1. PRODUCT AND COMPANY IDENTIFICATION

Product name: Chlorine
Product Number: 295132
Brand: Aldrich
Supplier: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052
Emergency Phone #: (314) 776-6555
Preparation Information: Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Compressed Gas, Oxidizer, Toxic by inhalation., Irritant

GHS Classification
Oxidising gases (Category 1)
Gases under pressure (Compressed gas)
Acute toxicity, Inhalation (Category 2)
Skin irritation (Category 2)
Eye irritation (Category 2A)
Specific target organ toxicity - single exposure (Category 3)
Acute aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger
Hazard statement(s)
H270 May cause or intensify fire; oxidiser.
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.

Precautionary statement(s)
P220 Keep/Store away from clothing/ combustible materials.
P260 Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P273 Avoid release to the environment.
P284 Wear respiratory protection.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses,
present and easy to do. Continue rinsing.
P410 + P403
Immediately call a POISON CENTER or doctor/physician.

HMIS Classification
Health hazard: 2
Flammability: 0
Physical hazards: 3

NFPA Rating
Health hazard: 4
Fire: 0
Reactivity Hazard: 0
Special hazard: OX

Potential Health Effects
Inhalation Tox if inhaled. Causes respiratory tract irritation.
Skin May be harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula: Cl₂
Molecular Weight: 70.91 g/mol

<table>
<thead>
<tr>
<th>Component</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine</td>
<td></td>
</tr>
<tr>
<td>CAS-No.</td>
<td>7782-50-5</td>
</tr>
<tr>
<td>EC-No.</td>
<td>231-959-5</td>
</tr>
<tr>
<td>Index-No.</td>
<td>017-001-00-7</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Hydrogen chloride gas

Further information
Use water spray to cool unopened containers.
6. ACCIDENTAL RELEASE MEASURES

**Personal precautions**
Wear respiratory protection. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

**Environmental precautions**
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

**Methods and materials for containment and cleaning up**
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

**Precautions for safe handling**
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Keep away from sources of ignition - No smoking.

**Conditions for safe storage**
Keep container tightly closed in a dry and well-ventilated place.
Contents under pressure.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Components with workplace control parameters**

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine</td>
<td>7782-50-5</td>
<td>TWA</td>
<td>0.5 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
</tbody>
</table>

Remarks
Eye & Upper Respiratory Tract irritation Not classifiable as a human carcinogen

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</thead>
<tbody>
<tr>
<td>STEL</td>
<td>1 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
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<td></td>
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Eye & Upper Respiratory Tract irritation Not classifiable as a human carcinogen

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</thead>
<tbody>
<tr>
<td>C</td>
<td>1 ppm</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The value in mg/m³ is approximate. Ceiling limit is to be determined from breathing-zone air samples.

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<tr>
<td>TWA</td>
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<td>USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 mg/m³</td>
<td>USA. NIOSH Recommended Exposure Limits</td>
<td></td>
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<tr>
<td></td>
<td>15 minute ceiling value</td>
<td></td>
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</table>

**Personal protective equipment**

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).
Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove’s outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance
Form Compressed gas
Colour yellow

Safety data
pH 1.8 at 6.4 g/l at 20 °C (68 °F)
Melting point/range: Melting point/range: -101 °C (-150 °F) - lit.
Boiling point -34 °C (-29 °F) - lit.
Flash point not applicable
Ignition temperature no data available
Autoignition temperature no data available
Lower explosion limit no data available
Upper explosion limit no data available
Vapour pressure 6,399 hPa (4,800 mmHg) at 20 °C (68 °F)
Density 1.563 g/cm³ at -34 °C (-29 °F)
Water solubility ca.10 g/l at 20 °C (68 °F)
Partition coefficient: no data available
n-octanol/water
Relative vapour density 2.44 - (Air = 1.0)
Odour pungent
Odour Threshold no data available
Evaporation rate no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available
Materials to avoid
Alcohols

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Hydrogen chloride gas
Reacts with water to form: - hydrochloric acid

11. TOXICOLOGICAL INFORMATION

Acute toxicity
Oral LD50
Inhalation LC50
LC50 Inhalation - rat - 1 h - 293 ppm

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
Genotoxicity in vitro - Human - lymphocyte
Cytogenetic analysis
Genotoxicity in vivo - mouse - Oral
sperm

Carcinogenicity
Carcinogenicity - rat - Oral
Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Leukaemia
Carcinogenicity - Monkey - Inhalation
Tumorigenic: Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration: Tumors.

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
Reproductive toxicity - rat - Oral
Effects on Newborn: Biochemical and metabolic.

no data available

Teratogenicity

no data available
Specific target organ toxicity - single exposure (Globally Harmonized System)
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

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<table>
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<tbody>
<tr>
<td><strong>Inhalation</strong></td>
<td>Toxic if inhaled. Causes respiratory tract irritation.</td>
</tr>
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<td><strong>Ingestion</strong></td>
<td>May be harmful if swallowed.</td>
</tr>
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<td><strong>Skin</strong></td>
<td>May be harmful if absorbed through skin. Causes skin irritation.</td>
</tr>
<tr>
<td><strong>Eyes</strong></td>
<td>Causes eye irritation.</td>
</tr>
</tbody>
</table>

Signs and Symptoms of Exposure
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea

Synergistic effects
no data available

Additional Information
RTECS: FO2100000

12. ECOLOGICAL INFORMATION

Toxicity

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td><strong>Toxicity to fish</strong></td>
<td>LC50 - Oncorhynchus mykiss (rainbow trout) - 0.014 mg/l - 96.0 h</td>
</tr>
<tr>
<td><strong>Toxicity to daphnia and other aquatic invertebrates</strong></td>
<td>EC50 - Daphnia magna (Water flea) - 0.019 mg/l - 24 h</td>
</tr>
</tbody>
</table>

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

<p>| | |</p>
<table>
<thead>
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<tbody>
<tr>
<td><strong>UN number</strong></td>
<td>1017</td>
</tr>
<tr>
<td><strong>Class</strong></td>
<td>2.3 (5.1, 8)</td>
</tr>
<tr>
<td><strong>Proper shipping name</strong></td>
<td>Chlorine</td>
</tr>
<tr>
<td><strong>Reportable Quantity (RQ)</strong></td>
<td>10 lbs</td>
</tr>
<tr>
<td><strong>Marine pollutant</strong></td>
<td>No</td>
</tr>
</tbody>
</table>
Poison Inhalation Hazard: Hazard zone B

**IMDG**
UN number: 1017  Class: 2.3 (5.1, 8)  
Proper shipping name: CHLORINE  
Marine pollutant: Marine pollutant

**IATA**
UN number: 1017  Class: 2.3 (5.1, 8)  
Proper shipping name: Chlorine  
IATA Passenger: Not permitted for transport  
IATA Cargo: Not permitted for transport

15. REGULATORY INFORMATION

**OSHA Hazards**
Compressed Gas, Oxidizer, Toxic by inhalation., Irritant

**SARA 302 Components**
The following components are subject to reporting levels established by SARA Title III, Section 302:

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**SARA 313 Components**
The following components are subject to reporting levels established by SARA Title III, Section 313:

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**SARA 311/312 Hazards**
Sudden Release of Pressure Hazard, Reactivity Hazard, Acute Health Hazard

**Massachusetts Right To Know Components**

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**Pennsylvania Right To Know Components**

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**New Jersey Right To Know Components**

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<td>2007-07-01</td>
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</table>

**California Prop. 65 Components**
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

**Further information**
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