# International Chemical Safety Cards

## CHLORINE DIOXIDE

ICSC: 0127

<table>
<thead>
<tr>
<th>Chlorine oxide</th>
<th>Chlorine peroxide</th>
<th>Chlorine(IV)oxide</th>
<th>ClO$_2$</th>
<th>Molecular mass: 67.5</th>
</tr>
</thead>
</table>

**ICSC #** 0127  
**CAS #** 10049-04-4  
**RTECS #** FO3000000  
**EC #** 006-089-00-2

### TYPES OF HAZARD/EXPOSURE

<table>
<thead>
<tr>
<th>FIRE</th>
<th>ACUTE HAZARDS/SYMPTOMS</th>
<th>PREVENTION</th>
<th>FIRST AID/FIRE FIGHTING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not combustible but enhances combustion of other substances. Many reactions may cause fire or explosion.</td>
<td>NO contact with combustibles.</td>
<td>In case of fire in the surroundings: water in large amounts, water spray.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EXPLOSION</th>
<th>ACUTE HAZARDS/SYMPTOMS</th>
<th>PREVENTION</th>
<th>FIRST AID/FIRE FIGHTING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Risk of fire and explosion: see Chemical Dangers.</td>
<td>Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT expose to friction or shock.</td>
<td>In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.</td>
</tr>
</tbody>
</table>

### EXPOSURE

<table>
<thead>
<tr>
<th>INHALATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closed system and ventilation.</td>
</tr>
<tr>
<td>Fresh air, rest. Half-upright position. Refer for medical attention.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SKIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redness. Pain.</td>
</tr>
<tr>
<td>Protective gloves. Protective clothing.</td>
</tr>
<tr>
<td>First rinse with plenty of water, then remove</td>
</tr>
</tbody>
</table>

---

La DISINFEZIONE delle Acque Reflue
La DISINFEZIONE
delle Acque Reflu

1. EYES
   - Redness. Pain.
   - Safety goggles or eye protection in combination with breathing protection.
   - First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.

2. INGESTION
   - EYES
   - Redness. Pain.
   - Safety goggles or eye protection in combination with breathing protection.
   - First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.

**SPILLAGE DISPOSAL**

**STORAGE**

**PACKAGING & LABELLING**
O symbol
T+ symbol
N symbol
R: 6-8-26-34-50

**SEE IMPORTANT INFORMATION ON BACK**
Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities (C) IPCS CEC 2000. No modifications to the International version have been made except to add the OSHA PELs, NIOSH RELs and NIOSH IDLH values.

---

**International Chemical Safety Cards**

**CHLORINE DIOXIDE**

**PHYSICAL STATE; APPEARANCE:**
RED-YELLOW GAS, WITH PUNGENT ODOUR.

**PHYSICAL DANGERS:**
The gas is heavier than air.

**CHEMICAL DANGERS:**
May explode on heating, on exposure to sunlight or if subjected to shock or sparks. The substance is a strong oxidant and reacts violently with combustible and reducing materials. Reacts.

**ROUTES OF EXPOSURE:**
The substance can be absorbed into the body by inhalation.

**INHALATION RISK:**
A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

**EFFECTS OF SHORT-TERM EXPOSURE:**
The substance irritates severely the eyes, the skin and the respiratory tract. Inhalation of gas may cause lung oedema.
OCCUPATIONAL EXPOSURE LIMITS:
TLV (as TWA): 0.1 ppm; (ACGIH 1999).
TLV (as (STEL) ): 0.3 ppm; (ACGIH 1999).
OSHA PEL: TWA 0.1 ppm (0.3 mg/m³)
NIOSH REL: TWA 0.1 ppm (0.3 mg/m³) ST 0.3 ppm (0.9 mg/m³)
NIOSH IDLH: 5 ppm

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The substance may have effects on the lungs, resulting in chronic bronchitis.

PHYSICAL PROPERTIES
Boiling point: 11°C
Melting point: -59°C
Relative density (water = 1): 1.6 at 0°C (liquid)
Solubility in water, g/100 ml at 20°C: 0.8
Vapour pressure, kPa at 20°C: 101
Relative vapour density (air = 1): 2.3
Explosive limits, vol% in air: 10

ENVIRONMENTAL DATA
This substance may be hazardous to the environment; special attention should be given to water organisms.

NOTES
The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Immediate administration of an appropriate spray, by a doctor or a person authorized by him/her, should be considered. Rinse contaminated clothes (fire hazard) with plenty of water.

ADDITIONAL INFORMATION

ICSC: 0127 CHLORINE DIOXIDE
(C) IPCS, CEC, 2000

IMPORTANT LEGAL NOTICE:
Neither NIOSH, the CEC or the IPCS nor any person acting on behalf of NIOSH, the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use. The only modifications made to produce the U.S. version is inclusion of the OSHA PELs, NIOSH RELs and NIOSH IDLH values.
NIOSH Pocket Guide to Chemical Hazards

**Chlorine dioxide**

<table>
<thead>
<tr>
<th>CAS</th>
<th>RTECS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10049-04-4</td>
<td>FO3000000</td>
</tr>
</tbody>
</table>

**Synonyms & Trade Names**
Chlorine oxide, Chlorine peroxide

**DOT ID & Guide**
9191 143 (hydrate, frozen)

**Exposure Limits**

| NIOSH REL: | TWA 0.1 ppm (0.3 mg/m³) | ST 0.3 ppm (0.9 mg/m³) |
| OSHA PEL+: | TWA 0.1 ppm (0.3 mg/m³) |

**IDLH** 5 ppm See: 10049044

**Conversion** 1 ppm = 2.76 mg/m³

**Physical Description**
Yellow to red gas or a red-brown liquid (below 52°F) with an unpleasant odor similar to chlorine and nitric acid.

| MW: 67.5 | BP: 52°F | FRZ: -74°F | Sol(77°F): 0.3% |
| VP: >1 atm | IP: 10.36 eV | RGasD: 2.33 | Sp.Gr: 1.6 (Liquid at 32°F) |

**Flammable Gas/Combustible Liquid**

**Incompatibilities & Reactivities**
Organic materials, heat, phosphorus, potassium hydroxide, sulfur, mercury, carbon monoxide [Note: Unstable in light. A powerful oxidizer.]

**Measurement Methods**
OSHA ID202
See: NMAM or OSHA Methods

**Personal Protection & Sanitation**
Skin: Prevent skin contact (liquid)
Eyes: Prevent eye contact (liquid)
Wash skin: When contaminated (liquid)
Remove: When wet (flammable)
Change: No recommendation
Provide: Eyewash (liquid), Quick drench (liquid)

**First Aid** (See procedures)
Eye: Irrigate immediately (liquid)
Skin: Soap wash immediately (liquid)
Breathing: Respiratory support
Swallow: Medical attention immediately (liquid)
**Respirator Recommendations** NIOSH/OSHA

**Up to 1 ppm:** (APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern/(APF = 10) Any supplied-air respirator

**Up to 2.5 ppm:** (APF = 25) Any supplied-air respirator operated in a continuous-flow mode)/(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern

**Up to 5 ppm:** (APF = 25) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern/(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

**Emergency or planned entry into unknown concentrations or IDLH conditions:** (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode/(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

**Escape:** (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/(APF = 10,000) Any appropriate escape-type, self-contained breathing apparatus

**Exposure Routes** inhalation, ingestion (liquid), skin and/or eye contact

**Symptoms** Irritation eyes, nose, throat; cough, wheezing, bronchitis, pulmonary edema; chronic bronchitis

**Target Organs** Eyes, respiratory system

See also: [INTRODUCTION](#)  See ICSC CARD: [0127](#)  See MEDICAL TESTS: [0045](#)
Chlorine dioxide

IDLH Documentation

CAS number: 10049044
NIOSH REL: 0.1 ppm (0.3 mg/m³) TWA, 0.3 ppm (0.9 mg/m³) STEL
Current OSHA PEL: 0.1 ppm (0.3 mg/m³) TWA
1989 OSHA PEL: 0.1 ppm (0.3 mg/m³) TWA, 0.3 ppm (0.9 mg/m³) STEL
19931994 ACGIH TLV: 0.1 ppm (0.28 mg/m³) TWA, 0.3 ppm (0.83 mg/m³) STEL

Description of Substance: Yellow to red gas or a redbrown liquid (below 52 F) with an unpleasant odor similar to chlorine and nitric acid.

LEL: . . Unknown

Original (SCP) IDLH: 10 ppm
Basis for original (SCP): IDLH AIHA [1958] reported that rats exposed repeatedly to about 10 ppm for 4 hours daily died, whereas those exposed to about 0.1 ppm, 5 hours daily for 10 weeks, showed no detectable effects [Dalhamn 1957]. AIHA [1958] also reported that animals survived 2hour exposures to 20 ppm, though some species exhibited symptoms [Gloemme and Lundgren 1957]. Elkins [1950] stated that 5 ppm is definitely irritating and 2 cases of illness (1 fatal) resulted from exposure to less than 19 ppm. AIHA [1958] reported that delayed deaths occur in animals after single exposures to 150 to 200 ppm for less than 1 hour [Gloemme and Lundgren 1957]. Based on the data cited above, an IDLH of 10 ppm is chosen.

Shortterm exposure guidelines None developed

ACUTE TOXICITY DATA

Lethal concentration data:

<table>
<thead>
<tr>
<th>Species</th>
<th>Reference</th>
<th>LC₅₀ (ppm)</th>
<th>LCₐ₀ (ppm)</th>
<th>Time</th>
<th>Adjusted 0.5-hr LC (CF)</th>
<th>Derived value</th>
</tr>
</thead>
</table>

La DISINFEZIONE delle Acque Reflu
La DISINFEZIONE delle Acque Reflu}

| Rat | Dalhamn 1957 | ----- | 260 | 2 hr | 416 ppm (1.6) | 42 ppm |

Lethal dose data:

<table>
<thead>
<tr>
<th>Species</th>
<th>Reference</th>
<th>Route</th>
<th>LD₅₀ (mg/kg)</th>
<th>LD₀ (mg/kg)</th>
<th>Adjusted LD</th>
<th>Derived value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rat</td>
<td>Abdel-Rahman et al. 1982</td>
<td>oral</td>
<td>292</td>
<td>-----</td>
<td>729 ppm</td>
<td>73 ppm</td>
</tr>
</tbody>
</table>

Human data: It has been reported that 5 ppm is definitely irritating and that 19 ppm caused the death of one worker inside a tank (time of exposure was not specified) [Elkins 1950].

**Revised IDLH:** 5 ppm

Basis for revised IDLH: The revised IDLH is 5 ppm based on acute inhalation toxicity data in humans [Elkins 1950].

REFERENCES:

5. Gloemme J, Lundgren KD [1957]. Health hazards from chlorine dioxide. AMA Arch Ind Health 16:169176.