

R-113

A-Gas (U.S. Headquarters)

Chemwatch: 10273

Version No: 6.1

Safety Data Sheet according to OSHA HazCom Standard (2024) requirements

Chemwatch Hazard Alert Code: 2

Initial Date: 30/11/2000

Revision Date: 20/06/2022

Print Date: 04/09/2026

L.GHS.USA.EN

SECTION 1 Identification

Product Identifier

Product name	R-113
Synonyms	C2-Cl3-F3; ClF2C-CCl2F; CFC-113; CFC113; trichlorotrifluoroethane; 1,1,2-trichlorotrifluoroethane; 1,2,2-trichlorotrifluoroethane; 1,1,2-trichloro-1,2,2-trifluoroethane; 1,1,2-trifluoro-1,2,2-trichloroethane; Arcton-63 Arklone-P Asahifron-113 Daiflon-S3 F-113 FC-113; Fluorocarbon-113 Forane Freon-113 Frigen-113A Frigen-113-TR; Frigen-113-TR-N Frigen-113-TR-T Genetron-113 Halocarbon-113; Isceon-113 Kaiser Chemicals-11 Khladon-113 Ledon-113 R-113; Refrigerant R-113 R-113 (Halocarbon) Ucon-113 Ucon Fluorocarbon-113; Ucon 113/Halocarbon-113; Freon TF Freon 113; Genesolv-D; Freon TF; Forane 113; Arklone P Arklone P113
Proper shipping name	Environmentally hazardous substance, liquid, n.o.s. (contains 1,1,2-trichlorotrifluoroethane)
Chemical formula	C2Cl3F3
Other means of identification	Not Available
CAS number	76-13-1

Recommended use of the chemical and restrictions on use

Relevant identified uses	Used for cleaning, degreasing electrical equipment; a dry-cleaning solvent; in manufacture of chlorotrifluoroethylene; in liquid fire extinguishers, as a urethane foam blowing agent, refrigerant. Ozone depletion potential 1.0/1.0 Severe. The Montreal Protocol on Substances that Deplete the Ozone Layer has caused a substantial decline in its use.
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Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

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

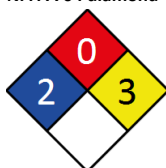
Emergency phone number

Association / Organisation	PERS	CHEMWATCH EMERGENCY RESPONSE (24/7)
Emergency telephone number(s)	1-800-633-8253	+1 855-237-5573 (ID#: 10273)
Other emergency telephone number(s)	International 1-801-629-0667	+61 3 9573 3188

SECTION 2 Hazard(s) identification

Classification of the substance or mixture

NFPA 704 diamond



Note: The hazard category numbers found in GHS classification in section 2 of this SDSs are NOT to be used to fill in the NFPA 704 diamond. Blue = Health, Red = Fire, Yellow = Reactivity and White = Special (Oxidizer or water reactive substances)

Classification	Skin Corrosion/Irritation Category 2, Serious Eye Damage/Eye Irritation Category 2A, Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3
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Label elements

Hazard pictogram(s)	
Signal word	Warning

Hazard statement(s)

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.

Hazard(s) not otherwise classified

Not Applicable

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

P271	Use only outdoors or in a well-ventilated area.
P261	Avoid breathing mist/vapours/spray.
P280	Wear protective gloves, protective clothing, eye protection and face protection.
P264	Wash all exposed external body areas thoroughly after handling.

Precautionary statement(s) Response

P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312	Call a POISON CENTER/doctor/physician/first aider/if you feel unwell.
P337+P313	If eye irritation persists: Get medical advice/attention.
P302+P352	IF ON SKIN: Wash with plenty of water and soap.
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P332+P313	If skin irritation occurs: Get medical advice/attention.
P362+P364	Take off contaminated clothing and wash it before reuse.

Precautionary statement(s) Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation.
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No further product hazard information.

SECTION 3 Composition / information on ingredients

Substances

CAS No	%[weight]	Name
76-13-1	>=99	<u>1,1,2-trichlorotrifluoroethane</u>

Mixtures

See section above for composition of Substances

Continued...

SECTION 4 First-aid measures

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: - Wash out immediately with fresh running water. - Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. - Seek medical attention without delay; if pain persists or recurs seek medical attention. - Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: - Immediately remove all contaminated clothing, including footwear. - Flush skin and hair with running water (and soap if available). - Seek medical attention in event of irritation.
Inhalation	- If fumes or combustion products are inhaled remove from contaminated area. - Lay patient down. Keep warm and rested. - Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures. - Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary. - Transport to hospital, or doctor, without delay.
Ingestion	- For advice, contact a Poisons Information Centre or a doctor. - Avoid giving milk or oils. - Avoid giving alcohol. - If swallowed do NOT induce vomiting. - If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. - Observe the patient carefully. - Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. - Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. - Seek medical advice.

Most important symptoms and effects, both acute and delayed

See Section 11

Indication of any immediate medical attention and special treatment needed

for intoxication due to Freons/ Halons;

A: Emergency and Supportive Measures

- Maintain an open airway and assist ventilation if necessary
- Treat coma and arrhythmias if they occur. Avoid (adrenaline) epinephrine or other sympathomimetic amines that may precipitate ventricular arrhythmias. Tachyarrhythmias caused by increased myocardial sensitisation may be treated with propranolol, 1-2 mg IV or esmolol 25-100 microgm/kg/min IV.
- Monitor the ECG for 4-6 hours

B: Specific drugs and antidotes:

- There is no specific antidote

C: Decontamination

- Inhalation; remove victim from exposure, and give supplemental oxygen if available.
- Ingestion; (a) Prehospital: Administer activated charcoal, if available. **DO NOT** induce vomiting because of rapid absorption and the risk of abrupt onset CNS depression. (b) Hospital: Administer activated charcoal, although the efficacy of charcoal is unknown. Perform gastric lavage only if the ingestion was very large and recent (less than 30 minutes)

D: Enhanced elimination:

- There is no documented efficacy for diuresis, haemodialysis, haemoperfusion, or repeat-dose charcoal.

POISONING and DRUG OVERDOSE, Californian Poison Control System Ed. Kent R Olson; 3rd Edition

- Do not administer sympathomimetic drugs unless absolutely necessary as material may increase myocardial irritability.
- No specific antidote.
- Because rapid absorption may occur through lungs if aspirated and cause systematic effects, the decision of whether to induce vomiting or not should be made by an attending physician.
- If lavage is performed, suggest endotracheal and/or esophageal control.
- Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach.
- Treatment based on judgment of the physician in response to reactions of the patient

SECTION 5 Fire-fighting measures

Extinguishing media

- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

Special hazards arising from the substance or mixture

Fire Incompatibility	Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result
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Special protective equipment and precautions for fire-fighters

Fire Fighting	- Alert Fire Brigade and tell them location and nature of hazard. - Wear breathing apparatus plus protective gloves in the event of a fire. - Prevent, by any means available, spillage from entering drains or water courses. - Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	- Non combustible. - Not considered to be a significant fire risk. - Heating may cause expansion or decomposition leading to violent rupture of containers. - May emit corrosive, poisonous fumes. Decomposes on heating and produces acrid and toxic fumes of: - carbon dioxide (CO2) hydrogen chloride phosgene hydrogen fluoride - other pyrolysis products typical of burning organic material. Contains low boiling substance: Closed containers may rupture due to pressure buildup under fire conditions.

SECTION 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

See section 8

Environmental precautions

See section 12

Methods and material for containment and cleaning up

Minor Spills	Environmental hazard - contain spillage. ▶ Clean up all spills immediately. ▶ Avoid breathing vapours and contact with skin and eyes. ▶ Control personal contact with the substance, by using protective equipment. ▶ Contain and absorb spill with sand, earth, inert material or vermiculite.											
Major Spills	Environmental hazard - contain spillage. ▶ Clear area of personnel and move upwind. ▶ Alert Fire Brigade and tell them location and nature of hazard. ▶ Wear breathing apparatus plus protective gloves. ▶ Prevent, by any means available, spillage from entering drains or water course. Chemical Class: aliphatics, halogenated For release onto land: recommended sorbents listed in order of priority.											
	<table><thead><tr><th>SORBENT TYPE</th><th>RANK</th><th>APPLICATION</th><th>COLLECTION</th><th colspan="2">LIMITATIONS</th></tr></thead></table>						SORBENT TYPE	RANK	APPLICATION	COLLECTION	LIMITATIONS	
	SORBENT TYPE	RANK	APPLICATION	COLLECTION	LIMITATIONS							
	LAND SPILL - SMALL											
	cross-linked polymer - particulate		1	shovel	shovel	R, W, SS						
	cross-linked polymer - pillow		1	throw	pitchfork	R, DGC, RT						
	wood fiber - pillow		2	throw	pitchfork	R, P, DGC, RT						
	treated wood fibre - particulate		2	shovel	shovel	R, W, DGC						
	sorbent clay - particulate		3	shovel	shovel	R, I, P						
	foamed glass - pillow		3	throw	pitchfork	R, P, DGC, RT						
	LAND SPILL - MEDIUM											
	cross-linked polymer - particulate		1	blower	skiploader	R,W, SS						
	cross-linked polymer - pillow		2	throw	skiploader	R, DGC, RT						
	sorbent clay - particulate		3	blower	skiploader	R, I, P						
	polypropylene - particulate		3	blower	skiploader	W, SS, DGC						
	foamed glass - pillow		3	throw	skiploader	R, P, DGC, RT						
	expanded mineral - particulate		4	blower	skiploader	R, I, W, P, DGC						
	Legend DGC: Not effective where ground cover is dense R; Not reusable I: Not incinerable P: Effectiveness reduced when rainy RT:Not effective where terrain is rugged SS: Not for use within environmentally sensitive sites W: Effectiveness reduced when windy Reference: Sorbents for Liquid Hazardous Substance Cleanup and Control; R.W Melvold et al: Pollution Technology Review No. 150: Noyes Data Corporation 1988											

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

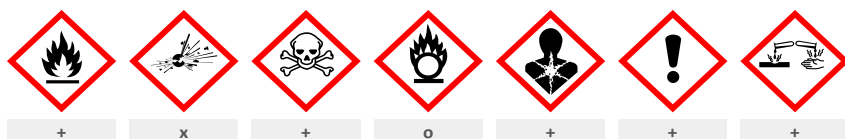
SECTION 7 Handling and storage

Precautions for safe handling

Safe handling	Contains low boiling substance: Storage in sealed containers may result in pressure buildup causing violent rupture of containers not rated appropriately. - Check for bulging containers. - Vent periodically - Always release caps or seals slowly to ensure slow dissipation of vapours DO NOT allow clothing wet with material to stay in contact with skin - Avoid skin contact, including inhalation. - Wear protective clothing when risk of exposure occurs. - Use in a well-ventilated area. - Avoid contact with moisture.
Other information	- Store in original containers. - Keep containers securely sealed. - Store in a cool, dry, well-ventilated area. - Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	DO NOT use aluminium or galvanised containers - Polyethylene or polypropylene container. - Packing as recommended by manufacturer. - Check all containers are clearly labelled and free from leaks.
Storage incompatibility	1,1,2-Trichlorotrifluoroethane: - reacts violently with chemically active metals, barium, calcium, lithium, potassium, sodium and powdered aluminium, beryllium, magnesium, potassium-sodium alloy, titanium, zinc - may decompose on contact with alloys containing more than 20% magnesium or on hot surfaces, with release of hydrogen chloride, hydrogen fluoride, carbon monoxide and smaller amounts of phosgene and carbonyl fluoride - will not combust at ordinary temperatures but will ignite and burn weakly at autoignition temperature (680 C) - attacks some forms of plastics, rubber and coatings. - CFCs may react with strong oxidising or reducing agents. Haloalkanes: - are highly reactive:some of the more lightly substituted lower members are highly flammable; the more highly substituted may be used as fire suppressants, not always with the anticipated results. - may react with the lighter divalent metals to produce more reactive compounds analogous to Grignard reagents. - may produce explosive compounds following prolonged contact with metallic or other azides - may react on contact with potassium or its alloys - although apparently stable on contact with a wide range of halocarbons, reaction products may be shock-sensitive and may explode with great violence on light impact; severity generally increases with the degree of halocarbon substitution and potassium-sodium alloys give extremely sensitive mixtures . BRETherick L.: Handbook of Reactive Chemical Hazards - react with metal halides and active metals, eg. sodium (Na), potassium (K), lithium (Li),calcium (Ca), zinc (Zn), powdered aluminium (Al) and aluminium alloys, magnesium (Mg) and magnesium alloys.



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.

SECTION 8 Exposure controls / personal protection

Control parameters

Occupational Exposure Limits (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US OSHA Permissible Exposure Limits (PELs) Table Z-1	1,1,2-trichlorotrifluoroethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1000 ppm / 7600 mg/m3	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	1,1,2-trichlorotrifluoroethane	1,1,2-Trichloro-1,2,2-trifluoroethane	1000 ppm / 7600 mg/m3	9500 mg/m3 / 1250 ppm	Not Available	Not Available

Emergency Limits

Continued...

Ingredient	TEEL-1	TEEL-2	TEEL-3
1,1,2-trichlorotrifluoroethane	1,250 ppm	3,900 ppm	4,500 ppm
Ingredient	Original IDLH		Revised IDLH
1,1,2-trichlorotrifluoroethane	2,000 ppm		Not Available

MATERIAL DATA

For 1,1,2-trichlorotrifluoroethane
Odour threshold: 45 ppm
This fluorocarbon causes narcosis and asphyxia at extremely high concentrations and has the potential to induce cardiac arrhythmia. OSHA concluded that the recommended TLV-TWA and STEL substantially reduced these risks and in addition reduced the risk of impaired psychomotor function.
Odour Safety Factor(OSF)
OSF=22 ("1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE")

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

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

The Odour Safety Factor (OSF) is defined as:

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

Classification into classes follows:	
Class	OSF Description
A	550 Over 90% of exposed individuals are aware by smell that the Exposure Standard (TLV-TWA for example) is being reached, even when distracted by working activities
B	26-550As "A" for 50-90% of persons being distracted
1-26	As "A" for less than 50% of persons being distracted
D	0.18-1 10-50% of persons aware of being tested perceive by smell that the Exposure Standard is being reached
E	<0.18 As "D" for less than 10% of persons aware of being tested

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.
Individual protection measures, such as personal protective equipment	
Eye and face protection	▶ Safety glasses with side shields. ▶ Chemical goggles.[AS/NZS 1337.1, EN166 or national equivalent] ▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience.
Skin protection	See Hand protection below
Hands/feet protection	▶ Wear chemical protective gloves, e.g. PVC. ▶ Wear safety footwear or safety gumboots, e.g. Rubber The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice. Personal hygiene is a key element of effective hand care.
Body protection	See Other protection below
Other protection	▶ Overalls. ▶ P.V.C apron. ▶ Barrier cream. ▶ Skin cleansing cream.

Recommended material(s)

GLOVE SELECTION INDEX

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

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

- ▶ 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

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Material	CPI
NITRILE	A
PE/EVAL/PE	A
TEFLON	A
PVA	B
NAT+NEOPR+NITRILE	C
NATURAL+NEOPRENE	C
NEOPRENE	C
NEOPRENE/NATURAL	C
PE	C

* CPI - Chemwatch Performance Index

A: Best Selection

B: Satisfactory; may degrade after 4 hours continuous immersion

C: Poor to Dangerous Choice for other than short term immersion

NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -

* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Ansell Glove Selection

Glove — In order of recommendation
AlphaTec® Solvex® 37-185
AlphaTec® 58-008
AlphaTec® 58-735
AlphaTec® 79-700
AlphaTec® 15-554
AlphaTec® 38-612
AlphaTec® 53-001
AlphaTec® 58-005
AlphaTec® 58-530B
AlphaTec® Solvex® 37-175

The suggested gloves for use should be confirmed with the glove supplier.

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

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

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

** - Continuous-flow or positive pressure demand.

A(All classes) = Organic vapours, B AUS or B1 = Acid gases, 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 deg C)

SECTION 9 Physical and chemical properties

Information on basic physical and chemical properties

Appearance	Colourless non flammable liquid; slightly soluble in water. Ethereal odour. Soluble in ether, alcohol and benzene.		
Physical state	Liquid	Relative density (Water = 1)	1.57 @ 25 C
Odour	Not Available	Partition coefficient n-octanol / water	Not Available
Odour threshold	Not Available	Auto-ignition temperature (°C)	680
pH (as supplied)	Not Applicable	Decomposition temperature (°C)	Not Available
Melting point / freezing point (°C)	-35	Viscosity (mm ² /s)	Not Available
Initial boiling point and boiling range (°C)	47.5	Molecular weight (g/mol)	187.37 Pure
Flash point (°C)	Not Applicable	Taste	Not Available
Evaporation rate	0.9 (BuAc=1)	Explosive properties	Not Available
Flammability	Not Applicable	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)	100
Vapour pressure (kPa)	44.5 @ 25 C	Gas group	Not Available
Solubility in water	Immiscible	pH as a solution (1%)	Not Applicable

Continued...

Vapour density (Air = 1)	2.9	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		

SECTION 10 Stability and reactivity

Reactivity	See section 7
Chemical stability	- Unstable in the presence of incompatible materials. - Product is considered stable. - Hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 Toxicological information

Information on toxicological effects

a) Acute Toxicity	Based on available data, the classification criteria are not met.
b) Skin Irritation/Corrosion	There is sufficient evidence to classify this material as skin corrosive or irritating.
c) Serious Eye Damage/Irritation	There is sufficient evidence to classify this material as eye damaging or irritating
d) Respiratory or Skin sensitisation	Based on available data, the classification criteria are not met.
e) Mutagenicity	Based on available data, the classification criteria are not met.
f) Carcinogenicity	Based on available data, the classification criteria are not met.
g) Reproductivity	Based on available data, the classification criteria are not met.
h) STOT - Single Exposure	There is sufficient evidence to classify this material as toxic to specific organs through single exposure
i) STOT - Repeated Exposure	Based on available data, the classification criteria are not met.
j) Aspiration Hazard	Based on available data, the classification criteria are not met.

Inhaled	Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial 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. Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo. 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. Although 1,1,2-trichlorotrifluoroethane acts as a weak narcotic it has a relatively potent cardiac sensitisation potential compared to homologous fluorocarbons. Other effects seen after massive exposures include irritation of the respiratory tract and hepatocyte enlargement. Transient lethargy was the only clinical sign seen in rats that inhaled 12000 pp.. Dogs experienced vomiting, lethargy, nervousness and tremors, all reversible within 15 minutes after cessation of exposure. Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved. Material is highly volatile and may quickly form a concentrated atmosphere in confined or unventilated areas. The vapour may displace and replace air in breathing zone, acting as a simple asphyxiant. This may happen with little warning of overexposure. Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin) Exposure to high concentrations of fluorocarbons may produce cardiac arrhythmias or cardiac arrest due sensitisation of the heart to adrenalin or noradrenalin. Deaths associated with exposures to fluorocarbons (specifically halogenated aliphatics) have occurred in occupational settings and in inhalation of bronchodilator drugs. Bronchospasm consistently occurs in human subjects inhaling fluorocarbons. At a measured concentration of 1700 ppm of one of the commercially available aerosols there is a biphasic change in ventilatory capacity, the first reduction occurring within a few minutes and the second delayed up to 30 minutes.
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Ingestion	Ingestion is not expected to produce harmful effects based on the available information. However, the material may still cause adverse health effects following ingestion, particularly in individuals with pre-existing organ damage (e.g. liver or kidney impairment). It was necessary to give multiple doses of 1,1,2-trichlorotrifluoroethane to determine an LD50 value. Pulmonary haemorrhage and mottled livers were noted in rats that died.	
Skin Contact	The material produces mild skin irritation; evidence exists, or practical experience predicts, that the material either - produces mild inflammation of the skin in a substantial number of individuals following direct contact, and/or - produces significant, but mild, inflammation when applied to the healthy intact skin of animals (for up to four hours), such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis. Skin contact is not expected to result in harmful health effects and the material is not classified as hazardous by the dermal route under Regulation (EC) No 1272/2008 (CLP), as amended. However, the material may cause harm following entry through wounds, lesions or abrasions. Repeated exposure may cause skin cracking, flaking or drying following normal handling and use. In common with other halogenated aliphatics, fluorocarbons may cause dermal problems due to a tendency to remove natural oils from the skin causing irritation and the development of dry, sensitive skin. They do not appear to be appreciably absorbed. Open cuts, abraded or irritated skin should not be exposed to this material 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.	
Eye	This material causes serious eye irritation.	
Chronic	Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems. Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems. 1,1,2-Trichlorotrifluoroethane showed no effect after 20 weeks of application to uncovered skin. By contrast trichloroethylene produced erythema and ulcerations at the end of the first week. Occluded contact of 5 gm/kg of the fluorocarbon produced local necrosis and sloughing plus conspicuous hepatomegaly (enlarged liver) It is generally accepted that the fluorocarbons are less toxic than the corresponding halogenated aliphatic based on chlorine. Repeated inhalation exposure to the fluorocarbon FC-11 does not produce pathologic lesions of the liver and other visceral organs in experimental animals. There has been conjecture in non-scientific publications that fluorocarbons may cause leukemia, cancer, sterility and birth defects; these have not been verified by current research. The high incidence of cancer, spontaneous abortion and congenital anomalies amongst hospital personnel, repeatedly exposed to fluorine-containing general anaesthetics, has caused some scientists to call for a lowering of the fluorocarbon exposure standard to 5 ppm since some are mutagens.	
R-113	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >11000 mg/kg ^[2]	Skin (Rodent - rabbit): 500mg - Mild
	Inhalation (Rat) LC50: 38000 ppm4h ^[2]	Skin (Rodent - rabbit): 500mg/24H - Mild
	Oral (Rat) LD50: 43000 mg/kg ^[2]	
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	

1,1,2- TRICHLOROTRIFLUOROETHANE	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. Chlorofluorocarbons may enter the human organism by inhalation, ingestion, or dermal contact. Inhalation is the most common and important route of entry, and exhalation is the most significant route of elimination from the body. Controlled studies with volunteer subjects and experimental animals have provided substantial data from exposures to a number of the chlorofluorocarbons. CFCs and HCFCs are known to sensitise the heart to adrenalin-induced arrhythmias. CFCs: - 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. 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. The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.			
	Acute Toxicity	✗	Carcinogenicity	✗
	Skin Irritation/Corrosion	✓	Reproductivity	✗

Serious Eye Damage/Irritation	✓	STOT - Single Exposure	✓
Respiratory or Skin sensitisation	✗	STOT - Repeated Exposure	✗
Mutagenicity	✗	Aspiration Hazard	✗

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

SECTION 12 Ecological information

Toxicity

R-113	Endpoint	Test Duration (hr)	Species	Value	Source
	BCF	1008h	Fish	11-33	7
	EC50	48h	Crustacea	71mg/l	1
	EC0(ECx)	24h	Crustacea	25mg/l	1
	LC50	96h	Fish	7mg/l	1
Legend: Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. US EPA, Ecotox database - Aquatic Toxicity Data 4. ECETOC Aquatic Hazard Assessment Data 5. NITE (Japan) - Bioconcentration Data 6. METI (Japan) - Bioconcentration Data 7. Vendor Data 8. User defined data					

log Kow : 3.16 Koc : 191-259 Half-life (hr) air : 17520-1068720 Half-life (hr) H2O surface water : 4 Henry's atm m3 /mol: 0.526 BCF : 11-34 controlled ozone depleting gases: phase out by 1996 (C) controlled ozone depleting potential: 1.0 Fish LC50 (168 h): 0.89-1.7 mg/L Bioaccumulation : sig
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.
Toxic to aquatic organisms.
Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.
Wastes resulting from use of the product must be disposed of on site or at approved waste sites.
May cause long-term adverse effects in the aquatic environment.

Following release of CFCs into the atmosphere, they eventually enter the troposphere where they persist undegraded. Subsequently they diffuse into the stratosphere and degrade slowly (half-lives of about 20 years). In the stratosphere, CFCs react slowly with oxygen free radicals and release chlorine atoms which catalytically destroy ozone producing irreversible damage. Use of CFCs has been restricted by the Montreal Protocol on Substances that Deplete the Ozone Layer (1988) and also by US EPA Regulation 3093/94.
DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
1,1,2-trichlorotrifluoroethane	HIGH (Half-life = 720 days)	HIGH (Half-life = 366666.67 days)

Bioaccumulative potential

Ingredient	Bioaccumulation
1,1,2-trichlorotrifluoroethane	LOW (BCF = 86)

Mobility in soil

Ingredient	Mobility
1,1,2-trichlorotrifluoroethane	LOW (Log KOC = 224.7)

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

Waste treatment methods

Product / Packaging disposal	Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked. A Hierarchy of Controls seems to be common - the user should investigate: - Reduction - Reuse - Recycling - Disposal (if all else fails)
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This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use.

- ▶ **DO NOT allow wash water from cleaning or process equipment to enter drains.**
- ▶ It may be necessary to collect all wash water for treatment before disposal.
- ▶ In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- ▶ Where in doubt contact the responsible authority.
- ▶ Recycle wherever possible or consult manufacturer for recycling options.
- ▶ Consult State Land Waste Authority for disposal.
- ▶ Bury or incinerate residue at an approved site.
- ▶ Recycle containers if possible, or dispose of in an authorised landfill.

SECTION 14 Transport information

Labels Required

	
Marine Pollutant	

Shipping container, transport vehicle placarding, and labeling may vary from the below information. This depends on the quantity shipped, the applicability of excepted quantity requirements, limited quantity requirements, and/or special provisions according to US DOT, IATA and IMDG regulations. In case of reshipment, it is the responsibility of the shipper to determine the appropriate labels and markings in accordance with applicable transport regulations.

Land transport (DOT)

14.1 UN number or ID number	3082	
14.2 UN proper shipping name	Environmentally hazardous substance, liquid, n.o.s. (contains 1,1,2-trichlorotrifluoroethane)	
14.3 Transport hazard class(es)	Class	9
	Subsidiary Hazard	Not Applicable
14.4 Packing group	III	
14.5 Environmental hazard	Environmentally hazardous	
14.6 Special precautions for user	Hazard Label	9
	Special provisions	8, 146, 173, 335, 441, IB3, T4, TP1, TP29
	Limited quantity	5 L

Air transport (ICAO-IATA / DGR)

14.1 UN number	3082	
14.2 UN proper shipping name	Environmentally hazardous substance, liquid, n.o.s. (contains 1,1,2-trichlorotrifluoroethane)	
14.3 Transport hazard class(es)	ICAO/IATA Class	9
	ICAO / IATA Subsidiary Hazard	Not Applicable
	ERG Code	9L
14.4 Packing group	III	
14.5 Environmental hazard	Environmentally hazardous	
14.6 Special precautions for user	Special provisions	A97 A158 A197 A215
	Cargo Only Packing Instructions	964
	Cargo Only Maximum Qty / Pack	450 L
	Passenger and Cargo Packing Instructions	964
	Passenger and Cargo Maximum Qty / Pack	450 L
	Passenger and Cargo Limited Quantity Packing Instructions	Y964
	Passenger and Cargo Limited Maximum Qty / Pack	30 kg G

Sea transport (IMDG-Code / GGVSee)

14.1. UN number	3082		
14.2 UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (contains 1,1,2-trichlorotrifluoroethane)		
14.3 Transport hazard class(es)	IMDG Class	9	
	IMDG Subsidiary Hazard	Not Applicable	
14.4. Packing group	III		
14.5 Environmental hazard	Marine Pollutant		
14.6 Special precautions for user	EMS Number	F-A, S-F	
	Special provisions	274 335 375 969	
	Limited Quantities	5 L	

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

Product name	Pollution Category	Ship Type
1,1,2-Trichloro-1,2,2-Trifluoroethane	Y	2

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

Product name	Group
1,1,2-trichlorotrifluoroethane	Not Applicable

14.7.3. Transport in bulk in accordance with the IGC Code

Product name	Ship Type
1,1,2-trichlorotrifluoroethane	Not Applicable

SECTION 15 Regulatory information

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

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

- US - Massachusetts - Right To Know Listed Chemicals
- US - New Jersey Right to Know Hazardous Substances
- US - Pennsylvania - Hazardous Substance List
- US DOE Temporary Emergency Exposure Limits (TEELs)
- US EPA Integrated Risk Information System (IRIS)
- US EPCRA Section 313 Chemical List
- US New York City Community Right-to-Know: List of Hazardous Substances
- US NIOSH Recommended Exposure Limits (RELs)
- US OSHA Permissible Exposure Limits (PELs) Table Z-1
- US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
- US TSCA New Chemical Exposure Limits (NCEL)

Additional Regulatory Information

Not Applicable

Federal Regulations

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Section 311/312 hazard categories

Flammable (Gases, Aerosols, Liquids, or Solids)	No
Gas under pressure	No
Explosive	No
Self-heating	No
Pyrophoric (Liquid or Solid)	No
Pyrophoric Gas	No

Corrosive to metal	No
Oxidizer (Liquid, Solid or Gas)	No
Organic Peroxide	No
Self-reactive	No
In contact with water emits flammable gas	No
Combustible Dust	No
Carcinogenicity	No
Acute toxicity (any route of exposure)	No
Reproductive toxicity	No
Skin Corrosion or Irritation	Yes
Respiratory or Skin Sensitization	No
Serious eye damage or eye irritation	Yes
Specific target organ toxicity (single or repeated exposure)	No
Aspiration Hazard	No
Germ cell mutagenicity	No
Simple Asphyxiant	No
Hazards Not Otherwise Classified	No

US. EPA CERCLA Hazardous Substances and Reportable Quantities (40 CFR 302.4)

None Reported

US. EPCRA Section 313 Toxic Release Inventory (TRI) (40 CFR 372)

This product contains the following EPCRA section 313 chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know-Act of 1986 (40 CFR 372):

CAS No	De Minimis Limit	Name
76-13-1	1	Freon 113 (CFC-113)

This information must be included in all SDSs that are copied and distributed for this material.

Additional Federal Regulatory Information

Not Applicable

State Regulations

US. California Proposition 65

None Reported

Additional State Regulatory Information

Not Applicable

National Inventory Status

National Inventory	Status
Australia - AIIC / Australia Non-Industrial Use	Yes
Canada - DSL	Yes
Canada - NDSL	No (1,1,2-trichlorotrifluoroethane)
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	Yes
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	Yes
USA - TSCA	All chemical substances in this product have been designated as TSCA Inventory 'Active'
Taiwan - TCSI	Yes
Mexico - INSQ	Yes

National Inventory	Status
Vietnam - NCI	No (1,1,2-trichlorotrifluoroethane)
Russia - FBEPH	Yes
UAE - Control List (Banned/Restricted Substances)	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	20/06/2022
Initial Date	30/11/2000

SDS Version Summary

Version	Date of Update	Sections Updated
4.1	21/04/2009	Toxicological information - Acute Health (eye), Toxicological information - Acute Health (inhaled), Toxicological information - Acute Health (skin), Toxicological information - Acute Health (swallowed), First Aid measures - Advice to Doctor, Toxicological information - Chronic Health, Hazards identification - Classification, Disposal considerations - Disposal, Exposure controls / personal protection - Engineering Control, Ecological Information - Environmental, Exposure controls / personal protection - Exposure Standard, Firefighting measures - Fire Fighter (extinguishing media), Firefighting measures - Fire Fighter (fire/explosion hazard), Firefighting measures - Fire Fighter (fire fighting), Firefighting measures - Fire Fighter (fire incompatibility), First Aid measures - First Aid (skin), First Aid measures - First Aid (swallowed), Handling and storage - Handling Procedure, Exposure controls / personal protection - Personal Protection (other), Exposure controls / personal protection - Personal Protection (Respirator), Exposure controls / personal protection - Personal Protection (eye), Exposure controls / personal protection - Personal Protection (hands/feet), Accidental release measures - Spills (major), Accidental release measures - Spills (minor), Handling and storage - Storage (storage incompatibility), Handling and storage - Storage (storage requirement), Handling and storage - Storage (suitable container), Identification of the substance / mixture and of the company / undertaking - Supplier Information, Toxicological information - Toxicity and Irritation (Other), Transport information - Transport, Transport Information
6.1	20/06/2022	Expiration. Review and Update

Other information

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

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

Definitions and abbreviations

- ▶ PC - TWA: Permissible Concentration-Time Weighted Average
- ▶ PC - STEL: Permissible Concentration-Short Term Exposure Limit
- ▶ IARC: International Agency for Research on Cancer
- ▶ ACGIH: American Conference of Governmental Industrial Hygienists
- ▶ STEL: Short Term Exposure Limit
- ▶ TEEL: Temporary Emergency Exposure Limit,
- ▶ IDLH: Immediately Dangerous to Life or Health Concentrations
- ▶ 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
- ▶ MARPOL: International Convention for the Prevention of Pollution from Ships
- ▶ IMSBC: International Maritime Solid Bulk Cargoes Code
- ▶ IGC: International Gas Carrier Code
- ▶ IBC: International Bulk Chemical Code
- ▶ 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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