CLO2 Remedies

Technical Bulletin
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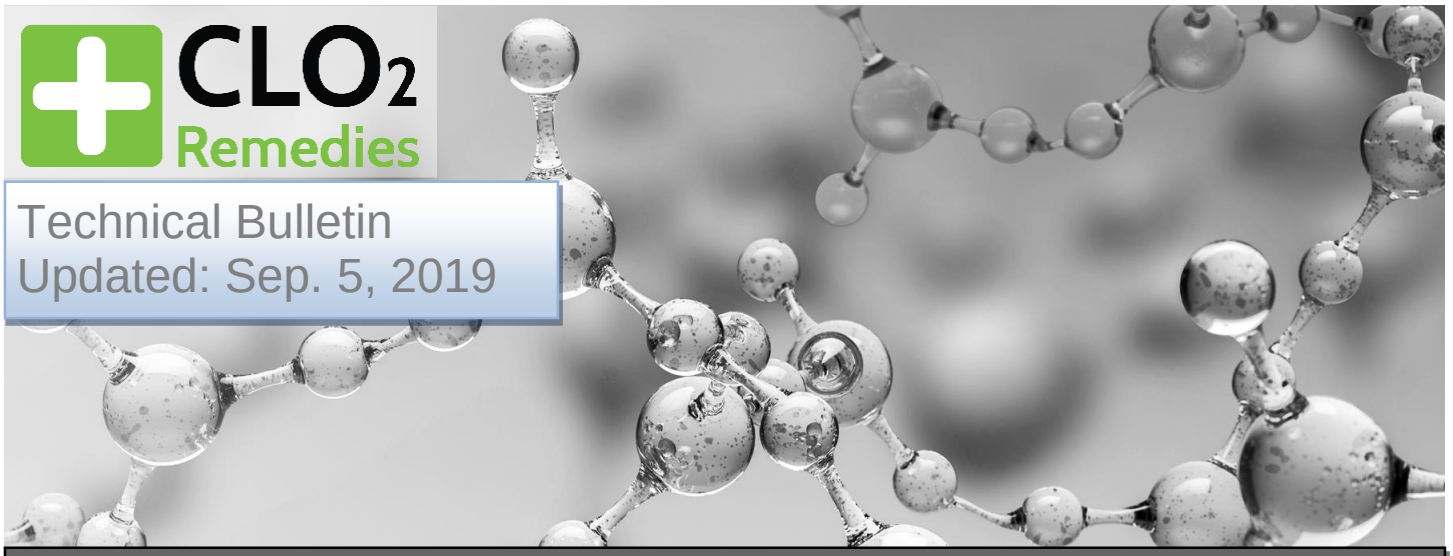


# Chlorine Dioxide ($ClO_2$) - safely sanitize, disinfect and deodorize

## Chlorine Dioxide ($ClO_2$) is an U.S. EPA Approved disinfectant, sanitizer, deodorizer, tuberculocide, algaecide, fungicide and U.S. FDA recognized food additive & preservative.

Micro-organic contamination is the leading cause of human death and suffering as well as industrial, commercial and agricultural losses.

$CLO_2$ Remedies is a BioSecurity Company specializing in customized biodegradable chlorine dioxide ($ClO_2$) solutions. $ClO_2$ is an exceptionally effective and versatile yet low toxicity anti-microbial that safely solves wide-spectrum contamination challenges better than chemical alternatives.

$CLO_2$ Remedies is dedicated to improving human health and industrial productivity by assisting clients identify cost-effective, high impact $ClO_2$ solutions to wide- spectrum, micro-organic challenges.

We help global commercial and humanitarian organizations overcome contamination and odors that impacts product quality, infrastructure and health of end- users with numerous $ClO_2$ products and delivery formats.





*Contact Information:*
*Orders: info@crazyclean.co.za*
*www.crazyclean.co.za*

## Chemical Definition

### Chlorine Dioxide ($ClO_2$) is a chemical compound

made up of one atom of chlorine and two atoms of oxygen.

Do not confuse $ClO_2$ with typical household chlorine bleach or HTH. Chlorine dioxide is actually **an oxidizing agent**, not a chlorinating agent.

Unlike alternative chemicals, $ClO_2$ reacts with organic matter through selective oxidation rather than substitution and **does not produce carcinogenic chlorinated byproducts**.

## Terminology

### Antimicrobial Pesticides

"Antimicrobial pesticides are substances or mixtures of substances used to destroy or suppress the growth of harmful microorganisms such as bacteria, viruses, or fungi on inanimate objects and surfaces." **

### $ClO_2$ is an antimicrobial pesticide that can be used in the following ways:

1. **Sterilizer** - to eliminate or destroy: fungi, fungal spores, viruses, vegetative bacteria, bacterial spores.
2. **Disinfectant** - used on nonliving surfaces and objects to destroy or irreversibly inactivate infectious fungi and bacteria.
3. **Sporicide** - to inactivate bacterial spores.
4. **Sanitizer** - to reduce microorganisms from the inanimate environment to safe levels.
5. **Germicide** - to kill a number of microorganisms (e.g., viruses, fungi, bacteria)

** Reference: https://www.epa.gov/pesticide-registration/what-are-antimicrobial-pesticides

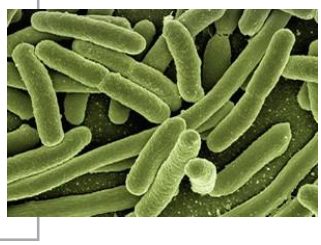
## Test Data

### $ClO_2$ is known to be effective on these tested organisms

For the complete list with references, send an email request.

#### Bacteria

- E. coli (multiple)
- Leginella
- Salmonella (multiple)
- Staphylococcus (multiple)
- many others



#### Viruses

- Hepatitis A, B, C
- Parvovirus (multiple)
- Norwalk Virus
- Rotavirus
- many others

#### Bacterial Spores

- Bacillus anthracis
- Bacillus pumilus
- Bacillus subtillis (multiple)
- Clostridium sporogenes
- many others

#### Algae/Fungi/Mold/Yeast

- Aspergillus clavatus
- Aspergillus (multiple)
- Candida (multiple)
- Fusarium solani
- many others

## Where to use $ClO_2$

$ClO_2$ is proven safe for use as directed on and around humans, pets, plants, food, water, materials and environment by both The Environmental Protection Agency and The World Health Organization and is currently used in the USA and EU in dozens of industries and hundreds of applications.

Below are typical places where $ClO_2$ is used.


Home and Apartment


Boat and Marine


Tanks and Lines


Agriculture & Horticulture


Hotel and Motel


Trucks and RVs

## Comparison

### $ClO_2$ is superior when compared to other options

The chart below shows how well $ClO_2$ performs against alternatives.

**Chlorine Dioxide Comparison Chart**

| Agent | Chlorine Dioxide | Sodium and Calcium Hypochlorite | Glutaraldehyde | Iodophor's | Quaternary Ammonium Compounds | Paracetic Acid |
|---|---|---|---|---|---|---|
| Performance | High | Moderate | Moderate to high | Moderate | Moderate to high | Moderate |
| Contact Time | Seconds to minutes | Minutes to hours | 30 minutes to several hours | Minutes to hours | Minutes to hours | Minutes |
| Concentration | .1 - 100 ppm | 1,000 - 10,000 ppm | 500 - 10,000 ppm | 500 - 10,000 ppm | 100 - 10,000 ppm | 30 - 200 ppm |
| pH | Neutral to Acidic | Alkaline | Neutral | Neutral to Acidic | Acidic to Neutral | Acidic |
| Corrosiveness | Negligible | Corrosive to iron and aluminum | Negligible | Corrosive to iron and stainless steel | Corrosive to iron, copper and brass | Corrosive to iron |
| Toxicity | Negligible | Harmful to tissues | Can cause skin irritation | Variable, iodine is extremely toxic | Can cause skin irritation | Skin and mucous membrane irritation |
| Biodegradable | High | Moderate to low | Moderate to high | Low | Low | High |
| Cost | Moderate to low | Low | Moderate to high | Moderate to high | Moderate to high | High |

## RECOMMENDED SPECIFICATIONS FOR CONTAINERS USED WITH CLO2 PRODUCTS FOR USE IN GENERATING OR STORING ACTIVATED SOLUTIONS

+ The container should be, or be comparable to, a UN-approved, liquid-resealable containment incorporating a gasket-sealing surface and locking mechanism.

+ Container construction should be of dark or opaque/UV-blocking (preferred) oxidation-resistant plastic or glass. SOME MATERIALS RECOMMENDED INCLUDE:

+ High Density Polyethylene (HDPE)

+ Polypropylene (PP)

+ Polyethylene Terephthalate (PET) (PETE) + Polyvinyl chloride (PVC)

+ Polycarbonate (PC)

+ Glass (UV-blocking preferred)

+ Gasket materials; silicone, viton or EPDM

## DURING USE, DILUTING, APPLYING OR WORKING WITH ACTIVATED PRODUCT:

1. Always work in well-ventilated area and avoid inhaling fumes of activated solution.
2. Wear protective gloves if hands will come in contact with activated solution.
3. Respiratory protection is not required under the limited exposure conditions of most normal use patterns. However, wear a NOISH/MSHA-approved respirator under the following conditions.
   a. when applying activated solution with a high-pressure sprayer
   b. when working with the product for extended period of time in a closed facility or in a poorly ventilated area.
   c. when normal work-shift duties entail uninterrupted periods of applying the activated solution with mop, sponge or sprayer.
   d. when opening the vessel containing stock activated solution (at least 500 ppm)
   e. if OSHA inhalation exposure limits are reached or exceeded (see the SDS)
4. DO NOT USE PRODUCT IN A MANNER INCONSISTENT WITH ITS LABEL.

# Liquid SANITIZER

## For hard, non-porous FOOD contact surfaces

As a sanitizer for stainless steel and other hard, nonporous food contact surfaces such as tanks, transfer lines and other food processing equipment in food processing plants such as poultry, fish & meat and in restaurants, commissaries, dairies, beverage and bottling plants, breweries & wineries:

1. Activate $ClO_2$ according to directions for use on product label.
2. Remove all gross food particles and soil (visible organic matter) prior to using pre-flush, pre-soak or pre-scrape treatment.
3. Clean surface thoroughly using a suitable detergent and rinse with clean, potable water before sanitizing.
4. Prepare a **10 ppm solution** in accordance with instructions.
5. To apply: spray, mop, sponge or swob surfaces OR fill, flush, immerse or circulate in tanks, lines and equipment in solution.

6. After sanitizing, allow surfaces or equipment to air dry. Do not rinse sanitized surface.
7. Dispose of product packaging and/or sachet per product label instructions.

# Liquid SANITIZER

## For hard, non-porous NON-FOOD contact surfaces

ALL POROUS & NON-POROUS SURFACES IN RESIDENTIAL & COMMERCIAL PROPERTIES; HOTELS & MOTELS; AUTO, TRUCK, BUS & RV'S; BOAT & MARINE; GYMS, LOCKER ROOMS & ATHLETIC EQUIPMENT; NURSING HOMES, DAYCARE CENTERS, SCHOOLS & CHURCHES, AGRICULTURE & HORTICULTURE ENVIRONMENTS.

As a sanitizer for non-food contact surfaces and equipment such as clothing, upholsteries, athletic equipment, carpets, beddings, furniture, floorings, sealed concrete, finished woods, metals, vinyls & plastics, counter tops, stainless steel or hard-surface equipment, glazed tile floors, walls and ceilings:

1. Activate $ClO_2$ according to 'Directions for Use' on product label.
2. Clean all surfaces thoroughly with a suitable detergent and rinse with water prior to sanitizing.
3. Prepare a **solution of 20 ppm**, per instructions on label.
4. To apply: spray, mop, sponge or swob surfaces OR fill, flush, immerse or circulate in tanks, lines and equipment, ensuring the target surfaces remain visibly wet **for at least one minute**. When applying these solutions using a high-pressure sprayer, wear a NOISH/MSHA -approved respirator for chlorine dioxide.
5. After sanitizing, allow surfaces or equipment to air dry. Do not rinse sanitized surface.
6. Dispose of product packaging and/or sachet per product label instructions.

# Liquid DISINFECTANT and deodorization

## For hard, porous and non-porous NON-FOOD contact surfaces

ALL POROUS & NON-POROUS SURFACES IN RESIDENTIAL & COMMERCIAL PROPERTIES; HOTELS & MOTELS; AUTO, TRUCK, BUS & RV'S; BOAT & MARINE; GYMS, LOCKER ROOMS & ATHLETIC EQUIPMENT; NURSING HOMES, DAYCARE CENTERS, SCHOOLS & CHURCHES, AGRICULTURE & HORTICULTURE ENVIRONMENTS.

As a disinfectant for non-food contact surfaces and equipment such as clothing, upholsteries, athletic equipment, carpets, beddings, furniture, floorings, sealed concrete, finished woods, metals, vinyls & plastics, counter tops, stainless steel or hard-surface equipment, glazed tile floors, walls and ceilings:

1. Activate $ClO_2$ according to 'Directions for Use' on product label.
2. Remove all gross food particles and soil (visible organic matter) prior to using pre-flush, pre-soak or pre-scrape treatment.
3. Clean tank, line or surface thoroughly using a suitable detergent and rinse with clean, potable water before sanitizing.
4. Prepare a **100 ppm solution** in accordance with instructions.
5. To apply: spray, mop, sponge or swob surfaces OR fill, flush, immerse or circulate in tanks, lines and equipment, ensuring the target surfaces remain visibly wet for at least TEN minutes. Longer Time Equals Better Results. When applying these solutions using a high-pressure sprayer, wear a NOISH/MSHA -approved respirator for chlorine dioxide.

6. After disinfecting, allow surfaces or equipment to air dry. Do not rinse disinfected surface.
7. Dispose of product packaging and/or sachet per product label instructions.

## DISINFECTANT USES IN MEDICAL AND DENTAL OFFICES, LABORATORIES, HOSPITALS, CLINICS, MORGUES AND INSTITUTIONS

CLO2 Remedies chlorine dioxide products are not to be used as a terminal sterilant/high-level disinfectant on any surface or instrument that (1) is introduced directly into the human body, either into or in contact with the blood stream or normally sterile areas of the body OR (2) contacts intact mucous membranes but which does not ordinarily penetrate the blood barrier or otherwise enter normally sterile areas of the body. These products may be used to clean or decontaminate critical or semi-critical medical devices prior to sterilization or high-level disinfection.

To disinfect non-porous, hard surfaces and equipment such as stainless steel or glazed tile floors, **walls and ceilings, less steel cold rooms and walk-in incubators**:

1. Activate $ClO_2$ according to 'Directions for Use' on product label.
2. Clean all surfaces thoroughly with a suitable detergent and rinse with water prior to sanitizing.
3. Prepare a $ClO_2$ solution of 100 ppm, per instructions on label.
4. To apply: spray, mop, sponge or swob surfaces OR fill, flush, immerse or circulate in tanks, lines and equipment, ensuring the target surfaces remain visibly wet for at least TEN minutes. When applying these solutions using a high-pressure sprayer, wear a NOISH/MSHA -approved respirator for chlorine dioxide.
5. After sanitizing, allow surfaces or equipment to air dry. Do not rinse disinfected surface.
6. Dispose of product packaging and/or sachet per product label instructions.

**To disinfect equipment tops, bench tops, biological hoods, incubators, stainless steel equipment and instruments:**

1. Activate $ClO_2$ according to 'Directions for Use' on product label.
2. Remove all animals and feed from the facility to be disinfected.
3. Remove all litter and manure from the floors, walls and surfaces of barns, pens, stalls, chutes and other structures occupied or traversed by animals. Empty all troughs, racks and other feeding and watering appliances.
4. Prepare a $ClO_2$ solution of 100 ppm, per instructions on label.

**For general application with sprayer:**

1. Clean all surfaces thoroughly with a suitable detergent and rinse with water prior to disinfecting.
2. Using a commercial sprayer, saturate all surfaces with the solution maintaining visible wetness for a period of at least TEN minutes. When applying these solutions using a high-pressure sprayer, wear a NIOSH/MSHA-approved respirator appropriate for chlorine dioxide.
3. After treatment, ventilate buildings, coops or other enclosed spaces before reentering. Do not house poultry or employ equipment until treatment has been absorbed, set, or dried.
4. Dispose of product packaging and/or sachet per product label instructions.

**As a disinfecting soak:**

1. With soap or detergent, thoroughly clean halters, ropes or other types of equipment used in handling and restraining animals and forks, shovels and scrapers used in removing liter and manure. Rinse with water.
2. Fill container or vat with a $ClO_2$ 100 ppm solution and immerse items for a period of at least TEN (10) minutes.
3. Discard solution in sanitary drain or as ordinary non-hazardous waste. Do not reuse solution.
4. Thoroughly scrub treated feed racks, troughs, automatic feeders, fountains and waterers with soap or detergent and rinse with potable water before use.
5. Dispose of product packaging and/or sachet per product label instructions.

**Disinfect for beverage, water systems and lines:**

To disinfect lines, holding tanks and other equipment used in fountain drink and other beverage preparation, storage, transfer, and dispensing operations or to disinfect the lines and storage tanks of potable water storage systems aboard aircraft, boats and RVs (clean in place applications)

- Prior to disinfecting, clean tanks and flush thoroughly with clean, potable water.

# HORTICULTURE

## HORTICULTURAL DISINFECTANT, SANITIZER, ALGAECIDE, FUNGICIDE AND SLIME REMOVER/INHIBITER

TREATS/CONTROLS/INHIBITS: Algae (Phormidium boneri) and Fungi (Penicillium digitatum, Botrytis sp., Fusarium solani, Pythium aphanidermatum, Pythium irregulare, Fasarium oxysporum f. sp bascilicum (Fob)

Chlorine dioxide products, when used as directed:

1. disinfects non-porous hard surfaces, pots, flats, flower buckets and cutting tools;
2. sanitizes non-porous hard surfaces, racks, stands, work areas, benches and cutting tools;
3. removes or inhibits (under continuous treatment) re-establishment of slime in irrigation/transfer lines and systems; treats, controls and prevents build-ups of soil-borne plant diseases and other algae, fungi and attendant slimes on: soils used to grow nursery stocks, bedding plants, flowering plants and ornamentals; on cut flowers and other cuttings, seedlings and seeds; and on and within greenhouse equipment and structures such as irrigation/transfer lines and systems, pots, floors, ventilation ducts and equipment, storage rooms, growing tables, evaporative coolers, plastics, benches and flower pots; and controls bacteria counts, **maintains freshness and extends shelf life for cut flowers.**

**NOTE: Do not use products at concentrations higher than those recommended for each application. When applied directly to plants, seeds, cuttings or flowers as directed, Chlorine dioxide solutions do not cause adverse cosmetic affects, as testing and experience has demonstrated.** However, testing has not been performed on EVERY plant species and users are advised to spot-test chlorine dioxide before applying it widely.
Active solution may be irritating if breathed. If applying solution inside greenhouse or enclosed area using a high pressure sprayer, wear a NOISH/MSHA-approved respirator appropriate for chlorine dioxide; after treatment, ventilate greenhouse before reentering.

**To disinfect non-porous hard surfaces, including stainless steel, glazed tiles, sealed concrete and sealed and finished wood used in horticultural applications:**

1. Activate $ClO_2$ according to 'Directions for Use' on product label or packaging.
2. Pre-clean all surfaces prior to application of disinfection solution. Sweep and remove all plant debris. Use power sprayer to wash all surfaces to remove loose dirt.
3. Prepare solutions in indicated concentrations and ensure surfaces are wetted and remain visibly wet for the times noted below and in instructions associated with the chosen application. Dispose of product as indicated on package.

**FOR WORK AREAS, BENCHES AND EVAPORATIVE COOLERS**

Prepare a 100ppm solution in accordance with the instructions above OR dilute higher strength solutions appropriately.

Spray or swob work area and bench surfaces before each work period and again after each planting is completed to help control the transfer of diseases. Spray or swob evaporative cooler surfaces, ensuring visible wetness for at least TEN (10) minutes. When applying these solutions using a high- pressure sprayer, wear a NIOSH/MSHA-approved respirator appropriate for chlorine dioxide.

**AS AN INITIAL OR REMEDIAL TREATMENT TO DISINFECT AND REMOVE SLIME, ALGAE AND FUNGI FROM WATER HOLDING TANKS AND IRRIGATION/TRANSFER LINES (CLEAN-IN-PLACE APPLICATION)**

Flush tank thoroughly with clean water.

1. Prepare a $ClO_2$ solution of 50 ppm, per instructions on label.
2. Fill tank completely with the 50 ppm solution. Run solution through transfer lines and appliances until the chlorine dioxide green solution appears at the outlets. Top-off tank with solution. Circulate or let stand in tank and lines for at least TWENTY (20) minutes. Overnight if possible. More Time equals Better Results.
3. Drain tanks and lines. Rinse with potable water. Resume normal operations.

**AS AN INITIAL OR REMEDIAL TREATMENT TO KILL ALGAE AND FUNGI ON SURFACES, EQUIPMENT, GREENHOUSE STRUCTURES, GLAZING, PLASTIC, BENCHES, WALKWAYS, FLOORS, WALLS, FAN BLADES, VENTILATION DUCTS, WATERING SYSTEMS, COOLERS AND STORAGE ROOMS:**

1. Activate $ClO_2$ according to 'Directions for Use' on product label.
2. Prepare a **10 ppm solution.** i.e. **100ppm diluted 10:1.**
3. To apply: spray, mop, sponge or swob surfaces ensuring the target surfaces remain visibly wet for at least ONE (1) HOUR. When applying these solutions using a high-pressure sprayer, wear a NOISH/MSHA - approved respirator for chlorine dioxide.

NOTE: heavy growth of algae or fungi may require scrubbing to remove dead growth.

# HORTICULTURE

## *APPLICATIONS FOR FRESH-CUT FLOWERS

As a dip to control and suppress bacteria (Erwinia chrysanthemi) on cuttings and cut flowers:

1. Activate $ClO_2$ according to 'Directions for Use' on product label.
2. Prepare a **5 ppm solution**. i.e. **100ppm diluted 20:1.**
3. Briefly dip cuttings or cut flowers and ensure they remain visibly wet with solution for at least one minute.
4. Dispose of the packaging as directed on label.

*To maintain freshness and extend shelf life for cut flowers:

1. Prepare a **5 ppm solution**. i.e. **100ppm diluted 20:1**.
2. Unbundle the flowers to preclude bunching and place in vase on display on in cold storage in the 5 ppm chlorine dioxide solution. Solution may include 2% sucrose.
3. Refresh solution every 24 hours.
4. Dispose of the packaging as directed on label.

# AGRICULTURE

## *APPLICATIONS FOR FRESH-CUT FRUITS & VEGETABLES

Chlorine dioxide products may be used to reduce spoilage or pathogenic microorganisms on cut or processed fruits and vegetables in food processing facilities, such as during flume and washing operations, and in other commercial food preparation areas. Depending on decontamination needs/contamination levels, use at concentrations up to 10 ppm to produce the desired microbial reductions on processed fruits and vegetables.

- Prepare a **10 ppm $ClO_2$ solution** per product package directions. OR
- Prepare a 500 ppm stock solution and use a dilution device appropriate to the end concentration desired:
- for 10 ppm, use a 1:50 dilution device (one part 500ppm solution to 49 parts water)
- for 5 ppm, use a 1:100 dilution device (one part 500ppm solution to 99 parts water)
- for 3 ppm, first dilute 500ppm solution to @300 ppm by adding 2 parts water to 3 parts 500 ppm solution; then use a dilution device (ONE part 300 ppm solution to 99 parts water)

## TO EXTEND THE SHELF-LIFE AND FRESHNESS OF FRUITS AND VEGETABLES IN FOOD PROCESSING FACILITIES.

### CHLORINE DIOXIDE WILL REDUCE CONCENTRATIONS OF SPOILAGE MICROBES ON RAW AGRICULTURAL COMMODITIES (RACS) INTENDED FOR COMMERCIAL FOOD PROCESSING.

1. Activate $ClO_2$ according to 'Directions for Use' on product label.
2. WASH AND THOROUGHLY RINSE FRUITS AND VEGETABLES WITH CLEAN, POTABLE WATER.
3. Prepare a **5 ppm chlorine dioxide solution**.

4. Apply to fruits and vegetables by: either immersing/dipping in a tank of 5 ppm solution for ONE (1) minute OR using an application-specific sprayer (the industry standard fan or cone spray nozzle pattern) to cover all surfaces evenly with a 5 ppm spray. Replenish immersion solution at the rate of depletion; verify 5 ppm concentration using CHLORINE DIOXIDE TEST STRIPS. Empty and wash immersion tanks with every shift change.
5. Follow application to fruit and vegetables with a potable water rinse or canning, blanching or cooking.

**PRICING STRUCTURE**

| 500ppm Chlorine Dioxide (CLO2) | Price |
|---|---|
| 1lt | **R130.00 inc** |
| 5lt | **R395.00 inc** |

PRICES QUOTED EXCLUDE COURIER FEES.

Contact Persons:
Rakesh Suknandan National Marketing 067-9385708

*Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of chlorine dioxide products are therefore assumed by the user, and WE EXPRESSLY DISCLAIM ALL WARRANTIES OF EVERY KIND AND NATURE, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE USE OR SUITABILITY OF THE PRODUCT.*