


SAFETY DATA SHEET

This SDS adheres to the standards and regulatory requirements of Canada and may not meet the regulatory requirements in other countries.

1. Identification

Product identifier	Chlorine Dioxide Solution
Other means of identification	Chlorine Peroxide, ClO ₂
Chemical family	Inorganic compound
Recommended use	Pulp bleaching, water treatment, disinfection
Recommended restrictions	None known
Manufacturer/Importer/Supplier/Distributor information	
Manufacturer	
Company name	ERCO Worldwide, A division of Superior Plus LP
Address	302 The East Mall Suite 200 Toronto, ON M9B 6C7 Canada
Telephone	(416) 239-7111 (M- F: 8:00 am – 5:00pm EST)
Website	http://www.ercoworldwide.com
E-mail	productinfo@ercoworldwide.com
Emergency phone number	Canada: 613-996-6666 (CANUTEC) USA: 1-800-424-9300 (CHEMTREC)
Supplier	Refer to Manufacturer

2. Hazard(s) Identification

Physical hazards	Oxidizing Liquids	Category 1
Health hazards	Skin Corrosion	Category 1
	Serious Eye Damage	Category 1
	Acute Toxicity, Inhalation	Category 1
Environmental hazards	Not currently regulated by the Canadian Hazardous Products Regulation (WHMIS 2015), refer to Section 12 for additional information.	
Label elements		
Signal word	Danger	
Hazard statement	May cause fire or explosion, strong oxidizer. Causes severe skin burns and serious eye damage. Fatal if inhaled.	

Precautionary statement
Prevention

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep away from clothing and other combustible materials. Wear protective gloves protective clothing, eye protection, face protection. Wear fire resistant or flame retardent clothing. Do not breathe dust, fume, gas mists, vapours, spray. Wash hands and face thoroughly after handling. Use only outdoors or in a well-ventilated area. Wear respiratory protection.

Response

IF ON CLOTHING: Rinse immediately contaminated clothing and skin with plenty of water before removing clothes.

IF INHALED: Remove person to fresh air and keep comfortable for breathing.

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do so. Continue rinsing.

In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

In case of fire: Use water to extinguish.

Immediately call a POISON CENTER/doctor.

Storage

Store separately. Store locked up. Store in a well-ventilated place. Keep container tightly closed.

Disposal

Dispose of contents and container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC)

Physical hazards: Category 1

Health hazards: Category 1

Supplemental information

Not applicable.

3. Composition/Information on Ingredients

Chemical name	Common name and synonyms	CAS number	Conc. % By Weight
Chlorine Dioxide	Chlorine Peroxide, ClO ₂	10049-04-4	1.0 to 1.2 w/w% (variable)
Dihydrogen Oxide	Water	7732-18-5	Balance

Note: This chemical is normally handled as water solution, typically containing 10-12 g/L of chlorine dioxide. Gaseous chlorine dioxide can only be handled diluted with air or other inert gas, when it's partial pressure does not exceed decomposition limit, which depends on the temperature.

4. First-Aid Measures

Inhalation	Chlorine dioxide gas is very toxic, corrosive and poses a very serious inhalation hazard. It is unstable and highly reactive at concentrations above 10% in air, and is a strong oxidizing agent. In many cases, exposure is not to chlorine dioxide alone, but to a mixture of chemicals that can include toxic and corrosive chlorine and/or sulphur dioxide. Remove person to fresh air and keep comfortable for breathing. If breathing is stopped, commence artificial respiration. Immediately call a POISON CENTER/doctor.
Skin Contact	May cause redness and irritation. Wash immediately using soap or mild detergent and water. Seek medical attention if irritation persists. Remove all contaminated clothing which should be laundered before reuse.
Eye Contact	Strong irritant to the eyes. May cause redness, pain, blurred vision, tearing, corneal injury and burns. Flush immediately with plenty of lukewarm water. Continue to wash for 20-30 minutes, lifting eyelids occasionally. Immediately call a POISON CENTER/doctor.
Ingestion	May cause irritation to the mucus membranes. DO NOT GIVE ANYTHING BY MOUTH OR INDUCE VOMITING IF THE PATIENT IS UNCONSCIOUS. Give large amounts of water to dilute stomach contents. Get immediate medical attention.
Most important symptoms/effects, acute and delayed	Chlorine dioxide irritates the nose, throat, trachea and bronchi at very low concentrations (less than 5 ppm) resulting in breathlessness, wheezing and coughing. Higher concentrations can cause inflammation in the upper respiratory tract, bronchial spasms and difficulty in breathing. A potentially fatal accumulation of fluid in the lungs (pulmonary edema) could occur. Symptoms of pulmonary edema (chest pain and shortness of breath) can be delayed for up to 24 or 48 hours after exposure. Long-term respiratory effects (e.g. sensitivity to respiratory irritants, chronic nasal inflammation, asthma, pulmonary emphysema and spastic bronchitis) have been noted in workers accidentally exposed to unspecified concentrations for a short time.
Indication of immediate medical attention and special treatment needed	None.
General information	No additional information available.

5. Fire-Fighting Measures

Suitable extinguishing media	When combustibles are burning in the presence of chlorine dioxide (or other strong oxidizers) water is the only effective extinguishing medium.
Unsuitable extinguishing media	DO NOT use dry chemical fire extinguishing agents containing ammonium compounds (such as some A:B:C agents) on oxidizers that contain chlorine, since an explosive compound (nitrogen trichloride) can be formed. DO NOT use Halon extinguishers or halocarbon extinguishers, because they can react with chlorine dioxide. DO NOT use carbon dioxide, dry chemical powder or other extinguishing agents that smother flames, since they are not effective in extinguishing fires involving oxidizers.
Specific hazards arising from the chemical	May react explosively with hydrocarbons (fuels). Thermally unstable. At concentrations greater than 10% in air and pressures greater than 10.1 kPa, there is a risk of explosion as a result of decomposition. Explosion may be caused by any source of initiation energy, such as sunlight, heat or electrostatic discharge, or contamination. Decomposes explosively under intense fire conditions to form corrosive and highly toxic chlorine and hydrogen chloride gases. Closed containers may rupture violently due to rapid decomposition, if exposed to fire or excessive heat for a sufficient period of time.
Special protective equipment and precautions for firefighters:	Wear a Self-Contained Breathing Apparatus (SCBA) with a full face piece operated in the “positive pressure demand” setting. Use SCBA in conjunction with appropriate chemically resistant personal protective gear.
Firefighting equipment/instructions:	When combustibles are burning in the presence of chlorine dioxide (or other strong oxidizers) water is the only effective extinguishing medium. DO NOT use dry chemical fire extinguishing agents containing ammonium compounds (such as some A:B:C agents) on oxidizers that contain chlorine, since an explosive compound (nitrogen trichloride) can be formed. DO NOT use Halon extinguishers or halocarbon extinguishers, because they can react with chlorine dioxide. DO NOT use carbon dioxide, dry chemical powder or other extinguishing agents that smother flames, since they are not effective in extinguishing fires involving oxidizers.
General fire hazards	Chloride dioxide solution is not flammable, but partial pressure of chlorine dioxide gas in the gas phase over solution is significant, especially at higher concentrations such as covered by this SDS. The hazards of the gaseous chlorine dioxide are therefore inherent to hazards of the solution. The gas is heavier than air and can accumulate in low-lying areas. Chlorine dioxide gas may decompose with a pink/violet flame which may ignite combustible materials. This flame can be extinguished by diluting and cooling with air. Chlorine dioxide gas may explode on heating. The products of chlorine dioxide decomposition in the gas phase include chlorine, oxygen, hydrogen chloride, chloric acid and perchloric acid. Chlorine dioxide gas is not

flammable in the normal sense, as no air is required for it to burn. However, it is a powerful oxidizing agent (enhances the combustion of other substances) and is a serious fire and explosion risk, especially when contaminated with, or if it comes into contact with, oxidizable, combustible materials (e.g. cloth, grease, leather, oil and solvents, paper, sawdust, rubber, plastics and wood). In these situations, there may be spontaneous ignition and explosion.

Hazardous combustion products Not applicable as chlorine dioxide is not combustible, but see "Hazardous Decomposition Products" in Section 10.

6. Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Chloride dioxide solution, especially at higher concentrations such as covered by this SDS, will release significant quantities of chlorine dioxide gas. The hazards of the gaseous chlorine dioxide are therefore inherent to hazards of the solution. A pale green liquid when dissolved in water, which is irritating to the eyes, skin and respiratory passages. The evolved gas is yellowish-green to orange in colour, is heavier than air and can accumulate in low-lying areas. Accumulation of chlorine dioxide in gas phase must be prevented. The pungent odour has been described as chlorine-like or resembling that of a mixture of chlorine or ozone. **POWERFUL OXIDIZER**. Promotes combustion. Contact with combustible materials may cause a fire and/or explosion. **DANGEROUSLY REACTIVE**. Thermally unstable. The gas explodes violently at concentrations greater than 10% by volume in air at pressures above 10.1 kPa (76 mm Hg). May be initiated by light, shock, electrical discharge including static electricity, hot surfaces, open flames or contact with a variety of materials. **VERY TOXIC**. May be fatal if inhaled. Irritating to the respiratory tract at very low concentrations. Causes lung injury - effects may be delayed. **CORROSIVE** to the eyes, skin and respiratory tract.

Methods and materials for containment and cleaning up

Evacuate locations downwind from the leak. Restrict access to area until completion of clean-up. Ensure clean-up is conducted by trained personnel only. Wear adequate personal protective equipment. Ventilate area. Extinguish or remove all ignition sources. Remove or isolate flammable and combustible materials and other incompatible materials. The gas is heavier than air and can accumulate in low-lying areas. Notify government occupational health and safety and environmental authorities. Treating spilled solution with caustic will convert chlorine dioxide to chlorate and chlorite, stopping release of gas in 15-20 minutes. Release may be stopped faster by adding hydrogen peroxide or white liquor after the caustic has made the solution alkaline. Appropriate personal protective equipment should be worn prior to treatment.

Environmental precautions

Chlorine dioxide must not be discharged to the general environment but may be discharged to mill sewer if allowable, otherwise storage tanks and other equipment should be provided with a bund (berm) to retain solution

in the event of rupture. Contained plant settling ponds containing organic matter will normally provide an environment in which residual chlorine dioxide will be reduced to harmless compounds quickly. Excessive amounts will kill bacteria used to treat wastes, necessitating restocking.

7. Handling and Storage

Precautions for safe handling Equipment manufacturer's recommendations for design, operation and maintenance of equipment must be followed.

Conditions for safe storage, including any incompatibilities Solutions are stored in FRP or tile-lined tanks. These tanks should be provided with adequate air-sweep to ensure that explosive concentrations of chlorine dioxide gas do not build up. The gas is unstable and it is not possible to store as a gas.

8. Exposure Controls/ Personal Protection

Occupational exposure limits ACGIH TWA 0.1 ppm
STEL 0.3 ppm

Biological limit values No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls Good ventilation should be provided, so that chlorine dioxide levels are maintained below TLV at all times.

Individual protection measures, such as personal protective equipment

Eye/face protection Use eye protection. Use of contact lenses should not be permitted when there is the potential for exposure to this material.

Skin protection

Hand protection Use impermeable gloves.

Other Use of full chemical protective suits if coming into contact with large volume of chlorine dioxide solution. In the event of a fire, use fire protective firefighting gear (including consideration of any other hazardous materials which may be present).

Respiratory protection Persons in the vicinity of chlorine dioxide gas or solutions should carry a respirator suitable for escape purposes at all times, in case of accidental release of significant amounts of gas.

General hygiene considerations No additional information available.

9. Physical and Chemical Properties

Appearance	Solution: Pale yellow; Gas: Yellow/green.
Physical state	Normally used as solution in water. Pure chlorine dioxide is a gas at normal temperatures, but is unstable and will decompose violently unless diluted with an inert gas or handled at a reduced pressure.
Odor	Similar to Chlorine or Ozone
Odor threshold	For gaseous chlorine dioxide - not available. Characteristic smell at 0.3 ppm STEL. Reported odour threshold values {9.4 ppm (method not specified) and 15 ppm (method not specified) have not been evaluated. A detection level of 0.1 ppm though widely reported is not considered correct.
pH	2 to 3 (8 g/L solution.)
Melting point	Not applicable.
Freezing point	Not applicable for solution. For gas: - 59°C
Initial boiling point	Not applicable for the water solution. For gas 11°C
Flash point	Not combustible
Evaporation rate	Not applicable. Gaseous chlorine dioxide will escape from solution leaving behind water.
Flammability (solid, gas) Upper/lower flammability or explosive limits	Not applicable.
Flammability limit – lower (%)	Not applicable.
Flammability limit – upper (%)	Not applicable.
Explosive limit	Not applicable. Chlorine dioxide solution is not explosive. Chlorine dioxide gas which may evolve from chlorine dioxide solution, may spontaneously decompose with a mild energy release at concentrations of 10% in air or greater at standard temperature and pressure (76 mm Hg partial pressure)
Vapor pressure	Not available.
Vapor density	2.4 (air=1) (for 100% ClO ₂)
Relative density (water = 1)	1.6 at 0°C (liquid)
Solubility (ies)	
Solubility (water)	The product is water solution of chlorine dioxide (the solubility depends on the temperature and partial pressure of the gas, e.g. 10 g/L @ 15°C and 74.5 mm Hg partial pressure is typical)
Partition coefficient (N-octanol/water)	Not available.
Coefficient of Water/Oil Distribution	Log P(oct) = -3.22 (estimated)
Auto-ignition temperature	Not applicable, but see "Chemical Stability", Section 10.
Mechanical Impact Sensitivity	Not available.

Static Discharge Sensitivity	Sensitive.
Decomposition temperature	Not available.
Viscosity	Not applicable.
Other information	
Bulk Density	Not applicable.
Molecular formula	ClO ₂
Specific gravity	For solution - close to 1 g/L

10. Stability and Reactivity

Reactivity	Gas is highly reactive on contact with incompatible materials, and will decompose upon exposure to ultraviolet light, heat or static discharge.
Chemical stability	<p>Chloride dioxide solution 10-14 g/L is relatively stable and can be stored at low temperature for extended time, but partial pressure of chlorine dioxide gas in the gas phase over solution is significant, especially at higher concentrations such as covered by this MSDS. The hazards of the gaseous chlorine dioxide are therefore inherent to hazards of the solution. The gas is heavier than air and can accumulate in low-lying areas. Accumulation of chlorine dioxide in gas phase must be prevented. Chlorine dioxide gas is unstable even at low (i.e. 120 mm Hg) partial pressures. At partial pressures above about 120 mm Hg it will decompose spontaneously and explode. At higher pressures the explosions become more violent. If explosion relief is inadequate, rupture of the vessel may occur. These explosions can ignite combustible materials. Explosive decomposition occurs above 45°C at concentrations greater than 10% by volume in air at pressures above 10.1 kPa (76 mm Hg). Decomposition can be caused by light, sparking, electrical discharge including static electricity, rapid heating, hot surfaces or open flames, and by contact with most flammable organic solvents, oxidizable materials, or inorganic substances, e.g. mercury and sulphur. Chlorine dioxide gas is pressure sensitive and will decompose violently if it is compressed for storage or shipping. The transfer of gas chlorine dioxide from one container to another can cause an explosion.</p>
Possibility of hazardous reactions	Material does not undergo hazardous polymerization.
Incompatible materials	<p>There is only limited information on materials incompatible with chlorine dioxide solutions.</p> <p>Corrosivity to Metals: Solutions of chlorine dioxide are acidic and oxidizing, therefore it can be expected that corrosion of common metals will occur. There is no information available on the corrosivity of chlorine dioxide gas to metals.</p> <p>Corrosivity to Non-Metals: It is expected that chlorine dioxide solutions will attack non-metals similarly to chlorine dioxide gas, which attacks</p>

plastics, like polyvinylidene chloride, polypropylene, nylon, polyurethane, high-density polyethylene, thermoset isophthalic acid polyester, and thermoset epoxy. It does not attack Teflon, acrylonitrile-butadiene-styrene (ABS), polyvinylidene fluoride, chlorinated polyvinyl chloride (CPVC), polyvinyl chloride (PVC) and vinyl ester.

Gaseous chlorine dioxide is incompatible with:

- COMBUSTIBLE MATERIALS (e.g. hydrocarbons (e.g. butadiene, ethane, ethylene, methane or propane), rubber, cork, sulphur, hydrogen sulphide, sugar, metallic dusts) - ignite on contact and may cause explosion.
- CARBON MONOXIDE - explode on mixing.
- NON-METALS (e.g. phosphorus) - ignite on contact and may cause explosion.
- DIFLUORAMINE or TRIFLUORAMINE - interaction in the gas phase is explosive.
- FLUORINE - reaction is explosive.
- HYDROGEN - mixtures detonate on sparking, or on contact with platinum sponge.
- MERCURY - chlorine dioxide gas explodes upon shaking with mercury.
- PHOSPHORUS PENTACHLORIDE and CHLORINE - mixture causes explosion.
- POTASSIUM HYDROXIDE - chlorine dioxide explodes in contact with solid potassium hydroxide or its concentrated solutions.

Hazardous decomposition products

Chlorine and oxygen are main decomposition products of gaseous chlorine dioxide.

11. Toxicological Information

Information on likely routes of exposure

Inhalation

A severe respiratory irritant. May cause bronchospasm and pulmonary oedema, which may be delayed in onset. May also cause severe headache. All symptoms may be delayed and long-lasting. Long term exposure may cause chronic bronchitis.

Skin contact

Solutions are highly irritant. May be absorbed, causing tissue and blood cell damage.

Eye contact

Severely irritant. Exposure may cause visual disturbance, i.e. seeing haloes around lights.

Ingestion

Not applicable except for solutions, in which case the symptoms would be expected to parallel those for inhalation.

Most important symptoms/effects, acute and delayed

Chlorine dioxide irritates the nose, throat, trachea and bronchi at very low concentrations (less than 5 ppm) resulting in breathlessness, wheezing and coughing. Higher concentrations can cause inflammation

in the upper respiratory tract, bronchial spasms and difficulty in breathing. A potentially fatal accumulation of fluid in the lungs (pulmonary edema) could occur. Symptoms of pulmonary edema (chest pain and shortness of breath) can be delayed for up to 24 or 48 hours after exposure. Long-term respiratory effects (e.g. sensitivity to respiratory irritants, chronic nasal inflammation, asthma, pulmonary emphysema and spastic bronchitis) have been noted in workers accidentally exposed to unspecified concentrations for a short time.

Information on toxicological effects May have synergistic effects in conjunction with chlorine, other chlorine oxides, and chlorine fluorine compounds.

Acute toxicity

Product	Species	Test Results
Chlorine Dioxide Solution		
Acute		
Oral		
LD ₅₀	Rat	292 mg/kg
Inhalation		
LC ₅₀	Rat	32 ppm (inhalation 4 hour exposure)
Skin corrosion/irritation	Severe irritant	
Serious eye damage/eye irritation	Severe irritant.	
Respiratory or skin sensitization		
Respiratory sensitization	No information available	
Skin sensitizer	No information available.	
Germ cell mutagenicity	No information available	
Carcinogenicity	This product is not considered to be a carcinogen by IARC or ACGIH	
Reproductive toxicity	No information available.	
Specific target organ toxicity - single exposure	No information available	
Specific target organ toxicity - repeated exposure	No information available.	
Aspiration toxicity	No information available.	
Chronic effects	No information available.	

12. Ecological Information

Ecotoxicity	No data available.
Persistence and degradability	No data available. Term 'biodegradability' pertains to organic material capable of decomposition as a result of attack by microorganisms. However, chlorine dioxide will be converted to chloride by reducers present in natural environment, including biomass.
Bio accumulative potential	No data available
Mobility in soil	No data available
Other adverse effects	No data available

13. Disposal Considerations

Disposal instructions	Chlorine dioxide solution should not be disposed into sewers and waterways. Chlorine dioxide solutions may be treated with sodium sulphite or bisulphite in a neutral to slightly alkaline solution to decompose the chlorine dioxide. The sodium chloride and sodium sulphate reaction products can then be disposed in a manner which complies with the Local, Provincial, and Federal Regulations.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations (see: Disposal instructions).
Contaminated packaging	Dispose of in accordance with local regulations (see: Disposal instructions).

14. Transport Information

TDG

Shipping Name (TDGR)	UN Number	Hazard Class	Packing Group
Chlorine Dioxide	Forbidden	Forbidden	Forbidden

IATA Transportation is FORBIDDEN.

IMDG Transportation is FORBIDDEN.

15. Regulatory Information

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s).

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other Information

Issue date	1/11/2018
Revision #	4
Revision Indicator	Minor text revision
List of abbreviations	ACGIH: American Conference of Governmental Industrial Hygienists CAS: Chemical Abstract Services FRP: Fiberglass Reinforced Plastic IARC: International Agency for Research on Cancer IATA: International Air Transport Association IMDG: International Maritime Dangerous Goods LC: Lethal Concentration LD: Lethal Dose PPE: Personal Protective Equipment SCBA: Self-Contained Breathing Apparatus SDS: Safety Data Sheet TDGR: Transport of Dangerous Goods Regulations TSCA: Toxic Substances Control Act UN: United Nations WHMIS: Workplace Hazardous Materials Information System

Disclaimer

Information presented in this SDS is furnished in accordance with the Workplace Hazardous Materials Information System (WHMIS).

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