



Material Safety Data Sheet

R-134A

Safety Data Sheet (Conforms to Regulation (EC) No 2015/830)

Current Issue Date: April, 2016

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

1.1. Product Identifier

Product name	R-134A
Chemical Name	tetrafluoroethane
Synonyms	1,1,1,2-tetrafluoroethane, Amerfrost A-134a, BOC R134A, Blow Hard O.S. Extra, C2H2F4, CF3CFH2, DuPont SUVA 134a Refrigerant, Dust-Pro Pressurized Duster, Freon 134a, propellant R 134A Fluorocarbon HFC HFA 134a
Proper shipping name	1,1,1,2- TETRAFLUOROETHANE (REFRIGERANT GAS R 134a)
Chemical formula	C2H2F4
Other means of identification	Not Available
CAS number	811-97-2
EC number	212-377-0
REACH registration number	01-2119459374-33-XXXX

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

Relevant identified uses	<p>The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing. Before starting consider control of exposure by mechanical ventilation.</p> <p>Wide use in household and commercial refrigeration and automotive air conditioning. Suitable for use in medium temperature food cabinets, water chillers and fountains, heat pumps and dehumidifiers and as a blowing agent for various foams. Other uses include as a propellant for aerosol pharmaceuticals, lacquers, deodorants, perfumes, mousses, air fresheners, insecticides, cleaning products and other household products.</p>
Uses advised against	Not Applicable

SECTION 2 HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

Considered a hazardous substance according to Reg. (EC) No 1272/2008 and its amendments. Classified as Dangerous Goods for transport purposes.


CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability	0	
Toxicity	1	
Body Contact	1	
Reactivity	1	
Chronic	0	

0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

DSD classification ^[1]	R4	Forms very sensitive explosive metallic compounds.
	R18	In use, may form flammable/ explosive vapour-air mixture
	R44	Risk of explosion if heated under confinement.
Legend:	<i>Classification drawn from EC Directive 67/548/EEC - Annex I ; Classification drawn from EC Directive 1272/2008 - Annex VI</i>	
DPD classification	In case of substances classification has been prepared by following DSD (Directive 67/548/EEC) and CLP Regulation (EC) No 1272/2008 regulations	
Classification according to regulation (EC) No 1272/2008 [CLP] ^[1]	Gas under Pressure (Compressed gas)	
Legend:	<i>Classification drawn from EC Directive 67/548/EEC - Annex I . Classification drawn from EC Directive 1272/2008 - Annex VI</i>	

2.2. Label elements

CLP label elements	
SIGNAL WORD	WARNING

Hazard statement(s)

H280	Contains gas under pressure; may explode if heated.
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Supplementary statement(s)

EUH018	In use may form flammable/explosive vapour- air mixture.
EUH044	Risk of explosion if heated under confinement.

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.
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Precautionary statement(s) Disposal

Not Applicable

2.3. Other hazards

Inhalation may produce health damage*.

Cumulative effects may result following exposure*.

May produce discomfort of the respiratory system and skin*.

Repeated exposure potentially causes skin dryness and cracking*.

Vapours potentially cause drowsiness and dizziness*.

REACH - Art.57-59: The mixture does not contain Substances of Very High Concern (SVHC) at the SDS print date.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

3.1.Substances

1.811-97-2

2.212-377-0

3.Not Available

4.01-2119459374-33-XXXX

1.CAS No 2.EC No	%[weight]	Name	Classification according to directive 67/548/EEC [DSD]	Classification according to regulation (EC) No 1272/2008 [CLP]
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3.Index No 4.REACH No			
>=99	<u>R-134A</u>	R4, R18, R44 [1]	Gas under Pressure (Compressed gas); H280, EUH018, EUH044 [1]

Legend: Classification drawn from EC Directive 67/548/EEC - Annex I ; Classification drawn from EC Directive 1272/2008 - Annex VI 4.

3.2.Mixtures

See 'Information on ingredients' in section 3.1

SECTION 4 FIRST AID MEASURES

4.1. Description of first aid measures

General	<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. ▶ 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> <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. <p>Not considered a normal route of entry.</p> <ul style="list-style-type: none"> ▶ Avoid giving milk or oils. ▶ Avoid giving alcohol. ▶ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.
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.

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	<p>Not considered a normal route of entry.</p> <ul style="list-style-type: none"> ▶ Avoid giving milk or oils. ▶ Avoid giving alcohol. ▶ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.

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 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

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

Cardiac sensitisation possible following exposure to the gas.

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.

5.2. Special hazards arising from the substrate or mixture

Fire Incompatibility	▶ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result
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5.3. Advice for firefighters

Fire Fighting	----- GENERAL ----- <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	WARNING: In use may form flammable/ explosive vapour-air mixtures. <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. Decomposition may produce toxic fumes of; carbon monoxide (CO)Combustion products include; carbon dioxide (CO2) 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. <ul style="list-style-type: none">▶ Vented gas is more dense than air and may collect in pits, basements. Although not flammable in air at temperatures up to 100 deg. C at atmospheric temperature, mixtures with high concentrations of air at elevated pressure and / or temperature can become combustible in the presence of an ignition source. The material can also become combustible in an oxygen enriched environment (oxygen concentrations greater than in air). Whether air-mixtures or oxygen-mixtures become combustible depends on temperature, pressure and oxygen concentration.

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	<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 were gas may have accumulated.▶ Increase ventilation.
Major Spills	<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.▶ The tubing network design connecting gas cylinders to the delivery system should include appropriate pressure indicators and vacuum or suction lines.▶ Fully-welded types of pressure gauges, where the bourdon tube sensing element is welded to the gauge body, are recommended.▶ Before connecting gas cylinders, ensure manifold is mechanically secure and does not containing another gas.▶ DO NOT transfer gas from one cylinder to another. Contact of welding or soldering torch flame with high concentration of refrigerant can result in visible changes in the size and colour of torch flames. This flame effect will only occur in concentrations of product well above the recommended exposure limit.; therefore stop all work and ventilate to disperse refrigerant vapours from the work area before using any open flames.
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.▶ 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"> ▸ DO NOT use aluminium or galvanised containers ▸ Cylinder: <ul style="list-style-type: none"> ▸ 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	<p>As a general rule, hydrofluorocarbons tend to be flammable unless they contain more fluorine atoms than hydrogen atoms.</p> <p>Haloalkanes:</p> <ul style="list-style-type: none"> ▸ are highly reactive:some of the more lightly substituted lower members are highly flammable; the more highly substituted may be used as fire suppressants, not always with the anticipated results. ▸ may react with the lighter divalent metals to produce more reactive compounds analogous to Grignard reagents. ▸ may produce explosive compounds following prolonged contact with metallic or other azides ▸ may react on contact with potassium or its alloys - although apparently stable on contact with a wide range of halocarbons, reaction products may be shock-sensitive and may explode with great violence on light impact; severity generally increases with the degree of halocarbon substitution and potassium-sodium alloys give extremely sensitive mixtures . <p>BREITHERICK L.: Handbook of Reactive Chemical Hazards</p> <ul style="list-style-type: none"> ▸ react with metal halides and active metals, eg. sodium (Na), potassium (K), lithium (Li),calcium (Ca), zinc (Zn), powdered aluminium (Al) and aluminium alloys, magnesium (Mg) and magnesium alloys. ▸ 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 <p> Avoid reaction with alkali metals, zinc, aluminium alloys (> 2% magnesium). Avoid contact with plastics such as methacrylate polymers, polyethylene and polystyrene.</p>

7.3. Specific end use(s)

See section 1.2

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1. Control parameters

DERIVED NO EFFECT LEVEL (DNEL)

EXPOSURE PATTERN	WORKERS	GENERAL POPULATION
Long term - dermal, systemic effects	Not Available	Not Available
Long term - inhalation, systemic effects	13936 mg/m ³	2476 mg/m ³
Long term - oral, systemic effects	Not Available	Not Available
Long term - dermal, local effects	Not Available	Not Available
Long term - inhalation, local effects	Not Available	Not Available
Short term - dermal, systemic effects	Not Available	Not Available
Short term - inhalation, systemic effects	Not Available	Not Available
Short term - oral, systemic effects	Not Available	Not Available
Short term - dermal, local effects	Not Available	Not Available
Short term - inhalation, local effects	Not Available	Not Available

PREDICTED NO EFFECT LEVEL (PNEC)

COMPARTMENT	VALUE
Fresh Water	0.1 mg/L
Marine Water	0.01 mg/L
Aqua	1 mg/L
Fresh water sediment	0.75 mg/kg sediment dw
Marine water sediment	Not Available
Soil	Not Available
STP	73 mg/L
ORAL	Not Available

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA


Source	Ingredient	Material name	TWA	STEL	Peak	Notes
UK Workplace Exposure Limits (WELs)	R-134A	1,1,1,2-Tetrafluoroethane (HFC 134a)	4240 mg/m ³ / 1000 ppm	Not Available	Not Available	Not Available

EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
R-134A	Tetrafluoroethane, 1,1,1,2-; (HFC 134a)	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
R-134A	Not Available	Not Available

8.2. Exposure controls

8.2.1. Appropriate engineering controls	<p>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:</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. Personal protection	
Eye and face protection	<ul style="list-style-type: none">▶ Safety glasses with side shields.▶ Chemical goggles.▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
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.
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.
Thermal hazards	Not Available

Respiratory protection

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

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

Required minimum protection factor	Maximum gas/vapour concentration present in air p.p.m. (by volume)	Half-face Respirator	Full-Face Respirator
up to 10	1000	AX-AUS / Class1	-
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 ** - Continuous-flow or positive pressure demand

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

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	Colourless gas with slight ethereal odour; does not mix well with water (0.09 wt %, 25 C, 1 Bar).		
Physical state	Compressed Gas	Relative density (Water = 1)	1.21

Odour	Not Available	Partition coefficient n-octanol / water	Not Available
Odour threshold	Not Available	Auto-ignition temperature (°C)	> 743
pH (as supplied)	Not Applicable	Decomposition temperature	Not Available
Melting point / freezing point (°C)	-101	Viscosity (cSt)	0.210
Initial boiling point and boiling range (°C)	-26.2	Molecular weight (g/mol)	102.03
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 Applicable	Surface Tension (dyn/cm or mN/m)	Not Available
Lower Explosive Limit (%)	Not Applicable	Volatile Component (%vol)	100
Vapour pressure (kPa)	581 @ 25 deg C	Gas group	Not Available
Solubility in water (g/L)	Immiscible	pH as a solution (1%)	Not Applicable
Vapour density (Air = 1)	3.5	VOC g/L	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 toxicological effects

Inhaled	<p>Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by sleepiness, reduced alertness, loss of reflexes, lack of co-ordination, and vertigo.</p> <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>There is some evidence to suggest that the material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.</p> <p>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.</p> <p>Symptoms of asphyxia (suffocation) may include headache, dizziness, shortness of breath, muscular weakness, drowsiness and ringing in the ears. If the asphyxia is allowed to progress, there may be nausea and vomiting, further physical weakness and unconsciousness and, finally, convulsions, coma and death.</p> <p>Exposure to fluorocarbons can produce non-specific flu-like symptoms such as chills, fever, weakness, muscle pain, headache, chest discomfort, sore throat and dry cough with rapid recovery. High concentrations can cause irregular heartbeats and a stepwise reduction in lung capacity.</p> <p>Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved.</p>
Ingestion	<p>Overexposure is unlikely in this form.</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> <p>Swallowing of the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis; serious consequences may result. (ICSC13733)</p>
Skin Contact	<p>Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions.</p> <p>Repeated exposure may cause skin cracking, flaking or drying following normal handling and use.</p> <p>There is some evidence to suggest that this material can cause inflammation of the skin on contact in some persons.</p> <p>Fluorocarbons remove natural oils from the skin, causing irritation, dryness and sensitivity.</p>

	Open cuts, abraded or irritated skin should not be exposed to this material Entry into the blood-stream, through, for example, cuts, abrasions 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	Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn). Not considered to be a risk because of the extreme volatility of the gas.				
Chronic	Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure. Principal route of occupational exposure to the gas is by inhalation. Fluorocarbons can cause an increased risk of cancer, spontaneous abortion and birth defects. No effects have been seen in rats exposed to up to 50,000 ppm for 90 days. It is not teratogenic in rats or rabbits. Short term screening tests for carcinogenicity have proved negative. No long term effects were noted when administered by gavage to rats at a dose of 300 mg/kg/day for one year and the rats held for the remainder of their life span. [CIG]				
R-134A	<table border="1"> <thead> <tr> <th>TOXICITY</th> <th>IRRITATION</th> </tr> </thead> <tbody> <tr> <td>Inhalation (rat) LC50: 1500 mg/L/4h^[2]</td> <td>Not Available</td> </tr> </tbody> </table>	TOXICITY	IRRITATION	Inhalation (rat) LC50: 1500 mg/L/4h ^[2]	Not Available
TOXICITY	IRRITATION				
Inhalation (rat) LC50: 1500 mg/L/4h ^[2]	Not Available				
Legend:	1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2. * Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances				

R-134A	* 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.
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Acute Toxicity	✘	Carcinogenicity	⊖
Skin Irritation/Corrosion	⊖	Reproductivity	⊖
Serious Eye Damage/Irritation	⊖	STOT - Single Exposure	⊖
Respiratory or Skin sensitisation	⊖	STOT - Repeated Exposure	⊖
Mutagenicity	⊖	Aspiration Hazard	⊖

Legend: ✘ – Data available but does not fill the criteria for classification
 ✔ – Data required to make classification available
 ⊖ – Data Not Available to make classification

SECTION 12 ECOLOGICAL INFORMATION

12.1. Toxicity

Ingredient	Endpoint	Test Duration (hr)	Species	Value	Source
R-134A	EC50	384	Crustacea	7.065mg/L	3
R-134A	EC50	96	Algae or other aquatic plants	97.260mg/L	3
R-134A	LC50	96	Fish	29.671mg/L	3
R-134A	EC50	48	Crustacea	980mg/L	5
R-134A	NOEC	72	Algae or other aquatic plants	ca.13.2mg/L	2

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

In addition to carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O), the greenhouse gases mentioned in the Kyoto Protocol include synthetic substances that share the common feature of being highly persistent in the atmosphere and inhibit radiation from escaping out of the atmosphere. These synthetic substances include hydrocarbons that are partially fluorinated (HFCs) or totally fluorinated (PFCs) as well as sulfur hexafluoride (SF₆). The greenhouse potential of these substances, expressed as multiples of that of CO₂, are within the range of 140 to 11,700 for HFCs, from 6500 to 9,200 for PFCs and 23,900 for SF₆. Once emitted into the atmosphere, these substances have an impact on the environment for decades, centuries, or even for thousands of years.

DO NOT discharge into sewer or waterways.

|Persistence and Degradation:|Ozone Destruction Potential (PDO) = 0 (R11=1)|Greenhouse Effect Potential (ESP) = 0.27 (R11=1)|Decomposed comparatively rapidly in the lower atmosphere (troposphere).|Atmospheric lifetime is 15.6 years. Products of decomposition will be highly dispersed and hence will have a very low concentration. Does not influence photochemical smog (i.e. is not a VOC under the terms of the UNECE agreement). Does not deplete ozone.|Effect on Effluent Treatment:|Discharges of the product will enter the atmosphere and will not result in long term aqueous contamination. [IC]|Ecotoxicity:|Fish LC50 (96 h): Salmo gairdneri 450 mg/l ; NOEC 300 mg/l (mortality) (semi-static tests)|Daphnia EC50 (48 h): 980 mg/l|Bacteria EC10 (6 h): Pseudomonas putida gt;730 mg/l (growth)|Mobility|Air: Henrys Law constant (H): 65 kPa.m³/ml (20 C/ calculated) - considerable volatility|Soil/ sediment log Koc 1.5 approx (adsorption - calculated)|Persistence and biodegradability|Abiotic degradation|Air, indirect photo-oxidation t_{1/2}=10.9 years|Conditions: sensitiser: OH radicals|Degradation products: carbon dioxide/ fluorhydric acid/ trichloroacetic acid|Air, photolysis, ODP=0|No effect on stratospheric ozone|Reference value for CFC 11: ODP=1|Air, greenhouse effect, GWP=0.25|Reference value for CFC 11: GWP=1|Biotic degradation|Aerobic, test ready biodegradability/ closed bottle, degradation from 2-3% 28 days|Result: not readily biodegradable|Aerobic, test biodegradation by methane oxidation|Result: non-biodegradable|Conditions: inoculum: Methylosinus trichosporium OB3b|Bioaccumulative potential; bioconcentration log PoW=1.06|Product is persistent in air (atmospheric lifetime: 15.7 years)|Product is not significantly hazardous for the aquatic environment as: very low toxicity for aquatic organisms|considerable volatility|no bioaccumulation

12.2. Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
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R-134A	HIGH	HIGH
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12.3. Bioaccumulative potential

Ingredient	Bioaccumulation
R-134A	LOW (LogKOW = 1.68)

12.4. Mobility in soil

Ingredient	Mobility
R-134A	LOW (KOC = 96.63)

12.5. Results of PBT and vPvB assessment

	P	B	T
Relevant available data	Not Available	Not Available	Not Available
PBT Criteria fulfilled?	Not Available	Not Available	Not Available

12.6. Other adverse effects

No data available

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
HAZCHEM	Not Applicable

Land transport (ADR)

14.1. UN number	3159										
14.2. Packing group	Not Applicable										
14.3. UN proper shipping name	1,1,1,2- TETRAFLUOROETHANE (REFRIGERANT GAS R 134a)										
14.4. Environmental hazard	Not Applicable										
14.5. Transport hazard class(es)	<table border="0"> <tr> <td>Class</td> <td>2.2</td> </tr> <tr> <td>Subrisk</td> <td>Not Applicable</td> </tr> </table>	Class	2.2	Subrisk	Not Applicable						
Class	2.2										
Subrisk	Not Applicable										
14.6. Special precautions for user	<table border="0"> <tr> <td>Hazard identification (Kemler)</td> <td>20</td> </tr> <tr> <td>Classification code</td> <td>2A</td> </tr> <tr> <td>Hazard Label</td> <td>2.2</td> </tr> <tr> <td>Special provisions</td> <td>662</td> </tr> <tr> <td>Limited quantity</td> <td>120 ml</td> </tr> </table>	Hazard identification (Kemler)	20	Classification code	2A	Hazard Label	2.2	Special provisions	662	Limited quantity	120 ml
Hazard identification (Kemler)	20										
Classification code	2A										
Hazard Label	2.2										
Special provisions	662										
Limited quantity	120 ml										

Air transport (ICAO-IATA / DGR)

14.1. UN number	3159
14.2. Packing group	Not Applicable
14.3. UN proper shipping name	Refrigerant gas R 134a; 1,1,1,2-Tetrafluoroethane

14.4. Environmental hazard	Not Applicable	
14.5. Transport hazard class(es)	ICAO/IATA Class	2.2
	ICAO / IATA Subrisk	Not Applicable
	ERG Code	2L
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	3159	
14.2. Packing group	Not Applicable	
14.3. UN proper shipping name	1,1,1,2-TETRAFLUOROETHANE (REFRIGERANT GAS R 134a)	
14.4. Environmental hazard	Not Applicable	
14.5. Transport hazard class(es)	IMDG Class	2.2
	IMDG Subrisk	Not Applicable
14.6. Special precautions for user	EMS Number	F-C, S-V
	Special provisions	Not Applicable
	Limited Quantities	120 mL

Inland waterways transport (ADN)

14.1. UN number	3159	
14.2. Packing group	Not Applicable	
14.3. UN proper shipping name	1,1,1,2-TETRAFLUOROETHANE (REFRIGERANT GAS R 134a)	
14.4. Environmental hazard	Not Applicable	
14.5. Transport hazard class(es)	2.2	Not Applicable
14.6. Special precautions for user	Classification code	2A
	Special provisions	662
	Limited quantity	120 ml
	Equipment required	PP
	Fire cones number	0

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

Not Applicable

SECTION 15 REGULATORY INFORMATION

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

R-134A(811-97-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS

European Customs Inventory of Chemical Substances ECICS (English)

UK Workplace Exposure Limits (WELs)

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

This safety data sheet is in compliance with the following EU legislation and its adaptations - as far as applicable - : 67/548/EEC, 1999/45/EC, 98/24/EC, 92/85/EC, 94/33/EC, 91/689/EEC, 1999/13/EC, Commission Regulation (EU) 2015/830, Regulation (EC) No 1272/2008 and their amendments as well as the following British legislation: - The Control of Substances Hazardous to Health Regulations (COSHH) 2002 - COSHH Essentials - The Management of Health and Safety at Work Regulations 1999

15.2. Chemical safety assessment

For further information please look at the Chemical Safety Assessment and Exposure Scenarios prepared by your Supply Chain if available.

ECHA SUMMARY

Ingredient	CAS number	Index No	ECHA Dossier
R-134A	811-97-2	Not Available	01-2119459374-33-XXXX

Harmonisation (C&L Inventory)	Hazard Class and Category Code(s)	Pictograms Signal Word Code(s)	Hazard Statement Code(s)
2	Liq. Gas, Press. Gas., Not Classified, STOT SE 1, STOT SE 2	GHS04, Wng, GHS08, Dgr	H280, H370

Harmonisation Code 1 = The most prevalent classification. Harmonisation Code 2 = The most severe classification.

National Inventory	Status
Australia - AICS	Y
Canada - DSL	Y
Canada - NDSL	N (R-134A)
China - IECSC	Y
Europe - EINEC / ELINCS / NLP	Y
Japan - ENCS	Y
Korea - KECI	Y
New Zealand - NZIoC	Y
Philippines - PICCS	Y
USA - TSCA	Y
Legend:	Y = All ingredients are on the inventory N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)

SECTION 16 OTHER INFORMATION

Full text Risk and Hazard codes

H370	Causes damage to organs.
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Other information

DSD / DPD label elements

Not Applicable

Relevant risk statements are found in section 2.1

Indication(s) of danger	Not Applicable
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SAFETY ADVICE

S02	Keep out of reach of children.
S03	Keep in a cool place.
S15	Keep away from heat.
S35	This material and its container must be disposed of in a safe way.
S56	Dispose of this material and its container at hazardous or special waste collection point.

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
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