



# Material Safety Data Sheet

R417A

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	R417a
Synonyms	Not Available
Proper shipping name	REFRIGERANT GAS, N.O.S., such as mixture F1, mixture F2 or mixture F3 (contains tetrafluoroethane and pentafluoroethane)
Other means of identification	Not Available

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

Relevant identified uses	Use according to manufacturer's directions. 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.
Uses advised against	Not Applicable

### 1.3. Details of the supplier of the safety data sheet

Distributor for Middle-East	Brothers Gas
Address	204, Al Fattan Plaza, Al Garhoud, Dubai
Telephone	+971 4 251 7979
Fax	+971 4 251 7900
Website	www.brothersgas.com
Email	sales@brothersgas.ae

### 1.4. Emergency telephone number

Association / Organisation	Not Available
Emergency telephone numbers	+971 50 221 2656
Other emergency telephone numbers	Not Available

## SECTION 2 HAZARDS IDENTIFICATION

### 2.1. Classification of the substance or mixture

**Considered a dangerous mixture according to Reg. (EC) No 1272/2008 and their 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	In case of mixtures, classification has been prepared by following DPD (Directive 1999/45/EC) and CLP Regulation (EC) No 1272/2008 regulations
DPD classification <sup>[1]</sup>	R44 Risk of explosion if heated under confinement.

<b>Legend:</b>	Classification drawn from EC Directive 67/548/EEC - Annex I ; Classification drawn from EC Directive 1272/2008 - Annex VI
<b>Classification according to regulation (EC) No 1272/2008 [CLP] <sup>[1]</sup></b>	Gas under Pressure (Liquefied gas)
<b>Legend:</b>	Classification drawn from EC Directive 67/548/EEC - Annex I ; Classification drawn from EC Directive 1272/2008 - Annex VI

## 2.2. Label elements

<b>CLP label elements</b>	
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<b>SIGNAL WORD</b>	<b>WARNING</b>
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## Hazard statement(s)

<b>H280</b>	Contains gas under pressure; may explode if heated.
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## Supplementary statement(s)

<b>EUH044</b>	Risk of explosion if heated under confinement.
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## Precautionary statement(s) Prevention

Not Applicable

## Precautionary statement(s) Response

Not Applicable

## Precautionary statement(s) Storage

<b>P410+P403</b>	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\*.

RECh - 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

See 'Composition on ingredients' in Section 3.2

### 3.2. Mixtures

1.811-97-2

2.212-377-0

3. Not Available

4.01-2119459374-33-XXXX

1.354-33-6

2.206-557-8

3. Not Available

4.01-2119485636-25-XXXX

1.106-97-8.

2.203-448-7

3.601-004-00-0, 601-004-01-8

4.01-2119474691-32-XXXX

1.CAS No 2.EC No 3.Index No 4.REACH No	%[weight]	Name	Classification according to directive 67/548/EEC [DSD]	Classification according to regulation (EC) No 1272/2008 [CLP]
40-50	<u>R-134A</u>	R4, R18, R44 <sup>[1]</sup>	Gas under Pressure (Compressed gas); H280, EUH018, EUH044 <sup>[1]</sup>	

Not Spec	<u>R125</u>	R4, R44 <sup>[1]</sup>	Gas under Pressure (Liquefied gas); H280, EUH044 <sup>[1]</sup>
1-10	<u>n-Butane</u> <u>99.95%</u>	R12, R44 <sup>[1]</sup>	Flammable Gas Category 1, Gas under Pressure (Liquefied gas); H220, H280, EUH044 <sup>[1]</sup>
<b>Legend:</b> Classification drawn from EC Directive 67/548/EEC - Annex I ; Classification drawn from EC Directive 1272/2008 - Annex VI .			

## SECTION 4 FIRST AID MEASURES

### 4.1. Description of first aid measures

<b>General</b>	<p>If skin contact occurs:</p> <ul style="list-style-type: none"> <li>▶ Immediately remove all contaminated clothing, including footwear.</li> <li>▶ Flush skin and hair with running water (and soap if available).</li> <li>▶ Seek medical attention in event of irritation.</li> </ul> <p>In case of cold burns (frost-bite):</p> <ul style="list-style-type: none"> <li>▶ Move casualty into warmth before thawing the affected part; if feet are affected carry if possible</li> <li>▶ Bathe the affected area immediately in luke-warm water (not more than 35 deg C) for 10 to 15 minutes, immersing if possible and without rubbing</li> <li>▶ <b>DO NOT apply hot water or radiant heat.</b></li> <li>▶ Apply a clean, dry, light dressing of "fluffed-up" dry gauze bandage</li> <li>▶ If a limb is involved, raise and support this to reduce swelling</li> <li>▶ If an adult is involved and where intense pain occurs provide pain killers such as paracetamol</li> <li>▶ Transport to hospital, or doctor</li> <li>▶ Subsequent blackening of the exposed tissue indicates potential of necrosis, which may require amputation.</li> <li>▶ If product comes in contact with eyes remove the patient from gas source or contaminated area.</li> <li>▶ Take the patient to the nearest eye wash, shower or other source of clean water.</li> <li>▶ Open the eyelid(s) wide to allow the material to evaporate.</li> <li>▶ 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.</li> <li>▶ 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.</li> <li>▶ 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)</li> <li>▶ Transport to hospital or doctor.</li> <li>▶ Even when no pain persists and vision is good, a doctor should examine the eye as delayed damage may occur.</li> <li>▶ If the patient cannot tolerate light, protect the eyes with a clean, loosely tied bandage.</li> <li>▶ Ensure verbal communication and physical contact with the patient.</li> </ul> <p><b>DO NOT</b> allow the patient to rub the eyes  <b>DO NOT</b> allow the patient to tightly shut the eyes  <b>DO NOT</b> introduce oil or ointment into the eye(s) without medical advice  <b>DO NOT</b> use hot or tepid water.</p> <ul style="list-style-type: none"> <li>▶ Following exposure to gas, remove the patient from the gas source or contaminated area.</li> <li>▶ NOTE: Personal Protective Equipment (PPE), including positive pressure self-contained breathing apparatus may be required to assure the safety of the rescuer.</li> <li>▶ Prosthesis such as false teeth, which may block the airway, should be removed, where possible, prior to initiating first aid procedures.</li> <li>▶ If the patient is not breathing spontaneously, administer rescue breathing.</li> <li>▶ If the patient does not have a pulse, administer CPR.</li> <li>▶ If medical oxygen and appropriately trained personnel are available, administer 100% oxygen.</li> <li>▶ Summon an emergency ambulance. If an ambulance is not available, contact a physician, hospital, or Poison Control Centre for further instruction.</li> <li>▶ Keep the patient warm, comfortable and at rest while awaiting medical care.</li> <li>▶ <b>MONITOR THE BREATHING AND PULSE, CONTINUOUSLY.</b></li> <li>▶ Administer rescue breathing (preferably with a demand-valve resuscitator, bag-valve mask-device, or pocket mask as trained) or CPR if necessary.</li> </ul> <p>Not considered a normal route of entry.</p> <ul style="list-style-type: none"> <li>▶ Avoid giving milk or oils.</li> <li>▶ Avoid giving alcohol.</li> <li>▶ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.</li> </ul>
<b>Eye Contact</b>	<ul style="list-style-type: none"> <li>▶ If product comes in contact with eyes remove the patient from gas source or contaminated area.</li> <li>▶ Take the patient to the nearest eye wash, shower or other source of clean water.</li> <li>▶ Open the eyelid(s) wide to allow the material to evaporate.</li> <li>▶ 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.</li> <li>▶ 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.</li> <li>▶ 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)</li> <li>▶ Transport to hospital or doctor.</li> <li>▶ Even when no pain persists and vision is good, a doctor should examine the eye as delayed damage may occur.</li> <li>▶ If the patient cannot tolerate light, protect the eyes with a clean, loosely tied bandage.</li> <li>▶ Ensure verbal communication and physical contact with the patient.</li> </ul> <p><b>DO NOT</b> allow the patient to rub the eyes  <b>DO NOT</b> allow the patient to tightly shut the eyes  <b>DO NOT</b> introduce oil or ointment into the eye(s) without medical advice  <b>DO NOT</b> use hot or tepid water.</p>

<b>Skin Contact</b>	<p>If skin contact occurs:</p> <ul style="list-style-type: none"> <li>▶ Immediately remove all contaminated clothing, including footwear.</li> <li>▶ Flush skin and hair with running water (and soap if available).</li> <li>▶ Seek medical attention in event of irritation.</li> </ul> <p>In case of cold burns (frost-bite):</p> <ul style="list-style-type: none"> <li>▶ Move casualty into warmth before thawing the affected part; if feet are affected carry if possible</li> <li>▶ Bathe the affected area immediately in luke-warm water (not more than 35 deg C) for 10 to 15 minutes, immersing if possible and without rubbing</li> <li>▶ <b>DO NOT apply hot water or radiant heat.</b></li> <li>▶ Apply a clean, dry, light dressing of "fluffed-up" dry gauze bandage</li> <li>▶ If a limb is involved, raise and support this to reduce swelling</li> <li>▶ If an adult is involved and where intense pain occurs provide pain killers such as paracetamol</li> <li>▶ Transport to hospital, or doctor</li> <li>▶ Subsequent blackening of the exposed tissue indicates potential of necrosis, which may require amputation.</li> </ul>
<b>Inhalation</b>	<ul style="list-style-type: none"> <li>▶ Following exposure to gas, remove the patient from the gas source or contaminated area.</li> <li>▶ NOTE: Personal Protective Equipment (PPE), including positive pressure self-contained breathing apparatus may be required to assure the safety of the rescuer.</li> <li>▶ Prostheses such as false teeth, which may block the airway, should be removed, where possible, prior to initiating first aid procedures.</li> <li>▶ If the patient is not breathing spontaneously, administer rescue breathing.</li> <li>▶ If the patient does not have a pulse, administer CPR.</li> <li>▶ If medical oxygen and appropriately trained personnel are available, administer 100% oxygen.</li> <li>▶ Summon an emergency ambulance. If an ambulance is not available, contact a physician, hospital, or Poison Control Centre for further instruction.</li> <li>▶ Keep the patient warm, comfortable and at rest while awaiting medical care.</li> <li>▶ <b>MONITOR THE BREATHING AND PULSE, CONTINUOUSLY.</b></li> <li>▶ Administer rescue breathing (preferably with a demand-valve resuscitator, bag-valve mask-device, or pocket mask as trained) or CPR if necessary.</li> </ul>
<b>Ingestion</b>	<p>Not considered a normal route of entry.</p> <ul style="list-style-type: none"> <li>▶ Avoid giving milk or oils.</li> <li>▶ Avoid giving alcohol.</li> <li>▶ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.</li> </ul>

#### 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 frost-bite caused by liquefied petroleum gas:

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

[Shell Australia 22/12/87]

For gas exposures:

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BASIC TREATMENT  
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- ▶ Establish a patent airway with suction where necessary.
- ▶ Watch for signs of respiratory insufficiency and assist ventilation as necessary.

- ▶ Administer oxygen by non-rebreather mask at 10 to 15 l/min.
- ▶ Monitor and treat, where necessary, for pulmonary oedema .
- ▶ Monitor and treat, where necessary, for shock.
- ▶ Anticipate seizures.

#### ADVANCED TREATMENT

- ▶ Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has occurred.
- ▶ Positive-pressure ventilation using a bag-valve mask might be of use.
- ▶ Monitor and treat, where necessary, for arrhythmias.
- ▶ Start an IV D5W TKO. If signs of hypovolaemia are present use lactated Ringers solution. Fluid overload might create complications.
- ▶ Drug therapy should be considered for pulmonary oedema.
- ▶ Hypotension with signs of hypovolaemia requires the cautious administration of fluids. Fluid overload might create complications.
- ▶ Treat seizures with diazepam.
- ▶ Proparacaine hydrochloride should be used to assist eye irrigation.

BRONSTEIN, A.C. and CURRANCE, P.L.

EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994

## SECTION 5 FIREFIGHTING MEASURES

### 5.1. Extinguishing media

**SMALL FIRE:** Use extinguishing agent suitable for type of surrounding fire.

**LARGE FIRE:** Cool cylinder.

**DO NOT** direct water at source of leak or venting safety devices as icing may occur.

### 5.2. Special hazards arising from the substrate or mixture

<b>Fire Incompatibility</b>	▶ 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

<b>Fire Fighting</b>	<p>-----</p> <p>GENERAL</p> <p>-----</p> <ul style="list-style-type: none"> <li>▶ Alert Fire Brigade and tell them location and nature of hazard.</li> <li>▶ Wear breathing apparatus and protective gloves.</li> <li>▶ Fight fire from a safe distance, with adequate cover.</li> <li>▶ Use water delivered as a fine spray to control fire and cool adjacent area.</li> </ul>
<b>Fire/Explosion Hazard</b>	<ul style="list-style-type: none"> <li>▶ Containers may explode when heated - Ruptured cylinders may rocket</li> <li>▶ Fire exposed containers may vent contents through pressure relief devices.</li> <li>▶ High concentrations of gas may cause asphyxiation without warning.</li> <li>▶ May decompose explosively when heated or involved in fire.</li> <li>▶ Contact with gas may cause burns, severe injury and/ or frostbite.</li> </ul> <p>Decomposition may produce toxic fumes of; carbon monoxide (CO) carbon dioxide (CO<sub>2</sub>) hydrogen fluoride, other pyrolysis products typical of burning organic material</p> <p><b>Contains low boiling substance:</b> Closed containers may rupture due to pressure buildup under fire conditions.</p>

## SECTION 6 ACCIDENTAL RELEASE MEASURES

### 6.1. Personal precautions, protective equipment and emergency procedures

See section 8

### 6.2. Environmental precautions

See section 12

### 6.3. Methods and material for containment and cleaning up

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

### 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"> <li>▶ Consider use in closed pressurised systems, fitted with temperature, pressure and safety relief valves which are vented for safe dispersal.</li> <li>▶ The tubing network design connecting gas cylinders to the delivery system should include appropriate pressure indicators and vacuum or suction lines.</li> <li>▶ Fully-welded types of pressure gauges, where the bourdon tube sensing element is welded to the gauge body, are recommended.</li> <li>▶ Before connecting gas cylinders, ensure manifold is mechanically secure and does not contain another gas.</li> <li>▶ <b>DO NOT transfer gas from one cylinder to another.</b></li> </ul>
Fire and explosion protection	See section 5
Other information	<ul style="list-style-type: none"> <li>▶ Cylinders should be stored in a purpose-built compound with good ventilation, preferably in the open.</li> <li>▶ Such compounds should be sited and built in accordance with statutory requirements.</li> <li>▶ The storage compound should be kept clear and access restricted to authorised personnel only.</li> <li>▶ Cylinders stored in the open should be protected against rust and extremes of weather.</li> </ul>

## 7.2. Conditions for safe storage, including any incompatibilities

Suitable container	<ul style="list-style-type: none"> <li>▶ <b>DO NOT use aluminium or galvanised containers</b></li> <li>▶ Cylinder: <ul style="list-style-type: none"> <li>▶ Ensure the use of equipment rated for cylinder pressure.</li> <li>▶ Ensure the use of compatible materials of construction.</li> <li>▶ Valve protection cap to be in place until cylinder is secured, connected.</li> <li>▶ Cylinder must be properly secured either in use or in storage.</li> </ul> </li> </ul>
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"> <li>▶ 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.</li> <li>▶ may react with the lighter divalent metals to produce more reactive compounds analogous to Grignard reagents.</li> <li>▶ may produce explosive compounds following prolonged contact with metallic or other azides</li> <li>▶ 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.</li> </ul> <p>BREITHERICK L.: Handbook of Reactive Chemical Hazards</p> <ul style="list-style-type: none"> <li>▶ 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.</li> <li>▶ 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</li> </ul>

## 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)

Not Available

#### PREDICTED NO EFFECT LEVEL (PNEC)

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 <sup>3</sup> / 1000 ppm	Not Available	Not Available	Not Available
UK Workplace Exposure Limits (WELs)	n-Butane, 99.95%	Butane	1450 mg/m <sup>3</sup> / 600 ppm	1810 mg/m <sup>3</sup> / 750 ppm	Not Available	Carc, (only applies if Butane contains more than 0.1% of buta-1,3-diene)

#### 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
n-Butane, 99.95%	Butane	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
R-134A	Not Available	Not Available
R125	Not Available	Not Available
n-Butane, 99.95%	Not Available	Not Available

### 8.2. Exposure controls

<b>8.2.1. Appropriate engineering controls</b>	<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.</p> <p>The basic types of engineering controls are:</p> <p>Process controls which involve changing the way a job activity or process is done to reduce the risk.</p> <p>Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.</p>
<b>8.2.2. Personal protection</b>	
<b>Eye and face protection</b>	<ul style="list-style-type: none"> <li>▶ Chemical goggles.</li> <li>▶ Full face shield may be required for supplementary but never for primary protection of eyes.</li> <li>▶ 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.</li> </ul>
<b>Skin protection</b>	See Hand protection below
<b>Hands/feet protection</b>	<ul style="list-style-type: none"> <li>▶ When handling sealed and suitably insulated cylinders wear cloth or leather gloves.</li> <li>▶ Insulated gloves:</li> </ul> <p>NOTE: Insulated gloves should be loose fitting so that may be removed quickly if liquid is spilled upon them. Insulated gloves are not made to permit hands to be placed in the liquid; they provide only short-term protection from accidental contact with the liquid.</p>
<b>Body protection</b>	See Other protection below
<b>Other protection</b>	<ul style="list-style-type: none"> <li>▶ Protective overalls, closely fitted at neck and wrist.</li> <li>▶ Eye-wash unit.</li> <li>▶ Ensure availability of lifeline in confined spaces.</li> <li>▶ Staff should be trained in all aspects of rescue work.</li> </ul>
<b>Thermal hazards</b>	Not Available

### Respiratory protection

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

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required. Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 5 x ES	Air-line*	AX-2	AX-PAPR-2 ^
up to 10 x ES	-	AX-3	-
10+ x ES	-	Air-line**	-

\* - Continuous Flow; \*\* - Continuous-flow or positive pressure demand

^ - Full-face

A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO<sub>2</sub>), G = Agricultural chemicals, K = Ammonia(NH<sub>3</sub>), 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

<b>Appearance</b>	Colourless liquified gas with a slight odour.		
<b>Physical state</b>	Liquified Gas	<b>Relative density (Water = 1)</b>	1.2
<b>Odour</b>	Not Available	<b>Partition coefficient n-octanol / water</b>	Not Available
<b>Odour threshold</b>	Not Available	<b>Auto-ignition temperature (°C)</b>	Not Available
<b>pH (as supplied)</b>	Not Available	<b>Decomposition temperature</b>	Not Available
<b>Melting point / freezing point (°C)</b>	Not Available	<b>Viscosity (cSt)</b>	Not Available
<b>Initial boiling point and boiling range (°C)</b>	Not Available	<b>Molecular weight (g/mol)</b>	Not Applicable
<b>Flash point (°C)</b>	Not Available	<b>Taste</b>	Not Available
<b>Evaporation rate</b>	Not Available	<b>Explosive properties</b>	Not Available
<b>Flammability</b>	Not Available	<b>Oxidising properties</b>	Not Available
<b>Upper Explosive Limit (%)</b>	Not Available	<b>Surface Tension (dyn/cm or mN/m)</b>	Not Available

Lower Explosive Limit (%)	Not Available	Volatile Component (%vol)	Not Available
Vapour pressure (kPa)	Not Available	Gas group	Not Available
Solubility in water (g/L)	Not Available	pH as a solution (1%)	Not Available
Vapour density (Air = 1)	Not Available	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"> <li>▶ Unstable in the presence of incompatible materials.</li> <li>▶ Product is considered stable.</li> <li>▶ Hazardous polymerisation will not occur.</li> </ul>
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>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>Inhalation of non-toxic gases may cause:</p> <ul style="list-style-type: none"> <li>▶ CNS effects: headache, confusion, dizziness, stupor, seizures and coma;</li> <li>▶ respiratory: shortness of breath and rapid breathing;</li> <li>▶ cardiovascular: collapse and irregular heart beats;</li> <li>▶ gastrointestinal: mucous membrane irritation, nausea and vomiting.</li> </ul> <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>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>Not normally a hazard due to physical form of product.</p> <p>Considered an unlikely route of entry in commercial/industrial environments</p>
Skin Contact	<p>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> <p>Open cuts, abraded or irritated skin should not be exposed to this material</p> <p>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.</p> <p>Vapourising liquid causes rapid cooling and contact may cause cold burns, frostbite, even through normal gloves. Frozen skin tissues are painless and appear waxy and yellow. Signs and symptoms of frost-bite may include "pins and needles", paleness followed by numbness, a hardening and stiffening of the skin, a progression of colour changes in the affected area, (first white, then mottled and blue and eventually black; on recovery, red, hot, painful and blistered).</p>
Eye	<p>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).</p> <p>Not considered to be a risk because of the extreme volatility of the gas.</p>
Chronic	<p>Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.</p> <p>Principal route of occupational exposure to the gas is by inhalation.</p> <p>Fluorocarbons can cause an increased risk of cancer, spontaneous abortion and birth defects.</p>

R417A (Isceon MO59)	TOXICITY	IRRITATION
	Not Available	Not Available
R-134A	TOXICITY	IRRITATION
	Inhalation (rat) LC50: 1500 mg/L/4h <sup>[2]</sup>	Not Available



R125	TOXICITY	IRRITATION
	Inhalation (rat) LC50: >709000 ppm/4h *[2]	Nil reported * [
	Inhalation (rat) LC50: 2910 mg/L/4H[2]	
	Inhalation (rat) LC50: 800000 ppm/4h*[2]	
n-Butane, 99.95%	TOXICITY	IRRITATION
	Inhalation (rat) LC50: 658 mg/L/4H[2]	Nil reported
<b>Legend:</b>	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	

R417A (Isceon MO59)	Disinfection by products (DBPs) re formed when disinfectants such as chlorine, chloramine, and ozone react with organic and inorganic matter in water. The observations that some DBPs such as trihalomethanes (THMs), di-/trichloroacetic acids, and 3-chloro-4-(dichloromethyl)-5-hydroxy-2(5H)-furanone (MX) are carcinogenic in animal studies have raised public concern over the possible adverse health effects of DBPs. To date, several hundred DBPs have been identified. Numerous haloalkanes and haloalkenes have been tested for carcinogenic and mutagenic activities.
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.
R125	Cardiac sensitisation threshold limit >245400 mg/m3 Anaesthetic effects threshold limit 490800 mg/m3 * DuPont SDS

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
R125	EC50	384	Crustacea	10.310mg/L	3
R125	LC50	96	Fish	43.427mg/L	3
R125	NOEC	96	Fish	10mg/L	2
R125	EC50	48	Crustacea	>97.9mg/L	2
R125	EC50	72	Algae or other aquatic plants	>114mg/L	2
n-Butane, 99.95%	EC50	384	Crustacea	1.416mg/L	3
n-Butane, 99.95%	LC50	96	Fish	5.862mg/L	3
n-Butane, 99.95%	EC50	96	Algae or other aquatic plants	7.71mg/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 (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), 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 (SF<sub>6</sub>). The greenhouse potential of these substances, expressed as multiples of that of CO<sub>2</sub>, are within the range of 140 to 11,700 for HFCs, from 6500 to 9,200 for PFCs and 23,900 for SF<sub>6</sub>. 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.**

### 12.2. Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
R-134A	HIGH	HIGH

R125	HIGH	HIGH
n-Butane, 99.95%	LOW	LOW

### 12.3. Bioaccumulative potential

Ingredient	Bioaccumulation
R-134A	LOW (LogKOW = 1.68)
R125	LOW (LogKOW = 1.5472)
n-Butane, 99.95%	LOW (LogKOW = 2.89)

### 12.4. Mobility in soil

Ingredient	Mobility
R-134A	LOW (KOC = 96.63)
R125	LOW (KOC = 154.4)
n-Butane, 99.95%	LOW (KOC = 43.79)

### 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

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

## SECTION 14 TRANSPORT INFORMATION

### Labels Required

	
<b>Marine Pollutant</b>	NO
<b>HAZCHEM</b>	2TE

### Land transport (ADR)

<b>14.1.UN number</b>	1078										
<b>14.2.Packing group</b>	Not Applicable										
<b>14.3.UN proper shipping name</b>	REFRIGERANT GAS, N.O.S., such as mixture F1, mixture F2 or mixture F3 (contains tetrafluoroethane and pentafluoroethane)										
<b>14.4.Environmental hazard</b>	Not Applicable										
<b>14.5. Transport hazard class(es)</b>	<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										
<b>14.6. Special precautions for user</b>	<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>274 582 662</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	274 582 662	Limited quantity	120 ml
Hazard identification (Kemler)	20										
Classification code	2A										
Hazard Label	2.2										
Special provisions	274 582 662										
Limited quantity	120 ml										

**Air transport (ICAO-IATA / DGR)**

<b>14.1. UN number</b>	1078	
<b>14.2. Packing group</b>	Not Applicable	
<b>14.3. UN proper shipping name</b>	Refrigerant gas, n.o.s. * (contains tetrafluoroethane and pentafluoroethane)	
<b>14.4. Environmental hazard</b>	Not Applicable	
<b>14.5. Transport hazard class(es)</b>	ICAO/IATA Class	2.2
	ICAO / IATA Subrisk	Not Applicable
	ERG Code	2L
<b>14.6. Special precautions for user</b>	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)**

<b>14.1. UN number</b>	1078	
<b>14.2. Packing group</b>	Not Applicable	
<b>14.3. UN proper shipping name</b>	REFRIGERANT GAS, N.O.S. (contains tetrafluoroethane and pentafluoroethane)	
<b>14.4. Environmental hazard</b>	Not Applicable	
<b>14.5. Transport hazard class(es)</b>	IMDG Class	2.2
	IMDG Subrisk	Not Applicable
<b>14.6. Special precautions for user</b>	EMS Number	F-C, S-V
	Special provisions	274
	Limited Quantities	120 mL

**Inland waterways transport (ADN)**

<b>14.1. UN number</b>	1078	
<b>14.2. Packing group</b>	Not Applicable	
<b>14.3. UN proper shipping name</b>	REFRIGERANT GAS, N.O.S., such as mixture F1, mixture F2 or mixture F3 (contains tetrafluoroethane and pentafluoroethane)	
<b>14.4. Environmental hazard</b>	Not Applicable	
<b>14.5. Transport hazard class(es)</b>	2.2   Not Applicable	
<b>14.6. Special precautions for user</b>	Classification code	2A
	Special provisions	274; 582; 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)

**R125(354-33-6) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

**N-BUTANE, 99.95%(106-97-8.) IS FOUND ON THE FOLLOWING REGULATORY LISTS**

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

EU REACH Regulation (EC) No 1907/2006 - Annex XVII (Appendix 1) Carcinogens: category 1A (Table 3.1)/category 1 (Table 3.2)

EU REACH Regulation (EC) No 1907/2006 - Annex XVII (Appendix 4) Mutagens: category 1B (Table 3.1)/category 2 (Table 3.2)

European Customs Inventory of Chemical Substances ECICS (English)

European Trade Union Confederation (ETUC) Priority List for REACH Authorisation

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

European Union (EU) Annex I to Directive 67/548/EEC on Classification and Labelling of Dangerous Substances - updated by ATP: 31

European Union (EU) Annex I to Directive 67/548/EEC on Classification and Labelling of Dangerous Substances (updated by ATP: 31) - Carcinogenic Substances

European Union (EU) Annex I to Directive 67/548/EEC on Classification and Labelling of Dangerous Substances (updated by ATP: 31) - Mutagenic Substances

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

International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft

UK Workplace Exposure Limits (WELs)

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.

Ingredient	CAS number	Index No	ECHA Dossier
R125	354-33-6	Not Available	01-2119485636-25-XXXX

Harmonisation (C&L Inventory)	Hazard Class and Category Code(s)	Pictograms Signal Word Code(s)	Hazard Statement Code(s)
1	Press. Gas.	GHS04, Wng	H280
2	Press. Gas., Liq. Gas, STOT SE 2	GHS04, Wng, GHS08	H280, H371

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

Ingredient	CAS number	Index No	ECHA Dossier
n-Butane, 99.95%	106-97-8.	601-004-00-0, 601-004-01-8	01-2119474691-32-XXXX

Harmonisation (C&L Inventory)	Hazard Class and Category Code(s)	Pictograms Signal Word Code(s)	Hazard Statement Code(s)
1	Flam. Gas 1	GHS02, GHS04, Dgr	H220
2	Flam. Gas 1, Liq. Gas, Press. Gas., Muta. 1B, Carc. 1A, Carc. 1B, STOT SE 3, STOT SE 1	GHS02, GHS04, Dgr, GHS08, Wng	H220, H280, H340, H350, H223, H336, H335, H304, H361, H373, H315, H370
1	Flam. Gas 1	GHS02, GHS04, Dgr	H220
2	Flam. Gas 1, Liq. Gas, Press. Gas., Muta. 1B, Carc. 1A, Carc. 1B, STOT SE 3, STOT SE 1	GHS02, GHS04, Dgr, GHS08, Wng	H220, H280, H340, H350, H223, H336, H335, H304, H361, H373, H315, 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 (R125; n-Butane, 99.95%; 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
<b>Legend:</b>	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

<b>H220</b>	Extremely flammable gas.
<b>H223</b>	Flammable aerosol.
<b>H304</b>	May be fatal if swallowed and enters airways.
<b>H315</b>	Causes skin irritation.
<b>H335</b>	May cause respiratory irritation.
<b>H336</b>	May cause drowsiness or dizziness.
<b>H340</b>	May cause genetic defects.
<b>H350</b>	May cause cancer.
<b>H361</b>	Suspected of damaging fertility or the unborn child.
<b>H370</b>	Causes damage to organs.
<b>H371</b>	May cause damage to organs.
<b>H373</b>	May cause damage to organs.
<b>R12</b>	Extremely flammable.
<b>R18</b>	In use, may form flammable/ explosive vapour-air mixture
<b>R4</b>	Forms very sensitive explosive metallic compounds.

### Other information

#### DSD / DPD label elements

Not Applicable

Relevant risk statements are found in section 2.1

<b>Indication(s) of danger</b>	Not Applicable
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#### SAFETY ADVICE

<b>S02</b>	Keep out of reach of children.
<b>S15</b>	Keep away from heat.
<b>S35</b>	This material and its container must be disposed of in a safe way.
<b>S56</b>	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