	AL KOUT INDUSTRIAL PROJECTS	Document No:	C-SM-XX-D-006
		Issue No:	1
	Safety Data Sheet CHLORINE	Rev no:	4
		Date revision	21.11.2018
		Page number	Page 1 of 7

1.0 Chemical Identity

1.1	Product Name	Chlorine (Liquefied Chlorine)
	Synonyms	Molecular Chlorine
	Formula	Cl ₂
1.2	Recommended Use and Restrictions	
	Use of substance	Industrial use. Use as directed.
1.3	Company Information	
		Name: Al Kout Industrial Projects , Kuwait Plant: Salt & Chlorine Plant, Shuaiba, Kuwait Company's Post Box No.: 10277, Shuaiba-65453, Kuwait Tel No.: 00-(965)-22283726 Intercom: 3726, 3725 Fax No.: 00-(965)- 22284043 Company's Emergency Phone No: 00-(965)-, 23261029, 97216020, 99794511
1.4	Emergency Telephone Number	00-(965)-, 23261029, 97216020

2.0 Hazards Identification






2.1	Classification of the Substance or Mixture
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GHS US Classification

Ox. Gas 1	H270
Liquefied gas	H280
Acute Tox. 2 (Inhalation: gas)	H330
Skin Corr. 1A	H314
Eye Dam. 1	H318
STOT SE 3	H335
Aquatic Acute 1	H400


2.2	Label Elements
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GHS US Labeling

Hazard Pictograms (GHS – US)	:	    
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Single Word (GHS-US)	: Danger
Hazard Statements (GHS-US)	: H270 - MAY CAUSE OR INTENSIFY FIRE; OXIDIZER H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED H314 - CAUSES SEVERE SKIN BURNS AND EYE DAMAGE H330 - FATAL IF INHALED H400 - VERY TOXIC TO AQUATIC LIFE CGA-HG22 - CORROSIVE TO THE RESPIRATORY TRACT


Precautionary Statements (GHS – US)	: P202 - Do not handle until all safety precautions have been read and understood
	P244 - Keep reduction valves/valves and fittings free from oil and grease P260 - Do not breathe gas P264 - Wash hands thoroughly after handling P271+P403 - Use and store only outdoors or in a well-ventilated place P273 - Avoid release to the environment P280+P284 - Wear protective gloves, protective clothing, eye protection, respiratory protection, and/or face protection P370+P376 - In case of fire: Stop leak if safe to do so P405 - Store locked up P501 - Dispose of contents/container Dispose in a safe manner in accordance with local/national regulations CGA-PG05 - Use a back flow preventive device in the piping CGA-PG20+CGA-PG10 - Use only with equipment of compatible materials of construction and rated for cylinder pressure

 al kout industrial projects الكوت للمشاريع الصناعية	AL KOUT INDUSTRIAL PROJECTS	Document No:	C-SM-XX-D-006
		Issue No:	1
	Rev no:	4	
	Safety Data Sheet CHLORINE	Date revision	21.11.2018
		Page number	Page 2 of 7

CGA-PG12 - Do not open valve until connected to equipment prepared for use CGA-PG18 - When returning cylinder, install leak tight valve outlet cap or plug CGA-PG06 - Close valve after each use and when empty CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F)	
2.3	Other Hazards
No additional information available	
2.4	Unknown acute toxicity (GHS US)
Not Applicable	

3.0 Composition/ Information on ingredients																												
3.1	Substances																											
Name : Chlorine CAS No : 7782-50-5 EINECS number : 231-959-5 Finished Product Specification : Chlorine																												
3.2	Chemical Analysis																											
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%; text-align: center;">Parameters</th> <th style="width: 20%; text-align: center;">Specification</th> </tr> </thead> <tbody> <tr> <td>Chlorine as Cl₂</td> <td style="text-align: center;">wt % min</td> <td style="text-align: center;">99.5</td> </tr> <tr> <td>Non volatile Residue at 25 °C</td> <td style="text-align: center;">ppm max</td> <td style="text-align: center;">40.0</td> </tr> <tr> <td>Moisture as H₂O</td> <td style="text-align: center;">ppm max</td> <td style="text-align: center;">40.0</td> </tr> <tr> <td>Iron as Fe⁺²</td> <td style="text-align: center;">ppm max</td> <td style="text-align: center;">3.0</td> </tr> <tr> <td>Nickel as Ni⁺²</td> <td style="text-align: center;">ppm max</td> <td style="text-align: center;">0.2</td> </tr> <tr> <td>Cobalt as Co⁺²</td> <td style="text-align: center;">ppm max</td> <td style="text-align: center;">0.1</td> </tr> <tr> <td>Copper as Cu⁺²</td> <td style="text-align: center;">ppm max</td> <td style="text-align: center;">0.1</td> </tr> <tr> <td>Manganese as Mn⁺²</td> <td style="text-align: center;">ppm max</td> <td style="text-align: center;">0.1</td> </tr> </tbody> </table>		Parameters	Specification	Chlorine as Cl ₂	wt % min	99.5	Non volatile Residue at 25 °C	ppm max	40.0	Moisture as H ₂ O	ppm max	40.0	Iron as Fe ⁺²	ppm max	3.0	Nickel as Ni ⁺²	ppm max	0.2	Cobalt as Co ⁺²	ppm max	0.1	Copper as Cu ⁺²	ppm max	0.1	Manganese as Mn ⁺²	ppm max	0.1
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4.0 First Aid Measures			
	Initially irritation of the eyes, nose and throat, followed by coughing and wheezing, dyspnoea, sputum production and chest pain. Larger exposures may lead to hyperchloraemic acidosis; anoxia may lead to cardiac and/or respiratory arrest and pulmonary oedema. Following chemical pneumonitis respiratory distress and chest pain generally subsides within 72 hours; cough may persist for up to 14 days.		
4.1	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; text-align: center;">Inhalation</td> <td>Take proper precautions to ensure your own safety before attempting rescue (e.g., wear appropriate protective equipment, use the buddy system). Remove source of contamination or move victim to fresh air. If breathing is difficult, oxygen may be beneficial if administered by trained personnel, preferably on doctor's advice. DO NOT allow victim to move about unnecessarily. Symptoms of pulmonary edema can be delayed up to 48 hours after exposure. Apply artificial respiration if victim is not breathing. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Give Cardiopulmonary Resuscitation (CPR) if there is no pulse AND no breathing. Obtain medical attention IMMEDIATELY.</td> </tr> </table>	Inhalation	Take proper precautions to ensure your own safety before attempting rescue (e.g., wear appropriate protective equipment, use the buddy system). Remove source of contamination or move victim to fresh air. If breathing is difficult, oxygen may be beneficial if administered by trained personnel, preferably on doctor's advice. DO NOT allow victim to move about unnecessarily. Symptoms of pulmonary edema can be delayed up to 48 hours after exposure. Apply artificial respiration if victim is not breathing. Induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Give Cardiopulmonary Resuscitation (CPR) if there is no pulse AND no breathing. Obtain medical attention IMMEDIATELY.
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4.2	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; text-align: center;">Skin</td> <td>Airborne gas may irritate and burn the skin. Direct contact with the liquefied gas escaping from its pressurized cylinder can cause frostbite. Symptoms of mild frostbite include numbness, prickling and itching in the affected area. Symptoms of more severe frostbite include a burning sensation and stiffness of the affected area. The skin may become waxy white or yellow Quickly remove victim from source of contamination and flush with lukewarm,</td> </tr> </table>	Skin	Airborne gas may irritate and burn the skin. Direct contact with the liquefied gas escaping from its pressurized cylinder can cause frostbite. Symptoms of mild frostbite include numbness, prickling and itching in the affected area. Symptoms of more severe frostbite include a burning sensation and stiffness of the affected area. The skin may become waxy white or yellow Quickly remove victim from source of contamination and flush with lukewarm,
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 al kout industrial projects الكوت للمشاريع الصناعية	AL KOUT INDUSTRIAL PROJECTS	Document No:	C-SM-XX-D-006
		Issue No:	1
	Rev no:	4	
	Safety Data Sheet CHLORINE	Date revision	21.11.2018
		Page number	Page 3 of 7

		gently flowing water for a minimum of 20 minutes. Liquefied gas: DO NOT attempt to re-warm the affected area on site. DO NOT rub area or apply dry heat. Gently remove clothing or jewelry that may restrict circulation. Carefully cut around clothing that sticks to the skin and remove the rest of the garment. Loosely cover the affected area with a sterile dressing. DO NOT allow victim to drink alcohol or smoke. Obtain medical attention IMMEDIATELY
4.3	Eyes	Chlorine gas is a severe eye irritant. Stinging, a burning sensation, rapid blinking, redness and watering of the eyes have been observed at concentrations of 1 ppm and higher. Direct contact with liquefied chlorine escaping from its high pressure cylinder may cause frostbite. Burns and permanent damage, including blindness may result. Immediately flush eyes with lukewarm running water for a minimum of 20 minutes. If a burn exists, cover both eyes with a sterile dressing. Liquefied Gas: DO NOT attempt to rewarm the affected area on site. DO NOT rub area or apply dry heat. Loosely cover the affected area with a sterile dressing. DO NOT allow victim to drink alcohol or smoke. Obtain medical attention IMMEDIATELY
4.4	Ingestion	Ingestion is not an applicable route of exposure for gases
4.5	TLV	0.5 ppm (laid down by ACGIH-American Conference of Governmental Industrial Hygienists)


5.0 Fire Fighting Measures		
5.1	Fire and Explosion Hazards	Chlorine does not burn. However, Chlorine is a strong oxidizing agent and poses a serious fire and explosion risk because it promotes combustion, like oxygen. Most combustible materials will ignite and/or burn in Chlorine atmospheres, forming irritating and toxic gases. Containers or cylinders may rupture violently due to over-pressurization, if exposed to fire or excessive heat for a sufficient period of time. Intense local heat (above 200°C) on the steel walls of Chlorine cylinders can cause an iron/chlorine fire resulting in rupture of the container cylinder and ton containers will vent through fusible plugs at 71°C (160°F). Chlorine gas is heavier than air and will collect and persist in pits, hollows, depressions, and other confined or low-lying areas
5.2	Extinguishing Media	Use extinguishing media appropriate to surrounding fire conditions, such as dry chemical powder, carbon dioxide, or foam.
5.3	Fire fighting procedure.	Apply water from as far a distance as possible, in flooding quantities as a spray or fog to keep fire-exposed cylinders, containers or equipment cool and absorb heat, until well after the fire is out. If there is a chlorine leak, stop the flow of gas, if this can be done safely. A chlorine fire can be extinguished only by stopping the flow of chlorine gas. Use water spray to protect personnel attempting to shut off the flow. Remove all flammable and combustible materials from the vicinity, especially oil and grease. Use water with caution. Do not apply water directly to the liquefied or gaseous chlorine. Reverse flow into cylinder may cause rupture. Take care not to block pressure relief valves
5.4	Fire fighting protective equipment	Use specialized protective equipment suitable for the situation. Firefighter's normal protective clothing (Bunker Gear) will not provide adequate protection. A full-body encapsulating chemical resistant suit with positive pressure self-contained breathing apparatus (MSHA/NIOSH approved or equivalent) may be necessary.

6.0 Accidental Release Measures		
6.1	Spills/Leaks/Releases	➤ Restrict access to area until completion of clean up. Ensure trained personnel

 al kout industrial projects الكوت للمشاريع الصناعية	AL KOUT INDUSTRIAL PROJECTS	Document No:	C-SM-XX-D-006
		Issue No:	1
		Rev no:	4
	Safety Data Sheet CHLORINE	Date revision	21.11.2018
		Page number	Page 4 of 7

		<p>conduct clean up</p> <ul style="list-style-type: none"> ➤ Wear adequate personal protective equipment including respiratory protection. ➤ Remove all combustible and flammable materials ➤ Remove all ignition sources (no smoking, flares, sparks or flames). All equipment should be grounded. Ventilate area. ➤ Stop leak if possible without personal risk. Emergency kits are available for handling chlorine leaks in cylinders, tank cars and tank trailers. All personnel must be trained in their particular usage. This information is available from the chlorine Institute. ➤ Large Leaks :Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Prevent entry into sewers and confined areas. Vapor knock down water is corrosive and toxic, thus it should be dyked for containment. Ensure compatible materials are used. ➤ Leaking cylinder ; Only to be conducted by trained personnel. Emergency kits are available for handling leaking chlorine cylinders. Contents may also be disposed of to a safe area out of doors or a hood with forced ventilation. Attach appropriate control valve provided with a trap or check valve and a long piece of flexible hose connected to the valve outlet. Discharge the gas at a moderate rate into an adequate amount of about 15% aqueous sodium hydroxide or other alkali or reducing solution in suitable container. When all the gas is discharged, close the cylinder valve and tag the cylinder as defective. Dispose of waste according to local environmental regulations.
6.2	Waste Disposal Methods	Dispose of waste material at an approved waste treatment/disposal facility, in accordance with applicable regulations. Do not dispose of waste with normal garbage or to sewer systems.

7.0 Handling and Storage		
7.1	Handling	Take all precautions to avoid personal contact. Prevent the release of gas into workplace air. Always ensure adequate ventilation in handling areas. Locate safety shower and eyewash station close to chemical handling area. Keep away from incompatibles, heat, sparks, flames and other ignition sources. Locate safety shower and eyewash station fairly close to chemical handling area. Only auxiliary valves and gauges designed solely for chlorine gas should be used. Secure containers at all times. Leaks should be fixed promptly. Vapors are heavier than air. Prevent liquid or vapor from entering sewers, sumps or pit areas. Vapors can create a toxic atmosphere, which may be fatal. Use self-contained breathing apparatus to avoid suffocation.
7.2	Storage	Store in a cool, dry, well-ventilated area, out of direct sunlight, away from heat, away from flammable materials, incompatibles and away from process and handling areas. Do not store near elevators, corridors or loading docks. Do not store below ground level or in confined spaces. Storage area should be clearly identified, clear of obstruction and accessible only to trained and authorized personnel. Post warning signs. Inspect periodically for damage or leaks. Keep quantities stored as small as possible. For large-scale storage of this material consider the installation of a leak detection system with an alarm. Facilities for the emergency disposal of chlorine from leaking containers should be provided in storage areas. Avoid storage of cylinders for more than six months. Use the oldest first. Compressed gas cylinders should be stored separately according to their chemical hazards. This material is highly reactive. Always store in original labeled cylinder, or in the type of container recommended by the manufacturer/supplier. Keep cylinders tightly closed when not in use and when empty. Cylinder valves should be tightly closed. Cylinder valve caps should be properly secured. Always check cylinder valve for evidence of damage, rust or dirt, which may inhibit operation. Always chain or


 al kout industrial projects الكوت للمشاريع الصناعية	AL KOUT INDUSTRIAL PROJECTS	Document No:	C-SM-XX-D-006	
		Issue No:	1	
	Rev no:	4		
	Safety Data Sheet CHLORINE		Date revision	21.11.2018
			Page number	Page 5 of 7

	<p>otherwise securely restrain cylinders in an upright position to a wall, rack or other solid structure when they are stored. Store empty cylinders separate from full ones with valves shut off, cap secure and labeled EMPTY or "MT". Empty containers may contain hazardous residues. Outdoor cylinder storage should be weatherproofed and have proper drainage. Have appropriate fire extinguishers and leak clean-up equipment in storage area.</p> <p>Storage Temperature: Protect from temperature extremes. (Never expose cylinders to temperatures higher than 52°C (125°F) or below -29°C (-20°F) unless they are designed for this.</p> <p>Other Precautions: Walls, floors, shelving, fittings, lighting and ventilation systems in storage area should be made from materials that do not react with chlorine. Below 121°C (250°F), iron, copper, steel, lead, nickel, platinum, silver and tantalum are resistant to dry chlorine gas or liquid. Storage facilities should be made of fire-resistant materials.</p>
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8.0 Exposure Controls/Personal Protection						
	Ingredient	% ge Volume	TLV-TWA	STEL	IDLH	LD 50 or LC 50
8.1	Chlorine Formula CL2 CAS 7782-50-	100 %	0.5 ppm	1 ppm	10 ppm	LC 50: 293 ppm/1H (rats)
8.2	Engineering Controls	Hood with forced ventilation. Use local ventilation to prevent accumulation above the exposure limit				
8.3	Eye/Face Protection	Chemical Goggles or Full Face respirator				
8.4	Skin Protection	PVC, Kel-F or Teflon suit				
8.5	Respiratory Protection	Cartridge type gas mask (upto 10 ppm) or for escape, Canister mask (upto 25 ppm), SCBA for higher concentrations				

9.0 Physical and Chemical Properties		
9.1	Appearance/ Colour	Greenish yellow gas /Amber colored liquid
9.2	Odour	Pungent
9.3	Molecular Weight	70.9
9.4	Freezing Point	-150°F (-101°C)
9.5	Boiling Point	-29°F (-34°C)
9.6	Specific gravity	1.467 at 0°C (32°F) and 368.9 kPa (saturated liquefied gas); 0.0032 at 0°C (gas) (water = 1)
9.7	Vapour Pressure	673.1 kPa (6.64 atm) (97.6 psig) at (20°C)
9.8	Solubility (water)	0.73 g/100 g water at 20°C
9.9	Vapor density	2.47 (Air=1)

10.0 Stability and Reactivity		
10.1	Chemical Stability	Stable at room temperature
10.2	Incompatibilities with other metals	<p>Chlorine gas can react explosively with alcohols, ammonia and compounds, hydrocarbon gases (e.g. acetylene and ethylene), hydrogen, antimony trichloride and bromine pentafluoride, dioxygen difluoride, oxygen difluoride, fluorine, dichloro(methyl)arsine, ethylphosphine, strong reducing agents, aqueous sulfamic acid, styrene, tetraselenium tetranitride and white phosphorus.</p> <p>Chlorine gas ignites on contact with mono and di-alkali metal acetylides, copper acetylides, halocarbons (e.g. dichloromethane), metals (e.g. finely powdered aluminum brass and copper foil, iron, potassium, sodium, tin and titanium), non-metals (e.g. boron, active carbon, phosphorous and silicon), iron, uranium and zirconium carbides, diethyl ether, diethyl zinc, metal and non-metal hydrides, phosphorus compounds, sulfides, tellurium, trialkyl boranes and tungsten dioxide</p>


 al kout industrial projects الكوت للمشاريع الصناعية	AL KOUT INDUSTRIAL PROJECTS	Document No:	C-SM-XX-D-006
		Issue No:	1
	Safety Data Sheet CHLORINE	Rev no:	4
		Date revision	21.11.2018
		Page number	Page 6 of 7

		Liquefied chlorine can react violently, explosively or ignite on contact with carbon disulfide, iron, bismuth, dibutyl phthalate, drawing wax, gasoline, glycerol, linseed oil, white phosphorus, polydimethylsiloxane, silicones, sodium hydroxide, tin, titanium and vanadium powder.
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11.0 Toxicological Information		
11.1	TUMORIGENIC:	Evidence of carcinogenic activity in experimental rats exposed orally.
11.2	REPRODUCTIVE:	Embryo and fetotoxicity observed after exposure of female rats exposed at 565 mg/kg prior to mating. Effects also observed from exposure of pregnant rats at same level.
11.3	MUTAGENIC:	Mutagenic effects seen in bacterial, mammalian and insect assay systems.
11.4	OTHER:	Toxic effects reported in renal system, blood and spleen from inhalation exposure of rats.


12.0 Ecological Information	
12.1	Very Toxic to Aquatic life.
LC50 fish 1	0.44 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [flow-through])
EC50 Daphnia 1	0.017 mg/l (Exposure time: 48 h - Species: Daphnia magna)
LC50 fish 2	0.014 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [flow-through])

13.0 Disposal Considerations	
13.1	Due to its inherent properties, hazardous conditions may result if the material is managed improperly. It is recommended that any containerized waste chlorine be managed as hazardous waste in accordance with all applicable state, and local health and environmental laws and regulations

14.0 Transport Information		
14.1	UN No	1017
14.2	IMCO Class	2.3 , Toxic Gas 
14.3	Packaging group	N/A
14.4	ADR/RID classification code	2TC

15.0 Regulatory Information		
15.1	Clean Air Act	Chlorine is listed under the accident prevention provisions of section 112 (r) of the Clean Air Act (CAA) with a Threshold Quantity (TQ) of 2500 pounds
15.2	SARA Title III Notifications and Information	Chlorine is listed as an Extremely Hazardous Substance (EHS) subject to state and local reporting under section 304 of SARA Title III (EPCRA)
15.3	SARA Title III Hazard Classes	Acute Health Hazard, Chronic Health Hazard, Fire Hazard, Sudden Release of Pressure Hazard & Reactivity Hazard

16.0 Other Information	
16.1	Packaging: In tonners (900Kgs), Small Cylinders, ISO tankers & Road Tankers (5- 20 MT)
16.2	DISCLAIMER

 al kout industrial projects الكوت للمشاريع الصناعية	AL KOUT INDUSTRIAL PROJECTS	Document No:	C-SM-XX-D-006
		Issue No:	1
		Rev no:	4
	Safety Data Sheet CHLORINE	Date revision	21.11.2018
		Page number	Page 7 of 7

The Information contained in this material data sheet is believed to be reliable but no representation, guarantee or warranties of any kind are made as to its accuracy, suitability for a particular application or results to be obtained from them. It is upto the manufacturer/seller to ensure that the information contained in the material safety data sheet is relevant to the product manufactured / handled or sold by him as the case may be. The AIPC makes no warranties expressed or implied in respect of the adequacy of this document for any particular purpose.

NFPA health hazard : 4 - Very short exposure could cause death or serious residual injury even though prompt medical attention was given.

NFPA fire hazard : 0 - Materials that will not burn.

NFPA reactivity : 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.

NFPA specific hazard : OX - This denotes an oxidizer, a chemical which can greatly increase the rate of combustion/fire.



Hazard Rating

Health given : 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is

Flammability : 0 Minimal Hazard

Physical : 2 Moderate Hazard

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.