

## Amaranth Method<sup>1</sup> 20 to 500 µg/L ClO<sub>2</sub>

## Method Amaranth Reagent Solution

**Scope and application:** For water and drinking water.

<sup>1</sup> This method is under license of Elf Atofina. Reagent sets for this method are only available in Europe.




### Test preparation

## Instrument-specific information

Table 1 shows all of the instruments that have the program for this test. The table also shows sample cell and orientation requirements for specific instruments.

To use the table, select an instrument, then read across to find the applicable information for this test.

**Table 1 Instrument-specific information**

Instrument	Sample cell orientation	Sample cell
DR 6000 DR 3800 DR 2800 DR 2700 DR 1900	The fill line is to the right.	2495402 
DR 5000 DR 3900	The fill line is toward the user.	

## Before starting

Samples must be analyzed immediately after collection and cannot be preserved for later analysis.

Make sure that each portion of sample is at the same temperature for best results.

Measure the volume of Chlorine Dioxide Reagent 2 accurately. Use a volumetric pipet. Use a TenSette Pipet to dispense Chlorine Dioxide reagents 1 and 3.

Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

Dispose of reacted solutions according to local, state and federal regulations. Refer to the Safety Data Sheets for disposal information for unused reagents. Refer to the environmental, health and safety staff for your facility and/or local regulatory agencies for further disposal information.

## Items to collect

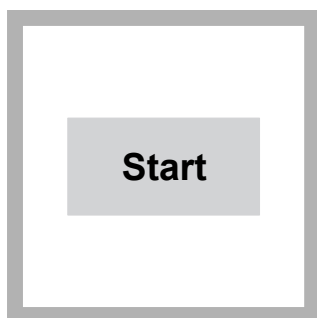
Description	Quantity
Chlorine Dioxide Reagent Set	1
Flask, volumetric, 25-mL	2
Syringe, 1-mL with needle	1
Sample cells (For information about sample cells, adapters or light shields, refer to <a href="#">Instrument-specific information</a> on page 1.)	2

Refer to [Consumables and replacement items](#) on page 4 for order information.

## Sample collection

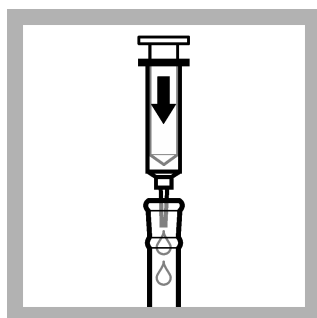
- Analyze the samples immediately. The samples cannot be preserved for later analysis.
- Chlorine dioxide is a strong oxidizing agent and is unstable in natural waters. Chlorine dioxide reacts quickly with various inorganic compounds and more slowly with organic compounds. Many factors, including reactant concentrations, sunlight, pH, temperature and salinity influence the decomposition of chlorine dioxide in water.
- Collect samples in clean glass bottles. Do not use plastic containers because these can have a large chlorine dioxide demand.
- Pretreat glass sample containers to remove chlorine dioxide demand. Soak the containers in a weak bleach solution (1 mL commercial bleach to 1 liter of deionized water) for at least 1 hour. Rinse fully with deionized or distilled water. If sample containers are rinsed fully with deionized or distilled water after use, only occasional pretreatment is necessary.
- Make sure to get a representative sample. If the sample is taken from a spigot or faucet, let the water flow for at least 5 minutes. Let the container overflow with the sample several times and then put the cap on the sample container so that there is no headspace (air) above the sample.

## Test procedure

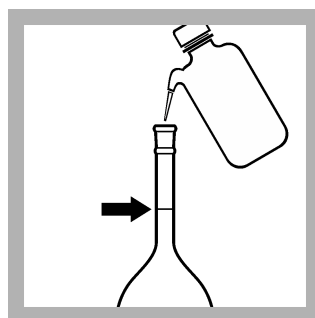


1. Start program **78 Chlor Diox Amaranth**. For information about sample cells, adapters or light shields, refer to [Instrument-specific information](#) on page 1.

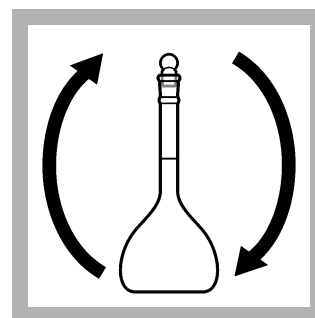
**Note:** Although the program name can be different between instruments, the program number does not change.



2. **Prepare the blank:** Use the syringe and needle to add 1.0 mL of Chlorine Dioxide Reagent A into a 25-mL volumetric flask.



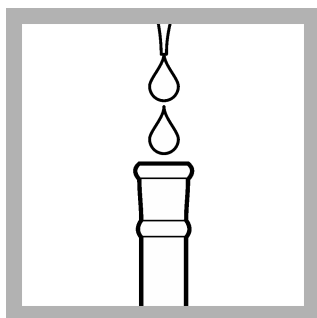
3. Dilute to the mark with deionized water.



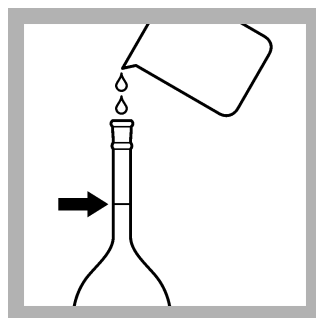
4. Put the stopper on the volumetric flask. Invert a minimum of seven times to mix.



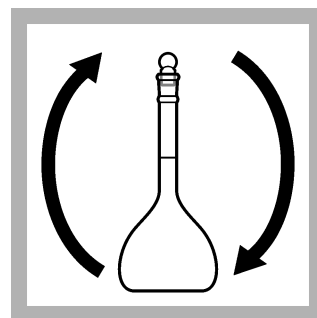
5. Pour 10 mL from the volumetric flask into a sample cell.



6. **Prepare the sample:** Use a pipet to add 1.0 mL of Chlorine Dioxide Reagent A into a second 25-mL volumetric flask.



7. Dilute to the mark with sample.



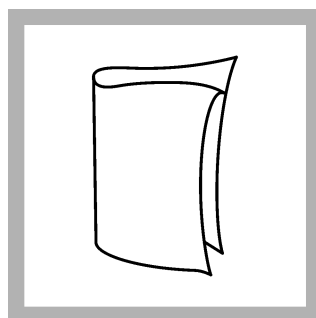
8. Put the stopper on the volumetric flask. Invert a minimum of seven times to mix.



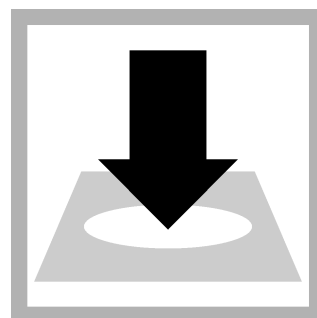
9. Start the instrument timer. A 1-minute reaction time starts.



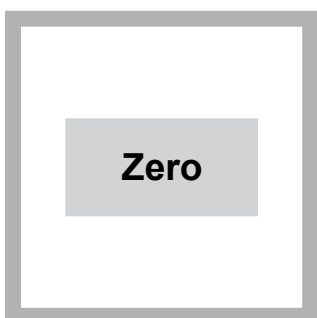
10. Pour 10 mL from the volumetric flask into a second sample cell.



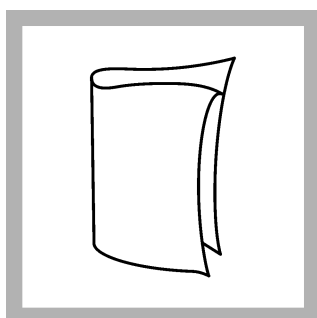
11. Clean the blank sample cell.



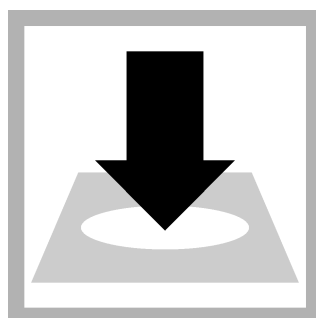
12. Insert the blank into the cell holder.



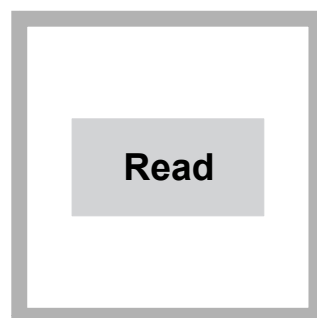
13. Push **ZERO**. The display shows 0 µg/L ClO<sub>2</sub>.



14. Clean the prepared sample cell.



15. When the timer expires, insert the prepared sample into the cell holder.



16. Push **READ**. Results show in µg/L ClO<sub>2</sub>.

## Interferences

Interfering substance	Interference level
ClO <sup>-</sup>	More than 2.0 mg/L
ClO <sub>2</sub> <sup>-</sup>	More than 2.0 mg/L
ClO <sub>3</sub> <sup>-</sup>	More than 2.0 mg/L
CrO <sub>4</sub> <sup>2-</sup>	More than 0.2 mg/L
Fe <sup>3+</sup>	More than 0.5 mg/L
Hardness	More than 1000 mg/L

Interfering substance	Interference level
Ozone	More than 0.5 mg/L
Turbidity	More than 1000 NTU

## Accuracy check

### Standard solution method

The preparation of chlorine dioxide standards is difficult and hazardous. These standards are explosive and volatile! Only a trained chemist should prepare the standards with applicable safety equipment and precautions. The manufacturer does not recommend preparation of chlorine dioxide standards. If an independent standard preparation is required, refer to the instructions in *Standard Methods for the Examination of Water and Wastewater*, Part 4500-ClO<sub>2</sub> Chlorine Dioxide, under the headings "Stock chlorine dioxide solution" and "Standard chlorine dioxide solution". Prepare a 0.25-mg/L (250-µg/L) chlorine dioxide standard.

### Method performance

The method performance data that follows was derived from laboratory tests that were measured on a spectrophotometer during ideal test conditions. Users can get different results under different test conditions.

Program	Standard	Precision (95% confidence interval)	Sensitivity Concentration change per 0.010 Abs change
78	250 µg/L ClO <sub>2</sub>	192–308 µg/L ClO <sub>2</sub>	24 µg/L ClO <sub>2</sub>

### Summary of Method

Chlorine dioxide (ClO<sub>2</sub>) reacts with the reagent and reduces the color. The color intensity of the solution decreases as the level of chlorine dioxide increases. The measurement wavelength is 521 nm.

## Consumables and replacement items

### Required reagents

Description	Quantity/Test	Unit	Item no.
Chlorine Dioxide Reagent Set <sup>1</sup>	1	100/pkg	LYW240

<sup>1</sup> Available only in Europe.

### Required apparatus

Description	Quantity/test	Unit	Item no.
Chlorine Dioxide Tool Set <sup>1</sup> , includes:	—	each	LZC140
Flask, volumetric, 25-mL	2	each	—
Syringe, 1-mL, with needle	1	each	—

<sup>1</sup> Available only in Europe.

### Optional reagents and apparatus

Description	Unit	Item no.
Pipet, TenSette <sup>®</sup> , 0.1–1.0 mL	each	1970001
Pipet tips for TenSette <sup>®</sup> Pipet, 0.1–1.0 mL	50/pkg	2185696
Pipet, volumetric, Class A, 1.00-mL	each	1451535
Pipet filler, safety bulb	each	1465100

---

**Optional reagents and apparatus (continued)**

Description	Unit	Item no.
Standard Methods Book, most current edition	each	2270800
Water, organic-free	500 mL	2641549



**FOR TECHNICAL ASSISTANCE, PRICE INFORMATION AND ORDERING:**

In the U.S.A. – Call toll-free 800-227-4224

Outside the U.S.A. – Contact the HACH office or distributor serving you.

On the Worldwide Web – [www.hach.com](http://www.hach.com); E-mail – [techhelp@hach.com](mailto:techhelp@hach.com)

**HACH COMPANY**  
WORLD HEADQUARTERS  
Telephone: (970) 669-3050  
FAX: (970) 669-2932