SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, REACH, European Union CLP EC 1272/2008, and the Global Harmonization Standard

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

CHEMICAL NAME; CLASS: SeAL.1

SYNONYMS: Proprietary
CHEMICAL FAMILY: Fluorinated Ethane
FORMULA: Proprietary

	Document Number: 80034
PRODUCT USE:	Various
MANUFACTURED/SUPPLIED FOR:	AIR LIQUIDE
SUPPLIER/MANUFACTURER'S NAME:	AIR LIQUIDE AMERICA
ADDRESS:	2700 Post Oak Drive Houston, TX 77056-8229
EMAIL ADDRESS FOR PRODUCT INFORMATION:	webmaster.us@airliquide.com
EMERGENCY PHONE:	CHEMTREC: (U.S., Canada) 1-800-424-9300 (24 hrs) (International) +703-527-3887 (collect-24 hrs)
BUSINESS PHONE:	General SDS Information: 1-713/896-2896 (8 am to 5 pm U.S. Central Time)

ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2010 format. This gas mixture has been classified in accordance with the hazard criteria of the CPR and the SDS contains all the information required by the CPR. The product is also classified per all applicable European Union CLP EC 1272/2008, REACH and the Global Harmonization Standard.

2. HAZARD IDENTIFICATION

GLOBAL HARMONIZATION AND EU CLP REGULATION (EC) 1272/2208 LABELING AND CLASSIFICATION: This product has been classified per GHS Standards under European regulations. For information on EU classification under (67/548/EEC), see below. This is a self-classification.

Classification: Gases Under Pressure, Flammable Gas Cat. 1
Signal Words: Danger
Hazard Statement Codes: H220, H280
Precautionary Statement Codes: P210, P377, P381, P410 + P403, P405, P501
Hazard Symbols/Pictograms: GHS02, GHS04

EU 67/548/EEC LABELING AND CLASSIFICATION: This product meets the classification of hazardous, as defined by the European Union Council Directive 67/548/EEC or subsequent Directives. This is a self-classification.

Classification: Extremely Flammable
Risk Phrase Codes: R12
Safety Phrase Codes: S9, S16, S33, S45
Hazard Symbols: F+

See Section 16 for a full definition of classification.

EMERGENCY OVERVIEW: **Product Description: DANGER!** Extremely flammable, liquefied gas. This is a colorless, extremely flammable, liquefied gas. **Health Hazards:** The primary health hazard associated with this gas is the potential for severe thermal burns from contact with flames resulting from the ignition of this gas. Depending on the severity of the burns, such exposure can be fatal. Inhalation may cause respiratory irritation. Direct skin or eye contact from rapidly released gas can cause freezing and tissue damage. High concentrations of this gas mixture can cause an oxygen-deficient environment. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. The skin of a victim of exposure may have a blue color. Under some circumstances of exposure, death may occur. Contact with rapidly expanding gases may cause frostbite. Rapid release can result in airborne objects which present a physical injury hazard. **Flammability Hazards:** This gas is extremely flammable and can ignite in the presence of any type of ignition source and can readily form explosive mixtures with air. Releases which have not ignited must be considered extremely dangerous, and should not be approached. This gas is heavier than air and can accumulate in low-lying spaces, creating an extreme fire hazard and hazard of oxygen-deficient atmosphere. When involved in a fire, this gas will decompose to produce toxic fumes including carbon oxides, carbonyl and hydrogen fluoride. **Reactivity Hazards:** This gas is not reactive under conditions of normal pressure and temperature. **Environmental Hazards:** This gas may cause harm to terrestrial and aquatic organisms if accidentally released. **Emergency Response Considerations:** Persons who respond to releases of this gas must protect themselves from inhalation of the gas, especially in areas which are downwind of the release.

3. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical Name	CAS #	EINECS or ELNICS #	MOLE %	LABEL ELEMENTS EU Classification (67/548/EEC) GHS & EU Classification (1272/2008) Risk Phrases/Hazard Statements
Proprietary Fluorinated Ethane			100%	EU 67/548/EEC Classification: Extremely Flammable Risk Phrases: R12 Symbols: F+ GHS & EU CLP 1272/2008: Classification: Gases under Pressure, Flammable Gas Cat. 1 Hazard Statement Codes: H220, H280 Hazard Symbols/Pictograms: GHS02, GHS04

See Section 16 for full text of Classification

4. FIRST-AID MEASURES

PROTECTION OF FIRST AID RESPONDERS: RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant clothing must be worn. Adequate fire protection must be provided during rescue situations. Rescuers should be taken for medical attention, if necessary. Victim(s) must be taken for medical attention. Take copy of label and SDS to physician or other health professional with victim(s).

DESCRIPTION OF FIRST AID MEASURES: Remove victim(s) to fresh air, as quickly as possible. 100% oxygen should be administered to victims of exposure to this gas as soon as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Remove and isolate contaminated clothing and shoes. Seek immediate medical attention. Take copy of label and SDS to physician or other health professional with victim(s).

Thermal Burns: In the event personnel are burned as a result a release of this product, if burns are first degree or second degree with closed blisters, flush area with cold water until pain subsides. Apply loose, moist, sterile dressings, and bandage. Treat for shock. If burns are second degree with open blisters or third degree, apply loose, dry, sterile dressings and bandage. Treat for shock. Transport victim immediately to hospital or emergency center. Burns over an area of 20% or more of body are life-threatening; medical attention should be immediately sought.

Inhalation Exposure: If inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Do not use mouth-to-mouth method; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Seek immediate medical attention.

Skin Exposure: If this gas contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 20 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention. Remove any clothing that may restrict circulation to any frozen area. Do not rub frozen parts as tissue damage may occur. As soon as practicable, place any affected area in warm water bath which has a temperature that does not exceed 105°F (40°C). NEVER USE HOT WATER. NEVER USE DRY HEAT. If area of frostbite is extensive, and if possible, remove clothing while showering with warm water. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area of the body in the armpit. Encourage victim to gently exercise the affected part while being warmed. Frozen tissue is painless and appears waxy, with a possible yellow color. Frozen tissue will become swollen, painful and prone to infection when thawed. If the frozen part of the body has been thawed by the time medical attention has been obtained, cover the area with a dry sterile dressing and a large bulky protective covering.

Eye Exposure: If this gas enters the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 20 minutes.

IMPORTANT SYMPTOMS AND EFFECTS (Acute and Chronic/Delayed): See Sections 2 (Hazard Identification) and 11 (Toxicological Information).

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE Skin conditions and respiratory disorders may be aggravated by exposure to this product and its decomposition products.

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT IF NEEDED: Treat symptoms and eliminate exposure. In case of frostbite, remove any clothing that may restrict circulation to any frozen area. Do not rub frozen parts as tissue damage may occur. As soon as practicable, place any affected area in warm water bath which has a temperature that does not exceed 105°F (40°C). NEVER USE HOT WATER. NEVER USE DRY HEAT. If area of frostbite is extensive, and if possible, remove clothing while showering with warm water. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area of the body in the armpit. Encourage victim to gently exercise the affected part while being warmed. Frozen tissue is painless and appears waxy, with a possible yellow color. Frozen tissue will become swollen, painful and prone to infection when thawed. If the frozen part of the body has been thawed by the time medical attention has been obtained, cover the area with a dry sterile dressing and a large bulky protective covering.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Extremely flammable gas; -76.2°C (-105.2°F) [predict.]

AUTOIGNITION TEMPERATURE: Not available.

FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): 3.8%; **Upper (UEL):** 10.0%

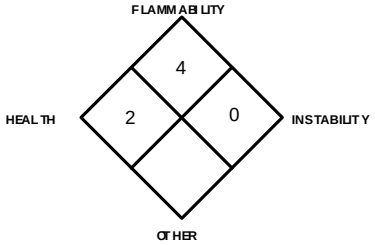
FIRE EXTINGUISHING MEDIA: Extinguish fires of this gas by shutting-off the source of the gas. Use a flooding quantity of water as a spray. Cool fire-exposed cylinders with water spray, from the maximum distance possible.

5. FIRE-FIGHTING MEASURES (Continued)

FIRE EXTINGUISHING MEDIA (continued): Carbon Dioxide and dry chemical can also be used to extinguish fires of gas.

UNSUITABLE FIRE EXTINGUISHING MEDIA: Do not use halocarbon-type fire extinguishing agents.

NFPA RATING



SPECIFIC HAZARDS ARISING FROM THE SUBSTANCE: DANGER! This gas is extremely flammable and can ignite in the presence of any type of ignition source and can readily form explosive mixtures with air. Releases which have not ignited must be considered extremely dangerous, and should not be approached. When involved in a fire, this gas will decompose to produce toxic fumes including carbon oxides, hydrogen and carbonyl fluoride.

This gas readily forms explosive mixtures with air over a very wide range. If released into a confined space, an extreme fire hazard exists. This gas is colder and/or heavier than air and may hug the ground and can travel a considerable distance to a source of ignition and flash back to leaking cylinder. Fires impinging (direct flame) on the outside surface of unprotected cylinders of this product can be very dangerous. Direct flame exposure on the cylinder wall can cause a catastrophic failure of the cylinder releasing the contents into a massive fireball and explosion. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the cylinder. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: This gas readily forms explosive mixtures with air, which are easily ignited by an electrostatic discharge.

SPECIAL PROTECTIVE ACTIONS FOR FIRE-FIGHTERS: Above 52°C (125.6°F) closed containers may rupture violently. Ruptured cylinders may rocket. Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Appropriate chemically-protective clothing may be necessary. Keep away from low-lying areas. Stay upwind. Because of the potential for a cylinder rupture during a fire, evacuation of non-emergency personnel is essential. If water is not available for cooling or protection of cylinder exposure, evacuate the area. Follow the guidelines of the North American Emergency Response Guidebook (Guide #119). If possible to do so without endangering personnel, shut off the flow of gas supporting the fire. Immediately cool the cylinders with water spray from a maximum distance. When cool, move cylinders from fire area if this can be done without risk to firefighters. Reverse flow into cylinder may cause rupture. Take care not to block pressure relief valves. Stay away from ends of tanks (but realize that shrapnel may travel in any direction). Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. In an advanced or massive fire, the area should be evacuated; use unmanned hose-holders or monitor nozzles. Do not enter without wearing specialized protective equipment suitable for the situation. If this gas is involved in a fire, run-off water should be contained to prevent possible environmental damage.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS AND EMERGENCY PROCEDURES: EVACUATE IMMEDIATE AREA. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Monitor the surrounding area for combustible vapor levels. Combustible vapor levels must be below 10% of the LEL for this gas (LEL = 3.8%) before personnel are permitted to enter the area. If necessary, ventilate area.

PERSONAL PROTECTIVE EQUIPMENT:

All Releases: Minimum Personal Protective Equipment should be **Level A: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), fully-encapsulating chemically resistant suit and boots, hard-hat, and Self Contained Breathing Apparatus.** The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus.

METHODS FOR CLEAN-UP AND CONTAINMENT:

Small Releases: Small leaks can be detected by means of an atomizer or squeeze bottle filled with soap solution. Small bubbles will show the location of the leak. Follow procedures for clean-up given under 'All Spills' below.

All Releases: Attempt to close the main source valve prior to entering the area. If this does not stop the release (or it is not possible to reach the valve), allow the gas to release in place or remove it to a safe area and allow the gas to be released there. Never apply water to a leak of this gas. Monitor the surrounding area for combustible gas levels and oxygen levels.

ENVIRONMENTAL PRECAUTIONS: Avoid release to the environment. Run-off water may be contaminated by other materials and should be contained to prevent possible environmental damage.

REFERENCE TO OTHER SECTIONS: See information in Section 8 (Exposure Controls – Personal Protection) and Section 13 (Disposal Considerations) for additional information.

7. HANDLING and USE

PRECAUTIONS FOR SAFE HANDLING: All employees who handle this gas should be trained to handle it safely. Avoid breathing gas. Wash hands after handling chemicals. Do not eat or drink while handling chemicals. All work practices should minimize the release of this gas. Be aware of any signs of dizziness or fatigue; exposure to fatal concentrations of this gas could occur without any significant warning symptoms, due to oxygen deficiency. Minimize all exposure to this gas. Non-sparking tools should be used. Do not attempt to repair, adjust, or in any other way modify the cylinders containing this gas. If there is a malfunction, or another type of operational problem, contact nearest distributor immediately. Working alone with this gas should be avoided when possible.

7. HANDLING and USE (Continued)

PRECAUTIONS FOR SAFE HANDLING (continued): All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. All areas where this gas is used should be monitored with gas detection instruments. Detection of any release should trigger immediate response and corrective action, with an alarm calling for evacuation of all personnel with the potential to be exposed. Avoid all contact with this gas. Use a check valve in the discharge line to prevent hazardous backflow. Never tamper with pressure relief devices in valves and cylinders. Any proposed use of this gas in elevated-temperature processes should be thoroughly evaluated to ensure that safe operating conditions are established and maintained. Periodic inspections of process equipment by knowledgeable persons should be made to ensure that the equipment is used appropriately and the system is kept in suitable operating condition.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Compressed gases can present significant safety hazards. The following rules are applicable to work situations in which cylinders are being used.

Before Use: Move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap (where provided) in-place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Do not use oils or grease on gas-handling fittings or equipment. Immediately contact the supplier if there are any difficulties associated with operating cylinder valve. Never insert an object (e.g., wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Never strike an arc, on a compressed gas cylinder or make a cylinder part of and electric circuit.

After Use: Close main cylinder valve. Replace valve protection cap. Mark empty cylinders "EMPTY".

CONDITIONS FOR SAFE STORAGE: Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Inc. at www.cganet.com pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers.* Local regulations may require specific equipment for storage and use. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked-over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Cylinders should be stored in dry, well-ventilated areas away from sources of heat, ignition and direct sunlight. Keep storage area clear of materials which can burn. Do not allow area where cylinders are stored to exceed 52°C (125°F). Store containers away from heavily trafficked areas and emergency exits. Store away from process and production areas, away from elevators, building and room exits or main aisles leading to exits. Protect cylinders against physical damage. Cylinders should be separated from oxygen cylinders, or other oxidizers, by a minimum distance of 20 ft., or by a barrier of non-combustible material at least 5 ft. high, having a fire-resistance rating of at least 0.5 hours. Isolate from other incompatible chemicals, such as strong oxidizers, metals, and metal oxides (refer to Section 10, Stability and Reactivity, for more information). Storage areas must meet national electrical codes for Class 1 Hazardous Areas. Post "No Smoking or Open Flames" signs in storage or use areas. Consider installation of leak detection and alarm for storage and use areas. Have appropriate extinguishing equipment in the storage area (i.e. sprinkler system, portable fire extinguishers). Keep the smallest amount on-site as is necessary.

NOTE: Use only DOT or ASME code containers designed for flammable gas storage. Close valve after each use and when empty. Earth-ground and bond all lines and equipment associated with this gas.

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA: Use the proper CGA connections, DO NOT USE ADAPTERS:

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (i.e. argon) before attempting repairs. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/CONTROL PARAMETERS:

Ventilation and Engineering Controls: Because of the high hazard associated with this gas, stringent control measures such as a gas cabinet enclosure or isolation may be necessary. Use a non-sparking, grounded, explosion-proof ventilation system separate from other exhaust ventilation systems. Ductwork should be constructed of non-metallic material, or should be lined to resist corrosion. If appropriate, install automatic monitoring equipment to detect the level of the gas.

Occupational/Workplace Exposure Limits/Guidelines:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR							
		ACGIH-TLVs		OSHA-PELs		NIOSH-RELs		NIOSH	OTHER
		TWA ppm	STEL ppm	TWA ppm	STEL ppm	TWA ppm	STEL ppm	IDLH ppm	
Proprietary Fluorinated Ethane		NE	NE	NE	NE	NE	NE	NE	NE

NE = Not Established

International Exposure Limits: Currently, the following international exposure limits are in force for this gas.

FLUOROETHANE:

Russia: STEL 1000 mg/m^3, JUN 2003

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

PROTECTIVE EQUIPMENT: *The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132, including* U.S. Federal OSHA Respiratory Protection (29 CFR 1910.134), OSHA Eye Protection 29 CFR 1910.133, OSHA Hard Protection 29 CFR 1910.138, OSHA Foot Protection 29 CFR 1910.136 and OSHA Body Protection 29 CFR1910.132)*, equivalent standards of Canada (including CSA Respiratory Standard Z94.4-02,* Z94.3-M1982, *Industrial Eye and Face Protectors and* CSA Standard Z195-02, *Protective Footwear), or standards of EU member states (including EN 529:2005 for respiratory PPE, CEN/TR 15419:2006 for hand protection, and CR 13464:1999 for face/eye protection). Please reference applicable regulations and standards for relevant details.*

Respiratory Protection: Maintain exposure levels of this gas (if applicable) and oxygen levels above 19.5% in the workplace. The use of supplied air respiratory protection is recommended when changing cylinders or working on systems containing this gas. Use supplied air respiratory protection when gas levels exceed 50% of the TLV or oxygen levels are below 19.5%, or during emergency response to a release of this product. During an emergency situation, before entering the area, check the concentration of this gas and oxygen. If necessary, use only respiratory protection authorized under appropriate regulations. In the U.S., oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard.

Eye Protection: Splash goggles or safety glasses, with a face shield for additional protection. If necessary, refer to appropriate regulations for further information.

Hand Protection: Wear leather gloves when handling cylinders of this product. Wear appropriate gloves for industrial use. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this SDS. If necessary, refer to appropriate regulations.

Body Protection: When chemical contact is possible, use splash apron, work uniform, and shoes or coverlets to prevent skin contact. Full-body chemical protective clothing is recommended for emergency response procedures. If necessary, refer to the U.S. OSHA Technical Manual (Section VII: Personal Protective Equipment) or other appropriate regulations. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in appropriate regulations.

9. PHYSICAL and CHEMICAL PROPERTIES

FORM: Liquefied gas.
COLOR: Colorless.
MOLECULAR FORMULA: Proprietary.
MOLECULAR WEIGHT: Proprietary.
ODOR: Not available.
ODOR THRESHOLD: Not available.
FREEZING POINT: -143°C (-225.4°F)
BOILING POINT: -37.1°C (-34.78°F)
SPECIFIC GRAVITY/DENSITIY, GAS (air = 1): 1.7
SPECIFIC VOLUME: Not available.
SPECIFIC GRAVITY/DENSITIY, LIQUID (water = 1): 0.78
VAPOR PRESSURE @ 20°C: 7.6 barr
FLASH POINT: Extremely flammable; -76.2°C (-105.2°F) [predict.]
AUTOIGNITION TEMPERATURE: Not available.
LOWER FLAMMABILITY LIMIT (LEL): 3.8%
UPPER FLAMMABILITY LIMIT (UEL): 10.0%
CRITICAL TEMPERATURE: 102°C (215.6°F)
pH: Not applicable.
CRITICAL PRESSURE: Not available.
EXPANSION RATIO: Not available.
SOLUBILITY IN WATER @ 20°C: 1.117e+004 [predict.]
OTHER SOLUBILITIES: Not available.
COEFFICIENT WATER/OIL DISTRIBUTION: Log P: 1.041 [predict.]
HOW TO DETECT THIS SUBSTANCE (identification properties): There are no distinctive warning properties of associated with this gas in event of identifying it in situations of a release.

10. STABILITY and REACTIVITY

CHEMICAL STABILITY: Stable under conditions of normal temperature and pressure.
DECOMPOSITION PRODUCTS: *Combustion:* Thermal decomposition produces carbon oxides, carbonyl and hydrogen fluoride. *Hydrolysis:* Contact with thermal decomposition products and moisture can produce corrosive materials.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: A very dangerous fire hazard when exposed to heat, flame, or oxidizers; explosive in the form of vapor when exposed to heat or flame. Incompatible with strong oxidizing and reducing agents. Also, may be incompatible with many amines, nitrides, azo/diazo compounds, with alkali metals, and with epoxides
POSSIBILITY OF POLYMERIZATION OR OTHER HAZARDOUS REACTION: Polymerization will not occur.
CONDITIONS TO AVOID: Avoid contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of exposure to this gas are by inhalation, eye and skin contact.

Inhalation: Low concentrations of this gas may be irritating to mucous membranes of the respiratory system. At higher concentrations the gas can ignite, causing a risk of thermal burns. High concentrations can cause an oxygen-deficient environment, especially if released in a poorly-ventilated area (e.g., an enclosed or confined space). Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of exposure, death may occur.

11. TOXICOLOGICAL INFORMATION (Continued)

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE (continued):

Inhalation (continued): The effects associated with various levels of oxygen are as follows:

CONCENTRATION OF OXYGEN	OBSERVED EFFECT
12-16% Oxygen:	Breathing and pulse rate increase, muscular coordination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

Exposure to atmospheres containing 8-10% or less oxygen will bring about unconsciousness without warning and so quickly that individuals cannot help or protect themselves. Lack of sufficient oxygen may cause serious injury or death. Chronic inhalation of oxygen-deficient atmospheres can cause damage to the heart and central nervous system.

See further in this Section for more information on frostbite hazards.

Contact with Skin or Eyes: Direct contact with the gas escaping from its pressurized cylinder can cause frostbite. Symptoms of mild frostbite include numbness, prickling and itching. Symptoms of more severe frostbite include a burning sensation and stiffness of the affected area. The skin may become waxy white or yellow. Blistering, tissue death and gangrene may also develop in severe cases. Direct eye contact with rapidly escaping gas from its high pressure cylinder may cause frostbite. Burns and permanent damage, including blindness may result. At higher concentrations this gas may ignite, causing a risk of thermal burns.

Skin Absorption: Not a significant route of exposure.

Ingestion: Not a significant route of exposure.

Other Potential Health Effects: Another health hazard presented by this is that it may ignite so rapidly, personnel in the area of a release can receive severe thermal burns. Depending on the severity of the burns, such exposure can be fatal.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	2
FLAMMABILITY HAZARD	(RED)	4
PHYSICAL HAZARD	(YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		SEE SECTION 8

For Routine Industrial Use and Handling Applications

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Exposure to this gas mixture may cause the health effects described below.

Acute: Though unlikely to occur under normal circumstances, inhalation of high concentrations of this gas may cause headache, nausea, and irritation of the upper respiratory tract. Exposure to high concentrations may result in thermal burns due to the pyrophoric nature of the gas.

Chronic: Chronic exposure to oxygen-deficient atmospheres (below 18% oxygen in air) may affect the heart and nervous system.

TARGET ORGANS: Acute: Respiratory system, skin, eyes. **Chronic:** Heart, central nervous system.

TOXICITY DATA: Currently, the following toxicity data are available for this gas.

PROPRIETARY:

LCLo (Inhalation-Rat) 26 pph/4 hours

CARCINOGENIC POTENTIAL: This gas is not listed by any agency tracking carcinogenic potential of chemical compounds. No carcinogenic studies located.

IRRITANCY OF PRODUCT: This gas may be irritating to exposed tissues.

SENSITIZATION TO THE PRODUCT: This gas is not known to be a human skin or respiratory sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Currently, there is no information on the potential human mutagenic, embryotoxic, teratogenic or reproductive effects of this gas. No animal information is available.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, no Biological Exposure Indices (BEIs) have been determined for this gas.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

The values given in this section are predicted data generated using the U.S. Environmental Protection Agency's EPISuite™.

MOBILITY: This material has not been tested for mobility in soil. The following estimated values are available.

Soil Adsorption Coefficient (PCKOCWIN v1.66): 23.74; Log Koc: 1.376

PERSISTENCE AND BIODEGRADABILITY: This material has not been tested for biodegradability or persistence. The following predicted values are available.

Probability of Rapid Biodegradation (BIOWIN v4.10):

Biowin1 (Linear Model): 0.7247 Biowin2 (Non-Linear Model): 0.911

Expert Survey Biodegradation Results:

Biowin3 (Ultimate Survey Model): 3.093 (weeks) Biowin4 (Primary Survey Model): 3.7784 (days)

MITI Biodegradation Probability:

Biowin5 (MITI Linear Model): 0.6364 Biowin6 (MITI Non-Linear Model): 0.0831

Anaerobic Biodegradation Probability:

Biowin7 (Anaerobic Linear Model): 0.7825

Ready Biodegradability Prediction: Yes

12. ECOLOGICAL INFORMATION (Continued)

PERSISTENCE AND BIODEGRADABILITY (continued):

Atmospheric Oxidation (25 deg C) [AopWin v1.92]:
Hydroxyl Radicals Reaction:
OVERALL OH Rate Constant = 0.1708 E-12 cm^3/molecule-sec
Half-Life = 62.639 Days (12-hr day; 1.5E6 OH/cm^3)
Ozone Reaction:
No Ozone Reaction Estimation
Fraction sorbed to airborne particulates (phi): 1.91E-010 (Junge,Mackay)
Note: the sorbed fraction may be resistant to atmospheric oxidation
Volatilization from Water:
Henry LC: 0.0223 atm-m^3/mole (estimated by Bond SAR Method)
Half-Life from Model River: 0.7256 hours (43.54 minutes)
Half-Life from Model Lake: 66.05 hours (2.752 days)
Removal in Wastewater Treatment:
Total removal = 89.68%
Total Biodegradation: 0.3%
Total Sludge Adsorption: 0.45%
Total to Air: 89.2%, (using 10000 hr Bio P,A,S)
Level III Fugacity Model:

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	54.3	1.11e+003	1000
Water	43.9	360	1000
Soil	1.71	720	1000
Sediment	0.0941	3.24e+003	0

Persistence Time: 141 hours

BIO-ACCUMULATION POTENTIAL: This material has not been tested for bioaccumulation potential. The following predicted values are available.

Bioaccumulation Estimates from Log Kow (BCFWIN v2.17):
Log BCF from regression-based method = 0.274 (BCF = 1.877)

ECOTOXICITY: All release to terrestrial, atmospheric and aquatic environments should be avoided as this gas may cause harm to terrestrial and aquatic organisms. No aquatic toxicity data are available for this gas.

OTHER ADVERSE EFFECTS: This gas does not have ozone depletion potential. This gas has a Global warming potential of (GWP):12 (Carbon dioxide = 1).

ENVIRONMENTAL EXPOSURE CONTROLS: Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

RESULTS OF PBT and vPvB ASSESSMENT: No data available. PBT and vPvB assessments are part of the chemical safety report required for some substances in European Union Regulation (EC) 1907/2006, Article 14.

13. DISPOSAL CONSIDERATIONS

PRECAUTIONS TO BE FOLLOWED DURING WASTE HANDLING: Wear proper protective equipment when handling waste materials.

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to Air Liquide. Do not dispose of locally. For emergency disposal, secure the cylinder and slowly discharge the gas to the atmosphere in a well-ventilated area or outdoors.

U.S. EPA WASTE NUMBER: D001 (Waste Characteristic-Ignitability)

14. TRANSPORTATION INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION REGULATIONS: This gas is classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

UN Identification Number: UN 2453
Proper Shipping Name: Ethyl Fluoride *or* Refrigerant Gas R161
Hazard Class Number and Description: 2.1 (Flammable Gas)
Dot Label(s) Required: Class 2.1 (Flammable Gas)
Packing Group: Not Applicable
North American Emergency Response Guidebook Number (2012): 115
Marine Pollutant: This gas is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is classified as Dangerous Goods, per regulations of Transport Canada. The use of the above U.S. DOT information from the U.S. 49 CFR regulations is allowed for shipments that originate in the U.S. For shipments via ground vehicle or rail that originate in Canada, the following information is applicable.

UN Identification Number: UN 2453
Proper Shipping Name: Ethyl Fluoride *or* Refrigerant Gas R161
Hazard Class Number and Description: 2.1 (Flammable Gas)
Hazard Label(s) Required: Class 2.1 (Flammable Gas)
Packing Group: Not Applicable

14. TRANSPORTATION INFORMATION (Continued)

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:

Special Provision:	38
Explosive Limit & Limited Quantity Index:	0.125
ERAP Index:	3000
Passenger Carrying Ship Index:	Forbidden
Passenger Carrying Road or Rail Vehicle Index:	Forbidden
Marine Pollutant:	This gas is not listed as a marine pollutant and does not meet the criteria.

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This gas is classified as dangerous goods, per the International Air Transport Association. This gas is forbidden for air transport.

UN Identification Number:	UN 2453
Proper Shipping Name:	Ethyl Fluoride *or* Refrigerant Gas R161
Hazard Class Number and Description:	2.1 (Flammable Gas)
Hazard Label(s) Required:	Class 2.1 (Flammable Gas)
Packing Group:	Not Applicable
Excepted Quantities:	E0
Passenger and Cargo Aircraft Packing Instruction:	Forbidden
Passenger and Cargo Aircraft Maximum Net Quantity per Pkg.:	Forbidden
Passenger and Cargo Aircraft Limited Quantity Packing Instruction:	Forbidden
Passenger and Cargo Aircraft Limited Quantity Maximum Net Quantity per Pkg.:	Forbidden
Cargo Aircraft Only Packing Instruction:	200
Cargo Aircraft Only Maximum Net Quantity per Pkg.:	150 kg
Special Provisions:	A1
ERG Code:	10L

INTERNATIONAL MARITIME ORGANIZATION (IMO): This gas is classified as Dangerous Goods, per rules of IMO.

UN No.:	2453
Proper Shipping Name:	Ethyl Fluoride *or* Refrigerant Gas R161
Hazard Class Number:	2.1
Packing Group:	Not Applicable.
Special Provisions:	None
Limited Quantities:	0
Excepted Quantities:	E0
Packing:	Instructions: P200; Provisions: None
IBCs:	Instructions: None; Provisions: None
Tanks:	Instructions: None; Provisions: None
EmS:	F-D, S-U
Stowage Category:	Category E. Clear of living quarters.

Marine Pollutant: This material is not designated by the IMO to be a Marine Pollutant.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This gas is classified by the Economic Commission for Europe to be dangerous goods.

UN No.:	2453
Proper Shipping Name:	Ethyl Fluoride *or* Refrigerant Gas R161
Class:	2
Classification Code:	2F
Packing Group:	None
Labels:	2.1
Special Provisions:	None
Limited Quantities:	0
Excepted Quantities:	E0
Packing Instructions:	P200
Special Packing Instructions:	None
Mixed Packing Provisions:	MP9
Portable Tank and Bulk Container:	Instructions: (M); Special Provisions: None
Hazard Identification No.:	23

TRANSPORT IN BULK ACCORDING TO THE IBC CODE: See the information under the individual jurisdiction listings for IBC information.

ENVIRONMENTAL HAZARDS: This gas does not meet the criteria of environmentally hazardous according to the criteria of the UN Model Regulations (as reflected in the IMDG Code, ADR, RID, and ADN); this gas is not specifically listed in Annex III under MARPOL 73/78.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA Reporting Requirements: This gas is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act.

15. REGULATORY INFORMATION (Continued)

ADDITIONAL U.S. REGULATIONS (continued):

U.S. SARA Section 302 Extremely Hazardous Threshold Planning Quantity (TPQ): There are no specific Threshold Planning Quantities for this gas. The default Federal SDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. SARA Section 304 Extremely Hazardous Reportable Quantity (RQ): Not applicable.

U.S. CERCLA Reportable Quantity (RQ): Not applicable.

U.S. TSCA Inventory Status: This gas is listed on the TSCA Inventory.

U.S. SARA Hazard Categories (Section 311/312, 40 CFR 370-21): ACUTE: Yes; CHRONIC: No; FIRE: Yes; REACTIVE: Yes; SUDDEN RELEASE: Yes

Other U.S. Federal Regulations: Not applicable.

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65): This gas is not on the California Proposition 65 lists.

ADDITIONAL CANADIAN REGULATIONS:

Canadian DSL Inventory Status: This gas is not listed on the DSL or NDSL Inventories.

Canadian Environmental Protection Act (CEPA) Priorities Substances Lists: This gas is not listed on the CEPA Priority Substances List.

Canadian WHMIS Regulations: This gas is classified as a Controlled Product, Hazard Classes A, B1, and D2B as per the Controlled Product Regulations.

16. OTHER INFORMATION

GLOBAL HARMONIZATION AND EU CLP REGULATION (EC) 1272/2208 LABELING AND CLASSIFICATION: Classified in accordance with CLP Regulation (EC) 1272/2008. This is a self-classification. For information on classification under (67/548/EEC), see below.

Classification: Gases under Pressure, Flammable Gas Category 1

Signal Words: Danger

Hazard Statements: H280: Contains gas under pressure; may explode if heated. H220: Extremely flammable gas.

Prevention Statements:

Precautionary: P210: Keep away from heat/sparks/open flames/hot surfaces. — No smoking.

Response: P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. P381: Eliminate all sources of ignition if it is safe to do so.

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

Disposal: P501: Dispose of contents/containers in accordance with all local, regional, national and international regulations.

Hazard Symbol: GHS02, GHS04

EU 67/548/EEC LABELING AND CLASSIFICATION: Under European Union Council Directive 67/548/EEC and subsequent Directives, this is no classification for simple compressed gases.

Classification: Extremely Flammable

Risk Phrases: R12: Extremely flammable.

Safety Phrases: S9: Keep container in a well-ventilated place. S16: Keep away from sources of ignition - No smoking. S33: Take precautionary measures against static discharges. S45: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible).

Hazard Symbol: F+

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information about gas mixtures can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 4221 Wainey Road, 5th Floor, Chantilly, VA 20151-2923 Telephone: (703) 788-2700.

P-1 *"Safe Handling of Compressed Gases in Containers"*
AV-1 *"Safe Handling and Storage of Compressed Gases"*
"Handbook of Compressed Gases"

REFERENCES AND DATA SOURCES: Contact the supplier for information.

METHODS OF EVALUATING INFORMATION FOR THE PURPOSE OF CLASSIFICATION: As a pure chemical, specific data available were used in order to classify this gas.

REVISION DETAILS: New.

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc. • PO Box 1961, Hilo, HI 96721 • (800) 441-3365 (808) 969-4846
Fax on Demand**:** 1-800/231-1366

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