



Method 8065

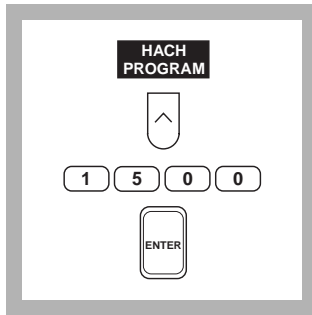
Chlorophenol Red Method*

LR (0 to 1.00 mg/L)

Scope and Application: For water and wastewater.

The estimated detection limit for program number 1500 is 0.02 mg/L ClO₂.

* Adapted from Harp, Klein, and Schoonover, *Jour. Amer. Water Works Assn.*, 73 387-388 (1981)



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

Select the stored program number for low range chlorine dioxide (ClO₂) by pressing **1500** with the numeric keys.

Press: **ENTER**

Note: Analyze samples immediately because of the instability and volatility of chlorine dioxide. See *Sample Collection, Storage and Preservation* following these steps.

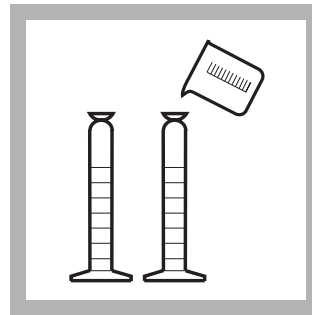
Note: For most accurate results, analyze each portion at the same sample temperature

Note: The Flow Cell and Sipper Modules can be used with this procedure if rinsed between samples with deionized water.



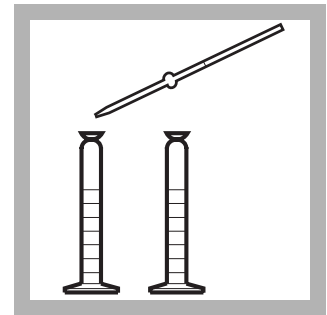
2. The display will show: **HACH PROGRAM: 1500 Chlor: Dioxide, LR**

The wavelength (λ), **575 nm**, is automatically selected.



3. Fill two 50-mL mixing graduated cylinders with sample to the 50-mL mark.

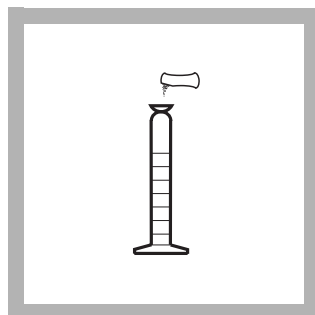
Note: For sample with extreme pH, see the *Interferences* section.



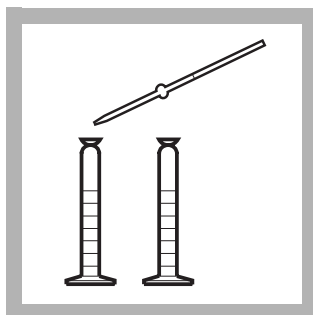
4. Add 1.0 mL of Chlorine Dioxide Reagent 1 to each cylinder. Stopper. Invert several times to mix.

Note: Use a volumetric pipet and pipet filler or a TenSette Pipet to add this reagent.

CHLORINE DIOXIDE, continued

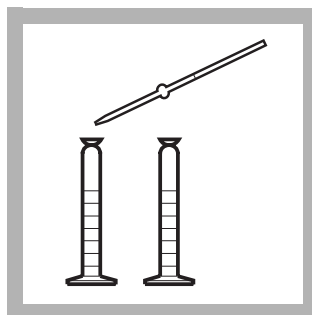


5. Add the contents of one Dechlorinating Reagent Powder Pillow to one cylinder. Stopper and invert several times until dissolved. This solution is the blank. The other solution is the prepared sample.



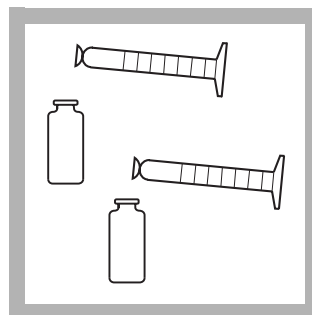
6. Add exactly 1.00 mL Chlorine Dioxide Reagent 2 to each cylinder. Stopper. Invert several times to mix.

Note: Use a Class A pipet to measure this reagent accurately.

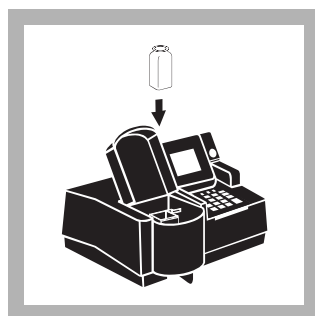


7. Add 1.0 mL of Chlorine Dioxide Reagent 3 to each cylinder. Stopper. Invert several times to mix.

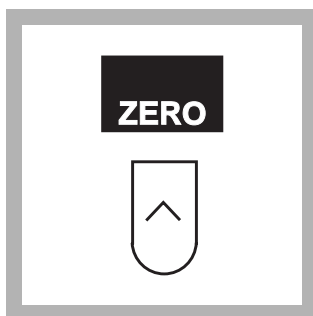
Note: Use a volumetric pipet and pipet filler or TenSette Pipet to add this reagent.



8. Pour 25 mL from each cylinder into respective sample cells.



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



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

The display will show:

0.00 mg/L ClO₂

Note: For alternate concentration units, press the soft key under **OPTIONS**. Then press the soft key under **UNITS** to scroll through the available options. Press **ENTER** to return to the read screen.



11. Place the prepared sample into the cell holder. Close the light shield. Results in mg/L ClO₂ (or chosen units) will be displayed.

Interferences

Table 1 Interfering Substances and Suggested Treatments

Interfering Substance	Interference Levels and Treatments
Highly acidic or alkaline water	May require 2.0 mL each of Chlorine Dioxide Reagent 1 and Chlorine Dioxide Reagent 3 instead of 1.0 mL
ClO ⁻	Greater than 5.5 mg/L
ClO ₂ ⁻	Greater than 6 mg/L
ClO ₃ ⁻	Greater than 6 mg/L
CrO ₄ ²⁻	Greater than 3.6 mg/L
Fe ³⁺	Greater than 5 mg/L
Hardness	Greater than 1000 mg/L
Ozone	Greater than 0.5 mg/L
Turbidity	Greater than 1000 NTU

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*, 18th ed., under the headings “Stock chlorine dioxide solution” and “Standard chlorine dioxide solution” (pg. 4–54). Prepare a 0.50-mg/L chlorine dioxide standard.

Method Performance

Precision

Standard: 0.50 mg/L ClO₂

Program	95% Confidence Limits
1500	0.49–0.51 mg/L ClO ₂

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

Estimated Detection Limit

Program	EDL
1500	0.02 mg/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: 1500

Portion of Curve	ΔAbs	ΔConcentration
0.010 Abs	0.010	0.001 mg/L
0.50 mg/L	0.010	0.006 mg/L
0.90 mg/L	0.010	0.009 mg/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*, 18th ed., under the heading “Standard chlorine dioxide solution” (pg. 4–54). Using the standards prepared and the analysis procedure, generate a calibration curve.

Summary of Method

Chlorine Dioxide (ClO₂) is determined by its combination with chlorophenol red at pH 5.2 to form a colorless complex. The net effect is bleaching of the color in an amount proportional to the chlorine dioxide concentration. The method is specific for ClO₂ and is unreactive to other active chlorine or moderate oxidizing compounds.

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 I.

REQUIRED REAGENTS AND STANDARDS

Description	Quantity Required Per Test	Unit	Cat. No
Chlorine Dioxide Reagent Set (100 Tests)			22423-00
Includes: (2) 20700-42, (2) 20701-42, (2) 20702-42, (1) 14363-69			
Chlorine Dioxide Reagent 1	2 mL	100 mL.....	20700-42
Chlorine Dioxide Reagent 2	2 mL	100 mL.....	20701-42
Chlorine Dioxide Reagent 3	2 mL	100 mL.....	20702-42
Dechlorinating Reagent Powder Pillows.....	1 pillow	100/pkg.....	14363-69

REQUIRED EQUIPMENT AND SUPPLIES

Cylinder, graduated mixing, 50-mL	2	each.....	1896-41
Pipet, volumetric, Class A, 1.00-mL	1	each.....	14515-35
Pipet Filler, safety bulb.....	1	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



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