SAFETY DATA SHEET

Date: 27 September 2021
Revision No.: 0

United States Hazard Communication Standard 29 CFR 1910.1200 (2012)
Canada Hazardous Products Regulations (SOR/2015-17)
NORMA MEXICANA NOM-018-STPS-2015

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

1.1 Product identifier

Product name: Klea R-473A

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

Recommended use(s): Low Temperature Refrigerant

Restrictions on use(s): Industrial/professional uses only; all other uses forbidden

1.3 Details of the supplier of the safety data sheet

Suppliers:	Koura Global 950 Winter Street, South Entrance Waltham, MA 02451 USA	Mexichem Fluor, S.A. de C.V. Matamoros-Reynosa Km. 4.5 Ejido Las Rusias Matamoros, Tam. Mexico. C.P. 87560
Telephone:	+1 (508) 259-4483	+52 (868) 811-10-05 (Office) +52 (868) 811-10-45 (Plant)

1.4 Emergency telephone number

24-hour Emergency Telephone: +1 (225) 642-6316 (USA)
+52 (868) 811-10-05 (Mexico)

Alternative Emergency Telephone: CHEMTREC: +1 (800) 424-9300 (USA)
International CHEMTREC: +1 (703) 527-3887

2. HAZARDS IDENTIFICATION:

2.1 Classification of substance or mixture

Classification in accordance with GHS as implemented by United States Hazard Communication Standard 29 CFR 1910.1200 (2012), Canada Hazardous Products Regulations (SOR/2015-17), and NORMA MEXICANA NOM-018-STPS-2015

Gases Under Pressure	Liquefied Gas
Simple asphyxiant	Category 1

2.2 Label Elements

Hazard pictogram:	 GHS04
Signal word:	Warning
Hazard statements:	H280 - Contains gas under pressure; may explode if heated May displace oxygen and cause rapid suffocation
Precautionary statements:	**Prevention** P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking P261: Avoid breathing gas P262: Do not get in eyes, on skin, or on clothing P271: Use only outdoors or in a well-ventilated area P280: Wear protective gloves, eye protection and/or face protection **Response** P302 + P353 + P336 - If on skin: rinse with water, thaw frosted parts with lukewarm water and do not rub affected areas P305 + P351 + P338 - If in eyes: rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing P304 – If inhaled, remove victim to fresh air, keep at rest, and seek medical attention if necessary P381: In case of leakage eliminate all ignition sources **Storage** P410 + P403: Protect from sunlight. Store in a well-ventilated place

2.3 Hazards not otherwise classified

Frostbite may occur as a result of skin or eye contact with liquid or gaseous jet

Exposure to high concentrations may cause an abnormal heart rhythm which can be fatal

Very high atmospheric concentrations may cause respiratory collapse; cardiac sensitization; cardiac arrhythmia; and, anesthetic effects such as light-headedness, dizziness, confusion, lack of coordination, drowsiness, and unconsciousness

3. COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substance

Ingredient	C.A.S. Number	Percent (%) by Weight
Carbon dioxide (R-744)	124-38-9	60

1,1-difluoroethylene (vinylidene fluoride, R-1132a)	75-38-7	20
1,1,1,2,2-pentafluoroethane (Klea®125, Fluorocarbon 125, R-125, HFC-125, HFA-125)	354-33-6	10
Trifluoromethane (R-23)	75-46-7	10

3.2 Mixture

This product is a mixture

4. FIRST AID MEASURES

4.1. Description of first aid measures

General advice: Seek medical attention. Show this safety data sheet to the doctor in attendance

Eye contact: Immediately flush with plenty of water holding eyelids open during flushing. After initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Obtain immediate medical attention

Skin contact: Immediately wash with plenty of lukewarm water to thaw affected area. Do not rub skin. Remove contaminated clothing. Caution - clothing may adhere to the skin in case of freeze burns. If irritation, blistering or other symptoms develop, get medical attention

Inhalation: Move patient to fresh air. Keep warm and at rest in a position comfortable for breathing. If breathing is labored, give oxygen. If breathing has stopped, give artificial respiration with a pocket mask equipped with a one-way valve to prevent exposure to product or body fluids. Obtain immediate medical attention

Ingestion: If swallowed, seek medical attention. Do not induce vomiting unless directed to do so by medical personnel. If patient is conscious, wash out mouth with water and give 200-300 ml (half a pint) of water to drink. In case of frostbite, immediately rinse lips and mouth with tepid water for at least 15 minutes. Obtain immediate medical attention

Note to physician: Provide symptomatic and supportive therapy, as indicated. Administration of epinephrine or similar sympathomimetic drugs should be with special caution and only in situations of emergency life support as cardiac arrhythmia may result

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/effects after eye & skin contact: May cause cold burns and/or frostbite

Symptoms/effects after inhalation:	Inhalation of high concentration may cause: respiratory collapse; cardiac sensitization; cardiac arrhythmia; and anesthetic effects - light-headedness; dizziness; confusion; lack of coordination; drowsiness; unconsciousness
Symptoms/effects after ingestion:	May cause burns similar to frostbite

4.3. Indication of any immediate medical attention and special treatment needed

Notes to physician	See section 4.1 above
Protection of first-aid responder:	No action should be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation

5. FIRE-FIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media	Product is not flammable in air under ambient temperature and pressure conditions. Use extinguishing media appropriate for surrounding fire Use water spray to cool containers exposed to fire
Unsuitable extinguishing media	None known

5.2. Special hazards arising from the substance or mixture

Specific hazards	When heated product can form toxic and corrosive gases such as hydrogen fluoride. Vapors may form explosive mixtures with air The vapor/gas is heavier than air and may spread along the ground. Heavy vapor may suffocate Containers may burst under intense heat. Ruptured cylinders may rocket or fragment
Hazardous combustion products	Fluorinated compounds including hydrogen fluoride (HF); carbon dioxide; carbon monoxide

5.3. Advice for firefighters

Special protective equipment for fire-fighters	Wear full protective acid resistant suit and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Fire-fighting equipment should be thoroughly decontaminated after use

Special procedures for fire-fighting	Remove personnel immediately from the incident area. Approach from upwind. Move containers from fire area only if safe to do so. Fight fire from a protected location to shield personnel from venting or ruptured containers. After the fire, proceed rapidly to clean the surfaces exposed to the fumes in order to limit the damage to the equipment.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

This product is a liquefied gas, which exits the container at temperatures capable of causing freeze burns (frostbite). Precautions should take into account the severity of the leak or spill. Use recommended personal protection

Evacuate/secure area. Approach from upwind. Ventilate the spill area. Eliminate all sources of ignition, and do not generate flames or sparks. Shut off the leak, if safe to do so. If possible, elevate leak position to highest point of container (container should leak gas, not liquid). Water should never be put on leak nor should cylinder be immersed in water

Refer to other sections of this SDS for information regarding physical and health hazards, respiratory protection, ventilation, and personal protective equipment

6.2. Environmental precautions

Prevent liquid from entering drains, sewers, basements and ditches as the vapor/gas is heavier than air and may create a suffocating atmosphere

6.3. Methods and material for containment and cleaning up

Local or national regulations may apply to releases and disposal of this product, as well as those materials and items employed in the cleanup of releases. Notify applicable government authorities if release is reportable or could adversely affect the environment

7. HANDLING AND STORAGE

7.1. Precautions for safe handling

Advice on safe handling	Do not handle until all safety precautions have been read and understood. Use only equipment and materials which are compatible with the product. Wear appropriate personal protective equipment. A safety shower and eyewash station should be nearby and ready for use This product is a liquefied gas, which exits the container at temperatures capable of causing freeze burns/frostbite (refer to Section 4). Ensure personnel are trained in handling and storing cylinders Secure containers at all times. Never attempt to lift cylinder by its cap. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement

Prevent backflow into the gas tank. Open the valves slowly to prevent pressure surges. Avoid trapping liquid between closed valves or overfilling containers as high pressures can develop with an increase in temperature. Close valve after each use and when empty

Do not change or force fit connections. Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems

Liquid transfers between containers may generate static electricity. Ensure adequate grounding. Do not use compressed air for transferring or handling the product. Purge piping circuits and equipment with nitrogen

Do not put mixtures of this product with air or oxygen under pressure; do not use such mixtures for leak or pressure testing

Prevent liquid or vapor from entering sumps or sewers since vapor is heavier than air and may form suffocating atmospheres

Caution: certain types of desiccants traditionally used to absorb moisture in common refrigerants such as HCFC-22 and HFC-134a may also absorb the R-23 component of this product. This may lead to excessive temperatures, decomposition of the product, and potentially produce hydrogen fluoride. Check compatibility with desiccant supplier

General hygiene considerations: Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment. Wear appropriate personal protective equipment (refer to Section 8). Eating, drinking and smoking prohibited in areas where this material is handled, stored and processed. Remove contaminated clothing and protective equipment before entering eating areas. Wash contaminated clothing before reuse

7.2. Conditions for safe storage, including any incompatibilities

Conditions for Safe Storage: Store in accordance with national and regional regulations

General information: Cylinders should be stored upright and firmly secured to prevent falling. Keep containers tightly closed, in a cool, well-ventilated place. Store at temperature not exceeding 125°F (52°C). Keep container closed when not in use. Keep containers dry. Keep in properly labelled containers

Do not store near combustible materials, open flames, hot surfaces, welding operations, and other heat sources. Do not store near incompatible products (refer to Section 10)

Do not store near the intake of air conditioning units, boiler units or open drains

Keep away from direct sunlight, salt or other corrosive materials. Keep away from finely divided metals such as aluminum, zinc, magnesium, and alloys containing

more than 2% magnesium. Can react violently if in contact with alkali metals and alkaline earth metals, such as sodium, potassium, or barium

8. EXPOSURE CONTROL/PERSONAL PROTECTION

8.1. Control parameters

Exposure limit values: No specific (inter)national regulations/recommendations identified for this product. The table below is a summary of exposure limits for specific components of this mixture. Please see the specific legislation for complete information. Consult your local authorities for acceptable exposure recommendations/limits

USA OSHA Permissible Exposure Level (PEL)	5,000 ppm, TWA; carbon dioxide (R-744)
USA ACGIH Threshold Limit Values (TLV)	5,000 ppm, TWA; carbon dioxide (R-744) 30,000 ppm, STEL; carbon dioxide (R-744) 500 ppm, TWA; 1,1-difluoroethylene (R1132a)
USA NIOSH Recommended Exposure Level (REL)	5,000 ppm, TWA; carbon dioxide (R-744) 30,000 ppm, STEL; carbon dioxide (R-744) 40,000 ppm, IDLH; carbon dioxide (R-744) 1 ppm, TWA; 1,1-difluoroethylene (R1132a) 5 ppm Ceiling; 1,1-difluoroethylene (R1132a)
American Industrial Hygiene Association (AIHA) Workplace Environmental Exposure Level (WEEL)	1,000 ppm, TWA; 1,1,1,2,2-pentafluoroethane (R-125)
Mexichem Flúor/Koura Global - Internal Company Exposure Limit	1,700 ppm, TWA; Klea R-473A

8.2. Exposure controls

Appropriate engineering controls	Provide appropriate local exhaust ventilation to reduce airborne exposure to below relevant occupational exposure limits and/or to control dust/fume/gas/mist/vapors/spray. Use respiratory protection equipment, if engineering controls are not adequate. Ensure easy access to eyewash station, safety showers, firefighting and emergency equipment
Respiratory protection	Respiratory protection complying with an approved standard should be worn if a risk assessment indicates inhalation exposure is possible. If a respirator is needed, use respirators as part of a full respiratory protection program. Use a NIOSH/MSHA or European Standard EN 137 approved respirator, if exposure limits are exceeded. Use a positive pressure, full face, air-supplied respirator if there is a potential for over exposure from an uncontrolled release, exposure levels are not known, or under any other

	circumstances where air-purifying respirators may not provide adequate protection. Note: Vapors are heavier than air and can cause suffocation by reducing oxygen available for breathing
Skin/hand protection	Select and use thermal insulating gloves and/or protective clothing approved to relevant local standards to prevent skin contact and to prevent skin from becoming frozen from contact with liquid product Gloves must be inspected prior to use. User should verify impermeability under normal conditions of use prior to general use. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands after gloves are removed Additional skin protection such as an apron, arm covers or full body suit may be required depending on use conditions
Eye/face	Wear chemical safety googles or a full-face shield with indirect vented safety goggles. Use of contact lenses prohibited

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical state and appearance	Clear, colorless liquefied gas
Odor	Odorless
Odor threshold	Not applicable
Melting point	Not applicable
Boiling point	-87.7°C to -82.7°C (-125.9°F to -116.9°F) boiling range
Flash point	Not applicable
Flammability (solid, gas)	Not flammable
Upper explosive limit	Not applicable
Lower explosive limit	Not applicable
Vapor pressure	720 psig at 20°C
Vapor density	0.141 lb/ft^3 (1.87 spgr # 20°C to Air = 1)
Density	46.2 at 20°C
Specific gravity (relative density)	No information available
Solubility(ies)	Insoluble in water Soluble in alcohols, chlorinated solvents esters
Partition coefficient	No data available
Auto-ignition temperature	No data available
Decomposition temperature	No data available

10. STABILITY AND REACTIVITY

No specific stability or reactivity information for the product. Information provided below for components of the mixture.

10.1. Reactivity

1,1-difluoroethylene: May react violently with hydrogen chloride and aluminum chloride. Alkyl boron and alkyl hyponitrite compounds initiate polymerization. Forms peroxides on exposure to pure oxygen. Contact with strong bases or alkaline materials may cause violent reactions or explosions

1,1,1,2,2-pentafluoroethane: May be incompatible with strong oxidizing and reducing agents. May be incompatible with many amines, nitrides, azo/diazo compounds, alkali metals, and epoxides. Can react violently if in contact with alkali metals and alkaline earth metals

Trifluoromethane: May react violently with strong reducing agents such as the very active metals and the active metals. Will oxidize with strong oxidizing agents and under extremes of temperature

10.2. Chemical stability

Product stable at ambient temperatures in closed containers, under the conditions and use, as directed

10.3. Possibility of hazardous reactions

See Section 10.1

10.4. Conditions to avoid

Extremes of temperature (i.e., heat and cold). Contact with flames, very hot surfaces, or sparks. Oxygen enriched environment. Elevated pressure above atmospheric pressure

10.5. Incompatible materials

Alkaline earth metals (i.e., beryllium, magnesium, calcium, strontium, barium and radium). Powdered metals. Light and/or alkaline metals (e.g., aluminum, titanium, lithium, sodium, potassium, etc.). Oxidizing and reducing agents. Strong bases. Finely divided metals such as aluminum, zinc, magnesium, and alloys containing more than 2% magnesium

10.6. Hazardous decomposition products

Hydrogen, hydrogen fluoride, carbon monoxide, toxic vapor and/or gas

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Note: Specific toxicology testing has not been conducted on this product. Toxicology information provided on components of this mixture

Carbon Dioxide (R-744)
Important Information: Vapor is heavier than air. May displace oxygen and cause rapid suffocation. Exposure to high concentrations may cause: frostbite; headaches; drowsiness; dizziness; paresthesia; difficulty breathing (dyspnea); abnormal heart rhythm (arrhythmia); convulsions; coma; asphyxia/death. May

cause cold burns/frostbite, penetrating through protective gloves/clothing	
Acute toxicity - oral	Study not feasible; substance is a gas
Acute toxicity - dermal	Study not feasible; substance is a gas
Acute toxicity - inhalation	Calculated LC50 (4hr) < 159,000 ppm (rat) (OECD Guideline TG 403 - Acute Inhalation Toxicity)
Skin corrosion/irritation	Study not feasible; substance is a gas
Serious eye damage/irritation	Study not feasible; substance is a gas
Skin sensitization	Study not feasible; substance is a gas
Cardiac sensitization	NOAEL - 30,000 ppm (15-minute TWA) (human)
Genotoxicity	No data available
Carcinogenicity	No data available
Anesthetic effects	NOAEL - 50,000 ppm (human) Acute toxicity limit - 40,000 ppm (human)

1,1 difluoroethylene (R-1132a)	
Acute toxicity - oral	Study not feasible; substance is a gas
Acute toxicity - dermal	Study not feasible; substance is a gas
Acute toxicity - inhalation	LCLo (1 hr) > 200 000 ppm (rat) (Similar to OECD Guideline 403 (Acute Inhalation Toxicity)
Skin corrosion/irritation	Study not feasible; substance is a gas
Serious eye damage/irritation	Study not feasible; substance is a gas
Skin sensitization	Study not feasible; substance is a gas
Cardiac sensitization	Calculated NOEL - 50,000 ppm (dog)
Germ cell mutagenicity Genotoxicity – in vitro	Negative (Some activity shown in an Ames test, negative in the in vitro chromosomal aberration and gene mutation study in mammalian cells)
Germ cell mutagenicity Genotoxicity – in vivo	Negative (Mouse micronucleus & Drosophila SLRL test)
Reproductive/developmental toxicity	Inhalation NOAEL $\geq$ 10,000 ppm (rat) (Similar to OECD Guideline 414 - Prenatal Developmental Toxicity Study)
Teratogenic toxicity	Inhalation NOAEL $\geq$ 10,000 ppm (rat) (Similar to OECD Guideline 414 - Prenatal Developmental Toxicity Study)
Specific target organ toxicity (STOT) - single exposure	No data available
Specific target organ toxicity (STOT) - repeated exposure - inhalation	NOAEC - 10,000 ppm (26,000mg/m3) (rat) (OECD Guideline 453 - Combined Chronic Toxicity / Carcinogenicity Studies)
Carcinogenicity	Not carcinogenic NOAEC – 10,000 ppm (26,000 mg/m^3) (rat) (OECD Guideline 453 - Combined Chronic Toxicity / Carcinogenicity Studies)

1,1,1,2,2-pentafluoroethane (R-125)	
Acute toxicity – oral	Study not feasible; substance is a gas
Acute toxicity – dermal	Study not feasible; substance is a gas
Acute toxicity - inhalation	LCLo (4 hr) > 800,000 ppm (rat) (OECD Guideline 403 - Acute Inhalation Toxicity
Skin corrosion/irritation	Study not feasible; substance is a gas
Serious eye damage/irritation	Study not feasible; substance is a gas
Skin sensitization	Study not feasible; substance is a gas
Cardiac sensitization	Positive response observed at concentrations greater than 7.5% (dogs primed with adrenaline)
Germ cell mutagenicity Genotoxicity – in vitro	Negative (mouse lymphoma L5178Y cells) (Similar to OECD Guideline 476 - In Vitro Mammalian Cell Gene Mutation Test)
Germ cell mutagenicity Genotoxicity – in vivo	Negative (mouse) (OECD Guideline 474 (Mammalian Erythrocyte Micronucleus Test)
Developmental toxicity/teratogenicity	Inhalation NOAEL > 50,000 ppm (rabbit) OECD Guideline 414 - Prenatal Developmental Toxicity Study)
Specific target organ toxicity (STOT) - single exposure	No data available
Specific target organ toxicity (STOT) - repeated exposure - inhalation	NOAEL $\geq$ 50,000 ppm (rat) (OECD Guideline 412 - Subacute Inhalation Toxicity: 28-Day Study)
Carcinogenicity	No data available
Anesthetic effects	NOAEL = 709,000 ppm (rat)

Trifluoromethane (R-23)	
Acute toxicity - oral	Study not feasible; substance is a gas
Acute toxicity - dermal	Study not feasible; substance is a gas
Acute toxicity - inhalation	LC50 (4 hr) > 663,000 ppm (rat) (Similar to OECD Guideline 403 (Acute Inhalation Toxicity)
Skin corrosion/irritation	Study not feasible; substance is a gas
Serious eye damage/irritation	Study not feasible; substance is a gas
Skin sensitization	Study not feasible; substance is a gas
Cardiac sensitization	Negative at concentrations up to 30% in air (dog)
Germ cell mutagenicity Genotoxicity – in vitro	Not Mutagenic (mouse lymphoma L5178Y cells) (OECD Guideline 476 - In Vitro Mammalian Cell Gene Mutation Test))
Germ cell mutagenicity Genotoxicity – in vivo	Not Mutagenic (Mouse micronucleus via inhalation) (OECD Guideline 474 - Mammalian Erythrocyte Micronucleus Test)
Reproductive/developmental toxicity	Inhalation NOEL - 50,000 ppm (rat) (OECD Guideline 414 - Prenatal Developmental Toxicity Study)
Teratogenic toxicity	No data available

Specific target organ toxicity (STOT) - single exposure	No data available
Specific target organ toxicity (STOT) - repeated exposure - inhalation	LOAEL & NOAEL > 10,000 ppm (rat) (Experimental Study)
Carcinogenicity	No data available
Anesthetic effects	NOEL - 51,000 ppm (rat) (OECD Guideline 414 - Prenatal Developmental Toxicity Study)

Carcinogenicity

IARC: No component of this product, present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC

ACGIH: No component of this product, present at levels greater than or equal to 0.1% is identified as confirmed animal, suspected human or confirmed human carcinogen by ACGIH. See note below*

NTP: No component of this product, present at levels greater than or equal to 0.1% has been classified as carcinogenic by NTP

OSHA: No component of this product, present at levels greater than or equal to 0.1% is identified as carcinogen by OSHA

*Note: ACGIH Determination for Fluoride (as F) - A4, Not Classifiable as a Human Carcinogen

12. ECOLOGICAL INFORMATION

Note: Specific ecotoxicology testing has not been conducted on this product. Ecotoxicity data provided for components of this product

1,1 difluoroethylene (R-1132a)	
Acute toxicity	Calculated LC50 (48-hrs) - 250 mg/L (estimated) (Daphnids)
	Calculated LC50 (96 hr) - 246 mg/L (estimated) (freshwater fish)
	Calculated EC50 (96-hr) - 150 mg/L (estimated) (green algae)
Persistence and degradability	Not expected to be persistent Not expected to be readily biodegradable (based on structural analogues - pentafluoroethane and vinylidine chloride)
Bioaccumulative potential	log Kow = 1.24 No bioaccumulation potential – low log Kow value

Mobility in soil	Gas under all environmental conditions; only slightly soluble in water. Any deposition to land or water will result in rapid redistribution to air due to its volatility and low sorption to soil
Results of PBT and vPvB assessment	Does not fulfill the screening criteria for vPvB or PBT substance
Hydrolysis	Not expected under normal environmental conditions

1,1,1,2,2-pentafluoroethane (R-125)	
Acute toxicity *(based on structurally analogue substances - 1,1,1,2 -tetrafluoroethane, 1,1,1 - trifluoroethane, 1,1,1,3,3 - pentafluoropropane and 1,1,1,2,2 - pentafluorobutane)	*LC50 (48-hr) - 100 mg/L (Daphnia magna)
	*LC50 (96 hr) - 100 mg/L (fish)
Acute toxicity to aquatic algae and cyanobacteria *read-across substances - 1,1,1,3,3- pentafluoropropane and 1,1,1,2,2 - pentafluorobutane	*EC50 (72 hr) - 114 mg/L (Selenastrum capricornutum)
Long-term toxicity	Calculated NOEC (30-day) - 32 mg/L (fish)
	EC50 (16-day) - 12 mg/L (invertebrate)
Persistence and degradability	Not readily biodegradable (OECD Guideline 301 D - Ready Biodegradability: Closed Bottle Test)
Bioaccumulative potential (aquatic & terrestrial)	log Kow = 1.48 Low bioaccumulation potential - low log Kow value
Mobility in soil	No exposure to soil expected
Hydrolysis	Stable water. Abiotic hydrolysis or phototransformation in water not considered significant degradation pathways

Trifluoromethane (R-23)	
Acute toxicity	Estimated LC50 (48-hrs) - 323.05 mg/L (Daphnia magna)
	Estimated LC50 (96 hr) - 633.26 mg/L (freshwater fish)

Acute toxicity to aquatic algae and cyanobacteria	Estimated EC50 (96-h) for freshwater algae - 154.54 mg/L Estimated EC50 (96-h) for marine water algae - 154.54 mg/L
Persistence and degradability	Not readily biodegradable (substance partitions to the air)
Bioaccumulative potential	Experimental Log Kow - 0.84 No bioaccumulation potential – low log Kow value
Mobility in soil	Direct and indirect exposure of the soil compartment is unlikely
Hydrolysis	Not expected under normal environmental conditions

13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Product	Disposal Method: The generation of waste should be avoided or minimized whenever possible. Disposal practices must be in compliance with all federal, state and local laws and regulations Discarded product is not a hazardous waste under US RCRA. 40 CFR 261. Contact a licensed professional waste disposal service to ensure proper disposal
Container	Disposal Method: Do not puncture or incinerate container/ cylinder. Return container/cylinder to supplier

NOTE: Subject to “no venting” regulations of Section 608 of the Clean Air Act during the servicing or disposal of equipment

14.TRANSPORT INFORMATION

The information below is relevant for US DOT, TDG, IMDG, IATA, and Mexico

14.1 UN Number:	3163
14.2 Proper shipping name:	LIQUEFIED GAS, N.O.S. (Carbon dioxide, 1,1-difluoroethylene, 1,1,1,2,2-pentafluoroethane, Trifluoromethane)
14.3 Transport hazard class(es) (UN):	2.2

Hazard labels (UN)**:**	
14.4 Packing group (UN):	Not applicable
14.5 Environmental hazards:	Not applicable
14.6 Other information:	Maximum quantity limits for hazardous material transport: Passenger aircraft/rail: 75 kg Cargo aircraft: 150 kg
14.7 Special precautions for user:	Consult regulations for special precautions applicable to transport outside of user's premises Transport within user's premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage
14.8 Transport in bulk according to Annex II of MARPOL and the IBC Code:	Not applicable

15. REGULATORY INFORMATION

International Inventories

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory	Complies; Listed as "Active"
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List	Complies
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances	Complies
IECSC - China Inventory of Existing Chemical Substances	Complies
PICCS - Philippines Inventory of Chemicals and Chemical Substances	Complies
AICS - Australian Inventory of Chemical Substances	Complies
TCSI – Taiwan Chemical Substance Inventory	Complies

U.S. Federal Regulations

CERLA Section 102-103 Hazardous Substance Release Notification: This material, as supplied, does not contain any substances subject to the requirements of Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302). May be subject to specific reporting requirements at the local, regional, or state level pertaining to releases of this material

EPCRA Section 302/304 Extremely Hazardous Substances: This material, as supplied, does not contain any substances subject to the requirements of the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). May be subject to specific reporting requirements at the local, regional, or state level pertaining to releases of this material

SARA 311/312 Emergency Planning and Community Right-to-Know Act (EPCRA): Subject to requirements if product is stored/used at any one time in amounts equal to or greater than 10,000 pounds

SDS requirements, product is determined to be hazardous according to the following EPA hazard categories: Simple asphyxiant; Gas under pressure

SARA Section 313 (40 CFR 372) Toxics Release Inventory: This product does not contain any chemicals subject to reporting requirements

CAA Section 112(r) (40 CFR 82): Ethene, 1,1-difluoro- (CAS No. 75-38-7); Threshold Quantity (TQ) 10,000

CAA Section 112 (40 CFR 82): This product does not contain any components listed as a Class 1 or 2 Ozone Depletor. This product is not manufactured with listed ozone depleting substances

U.S. State Regulations – Right to Know

Massachusetts	New Jersey	Rhode Island	Pennsylvania
-	Carbon dioxide Trifluoromethane Vinylidene fluoride	Carbon dioxide	Carbon dioxide

California Proposition 65: This product does not contain any Proposition 65 chemical

Canada Federal Regulations

Controlled Products Regulation (WHMIS Classification): Class A: Compressed Gas

Greenhouse Gas Reporting: This product contains the following substance subject to mandatory reporting: Carbon Dioxide - CAS No. 24-38-9; Trifluoromethane - CAS No. 75-46-7; 1,1,1,2,2-pentafluoroethane - CAS No. 354-33-6

16. OTHER INFORMATION

Glossary:

IARC: International Agency for Research on Cancer

ACGIH: American Conference of Governmental Industrial Hygienists

NTP: National Toxicology Program of the United States

NIOSH: National Institute for Occupational Safety and Health
STEL: Short-term exposure limit
IDLH: Immediately Dangerous to Life or Health
OSHA: US Occupational Safety and Health Administration
ADR: Accord eneuropeen sur le transport des merchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
RID: Reglement international concernant le transportdes marchandises dangereuses par chemin de fer (Regulations concerning the International Transport of Dangerous Goods by Rail))
IATA: International Air Transport Association
ICAO: International Civil Aviation Organization
IMDG: International Maritime Dangerous Goods
IMO: International Maritime Organization
CAS: Chemical Abstracts Service
EC_{50}: Concentration at which growth or mobilization is reduced by 50%
LC_{50}: Lethal Concentration to 50% of a test population
LD_{50}: Lethal Dose to 50% of a test population (Median Lethal Dose)
LCLo: Lowest Lethality Concentration
PBT: Persistent, Bioaccumulative and Toxic substance
vPvB: Very Persistent and Very Bioaccumulative
CAA - Clean Air Act Amendments of 1990

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