FSI Controlled Environment Formulation B-Side

Fastener Systems Inc.

Version No: **1.1**
Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

Issue Date: **12/06/2024**
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S.GHS.USA.EN

SECTION 1 Identification

Product Identifier

Product name	FSI Controlled Environment Formulation B-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 Spray Polyurethane Foam Sealant B-side Component

Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

Registered company name	**Fastener Systems Inc.**
Address	1210 American Blvd. West Chester, PA 19380 United States
Telephone	1-800-232-5060
Fax	Not Available
Website	Not Available
Email	sales@fastenersystems.com

Emergency phone number

Association / Organisation	**ChemTrec**
Emergency telephone number(s)	**1-800-424-9300**
Other emergency telephone number(s)	**Not Available**

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	Gases Under Pressure (Compressed Gas), Skin Corrosion/Irritation Category 2, Serious Eye Damage/Eye Irritation Category 2A, Reproductive Toxicity Category 2, Hazardous to the Aquatic Environment Long-Term Hazard Category 3, Simple Asphyxiant

Label elements

Hazard pictogram(s)	
Signal word	**Warning**

Hazard statement(s)

H280	Contains gas under pressure; may explode if heated.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H361	Suspected of damaging fertility or the unborn child.

Page 1 continued...

H412	Harmful to aquatic life with long lasting effects.
	May displace oxygen and cause rapid suffocation

Hazard(s) not otherwise classified

Not Applicable

Precautionary statement(s) Prevention

P201	Obtain special instructions before use.
P280	Wear protective gloves, protective clothing, eye protection and face protection.
P273	Avoid release to the environment.
P202	Do not handle until all safety precautions have been read and understood.
P264	Wash all exposed external body areas thoroughly after handling.

Precautionary statement(s) Response

P308+P313	IF exposed or concerned: Get medical advice/ attention.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.
P302+P352	IF ON SKIN: Wash with plenty of water.
P332+P313	If skin irritation occurs: Get medical advice/attention.
P362+P364	Take off contaminated clothing and wash it before reuse.

Precautionary statement(s) Storage

P405	Store locked up.
P410+P403	Protect from sunlight. Store in a well-ventilated place.

Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation.

SECTION 3 Composition / information on ingredients

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
29118-24-9	10-20	1,3,3,3-tetrafluoropropene
108-32-7	1-5	propylene carbonate
111-46-6	1-5	diethylene glycol
13674-84-5	15-40	tris(2-chloroisopropyl)phosphate
7560-83-0	1-5	N-methyldicyclohexylamine
56-81-5	1-5	glycerol
7727-37-9.	<5	nitrogen

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	▸ If product comes in contact with eyes remove the patient from gas source or contaminated area. ▸ Take the patient to the nearest eye wash, shower or other source of clean water. ▸ Open the eyelid(s) wide to allow the material to evaporate. ▸ Gently rinse the affected eye(s) with clean, cool water for at least 15 minutes. Have the patient lie or sit down and tilt the head back. Hold the eyelid(s) open and pour water slowly over the eyeball(s) at the inner corners, letting the water run out of the outer corners. ▸ The patient may be in great pain and wish to keep the eyes closed. It is important that the material is rinsed from the eyes to prevent further damage. ▸ Ensure that the patient looks up, and side to side as the eye is rinsed in order to better reach all parts of the eye(s) ▸ Transport to hospital or doctor. ▸ Even when no pain persists and vision is good, a doctor should examine the eye as delayed damage may occur. ▸ If the patient cannot tolerate light, protect the eyes with a clean, loosely tied bandage. ▸ Ensure verbal communication and physical contact with the patient. **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.
Skin Contact	If skin or hair contact occurs: ▸ 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	▸ 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.

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	▸ 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. ▸ Avoid giving milk or oils. ▸ Avoid giving alcohol.

Most important symptoms and effects, both acute and delayed

See Section 11

Indication of any immediate medical attention and special treatment needed

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

B: Specific drugs and antidotes:
- There is no specific antidote

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

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

POISONING and DRUG OVERDOSE, Californian Poison Control System Ed. Kent R Olson; 3rd Edition
- Do not administer sympathomimetic drugs unless absolutely necessary as material may increase myocardial irritability.
- No specific antidote.
- Because rapid absorption may occur through lungs if aspirated and cause systematic effects, the decision of whether to induce vomiting or not should be made by an attending physician.
- If lavage is performed, suggest endotracheal and/or esophageal control.
- Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach.
- Treatment based on judgment of the physician in response to reactions of the patient

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
As in all cases of suspected poisoning, follow the ABCDEs of emergency medicine (airway, breathing, circulation, disability, exposure), then the ABCDEs of toxicology (antidotes, basics, change absorption, change distribution, change elimination).
For poisons (where specific treatment regime is absent):

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.
- **DO NOT** use emetics. Where ingestion is suspected rinse mouth and give up to 200 ml water (5 ml/kg recommended) for dilution where patient is able to swallow, has a strong gag reflex and does not drool.

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.
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BRONSTEIN, A.C. and CURRANCE, P.L.
EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994

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SECTION 5 Fire-fighting measures

Extinguishing media

- Water spray or fog.
- Foam.
- Dry chemical powder.

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

Special protective equipment and precautions for fire-fighters

Fire Fighting	---------- GENERAL ---------- ‣ 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	‣ 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. Decomposition may produce toxic fumes of: carbon monoxide (CO) carbon dioxide (CO_2) hydrogen fluoride other pyrolysis products typical of burning organic material.

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	‣ 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	‣ 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 NOTattempt 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	· 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. ‣ **DO NOT** transfer gas from one cylinder to another.
Other information	‣ 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.

Conditions for safe storage, including any incompatibilities

Suitable container	‣ 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	As a general rule, hydrofluorocarbons tend to be flammable unless they contain more fluorine atoms than hydrogen atoms. ‣ Avoid magnesium, aluminium and their alloys, brass and steel. ‣ Avoid reaction with oxidising agents ‣ 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

Continued...

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US OSHA Permissible Exposure Limits (PELs) Table Z-1	glycerol	Glycerin (mist)- Total dust	15 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	glycerol	Glycerin (mist)- Respirable fraction	5 mg/m3	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	glycerol	Glycerin (mist)	Not Available	Not Available	Not Available	See Appendix D

Emergency Limits

Ingredient	TEEL-1	TEEL-2	TEEL-3
1,3,3,3-tetrafluoropropene	1,400 ppm	Not Available	Not Available
propylene carbonate	34 mg/m3	370 mg/m3	2,200 mg/m3
diethylene glycol	6.9 ppm	140 ppm	860 ppm
glycerol	45 mg/m3	180 mg/m3	1,100 mg/m3
nitrogen	7.96E+05 ppm	8.32E+05 ppm	8.69E+05 ppm

Ingredient	Original IDLH	Revised IDLH
1,3,3,3-tetrafluoropropene	Not Available	Not Available
propylene carbonate	Not Available	Not Available
diethylene glycol	Not Available	Not Available
tris(2-chloroisopropyl)phosphate	Not Available	Not Available
N-methyldicyclohexylamine	Not Available	Not Available
glycerol	Not Available	Not Available
nitrogen	Not Available	Not Available

Occupational Exposure Banding

Ingredient	Occupational Exposure Band Rating	Occupational Exposure Band Limit
propylene carbonate	E	≤ 0.1 ppm
diethylene glycol	E	≤ 0.1 ppm
tris(2-chloroisopropyl)phosphate	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	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk.
Individual protection measures, such as personal protective equipment	
Eye and face protection	▸ Safety glasses with side shields. ▸ Chemical goggles. [AS/NZS 1337.1, EN166 or national equivalent] ▸ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants.
Skin protection	See Hand protection below
Hands/feet protection	▸ When handling sealed and suitably insulated cylinders wear cloth or leather gloves.
Body protection	See Other protection below
Other protection	▸ Protective overalls, closely fitted at neck and wrist. ▸ Eye-wash unit. ▸ Ensure availability of lifeline in confined spaces.

Respiratory protection

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

- Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the 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

Continued...

Appearance	Not Available		
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 (°C)**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Available
Flash point (°C)	>200	**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 (1%)**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	37 when mixed as intended
Heat of Combustion (kJ/g)	Not Available	**Ignition Distance (cm)**	Not Available
Flame Height (cm)	Not Available	**Flame Duration (s)**	Not Available
Enclosed Space Ignition Time Equivalent (s/m3)	Not Available	**Enclosed Space Ignition Deflagration Density (g/m3)**	Not Available
Nanoform Solubility	Not Available	**Nanoform Particle Characteristics**	Not Available
Particle Size	Not Available		

SECTION 10 Stability and reactivity

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

SECTION 11 Toxicological information

Information on toxicological effects

Inhaled	The material is not thought to produce respiratory irritation (as classified by EC Directives using animal models). Nevertheless inhalation of the material, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress. 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. 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. Inhalation of the vapour is hazardous and may even be fatal 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. Inhalation of toxic gases may cause: ▸ 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.
Ingestion	Accidental ingestion of the material may be damaging to the health of the individual. Not normally a hazard due to physical form of product. Considered an unlikely route of entry in commercial/industrial environments
Skin Contact	This material can cause inflammation of the skin on contact in some persons. The material may accentuate any pre-existing dermatitis condition Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions. Open cuts, abraded or irritated skin should not be exposed to this material Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected. Fluorocarbons remove natural oils from the skin, causing irritation, dryness and sensitivity.
Eye	This material can cause eye irritation and damage in some persons. Not considered to be a risk because of the extreme volatility of the gas.
Chronic	Repeated or long-term occupational exposure is likely to produce cumulative health effects involving organs or biochemical systems. Ample evidence from experiments exists that there is a suspicion this material directly reduces fertility.

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	The reactivity of an epoxide intermediate may be the reason for the cancer-causing properties of halogenated oxiranes. It is reported that 1,1-dichloroethyne, vinyl chloride, trichloroethylene, tetrachloroethylene and chloroprene all cause cancer. Generally speaking, substances with one halogen substitution show higher potential to cause cancer compared to substances with two. Main route of exposure to the gas in the workplace is by inhalation. There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment. Fluorocarbons can cause an increased risk of cancer, spontaneous abortion and birth defects.

FSI Controlled Environment Formulation B-Side

TOXICITY	IRRITATION
Not Available	Not Available

1,3,3,3-tetrafluoropropene

TOXICITY	IRRITATION
Inhalation (Rat) LC50: >1157.752 ppm4h[2]	Skin: no adverse effect observed (not irritating)[1]

propylene carbonate

TOXICITY	IRRITATION
Dermal (rabbit) LD50: >=2000 mg/kg[1]	Eye (Rodent - rabbit): 60mg - Moderate
Oral (Rat) LD50: >5000 mg/kg[1]	Eye: adverse effect observed (irritating)[1]
	Skin (Human): 100mg/3D (intermittent) - Moderate
	Skin (Rodent - rabbit): 500mg - Moderate
	Skin: no adverse effect observed (not irritating)[1]

diethylene glycol

TOXICITY	IRRITATION
Dermal (rabbit) LD50: 11890 mg/kg[2]	Eye (Rodent - rabbit): 50mg - Mild
Inhalation (Rat) LC50: >4.6 mg/l4h[1]	Eye: no adverse effect observed (not irritating)[1]
Oral (Rat) LD50: 12565 mg/kg[2]	Skin (Human): 112mg/3D (intermittent) - Mild
	Skin (Rodent - rabbit): 500mg - Mild
	Skin: no adverse effect observed (not irritating)[1]

tris(2-chloroisopropyl)phosphate

TOXICITY	IRRITATION
Dermal (rabbit) LD50: >5000 mg/kg*[2]	Eye: no adverse effect observed (not irritating)[1]
Inhalation (Rat) LC50: >4.6 mg/kl/4H*[2]	Skin: no adverse effect observed (not irritating)[1]
Intravenous (Mouse) LD50: 56 mg/kg[2]	
Oral (Rat) LD50: 1500 mg/kg[2]	

N-methyldicyclohexylamine

TOXICITY	IRRITATION
Dermal (rabbit) LD50: 323 mg/kg[2]	Not Available
Inhalation (Rat) LC50: >0.54 mg/L4h[2]	
Oral (Rat) LD50: >=267 mg/kg[1]	

glycerol

TOXICITY	IRRITATION
Dermal (Guinea Pig) LD50: 58500 mg/kg[1]	Eye (Rodent - rabbit): 500mg/24H - Mild
Inhalation (Rat) LC50: >5.85 mg/L4h[1]	Eye: no adverse effect observed (not irritating)[1]
Oral (Mouse) LD50; 4090 mg/kg[2]	Skin (Rodent - rabbit): 500mg/24H - Mild
	Skin: no adverse effect observed (not irritating)[1]

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***

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).
PROPYLENE CARBONATE	**WARNING:** This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

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	for propylene carbonate: Numerous adequate and reliable acute toxicity tests are available on propylene carbonate. Oral and dermal tests meet OECD and EPA test guidelines. Propylene carbonate is practically nontoxic following acute exposures; the oral LD50 is >.5000 mg/kg and the dermal LD50 is >3000 mg/kg.
DIETHYLENE GLYCOL	Diglycolic acid is formed following the oxidation of accidentally ingested diethylene glycol in the body and can lead to severe complications with fatal outcome.
tris(2-chloroisopropyl)phosphate	Non-chlorinated triphosphates have varying chemical, physical, toxicological and environmental properties. Blooming has been identified as a source of potential exposure (human and environmental) to triphosphate plasticisers / flame retardants. Blooming is the movement of an ingredient in rubber or plastic to the outer surface after curing. For tris(2-chloro-1-methylethyl)phosphate (TCPP) The flame retardant product supplied in the EU, marketed as TCPP, is actually a reaction mixture containing four isomers. The individual isomers in this reaction mixture are not separated or marketed. The individual components are never produced as such. Alkyl esters of phosphoric acid exhibit a low to moderate acute toxicity and metabolised. From studies done on mice, they are not likely to cause gene damage or affect reproduction. However, 2-ethylhexanoic acid produced an effect on newborn rats at high doses to the pregnant female.
N-METHYLDICYCLOHEXYLAMINE	Somnolence, convulsions recorded. When applied to the skin of male rabbits, most adverse effects were observed within an hour after treatment and lasted several hours. The onset of paralysis occurred between several hours and two days after treatment. Paralysis affected only the hindlimbs in some rabbits and affected both the forelimbs and hindlimbs in others. Sensitisation: After identification of the slightly irritating and the non-irritating test article concentrations in the primary irritation experiments, a main study was performed with the selected test article concentrations. The experimental animals were intradermally injected with a 5 % concentration and epidermally exposed to the undiluted test substance while the control animals were similarly treated, but with the vehicle only. Immediately after the epidermal exposure, the skin irritation was scored. The epidermal exposure the induction phase resulted in severe skin irritation.The epidermal exposure in the challenge phase resulted in one positive sensitisation reaction in response to the 10 % test article concentration. Under the conditions used in this study, the substance produced sensitisation rate of 5 %. Based on these results and according to the EEC criteria for classification and labelling requirements for dangerous substances and preparations (EEC Directive 91/325/EEC, Amendment to Annex VI of the EEC Directive 67/548/EEC), POLYCAT 12 need not be labelled as a skin sensitiser. Repeat dose toxicity: The test substance caused significant changes of clinical status of animals (mainly convulsions accompanied with marked salivation). These clinical findings were detected in both sexes at the highest dose level. At the middle dose level these symptoms were recorded only sporadically and at the lowest dose level only salivation in males was observed. Genetic toxicity: in vitro The test compound did not demonstrate genetic activity in any of the assays conducted in this evaluation and was considered not mutagenic under these test conditions. Genetic toxicity: in vivo N-methyldicyclohexylamine did not increase the frequency of aberrant cells in rat bone marrow. Toxicity to reproduction: Based on the Reproduction/Developmental toxicity screening test (OECD Guideline 421), NOAEL (offsprings): 40 mg/kg bw/day (male/female), NOAEL (P): 40 mg/kg bw/day (male/female) Developmental; toxicity/ teratogenicity: *REACh Dossier Overexposure to most of these materials may cause adverse health effects. Many amine-based compounds can cause release of histamines, which, in turn, can trigger allergic and other physiological effects, including constriction of the bronchi or asthma and inflammation of the cavity of the nose. Whole-body symptoms include headache, nausea, faintness, anxiety, a decrease in blood pressure, rapid heartbeat, itching, reddening of the skin, urticaria (hives) and swelling of the face, which are usually transient. There are generally four routes of possible or potential exposure: inhalation, skin contact, eye contact, and swallowing. Inhalation: Inhaling vapours may result in moderate to severe irritation of the tissues of the nose and throat and can irritate the lungs. Higher concentrations of certain amines can produce severe respiratory irritation, characterized by discharge from the nose, coughing, difficulty in breathing and chest pain. The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis. The material may produce respiratory tract irritation, and result in damage to the lung including reduced lung function.
GLYCEROL	At very high concentrations, evidence predicts that glycerol may cause tremor, irritation of the skin, eyes, digestive tract and airway. Otherwise it is of low toxicity. There is no significant evidence to suggest that it causes cancer, genetic, reproductive or developmental toxicity.
NITROGEN	No significant acute toxicological data identified in literature search.
FSI Controlled Environment Formulation B-Side & 1,3,3,3-TETRAFLUOROPROPENE	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. 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.
PROPYLENE CARBONATE & DIETHYLENE GLYCOL & N-METHYLDICYCLOHEXYLAMINE	The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.
N-METHYLDICYCLOHEXYLAMINE & GLYCEROL	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.

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

FSI Controlled Environment Formulation B-Side

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(ECx)	48h	Crustacea	>160mg/l	2

Continued...

	EC50	48h	Crustacea	>160mg/l	2
	ErC50	72h	Algae or other aquatic plants	>170mg/l	2
	LC50	96h	Fish	>117mg/l	2
	EC50	72h	Algae or other aquatic plants	>10mg/l	2
	EC50(ECx)	72h	Algae or other aquatic plants	>10mg/l	2

propylene carbonate				
Endpoint	**Test Duration (hr)**	**Species**	**Value**	**Source**
LC50	96h	Fish	1000mg/l	1
EC50	72h	Algae or other aquatic plants	>900mg/l	1
NOEC(ECx)	72h	Algae or other aquatic plants	900mg/l	1
EC50	48h	Crustacea	>1000mg/l	1

diethylene glycol				
Endpoint	**Test Duration (hr)**	**Species**	**Value**	**Source**
EC50	96h	Algae or other aquatic plants	4566mg/l	2
EC50	72h	Algae or other aquatic plants	>6500<13000mg/l	2
NOEC(ECx)	192h	Algae or other aquatic plants	800mg/l	1
EC50	48h	Crustacea	>100mg/l	2
LC50	96h	Fish	>100mg/l	4

tris(2-chloroisopropyl)phosphate				
Endpoint	**Test Duration (hr)**	**Species**	**Value**	**Source**
BCF	1008h	Fish	0.8-2.8	7
EC50	72h	Algae or other aquatic plants	82mg/l	Not Available
EC50(ECx)	96h	Algae or other aquatic plants	4mg/l	1
EC50	48h	Crustacea	65335mg/l	1
ErC50	72h	Algae or other aquatic plants	4mg/l	1
LC50	96h	Fish	56.2mg/l	Not Available
EC50	96h	Algae or other aquatic plants	4mg/l	1

N-methyldicyclohexylamine				
Endpoint	**Test Duration (hr)**	**Species**	**Value**	**Source**
EC50	72h	Algae or other aquatic plants	0.063mg/l	Not Available
EC50(ECx)	72h	Algae or other aquatic plants	0.063mg/l	Not Available
EC50	48h	Crustacea	8mg/l	Not Available
LC50	96h	Fish	62mg/l	Not Available

glycerol				
Endpoint	**Test Duration (hr)**	**Species**	**Value**	**Source**
EC0(ECx)	24h	Crustacea	>500mg/l	1
LC50	96h	Fish	>11mg/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***

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.
Wastes resulting from use of the product must be disposed of on site or at approved waste sites.
In addition to carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), 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 (HCFs) or totally fluorinated (PFCs) as well as sulfur hexafluoride (SF_6). The greenhouse potential of these substances, expressed as multiples of that of CO_2, are within the range of 140 to 11,700 for HFCs, from 6500 to 9,200 for PFCs and 23,900 for SF_6.
DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
propylene carbonate	HIGH	HIGH
diethylene glycol	LOW	LOW
tris(2-chloroisopropyl)phosphate	HIGH	HIGH
N-methyldicyclohexylamine	HIGH	HIGH
glycerol	LOW	LOW

Bioaccumulative potential

Continued...

Ingredient	Bioaccumulation
propylene carbonate	LOW (LogKOW = -0.41)
diethylene glycol	LOW (BCF = 180)
tris(2-chloroisopropyl)phosphate	LOW (BCF = 4.6)
N-methyldicyclohexylamine	LOW (LogKOW = 3.71)
glycerol	LOW (LogKOW = -1.76)
nitrogen	LOW (LogKOW = 0.67)

Mobility in soil

Ingredient	Mobility
propylene carbonate	LOW (Log KOC = 14.85)
diethylene glycol	HIGH (Log KOC = 1)
tris(2-chloroisopropyl)phosphate	LOW (Log KOC = 1278)
N-methyldicyclohexylamine	LOW (Log KOC = 325)
glycerol	HIGH (Log KOC = 1)

Other adverse effects

No evidence of ozone depleting properties were found in the current literature.

SECTION 13 Disposal considerations

Waste treatment methods

Product / Packaging disposal	▸ 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.

SECTION 14 Transport information

Labels Required

Marine Pollutant	NO

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

Land transport (DOT)

14.1. **UN number or ID number**	3500
14.2. **UN proper shipping name**	Chemical under pressure, n.o.s. (Hydrofluoroolefin, Nitrogen)
14.3. **Transport hazard class(es)**	Class: 2.2 Subsidiary Hazard: Not Applicable
14.4. **Packing group**	Not Applicable
14.5. **Environmental hazard**	Not Applicable
14.6. **Special precautions for user**	Hazard Label: 2.2 Special provisions: 362, T50, TP40

Air transport (ICAO-IATA / DGR)

14.1. **UN number**	3500
14.2. **UN proper shipping name**	Chemical under pressure, n.o.s. * (Hydrofluoroolefin, Nitrogen)
14.3. **Transport hazard class(es)**	ICAO/IATA Class: 2.2 ICAO / IATA Subsidiary Hazard: Not Applicable ERG Code: 2L
14.4. **Packing group**	Not Applicable
14.5. **Environmental hazard**	Not Applicable
14.6. **Special precautions for user**	Special provisions: A187 Cargo Only Packing Instructions: 218

Continued...

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)

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

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

Not Applicable

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

Product name	Group
1,3,3,3-tetrafluoropropene	Not Available
propylene carbonate	Not Available
diethylene glycol	Not Available
tris(2-chloroisopropyl)phosphate	Not Available
N-methyldicyclohexylamine	Not Available
glycerol	Not Available
nitrogen	Not Available

14.7.3. Transport in bulk in accordance with the IGC Code

Product name	Ship Type
1,3,3,3-tetrafluoropropene	Not Available
propylene carbonate	Not Available
diethylene glycol	Not Available
tris(2-chloroisopropyl)phosphate	Not Available
N-methyldicyclohexylamine	Not Available
glycerol	Not Available
nitrogen	Not Available

SECTION 15 Regulatory information

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

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)

propylene carbonate is found on the following regulatory lists

US DOE Temporary Emergency Exposure Limits (TEELs)
US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

diethylene glycol is found on the following regulatory lists

US - Pennsylvania - Hazardous Substance List
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)

tris(2-chloroisopropyl)phosphate is found on the following regulatory lists

US - California - Biomonitoring - Priority Chemicals
US New York City Community Right-to-Know: List of Hazardous Substances
US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

Continued...

N-methyldicyclohexylamine is found on the following regulatory lists

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

glycerol is found on the following regulatory lists

US - Massachusetts - Right To Know Listed Chemicals
US - New Jersey Right to Know Hazardous Substances
US - Pennsylvania - Hazardous Substance List
US DOE Temporary Emergency Exposure Limits (TEELs)
US NIOSH Recommended Exposure Limits (RELs)
US OSHA Permissible Exposure Limits (PELs) Table Z-1
US OSHA Permissible Exposure Limits (PELs) Table Z-1 (Spanish)
US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

nitrogen is found on the following regulatory lists

US - Massachusetts - Right To Know Listed Chemicals
US - New Jersey Right to Know Hazardous Substances
US - Pennsylvania - Hazardous Substance List
US DOE Temporary Emergency Exposure Limits (TEELs)
US New York City Community Right-to-Know: List of Hazardous Substances
US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

Additional Regulatory Information

Not Applicable

Federal Regulations

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Section 311/312 hazard categories

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

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

None Reported

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

None Reported

Additional Federal Regulatory Information

Not Applicable

State Regulations

US. California Proposition 65

WARNING: This product can expose you to chemicals including 1,4-dioxane, which is known to the State of California to cause birth defects or other reproductive harm. Formore information, go to www.P65Warnings.ca.gov.

Additional State Regulatory Information

Continued...

Not Applicable

National Inventory Status

National Inventory	Status
Australia - AIIC / Australia Non-Industrial Use	Yes
Canada - DSL	Yes
Canada - NDSL	No
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	No (nitrogen)
Korea - KECI	No (N-methyldicyclohexylamine)
New Zealand - NZIoC	No (1,3,3,3-tetrafluoropropene)
Philippines - PICCS	No (1,3,3,3-tetrafluoropropene)
USA - TSCA	All chemical substances in this product have been designated as TSCA Inventory 'Active'
Taiwan - TCSI	Yes
Mexico - INSQ	No (1,3,3,3-tetrafluoropropene; N-methyldicyclohexylamine)
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	12/06/2024
Initial Date	12/15/2019

CONTACT POINT

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.

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