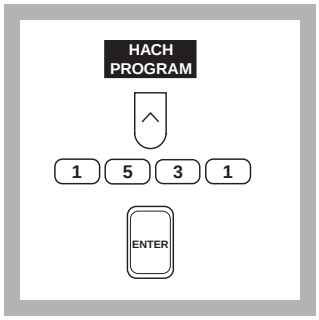
CHLORINE DIOXIDE

Amaranth Method*

LR (20 to 500 µg/L)

Scope and Application: *For water and drinking water.*
The estimated detection limit is 20 µg/L ClO_2.

* This method is under license of Elf Atofina. Reagent sets for this method are only available in Europe.



1. Press the soft key under ***HACH PROGRAM***.

Select the stored program number for Chlorine Dioxide (ClO_2) by pressing **1531** with the numeric keys.

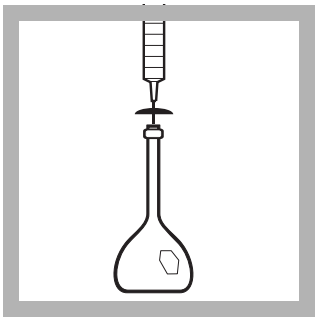
Press: **ENTER**

2. The display will show:

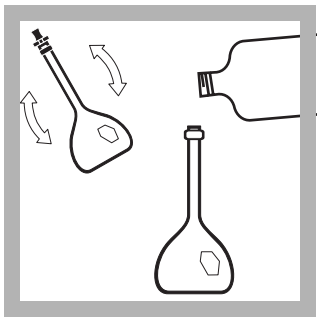
HACH PROGRAM:
1531 ClO_2 Amaranth

The wavelength (λ), **521 nm**, is automatically selected.

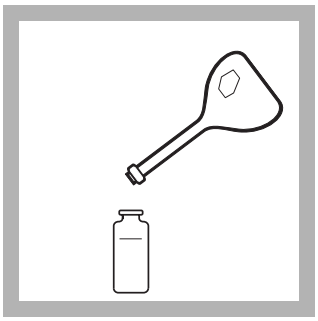
3. Place the DR/4000 1-inch Cell Adapter into the sample cell module by sliding it under the thumb screw and into the alignment grooves. Fasten with the thumb screw.



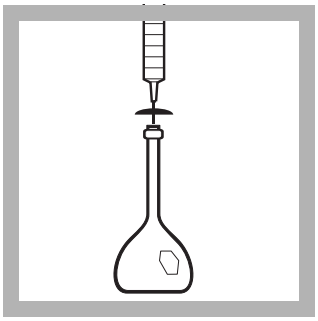
4. Using the syringe and needle provided, add 1.0 mL of Chlorine Dioxide Reagent A into a 25-mL volumetric flask.



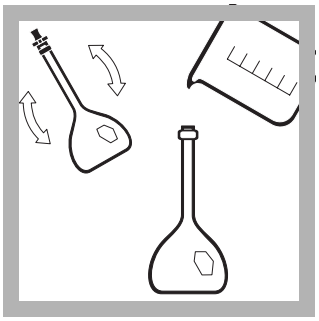
5. Fill the volumetric flask to the mark with deionized water. Stopper. Invert several times to mix.



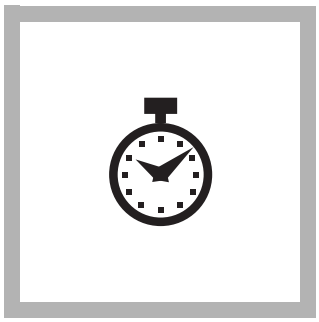
6. Pour 10mL from the volumetric flask into a 10-mL sample cell. This is the blank.



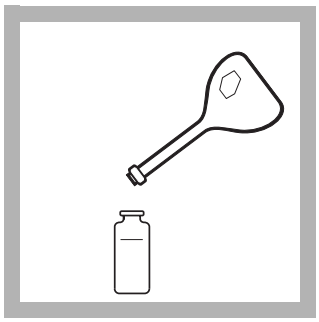
7. Using the syringe and needle provided, add 1.0 mL of Chlorine Dioxide Reagent A into a second 25-mL volumetric flask.



8. Fill the second volumetric flask to the mark with the sample. Stopper. Invert several times to mix. This is the sample.

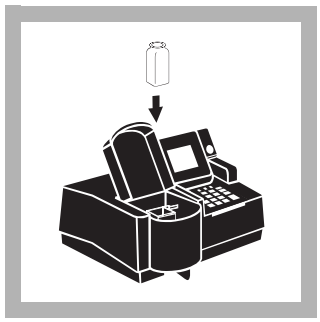


9. Begin a 1-minute reaction period.

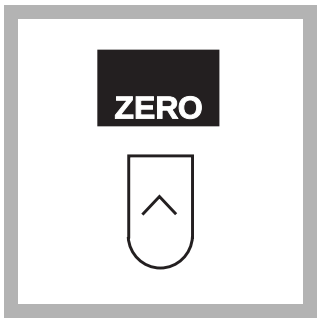


10. Pour 10 mL from the second volumetric flask into a 10-mL sample cell. This is the sample.

11. Wipe the cells with a damp towel followed by a dry one, to remove fingerprints and other marks.



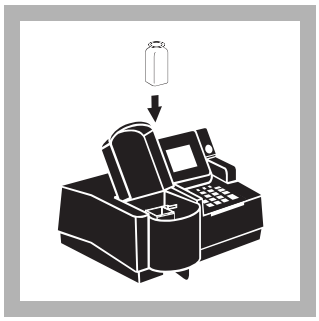
12. Place the blank cell into the cell holder. Close the light shield.



13. Press the soft key under ***ZERO***.

The display will show:

0 µg/L ClO_2



14. When the timer beeps, place the sample cell into the cell holder. Close the light shield. Results in µg/L ClO_2 will be displayed.

Interferences

Interfering Substance	Interference Levels
ClO^-	Greater than 2.0 mg/L
ClO_2^-	Greater than 2.0 mg/L
ClO_3^-	Greater than 2.0 mg/L
CrO_4^{2-}	Greater than 0.2 mg/L
Fe^{3+}	Greater than 0.5 mg/L
Cu^{2+}	Greater than 1 mg/L

Sample Collection, Storage and Preservation

Collect samples in clean plastic or glass bottles. Fill completely and cap tightly. Avoid excessive agitation and exposure to light, especially sunlight. Samples must be analyzed immediately upon collection and cannot be preserved or stored for later analysis.

Accuracy Check

Standard Solution Method.
Preparing chlorine dioxide standards is difficult and dangerous. In addition, these standards are both explosive and volatile! Only a trained chemist should prepare the standards using appropriate safety equipment and precautions. Hach does not recommend preparation of chlorine dioxide standards. If independent standard preparation is required, please see the instructions in *Standard Methods for the Examination of Water and Wastewater*, 20th ed., under the headings "Stock chlorine dioxide solution" and "Standard chlorine dioxide solution" (pg. 4–74). Prepare a 0.25-mg/L (250-µg/L) chlorine dioxide standard and analyze as described.

Method Performance

Precision

Standard: 250 µg/L ClO_2

Program	95% Confidence Limits
1531	192–308 µg/L ClO_2

For more information on determining precision data and method detection limits, refer to Section *1.5*.

Estimated Detection Limit

Program	EDL
1531	20 µg/L ClO_2

For more information on derivation and use of Hach's estimated detection limit, see Section *1.5.2*. To determine a method detection limit (MDL) as defined by the 40 CFR part 136, Appendix B, see Section *1.5.1*.

Sensitivity
Program Number: 1531

Portion of Curve	ΔAbs	ΔConcentration
Entire Range	0.010	24 µg/L

See Section *1.5.3 Sensitivity Explained* for more information.

Calibration Standard Preparation

Preparing chlorine dioxide standards is difficult and dangerous. In addition, these standards are both explosive and volatile! Only a trained chemist should prepare the standards using appropriate safety equipment and precautions. Hach does not recommend preparation of chlorine dioxide standards. If independent standard preparation is required, please see the instructions in *Standard Methods for the Examination of Water and Wastewater*, 20th ed., under the heading "Standard chlorine dioxide solution" (pg. 4–74). Using the standards prepared and the analysis procedure, generate a calibration curve.

Summary of Method

Chlorine Dioxide (ClO_2) is determined by its combination with Amaranth. The resulting decrease in color intensity is measured at 521 nm.

Safety

Good safety habits and laboratory techniques should be used throughout the procedure. Consult the *Material Safety Data Sheet* for information specific to the reagents used. For additional information, refer to Section *1*.

Pollution Prevention and Waste Management

For information on pollution prevention and waste management, refer to Section *1*

REQUIRED REAGENTS AND STANDARDS

Description	Unit	Cat. No.
Chlorine Dioxide Amaranth Reagent Set*	100/pkg	LYW 240
Chlorine Dioxide Tool Kit	each	LZC 140
Includes:		
Flask, volumetric, 25-mL	2/pkg	
Syringe, 1-mL (includes needle)	each	

REQUIRED EQUIPMENT AND SUPPLIES

DR/4000 1-inch Cell Adapter	each	48190-00
Sample Cells, 1-inch, matched pair	2/pkg	26126-02
Pipet, volumetric, Class A, 1.00-mL	each	14515-35
Pipet Filler, safety bulb	each	14651-00

OPTIONAL EQUIPMENT AND SUPPLIES

DR/4000 Carousel Module Kit	each	48070-02
DR/4000 Flow Cell Module Kit, 1-inch	each	48070-04
DR/4000 Sipper Module Kit, 1-inch	each	48090-03
Pipet, TenSette, 0.1 to 1.0 mL	each	19700-01
Pipet Tips, for 19700-01 TenSette Pipet	50/pkg	21856-96

* Available in Europe only

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