Chlorine

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Revision date: 9/26/2016 Supersedes: 11/12/2015 Version: 2.1

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form	:	Substance
Name	:	Chlorine
EC index no	:	017-001-00-7
EC no	:	231-959-5
CAS No	:	7782-50-5
REACH registration No	:	01-2119486560-35
Formula	:	Cl2

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.2.1. Relevant identified uses

Use of the substance/mixture : Industrial uses: Uses of substances as such or in preparations at industrial sites
Manufacture of textiles, leather, fur
Manufacture of pulp, paper and paper products
Manufacture of bulk, large scale chemicals (including petroleum products)
Manufacture of fine chemicals
Manufacture of other non-metallic mineral products, e.g. plasters, cement
Manufacture of basic metals, including alloys
Manufacture of computer, electronic and optical products, electrical equipment

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

MSSA S.A.S.
111, Rue de la Volta - Pomblière
73600 SAINT-MARCEL - France
T +33 (0)4 79 24 70 70 - F +33 (0)4 79 24 70 50
fds-msds@metauxspeciaux.fr

1.4. Emergency telephone number

Country	Organisation/Company	Address	Emergency number	Comment
United Kingdom	National Poisons Information Service (Birmingham Centre) City Hospital, Guy's & St Thomas' Hospital Trust	Dudley Road B18 7QH Birmingham	0844 892 0111 (UK only, Monday to Friday, 08.00 to 18.00 hours)	

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Ox. Gas 1	H270	
Press. Gas Liq.	H280	
Acute Tox. 2 (Inhalation)	H330	
Skin Irrit. 2	H315	
Eye Irrit. 2	H319	
STOT SE 3	H335	
Aquatic Acute 1	H400	(M=100)
Aquatic Chronic 1	H410	

Full text of hazard classes and H-statements : see section 16

Adverse physicochemical, human health and environmental effects

Oxidizing. Fatal if inhaled. Corrosive to the respiratory tract. Causes skin irritation. Causes serious eye irritation. Very toxic to aquatic life with long lasting effects.

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP) :

GHS03 GHS04 GHS06 GHS09

Signal word (CLP) : Danger

Hazard statements (CLP) : H270 - May cause or intensify fire; oxidizer
H280 - Contains gas under pressure; may explode if heated
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H330 - Fatal if inhaled
H410 - Very toxic to aquatic life with long lasting effects

Precautionary statements (CLP) : P220 - Keep/Store away from clothing, combustibles
P244 - Keep reduction valves free from grease and oil
P260 - Do not breathe gas
P273 - Avoid release to the environment
P280 - Wear protective gloves, protective clothing, eye protection, face protection
P370+P376 - In case of fire: stop leak if safe to do so
P302+P352 - IF ON SKIN: Wash with plenty of soap and water
P304+P340+P315 - IF INHALED : Remove person to fresh air and keep comfortable for breathing. Get immediate medical advice / attention
P305+P351+P338+P315 - IF IN EYES : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice / attention
P332+P313 - If skin irritation occurs: Get medical advice/attention
P403 - Store in a well-ventilated place
P405 - Store locked up

EUH-statements : EUH071 - Corrosive to the respiratory tract

2.3. Other hazards

This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII

This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Chlorine (Note U)	(CAS No) 7782-50-5 (EC no) 231-959-5 (EC index no) 017-001-00-7 (REACH-no) 01-2119486560-35	100	Ox. Gas 1, H270 Press. Gas Liq., H280 Acute Tox. 2 (Inhalation), H330 Skin Irrit. 2, H315 Eye Irrit. 2, H319 STOT SE 3, H335 Aquatic Acute 1, H400 (M=100) Aquatic Chronic 1, H410

Full text of H-statements: see section 16

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Move the affected person away from the contaminated area and into the fresh air. Remove contaminated clothing. Provide oxygen and/or ventilation assistance, if needed. Call a physician immediately. Transport to hospital immediately. Keep victim warm and rested. Delayed adverse effects possible.

First-aid measures after skin contact : Immediately remove contaminated clothing or footwear. Rinse immediately with plenty of water. If necessary seek medical advice.

First-aid measures after eye contact : Rinse immediately and thoroughly, pulling the eyelids well away from the eye (15 minutes minimum). Consult an eye specialist immediately.

First-aid measures after ingestion : Not specifically applicable.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : Exceeding the exposure limits atmospheric concentrations may lead to immediate and severe irritation of the upper respiratory tract, severe coughing, choking and bronchospasm (15-20 ppm), shortness of breath, chest pain, nausea and vomiting (30 ppm). There are indications that some exposures may cause bronchial hyperactivity in some sensitive individuals. Fainting and death may occur after exposure above 50 ppm (depending on the duration of exposure). Chemical tracheobronchitis, pulmonary edema may occur up to 48 hours after exposure (above 40 ppm).

Symptoms/injuries after skin contact : Causes skin irritation.

Symptoms/injuries after eye contact : Causes serious eye irritation.

4.3. Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : All extinguishing agents can be used. If leaking do not spray water onto container. Water surrounding area (from protected position) to contain fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : May intensify fire; oxidiser.

5.3. Advice for firefighters

Firefighting instructions : Clear the danger area. Combat the gas with a water-spray. Contain the extinguishing fluids by bunding (the product is hazardous for the environment). Use water spray or fog for cooling exposed containers. If leaking do not spray water onto container. Water surrounding area (from protected position) to contain fire. Keep upwind.

Protection during firefighting : Do not attempt to take action without suitable protective equipment. Self-contained breathing apparatus. Complete protective clothing.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Ensure adequate ventilation. Do not breathe vapours. Avoid any direct contact with the product. Access forbidden to unauthorised personnel.

6.1.1. For non-emergency personnel

Emergency procedures : Mark out the contaminated area with signs and prevent access to unauthorized personnel. Consult an expert immediately. Avoid any direct contact with the product. Do not breathe vapours. Prevent wind dispersal. Keep upwind.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Stop leak if safe to do so. Use water curtains to contain the toxic clouds. Contain the spilled material by bunding. Turn leaking containers leak-side up to prevent the escape of liquid. Notify authorities if product enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Combat the gas with a water-spray. Suck towards a neutralization installation. Wash with sodium carbonate solution (5% Na2 CO3).

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Ensure good ventilation of the work station. Avoid any direct contact with the product. Smoking is forbidden. Avoid contact of substance with water. Do not breathe gas. Closed system. Vapour extraction at source. Only oil the equipment with specialist greases (chlorofluorinated).

Hygiene measures : Do not drink, eat or smoke in the workplace. Always wash hands after handling the product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : The floor of the depot should be impermeable and designed to form a water-tight basin. Storage areas must be equipped with a high and low ventilation and connected to a neutralization / absorption unit.

Storage conditions : Keep container tightly closed and dry. Store in a cool, well-ventilated place. Protect from sunlight. Keep away from heat. Keep at temperature not exceeding 50 °C.

Incompatible materials	:	Combustible materials. reducing materials. Organic materials. Finely divided metals (Al, Mg, Zn). Hydrogen. Acetylene. Ethylene. ethane. Hydrazine. Phosphorus. Arsenic. antimony. Fats. Silicons. (Risk of violent reaction -. Ignition).
Storage temperature	:	< 50 °C
Packaging materials	:	Recommended materials : Ordinary steel. Polytetrafluoroethylene (PTFE). PVC. Packing material to avoid : metals. Titanium. Aluminium. Some plastics.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Chlorine (7782-50-5)		
United Kingdom	Local name	Chlorine
United Kingdom	WEL STEL (mg/m³)	1.5 mg/m³
United Kingdom	WEL STEL (ppm)	0.5 ppm

Chlorine (7782-50-5)	
DNEL/DMEL (Workers)	
Acute - systemic effects, inhalation	1.5 mg/m³
Acute - local effects, inhalation	1.5 mg/m³
Long-term - local effects, dermal	0.5 % in mixture
Long-term - systemic effects, inhalation	0.75 mg/m³
Long-term - local effects, inhalation	0.75 mg/m³
DNEL/DMEL (General population)	
Acute - systemic effects, inhalation	1.5 mg/m³
Acute - local effects, inhalation	1.5 mg/m³
Long-term - systemic effects,oral	0.25 mg/kg bodyweight/day
Long-term - systemic effects, inhalation	0.75 mg/m³
Long-term - local effects, dermal	0.5 % in mixture
Long-term - local effects, inhalation	1.5 mg/m³
PNEC (Water)	
PNEC aqua (freshwater)	0.21 µg/l
PNEC aqua (marine water)	0.042 µg/l
PNEC aqua (intermittent, freshwater)	0.26 µg/l
PNEC (Oral)	
PNEC oral (secondary poisoning)	11.1 mg/kg dwt
PNEC (STP)	
PNEC sewage treatment plant	0.03 mg/l

8.2. Exposure controls

Appropriate engineering controls:

Ensure good ventilation of the work station. Extraction to remove vapours at their source. Safety shower. Eye fountain. Monitor the atmosphere at regular intervals.

Hand protection:

Neoprene protective gloves. Breakthrough time : refer to the recommendations of the supplier. The protective gloves to be used must comply with the specifications of EC directive 89/686/EEC and the resultant standard EN 374

Eye protection:

Safety glasses. Face-shield

Skin and body protection:

Protective clothing

Respiratory protection:

Gas mask with filter type B

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Gas
Colour	:	Slightly yellow to green.

Odour	:	Pungent.
Odour threshold	:	0.3 - 0.5 ppm
pH	:	Not applicable
Relative evaporation rate (butylacetate=1)	:	No data available
Melting point	:	-101 °C
Freezing point	:	No data available
Boiling point	:	-34 °C
Flash point	:	Not applicable
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Flammability (solid, gas)	:	No data available
Vapour pressure	:	6780 hPa (20 °C)
Relative vapour density at 20 °C	:	No data available
Relative density	:	2.49
Density	:	1.411 g/cm³
Solubility	:	Benzene : 318 g/kg (20 °C). Acetic acid : 121 g/kg (15 °C). Tetrachloromethane : 114 g/kg (20 °C). Water: 7.41 g/l (20 °C)
Log Pow	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	0.0134 mPa.s (20 °C)
Explosive properties	:	Not explosive.
Oxidising properties	:	Oxidizing.
Explosive limits	:	Not applicable

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Oxidizing. Contact with combustible material may cause fire.

10.2. Chemical stability

Stable at ambient temperature and under normal conditions of use.

10.3. Possibility of hazardous reactions

Explosive when mixed with : Hydrogen. Ammonia. Organic materials. Attacks many metals in the presence of water or humidity. Reacts violently with unsaturated organic compounds, alcohols, ethers, fats, mineral oils (including silicones), phosphorus, arsenic, antimony, aluminum, finely divided metals. Dry chlorine reacts violently with titanium.

10.4. Conditions to avoid

Moisture.

10.5. Incompatible materials

reducing materials. Combustible materials. Powdered metals. Acetylene. Hydrogen. Organic materials. Ammonia. Various hydrocarbon fragments. Water. Hydrazine. Fats. Silicons. Iron (>100 °C).

10.6. Hazardous decomposition products

On contact with water : Hydrochloric acid. Hypochlorous acid.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Inhalation: Fatal if inhaled.

Chlorine (7782-50-5)	
LD50 oral rat	1100 mg/kg (OECD 401) (Read accross)
LD50 dermal rabbit	> 20000 mg/kg (OECD 402) (Read accross)
LC50 inhalation rat	1321 mg/m³ (60 minutes) (equivalent or similar to OECD Guideline 403)

Skin corrosion/irritation : Causes skin irritation.
pH: Not applicable

Additional information : (OECD 404 method)
(read-across)

Serious eye damage/irritation	:	Causes serious eye irritation. pH: Not applicable
Additional information	:	(OECD 405) (read-across)
Respiratory or skin sensitisation	:	Not classified (Conclusive but not sufficient for classification)
Additional information	:	Does not cause cutaneous sensitisation for guinea-pigs (OECD 406) (read-across)
Germ cell mutagenicity	:	Not classified (Conclusive but not sufficient for classification) Mutagenicity : Ames test : negative (OECD 471) (read-across)
Carcinogenicity	:	Not classified (Conclusive but not sufficient for classification)
Additional information	:	No carcinogenic effects reported (read-across)
Reproductive toxicity	:	Not classified (Conclusive but not sufficient for classification)
Additional information	:	No observed effects NOAEL (oral,rat) : > 5 mg/kg/d (OECD 415 method)
STOT-single exposure	:	May cause respiratory irritation.
Additional information	:	Corrosive to the respiratory tract
STOT-repeated exposure	:	Not classified (Conclusive but not sufficient for classification)

Chlorine (7782-50-5)	
LOAEL (oral, rat, 90 days)	20 mg/kg bodyweight/day (OECD 408) (Read accross)
NOAEL (oral, rat, 90 days)	20 mg/kg bodyweight/day (OECD 408) (Read accross)

Aspiration hazard : Not classified (Technical impossibility to obtain the data)

Chlorine (7782-50-5)	
Viscosity, kinematic	0.00949681 mm²/s

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Very toxic to aquatic life with long lasting effects.

Chlorine (7782-50-5)	
LC50 fish	0.06 mg/l/96h (Salmo gairdneri) (Read accross)
EC50 Daphnia	0.141 mg/l/48h (Daphnia magna) (Read accross)
ErC50 (algae)	< 0.05 mg/l/48h (Arcatia) (Read accross)
ErC50 (other aquatic plants)	0.1 - 0.4 mg/l (Myriophyllum spicatum)
NOEC chronic fish	0.04 mg/l (Menidia peninsulae) (Read accross)
NOEC chronic crustacea	0.01 mg/l (E. capsaeformis) (Read accross)
Additional information	Activated sludge : EC50 > 3 mg/l (3h)

12.2. Persistence and degradability

Chlorine (7782-50-5)	
Persistence and degradability	hydrolysis: In water, formation of hypochlorous acid and hypochlorites according to the environmental pH. Photodegradation in air: In the atmosphere, chlorine deteriorates during the day with half-lives ranging from a few minutes to a few hours depending on latitude, season and time of the day Photodegradation in water: Chlorine sensitivity to light is high. The half-life varies between 12 min at pH 8 and 60 min at pH 5 Photodegradation in soil: No data available.

12.3. Bioaccumulative potential

Chlorine (7782-50-5)	
Bioaccumulative potential	Not bioaccumulation due to its water solubility and its high reactivity.

12.4. Mobility in soil

Chlorine (7782-50-5)	
Ecology - soil	Very volatile. easily degradable in the soil.

12.5. Results of PBT and vPvB assessment

Chlorine (7782-50-5)
This substance/mixture does not meet the PBT criteria of REACH regulation, annex XIII
This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

12.6. Other adverse effects

Other adverse effects : No additional information available. In general, chlorine is known for its toxic effects on living organisms.

SECTION 13: Disposal considerations

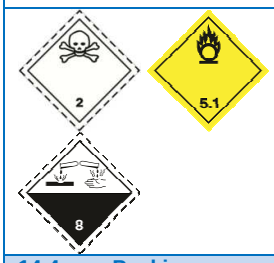
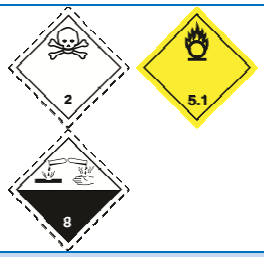
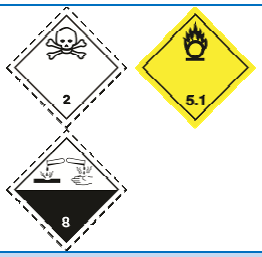
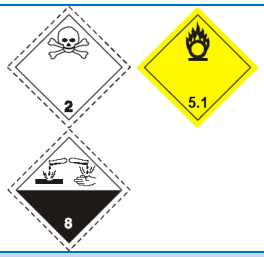
13.1. Waste treatment methods

Waste treatment methods : Vacuum to a soda neutralization system. Clean contaminated packagings with a solution of sodium carbonate . After cleaning, recycle or dispose of at an authorised site.

Additional information : The user's attention is drawn to the possible existence of specific european, national or local regulations regarding disposal.

SECTION 14: Transport information

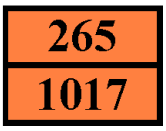
In accordance with ADR / RID / IMDG / IATA / ADN

ADR	IMDG	IATA	ADN	RID
14.1. UN number				
1017	1017	1017	1017	1017
14.2. UN proper shipping name				
CHLORINE	CHLORINE	Chlorine	CHLORINE	CHLORINE
14.3. Transport hazard class(es)				
2.3 (5.1, 8)	2.3 (5.1, 8)	2.3 (5.1, 8)	2.3 (5.1, 8)	2.3 (5.1, 8)
				
14.4. Packing group				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.5. Environmental hazards				
Dangerous for the environment : Yes 	Dangerous for the environment : Yes Marine pollutant : Yes 	Dangerous for the environment : Yes 	Dangerous for the environment : Yes 	Dangerous for the environment : Yes 

14.6. Special precautions for user

- Overland transport

Classification code (ADR) : 2TOC
Limited quantities (ADR) : 0
Excepted quantities (ADR) : E0
Packing instructions (ADR) : P200
Mixed packing provisions (ADR) : MP9
Portable tank and bulk container instructions (ADR) : (M), T50
Portable tank and bulk container special provisions (ADR) : TP19
Tank code (ADR) : P22DH(M)
Tank special provisions (ADR) : TA4, TT9, TT10
Vehicle for tank carriage : AT
Transport category (ADR) : 1

Special provisions for carriage - Loading, unloading and handling (ADR)	:	CV9, CV10, CV36
Special provisions for carriage - Operation (ADR)	:	S14
Hazard identification number (Kemler No.)	:	265
Orange plates	:	
Tunnel restriction code (ADR)	:	C/D
EAC code	:	2XE
APP code	:	A(c)

- Transport by sea

Limited quantities (IMDG)	:	0
Excepted quantities (IMDG)	:	E0
Packing instructions (IMDG)	:	P200
Tank instructions (IMDG)	:	T50
Tank special provisions (IMDG)	:	TP19
EmS-No. (Fire)	:	F-C
EmS-No. (Spillage)	:	S-U
Stowage category (IMDG)	:	D
Stowage and handling (IMDG)	:	SW2
Properties and observations (IMDG)	:	Non-flammable, toxic and corrosive yellow gas with a pungent odour. Corrosive to glass and to most metals. Much heavier than air (2.4). Highly irritating to skin, eyes and mucous membranes. Powerful oxidant which may cause fire.
MFAG-No	:	124

- Air transport

Transport regulations (IATA)	:	Passenger aircraft : FORBIDDEN
PCA Limited quantities (IATA)	:	Forbidden
PCA limited quantity max net quantity (IATA)	:	Forbidden
PCA packing instructions (IATA)	:	Forbidden
PCA max net quantity (IATA)	:	Forbidden
CAO packing instructions (IATA)	:	Forbidden
CAO max net quantity (IATA)	:	Forbidden
Special provisions (IATA)	:	A2
ERG code (IATA)	:	2CP

- Inland waterway transport

Classification code (ADN)	:	2TOC
Limited quantities (ADN)	:	0
Excepted quantities (ADN)	:	E0
Equipment required (ADN)	:	PP, EP, TOX, A
Ventilation (ADN)	:	VE02
Number of blue cones/lights (ADN)	:	2

- Rail transport

Classification code (RID)	:	2TOC
Limited quantities (RID)	:	0
Excepted quantities (RID)	:	E0
Packing instructions (RID)	:	P200
Mixed packing provisions (RID)	:	MP9
Portable tank and bulk container instructions (RID)	:	T50(M)
Portable tank and bulk container special provisions (RID)	:	TP19
Tank codes for RID tanks (RID)	:	P22DH(M)
Special provisions for RID tanks (RID)	:	TU38, TE22, TE25, TA4, TT9, TT10, TM6
Transport category (RID)	:	1

Special provisions for carriage - Loading, unloading and handling (RID) : CW9, CW10, CW36

Hazard identification number (RID) : 265

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

No REACH Annex XVII restrictions

Chlorine is not on the REACH Candidate List

Chlorine is not on the REACH Annex XIV List

15.1.2. National regulations

Listed on the United States TSCA (Toxic Substances Control Act) inventory
Subject to reporting requirements of United States SARA Section 313
Listed on the Canadian DSL (Domestic Substances List)

15.2. Chemical safety assessment

A chemical safety assessment has been carried out

SECTION 16: Other information

Indication of changes:
This sheet was updated (refer to the date at the top of this page). SDS changed section(s) : 9.

Data sources : ECHA - European Chemicals Agency. EPA (Environmental Protection Agency). NIOSH (National Institute for Occupational Safety and Health).

Other information : Safety data sheet established by : LISAM SERVICES - TELEGIS
17 rue de la Couture F-60400 Passel
www.lisam-telegis.fr.

Full text of H- and EUH-statements:

Acute Tox. 2 (Inhalation)	Acute toxicity (inhal.), Category 2
Aquatic Acute 1	Hazardous to the aquatic environment — Acute Hazard, Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment — Chronic Hazard, Category 1
Eye Irrit. 2	Serious eye damage/eye irritation, Category 2
Ox. Gas 1	Oxidising Gases, Category 1
Press. Gas Liq.	Gases under pressure : Liquefied gas
Skin Irrit. 2	Skin corrosion/irritation, Category 2
STOT SE 3	Specific target organ toxicity — Single exposure, Category 3, Respiratory tract irritation
H270	May cause or intensify fire; oxidizer
H280	Contains gas under pressure; may explode if heated
H315	Causes skin irritation
H319	Causes serious eye irritation
H330	Fatal if inhaled
H335	May cause respiratory irritation
H400	Very toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects
EUH071	Corrosive to the respiratory tract

SDS EU (REACH Annex II)

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

ANNEX TO THE SAFETY DATA SHEET

Table of contents of the Annex

1. ES2: End uses of chlorine as such or preparations at industrial sites

1.1. Title section

End uses of chlorine as such or preparations at industrial sites

ES Ref.: ES2 ES Type: Worker Version: 1.0	Date of issue: 25/07/2013

Environment		
	Contributing scenario controlling environmental exposure	ERC1, ERC4, ERC6b
Worker		
	Worker Contributing Scenario	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC13, PROC14

Processes, tasks, activities covered	Industrial use

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: Contributing scenario controlling environmental exposure (ERC1, ERC4, ERC6b)

ERC1	Manufacture of substances
ERC4	Industrial use of processing aids in processes and products, not becoming part of articles
ERC6b	Industrial use of reactive processing aids

Product characteristics

Physical form of product	Liquefied gas
Concentration of substance in product	100 %

Amount used, frequency and duration of use (or from service life)

Regional use tonnage (tonnes/year):	10443000
Continuous release	
Emission Days (days/year):	365

Technical and organisational conditions and measures

Practically no release to waste water and soil	
Immediately notify the appropriate authorities in case of gas spill. Do not discharge the product into the environment	
All personnel are trained	

Conditions and measures related to sewage treatment plant

Size of the STP (by default)	2000 m^3/d

Conditions and measures related to treatment of waste (including article waste)

Product residual disposal complies with applicable regulations	

Other conditions affecting environmental exposure

Local freshwater dilution factor:	10
Local marine water dilution factor:	100

1.2.2. Control of worker exposure: Worker Contributing Scenario (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC13, PROC14)

PROC1	Use in closed process, no likelihood of exposure
PROC2	Use in closed, continuous process with occasional controlled exposure
PROC3	Use in closed batch process (synthesis or formulation)
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC13	Treatment of articles by dipping and pouring
PROC14	Production of preparations or articles by tabletting, compression, extrusion, pelletisation

Product characteristics

Physical form of product	Liquefied gas

Concentration of substance in product	100 %

Amount used (or contained in articles), frequency and duration of use/exposure

Exposure duration	> 4 h/day
Use frequency	220 days/yr

Technical and organisational conditions and measures

The opening of chlorine system takes place only after it has been emptied, purged, completely degassed, shut-off via blind flange and disconnected. In case of chlorine leaks, detection and monitoring are performed. Loading and unloading: Gaseous chlorine is transferred via pipelines to on-site users and chlorine is filled into the reaction vessel through closed systems, while off-gases from the reactor are treated before release to the atmosphere. When tankers or cylinders are used for smaller productions, the transfer of chlorine is done through loading stations adapted to the size of the vessel	
Plants are equipped with chlorine detectors in different locations. They can generally detect 0.1 ppmV and have a pre-alarm level of 0.25 ppmV and an alarm level of 0.5 ppmV. The measuring device used for chlorine monitoring is an electrochemical sensor, which is sensible not only to chlorine, but also to other chlorinated substances present in the air. Chlorine concentration measured in the atmosphere of a Chlor-Alkali plant takes into account the exposure coming from the production of various substances (chlorine and, in most cases, other chlorinated chemicals)	
Good standard of general ventilation	
All personnel are trained. Supervision in place to check that the RMMs in place are being used correctly and OCs followed	

Conditions and measures related to personal protection, hygiene and health evaluation

Safety glasses. Safety foot-wear. Protective overalls (trousers and long sleeves)	
Gas mask. with cartridge/filter. Filter type:	B
In the event of insufficient ventilation: Self-contained breathing apparatus	
Neoprene rubber gloves	
Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Separate working clothes from town clothes. Launder separately	

Other conditions affecting workers exposure

Body weight	70 kg
Respiration volume	10 m³/d
Indoors and outdoors,Assumes activities are at room temperature	

1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure Contributing scenario controlling environmental exposure (ERC1, ERC4, ERC6b)

Information for contributing exposure scenario
Total chlorine emission (release) from such industrial activity is estimated a bit higher as 100 t/y and globally, with the natural release comparison, this value don't account it-self of the chlorine balance in the atmosphere and water

1.3.2. Worker exposure Worker Contributing Scenario (PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC13, PROC14)

Information for contributing exposure scenario

Worker exposure is limited taking into account that productions processes take place in closed system; exposure to chlorine is possible only in case of accident or leak,Worst case assumption

Route of exposure and type of effects	Exposure estimate	RCR	Method
Inhalation - Long-term - systemic effects	0.705 mg/m³	0.94	
Sum RCR - Long-term - systemic effects		0.94	
Inhalation - Acute	0.54 mg/m³	0.36	
Sum RCR - Acute		0.36	
Acute - Local - Inhalation	0.54 mg/m³	0.36	
Long term - Local - Inhalation	0.705 mg/m³	0.94	

1.4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the ES

1.4.1. Environment

Guidance - Environment	No additional risk management measures required

1.4.2. Health

Guidance - Health	No additional risk management measures, besides those that are mentioned above, are needed to guarantee safe use for workers