoroethane	LOW (LogKOW = 2.0526)
octafluoropropane	LOW (LogKOW = 3.1211)

12.4. Mobility in soil

Ingredient	Mobility
chlorodifluoromethane	LOW (Log KOC = 23.74)
1,1,1,2-tetrafluoroethane	LOW (Log KOC = 96.63)
pentafluoroethane	LOW (Log KOC = 154.4)
difluoromethane	LOW (Log KOC = 23.74)
1,1,1-trifluoroethane	LOW (Log KOC = 48.64)
1,1-difluoroethane	LOW (Log KOC = 35.04)
dichlorodifluoromethane	LOW (Log KOC = 48.64)
trichlorofluoromethane	LOW (Log KOC = 48.64)
propane	LOW (Log KOC = 23.74)
1-chloro-1,1,2,2-tetrafluoroethane	LOW (Log KOC = 154.4)
iso-butane	LOW (Log KOC = 35.04)
1-chloro-1,1-difluoroethane	LOW (Log KOC = 48.64)
octafluoropropane	LOW (Log KOC = 1038)

12.5. Results of PBT and vPvB assessment

	P	B	T
Relevant available data	Not Available	Not Available	Not Available
PBT	✗	✗	✗
vPvB	✗	✗	✗
PBT Criteria fulfilled?	No		
vPvB	No		

12.6. Endocrine disrupting properties

No evidence of endocrine disrupting properties were found in the current literature.

12.7. Other adverse effects

One or more ingredients within this SDS has the potential of causing ozone depletion and/or photochemical ozone creation.


SECTION 13 Disposal considerations

13.1. Waste treatment methods

Product / Packaging disposal	<ul style="list-style-type: none">▶ Evaporate residue at an approved site.▶ Return empty containers to supplier. If containers are marked non-returnable establish means of disposal with manufacturer prior to purchase.▶ Ensure damaged or non-returnable cylinders are gas-free before disposal.
Waste treatment options	Not Available
Sewage disposal options	Not Available

SECTION 14 Transport information

Labels Required

	
Marine Pollutant	NO

Land transport (ADR-RID)

14.1. UN number or ID number	1078
14.2. UN proper shipping name	REFRIGERANT GAS, N.O.S., such as mixture F1, mixture F2 or mixture F3 (contains pentafluoroethane, trichlorofluoromethane, chlorodifluoromethane, 1,1-difluoroethane, dichlorodifluoromethane, iso-butane, propane, 1,1,1-trifluoroethane,

Continued...

A-Gas Recovered Refrigerant Gas

	octafluoropropane, 1-chloro-1,1-difluoroethane, difluoromethane, 1,1,1,2-tetrafluoroethane and 1-chloro-1,1,2,2-tetrafluoroethane)	
14.3. Transport hazard class(es)	Class	2.2
	Subsidiary Hazard	Not Applicable
14.4. Packing group	Not Applicable	
14.5. Environmental hazard	Not Applicable	
14.6. Special precautions for user	Hazard identification (Kemler)	20
	Classification code	2A
	Hazard Label	2.2
	Special provisions	274 582 662
	Limited quantity	120 ml
	Tunnel Restriction Code	C/E

Air transport (ICAO-IATA / DGR)

14.1. UN number	1078	
14.2. UN proper shipping name	Refrigerant gas, n.o.s. * (contains pentafluoroethane, trichlorofluoromethane, chlorodifluoromethane, 1,1-difluoroethane, dichlorodifluoromethane, iso-butane, propane, 1,1,1-trifluoroethane, octafluoropropane, 1-chloro-1,1-difluoroethane, difluoromethane, 1,1,1,2-tetrafluoroethane and 1-chloro-1,1,2,2-tetrafluoroethane)	
14.3. Transport hazard class(es)	ICAO/IATA Class	2.2
	ICAO / IATA Subsidiary Hazard	Not Applicable
	ERG Code	2L
14.4. Packing group	Not Applicable	
14.5. Environmental hazard	Not Applicable	
14.6. 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)

14.1. UN number	1078	
14.2. UN proper shipping name	REFRIGERANT GAS, N.O.S. (contains pentafluoroethane, trichlorofluoromethane, chlorodifluoromethane, 1,1-difluoroethane, dichlorodifluoromethane, iso-butane, propane, 1,1,1-trifluoroethane, octafluoropropane, 1-chloro-1,1-difluoroethane, difluoromethane, 1,1,1,2-tetrafluoroethane and 1-chloro-1,1,2,2-tetrafluoroethane)	
14.3. Transport hazard class(es)	IMDG Class	2.2
	IMDG Subsidiary Hazard	Not Applicable
14.4. Packing group	Not Applicable	
14.5. Environmental hazard	Not Applicable	
14.6. Special precautions for user	EMS Number	F-C , S-V
	Special provisions	274
	Limited Quantities	120 mL

Inland waterways transport (ADN)

14.1. UN number	1078	
14.2. UN proper shipping name	REFRIGERANT GAS, N.O.S., such as mixture F1, mixture F2 or mixture F3 (contains pentafluoroethane, trichlorofluoromethane, chlorodifluoromethane, 1,1-difluoroethane, dichlorodifluoromethane, iso-butane, propane, 1,1,1-trifluoroethane, octafluoropropane, 1-chloro-1,1-difluoroethane, difluoromethane, 1,1,1,2-tetrafluoroethane and 1-chloro-1,1,2,2-tetrafluoroethane)	
	2.2	Not Applicable

Continued...

14.3. Transport hazard class(es)		
14.4. Packing group	Not Applicable	
14.5. Environmental hazard	Not Applicable	
14.6. Special precautions for user	Classification code	2A
	Special provisions	274; 582; 662
	Limited quantity	120 ml
	Equipment required	PP
	Fire cones number	0

14.7. Maritime transport in bulk according to IMO instruments

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

Not Applicable

14.7.2. Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

Product name	Group
chlorodifluoromethane	Not Available
1,1,1,2-tetrafluoroethane	Not Available
pentafluoroethane	Not Available
difluoromethane	Not Available
1,1,1-trifluoroethane	Not Available
1,1-difluoroethane	Not Available
dichlorodifluoromethane	Not Available
trichlorofluoromethane	Not Available
propane	Not Available
1-chloro-1,1,2,2-tetrafluoroethane	Not Available
iso-butane	Not Available
1-chloro-1,1-difluoroethane	Not Available
octafluoropropane	Not Available

14.7.3. Transport in bulk in accordance with the IGC Code

Product name	Ship Type
chlorodifluoromethane	Not Available
1,1,1,2-tetrafluoroethane	Not Available
pentafluoroethane	Not Available
difluoromethane	Not Available
1,1,1-trifluoroethane	Not Available
1,1-difluoroethane	Not Available
dichlorodifluoromethane	Not Available
trichlorofluoromethane	Not Available
propane	Not Available
1-chloro-1,1,2,2-tetrafluoroethane	Not Available
iso-butane	Not Available
1-chloro-1,1-difluoroethane	Not Available
octafluoropropane	Not Available

SECTION 15 Regulatory information

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

chlorodifluoromethane is found on the following regulatory lists

Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)

A-Gas Recovered Refrigerant Gas

EU Consolidated List of Indicative Occupational Exposure Limit Values (IOELVs)

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Not Classified as Carcinogenic

1,1,1,2-tetrafluoroethane is found on the following regulatory lists

Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Not Classified as Carcinogenic

UNEP (United Nations Environment Programme) Montreal Protocol Ozone Depletors - Annex F

pentafluoroethane is found on the following regulatory lists

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

UNEP (United Nations Environment Programme) Montreal Protocol Ozone Depletors - Annex F

difluoromethane is found on the following regulatory lists

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

UNEP (United Nations Environment Programme) Montreal Protocol Ozone Depletors - Annex F

1,1,1-trifluoroethane is found on the following regulatory lists

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

UNEP (United Nations Environment Programme) Montreal Protocol Ozone Depletors - Annex F

1,1-difluoroethane is found on the following regulatory lists

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

UNEP (United Nations Environment Programme) Montreal Protocol Ozone Depletors - Annex F

dichlorodifluoromethane is found on the following regulatory lists

Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

UNEP (United Nations Environment Programme) Montreal Protocol Ozone Depletors - Annex A

trichlorofluoromethane is found on the following regulatory lists

Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

UNEP (United Nations Environment Programme) Montreal Protocol Ozone Depletors - Annex A

propane is found on the following regulatory lists

Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)

EU REACH Regulation (EC) No 1907/2006 - Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI

1-chloro-1,1,2,2-tetrafluoroethane is found on the following regulatory lists

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

iso-butane is found on the following regulatory lists

Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)

Chemical Footprint Project - Chemicals of High Concern List

EU REACH Regulation (EC) No 1907/2006 - Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

EU REACH Regulation (EC) No 1907/2006 - Annex XVII (Appendix 1) Carcinogens: Category 1 A

EU REACH Regulation (EC) No 1907/2006 - Annex XVII (Appendix 4) Germ cell mutagens: Category 1 B

Europe EC Inventory

European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI

Continued...

1-chloro-1,1-difluoroethane is found on the following regulatory lists

- Austria Occupational Exposure Limits - Maximum Workplace Concentrations (MAK) (German)
- Europe EC Inventory
- European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

octafluoropropane is found on the following regulatory lists

- Europe EC Inventory
- European Union - European Inventory of Existing Commercial Chemical Substances (EINECS)

Additional Regulatory Information

Not Applicable

This safety data sheet is in compliance with the following EU legislation and its adaptations - as far as applicable - : Directives 98/24/EC, - 92/85/EEC, - 94/33/EC, - 2008/98/EC, - 2010/75/EU; Commission Regulation (EU) 2020/878; Regulation (EC) No 1272/2008 as updated through ATPs.

Information according to 2012/18/EU (Seveso III):

Seveso Category	Not Available
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15.2. Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

National Inventory Status

National Inventory	Status
Australia - AIIC / Australia Non-Industrial Use	No (1-chloro-1,1,2,2-tetrafluoroethane)
Canada - DSL	Yes
Canada - NDSL	No (chlorodifluoromethane; 1,1,1,2-tetrafluoroethane; pentafluoroethane; difluoromethane; 1,1,1-trifluoroethane; 1,1-difluoroethane; dichlorodifluoromethane; trichlorofluoromethane; propane; 1-chloro-1,1,2,2-tetrafluoroethane; iso-butane; 1-chloro-1,1-difluoroethane; octafluoropropane)
China - IECSC	No (difluoromethane)
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	No (1-chloro-1,1,2,2-tetrafluoroethane)
Korea - KECI	No (1-chloro-1,1,2,2-tetrafluoroethane)
New Zealand - NZIoC	Yes
Philippines - PICCS	No (1-chloro-1,1,2,2-tetrafluoroethane)
USA - TSCA	All chemical substances in this product have been designated as TSCA Inventory 'Active'
Taiwan - TCSI	No (1-chloro-1,1,2,2-tetrafluoroethane)
Mexico - INSQ	No (1-chloro-1,1,2,2-tetrafluoroethane)
Vietnam - NCI	No (dichlorodifluoromethane; 1-chloro-1,1,2,2-tetrafluoroethane; octafluoropropane)
Russia - FBEPH	Yes
Legend:	Yes = All CAS declared ingredients are on the inventory No = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.

SECTION 16 Other information

Revision Date	23/12/2022
Initial Date	11/08/2010

Full text Risk and Hazard codes

H220	Extremely flammable gas.
H302	Harmful if swallowed.
H302+H312	Harmful if swallowed or if contact with skin.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H331	Toxic if inhaled.
H335	May cause respiratory irritation.
H410	Very toxic to aquatic life with long lasting effects.
H412	Harmful to aquatic life with long lasting effects.

A-Gas Recovered Refrigerant Gas**SDS Version Summary**

Version	Date of Update	Sections Updated
7.1	01/11/2019	One-off system update. NOTE: This may or may not change the GHS classification
8.1	23/12/2022	Classification review due to GHS Revision change.

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.

For detailed advice on Personal Protective Equipment, refer to the following EU CEN Standards:

EN 166 Personal eye-protection

EN 340 Protective clothing

EN 374 Protective gloves against chemicals and micro-organisms

EN 13832 Footwear protecting against chemicals

EN 133 Respiratory protective devices

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
- ES: Exposure Standard
- 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
- DNEL: Derived No-Effect Level
- PNEC: Predicted no-effect concentration

- AIIC: Australian Inventory of Industrial Chemicals
- DSL: Domestic Substances List
- NDSL: Non-Domestic Substances List
- IECSC: Inventory of Existing Chemical Substance in China
- EINECS: European INventory of Existing Commercial chemical Substances
- ELINCS: European List of Notified Chemical Substances
- NLP: No-Longer Polymers
- ENCS: Existing and New Chemical Substances Inventory
- KECI: Korea Existing Chemicals Inventory
- NZIoC: New Zealand Inventory of Chemicals
- PICCS: Philippine Inventory of Chemicals and Chemical Substances
- TSCA: Toxic Substances Control Act
- TCSI: Taiwan Chemical Substance Inventory
- INSQ: Inventario Nacional de Sustancias Químicas
- NCI: National Chemical Inventory
- FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances

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