ITTEHAD CHEMICALS LIMITED

Doc. # Cl_2-MSDS-04	Rev. # 01	Effective Date: 01.01.2022

Title: # MATERIAL SAFETY DATA SHEET (MSDS)

LIQUID CHLORINE

Section 1: Chemical Product and Company Identification

Product Name: Liquid Chlorine

Chemical Name: Chlorine

Synonyms: Chlorine Bleach, Bertholite; Chloor; Chlor; Chlore; Chlorine mol.; Cloro; Molecular chlorine

Chemical Formula: Cl_2

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Recommended Use and Restrictions on Use:

Recommended use:

Synthetic/Analytical/Pharmaceuticals Chemistry, Purification of water, bleaching agent, insecticides, herbicides, fungicides, paper, board, household and laundry bleach.

Section 2 : Composition and Information on Ingredients

Substance/Mixture: Substance

Name	Concentration % (v/v)	CAS No.	EC No.	Annex I Index No.	Hazard Symbol	Risk phrases
Chlorine	>99.5	7782-50-5	231-959-5	017-001-00-7	T	23
					Xi	36/37/38
					N	50

Section 3: Hazards Identification

Potential Acute Health Effects:

Causes severe skin burns and eye damage. Very toxic to aquatic life. Toxic by inhalation. Highly Corrosive in moist conditions. Irritating to nose, throat, tearing, and coughing and chest pain. Repeated exposures/single high exposure permanently damages the lungs and can cause death.

Environmental effects:

Chlorine hydrolyzes very rapidly in water. In fresh and waste water at pH > 6, complete hydrolysis occurs with the formation of hypochlorous acid and chloride ion. Chlorine may react with soil components to form chlorides. Depending on their water solubility these chlorides are easily washed out from the soil.
Free chlorine reacts rapidly with inorganic such as bromide and more slowly, with organic material present in natural water. These reactions yield chlorides, oxidized organics, chlororganics, oxygen, nitrogen, chlorates, bromates and bromorganics. There is no potential for the bioaccumulation or bio-concentration of chlorine.

Emergency Overview:

Chlorine is a greenish yellow gas (or amber liquid) with an irritating odor. High concentration of chlorine gas may cause an oxygen–deficit atmosphere. Chlorine is an oxidizer, which can act to initiate and sustain the combustion of flammable materials. Chlorine is heavier than air and pockets of this gas can accumulate in low-lying areas.

Section 4 : First Aid Measures

Eye Contact:

May cause severe chemical burns to cornea. If liquid chlorine or high concentrations of chlorine gas get into the eyes, flush eyes immediately with a direct stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissue. Do not attempt chemical neutralization of any kind. Get medical attention immediately. Contact lenses should not be worn when working with chlorine.

Skin Contact:

Contact with evaporating liquid may cause frostbite or freezing of skin. Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention.

Inhalation:

Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give

artificial respiration. If breathing is difficult, trained personnel should give oxygen. Call a Physician.

Warning:

To avoid possible chemical burns, the rescuer should avoid breathing any exhaled air from the victim.

Section 5: Fire and Explosion Data

General Fire Hazards:

Heat may cause the containers to explode.

Suitable Extinguishing Media:

Water spray, fog or foam. Large fire: flood with fine water spray. Use water to keep fire - exposed containers cool and continue until well after fire is out.

Unsuitable Extinguishing Media:

Do not use carbon dioxide or halogenated extinguishing agents.

Special Hazards Arising from the Substance or Mixture:

Fire or excessive heat may produce hazardous decomposition products. Supports combustion.

Advice for Firefighter's Special Fire-fighting Procedures:

- Stop leak if safe to do so.
- Use of water may result in the formation of very toxic aqueous solutions.
- Keep run-off water out of sewers and water sources.
- Continue water spray from protected position until container stays cool.
- Use extinguishing ants to contain the fire. Isolate the source of the fire or let it burn out.

Special Protective Equipment for Firefighters:

Gas tight chemically protective clothing (Type 1) in combination with self-contained breathing apparatus. Guideline: EN 943-2 Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Performance requirements for gas-tight (Type 1) chemical protective suits for emergency teams (ET)

Section 6: Accidental Release Measures

Personal Precaution:
Evacuate area. Eliminate all ignition sources if safe to do so. Provide adequate ventilation. Monitor the concentration of the released product. Prevent from entering sewers, basements and work pits, or any place where its accumulation can be dangerous. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. EN 137 Respiratory protective devices - Self-contained open- circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.

Environmental Precautions:
Isolate area until gas has dispersed. Uncontrollable leaks may require evacuation of surrounding area. Keep material out of water courses and sewers. Use water spray to reduce vapor but do not apply water to point leak or spill area. Use general or local exhaust ventilation. Keep combustibles (such as wood, paper, oil) away from spilled material.

Methods and Materials for Containment and Cleaning up:

Small Spill:
Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.
Large spill:

Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7: Handling and Storage

This material is a Scheduled Poison S7 and must be stored, maintained and used in accordance with the relevant regulations.

Precautions for Safe Handling:

Avoid all contact. When using do not eat, drink or smoke. Only experienced and properly instructed persons should handle gases under pressure. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Do not drag, drop, slide or roll cylinders. The uncontrolled release of a gas under pressure may cause physical harm. Use a suitable hand truck for cylinder movement. Never attempt to transfer gases from one container to another.

Conditions for Safe Storage, Including any Incompatibilities:

Store in a well-ventilated area. Store below 50°C. Store away from foodstuffs. Store away from combustible materials.
Store away from incompatible materials described in Section 10. Keep dry - reacts with water. Cylinders should be securely restrained so that they are kept upright at all times. Drums should be stored horizontally. Keep containers closed when not in use - check regularly for leaks.

Section 8: Exposure Controls/Personal Protection

Control Parameters
Occupational Exposure Limits:

Chemical name	type	Exposure Limit Values	Source
Chlorine	STEL	0.5 ppm (1.5 mg/m^3)	UK. EH40 Workplace Exposure Limits (WELs) (12 2011)
	STEL	0.5 ppm (1.5 mg/m^3)	EU. Indicative Exposure Limit Values in Directives 91/322/EEC, 2000/39/EC, 2006/15/EC, 2009/161/EU (12 2009)

DNEL-Values

Critical component	Type	Value	Remarks
Chlorine	Worker - inhalative, long-term - systemic	0.75 mg/m³	
	Worker - inhalative, short-term - systemic	1.5 mg/m³	
	Worker - inhalative, long-term - local	0.75 mg/m³	
	Worker - inhalative, short-term - local	1.5 mg/m³	
	0.5 % w		
Chlorine	Aquatic (freshwater)	0.21 µg/l	
Chlorine	Sewage treatment plant	0.03 mg/l	
	Aquatic (intermit. releases)	0.26 µg/l	
	Aquatic (marine water)	0.042 µg/l	

Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental Exposure Controls:

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual Protection Measures:

Hygiene Measures:

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face Protection:

Safety eyewear complying with an approved standard should be used when a risk assess gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/ or face shield. If inhalation hazards exist, a full-face respirator may be required instead. It indicates this is necessary to avoid exposure to liquid splashes, mists.

Skin Protection
Hand Protection:

Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of

several substances, the protection time of the gloves cannot be accurately estimated.

Body Protection:

Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other Skin Protection:

Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory Protection:

Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9: Physical and Chemical Properties

Information on Basic Physical and Chemical Properties

Appearance:	Greenish-Yellow Gas with Suffocating Odour
Physical State:	Gas
Color:	Green, Yellow
Molecular Weight:	70.9 g/mole
Molecular Formula:	Cl_2
Boiling/Condensation Point:	-34°C (-29.2°F)
Melting/Freezing Point:	-101°C (-149.8°F)
Critical Temperature:	143.85°C (290.9°F)
Odor:	Pungent
Odor Threshold:	Not available
pH:	Not available
Flash Point:	[Product does not sustain combustion.]
Burning Time:	Not applicable
Burning Rate:	Not applicable

Evaporation Rate: Not available

Flammability (solid, gas):

Extremely flammable in the presence of the following materials or conditions: reducing materials, combustible materials, organic materials and alkalis.

Lower and Upper Explosive: Not available.

Vapor Pressure: 85.3 (psig)

Vapor Density: 2.5 (Air = 1)

Specific Volume 70°F 1atm (ft^3/lb): 5.4054

Gas Density 70°F 1atm (lb/ft^3): 0.185

Section 10: Stability and Reactivity Data

Reactivity:

No specific test data related to reactivity available for this product or its ingredients.

Chemical Stability: The product is stable.

Possibility of Hazardous Reactions:

Hazardous reactions or instability may occur under certain conditions of storage or use.
Conditions may include the following: contact with combustible materials Reactions may include the following: risk of causing fire

Conditions to Avoid: No specific data.

Section 11: Toxicological Information

Inhalation:

Major potential route of exposure. Exposure to chlorine gas may cause severe irritation of mucous membranes of the nose, throat and respiratory tract followed by severe coughing, burning, chest pain, vomiting, headache, anxiety and feeling of suffocation. Severe breathing difficulties may occur which may be delayed in onset. Severe exposure may lead to chemical pneumonitis and pulmonary edema and may be fatal. Repeated or prolonged exposure may result in reduced pulmonary capacity and dental erosion.

Ingestion:

Ingestion of liquid chlorine may result in severe irritation or ulceration of the mouth, throat and digestive tract which may be displayed by nausea, pain, vomiting and in severe cases, collapse, shock and death.

Eye Contact:

Exposure to chlorine gas may cause severe eye damage. Direct contact of the eyes with liquid chlorine will produce serious eye burns even blindness.

Skin Contact:

Contact with liquid chlorine may cause serious burns, blistering and tissue destruction. Chlorine vapors can cause irritation, burning and blisters. Contact with rapidly expanding gas poses a frostbite hazard.

Chronic Effects:

Chlorine is a primary irritant to the mucous membranes of the eyes, nose, and throat and to the linings of the entire respiratory tract. The major target organs for the sub chronic/chronic toxicity of chlorine in humans are the respiratory tract and the blood. The major target organs for the sub chronic/chronic toxicity of chlorine in animals are the immune system, the blood, the cardiovascular system and the respiratory tract. EPA has derived an oral RfD (reference dose) of 0.1 mg/kg/day for chlorine, based on a no-observed-adverse-effect level of 14.4 mg/kg/day in a chronic drinking water study in rats. In one case study, exposure to 0.015 mg/L of chlorine, 8 h/day for 6 years resulted in dyspnea, marked emphysema of both lower lung lobes, and reduced respiratory mobility.

CMR Effects
Carcinogenicity:

No conclusion on the carcinogenicity of chlorine can be made based on the limited information available from human and animal studies. Not classifiable as a Human Carcinogen.

Mutagenicity:

Chlorine has not been reported to cause mutagenic effect in humans.

Teratogenicity and Embryo toxicity: No data available

Section 12: Ecological Information

General Information:

Avoid release to the environment. Product is not allowed to be discharged into ground water or the aquatic environment.

Toxicity

Acute Toxicity Product:

Very toxic to aquatic life.

Acute Toxicity - Fish Chlorine

LC 50 (Fish, 96 h):

0.032 mg/l Acute toxicity - Aquatic Invertebrates chlorine LC 50 (Water flea (Daphnia magna), 48 h): 0.15 mg/l (Static) Remarks: Mortality

Toxicity to Microorganisms Chlorine:

EC 50 (Algae (Scenedesmus subspicatus), 72 h): 0.001 mg/l

Additional Ecological Information: None.

Persistence and Degradability Product:

Not applicable to gases and gas mixtures. Biodegradation Inorganic The product is not readily biodegradable.

Bio-accumulative Potential Product:

The substance has no potential for bioaccumulation.

Mobility in Soil Product:

The substance has low mobility in soil.

Results of PBT and vPvB assessment Product:

Not classified as PBT or vPvB.

Other Adverse Effects:

Other Ecological Information:

May cause pH changes in aqueous ecological systems. Depending on local conditions and existing concentrations, disturbances in the biodegradation process of activated sludge are possible.

Section 13: Disposal Considerations

Disposal Methods:

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001.

Component Waste Numbers:
The U.S. EPA has not published waste numbers for this product's components

Section 14: Transport Information

Component Marine Pollutants:

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS	
CHLORINE	7782-50-5	DOT regulated marine pollutant

US DOT Information

Shipping Name: Chlorine

UN/NA #: UN1017

Hazard Class: 2.3

Required Label(s): 2.3, 5.1, 8

Additional Info.: Toxic-Inhalation Hazard Zone B

IMDG Information

Shipping Name: Chlorine

UN #: UN1017 **Hazard Class:** 2.3

Required Label(s): 2.3, 5.1, 8

Section 15: Other Regulatory Information

Chlorine is classified and labeled under Directive 67/548/EC, Annex I. This product is listed on EINECS.

EC Classification EC Index No 017-001-00-7
T; R23
Xi;
R36/37/38
N; R50

EC Labeling		
EC label name	Chlorine	
EC No.	231-959-5	
Hazard Symbol	T	Toxic
	N	Dangerous for environment
R Phrases	**R23**	Toxic by inhalation.
	R 36/37/38	Irritating to eyes, respiratory system and skin.
	R 50	Very **t**oxic to aquatic life.
S Phrases	**S 7/ 9**	Keep container tightly closed in a well- ventilated place.
	S 45	In case of accident or if you fell unwell, seek medical immediately (show the label whenever possible).
	S 61	Avoid release to the environment. Refer to Special instructions/safety data sheets.

Section 16: Other Information

Reference: Not available

Other special consideration: Not available

Created on: 01-01-2022

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