



CHLORINE TRIFLUORIDE

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	CHLORINE TRIFLUORIDE
Product Code(s)	G-240, 1039
UN-No	UN1749
Recommended Use	Compressed gas.
Synonyms	Chlorine fluoride
Supplier Address*	Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC 575 Mountain Ave. Murray Hill, NJ 07974 Phone: 908-464-8100 www.lindeus.com Linde Gas Puerto Rico, Inc. Las Palmas Village Road No. 869, Street No. 7 Catano, Puerto Rico 00962 Phone: 787-641-7445 www.pr.lindegas.com Linde Canada Limited 5860 Chedworth Way Mississauga, Ontario L5R 0A2 Phone: 905-501-1700 www.lindecana.com * May include subsidiaries or affiliate companies/divisions. For additional product information contact your local customer service.
Chemical Emergency Phone Number	Chemtrec: 1-800-424-9300 for US/ 703-527-3887 outside US

2. HAZARDS IDENTIFICATION

DANGER!		
Emergency Overview		
Oxidizer Corrosive Fatal if inhaled. Water reactive The product causes burns of eyes, skin and mucous membranes Accelerates combustion and increases risk of fire. Contents under pressure Keep at temperatures below 52°C / 125°F		
Appearance Greenish yellow fuming liquid to colorless gas	Physical State Gas.	Odor Sweet, Irritating

OSHA Regulatory Status This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Potential Health Effects

Principle Routes of Exposure Eye contact. Skin contact. Inhalation.

Acute Toxicity

Inhalation Fatal if inhaled. Inhalation of corrosive fumes/gases may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate.

Eyes Corrosive to the eyes and may cause severe damage including blindness.

Skin Causes burns. Symptoms may be delayed.

Skin Absorption Hazard No known hazard by skin absorption.

Ingestion Not an expected route of exposure. Ingestion causes burns of the upper digestive and respiratory tract.

Chronic Effects No known effect based on information supplied.

Aggravated Medical Conditions Pre-existing eye disorders. Skin disorders. Respiratory disorders. Kidney disorders. Lungs.

Environmental Hazard See Section 12 for additional Ecological Information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Volume %	Chemical Formula
Chlorine Trifluoride	7790-91-2	>99	ClF ₃

4. FIRST AID MEASURES

General Advice Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact Immediate medical attention is required. In case of contact with substance, immediately flush eyes with running water for at least 30 minutes. Keep eye wide open while rinsing.

Skin Contact	Immediate medical attention is required. Wash off immediately with soap and plenty of water for at least 30 minutes while removing all contaminated clothing and shoes. Dermal burns may be treated with calcium gluconate gel or slurry in water or glycerine. This compound binds the active fluorides in an insoluble form and limits burn extension and pain.
Inhalation	PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF INHALATION OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Conscious inhalation victims should be assisted to an uncontaminated area and inhale fresh air. If breathing is difficult, administer oxygen. Unconscious persons should be moved to an uncontaminated area and, as necessary, given artificial resuscitation and supplemental oxygen. Treatment should be symptomatic and supportive.
Ingestion	Not an expected route of exposure. Immediate medical attention is required. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Call a physician or Poison Control Center immediately.
Notes to Physician	For dermal exposure, the use of 2.5-33% calcium gluconate or carbonate gel or slurry has been recommended. The gel is either placed into a surgical glove into which the affected extremity is then placed or applied directly on the burn. This compound binds with the active fluorides in an insoluble form and limits burn extension and pain. Calcium chloride should not be used.
Protection of First-aiders	Use personal protective equipment. Avoid contact with skin, eyes and clothing.

5. FIRE-FIGHTING MEASURES

Flammable Properties	Oxidizer. May vigorously accelerate combustion.
Suitable Extinguishing Media	Dry chemical. Carbon dioxide (CO ₂). DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
Unsuitable Extinguishing Media	DO NOT USE WATER. Water reactive.
Hazardous Combustion Products	Chlorine gas. Chlorine oxide. Chlorine fluoride and Chlorine oxyfluoride compounds.
<u>Explosion Data</u>	
Sensitivity to Mechanical Impact	None
Sensitivity to Static Discharge	None
Specific Hazards Arising from the Chemical	Chlorine trifluoride reacts violently with water to form chlorine and hydrofluoric acid. Cylinders may rupture under extreme heat. Continue to cool fire exposed cylinders until flames are extinguished. Damaged cylinders should be handled only by specialists.
Protective Equipment and Precautions for Firefighters	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Corrosive hazard. Wear protective gloves/clothing and eye/face protection. Do not get water inside containers. If water is necessary to fight fire, use in flooding quantities. For massive fire, use unmanned hose holders or monitor nozzles.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	Evacuate personnel to safe areas. Use personal protective equipment. Keep people away from and upwind of spill/leak. Do not get in eyes, on skin, or on clothing. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
Environmental Precautions	Prevent further leakage or spillage if safe to do so. Should not be released into the environment. Prevent entry into waterways, sewers, basements or confined areas.

Methods for Containment	Stop the flow of gas or remove cylinder to outdoor location if this can be done without risk. If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1 or call your closest Linde location.
Methods for Cleaning Up	Return cylinder to Linde or an authorized distributor.
Other Information	Refer to protective measures listed in Sections 7 and 8.

7. HANDLING AND STORAGE

Handling	Always remove chlorine trifluoride from the cylinder as a gas. Do not connect cylinders of chlorine trifluoride directly to apparatus containing a liquid absorbing medium. Recommended materials for use with chlorine trifluoride are dry, highly fluorinated polymers such as Teflon® and Kel-F®, the metals used in storage containers (monel, copper and stainless steel) or gaskets (Teflon®). Wetted surfaces should be passivated with an "active" fluorine compound to establish a metal fluoride coating for additional protection. Many metal fluorides are water soluble so that the passive film corrosion protection may be destroyed if wetted with water. Ensure adequate ventilation. Wear personal protective equipment. Avoid contact with skin, eyes and clothing. "NO SMOKING" signs should be posted in storage and use areas. Use only in ventilated areas. Never attempt to lift a cylinder by its valve protection cap. Protect cylinders from physical damage; do not drag, roll, slide or drop. Use equipment rated for cylinder pressure. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing leak to occur. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder. Use an adjustable strap wrench to remove over-tight or rusted caps. Close valve after each use and when empty. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Never put cylinders into trunks of cars or unventilated areas of passenger vehicles. Never attempt to refill a compressed gas cylinder without the owner's written consent. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit.
Storage	Protect from physical damage. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling. Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Keep at temperatures below 52°C / 125°F. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders from being stored for excessive periods of time. Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, pamphlet CGA-P1, Safe Handling of Compressed Gases in Containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Chemical Name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Chlorine Trifluoride 7790-91-2	TWA: 2.5 mg/m ³ F Ceiling: 0.1 ppm	Ceiling: 0.4 mg/m ³	IDLH: 20 ppm Ceiling: 0.4 mg/m ³ Ceiling: 0.1 ppm

NIOSH IDLH: Immediately Dangerous to Life or Health.

Other Exposure Guidelines	Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).
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Engineering Measures	Showers. Eyewash stations. Ventilation systems. Exhaust gas should be vented to a gas treatment system.
Ventilation	Use ventilation adequate to keep exposures below recommended exposure limits.
<u>Personal Protective Equipment</u>	
Eye/Face Protection	Tightly fitting safety goggles. Face-shield.
Skin and Body Protection	Appropriate protective and chemical resistant gloves, clothing and splash protection, or fully encapsulating vapor protective clothing to prevent exposure. For materials of construction consult protective clothing manufacturer's specifications. (Teflon® is generally effective for exposures longer than 4 hours).
Respiratory Protection	
General Use	If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.
Emergency Use	Use positive pressure air line respirator or self-contained breathing apparatus for exposure over exposure limits or emergency use. For exposures above IDLH, an additional escape bottle is required.
Hygiene Measures	Do not eat, drink or smoke when using this product. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Contaminated work clothing should not be allowed out of the workplace. Provide regular cleaning of equipment, work area and clothing. Keep away from food, drink and animal feeding stuffs.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Greenish yellow fuming liquid to colorless gas.	Odor	Sweet, Irritating.
Odor Threshold	No information available.	Physical State	Gas
Flash Point	No information available.	Autoignition Temperature	No information available.
Decomposition Temperature	No information available.	Boiling Point/Range	11.75°C / 53.15°F
Freezing Point	-76.34°C / -105.41°F	Molecular Weight	92.448
Water Solubility	Decomposes	Evaporation Rate	No information available
Vapor Pressure	760 mmHg @ 11.5°C	Vapor Density	3.19 (air = 1)
VOC Content (%)	Not applicable.	Specific Vol. @ 21.1°C & 1 atm	4.2 ft³/lb (262.2 dm³/kg)
Critical Pressure	837.7 psia (57.76 bar)	Critical Temperature	345.2°F / 174.0°C
Flammability Limits in Air			
Upper	Not applicable		
Lower	Not applicable		

10. STABILITY AND REACTIVITY

Stability	Unstable on exposure to moisture.
Incompatible Products	Water. Alkalis. Organic material. Acids. Halogens. Metal oxides. Oxidizing agents. Combustible materials. Sand. Asbestos. Glass. Chlorofluorocarbons.
Conditions to Avoid	Contact with water or moist air liberates irritating gas. Catalyst for many polymerization reactions.
Hazardous Decomposition Products	Chlorine gas. Hydrogen fluoride. Chlorine oxide. Chlorine fluoride and Chlorine oxyfluoride compounds.

Hazardous Polymerization Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

LD50 Oral:	No information available.
LD50 Dermal:	No information available.
LC50 Inhalation:	Per CGA P-20:LC50: 299 ppm/1 hr. (Rat)
Inhalation	All rats exposed to 800 ppm of chlorine trifluoride for 15 minutes died. Reducing exposure time to 13 minutes allowed survival in most tests. Exposure at 400 ppm for 35 minutes resulted in death.
Eye Contact	Corrosive to the eyes and may cause severe damage including blindness.
Skin Contact	Corrosive. Tissue destruction proceeds under toughened coagulated resulting in deep ulcers, slow healing and scarring. Burns can be progressive, resembling those caused by hydrogen fluoride.
Repeated Dose Toxicity	Two dogs and 20 rats exposed to an average concentration of 1.17 ppm chlorine trifluoride for 6 hr/day/5 days/wk exhibited signs of toxicity including sneezing, salivation, panting respiration and occasional expulsion of frothy fluid from the mouth and nose (signs were not as pronounced in rats). After several weeks of exposure a blood-tinged discharge appeared about the nares and eyes of the rats. Six rats and one dog died during the course of the experiment. Severe pulmonary irritation was found in both species among the survivors as well as the animals that died.

Chronic Toxicity

Chronic Toxicity	None known.
Carcinogenicity	Contains no ingredient listed as a carcinogen.

Irritation	No information available.
Sensitization	No information available.
Reproductive Toxicity	No information available.
Developmental Toxicity	No information available.
Synergistic Materials	None known.
Target Organ Effects	Eyes. Respiratory system. Skin.

12. ECOLOGICAL INFORMATION

Ecotoxicity

The environmental impact of this product has not been fully investigated.

Ozone depletion potential; ODP; (R-11 = 1): Does not contain ozone depleting chemical (40 CFR Part 82).

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods	Do not attempt to dispose of residual waste or unused quantities. Return in the shipping container PROPERLY LABELED WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to Linde for proper disposal.
Contaminated Packaging	Do not re-use empty containers.

14. TRANSPORT INFORMATION

DOT

Proper Shipping Name	Chlorine trifluoride
Hazard Class	2.3
Subsidiary Class	5.1, 8
UN-No	UN1749
Description	UN1749,Chlorine trifluoride,2.3,(5.1, 8)
Additional Description:	"Toxic-Inhalation Hazard Zone B".
Additional Marking Requirements:	"Inhalation Hazard".
Emergency Response Guide Number	124

TDG

Proper Shipping Name	Chlorine trifluoride
Hazard Class	2.3
Subsidiary Class	(5.1), (8)
UN-No	UN1749
Description	UN1749,CHLORINE TRIFLUORIDE,2.3(5.1), (8)

MEX

Proper Shipping Name	Chlorotrifluoride
Hazard Class	2.3
Subsidiary Class	5.1, 8
UN-No	UN1749
Description	UN1749 Chlorotrifluoride,2.3

IATA

UN-No	UN1749
Proper Shipping Name	Chlorine trifluoride
Hazard Class	2.3
Subsidiary Class	5.1, 8
ERG Code	2PX
Description	UN1749,Chlorine trifluoride,2.3(5.1, 8)
Maximum Quantity for Passenger	Forbidden
Maximum Quantity for Cargo Only	Forbidden
Limited Quantity	No information available.

IMDG/IMO

Proper Shipping Name	Chlorine trifluoride
Hazard Class	2.3
Subsidiary Class	5.1, 8
UN-No	UN1749
EmS No.	F-C, S-W
Description	UN1749, Chlorine trifluoride,2.3(5.1, 8)

ADR

Proper Shipping Name	Chlorine trifluoride
Hazard Class	2.3
UN-No	UN1749
Classification Code	2TOC
Description	UN1749 Chlorine trifluoride,2.3,
ADR/RID-Labels	5.1, 8

15. REGULATORY INFORMATION

International Inventories

TSCA	Complies
DSL	Does not Comply
EINECS/ELINCS	Complies

Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	No
Fire Hazard	Yes
Sudden Release of Pressure Hazard	Yes
Reactive Hazard	Yes

Clean Water Act

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

Risk and Process Safety Management Programs

This material, as supplied, contains one or more regulated substances with specified thresholds under 40 CFR Part 68 or regulated as a highly hazardous chemical pursuant to the 29 CFR Part 1910.110 with specified thresholds:

Chemical Name	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Toxic Substances	U.S. - CAA (Clean Air Act) - Accidental Release Prevention - Flammable Substances	U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals
Chlorine Trifluoride			1000 lb

Clean Air Act, Section 112 Hazardous Air Pollutants (HAPs) (see 40 CFR 61)

This product does not contain any substances regulated as hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act Amendments of 1990.

CERCLA/SARA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.

U.S. State Regulations**California Proposition 65**

This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

Chemical Name	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Chlorine Trifluoride	X	X	X		X

International Regulations

Chemical Name	Carcinogen Status	Exposure Limits
Chlorine Trifluoride		Mexico: Ceiling= 0.1 ppm Mexico: Ceiling= 0.4 mg/m ³

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class

A Compressed gases

D1A Very toxic materials

E Corrosive material

F Dangerously reactive material

**16. OTHER INFORMATION**

Prepared By	Product Stewardship 23 British American Blvd. Latham, NY 12110 1-800-572-6501
Issuing Date	17-Mar-2010
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Revision Number	1
Revision Note	(M)SDS sections updated. 1.

<u>NFPA</u>	Health Hazard 4	Flammability 0	Stability 3	Physical and Chemical Hazards W OX
<u>HMIS</u>	Health Hazard 3	Flammability 0	Physical Hazard 3	Personal Protection -

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2009, CGA Recommended Hazard Ratings for Compressed Gases, 3rd Edition.

General Disclaimer

For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Linde LLC, Linde Merchant Production, Inc. or Linde Gas North America LLC (or any of their affiliates and subsidiaries) and the purchaser.

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End of Safety Data Sheet