



HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO FRF-160 A-sides

ICP Construction Inc.

Version No: 2.3
Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

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S.GHS.USA.EN

SECTION 1 Identification

Product Identifier

Product name	HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO, FRF-160 A-side
Synonyms	Not Available
Proper shipping name	Chemical under pressure, n.o.s. (Hydrofluoroolefin, Nitrogen)
Other means of identification	Not Available

Recommended use of the chemical and restrictions on use

Relevant identified uses	Low pressure polyurethane foam. Side A Component. For PROFESSIONAL USE ONLY
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Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

Registered company name	ICP Construction Inc.
Address	150 Dascomb Road Andover, MA 01810 United States
Telephone	1-866-667-5119 1-978-623-9987
Fax	Not Available
Website	www.icpgroup.com
Email	sds@icpgroup.com

Emergency phone number

Association / Organisation	ChemTel
Emergency telephone numbers	1-800-255-3924
Other emergency telephone numbers	1-813-248-0585

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 White = Special (Oxidizer or water reactive substances)

Classification	Serious Eye Damage/Eye Irritation Category 2A, Sensitisation (Respiratory) Category 1, Specific Target Organ Toxicity - Repeated Exposure Category 2, Acute Toxicity (Inhalation) Category 4, Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3, Skin Corrosion/Irritation Category 2, Gases Under Pressure (Compressed Gas), Sensitisation (Skin) Category 1, Carcinogenicity Category 2
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Label elements

Hazard pictogram(s)	
Signal word	Danger

HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side

Hazard statement(s)

H319	Causes serious eye irritation.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H373	May cause damage to organs through prolonged or repeated exposure. (Respiratory system) (Inhalation)
H332	Harmful if inhaled.
H335	May cause respiratory irritation.
H315	Causes skin irritation.
H280	Contains gas under pressure; may explode if heated.
H317	May cause an allergic skin reaction.
H351	Suspected of causing cancer.

Hazard(s) not otherwise classified

Persons previously sensitized to isocyanates may develop a cross-sensitization reaction to other isocyanates.

Precautionary statement(s) Prevention

P202	Do not handle until all safety precautions have been read and understood
P262	Do not get in eyes, on skin, or on clothing
P260	Do not breathe gas.
P264	Wash hands and other skin areas exposed to material thoroughly after handling
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves, protective clothing and eye protection
P284	Wear respiratory protection

Precautionary statement(s) Response

P308+P313	IF exposed or concerned: Get medical advice/ attention.
P342+P311	If experiencing respiratory symptoms: Call a POISON CENTER/doctor/physician/first aider.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P302+P352+P333+P313	IF ON SKIN: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical attention
P304+P341	IF INHALED: if breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing

Precautionary statement(s) Storage

P405	Store locked up.
P410+P403	Protect from sunlight. Store in a well-ventilated place.
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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Not Applicable

SECTION 3 Composition / information on ingredients

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
101-68-8	30-60	<u>4,4'-diphenylmethane diisocyanate (MDI)</u>
9016-87-9	30-60	<u>polymeric diphenylmethane diisocyanate</u>
29118-24-9	5-10	<u>1,3,3,3-tetrafluoropropene</u>
7727-37-9.	<5	<u>nitrogen</u>

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret.

SECTION 4 First-aid measures

Description of first aid measures

Eye Contact	<ul style="list-style-type: none"> ▶ If product comes in contact with eyes remove the patient from gas source or contaminated area. ▶ Take the patient to the nearest eye wash, shower or other source of clean water. ▶ Open the eyelid(s) wide to allow the material to evaporate. ▶ Gently rinse the affected eye(s) with clean, cool water for at least 15 minutes. Have the patient lie or sit down and tilt the head back. Hold the eyelid(s) open and pour water slowly over the eyeball(s) at the inner corners, letting the water run out of the outer corners. ▶ The patient may be in great pain and wish to keep the eyes closed. It is important that the material is rinsed from the eyes to prevent further damage. ▶ Ensure that the patient looks up, and side to side as the eye is rinsed in order to better reach all parts of the eye(s)
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HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side

	<ul style="list-style-type: none"> ▶ 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 or hair contact occurs:</p> <ul style="list-style-type: none"> ▶ Immediately flush body and clothes with large amounts of water, using safety shower if available. ▶ Quickly remove all contaminated clothing, including footwear. ▶ Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre. ▶ Transport to hospital, or doctor.
Inhalation	<p>Following uptake by inhalation, move person to an area free from risk of further exposure. Oxygen or artificial respiration should be administered as needed. Asthmatic-type symptoms may develop and may be immediate or delayed up to several hours. Treatment is essentially symptomatic. A physician should be consulted.</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.
Ingestion	Not considered a normal route of entry.

Most important symptoms and effects, both acute and delayed

See Section 11

Indication of any immediate medical attention and special treatment needed

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

For sub-chronic and chronic exposures to isocyanates:

- ▶ This material may be a potent pulmonary sensitiser which causes bronchospasm even in patients without prior airway hyperreactivity.
- ▶ Clinical symptoms of exposure involve mucosal irritation of respiratory and gastrointestinal tracts.
- ▶ Conjunctival irritation, skin inflammation (erythema, pain vesiculation) and gastrointestinal disturbances occur soon after exposure.
- ▶ Pulmonary symptoms include cough, burning, substernal pain and dyspnoea.
- ▶ Some cross-sensitivity occurs between different isocyanates.
- ▶ Noncardiogenic pulmonary oedema and bronchospasm are the most serious consequences of exposure. Markedly symptomatic patients should receive oxygen, ventilatory support and an intravenous line.
- ▶ Treatment for asthma includes inhaled sympathomimetics (epinephrine [adrenalin], terbutaline) and steroids.
- ▶ Activated charcoal (1 g/kg) and a cathartic (sorbitol, magnesium citrate) may be useful for ingestion.
- ▶ Mydriatics, systemic analgesics and topical antibiotics (Sulamyd) may be used for corneal abrasions.
- ▶ There is no effective therapy for sensitised workers.

[Ellenhorn and Barceloux; Medical Toxicology]

NOTE: Isocyanates cause airway restriction in naive individuals with the degree of response dependant on the concentration and duration of exposure. They induce smooth muscle contraction which leads to bronchoconstrictive episodes. Acute changes in lung function, such as decreased FEV1, may not represent sensitivity.

[Karol & Jin, Frontiers in Molecular Toxicology, pp 56-61, 1992]

Personnel who work with isocyanates, isocyanate prepolymers or polyisocyanates should have a pre-placement medical examination and periodic examinations thereafter, including a pulmonary function test. Anyone with a medical history of chronic respiratory disease, asthmatic or bronchial attacks, indications of allergic responses, recurrent eczema or sensitisation conditions of the skin should not handle or work with isocyanates. Anyone who develops chronic respiratory distress when working with isocyanates should be removed from exposure and examined by a physician. Further exposure must be avoided if a sensitivity to isocyanates or polyisocyanates has developed.

SECTION 5 Fire-fighting measures

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HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side

Extinguishing media

- ▶ Small quantities of water in contact with hot liquid may react violently with generation of a large volume of rapidly expanding hot sticky semi-solid foam.
- ▶ Presents additional hazard when fire fighting in a confined space.
- ▶ Cooling with flooding quantities of water reduces this risk.
- ▶ Dry chemical powder.
- ▶ BCF (where regulations permit).
- ▶ Carbon dioxide.

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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Special protective equipment and precautions for fire-fighters

Fire Fighting	<p style="text-align: center;">----- GENERAL -----</p> <ul style="list-style-type: none"> ▶ Alert Fire Brigade and tell them location and nature of hazard. ▶ Wear full body protective clothing with breathing apparatus. ▶ Fight fire from a safe distance, with adequate cover.
Fire/Explosion Hazard	<ul style="list-style-type: none"> - Combustible. - Moderate fire hazard when exposed to heat or flame. - When heated to high temperatures decomposes rapidly generating vapour which pressures and may then rupture containers with release of flammable and highly toxic isocyanate vapour. <ul style="list-style-type: none"> ▶ Containers may explode when heated - Ruptured cylinders may rocket ▶ May burn but does not ignite easily. ▶ Fire exposed cylinders may vent contents through pressure relief devices thereby increasing vapour concentration.. ▶ Fire may produce irritating, poisonous or corrosive gases. <p>Decomposition may produce toxic fumes of: carbon monoxide (CO) carbon dioxide (CO₂) isocyanates hydrogen cyanide and minor amounts of nitrogen oxides (NO_x) other pyrolysis products typical of burning organic material.</p>

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	<ul style="list-style-type: none"> ▶ Avoid breathing vapour and any contact with liquid or gas. Protective equipment including respirator should be used. ▶ DO NOT enter confined spaces where gas may have accumulated.
Major Spills	<p>For isocyanate spills of less than 40 litres (2 m²):</p> <ul style="list-style-type: none"> ▶ Evacuate area from everybody not dealing with the emergency, keep them upwind and prevent further access, remove ignition sources and, if inside building, ventilate area as well as possible. ▶ Notify supervision and others as necessary. ▶ Put on personal protective equipment (suitable respiratory protection, face and eye protection, protective suit, gloves and impermeable boots). ▶ Avoid contamination with water, alkalis and detergent solutions. ▶ Material reacts with water and generates gas, pressurises containers with even drum rupture resulting. ▶ DO NOT reseal container if contamination is suspected. ▶ DO NOT touch the spill material ▶ Clear area of all unprotected personnel and move upwind. ▶ Alert Emergency Authority and advise them of the location and nature of hazard. ▶ Wear full body clothing with breathing apparatus. ▶ 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.

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

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling	<ul style="list-style-type: none"> · Consider use in closed pressurised systems, fitted with temperature, pressure and safety relief valves which are vented for safe dispersal. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature · The tubing network design connecting gas cylinders to the delivery system should include appropriate pressure indicators and vacuum or suction lines. · Fully-welded types of pressure gauges, where the bourdon tube sensing element is welded to the gauge body, are recommended. <ul style="list-style-type: none"> ▶ DO NOT transfer gas from one cylinder to another.
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HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side

Other information	<p>Consider storage under inert gas.</p> <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.
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Conditions for safe storage, including any incompatibilities

Suitable container	<ul style="list-style-type: none"> ▶ Cylinder: ▶ Ensure the use of equipment rated for cylinder pressure. ▶ Ensure the use of compatible materials of construction. ▶ Valve protection cap to be in place until cylinder is secured, connected.
Storage incompatibility	<ul style="list-style-type: none"> · Avoid reaction with water, alcohols and detergent solutions. Isocyanates are electrophiles, and as such they are reactive toward a variety of nucleophiles including alcohols, amines, and even water. Upon treatment with an alcohol, an isocyanate forms a urethane linkage. ▶ A range of exothermic decomposition energies for isocyanates is given as 20-30 kJ/mol. ▶ The relationship between energy of decomposition and processing hazards has been the subject of discussion; it is suggested that values of energy released per unit of mass, rather than on a molar basis (J/g) be used in the assessment. ▶ For example, in "open vessel processes" (with man-hole size openings, in an industrial setting), substances with exothermic decomposition energies below 500 J/g are unlikely to present a danger, whilst those in "closed vessel processes" (opening is a safety valve or bursting disk) present some danger where the decomposition energy exceeds 150 J/g. ▶ 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

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	4,4'-diphenylmethane diisocyanate (MDI)	Methylene bisphenyl isocyanate (MDI)	Not Available	Not Available	0.02 ppm / 0.2 mg/m3	Not Available
US NIOSH Recommended Exposure Limits (RELs)	4,4'-diphenylmethane diisocyanate (MDI)	Methylene bisphenyl isocyanate	0.005 ppm / 0.05 mg/m3	Not Available	0.020 (10-minute) ppm / 0.2 (10-minute) mg/m3	Not Available
US ACGIH Threshold Limit Values (TLV)	4,4'-diphenylmethane diisocyanate (MDI)	Methylene bisphenyl isocyanate	0.005 ppm	Not Available	Not Available	Not Available
US ACGIH Threshold Limit Values (TLV)	nitrogen	Nitrogen	Not Available	Not Available	Not Available	See Appendix F: Minimal Oxygen Content

Emergency Limits

Ingredient	TEEL-1	TEEL-2	TEEL-3
4,4'-diphenylmethane diisocyanate (MDI)	0.45 mg/m3	Not Available	Not Available
4,4'-diphenylmethane diisocyanate (MDI)	29 mg/m3	40 mg/m3	240 mg/m3
polymeric diphenylmethane diisocyanate	0.15 mg/m3	3.6 mg/m3	22 mg/m3
1,3,3,3-tetrafluoropropene	1,400 ppm	Not Available	Not Available
nitrogen	7.96E+05 ppm	8.32E+05 ppm	8.69E+05 ppm

Ingredient	Original IDLH	Revised IDLH
4,4'-diphenylmethane diisocyanate (MDI)	75 mg/m3	Not Available
polymeric diphenylmethane diisocyanate	Not Available	Not Available
1,3,3,3-tetrafluoropropene	Not Available	Not Available
nitrogen	Not Available	Not Available

Occupational Exposure Banding


Ingredient	Occupational Exposure Band Rating	Occupational Exposure Band Limit
polymeric diphenylmethane diisocyanate	E	≤ 0.1 ppm

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

Exposure controls

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>
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HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side

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.
Skin protection	See Hand protection below
Hands/feet protection	<p>NOTE:</p> <ul style="list-style-type: none"> ▶ The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact. ▶ Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed. ▶ Isocyanate resistant materials include Teflon, Viton, nitrile rubber and some PVA gloves. ▶ Protective gloves and overalls should be worn as specified in the appropriate national standard. ▶ Contaminated garments should be removed promptly and should not be re-used until they have been decontaminated. ▶ 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.

Respiratory protection

Full face respirator with supplied air.

- ▶ Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- ▶ The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
- ▶ Cartridge performance is affected by humidity. Cartridges should be changed after 2 hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used
- ▶ Positive pressure, full face, air-supplied breathing apparatus should be used for work in enclosed spaces if a leak is suspected or the primary containment is to be opened (e.g. for a cylinder change)
- ▶ Air-supplied breathing apparatus is required where release of gas from primary containment is either suspected or demonstrated.

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

Appearance	Moisture sensitive.		
Physical state	Compressed Gas	Relative density (Water = 1)	1.2
Odour	Not Available	Partition coefficient n-octanol / water	Not Available
Odour threshold	Not Available	Auto-ignition temperature (°C)	Not Available
pH (as supplied)	Not Available	Decomposition temperature	Not Available
Melting point / freezing point (°C)	Not Available	Viscosity (cSt)	Not Available
Initial boiling point and boiling range (°C)	208	Molecular weight (g/mol)	Not Available
Flash point (°C)	>199	Taste	Not Available
Evaporation rate	Not Available	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)	Not Available
Vapour pressure (kPa)	Not Available	Gas group	Not Available
Solubility in water	Partly miscible	pH as a solution (Not Available%)	Not Available
Vapour density (Air = 1)	Not Available	VOC g/L	Not Available

SECTION 10 Stability and reactivity

Reactivity	See section 7
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HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side

Chemical stability	<ul style="list-style-type: none"> ▶ Unstable in the presence of incompatible materials. ▶ Product is considered stable. ▶ Hazardous polymerisation will not occur. ▶ Presence of elevated temperatures.
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**

Inhaled	<p>The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage. Inhalation of the vapour is hazardous and may even be fatal</p> <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>Inhalation of toxic gases may cause:</p> <ul style="list-style-type: none"> ▶ Central Nervous System effects including depression, headache, confusion, dizziness, stupor, coma and seizures; ▶ respiratory: acute lung swellings, shortness of breath, wheezing, rapid breathing, other symptoms and respiratory arrest; ▶ heart: collapse, irregular heartbeats and cardiac arrest; ▶ gastrointestinal: irritation, ulcers, nausea and vomiting (may be bloody), and abdominal pain. <p>The vapour/mist may be highly irritating to the upper respiratory tract and lungs; the response may be severe enough to produce bronchitis and pulmonary oedema. Possible neurological symptoms arising from isocyanate exposure include headache, insomnia, euphoria, ataxia, anxiety neurosis, depression and paranoia. Gastrointestinal disturbances are characterised by nausea and vomiting.</p> <p>Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may produce severely toxic effects. Relatively small amounts absorbed from the lungs may prove fatal.</p> <p>There is strong evidence to suggest that this material can cause, if inhaled once, very serious, irreversible damage of organs.</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> <p>Accidental ingestion of the material may be seriously damaging to the health of the individual; animal experiments indicate that ingestion of less than 40 gram may be fatal.</p>	
Skin Contact	<p>This material can cause inflammation of the skin on contact in some persons.</p> <p>The material may accentuate any pre-existing dermatitis condition</p> <p>Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.</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>	
Eye	<p>Not considered to be a risk because of the extreme volatility of the gas.</p> <p>This material may produce eye irritation in some persons and produce eye damage 24 hours or more after instillation. Moderate inflammation may be expected with redness; conjunctivitis may occur with prolonged exposure.</p>	
Chronic	<p>There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment.</p> <p>Long-term exposure to respiratory irritants may result in airways disease, involving difficulty breathing and related whole-body problems. Inhaling this product is more likely to cause a sensitisation reaction in some persons compared to the general population.</p> <p>Skin contact with the material is more likely to cause a sensitisation reaction in some persons compared to the general population.</p> <p>Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.</p> <p>This material can cause serious damage if one is exposed to it for long periods. It can be assumed that it contains a substance which can produce severe defects.</p> <p>Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.</p> <p>This product contains a polymer with a functional group considered to be of high concern. Isothiocyanates may cause hypersensitivity of the skin and airways.</p> <p>The reactivity of an epoxide intermediate may be the reason for the cancer-causing properties of halogenated oxiranes. It is reported that 1,1-dichloroethylene, vinyl chloride, trichloroethylene, tetrachloroethylene and chloroprene all cause cancer.</p> <p>Generally speaking, substances with one halogen substitution show higher potential to cause cancer compared to substances with two.</p> <p>Main route of exposure to the gas in the workplace is by inhalation.</p> <p>Persons with a history of asthma or other respiratory problems or are known to be sensitised, should not be engaged in any work involving the handling of isocyanates.</p> <p>The chemistry of reaction of isocyanates, as evidenced by MDI, in biological milieu is such that in the event of a true exposure of small MDI doses to the mouth, reactions will commence at once with biological macromolecules in the buccal region and will continue along the digestive tract prior to reaching the stomach. Reaction products will be a variety of polyureas and macromolecular conjugates with for example mucus, proteins and cell components.</p> <p>Animal testing shows that polymeric MDI can damage the nasal cavities and lungs, causing inflammation and increased cell growth.</p> <p>Isocyanate vapours are irritating to the airways and can cause their inflammation, with wheezing, gasping, severe distress, even loss of consciousness and fluid in the lungs. Nervous system symptoms that may occur include headache, sleep disturbance, euphoria, inco-ordination, anxiety, depression and paranoia.</p>	
HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side	TOXICITY	IRRITATION
	Not Available	Not Available
4,4'-diphenylmethane diisocyanate (MDI)	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >6200 mg/kg ^[2]	Dermal Sensitiser *
	Inhalation (Rat) LC50: 0.368 mg/L4h ^[1]	Eye: no adverse effect observed (not irritating) ^[1]

HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side

	Oral (Rat) LD50: >2000 mg/kg ^[1]	Skin (rabbit): 500 mg /24 hours
		Skin: adverse effect observed (irritating) ^[1]
polymeric diphenylmethane diisocyanate	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >9400 mg/kg ^[2]	Eye (rabbit): 100 mg - mild
	Inhalation(Rat) LC50; 0.49 mg/L4h ^[2]	
	Oral (Rat) LD50; 43000 mg/kg ^[2]	
1,3,3,3-tetrafluoropropene	TOXICITY	IRRITATION
	Inhalation(Rat) LC50; >1157.752 ppm4h ^[2]	Not Available
nitrogen	TOXICITY	IRRITATION
	Not Available	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

4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI)	Inhalation (human) TCLo: 0.13 ppm/30 mins Eye (rabbit): 0.10 mg moderate
POLYMERIC DIPHENYLMETHANE DIISOCYANATE	product
1,3,3,3-TETRAFLUOROPROPENE	Inhalation (rat) NOEL (28 days): >1.5 mg/l * * Vendor HFO-1234ze is not likely to accumulate in the bodies of humans or animals HFO-1234ze is practically non-toxic. Short-term exposures at levels higher than 10% have not induced cardiac sensitization to adrenalin nor induced serious toxic effects. Rats and rabbits did not exhibit any serious toxic, developmental or reproductive effects even with exposures to high levels of HFO-1234ze. Based on a series of mutagenicity and genomics studies, the cancer risk for HFO-1234ze is low, no cardiac sensitisation was observed in dogs with exposures up to 120,000 ppm; repeated dose toxicity in rats (13-wk) found mild effects on the heart (NOEL 5,000ppm); in vitro genotoxicity findings include negative Ames Test and negative human lymphocyte chromosome aberration test; in vivo genotoxicity findings in the mouse micronucleus test were negative (inhalation, mammalian bone-marrow cytogenic test with chromosomal analysis). Inhalation of perfluoroalkenes can cause lung injury, kidney damage, brain changes and death. Repeated exposures may alter blood pressure and the production of blood cells. The potential for causing cancer is the subject of speculation.
NITROGEN	No significant acute toxicological data identified in literature search.
HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side & 4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI) & POLYMERIC DIPHENYLMETHANE DIISOCYANATE	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. Allergic reactions involving the respiratory tract are usually due to interactions between IgE antibodies and allergens and occur rapidly. Allergic potential of the allergen and period of exposure often determine the severity of symptoms. Some people may be genetically more prone than others, and exposure to other irritants may aggravate symptoms. Attention should be paid to atopic diathesis, characterised by increased susceptibility to nasal inflammation, asthma and eczema. Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure. The following information refers to contact allergens as a group and may not be specific to this product. Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type.
HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side & 1,3,3,3-TETRAFLUOROPROPENE	Disinfection byproducts (DBPs) are formed when disinfectants such as chlorine, chloramines and ozone react with organic and inorganic matter in water. Animal studies have shown that some DBPs cause cancer. To date, several hundred DBPs have been identified. Numerous haloalkanes and haloalkenes have been tested for cancer-causing and mutation-causing activities.
4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI) & POLYMERIC DIPHENYLMETHANE DIISOCYANATE	Isocyanate vapours are irritating to the airways and can cause their inflammation, with wheezing, gasping, severe distress, even loss of consciousness and fluid in the lungs. Nervous system symptoms that may occur include headache, sleep disturbance, euphoria, inco-ordination, anxiety, depression and paranoia. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis. Aromatic and aliphatic diisocyanates may cause airway toxicity and skin sensitization. Monomers and prepolymers exhibit similar respiratory effect. Of the several members of diisocyanates tested on experimental animals by inhalation and oral exposure, some caused cancer while others produced a harmless outcome. The substance is classified by IARC as Group 3: NOT classifiable as to its carcinogenicity to humans. Evidence of carcinogenicity may be inadequate or limited in animal testing.

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

Continued...

HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side

HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side	Endpoint	Test Duration (hr)	Species	Value	Source	
	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
4,4'-diphenylmethane diisocyanate (MDI)	Endpoint	Test Duration (hr)	Species	Value	Source	
	NOEC(ECx)	504h	Crustacea	>=10mg/l	2	
	LC50	96h	Fish	>1000mg/l	2	
	BCF	672h	Fish	61-150	7	
polymeric diphenylmethane diisocyanate	Endpoint	Test Duration (hr)	Species	Value	Source	
	Not Available	Not Available	Not Available	Not Available	Not Available	
	1,3,3,3-tetrafluoropropene	Endpoint	Test Duration (hr)	Species	Value	Source
		EC50	72h	Algae or other aquatic plants	>170mg/l	2
EC50		48h	Crustacea	>160mg/l	2	
nitrogen	Endpoint	Test Duration (hr)	Species	Value	Source	
	Not Available	Not Available	Not Available	Not Available	Not Available	
Legend:	Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data					

for polyisocyanates:

Polyisocyanates are not readily biodegradable. However, due to other elimination mechanisms (hydrolysis, adsorption), long retention times in water are not to be expected. The resulting polyurea is more or less inert and, due to its molecular size, not bioavailable.

For Isocyanate Monomers:

Environmental Fate: Isocyanates, (di- and polyfunctional isocyanates), are commonly used to make various polymers, such as polyurethanes. Polyurethanes find significant application in the manufacture of rigid and flexible foams. They are also used in the production of adhesives, elastomers, and coatings.

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
4,4'-diphenylmethane diisocyanate (MDI)	LOW (Half-life = 1 days)	LOW (Half-life = 0.24 days)

Bioaccumulative potential

Ingredient	Bioaccumulation
4,4'-diphenylmethane diisocyanate (MDI)	LOW (BCF = 15)

Mobility in soil

Ingredient	Mobility
4,4'-diphenylmethane diisocyanate (MDI)	LOW (KOC = 376200)

SECTION 13 Disposal considerations

Waste treatment methods

Product / Packaging disposal	<ul style="list-style-type: none"> ▶ 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. ▶ 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.
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SECTION 14 Transport information

Labels Required

	
Marine Pollutant	NO

HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side

Land transport (DOT)

UN number	3500	
UN proper shipping name	Chemical under pressure, n.o.s. (Hydrofluoroolefin, Nitrogen)	
Transport hazard class(es)	Class	2.2
	Subrisk	Not Applicable
Packing group	Not Applicable	
Environmental hazard	Not Applicable	
Special precautions for user	Hazard Label	2.2
	Special provisions	362, T50, TP40

Air transport (ICAO-IATA / DGR)

UN number	3500	
UN proper shipping name	Chemical under pressure, n.o.s. * (Hydrofluoroolefin, Nitrogen)	
Transport hazard class(es)	ICAO/IATA Class	2.2
	ICAO / IATA Subrisk	Not Applicable
	ERG Code	2L
Packing group	Not Applicable	
Environmental hazard	Not Applicable	
Special precautions for user	Special provisions	A187
	Cargo Only Packing Instructions	218
	Cargo Only Maximum Qty / Pack	150 kg
	Passenger and Cargo Packing Instructions	218
	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)

UN number	3500	
UN proper shipping name	CHEMICAL UNDER PRESSURE, N.O.S. (Hydrofluoroolefin, Nitrogen)	
Transport hazard class(es)	IMDG Class	2.2
	IMDG Subrisk	Not Applicable
Packing group	Not Applicable	
Environmental hazard	Not Applicable	
Special precautions for user	EMS Number	F-C, S-V
	Special provisions	274 362
	Limited Quantities	0

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

Not Applicable

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

Product name	Group
4,4'-diphenylmethane diisocyanate (MDI)	Not Available
polymeric diphenylmethane diisocyanate	Not Available
1,3,3,3-tetrafluoropropene	Not Available
nitrogen	Not Available

Transport in bulk in accordance with the ICG Code

Product name	Ship Type
4,4'-diphenylmethane diisocyanate (MDI)	Not Available
polymeric diphenylmethane diisocyanate	Not Available
1,3,3,3-tetrafluoropropene	Not Available
nitrogen	Not Available

Continued...

HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side

SECTION 15 Regulatory information**Safety, health and environmental regulations / legislation specific for the substance or mixture****4,4'-diphenylmethane diisocyanate (MDI) is found on the following regulatory lists**

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs

US - California Hazardous Air Pollutants Identified as Toxic Air Contaminants

US - Massachusetts - Right To Know Listed Chemicals

US ACGIH Threshold Limit Values (TLV)

US Clean Air Act - Hazardous Air Pollutants

US DOE Temporary Emergency Exposure Limits (TEELs)

US EPA Integrated Risk Information System (IRIS)

US EPCRA Section 313 Chemical List

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 Chemical Substance Inventory - Interim List of Active Substances

US TSCA New Chemical Exposure Limits (NCEL)

polymeric diphenylmethane diisocyanate is found on the following regulatory lists

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs

US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)

US DOE Temporary Emergency Exposure Limits (TEELs)

US EPCRA Section 313 Chemical List

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US TSCA Chemical Substance Inventory - Interim List of Active Substances

1,3,3,3-tetrafluoropropene is found on the following regulatory lists

US AIHA Workplace Environmental Exposure Levels (WEELs)

US DOE Temporary Emergency Exposure Limits (TEELs)

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US Toxicology Excellence for Risk Assessment (TERA) Workplace Environmental Exposure Levels (WEEL)

US TSCA Chemical Substance Inventory - Interim List of Active Substances

nitrogen is found on the following regulatory lists

US - Massachusetts - Right To Know Listed Chemicals

US ACGIH Threshold Limit Values (TLV)

US DOE Temporary Emergency Exposure Limits (TEELs)

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US TSCA Chemical Substance Inventory - Interim List of Active Substances

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	Yes
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	Yes
Acute toxicity (any route of exposure)	Yes
Reproductive toxicity	No
Skin Corrosion or Irritation	Yes
Respiratory or Skin Sensitization	Yes
Serious eye damage or eye irritation	Yes
Specific target organ toxicity (single or repeated exposure)	Yes
Aspiration Hazard	No
Germ cell mutagenicity	No
Simple Asphyxiant	No
Hazards Not Otherwise Classified	Yes

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

Name	Reportable Quantity in Pounds (lb)	Reportable Quantity in kg
4,4'-diphenylmethane diisocyanate (MDI)	5000	2270

State Regulations**US. California Proposition 65**

None Reported

National Inventory Status

National Inventory	Status

Continued...

HandiFoam E84 HFO, HandiFoam Slow Rise HFO, HandiFoam Commercial Vehicle HFO A-side

National Inventory	Status
Australia - AIIC / Australia Non-Industrial Use	Yes
Canada - DSL	Yes
Canada - NDSL	No (4,4'-diphenylmethane diisocyanate (MDI); polymeric diphenylmethane diisocyanate; nitrogen)
China - IECSC	No (1,3,3,3-tetrafluoropropene)
Europe - EINEC / ELINCS / NLP	No (polymeric diphenylmethane diisocyanate; 1,3,3,3-tetrafluoropropene)
Japan - ENCS	Yes
Korea - KECI	Yes
New Zealand - NZIoC	No (1,3,3,3-tetrafluoropropene)
Philippines - PICCS	No (1,3,3,3-tetrafluoropropene)
USA - TSCA	Yes
Taiwan - TCSI	Yes
Mexico - INSQ	No (1,3,3,3-tetrafluoropropene)
Vietnam - NCI	Yes
Russia - FBEPH	Yes
Legend:	Yes = All CAS declared ingredients are on the inventory No = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.

SECTION 16 Other information

Revision Date	05/18/2022
Initial Date	03/01/2021

CONTACT POINT

PLEASE NOTE THAT TITANIUM DIOXIDE IS NOT PRESENT IN CLEAR OR NEUTRAL BASES

SDS Version Summary

Version	Date of Update	Sections Updated
1.3	05/18/2022	Acute Health (inhaled), Physical Properties, Supplier Information, Name

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.

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
 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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