SAFETY DATA SHEET

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

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

IDENTIFICATION of the SUBSTANCE or PREPARATION: TRIFLUOROMETHANESUNFONYL FLUORIDE

SYNONYMS: Fluoro(trifluoromethyl)sulfone; Methanesulfonyl fluoride, trifluoro-; Trifluoromethanesulphonyl Fluoride; Fluoro(Trifluoromethyl)Sulfone; Perfluoromethanesulfonylfluoride

CHEMICAL FAMILY NAME: Sulfonylfluoride

FORMULA: CF_4O_2S

	Document Number: 80032
RELEVANT USE:	Various
USES ADVISED AGAINST	Other than Relevant Use
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) +01-703-527-3887 (collect-24 hrs)
BUSINESS PHONE:	General SDS Information: 1-713/896-2896 (8 am to 5 pm U.S. Central Time) Fax on Demand: 1-800/231-1366

ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2010 format. This product 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 2013.

U.S. TSCA Status: This compound is not included in the TSCA Inventory. In accordance with the conditions listed in 40 CFR 720.36 and 721.47, this material must be used only for research and development, pharmaceutical manufacture, or export. It must be used by, or directly under the supervision of, a technically qualified individual. The manufacturer should be consulted prior to using this material for other applications. Other requirements may apply.

2. HAZARD IDENTIFICATION

The following classifications are provisional, pending further toxicity and physical testing.

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, Acute Inhalation Toxicity Cat. 3

Signal Words: Danger

Hazard Statement Codes: H280, H331

Precautionary Statement Codes: P260, P264, P280, P304 + P340, P311, P321, P410, P403 + P233 + P405, P501

Hazard Symbols/Pictograms: GHS04, GHS06

EU 67/548/EEC LABELING AND CLASSIFICATION: This compound has been classified per European Union Council Directive 67/548/EEC or subsequent Directives. The following is a self-classification based on anticipated hazards.

Classification: Toxic

Risk Phrase Codes: R23

Safety Phrases: S23, S36/37/39, S38, S45

Hazard Symbols: T

See Section 16 for full text of classification

EMERGENCY OVERVIEW: THE TOXICOLOGICAL AND PHYSICAL PROPERTIES OF THIS GAS HAVE NOT BEEN FULLY INVESTIGATED; ALL EXPOSURE BY SHOULD BE AVOIDED. FOR RESEARCH USE ONLY. ALL EXPOSURE MUST BE MINIMIZED. **Product Description:** This compound is a clear, colorless compressed gas or liquefied gas with a slight sulfurous odor. **Health Hazards: DANGER!** TOXIC BY INHALATION. Inhalation can cause adverse central nervous effects. High concentrations of this gas can cause also cause an oxygen-deficient environment. Contact with rapidly expanding gases may cause frostbite. **Flammability Hazards:** This gas is not flammable or combustible. If involved in a fire, this material will ignite to produce toxic gases (carbon and sulfur oxides, sulfur oxyfluorides, hydrogen fluoride). **Reactivity Hazards:** No information is available on the reactivity of this gas. **Environmental Hazards:** This gas may cause harm if accidentally released to the environment, although details of environmental effects are not currently available. **Emergency Response Procedures:** Emergency responders must wear the proper personal protective equipment (and have appropriate fire-suppression equipment) suitable for the situation to which they are responding.

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
Trifluormethanesulfonyl Fluoride	335-05-7	206-384-8	100%	EU 67/548/EEC Classification: Toxic Risk Phrases: R23 Symbols: T GHS & EU CLP: 1272/2008: Classification: Gases Under Pressure, Oxidizing Gas Cat. 1, Acute Inhalation Toxicity Category 3 Hazard Statement Codes: H280, H331 Hazard Symbols/Pictograms: GHS04, GHS06

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 GAS WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus, and personal protective equipment should be worn. Rescuers should be taken for medical attention, if necessary. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

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).

Inhalation Exposure: If inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Due to toxicity, a pocket mask or similar device to cover mouth of victim during artificial respiration should be used. 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. An ophthalmologist should be sought as soon as possible.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing dermatitis, other skin conditions, and respiratory disorders may be aggravated by exposure to this gas mixture.

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT IF NEEDED: Administer oxygen. Treatment is symptomatic and supportive.

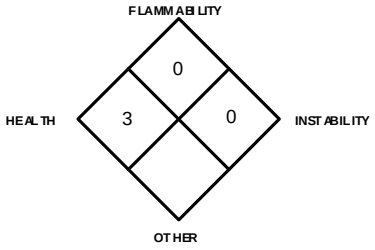
5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Unknown.

FLAMMABLE LIMITS (in air by volume, %): Not available.

NFPA RATING



FIRE EXTINGUISHING MEDIA: Extinguish fires of this gas by shutting-off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment. Alcohol foam, halons, carbon dioxide or dry chemical forms of fire extinguishing agents can be used against fires involving this gas.

UNSUITABLE FIRE EXTINGUISHING MEDIA: None known.

SPECIFIC HAZARDS ARISING FROM THE CHEMICAL: This gas is toxic by inhalation. The gas can accumulate in confined spaces, resulting in an oxygen deficient and toxic atmosphere. During a fire, corrosive and very toxic gases such as hydrogen fluoride, sulfur oxyfluorides and carbon and sulfur oxides may be generated. 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. The resulting explosion can cause severe equipment damage and personnel injury or death over a large area around the cylinder.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL PROTECTIVE ACTIONS FOR FIRE-FIGHTERS: Evacuate all personnel from danger area. Immediately cool cylinders with water spray from maximum distance to prevent failure. Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. When cool, move cylinders from fire area if this can be done without risk to firefighters.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS AND EMERGENCY PROCEDURES: Danger! Toxic gas. If a release occurs, evacuate area immediately! Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a large release, clear the affected area, protect people, and respond with trained personnel. Call CHEMTREC (1-800-424-9300) for emergency assistance. Or if in Canada, call CANUTEC (613-996-6666). The atmosphere must at least 19.5 percent Oxygen before non-emergency personnel can be allowed in the area without Self-Contained Breathing Apparatus and fire protection. If gas is leaking incidentally from the cylinder or its valve, contact your supplier.

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 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus.

METHODS FOR CLEAN-UP AND CONTAINMENT: Follow the guidelines of the North American Emergency Response Guidebook (Guide # 123) for toxic, liquefied gases.

All Releases: Evacuate area of release. Locate and seal the source of the leaking gas. Protect personnel attempting the shut-off with water-spray. Allow the gas to dissipate, if it can be done to an area in which there are no personnel. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if 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. Non-emergency personnel should not be allowed in area until a breathing oxygen level has been confirmed and this gas cannot be detected.

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

WORK PRACTICES AND HYGIENE PRACTICES: This gas must be used under the direct supervision of a technically qualified individual. All employees who handle this gas should be trained to handle it safely. Minimize all exposures to this substance. As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing this gas. Be aware of any signs of dizziness or fatigue; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms. Use in a well-ventilated location, segregated from other materials and operations. For example, laboratory work with this product should be conducted in a hood with the sash pulled down.

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. Use piping and equipment adequately designed to withstand pressures to be encountered. Do not heat cylinder by any means to increase the discharge rate of the gas from the cylinder. Do not use oils or grease on gas-handling fittings or equipment. Do not "crack" valve open before connecting it, since self-ignition may occur. Leak check system with leak detection solution, never with flame. 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, casing a leak to occur. Use an adjustable strap wrench to remove overly tight or rusted caps. Never strike an arc on a compressed gas cylinder or make a cylinder part of an electric circuit.

After Use: Close main cylinder valve. Valves should be closed tightly. Replace valve protection cap. Mark empty cylinders "EMPTY".

CONDITIONS FOR SAFE STORAGE: Always store and handle toxic, liquefied, 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. Emergency equipment should be available near the point of storage. 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. Cylinders should be separated incompatible materials (refer to Section 10, Stability and Reactivity, for more information). 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 storage area clear of materials which can burn. Do not allow area where cylinders are stored to exceed 52°C (125°F). Store cylinders away from heavily trafficked areas and emergency exits. Isolate from other non-compatible chemicals (refer to Section 10, Stability and Reactivity). 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. Keep the smallest amount necessary on-site at any one time. Full and empty cylinders should be segregated. Use a first-in, first-out inventory systems to prevent full containers from being stored for long periods of time.

NOTE: Use only DOT or ASME code containers designed for toxic, liquefied gas storage.

SPECIFIC END USE(S): This product is for use within the electronics industry. Follow all industry standards for use of this product.

7. HANDLING and USE (Continued)

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: If appropriate, install automatic monitoring equipment to detect the level of oxygen and gas. Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents gas dispersion into the work place by eliminating it at its source.

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	ppm
Trifluoromethanesulfonyl Fluoride	335-05-7	NE	NE	NE	NE	NE	NE	NE	NE

NE = Not Established.

International Exposure Limits: Currently, there are no international exposure limits for this gas.

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 the Oxygen level above 19.5% in the workplace. If necessary, use only respiratory protection authorized in appropriate country regulations and standards. 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 U.S. OSHA's Respiratory Protection Standard (1910.134-1998).

Eye Protection: Use approved safety goggles or safety glasses. If necessary, refer to appropriate regulations.

Hand Protection: Wear leather gloves when handling cylinders of this gas. Otherwise, wear glove protection appropriate to the specific operation for which this gas is used. If necessary, refer to appropriate regulations.

Body Protection: Use body protection appropriate for task. Safety shoes are recommended when handling cylinders. 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 at room temperature and pressure.
COLOR: Colorless.
MOLECULAR FORMULA: CF_3O_5S
MOLECULAR WEIGHT: 152.07 g/mol
ODOR: Slightly sulfur-like
ODOR THRESHOLD: Not applicable.
VAPOR PRESSURE @ 21°C: 60-70 psia
BOILING POINT: -21 to -25°C (-5.8 to -13°F)
FREEZING POINT: Not available.
pH: Not available.
VAPOR/GAS DENSITIY (air = 1): 5.3 (calc.)
EXPANSION RATIO: Not available.
SOLUBILITY IN WATER: Reacts slowly.
OTHER SOLUBILITIES: Not available.
AUTOINGNITION TEMPERATURE: Not available.
FLASH POINT: Not flammable.
DECOMPOSITION TEMPERATURE: Not available.
CRITICAL TEMPERATURE: Not available.
CRITICAL PRESSURE: Not available.
DIELECTRIC CONSTANT @ 20°C: Not available.
EVAPORATION RATE: Not applicable as a gas; liquefied gas rapidly returns to the gaseous state at room temperature.
COEFFICIENT WATER/OIL DISTRIBUTION: Log P: 1.574 [predict.]
SPECIFIC GRAVITY @ 21°C and 70 psi: 1.7
HOW TO DETECT THIS SUBSTANCE (identification/warning properties): There are no adequate identification properties for this material in event of an accidental release. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

CHEMICAL STABILITY: This material is stable under conditions of normal temperature and pressure.
DECOMPOSITION PRODUCTS: *Combustion:* Carbon and sulfur oxides, sulfuroxyfluorides and hydrogen fluoride. *Hydrolysis:* None known.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This compound is incompatible with alkaline-earth and alkali metals and amines.
POSSIBILITY OF HAZARDOUS REACTION/POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials and exposure to air, heat, sparks and other sources of ignition, water and moisture.

11. TOXICOLOGICAL INFORMATION

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: This gas is toxic by inhalation. The most significant routes of exposure are by inhalation, skin and eyes.

Inhalation: This gas is toxic by inhalation. Inhalation of low concentration may cause depression of the central nervous system with symptoms of dizziness, headache, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. Inhalation can also cause cholinergic effects, including pin-point pupils, sensitivity to light, salivation, muscular twitching, diarrhea, tremors, convulsions, and decreased heart rate. Irritation to upper respiratory tract: signs/symptoms can include soreness of the nose and throat, coughing and sneezing.

High concentrations of this gas can also 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 overexposure may have a blue color. Under some circumstances of overexposure, death may occur. 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.

WARNING: 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.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD	(BLUE)	3
FLAMMABILITY HAZARD	(RED)	0
PHYSICAL HAZARD	(YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	SEE SECTION 8		SEE SECTION 8

For Routine Industrial Use and Handling Applications

Contact with Skin or Eyes: Contact of this material with the skin may be irritating. Eye contact may cause immediate eye irritation. Contact with rapidly expanding gases (which are released under high pressure) may cause frostbite.

Skin Absorption: Currently, there are no data for possible skin absorption of this material. All skin contact should be avoided.

Ingestion: Not applicable to compressed gases.

Injection: Not a likely route of exposure for this material.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Exposure to this compound may cause the following health effects:

Acute: This gas is toxic by inhalation. Low level inhalation may cause cholinergic effects and depression of central nervous system. Inhalation may result in oxygen-deficiency. At high concentrations, unconsciousness or death may occur.

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, heart, eyes. CHRONIC: Skin, respiratory system, heart, central nervous system.

TOXICITY DATA: Currently, no toxicology data available for this gas.

CARCINOGENIC POTENTIAL: This gas is not found on the following lists: U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, GERMAN MAK, IARC, and ACGIH, and is therefore not considered to be, nor suspected to be, a cancer-causing agent by these agencies.

IRRITANCY OF PRODUCT: This gas may be irritating if inhaled or by eye contact.

SENSITIZATION TO THE PRODUCT: No data is available as to whether this gas is a human skin or respiratory sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Currently, there are no data or other information available on possible mutagenic, embryotoxic, teratogenic or reproductive effects for this gas.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) have not been determined for this gas; however, the following BEI values are in place for Fluorides.

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
FLUORIDES •Fluorides in urine	• Prior to shift • End of shift	• 3 mg/g creatinine • 10 mg/g creatinine

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 IN SOIL: This compound has not been tested for mobility in soil. The following estimated values are available.

Soil Adsorption Coefficient (PCKOCWIN v1.66): Koc: 275.5; Log Koc: 2.440

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

Probability of Rapid Biodegradation (BIOWIN v4.10):

Biowin1 (Linear Model): 0.1547 Biowin2 (Non-Linear Model): 0.008

Expert Survey Biodegradation Results:

Biowin3 (Ultimate Survey Model): 2.3502 (weeks-months) Biowin4 (Primary Survey Model): 3.3539 (days-weeks)

12. ECOLOGICAL INFORMATION (Continued)

PERSISTENCE AND BIODEGRADABILITY (continued):

MITI Biodegradation Probability:
Biowin5 (MITI Linear Model): 0.3293 Biowin6 (MITI Non-Linear Model): 0.0
Anaerobic Biodegradation Probability:
Biowin7 (Anaerobic Linear Model): 0.8361
Ready Biodegradability Prediction: No
Atmospheric Oxidation (25 deg C) [AopWin v1.92]:
Hydroxyl Radicals Reaction:
Overall OH Rate Constant = 0.0 E-12 cm^3/molecule-sec
Half-Life = Not available.
Ozone Reaction:
No Ozone Reaction Estimation
Fraction sorbed to airborne particulates (phi) [Junge,Mackay]: 5.12E-008
Note: the sorbed fraction may be resistant to atmospheric oxidation
Volatilization from Water:
Henry LC: 0.000614 atm-m^3/mole (estimated by Bond SAR Method)
Half-Life from Model River: 2.434 hours
Half-Life from Model Lake: 130 hours (5.415 days)
Removal in Wastewater Treatment:
Total removal = 24.4%
Total Biodegradation: 0.10%
Total Sludge Adsorption: 3.93%
Total to Air: 20.37%, (using 10000 hr Bio P,A,S)
Level III Fugacity Model:

	Mass Amount (percent)	Half-Life (hr)	Emissions (kg/hr)
Air	10.9	1e+005	1000
Water	16.7	900	1000
Soil	72.2	1.8e+003	1000
Sediment	0.274	8.1e+003	0

Persistence Time: 602 hours

BIO-ACCUMULATIVE POTENTIAL: This compound 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 = 1.498 (BCF = 31.46)

ECOTOXICITY: This gas has not been fully tested for aquatic or animal toxicity. All release to terrestrial, atmospheric and aquatic environments should be avoided.

OTHER ADVERSE EFFECTS: This gas is not listed as having ozone depletion potential. This gas is a greenhouse gas which may contribute to the global warming if released in large quantity. Global Warming Potential: 950 (CO2 = 1; 100 years).

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

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual gas 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, away from all sources of ignition.

U.S. EPA WASTE NUMBER: Not applicable.

EUROPEAN (EWC) WASTE CODES: 16 05 05 Gases in pressure containers other than those mentioned in 16 05 04

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 3162
Proper Shipping Name: Liquefied gas, toxic, n.o.s. (Trifluoromethanesulfonyl Fluoride)
Hazard Class Number and Description: 2.3 (Toxic Gas)
Packing Group: None
DOT Label(s) Required: Class 2.3 (Toxic Gas)
North American Emergency Response Guidebook Number (2013): 123
Marine Pollutant: This compound is not classified by the DOT as a Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).
Special Provision: Shipments must be described as “Poison Inhalation Hazard - ZONE B”.
Special Shipping Information: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles present serious safety hazards and should be discouraged.
Note: Shipment of compressed gas cylinders which have not been filled with the owners consent is a violation of Federal law (49 CFR, Part 173.301 (b).

14. TRANSPORTATION INFORMATION (Continued)

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 3162
Proper Shipping Name:	Liquefied gas, toxic, n.o.s. (Trifluoromethanesulfonyl Fluoride)
Hazard Class Number and Description:	2.3 (Toxic Gas)
Packing Group:	None
Hazard Shipping Label(s) Required:	Class 2.3 (Toxic Gas)
Special Provisions:	16, 38
Explosive Limit & Limited Quantity Index:	0
ERAP Index:	0
Passenger Carrying Ship Index:	Forbidden
Passenger Carrying Road Or Rail Vehicle Index:	Forbidden

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This gas is forbidden to be shipped via air.

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): This material is classified as dangerous goods, per the International Maritime Organization.

UN Identification Number:	UN 3162
Proper Shipping Name:	Liquefied gas, toxic, n.o.s. (Trifluoromethanesulfonyl Fluoride)
Hazard Class Number and Description:	2.3 (Toxic Gas)
Labels:	Class 2.3 (Toxic Gas)
Packing Group:	Not Applicable
Special Provisions:	274
Limited Quantities:	None
Excepted Quantities:	E0
Packing:	Instructions: P200; Provisions: None
IBCs:	Instructions: None; Provisions: None
Tanks:	Instructions: None; Provisions: None
EmS:	F-C, S-U
Stowage Category:	Category D. Clear of living quarters.

Marine Pollutant: This compound does not meet the criteria under the IMO to be a Marine Pollutant.

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

UN No.:	3162
Proper Shipping Name:	Liquefied gas, toxic, n.o.s. (Trifluoromethanesulfonyl Fluoride)
Class:	2.3
Classification Code:	2T
Packing Group:	Not Applicable
Labels:	2.3
Special Provisions:	274
Limited Quantities:	None
Excepted Quantities:	E0
Packaging:	Packing Instructions: P200; Special Packing Instructions: None Mixed Packing Provisions: MP9
Portable Tanks and Bulk Containers:	Instructions: (M); Provisions: None
Hazard Identification No.:	26

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 UNITED STATES 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.

U.S. SARA 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 Title III SARA Sections 311/312 Hazardous Categories (40 CFR 370.21): ACUTE: Yes; CHRONIC: No; FIRE: No; REACTIVE: No; SUDDEN RELEASE: Yes

U.S. TSCA Inventory Status: This gas is not included in the TSCA Inventory. In accordance with the conditions listed in 40 CFR 720.36 and 721.47, this product must be used only for research and development, pharmaceutical manufacture, or export. This compound must be used by, or directly under the supervision of, a technically qualified individual. The manufacturer should be consulted prior to using this gas for other applications.

15. REGULATORY INFORMATION (Continued)

ADDITIONAL UNITED STATES REGULATIONS (continued):

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

Other U.S. Federal Regulations: Not applicable.

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

ADDITIONAL CANADIAN REGULATIONS:

Canadian DSL/NDSL Inventory Status: This material is not included in the DSL or NDSL Inventories. This compound must be used only for research and development purposes. Other requirements may apply.

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

Canadian WHMIS Regulations: This gas is classified as a Controlled Product, Hazard Classes A, D1A, and D2A, as per the Controlled Product Regulations.

ADDITIONAL EUROPEAN REGULATIONS:

SAFETY, HEALTH, AND ENVIRONMENTAL REGULATIONS/LEGISLATION SPECIFIC FOR THE PRODUCT: Currently, there is no specific legislation pertaining to this product.

Chemical Safety Assessment: No data available. The chemical safety assessment is required for some substances according to European Union Regulation (EC) 1907/2006, Article 14.

16. OTHER INFORMATION

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

Classification: Gases Under Pressure, Skin Irritation Category 2, Acute Inhalation Toxicity Category 3

Signal Words: Danger

Hazard Statements: H280: Contains gas under pressure; may explode if heated. H331: Toxic if inhaled

Prevention Statements: P304 + P340, P311, P321, P403 + P233, P405, P501

Precautionary: P260: Do not breathe gas OR VAPORS. P264: Wash thoroughly after handling. P271: Use only outdoors or in a well-ventilated area. P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response: P304 + P340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. P311: Call a POISON CENTER or doctor. P321: Specific treatment (remove from exposure and treat symptoms). Refer to other portions of precautionary text on this label, SDS or other product information sheets, as appropriate.

Storage: P410: Protect from sunlight. P403 + P233 + P405: Store in a well-ventilated place. Keep container tightly closed. Store locked up.

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

Hazard Symbols/Pictograms: GHS04, GHS06

EU 67/548/EEC LABELING AND CLASSIFICATION: This product has been classified as per European Union Council Directive 67/548/EEC or subsequent Directives.

Classification: Toxic

Risk Phrases: R23: Toxic by inhalation.

Safety Phrases: S23: Do not breathe gas or vapors. S36/37/39: Wear suitable protective clothing, gloves and eye/face protection. S38: In case of insufficient ventilation wear suitable respiratory equipment. S45: In case of accident or if you feel unwell seek medical advice immediately (show the label where possible).

Hazard Symbols: T

REFERENCES AND DATA SOURCES: Contact the supplier for information.

METHODS OF EVALUATING INFORMATION FOR THE PURPOSE OF CLASSIFICATION: Bridging principles were used to classify this compound.

REVISION DETAILS: New

unexpected hazards. Obtain and evaluate the safety information for each component before you use 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 can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 421 Walney Road, 5th Floor, Chantilly, VA 20151. Telephone: (703) 788-2700, Fax: (703) 961-1831.

"Safe Handling of Compressed Gases in Containers" (P-1, 1999)
"Safe Handling and Storage of Compressed Gases" (AV-1, 1999)
"Handbook of Compressed Gases" (1992)

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

AIR LIQUIDE