The life science business of Merck operates as MilliporeSigma in the US and Canada

SAFETY DATA SHEET
according to Regulation (EC) No. 1907/2006

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

1.1 Product identifiers

Product name: Chlorine
Product Number: 295132
Brand: Aldrich
Index-No.: 017-001-00-7
REACH No.: A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.
CAS-No.: 7782-50-5

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

Identified uses: Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company: Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone: +1 314 771-5765
Fax: +1 800 325-5052

1.4 Emergency telephone

Emergency Phone #: 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008
Oxidizing gases (Category 1), H270
Gases under pressure (Compressed gas), H280
Acute toxicity, Inhalation (Category 1), H330
Skin irritation (Category 2), H315
Eye irritation (Category 2), H319
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Short-term (acute) aquatic hazard (Category 1), H400
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2.2 Label elements

Labelling according Regulation (EC) No 1272/2008

Pictogram

Signal word: Danger

Hazard statement(s)
- 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.
- H410: Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
- P273: Avoid release to the environment.
- P302 + P352: IF ON SKIN: Wash with plenty of water.
- P304 + P340 + P310: IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
- P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P403 + P233: Store in a well-ventilated place. Keep container tightly closed.
- P410 + P403: Protect from sunlight. Store in a well-ventilated place.

Supplemental Hazard Statements: none

Reduced Labeling (<= 125 ml)

Pictogram

Signal word: Danger

Hazard statement(s)
- H330: Fatal if inhaled.

Precautionary statement(s)
- P304 + P340 + P310: IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.
- P403 + P233: Store in a well-ventilated place. Keep container tightly closed.

Supplemental Hazard Statements: none

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

Contact with liquid or refrigerated gas can cause cold burns and frostbite.
SECTION 3: Composition/information on ingredients

3.1 Substances

Formula: \( \text{Cl}_2 \)
Molecular weight: 70,91 g/mol
CAS-No.: 7782-50-5
EC-No.: 231-959-5
Index-No.: 017-001-00-7

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dichlorine</td>
<td>Ox. Gas; Press. Gas; Compr. Gas; Acute Tox. 1; Skin Irrit. 2; Eye Irrit. 2; STOT SE 3; Aquatic Acute 1; Aquatic Chronic 1; H270, H280, H330, H315, H319, H335, H400, H410</td>
<td>&lt;= 100 %</td>
</tr>
<tr>
<td>CAS-No.</td>
<td>7782-50-5</td>
<td></td>
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<tr>
<td>EC-No.</td>
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<td></td>
</tr>
<tr>
<td>Index-No.</td>
<td>017-001-00-7</td>
<td></td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available
SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Hydrogen chloride gas
Not combustible.
Has a fire-promoting effect due to release of oxygen.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe gas. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert. For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Stop flow of gas, move leaking cylinder to open air if without risk.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Keep locked up or in an area accessible only to qualified or authorized persons. Keep away from combustible materials and sources of ignition. Contents under pressure.

7.3 **Specific end use(s)**
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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**SECTION 8: Exposure controls/personal protection**

8.1 **Control parameters**

**Ingredients with workplace control parameters**

8.2 **Exposure controls**

**Personal protective equipment**

**Eye/face protection**
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

**Skin protection**
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

- Full contact
  - Material: Viton®
  - Minimum layer thickness: 0,7 mm
  - Break through time: 480 min
  - Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

- Splash contact
  - Material: Viton®
  - Minimum layer thickness: 0,7 mm
  - Break through time: 480 min
  - Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

**Body Protection**
protective clothing

**Respiratory protection**
Recommended Filter type: Filter B-(P3)

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.

**Control of environmental exposure**
Do not let product enter drains.
SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance
   Form: Compressed gas
   Color: yellow

b) Odor
   Pungent

c) Odor Threshold
   No data available

d) pH
   1.8 at 6.4 g/l at 20 °C

e) Melting point/freezing point
   Melting point/range: -101 °C - lit.

f) Initial boiling point and boiling range
   -34 °C - lit.

g) Flash point
   Not applicable

h) Evaporation rate
   No data available

i) Flammability (solid, gas)
   No data available

j) Upper/lower flammability or explosive limits
   No data available

k) Vapor pressure
   6.399 hPa at 20 °C

l) Vapor density
   2.44 - (Air = 1.0)

m) Density
   1.4 g/cm³ at 20 °C at 6.946,09 hPa
   Relative density
   No data available

n) Water solubility
   7.41 g/l at 20 °C - soluble

o) Partition coefficient: n-octanol/water
   Not applicable for inorganic substances

p) Autoignition temperature
   No data available

q) Decomposition temperature
   No data available

r) Viscosity
   Viscosity, kinematic: No data available
   Viscosity, dynamic: 12.4 mPa.s at 0 °C, 13.3 mPa.s at 20 °C

s) Explosive properties
   No data available

t) Oxidizing properties
   May cause or intensify fire; oxidizer.

9.2 Other safety information

Surface tension
   82.4 mN/m at 20 °C
   - OECD Test Guideline 115

Dissociation constant
   7 at 20 °C

Relative vapor
   2.44 - (Air = 1.0)
SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature).

10.3 Possibility of hazardous reactions
Risk of ignition or formation of inflammable gases or vapours with:
- Copper
- Hydrogen
- Acetylene
- Ammonia
- Metals
- Aluminum
- Tin
- Mild steel
- Iron
- Phosphorus
Violent reactions possible with:
- Numerous inorganic and/or organic compounds
- Water
- Oxygen
- Acids

10.4 Conditions to avoid
No information available

10.5 Incompatible materials
- Bronze

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

**Acute toxicity**
- Oral: No data available
- LC50 Inhalation - Rat - male and female - 4 h - 0,2 mg/l (OECD Test Guideline 403)
- Symptoms: damage of respiratory tract, Cough, Shortness of breath
- LD50 Dermal - Rabbit - male and female - > 20.000 mg/kg (OECD Test Guideline 402)
- The value is given in analogy to the following substances: sodium hypochlorite solution

**Skin corrosion/irritation**
- Skin - Rabbit
- Result: Irritating to skin. - 4 h
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(OECD Test Guideline 404)
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: sodium hypochlorite solution
Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

**Serious eye damage/eye irritation**
Causes serious eye irritation. Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

**Respiratory or skin sensitization**
Buehler Test - Guinea pig
Result: negative
(OECD Test Guideline 406)
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: sodium hypochlorite solution

**Germ cell mutagenicity**
No data available

**Carcinogenicity**
No data available

**Reproductive toxicity**
No data available

**Specific target organ toxicity - single exposure**
Inhalation - May cause respiratory irritation. - Respiratory Tract
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

**Specific target organ toxicity - repeated exposure**
No data available

**Aspiration hazard**
No data available

**11.2 Additional Information**
Repeated dose toxicity - Rat - male - Oral - 90 Days - NOAEL (No observed adverse effect level) - >= 16,7 mg/kg - LOAEL (Lowest observed adverse effect level) - > 16,7 mg/kg
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: sodium hypochlorite solution

RTECS: FO2100000
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Possible damages:

in case of perspiration/moisture corrosive.

After long-term exposure to the chemical:

Cyanosis
Lung edema
Vomiting
Circulatory collapse

The substance has delayed effects.
In high concentrations:
respiratory arrest
Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish
flow-through test LC50 - Leiostomus xanthurus - 0,09 mg/l - 96 h
Remarks: (in analogy to similar products)
(ECHA)

Toxicity to daphnia and other aquatic invertebrates
flow-through test EC50 - Ceriodaphnia dubia (water flea) - 0,035 mg/l - 48 h
(OECD Test Guideline 202)

Toxicity to algae
flow-through test NOEC - algae - 0,002 mg/l - 7 Days
Remarks: (in analogy to similar products)
(ECHA)
The value is given in analogy to the following substances: sodium hypochlorite solution

Toxicity to bacteria
static test EC50 - activated sludge - 563 mg/l - 3 h
(OECD Test Guideline 209)
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: sodium hypochlorite solution

12.2 Persistence and degradability
The methods for determining biodegradability are not applicable to inorganic substances.

Theoretical oxygen demand
0 - 230 mg/g
Remarks: (calculated)(IUCLID)

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects
Biological effects:
Forms toxic mixtures in water, dilution measures notwithstanding.
Discharge into the environment must be avoided.
SECTION 13: Disposal considerations
13.1 Waste treatment methods
Product
Pressurised gas bottle: dispose of only in empty condition! See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information
14.1 UN number
ADR/RID: 1017  IMDG: 1017  IATA: 1017
14.2 UN proper shipping name
ADR/RID: CHLORINE  IMDG: CHLORINE  IATA: Chlorine
Passenger Aircraft: Not permitted for transport
Cargo Aircraft: Not permitted for transport
14.3 Transport hazard class(es)
ADR/RID: 2.3 (5.1, 8)  IMDG: 2.3 (5.1, 8)  IATA: 2.3 (5.1)(8)
14.4 Packaging group
ADR/RID: -  IMDG: -  IATA: -
14.5 Environmental hazards
ADR/RID: yes  IMDG Marine pollutant: yes  IATA: no
14.6 Special precautions for user
No data available

SECTION 15: Regulatory information
15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture
This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

National legislation

: ACUTE TOXIC
: OXIDISING GASES
: ENVIRONMENTAL HAZARDS
: Chlorine

Other regulations
Observe work restrictions regarding maternity protection in accordance to Dir 92/85/EEC or stricter national regulations where applicable.
Take note of Dir 94/33/EC on the protection of young people at work.
15.2 Chemical Safety Assessment
For this product a chemical safety assessment was not carried out

SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3.

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.
H335 Very toxic to aquatic life.
H400 Very toxic to aquatic life with long lasting effects.

Relevant changes since previous version
2. Hazards identification

Further information
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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