SAFETY DATA SHEET R407c

Section 1.	Product information and supplier details.
Item code:	RG0407
Product name:	R-407c Refrigerant
Other names:	Difluoromethane, Pentafluoroethane, Tetrafluoroethane, Suva® 9000
HSNO Approval number(s):	HSR001031 (R134a), Group standard (R-125), HSR001023 (R-32)
Global warming potential:	1774
Ozone depletion potential:	0
ASHRAE Safety Group	A1
Use:	Refrigerant, Professional use only.
New Zealand supplier:	Refrigeration specialties Ltd
Website:	http://www.refspecs.co.nz/
Physical address:	181a Station Rd, Penrose, Auckland 1061
Phone number:	09 582 0200
Manufacturer:	Global Refrigerants (s) PTE. LTD. 9 TUAS LINK 1, SINGAPORE 638587

EMERGENCY CONTACT 0800 766 764 (National Poison Centre)

Section 2.	Hazard Identification.	
GHS Classification:	Gases under pressure, Liquefiable gas	
Signal word:	**WARNING**	
Hazard statements:	**H280** Contains gas under pressure, may explode if heated.	
Pictogram:	 GHS04	
Prevention:	**P103** Read label before use.	
Precautionary statements:	**P410-P403** Protect from sunlight, store in a well-ventilated place.	
Emergency overview:	Colourless, volatile liquid with ethereal and faint sweetish odour. Non-flammable material. Overexposure may cause dizziness and loss of concentration. At higher levels, CNS depression and cardiac arrhythmia may result from exposure. Vapours displace air and can cause asphyxiation in confined spaces. At higher temperatures, (>250°C), decomposition products may include Hydrofluoric Acid (HF) and carbonyl halides.	
Potential health hazards:	**Skin:**	Irritation would result from a defatting action on tissue. Liquid contact could cause frostbite.
	Eyes:	Liquid contact can cause severe irritation and frostbite. Mist may irritate.
	Inhalation:	R-407c, is low in acute toxicity in animals. When oxygen levels in air are reduced to 12-14% by displacement, symptoms of asphyxiation, loss of coordination, increased pulse rate and deeper respiration will occur. At high levels, cardiac arrhythmia may occur.
	Delayed effects:	No delayed effects known.

Other hazards:	This mixture contains no substance considered to be persistent, bioaccumulating and toxic (PBT). This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB). Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Rapid evaporation of the liquid may cause frostbite. Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects. May cause cardiac arrhythmia.

Section 3.	**Composition Information on Ingredients**		
Chemical nature:	Fluorinated hydrocarbons		
Ingredient:	**Weight (%w/w)**	**CAS number:**	**Classification**
1,1,1,2-Tetrafluoroethane (HFC-134a)	52	811-97-2	Gas under Pressure (Liquefied gas); H280
Pentafluoroethane (HFC-125)	25	354-33-6	Gas under Pressure (Liquefied gas); H280
Difluoromethane (HFC-32)	23	75-10-5	Flammable Gas Category 1; H220
There are no impurities or stabilizers that contribute to the classification of the material identified in Section 2			

Section 4.	**First aid measures**
General advice:	Never give anything by mouth to an unconscious person. When symptoms persist or in all cases of doubt seek medical advice.
First responders:	First aider needs to protect themselves, See Section 8. For personal protective equipment. **MONITOR THE BREATHING AND PULSE, CONTINUOUSLY.**
Symptoms:	Anaesthetic effects, Light-headedness, dizziness, confusion, incoordination, drowsiness, or unconsciousness, irregular heartbeat with a strange sensation in the chest, heart thumping, apprehension, feeling of fainting, dizziness or weakness. Contact with liquid or refrigerated gas can cause cold burns and frostbite. Skin contact may provoke Irritation, Discomfort, itching, redness, or swelling. Eye contact may provoke Irritation, Tearing, redness, or discomfort.
Skin:	Promptly flush skin with water until all chemical is removed. If there is evidence of frostbite, bathe (do not rub) with lukewarm (not hot) water. If water is not available, cover with a clean, soft cloth or similar covering. Get medical attention if symptoms persist.
Eyes:	Immediately flush eyes with large amounts of water for at least 15 minutes (in case of frostbite, water should be lukewarm, not hot) lifting eyelids occasionally to facilitate irrigation. Get medical attention if symptoms persist.
Inhalation:	Immediately move to fresh air. If breathing has stopped, give artificial respiration. Use oxygen as required, provided a qualified operator is available. Get medical attention immediately. DO NOT give epinephrine (adrenaline).
Ingestion:	Ingestion is unlikely because of the physical properties and is not expected to be hazardous.
Advice to physician:	Because of the possible disturbances of cardiac rhythm, catecholamine drugs, such as epinephrine, should be used with special caution and only in situations of emergency life support. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.

Section 5.	Fire fighting measures.
Hazard type:	Compressed gas non-flammable
HAZCHEM code:	2TE
Decomposition products:	The product is not flammable in air under ambient conditions of temperature and pressure. When pressurised with air or oxygen, the mixture may become flammable. If involved in a fire the following toxic and/or corrosive fumes may be produced by thermal decomposition: Carbon oxides, Hydrogen fluoride, Carbonyl difluoride.
Extinguishing media:	Use any standard agent – choose the one most appropriate for type of surrounding fire. Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. (material itself is not flammable)
Precautions for firefighters and special protective clothing:	Firefighters should wear self-contained, NIOSH-approved breathing apparatus for protection against possible toxic decomposition products. Use water spray to keep fire-exposed containers cool. In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment. Wear neoprene gloves during cleaning up work after a fire.
Auto ignition temperature:	Not available.
Flash point:	Not available.
Decomposition temperature:	>250°C
Further advice:	Cool containers/tanks with water spray.

Section 6.	Accidental release.
Personal precautions:	Always wear recommended personal protective equipment. (section 8) Evacuate unprotected personnel. Product dissipates upon release. Protected personnel should remove ignition sources and shut off leak, if without risk, and provide ventilation. Unprotected personnel should not return to the affected area until air has been tested and determined safe, including low-lying areas.
Environmental:	Contain the spilled material, prevent the product from spreading into the environment. Spills and releases must be reported to Worksafe New Zealand
Method of clean up:	Evaporates. Recover as much product as possible if safe to do so.
Further advice:	Avoid open flames and high temperatures. Self-contained breathing apparatus (SCBA) is required if a large release occurs.

Section 7.	Handling and Storage.
Normal handling:	Only qualified, experienced and properly instructed persons should handle gases under pressure. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Do not remove or deface labels provided by the supplier for the identification of the container contents. Observe all regulations and local requirements regarding storage of containers. When using do not eat, drink or smoke. Never use direct flame or electrical heating devices to raise the pressure of a container. Leave valve protection caps in place until the container is ready for use. Damaged valves should be reported immediately to the supplier. Never attempt to repair or modify container valves

	or safety relief devices. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Keep container valve outlets clean and free from contaminates particularly oil and water. If user experiences any difficulty operating container valve discontinue use and contact supplier. Container valve guards or caps should be in place. Always wear recommended personal protective equipment. Avoid breathing vapours and liquid contact with eyes, skin or clothing. Provide sufficient air exchange and/or exhaust in work rooms. Do not puncture, roll, slide, drag or drop cylinders, expose them to open flame or excessive heat. Use authorized cylinders only. Follow standard safety precautions for handling and use of compressed gas cylinders. R-407c should not be mixed with air above atmospheric pressure for leak testing or any other purpose.
Storage recommendations:	Store in a cool, well-ventilated area of low fire risk and out of direct sunlight. Protect cylinder and its fittings from physical damage. Storage in subsurface locations should be avoided. Close valve tightly after use and when empty.
Incompatibilities:	Freshly abraded aluminium surfaces at specific temperatures and pressures may cause a strong exothermic reaction. Chemically reactive metals: potassium, calcium, powdered aluminium, magnesium, and zinc.

Section 8.	**Exposure controls – personal protection**
Ingredient	**Workplace Exposure standards (WES – TWA) 8hr.**
Difluoromethane (HFC-32)	1000ppm
Pentafluoroethane (HFC-125)	1000ppm
1,1,1,2-Tetrafluoroethane (HFC-143a)	1000ppm
De-composition products:	**Workplace Exposure standards (WES – TWA) 8hr.**
Hydrogen Fluoride	0.5 ppm TWA
Carbonyl difluoride	2 ppm TWA
Workplace Exposure Standard – Time Weighted Average (WES-TWA). The time-weighted average exposure standard designed to protect the worker from the effects of long-term exposure.	

Other exposure guidelines:	Use work permit and line breaking procedure for maintenance work. Where open flame used during repairs, ensure system is purged with oxygen free nitrogen before commencing any work. Gas detection should be used when asphyxiating and potentially toxic or flammable gases may be released. Provide adequate ventilation, including appropriate local extraction, to ensure that the defined occupational exposure limit is not exceeded. Systems under pressure should be regularly checked for leakages. Preferably use permanent leak tight connections. Do not eat, drink or smoke when using the product.		
Engineering controls:	Provide local ventilation at filling zones and areas where leakage is probable. Mechanical (general) ventilation may be adequate for other operating and storage areas. Fixed gas detection should be installed when asphyxiating and potentially toxic or flammable gases may be released.		
Personal protective equipment:	**Respiratory protection**		None generally required for adequately ventilated work situations. For accidental release or non-ventilated situations, or release into confined space, where the concentration may be above the TWA, use a self-contained breathing apparatus or supplied air respirator.

	Eye protection		For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear chemical safety goggles or face shield.
	Skin protection	 	Skin contact with refrigerant may cause frostbite. General work clothing, overalls and gloves (leather) should provide adequate protection. If prolonged contact with liquid or gas is anticipated, insulated gloves constructed of PVA, neoprene or butyl rubber should be used. Any contaminated clothing should be promptly removed and washed before reuse.
Additional controls:	Where contact with liquid is likely, such as in a spill or leak, impervious boots and clothing should be worn. High dose-level warning signs are recommended for areas of principle exposure. Provide eyewash stations and quick drench shower facilities at convenient locations.		

Section 9.	**Physical & Chemical Properties**
Appearance:	Clear, colourless liquid and vapor
Odour:	Odourless, Faint ethereal odour
Odour threshold:	Odour threshold is subjective and is inadequate to warn of over exposure.
Boiling point:	-43°C
Freezing Point:	Not determined
Physical state:	Liquefiable gas, Gas at ambient temperatures
Specific gravity:	1.16 @ 21.1°C
Vapour pressure:	1,190.3 kPa @25 °C
Vapour density:	3.03
Solubility:	Unknown
pH:	Not available.
Oxidising properties:	Not available.
Decomposition temperature:	>250°C
UEL / LEL:	No applicable data available
Flash point:	Not available.
Molecular weight:	86.2
Chemical Formula:	CH_2F_2, CHF_2CF_3, CH_2FCF_3

Section 10.	**Stability and reactivity.**
Stability:	The product is chemically stable under recommended conditions of storage, use and temperature.
Conditions to avoid:	Avoid open flames and high temperatures. The product is not flammable in air under ambient conditions of temperature and pressure. When pressurised with air or oxygen, the mixture may become flammable. Certain mixtures may become flammable or reactive under certain conditions. Pressurized container: Do not pierce or burn, even after use. Keep at temperature not exceeding 52°C.

Conditions to avoid:	Any source of high temperatures, such as lighted cigarettes, flames, hot spots or welding may yield toxic and/or corrosive decomposition products.
Incompatibilities:	Strong bases, Alkaline earth metals, Strong oxidisers. Under specific conditions: e.g. very high temperatures and/or appropriate pressures) – Fine metal powders (may cause strong exothermic reaction). Chemically reactive metals: powdered aluminium, magnesium, and zinc.
Hazardous decomposition products:	On Combustion or thermal decomposition (Pyrolysis) and Hydrolysis releases toxic gasses (halogenated compounds) (Hydrogen Chloride and Hydrogen Fluoride), Carbonyl fluoride, Carbon oxides, Fluorocarbons,
Hazardous polymerization:	Polymerization will not occur. Stable under recommended storage conditions.

Section 11.	**Toxicological information.**	
Acute inhalation toxicity:	**1,1,1,2-Tetrafluoroethane**	LC50: Inhalation 4hr. (rat) - > 500,000 ppm / Cardiac Sensitization threshold (dog) > 80,000 ppm
	Pentafluoroethane	LC50: Inhalation 4 hr. (rat) - > 800,000 ppm / Cardiac Sensitization threshold (dog) 75,000 ppm
	Difluoromethane	LC50: Inhalation 4 hr. (rat) - 520,000 ppm / Cardiac Sensitization threshold (dog) 350,000 ppm
Skin irritation:	**1,1,1,2-Tetrafluoroethane**	Rabbit Classification: Not classified as irritant Result: No skin irritation
	Difluoromethane	Not tested on animals Classification: Not classified as irritant Result: No skin irritation Not expected to cause skin irritation based on expert review of the properties of the substance.
Eye irritation:	**1,1,1,2-Tetrafluoroethane**	Rabbit Classification: Not classified as irritant Result: No eye irritation
	Difluoromethane	Not tested on animals Classification: Not classified as irritant Result: No eye irritation Not expected to cause eye irritation based on expert review of the properties of the substance.
Sensation:	**1,1,1,2-Tetrafluoroethane**	Guinea pig Classification: Does not cause skin sensitisation. Result: Does not cause skin sensitisation. Rat Classification: Does not cause respiratory sensitisation. Result: Does not cause respiratory sensitisation.
	Pentafluoroethane	Human Classification: Does not cause respiratory sensitisation. Result: Does not cause respiratory sensitisation.
	Difluoromethane	Not tested on animals Result: Does not cause skin sensitisation. Not expected to cause sensitization based on expert review of the properties of the substance. There are no reports of human respiratory sensitization.
Repeated dose:	**1,1,1,2-Tetrafluoroethane**	Inhalation Rat No toxicologically significant effects were found. •
	Pentafluoroethane	Inhalation Rat No toxicologically significant effects were found.
	Difluoromethane	Inhalation Rat No toxicologically significant effects were found.

Mutagenicity assessment	**1,1,1,2-Tetrafluoroethane**	Animal testing did not show any mutagenic effects. Tests on bacterial or mammalian cell cultures did not show mutagenic effects.
	Pentafluoroethane	Animal testing did not show any mutagenic effects. Evidence suggests this substance does not cause genetic damage in cultured mammalian cells. Did not cause genetic damage in cultured bacterial cells.
	Difluoromethane	Animal testing did not show any mutagenic effects. Tests on bacterial or mammalian cell cultures did not show mutagenic effects.
Carcinogenicity assessment:	**1,1,1,2-Tetrafluoroethane**	Not classifiable as a human carcinogen. Overall weight of evidence indicates that the substance is not carcinogenic.
	Pentafluoroethane	Not classifiable as a human carcinogen. Overall weight of evidence indicates that the substance is not carcinogenic.
Reproductive toxicity:	**1,1,1,2-Tetrafluoroethane**	No toxicity to reproduction No effects on or via lactation Animal testing showed no reproductive toxicity.
	Pentafluoroethane	No toxicity to reproduction Animal testing showed no reproductive toxicity
	Difluoromethane	No toxicity to reproduction Animal testing showed no reproductive toxicity. Information given is based on data obtained from similar substances.
Assessment teratogenicity	**1,1,1,2-Tetrafluoroethane**	Animal testing showed no developmental toxicity.
	Pentafluoroethane	Animal testing showed no developmental toxicity.
	Difluoromethane	Animal testing showed no developmental toxicity.
Acute symptoms:	Effects following high level exposure: Headaches, Dizziness, Loss of Consciousness	

Section 12.	**Ecotoxicological Information.**	
Persistence / Degradability:	Decomposes comparatively rapidly in lower atmosphere (troposphere), products of decomposition will be highly dispersed and hence will have a very low concentration. R-407c is a gas at room temperature; therefore, it is unlikely to remain in water.	
	1,1,1,2-Tetrafluoroethane	Not readily biodegradable
	Pentafluoroethane	Not readily biodegradable. Biodegradation: 5 % Exposure time: 28 d Method: OECD Test Guideline 301D
	Difluoromethane	Not readily biodegradable. Biodegradation: 5 % Exposure time: 28 d Method: OECD Test Guideline 301D
Bio accumulative Potential Product	**1,1,1,2-Tetrafluoroethane**	Partition coefficient: octanol/water: log Pow: 1.06
	Pentafluoroethane	Partition coefficient: octanol/water: Pow: 1.48 (25 °C)
	Difluoromethane	Partition coefficient: octanol/water: log Pow: 0.714
Mobility in soil:	No data available.	

Results of PBT and vPvB assessment:	This mixture contains no substance considered to be persistent, bioaccumulating and toxic (PBT). This mixture contains no substance considered to be very persistent and very bioaccumulating (vPvB).	
Acute toxicity - Fish Component information	**1,1,1,2-Tetrafluoroethane**	LC 50 (Oncorhynchus mykiss, 96 h): 450 mg/l (semi-static) Remarks: experimental result
	Pentafluoroethane	LC 50 (Rainbow trout (Oncorhynchus mykiss), 96 h): 109 mg/l
	Difluoromethane	LC 50 (Fish, 96 h): 1,507 mg/l
Acute toxicity - Aquatic Invertebrates Component information	**1,1,1,2-Tetrafluoroethane**	EC 50 (Water flea (Daphnia magna), 48 h): 930 mg/l
	Pentafluoroethane	EC 50 (Water flea (Daphnia magna), 48 h): > 100 mg/l
	Difluoromethane	EC 50 (Water flea (Daphnia), 48 h): 652 mg/l
Toxicity to aquatic plants Component information	**Pentafluoroethane**	EC 50 (Green algae, 72 h): 142 mg/l
	Difluoromethane	EC 50 (Alga, 96 h): 142 mg/l
GWP, Component information:	**1,1,1,2-Tetrafluoroethane**	Global warming potential: 1430 100-yr
	Pentafluoroethane	Global warming potential: 3500 100-yr
	Difluoromethane	Global warming potential: 675 100-yr

Section 13.	**Disposal Information.**
Do not allow the product to be released into the environment, Consult the manufacturer or supplier for information regarding recovery and recycling of the product. Contact Refrigerant Recovery New Zealand for your closest depot.	
Disposal must comply with local disposal or discharge laws. R-407c is subject to the Climate Change Response Act (CCRA) 2002,	
Reclaim any residual refrigerant from disposable cylinders.	

Section 14.	**Transport Information.**		
United Nations Model number: (UN)	**Land**	**Sea**	**Air**
	UN 3340	UN 3340	UN 3340
Transport Hazard class:	Class 2.2 Subrisk Not Applicable	Class 2.2 Subrisk Not Applicable	ICAO/IATA Class 2.2 ICAO / IATA Subrisk – Not Applicable, ERG Code 2L
Special precautions for User:	Special provisions Limited quantity 120 ml	EMS Number F-C, S-V Special provisions Limited Quantities 120 mL	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

Shipping name:	REFRIGERANT GAS R 407C (1,1,1,2-Tetrafluoroethane, Pentafluoroethane)
Primary classification:	2.2
Packing group:	None allocated
HAZCHEM code:	2TE
Label:	
Other information:	Appropriate safety practices must be followed during transfer of refrigerant from a refrigerating system to a refrigerant container for transport or storage. Land Transport Rule: Dangerous Goods 2005 (and its amendments). Gas cylinders must be marked with: the proper shipping name, the United Nations number, preceded by the letters UN, a class label (red diamond). Gas cylinders must not be stored on the transport vehicle near a source of heat. The cylinder must be stored upright so the pressure release device communicates with the vapour space. The main cylinder valve must be shut and any regulator removed prior to loading. Ventilation is required to prevent the build-up of flammable gas in the event of a leak. For enclosed vehicles like vans, station wagons and utilities with a canopy/cover, one means of providing ventilation is to stow the gas cylinders in a cabinet that is vented externally only, i.e. not into the vehicle. In the case of an open tray truck or utility vehicle, gas cylinders need to be in a locked cage for security. The vehicle should be fitted with a fire extinguisher that has a preferable rating of at least 30B. For larger quantities, additional requirements apply – see the Land Transport Rule: Dangerous Goods 2005. Unodourised flammable refrigerant, including recovered refrigerant that has suffered from odorant fade, should not be transported in an enclosed vehicle or stored in an enclosed space, regardless of the quantity.

Section 15.	**Regulatory Information.**
HSNO Approval number(s):	HSR001031 (R134a), Group standard (R-125), HSR001023 (R-32)
National Inventory:	All substances are listed on the New Zealand Inventory of Chemicals (NZIoC)
DO NOT VENT TO THE ATMOSPHERE. To comply with provisions of the Climate Change Response Act (CCRA) 2002, Section 264; Offence in relation to release of synthetic greenhouse gases. any residual must be recovered. Contains: Difluoromethane (HFC-32, Pentafluoroethane (HFC-125), Tetrafluoropropene, (HFO-1234yf) & Tetrafluoroethane (HFC-134a), a greenhouse gas which may contribute to global warming.	
Training & supervision:	The hazard of asphyxiation is often overlooked and must be stressed during operator training. HSWA (Hazardous Substance) Regulations, Regulation 4.5
Certified Handler:	Not applicable under current statute.
Certified Filler:	HSWA (Hazardous Substance) Regulations, Part 15, Gases under pressure

Controlled substance licence required:	Not applicable under current statute.
Tracking required:	Not applicable under current statute.
Personal Protective Equipment:	HSWA General Risk Workplace Management Regulation 15

Section 16.	**Other Information.**
Date of issue: **Date of review:**	10 December 2018 29 February 2024
Management of this product:	HSW (Hazardous Substance) Regulations Part 2 Labelling, signage, safety data sheets and packaging
	HSWA (Hazardous Substance) Regulations Part 3 General duties relating to risk management.
References:	Various sources of data have been used in the compilation of this SDS, they include but are not exclusive to: Guidance on the Compilation of Safety Data Sheets. (Environmental Protection Authority , 2017) Third party Safety Data Sheets.
Management of this product must comply with the Climate Change Response Act (CCRA) 2002,	

Disclaimer.

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