

CHLORINE TRIFLUORIDE

CTF

CAUTIONARY RESPONSE INFORMATION

Common Synonyms CTF	Liquefied compressed gas Sinks and may boil in water. Reacts violently with water to produce poisonous gas. Boiling point is 53°F.	Greenish yellow liquid or colorless gas Strong sweetish odor
KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND VAPOR. Avoid inhalation. Wear chemical protective suit with self-contained breathing apparatus. Evacuate area in case of large discharge. Call fire department. Notify local health and pollution control agencies. Protect water intakes.		
Fire	Not flammable. May explode on contact with combustibles. POISONOUS GASES ARE PRODUCED WHEN HEATED. Containers may explode in fire. Wear chemical protective suit with self-contained breathing apparatus. Combat fires from safe distance or protected location. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON ADJACENT FIRES. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED. Irritating to skin, eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Chemical and Physical Treatment:
Neutralize
Do not add water to undissolved material

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: Not listed.
2.2 Formula: ClF₃
2.3 IMO/UN Designation: 2/1749
2.4 DOT ID No.: 1749
2.5 CAS Registry No.: 7790-91-2
2.6 NAERG Guide No.: 124
2.7 Standard Industrial Trade Classification: 52241

3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Neoprene gloves and protective clothing made of glass fiber and Teflon, including full hood; self-contained breathing apparatus with full face mask.
 3.2 Symptoms Following Exposure: Inhalation causes extreme irritation of respiratory tract; pulmonary edema may result. Vapors are very irritating to eyes and skin; liquid causes severe burns.
 3.3 Treatment of Exposure: Call physician at once after any exposure to this compound. INHALATION: remove victim to fresh air and keep him quiet; give artificial respiration if breathing has stopped; give oxygen; enforce rest for 24 hours. EYES: flush with water for at least 15 min.; get medical attention, but do not interrupt flushing for at least 10 min. SKIN: flush with water, then with 2-3% aqueous ammonia, then again with water; apply ice-cold pack of saturated Epsom salt or 70% ethyl alcohol.
 3.4 TLV-TWA: Not listed.
 3.5 TLV-STEL: Not listed.
 3.6 TLV-Ceiling: 0.1 ppm
 3.7 Toxicity by Ingestion: Grade 4; LD₅₀ < 50 mg/kg
 3.8 Toxicity by Inhalation: Currently not available.
 3.9 Chronic Toxicity: Currently not available.
 3.10 Vapor (Gas) Irritancy Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations.
 3.11 Liquid or Solid Characteristics: Severe skin irritant, causes second-and third-degree burns on short contact and is very injurious to the eyes.
 3.12 Odor Threshold: Currently not available.
 3.13 IDLH Value: 20 ppm
 3.14 OSHA PEL-TWA: Not listed.
 3.15 OSHA PEL-STEL: Not listed.
 3.16 OSHA PEL-Ceiling: 0.1 ppm
 3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable, but may cause fire on contact with some materials.
 4.2 Flammable Limits in Air: Not pertinent
 4.3 Fire Extinguishing Agents: Dry chemical
 4.4 Fire Extinguishing Agents Not to Be Used: Do not use water on adjacent areas unless well protected against hydrogen fluoride gas.
 4.5 Special Hazards of Combustion Products: If released from container, fumes are toxic and irritating.
 4.6 Behavior in Fire: If released from container, can increase the intensity of fire. Containers may explode.
 4.7 Auto Ignition Temperature: Not pertinent
 4.8 Electrical Hazards: Not pertinent
 4.9 Burning Rate: Not pertinent
 4.10 Adiabatic Flame Temperature: Currently not available
 4.11 Stoichiometric Air to Fuel Ratio: Not pertinent
 4.12 Flame Temperature: Currently not available
 4.13 Combustion Molar Ratio (Reactant to Product): Not pertinent
 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: Reacts explosively with water, evolving hydrogen fluoride (hydrofluoric acid) and chlorine.
 5.2 Reactivity with Common Materials: Causes ignition of all combustible materials and even sand or concrete. Very similar to fluorine gas.
 5.3 Stability During Transport: Stable
 5.4 Neutralizing Agents for Acids and Caustics: Currently not available
 5.5 Polymerization: Not pertinent
 5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
 6.2 Waterfowl Toxicity: Currently not available
 6.3 Biological Oxygen Demand (BOD): None
 6.4 Food Chain Concentration Potential: None
 6.5 GESAMP Hazard Profile:
 Bioaccumulation: 0
 Damage to living resources: 2
 Human Oral hazard: (3)
 Human Contact hazard: II
 Reduction of amenities: XX

7. SHIPPING INFORMATION

- 7.1 Grades of Purity: 99+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Safety relief
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: Currently not available
8. HAZARD CLASSIFICATIONS
- 8.1 49 CFR Category: Poison Gas
- 8.2 49 CFR Class: 2.3
- 8.3 49 CFR Package Group: Not pertinent
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 8.6 EPA Reportable Quantity: Not listed
- 8.7 EPA Pollution Category: Not listed
- 8.8 RCRA Waste Number: Not listed
- 8.9 EPA FWPCA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15°C and 1 atm: Gas
- 9.2 Molecular Weight: 92.5
- 9.3 Boiling Point at 1 atm: 53°F = 11.6°C = 284.8°K
- 9.4 Freezing Point: -105°F = -76.1°C = 197.1°K
- 9.5 Critical Temperature: 307.4°F = 153°C = 426.2°K
- 9.6 Critical Pressure: 837 psia = 56.9 atm = 5.77 MN/m²
- 9.7 Specific Gravity: 1.85 at 11°C (liquid)
- 9.8 Liquid Surface Tension: 26.6 dynes/cm = 0.0266 N/m at 0°C
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 3.2
- 9.11 Ratio of Specific Heats of Vapor (Gas): 1.2832
- 9.12 Latent Heat of Vaporization: 128 Btu/lb = 71.2 cal/g = 2.98 X 10⁶ J/kg
- 9.13 Heat of Combustion: Not pertinent
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Currently not available
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

NOTES

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9.20 SATURATED LIQUID DENSITY		9.21 LIQUID HEAT CAPACITY		9.22 LIQUID THERMAL CONDUCTIVITY		9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit inch per hour-square foot-F	Temperature (degrees F)	Centipoise
35	117.400	-75	0.291	33	1.048	16	0.595
40	116.900	-70	0.291	34	1.048	18	0.588
45	116.299	-65	0.292	35	1.048	20	0.580
50	115.799	-60	0.292	36	1.048	22	0.573
		-55	0.293	37	1.048	24	0.566
		-50	0.293	38	1.048	26	0.559
		-45	0.294	39	1.048	28	0.553
		-40	0.294	40	1.048	30	0.546
		-35	0.295	41	1.048	32	0.539
		-30	0.295	42	1.048	34	0.533
		-25	0.296	43	1.048	36	0.527
		-20	0.296	44	1.048	38	0.521
		-15	0.297	45	1.048	40	0.515
		-10	0.298	46	1.048	42	0.509
		-5	0.298	47	1.048	44	0.503
		0	0.299	48	1.048	46	0.497
		5	0.299	49	1.048	48	0.492
		10	0.300	50	1.048	50	0.486
		15	0.300	51	1.048	52	0.481
		20	0.301	52	1.048		
		25	0.301				
		30	0.302				
		35	0.302				
		40	0.303				
		45	0.303				
		50	0.304				

9.24 SOLUBILITY IN WATER		9.25 SATURATED VAPOR PRESSURE		9.26 SATURATED VAPOR DENSITY		9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
R	-50	0.622	-50	0.01308	-5	0.097	
E	-45	0.757	-45	0.01574	0	0.097	
A	-40	0.917	-40	0.01883	5	0.097	
C	-35	1.105	-35	0.02242	10	0.097	
T	-30	1.324	-30	0.02655	15	0.097	
S	-25	1.579	-25	0.03130	20	0.097	
	-20	1.873	-20	0.03672	25	0.097	
	-15	2.213	-15	0.04288	30	0.097	
	-10	2.602	-10	0.04987	35	0.097	
	-5	3.047	-5	0.05776	40	0.097	
	0	3.554	0	0.06663	45	0.097	
	5	4.129	5	0.07657	50	0.097	
	10	4.778	10	0.08767	55	0.097	
	15	5.510	15	0.10000	60	0.097	
	20	6.332	20	0.11370	65	0.097	
	25	7.251	25	0.12890	70	0.097	
	30	8.277	30	0.14570	75	0.097	
	35	9.419	35	0.16410	80	0.097	
	40	10.690	40	0.18430			
	45	12.090	45	0.20640			
	50	13.630	50	0.23050			
	55	15.340	55	0.25680			
	60	17.210	60	0.28530			
	65	19.260	65	0.31630			
	70	21.500	70	0.34980			
	75	23.940	75	0.38590			