



# CHEMetrics

2008 - 2009

 **I.C.T, S.L.**  
INSTRUMENTACIÓN CIENTÍFICO TÉCNICA



# Water Analysis Systems

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[www.ictsl.net](http://www.ictsl.net)



## A n a l y t i c a l M e t h o d s

|                                  |    |                             |    |                                      |    |
|----------------------------------|----|-----------------------------|----|--------------------------------------|----|
| Alkalinity                       | 16 | Fluoride                    | 37 | Peracetic Acid                       | 64 |
| Aluminum                         | 17 | Formaldehyde                | 38 | Permanganate                         | 65 |
| Ammonia                          | 18 | Glutaraldehyde              | 40 | pH                                   | 66 |
| Bromine                          | 20 | Glycol                      | 41 | Phenols                              | 67 |
| Calcium (see Hardness)           | 43 | Hardness                    | 43 | Phosphate                            | 69 |
| Carbon Dioxide                   | 21 | Hydrazine                   | 44 | Quaternary Ammonium Compounds (QACs) | 71 |
| Chemical Oxygen Demand (COD)     | 22 | Hydrogen Peroxide           | 46 | Silica                               | 72 |
| Chloride                         | 24 | Hypochlorite (see chlorine) | 26 | Sulfate                              | 73 |
| Chlorine                         | 26 | Iron                        | 49 | Sulfide                              | 74 |
| Chlorine Dioxide                 | 28 | Iron in Brine               | 49 | Sulfite                              | 76 |
| Chromate                         | 29 | Manganese                   | 52 | Sulfite in Wine                      | 76 |
| Conductivity                     | 31 | Mercaptobenzothiazole (MBT) | 53 | Thiosulfate                          | 78 |
| Copper                           | 32 | Molybdate                   | 54 | Total Dissolved Solids (TDS)         | 79 |
| Cyanide                          | 33 | Nitrate                     | 55 | Total Petroleum Hydrocarbons (TPH)   | 80 |
| DEHA                             | 34 | Nitrite                     | 57 | Turbidity                            | 81 |
| Detergents (anionic surfactants) | 35 | Oxygen, dissolved           | 59 | Zinc                                 | 82 |
| Filming Amine (aliphatic amine)  | 36 | Ozone                       | 62 |                                      |    |

# Company Introduction

## No More Problems With Solutions.

If water analysis is your responsibility, your first analysis should start with CHEMetrics® self-filling reagent ampoules. These extraordinarily simple *snap-and-read* test kits actually have a lower cost per test than the labor-intensive versions you may be using now. Measured either instrumentally or by visual color comparison, you can have accurate, reliable, quantitative results for over 45 analytes in just two minutes or less.

## No Mixing. No Measuring. No Mess.

Traditional methods often require sample and reagent preparation, multiple steps, and clean up. With the CHEMetrics systems, you simply immerse the ampoule in the sample, snap the tip, and quickly obtain dependable results.

## Fewer Steps Means Fewer Errors.

Because test preparation is virtually eliminated, our products reduce potential operator error. That saves retesting time and money. And CHEMetrics vacuum-sealing helps you avoid inaccurate results from stale or unstable reagents.



## Safer Testing.

Instead of handling chemicals and samples, you can reduce exposure significantly with CHEMetrics self-filling ampoules. Each contains a unit dose of pre-formulated reagent sealed in glass so that direct contact with chemicals is minimized.

## Portable & Refillable.

Packaged with everything you need to run 30 tests, CHEMetrics products are compact and highly portable, making them ideal for fast, dependable analysis in the lab or in the field. And refill packs of 30 ampoules are always available with a single telephone call or online.

## Our Reputation Is Your Greatest Assurance.

CHEMetrics is known for more than quality products. Our reputation is built on customer service. Expert, prompt, and courteous support is always available from our Technical Services and Sales Departments. Our rigorous Quality Assurance Program makes certain that our products perform as you expect them to. Our innovative Research and Development Group continuously develops exciting new products to meet emerging water analysis needs. And we stand 100% behind every aspect of every product and service we provide.

## Better Water Testing Is A Snap

Dear Analyst,

For over thirty-eight years CHEMetrics has stood out from the pack because of one important characteristic: innovation. Our products have always provided faster, simpler, safer solutions to your water analysis needs, and we remain committed to continuing that tradition.

But providing test systems that save you time and make your work safer and easier is not our only forte; we are also known for the high level of quality and dependability of our products, the result of meticulous testing by our quality assurance staff. You can be sure of accurate, reliable results whether you are working in the laboratory or out in the field, testing a single sample or dozens.

Service, of course, is important to you, and it's extremely important to us, too. Our technical support staff is just a phone call or an email away, providing fast, helpful answers from knowledgeable, courteous people who are anxious to solve your testing problems. You will also find that they are able to work closely with you to develop a test system that is customized for your

particular application when one of our standard products is not well suited to your special requirements. Whatever your need, please ask—we'll do our best to be of service.

We realize that there are many firms to which you can turn for your water testing needs, but we are working hard to be your supplier of choice. If you are not already one of our many loyal customers, please give us the opportunity to demonstrate that we can provide the best combination of innovation, quality and service you can find anywhere. With CHEMetrics, it's not just about doing it well. It's about doing it better.



Sincerely,

Gordon A. Rampy, President  
CHEMetrics, Inc.

# CHEMetrics Management

## For Custom Or Private-Label Products, Test Us Out.

CHEMetrics® products often originate directly from customers like you—looking for easier ways to perform routine determinations. We have innumerable ways of creating customized, self-filling ampoules methods for almost any lab procedure.

We invite you to challenge us. Just keep in mind that to be considered for a custom product, the test should be run frequently, or it should be a procedure that is performed widely in the industry.

We also have extensive experience with private-label packaging and services. We're very flexible in working with customers' needs, from simply printing labels to creating customized packaging.

For more information on custom products and private labeling, ask for our Vice President of Operations and Product Support, Teresa Neale.



### From Center:

Gordon A. Rampy *President and CEO*  
Teresa Neale *Vice President of Operations and Product Support*  
Bruce H. Rampy *Vice President and General Manager*  
Henry B. Castañeda *Vice President of Marketing and Technology*

## Like Water, We Cover The Globe.



Our products are sold around the world by distributors under contract to CHEMetrics. Contact our International Business Manager, Shirley Ward, for more information on distribution in the following countries: Argentina, Australia, Belgium, Brazil, Bulgaria, Canada, China, Colombia, Costa Rica, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, India, Indonesia, Republic of Ireland, Italy, Japan, Korea, Malaysia, Mexico, Netherlands, New Zealand, Norway, Oman, Portugal, Russia, Saudi Arabia, Singapore, Slovakia, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Arab Emirates, United Kingdom, Venezuela, West Indies.

# Industries & Applications

## POWER GENERATION

CHEMetrics is the worldwide leader in colorimetric, low-level Dissolved Oxygen analysis. Additionally, CHEMetrics' products are used throughout the power generation industry to monitor deposit forming and corrosive elements in water, and to monitor biocides and corrosion inhibitors. CHEMetrics is the worldwide "Gold Standard" in ppb dissolved oxygen determination!

|                  |                   |                              |
|------------------|-------------------|------------------------------|
| Ammonia          | Hardness (Total)  | Silica                       |
| Alkalinity       | Hydrazine         | Sulfate                      |
| Chlorine         | Hydrogen Peroxide | Total Dissolved Solids (TDS) |
| Copper           | Iron              | Zinc                         |
| DEHA             | Molybdate         |                              |
| Dissolved Oxygen | Phosphate         |                              |

## PETRO/CHEMICAL INDUSTRY

CHEMetrics kits are widely used for influent, process water, and wastewater/effluent water analysis in refineries and chemical plants. From power plant applications to injection water to closed loop systems, field tests to lab testing, CHEMetrics can simplify your testing routine. Leaking underground storage tanks (LUSTs) can be identified with CHEMetrics' Total Petroleum Hydrocarbons (TPH) in soil test kit – RemediAid™.

|                  |                   |                                   |
|------------------|-------------------|-----------------------------------|
| Ammonia          | Formaldehyde      | pH                                |
| Bromine          | Hydrazine         | Phenols                           |
| Carbon Dioxide   | Hydrogen Peroxide | Phosphate                         |
| Chloride         | Iron              | Sulfide                           |
| Chlorine         | Molybdate         | Thiosulfate                       |
| COD              | Nitrate           | Total Petroleum Hydrocarbon (TPH) |
| Dissolved Oxygen | Permanganate      |                                   |

## ENVIRONMENTAL/EDUCATION

CHEMetrics kits are used in environmental education, environmental monitoring, site characterization, and remediation programs. Applications include surface water monitoring for nutrient runoff and industrial effluent contamination, groundwater monitoring, and soil monitoring for petroleum hydrocarbon contamination.

|                  |                   |                                   |
|------------------|-------------------|-----------------------------------|
| Alkalinity       | Glycol            | Phosphate                         |
| Ammonia          | Hardness          | Sulfide                           |
| Carbon Dioxide   | Hydrogen Peroxide | Total Dissolved Solids (TDS)      |
| COD              | Iron              | Total Petroleum Hydrocarbon (TPH) |
| Conductivity     | Nitrate           | Turbidity                         |
| Copper           | Ozone             |                                   |
| Detergents       | Persulfate        |                                   |
| Dissolved Oxygen | Phenols           |                                   |



# Industries & Applications

## WATER/WASTEWATER

CHEMetrics products are applicable in both drinking water and wastewater plants. Wastewater plants monitor influent, settling tanks, and effluent waters. Drinking water treatment plants monitor residual disinfectant products.

|                  |                  |           |
|------------------|------------------|-----------|
| Aluminum         | Detergents       | Nitrate   |
| Ammonia          | Dissolved Oxygen | Nitrite   |
| Bromine          | Fluoride         | Phenols   |
| Chloride         | Glycol           | Phosphate |
| Chlorine         | Hardness (total) | Sulfate   |
| Chlorine Dioxide | Iron             | Sulfide   |
| COD              | Manganese        | Turbidity |

## WATER TREATMENT

CHEMetrics kits are used to monitor process water, boiler water, cooling water, as well as for the analysis of wastewater and effluents. In addition, in systems that employ on-line analyzers, CHEMetrics kits are used for system confirmation, troubleshooting, and in periods of downtime.

|                  |           |
|------------------|-----------|
| Alkalinity       | Hardness  |
| Aluminum         | Hydrazine |
| Ammonia          | Iron      |
| Bromine          | Molybdate |
| Chlorine         | Nitrate   |
| Conductivity     | pH        |
| Cyanide          | Phenols   |
| DEHA             | Phosphate |
| Dissolved Oxygen | Silica    |
| Filming Amines   | Sulfide   |
| Glycol           |           |

## MINING AND MANUFACTURING

Applications for CHEMetrics kits in these industries include everything from metals & pH testing in the mining sector to a variety of tests for manufacturing plants such as textile & steel mills, and electronics & automotive plants. Whether testing for contaminants on the influent side or spot checks of effluent water, CHEMetrics can equip your lab or field personnel with accurate, easy to use, reliable test kits.

|                  |                   |             |
|------------------|-------------------|-------------|
| Alkalinity       | Formaldehyde      | Phosphate   |
| Ammonia          | Glycol            | Sulfide     |
| Chlorine         | Hardness          | Sulfate     |
| Chromate         | Hydrogen Peroxide | Thiosulfate |
| COD              | Iron              | Zinc        |
| Copper           | Molybdate         |             |
| Cyanide          | Nitrate           |             |
| Dissolved Oxygen | Phenols           |             |



**LAB/CLINIC/MEDICAL**

In hospitals and other medical facilities, CHEMetrics test kits are used to validate sanitization and check for detergent residual, as well as testing for low-level contaminants. Our detergents test method is used to monitor the efficiency of cleaning cycles of manufacturing equipment used in drug research and pilot batch prototyping evaluations.

|                  |                   |         |
|------------------|-------------------|---------|
| Ammonia          | Detergents        | Iron    |
| Bromine          | Dissolved Oxygen  | Ozone   |
| Chlorine Dioxide | Formaldehyde      | Phenols |
| COD              | Hydrogen Peroxide | Silica  |

**PULP AND PAPER**

The primary applications for CHEMetrics products in pulp and paper plants are in boiler/cooling water and wastewater/effluent water treatment. Since water is used in nearly every mill operation, this industry also requires analytical products for processes including bleaching, cooking and washing, pulp processing, and pulp liquor recovery.

|            |                   |           |
|------------|-------------------|-----------|
| Alkalinity | Dissolved Oxygen  | Nitrite   |
| Ammonia    | Formaldehyde      | Phenols   |
| Chlorine   | Hydrogen Peroxide | Phosphate |
| COD        | Hydrazine         | Silica    |
| DEHA       | Nitrate           | Sulfite   |

**FOOD AND BEVERAGE**

CHEMetrics products are used throughout the food and beverage industry in production, packaging, and sanitizing processes. Bottled water plants, breweries, and carbonated beverage facilities test impurities in their production water. Packaging operations use CHEMetrics kits to verify sterilization and to monitor the efficacy of sterilization solutions. COD vials are used to monitor wastewater conditions. Our ozone test method has been approved for worldwide use by a major bottler to monitor trace ozone levels in bottled water plants.

|                  |                   |             |
|------------------|-------------------|-------------|
| Ammonia          | Glycol            | Phenols     |
| Bromine          | Hardness          | QAC's       |
| Chlorine         | Hydrogen Peroxide | Sulfate     |
| Chlorine Dioxide | Iron              | Sulfite     |
| COD              | Nitrate           | Thiosulfate |
| Dissolved Oxygen | Nitrite           | Zinc        |
| Formaldehyde     | Ozone             |             |



## Visual Colorimetric Analysis

### The CHEMets® Method

To perform a test, immerse the CHEMets™ ampoule into the sample and snap off the tip (Step 1)—the correct volume of sample is automatically drawn in, filling the ampoule; a small inert gas bubble remains in the ampoule. To facilitate mixing the sample and reagent, tilt the ampoule back and forth so the bubble travels from end to end (Step 2). In 2 minutes or less, quantify the result by comparing the filled ampoule to the appropriate color standard(s) (Step 3). For higher concentrations, the flat comparator is used. For lower concentrations, the round comparator is used. The ampoule is compared with the standards until a color match is found.

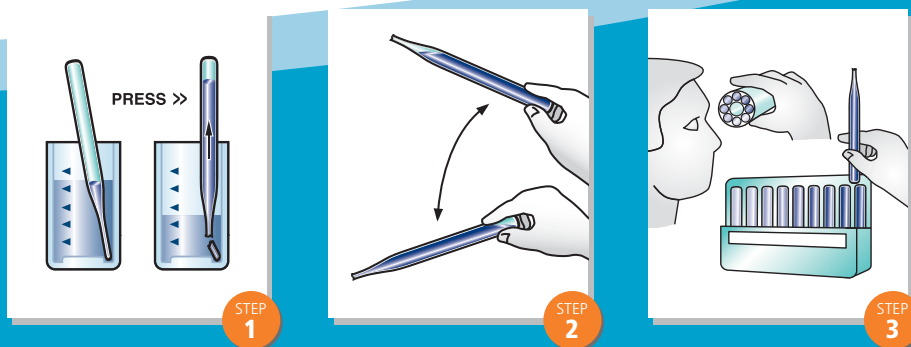


Kits include 30 ampoules, comparator(s), accessory solution(s) (when necessary), a sample cup, and instructions. Refill packs of 30 ampoules and accessory solutions are available separately.

Most comparators have a 2-year shelf-life. Material Safety Data Sheets are provided in test kits.

CHEMets ampoules are designed for maximum simplicity and accuracy. Each glass ampoule is 7 mm in diameter, 100 mm in length, with a tapered, pre-scored tip; reagents are vacuum-sealed inside.

### The CHEMets Test Procedure





# Instrumental Colorimetric Analysis

## The Vacu-vials® Method

The sampling method is the same as the CHEMets method (Steps 1 & 2), but rather than comparing results visually, the user places the filled ampoule in the cell holder of an instrument set to a wavelength for optimal absorbance (Step 3). If you use an instru-

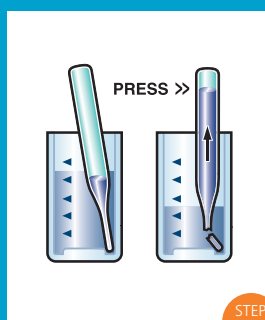


ment that reads absorbance, the absorbance value can be converted to concentration units with the supplied calibration chart. Direct-reading instruments are available (pages 12-13, 15).

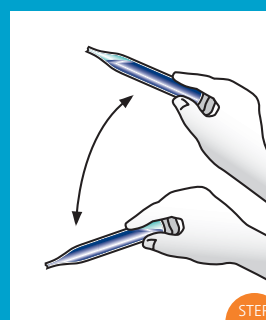
Vacu-vials® Kits include 30 ampoules, a calibration chart, a zero standard, accessory solution(s) (when necessary), a sample cup, and instructions. Material Safety Data Sheets are provided in test kits.

Designed with the same technology as the CHEMets ampoules, the Vacu-vials ampoules are 13 mm in diameter with a tapered, pre-scored tip; color forming reagents are vacuum-sealed inside.

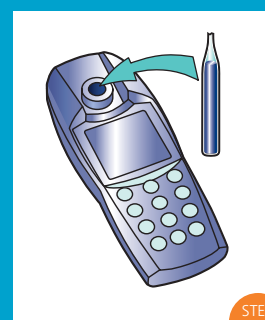
## The Vacu-vials Test Procedure



STEP 1



STEP 2



STEP 3

## High Range Visual Colorimetric Analysis

### The VACUettes® Auto Dilution Method

Hold the ampoule in a horizontal position while the capillary tip contacts the sample (Step 1). After the capillary fills, immerse it in a diluent (usually deionized water); snap the tip off the ampoule (Step 2). The sample and diluent are drawn into the ampoule where they mix with the reagent (Step 3). The resulting color change can then be compared with the flat or round comparator to quantify results (Step 4).

Kits include 30 ampoules, comparator(s), accessory solution(s) (when necessary), a sample cup, and instructions. Refill packs of 30 ampoules and accessory solutions are available separately.

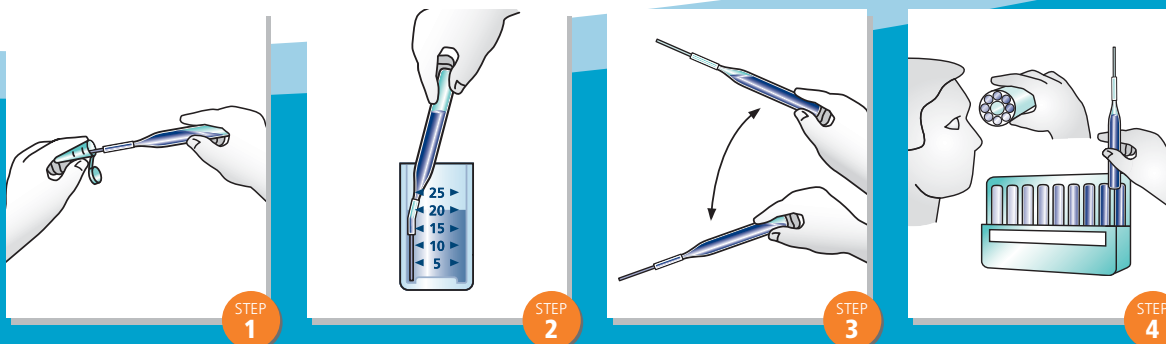
Most comparators have a 2-year shelf-life. Material Safety Data Sheets are provided in test kits.



VACUettes ampoules are designed for highly concentrated samples. They employ a patented auto-dilution feature that eliminates the need for a time-consuming and error-prone preliminary dilution. As a result, the entire test typically takes

only 2 to 3 minutes, with a rate of accuracy comparable to a volumetric procedure. The basic design of these 7 mm ampoules is the same as CHEMets ampoules, however, a capillary tip is attached to the tip of each ampoule.

### The VACUettes Test Procedure



# Titrimetric Analysis

## The Titrets® Method

Titrets ampoules use *reverse titration* to quantify concentrations. After snapping the ampoule tip, the sample is drawn into the ampoule in small doses (with the Titrettor™ device included in each kit that precisely controls the sample) (Step 1), until a color change signals that

the equivalence point has been reached (Step 2). The titration is stopped at the end point and the ampoule is held upright. The liquid level will correspond to a printed scale on the ampoule's outer surface (Step 3).

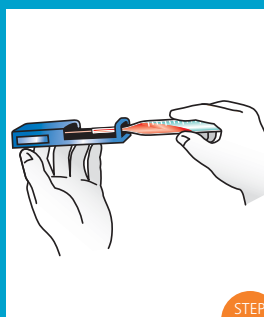
Kits include 30 ampoules with valve assemblies, a titrettor, accessory solution(s) (when necessary), a sample cup, and instructions.

Material Safety Data Sheets are provided in test kits.

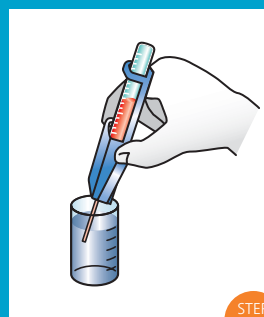


Each Titret™ ampoule is 13 mm in diameter and is designed for titrimetric analysis. The ampoule contains vacuum-sealed liquid titrant and has a flexible valve assembly attached.

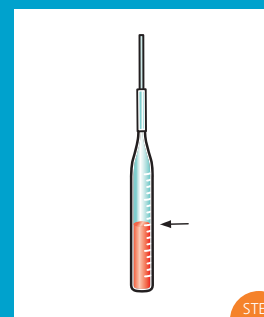
## The Titrets Test Procedure



STEP 1



STEP 2



STEP 3

Notice  
the  
difference?

## Chemical Oxygen Demand (COD) Reagent Vials

**NEW** for 2008!

- 25-count kit package
- Lower cost per test
- Additional savings on 150-count package

Standard features:

- EPA-approved for wastewater analysis
- Mercury-free method available
- Less expensive than other brands
- Use with built-in Hach<sup>1</sup> COD methods, CHEMetrics V-2000 or Single-analyte Meters (SAMs)



Ours

Theirs

<sup>1</sup>NOTE: No endorsement by Hach Company is implied or intended.



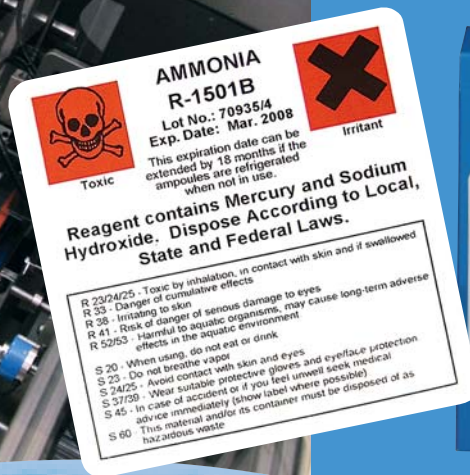
See pages 22-23 for details.



## NEW European Compliance Packaging

Now available for CHEMets and VACUettes Boxes, featuring:

- Universal Hazard Warning Symbols
- Product Description
- Expiration Date
- Lot Number Reference
- Detailed Safety Information



Available in 2009:  
European Compliance  
packaging for Titrets  
and Vacu-vials.

## Detergents Test Kits for Instrumental and Visual Analysis

NEW higher range (0.25-2.50 ppm) instrumental test kit available in 2nd quarter 2008!



Cleaning-in-place (CIP) processes are in widespread use throughout the clinical, biotechnology, food and pharmaceutical industries. Not only must detergents critically clean equipment and instrument surfaces, the Good Manufacturing Practices (GMP), mandated by FDA, require manufacturers to routinely monitor detergent residues to ensure complete removal of detergent from equipment following the rinse cycle.

Once the equipment is rinsed, it may then be tested for the absence of detergents using CHEMetrics Detergent Test Kits, K-9400 or K-9403.



See page 35 for details.

## V-2000 Multi-Analyte Photometer for Water Quality Analysis

The CHEMetrics® Photometer Model V-2000 (Cat. No. V-2000) is the most advanced portable microprocessor-based LED colorimeter on the market today. Packed with features, this portable water analyzer automatically tests pre-programmed analytes using CHEMetrics Vacu-vials® self-filling, pre-measured ampoules. Operator safety is ensured with no sample preparation, mixing or chemical contact. As new tests are available, a simple upload procedure from the CHEMetrics website updates this analyzer with the most recent programs. Uploading takes a few minutes and keeps the V-2000 constantly current. Up to ten user-created custom methods can be stored in the photometer's memory. The simple interface guides a user through setup and measurement.

State-of-the-art technology and research gives this instrument unparalleled capability with push-button ease. The V-2000 displays concentration, absorbance or percent transmittance. Up to 100 data points with their date/time tags can be stored for later download to a lab computer or sent directly to a printer.

A two-year warranty makes the V-2000 a totally reliable field instrument for superior water quality testing.

- **Field Portable**
- **Battery operated**
- **Lightweight**
- **Rugged**
- **Waterproof**

### V-2000 Specifications & Features

|                                   |   |
|-----------------------------------|---|
| <b>Wavelengths (nm)</b>           | 420, 520, 580, 610  |
| <b>Wavelength Accuracy</b>        | ± 2 nm  |
| <b>Wavelength Selection</b>       | Automatic   |
| <b>Photometric Range</b>          | 0 - 2 A   |
| <b>Light Source</b>               | Light Emitting Diode (LED)                                |
| <b>Detector</b>                   | Photodiode  |
| <b>Bandwidth</b>                  | 10 ± 2 nm   |
| <b>Operating Temperature</b>      | 0.0 to 45.0 °C  |
| <b>Humidity</b>                   | 90% at 50.0 °C max  |
| <b>Waterproof</b>                 | IP67  |
| <b>Cell Adapter(s)</b>            | 16 mm, 13 mm  |
| <b>Output Units</b>               | mg/L, ppm, µg/L, ppb, g/L, Absorbance, or % Transmittance |
| <b>Data logging</b>               | 100 points, Date and Time Tag                             |
| <b>Download Capability</b>        | Data to Spreadsheet and Printer, RS232 Output             |
| <b>Upload Capability</b>          | Web-Based Methods Update                                  |
| <b>Power Supply</b>               | 4 AA Alkaline Batteries - 2500 Hours                      |
| <b>Compliance</b>                 | European CE Mark  |
| <b>Programmed Method Capacity</b> | 190 and 10 User Defined                                   |
| <b>Timing Capability</b>          | Built-in Timer  |



Most kits contain everything needed to perform 30 tests

See Specific Analyte Pages for Contents of Individual Kits

| Analyte                          | Cat. No.        | V-2000 Range, ppm |   |        |
|----------------------------------|-----------------|-------------------|---|--------|
| Aluminum                         | K-0603          | 0.04              | - | 0.25   |
| Ammonia 3                        | K-1403          | 0.10              | - | 3.00   |
| *Ammonia                         | K-1503          | 0.50              | - | 7.00   |
| *Ammonia 2                       | K-1523          | 1.0               | - | 14.0   |
| Bromine                          | K-1603          | 0.90              | - | 9.00   |
| *Chloride                        | K-2103          | 2.5               | - | 40.0   |
| Chlorine 2 <i>USEPA Approved</i> | K-2513          | 0.40              | - | 5.00   |
| Chlorine 3 <i>USEPA Approved</i> | K-2523          | 0.40              | - | 5.00   |
| Chlorine Dioxide                 | K-2703          | 0.80              | - | 11.00  |
| Chromate                         | K-2803          | 0.20              | - | 3.50   |
| Chromate 2                       | K-2823          | 0.70              | - | 13.00  |
| *COD LR, <i>USEPA Approved</i>   | K-7350S, K-7355 | 0                 | - | 150    |
| COD LR, <i>Mercury Free</i>      | K-7351S, K-7356 | 0                 | - | 150    |
| *COD HR, <i>USEPA Approved</i>   | K-7360S, K-7365 | 0                 | - | 1500   |
| COD HR, <i>Mercury Free</i>      | K-7361S, K-7366 | 0                 | - | 1500   |
| *COD HR+,                        | K-7370S, K-7375 | 0                 | - | 15,000 |
| COD HR+, <i>Mercury Free</i>     | K-7371S, K-7376 | 0                 | - | 15,000 |
| Copper                           | K-3503          | 0.50              | - | 12.00  |
| Cyanide                          | K-3803          | 0.020             | - | 0.400  |
| DEHA 1                           | K-3903          | 0.15              | - | 2.00   |
| Fluoride                         | K-4003          | 0.30              | - | 2.00   |
| Formaldehyde                     | K-4203          | 0.40              | - | 8.00   |
| Glycol (as ethylene glycol)      | K-4403          | 0.60              | - | 10.00  |
| Glycol 2 (as propylene glycol)   | K-4423          | 5                 | - | 65     |
| Hydrazine                        | K-5003          | 0.10              | - | 1.20   |
| Peroxide 1                       | K-5503          | 0.20              | - | 2.00   |
| Peroxide 2                       | K-5543          | 0.15              | - | 6.00   |
| Iron 1                           | K-6003          | 0.20              | - | 6.00   |
| Iron 3                           | K-6013          | 1.0               | - | 25.0   |
| Iron 2                           | K-6023          | 0.10              | - | 2.50   |
| Iron 4                           | K-6203          | 0.20              | - | 6.00   |
| Manganese                        | K-6503          | 1.0               | - | 30.0   |
| Molybdate                        | K-6703          | 1.0               | - | 25.0   |
| Nitrate (as N)                   | K-6903          | 0.20              | - | 1.50   |
| Nitrate 2 (as N)                 | K-6923          | 0.20              | - | 3.00   |
| Nitrate 3 (as NO <sub>3</sub> )  | K-6933          | 10                | - | 60     |
| Nitrite (as N)                   | K-7003          | 0.080             | - | 0.800  |
| Ozone                            | K-7403          | 0.20              | - | 2.50   |
| Ozone 2                          | K-7413          | 0.15              | - | 1.00   |
| Oxygen 1                         | K-7503          | 0.20              | - | 2.00   |
| Oxygen 2                         | K-7513          | 2.0               | - | 15.0   |
| Oxygen 3                         | K-7553          | 0.100             | - | 1.400  |
| Peracetic Acid                   | K-7903          | 0.40              | - | 4.00   |
| Phenols                          | K-8003          | 0.40              | - | 8.00   |
| Phenols 2                        | K-8023          | 1.0               | - | 20.0   |
| Phosphate 1                      | K-8503          | 5                 | - | 40     |
| Phosphate 2                      | K-8513          | 0.75              | - | 8.00   |
| Silica                           | K-9003          | 0.50              | - | 10.00  |
| Sulfate                          | K-9203          | 8                 | - | 100    |
| Sulfide                          | K-9503          | 0.20              | - | 3.00   |
| Sulfide 2                        | K-9523          | 0.60              | - | 6.00   |
| Zinc                             | K-9903          | 0.30              | - | 3.00   |
| Zinc 2                           | K-9923          | 0.60              | - | 6.00   |

\*Contains mercury. Dispose according to local, state and federal laws.

### V-2000 Multi-Analyte Photometer

Carrying Case, holds V-2000 Photometer and up to 4 test kits  
(NOTE: Photometer and Kits must be purchased separately.)

V-2000

A-0182

# Water Industry Application Guide



**Create-A-Lab** by purchasing CHEMetrics' handheld V-2000 LED Photometer and any number of test kits. CHEMetrics gives you the freedom to tailor your lab with whatever you need for your application.

The V-2000 is field portable, lightweight, tough, and waterproof. Reading concentration, absorbance, or percent transmittance, this versatile instrument stores up to 100 data points with date/time tags that can be downloaded to a computer or printed to a printer. **See pages 12-13 for details.**

CHEMetrics offers test kits for more than 45 analytes, so you may customize your Create-A-Lab to your application. Each test kit contains everything necessary for up to 30 tests (except COD kits, which

offer 25-, 100- and 150-count tests).

Dedicated meters are also available to measure additional field parameters (pH, conductivity, total dissolved solids (TDS), and turbidity).

Simply purchase the V-2000 and use the guide attached to help you choose what test kits and/or dedicated instruments you need. For personalized service, call one of our expert Customer Service Representatives at 1-800-356-3072 to help you get started.

We also offer a carrying case (catalog number: A-0182) for the V-2000 that holds up to 4 Vacu-vials test kits (order separately).







## SAM Single Analyte Meters

### SAMs (Single Analyte Meters): Value and Convenience

Single Analyte Meters (SAMs) provide unprecedented economy, simplicity, and accuracy for dedicated photometers. SAMs provide results equivalent to dedicated meters and probes costing much more. Each kit contains a dedicated instrument and everything required to run 30 tests with the exception of A-7320, A-7325, I-2017 and I-2018.

| Analyte           | Cat. No. | Range (mg/L) | Replacement Kits                      |
|-------------------|----------|--------------|---------------------------------------|
| Chlorine          | I-2001   | 0.40-5.00    | K-2513                                |
| Chlorine Dioxide  | I-2005   | 1.0-11.0     | K-2703                                |
| COD Low Range     | A-7320   | 20-150       | *K-7350S, K-7351S,<br>*K-7355, K-7356 |
| COD High Range    | A-7325   | 100-1500     | *K-7360S, K-7361S,<br>*K-7365, K-7366 |
| COD High Range    | A-7325   | 1000-15,000  | *K-7370S, K-7371S,<br>*K-7375, K-7376 |
| Detergents        | I-2017   | 0.25-2.50    | K-9403                                |
| Hydrogen Peroxide | I-2016   | 0.15-6.00    | K-5543                                |
| Oxygen            | I-2002   | 2.0-15.0     | K-7513                                |
| Ozone             | I-2007   | 0.20-3.00    | K-7403                                |
| Ozone 2           | I-2015   | 0.15-1.00    | K-7413                                |
| Ozone 3           | I-2018   | 0.10-0.75    | K-7463                                |

\*Contains mercury. Dispose according to local, state or federal laws.



### SAM Specifications & Features

**Light Source:** Light-emitting diode.

**Optical Paths:** 13-mm light path / 16-mm light path / 22.5 mm light path.

**Power Source:** Battery operated.

**Compliance:** European CE Mark.

See Specific Analyte Pages for Contents of Individual Kits

## Methods

### Alkalinity (total)

References: ASTM D 1067-02, Acidity or Alkalinity of Water, Test Method B. APHA Standard Methods, 20<sup>th</sup> ed., pp. 2-27, Method 2320 B (1998). USEPA Methods for Chemical Analysis of Water and Wastes, Method 310.1 (1983).

The alkalinity of water is a measurement of its buffering capacity. Alkalinity of natural waters is typically a combination of bicarbonate, carbonate, and hydroxide ions. Sewage and wastewaters usually exhibit higher alkalinities due to the presence of silicates and phosphates.

Alkalinity inhibits corrosion in boiler and cooling waters. It is also measured as a means of controlling water and wastewater treatment processes or the quality of various process waters.

CHEMetrics' total alkalinity tests determine total or *M* alkalinity using a hydrochloric acid titrant and a bromocresol green/methyl red indicator. The end point of the titration occurs at pH 4.5. Results are expressed as ppm (mg/L) CaCO<sub>3</sub>.

### Alkalinity (hydrate)

Reference: Developed with Calgon Corporation.

Hydrate alkalinity is a component of total alkalinity. Boiler operators must maintain relatively high hydrate alkalinity levels when phosphate cycle treatments are used to ensure the formation of softer, more easily removable deposits. This specific test for hydrate alkalinity provides a more accurate value than the calculation method.

The hydrate alkalinity reagent has been specially formulated to inhibit interference from carbonate and bicarbonate alkalinity, as well as up to one-third of the phosphate and silicate alkalinity.

For hydrate alkalinity, CHEMetrics developed a titrimetric method that uses a hydrochloric acid titrant with a phenolphthalein indicator and an inhibiting agent. The end point of the titration occurs at pH 8.3. Results are expressed as ppm (mg/L) NaOH.

## Visual Kits

**Range: 10-100 ppm as CaCO<sub>3</sub>**  
MDL: 10 ppm / Method: Acid Titrant with pH Indicator

|                                       | Cat#          |
|---------------------------------------|---------------|
| <b>Alkalinity (total) Titrets Kit</b> | <b>K-9810</b> |

Increments:  
10, 11, 12, 13, 14, 15, 16, 18, 20, 25, 30, 35, 40, 50, 70, 100 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 50-500 ppm as CaCO<sub>3</sub>**  
MDL: 50 ppm / Method: Acid Titrant with pH Indicator

|                                       | Cat#          |
|---------------------------------------|---------------|
| <b>Alkalinity (total) Titrets Kit</b> | <b>K-9815</b> |

Increments:  
50, 55, 60, 65, 70, 75, 80, 90, 100, 125, 150, 175, 200, 250, 350, 500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 100-1000 ppm as CaCO<sub>3</sub>**  
MDL: 100 ppm / Method: Acid Titrant with pH Indicator

|                                       | Cat#          |
|---------------------------------------|---------------|
| <b>Alkalinity (total) Titrets Kit</b> | <b>K-9820</b> |

Increments:  
100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 100-1000 ppm as NaOH**  
MDL: 100 ppm / Method: Acid Titrant with pH Indicator

|   | Cat#          |
|---|---------------|
| <b>Alkalinity (hydrate) Titrets Kit</b> | <b>K-4710</b> |

Increments:  
100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, Neutralizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Alkalinity

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Titrettor Pack (1 ea)         | A-0053 |

**Instructions are posted on our website.**  
*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

## Method

References: APHA Standard Methods, 20<sup>th</sup> ed., pp. 3-56, Method 3500-AI B (1998). Rapid Modified Eriochrome Cyanine R (ECR) Method for Determination of Aluminum in Water, Kenneth E. Shull and Gene R. Guthan, pp 1456-1468, *J. AWWA*, Nov. 1967.

Aluminum forms a variety of minerals in the earth's crust. Aluminum and its alloys have many uses: heat exchangers, construction materials, and aircraft parts. Alum (aluminum potassium sulfate) is used in water treatment to flocculate suspended particles but may raise the level of aluminum in finished drinking water. The maximum secondary contaminant limit for drinking water is 0.05-0.2 mg/L.

The Aluminum Vacu-vials<sup>®</sup> test method is based on the reaction between aluminum and Eriochrome Cyanine R (ECR), which forms a red dye-lake at approximately pH 6.0 in proportion to the amount of aluminum present in the sample. Results are expressed as ppm (mg/L) aluminum.

## Instrumental Kit

### V-2000 Multi-Analyte Photometer (See page 12 for instrumental features)

Range: 0.04-0.25 ppm  
Method: Eriochrome Cyanine R (ECR)

|                |                               |
|----------------|-------------------------------|
| Vacu-vials Kit | Cat#<br>K-0603 <sup>1,2</sup> |
|----------------|-------------------------------|

Kit comes in a cardboard box and contains everything needed to perform up to 29 tests (except distilled water): thirty ampoules, Activator Solution, Neutralizer Solution, 25 mL sample cup, ampoule blank, 1.0 mL syringe, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

<sup>1</sup> Although the test kit contains 30 ampoules, a fresh reagent ampoule blank must be prepared for each series of tests; therefore, the number of samples that can be tested with each kit will vary from a maximum of 29 to a minimum of 15.

<sup>2</sup> The Neutralizer Solution is supplied as a dry chemical with NO expiration date. Once reconstituted, it has a shelf-life of 6 weeks that can be extended to 3 months if stored in the refrigerator when not in use.

#### Kit Components common to Aluminum

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Ampoule Blank Pack (5 ea)     | A-0023 |
| Syringe Pack, 1.0 mL (6 ea)   | A-0027 |

Instructions are posted on our website.



## Methods

Low-level ammonia nitrogen may be naturally present in water as a result of the biological decay of plant and animal matter. Higher concentrations in surface waters can indicate contamination from waste treatment facilities, raw sewage, industrial effluents (particularly from petroleum refineries), or fertilizer runoff. Excessive ammonia concentrations are toxic to aquatic life.

### The Direct Nesslerization Method

**Reference:** ASTM D 1426-03, Ammonia Nitrogen in Water, Test Method A. APHA Standard Methods, 18<sup>th</sup> ed., pp. 4-78, Method 4500-NH<sub>3</sub> C (1992).

The test kits employing the well-established Nessler reagent\* to determine ammonia concentrations are applicable to drinking water, clean surface water, good-quality nitrified wastewater effluent, and seawater. In some waters, calcium and magnesium concentrations can cause cloudiness of the reagent. Adding a few drops of stabilizer solution (Rochelle Salt) will prevent this cloudiness. References recommend distilling samples prior to analysis. Results are expressed as ppm (mg/L) ammonia-nitrogen, NH<sub>3</sub>-N.

Shelf-life: although the Nessler reagent is stable, its high alkali content attacks the glass ampoule. The resulting precipitate interferes with color comparison. We recommend stocking quantities of CHEMets® and VACUettes® ampoules that will be used within five months. A two-month supply of Vacu-vials ampoules is suggested. **Refrigeration will dramatically extend the shelf-life of these products.**

\*Contains mercury. Dispose according to local, state or federal laws.

### The Salicylate Method

**References:** Krom, Michael D., Spectrophotometric Determination of Ammonia: A Study of a Modified Berthelot Reduction Using Salicylate and Dichloroisocyanurate, *The Analyst*, V105, pp. 305-316, 1980.

In the ammonia test method that employs the Salicylate chemistry, free ammonia reacts with hypochlorite to form monochloramine. Monochloramine reacts with salicylate, in the presence of sodium nitro-ferricyanide, to form 5-aminosalicylate, a green-colored complex. This test method measures free ammonia and monochloramine. Results are expressed in ppm (mg/L) ammonia-nitrogen, NH<sub>3</sub>-N.

The Salicylate Method offers similar sensitivity to the Nesslerization Method and is available in both visual and instrumental versions. The benefits that the Salicylate product line offers are that the shelf-life of the ampoules is unlimited and there is no generation of mercury-containing waste.

## Visual Kits

| Range: 0-1 & 1-10 ppm<br>MDL: 0.05 ppm / Method: Direct Nesslerization   |                       |
|--|-----------------------|
|  | Cat#                  |
| <b>CHEMets Kit</b>   | <b>*K-1510</b>        |
| CHEMets Refill, 30 ampoules, Shelf-life 5 months   | *R-1501 <sup>2</sup>  |
| Stabilizer Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-1500 <sup>1</sup>   |
| Stabilizer Solution Pack, six 70 mL bottles, Shelf-life 2 years  | A-1501 <sup>1</sup>   |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm  | C-1501                |
| High Range Comparator, Shelf-life 2 years:<br>1, 2, 3, 4, 5, 6, 7, 8, 10 ppm   | C-1510                |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Stabilizer Solutions, 25 mL sample cup, 1.0 mL syringe, instructions, and MSDS.                        |                       |
| Range: 0-2 & 0-20 ppm<br>MDL: 0.05 ppm / Method: Salicylate  |                       |
|  | Cat#                  |
| <b>CHEMets Kit</b>   | <b>K-1410</b>         |
| CHEMets Refill, 30 ampoules  | R-1401                |
| Activator Solution Pack, six 20 mL bottles, Shelf-life 8 months  | A-1400 <sup>1</sup>   |
| Catalyzer Solution Pack, six 20 mL bottles, Shelf-life 2 years   | A-1401 <sup>1</sup>   |
| Comparator, Shelf-life 2 years:<br>0, 0.25, 0.50, 0.75, 1.0, 1.25, 1.5, 1.75, 2.0 ppm  | C-1402                |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Activator Solution, Catalyzer Solution, 25 mL sample cup, 3.0 mL syringe, instructions, and MSDS. |                       |
| Range: 0-30 & 30-300 ppm<br>MDL: 5 ppm / Method: Direct Nesslerization   |                       |
|  | Cat#                  |
| <b>VACUettes Kit</b>   | <b>*K-1510D</b>       |
| VACUettes Refill, 30 ampoules, Shelf-life 5 months   | *R-1501D <sup>2</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 5, 7.5, 10, 15, 20, 25, 30 ppm   | C-1501D               |
| High Range Comparator, Shelf-life 2 years:<br>30, 60, 90, 120, 150, 175, 200, 250, 300 ppm   | C-1510D               |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.                 |                       |

\*Contains mercury. Dispose according to local, state or federal laws.

 Instrumental Kits

**Range: 0-60 & 60-600 ppm**  
MDL: 10 ppm / Method: Direct Nesslerization

|  | Cat#                  |
|--|-----------------------|
| <b>VACUettes Kit</b>   | <b>*K-1510A</b>       |
| VACUettes Refill, 30 ampoules, Shelf-life 5 months   | *R-1501A <sup>2</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 10, 15, 20, 30, 40, 50, 60 ppm               | C-1501A               |
| High Range Comparator, Shelf-life 2 years:<br>60, 120, 180, 240, 300, 350, 400, 500, 600 ppm | C-1510A               |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-120 & 120-1200 ppm**  
MDL: 20 ppm / Method: Direct Nesslerization

|   | Cat#                  |
|---|-----------------------|
| <b>VACUettes Kit</b>  | <b>*K-1510B</b>       |
| VACUettes Refill, 30 ampoules, Shelf-life 5 months  | *R-1501B <sup>2</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 20, 30, 40, 60, 80, 100, 120 ppm                | C-1501B               |
| High Range Comparator, Shelf-life 2 years:<br>120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm | C-1510B               |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-1000 & 1000-10,000 ppm**  
MDL: 100 ppm / Method: Direct Nesslerization

|  | Cat#                  |
|--|-----------------------|
| <b>VACUettes Kit</b>   | <b>*K-1510C</b>       |
| VACUettes Refill, 30 ampoules, Shelf-life 5 months   | *R-1501C <sup>2</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 100, 200, 300, 400, 600, 800, 1000 ppm                   | C-1501C               |
| High Range Comparator, Shelf-life 2 years:<br>1000, 2000, 3000, 4000, 5000, 6000, 7000, 8000, 10,000 ppm | C-1510C               |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests. A-1501 accessory pack supplies enough solution to analyze at least 200 seawater samples.

<sup>2</sup>This shelf-life can be extended by 18 months if the ampoules are stored in the refrigerator when not in use.

Instructions are posted on our website.

If no shelf-life is listed for a product, then the shelf-life is at least 2 years.

**V-2000 Multi-Analyte Photometer**  
(See page 12 for instrumental features)

**Range: 0.10-3.00 ppm**  
Method: Salicylate

|   | Cat#          |
|---|---------------|
| <b>Vacu-vials Kit</b> , Shelf-life 8 months | <b>K-1403</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, Catalyst Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

**Range: 0.50-7.00 ppm**  
Method: Direct Nesslerization

|   | Cat#                       |
|---|----------------------------|
| <b>Vacu-vials Kit</b> , Shelf-life 2 months | <b>*K-1503<sup>2</sup></b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Stabilizer Solutions, 25 mL sample cup, ampoule blank, 1.0 mL syringe, instructions, calibration table, and MSDS.

**Range: 1.0-14.0 ppm**  
Method: Direct Nesslerization

|   | Cat#                       |
|---|----------------------------|
| <b>Vacu-vials Kit</b> , Shelf-life 2 months | <b>*K-1523<sup>2</sup></b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Stabilizer Solutions, 25 mL sample cup, ampoule blank, 1.0 mL syringe, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

| Kit Components common to Ammonia |        |
|----------------------------------|--------|
| Description                      | Cat#   |
| Sample Cup Pack, 25 mL (6 ea)    | A-0013 |
| Micro Test Tube Pack (10 ea)     | A-0015 |
| Dilutor Snapper Cup Pack (6 ea)  | A-0018 |
| Ampoule Blank Pack (5 ea)        | A-0023 |
| Syringe Pack, 1.0 mL (6 ea)      | A-0027 |
| Syringe Pack, 3.0 mL (6 ea)      | A-0063 |

\*Contains mercury. Dispose according to local, state or federal laws.



# Bromine

## Method

Reference: Developed by CHEMetrics, Inc.

Bromine, a less volatile compound than chlorine, is used as a sanitizing agent in drinking water systems, swimming pools, and spas.

The DDPD Reagent, a methyl-substituted form of DPD is employed. Potassium iodide is added to the sample before analysis. Bromine reacts with the iodide to liberate iodine. The iodine reacts with the DDPD reagent to form a purple color. Results are expressed in ppm (mg/L) bromine as Br<sub>2</sub>.



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

Range: 0.90-9.00 ppm  
Method: DDPD

|                | Cat#   |
|----------------|--------|
| Vacu-vials Kit | K-1603 |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Visual Kit

Range: 0-2 & 2-10 ppm  
MDL: 0.1 ppm / Method: DDPD

|   | Cat#                |
|---|---------------------|
| <b>CHEMets Kit</b>  | <b>K-1610</b>       |
| CHEMets Refill, 30 ampoules   | R-1610              |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years                        | A-1600 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.2, 0.4, 0.6, 0.8, 1.2, 1.6, 2.0 ppm | C-1602              |
| High Range Comparator, Shelf-life 2 years:<br>2, 3, 4, 5, 6, 7, 8, 9, 10 ppm          | C-1610              |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Bromine

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Ampoule Blank Pack (5 ea)     | A-0023 |

Instructions are posted on our website.



## Method

References: APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-31, Method 4500-CO<sub>2</sub> C (1998). ASTM D 513-82, Total and Dissolved Carbon Dioxide in Water, Test Method E.

Dissolved carbon dioxide (CO<sub>2</sub>) is naturally present as a result of animal respiration, the decay of organic matter, and the decomposition of certain minerals. It is the major source of acidity in unpolluted water samples. Surface waters typically contain less than 10 ppm (mg/L) dissolved CO<sub>2</sub>, while ground waters, particularly if deep, may contain several hundred ppm (mg/L).

CHEMetrics' carbon dioxide test kits employ a sodium hydroxide titrant and phenolphthalein indicator. The kits contain a neutralizer solution to correct for sulfide interference. Results are expressed as ppm (mg/L) CO<sub>2</sub>.

## Visual Kits

**Range: 10-100 ppm**  
MDL: 10 ppm / Method: Caustic Titrant with pH Indicator

**Titrets Kit** **Cat#**  
**K-1910**

Increments:  
10, 11, 12, 13, 14, 15, 16, 18, 20, 25, 30, 35, 40, 50, 70, 100 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, Neutralizer Solution, titrettor, 25 mL sample cup, 1.0 mL syringe, instructions, and MSDS.

**Range: 100-1000 ppm**  
MDL: 100 ppm / Method: Caustic Titrant with pH Indicator

**Titrets Kit** **Cat#**  
**K-1920**

Increments:  
100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm

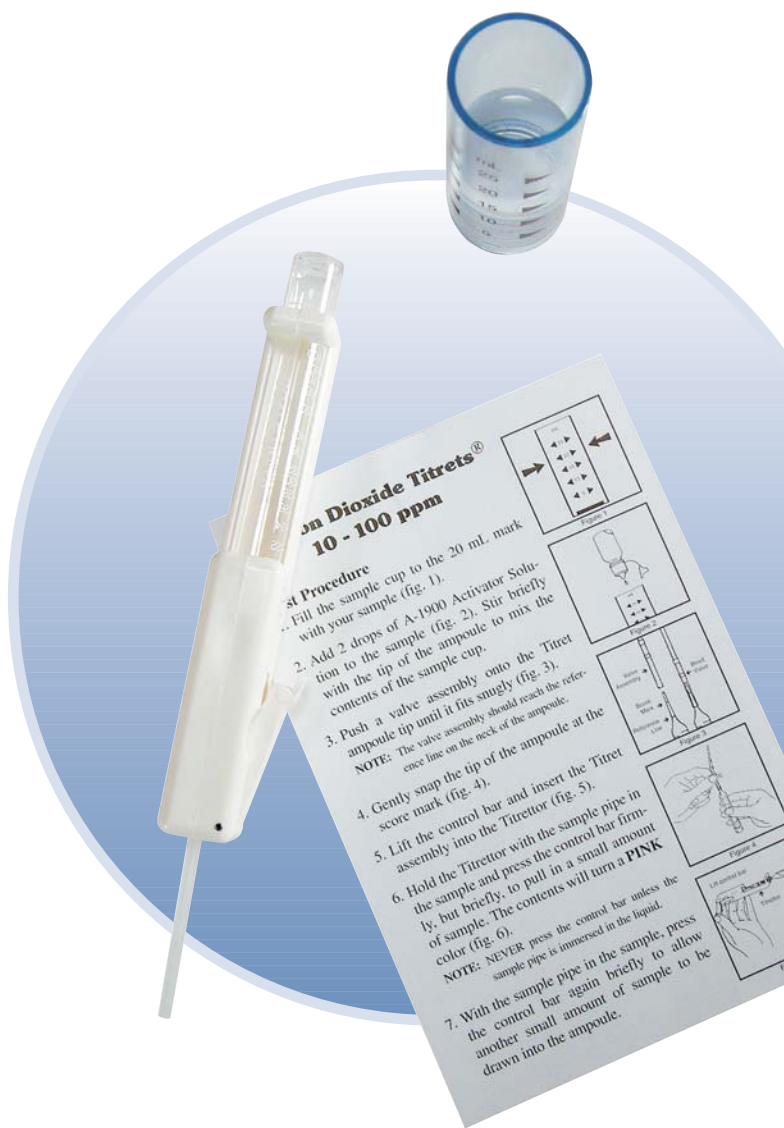
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, Neutralizer Solution, titrettor, 25 mL sample cup, 1.0 mL syringe, instructions, and MSDS.

**Range: 250-2500 ppm**  
MDL: 250 ppm / Method: Caustic Titrant with pH Indicator

**Titrets Kit** **Cat#**  
**K-1925**

Increments:  
250, 275, 300, 325, 350, 375, 400, 450, 500, 625, 750, 875, 1000, 1250, 1750, 2500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, Neutralizer Solution, titrettor, 25 mL sample cup, 1.0 mL syringe, instructions, and MSDS.



### Kit Components common to Carbon Dioxide

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Syringe Pack, 1.0 mL (6 ea)   | A-0027 |
| Titrettor Pack (1 ea)         | A-0053 |

Instructions are posted on our website.

If no shelf-life is listed for a product, then the shelf-life is at least 2 years.

## Methods

References: USEPA Methods for Analysis of Water and Wastes, Method 410.4 (1983).

APHA Standard Methods, 20<sup>th</sup> ed., pp. 5-17, Method 5220 D (1998). A. M. Jirka and M. J.

Carter, "Micro Semi-Automated Analysis of Surface and Wastewaters for Chemical Oxygen Demand," *Analytical Chemistry*, Vol. 47, p.1397 (1975). J. A. Winter, "Method Research Study 3, Demand Analysis, An Evaluation of Analytical Methods for Water and Wastewater," USEPA, 1971. ASTM D 1252-00, Chemical Oxygen Demand (Dichromate Oxygen Demand) of Water, Test Method B.

The determination of Chemical Oxygen Demand (COD) is widely used in municipal and industrial laboratories to measure the overall level of organic contamination in wastewater. The contamination level is determined by measuring the equivalent amount of oxygen required to oxidize organic matter in the sample.

CHEMetrics offers two dichromate reactor digestion methods for fast, easy, safe determinations of low-, mid-, and high-range COD levels in wastewater: the USEPA-approved Method\*, and a mercury-free method. The products using the USEPA-approved method contain mercuric sulfate in the reagent to eliminate chloride interferences. The more readily disposable mercury-free product line is applicable when chloride interference is not a concern and USEPA reporting is not required.

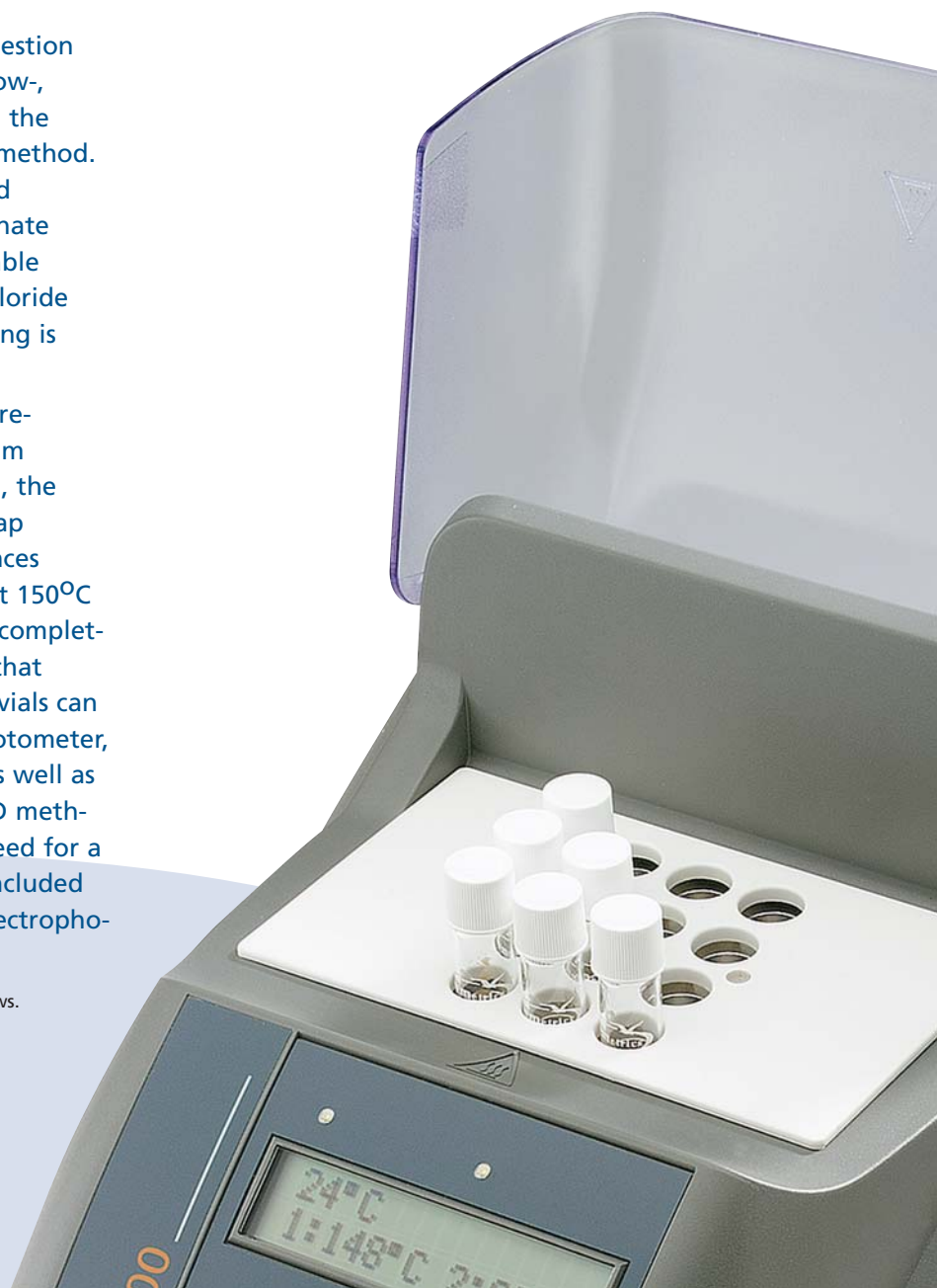
CHEMetrics' leakproof reagent vials contain pre-measured solutions of sulfuric acid and potassium dichromate. To perform the COD determination, the analyst simply removes the Teflon-lined screw cap from the vial, adds sample to the vial, and replaces the cap. The vial is then heated for two hours at 150°C in a standard digester block. Once digestion is completed, results are obtained using any photometer that accepts 16-mm diameter cells. CHEMetrics COD vials can be directly used in our V-2000 multi-analyte photometer, CHEMetrics' single analyte COD photometers, as well as in Hach<sup>1</sup> spectrophotometers. Built-in Hach COD methods and calibrations can be used without the need for a new calibration. A generic calibration table is included within the CHEMetrics kit for use with other spectrophotometers.

\*Contains mercury. Dispose according to local, state or federal laws.

**See Product Price List for COD Quantity Discount Schedule.**

<sup>1</sup>NOTE: No endorsement by Hach Company is implied or intended.

USEPA Approved





 Instrumental Kits

**V-2000 Multi-Analyte Photometer**

(See page 12 for instrumental features)

**Range: 0-150 ppm**

**Method: Dichromate Reactor Digestion**

|                                       |                                |
|---------------------------------------|--------------------------------|
| <b>COD (USEPA Approved) Vials Kit</b> | <b>Cat#</b><br><b>*K-7350S</b> |
|---------------------------------------|--------------------------------|

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials, instruction book with MSDS and calibration tables.

|                                       |                |
|---------------------------------------|----------------|
| <b>COD (USEPA Approved) Vials Kit</b> | <b>*K-7355</b> |
|---------------------------------------|----------------|

Kit comes in a cardboard box and contains everything needed to perform up to 149 tests (except distilled water): 150 vials, instruction book with MSDS and calibration tables.

**Range: 0-150 ppm**

**Method: Dichromate Reactor Digestion**

|                                     |                               |
|-------------------------------------|-------------------------------|
| <b>COD (Mercury Free) Vials Kit</b> | <b>Cat#</b><br><b>K-7351S</b> |
|-------------------------------------|-------------------------------|

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials, instruction book with MSDS and calibration tables.

|                                     |               |
|-------------------------------------|---------------|
| <b>COD (Mercury Free) Vials Kit</b> | <b>K-7356</b> |
|-------------------------------------|---------------|

Kit comes in a cardboard box and contains everything needed to perform up to 149 tests (except distilled water): 150 vials, instruction book with MSDS and calibration tables.

**Range: 0-1500 ppm**

**Method: Dichromate Reactor Digestion**

|                                       |                                |
|---------------------------------------|--------------------------------|
| <b>COD (USEPA Approved) Vials Kit</b> | <b>Cat#</b><br><b>*K-7360S</b> |
|---------------------------------------|--------------------------------|

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials, instruction book with MSDS and calibration tables.

|                                       |                |
|---------------------------------------|----------------|
| <b>COD (USEPA Approved) Vials Kit</b> | <b>*K-7365</b> |
|---------------------------------------|----------------|

Kit comes in a cardboard box and contains everything needed to perform up to 149 tests (except distilled water): 150 vials, instruction book with MSDS and calibration tables.

**Range: 0-1500 ppm**

**Method: Dichromate Reactor Digestion**

|                                     |                               |
|-------------------------------------|-------------------------------|
| <b>COD (Mercury Free) Vials Kit</b> | <b>Cat#</b><br><b>K-7361S</b> |
|-------------------------------------|-------------------------------|

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials, instruction book with MSDS and calibration tables.

|                                     |               |
|-------------------------------------|---------------|
| <b>COD (Mercury Free) Vials Kit</b> | <b>K-7366</b> |
|-------------------------------------|---------------|

Kit comes in a cardboard box and contains everything needed to perform up to 149 tests (except distilled water): 150 vials, instruction book with MSDS and calibration tables.

**Range: 0-15,000 ppm**

**Method: Dichromate Reactor Digestion**

|   |                                |
|---|--------------------------------|
| <b>COD (Not USEPA Approved) Vials Kit</b> | <b>Cat#</b><br><b>*K-7370S</b> |
|---|--------------------------------|

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials, instruction book with MSDS and calibration tables.

|   |                |
|---|----------------|
| <b>COD (Not USEPA Approved) Vials Kit</b> | <b>*K-7375</b> |
|---|----------------|

Kit comes in a cardboard box and contains everything needed to perform up to 99 tests (except distilled water): 100 vials, instruction book with MSDS and calibration tables.

**Range: 0-15,000 ppm**

**Method: Dichromate Reactor Digestion**

|                                     |                               |
|-------------------------------------|-------------------------------|
| <b>COD (Mercury Free) Vials Kit</b> | <b>Cat#</b><br><b>K-7371S</b> |
|-------------------------------------|-------------------------------|

Kit comes in a cardboard box and contains everything needed to perform up to 24 tests (except distilled water): 25 vials, instruction book with MSDS and calibration tables.

|                                     |               |
|-------------------------------------|---------------|
| <b>COD (Mercury Free) Vials Kit</b> | <b>K-7376</b> |
|-------------------------------------|---------------|

Kit comes in a cardboard box and contains everything needed to perform up to 99 tests (except distilled water): 100 vials, instruction book with MSDS and calibration tables.

*All COD Kits require the use of a Digester Block and the V-2000 Photometer, a COD Photometer, or a spectrophotometer capable of accepting a 16 mm round cell. Instruments sold separately.*

*A fresh reagent ampoule blank must be prepared for each series of tests; therefore the number of samples that can be tested with each kit will vary.*

**Accessories**

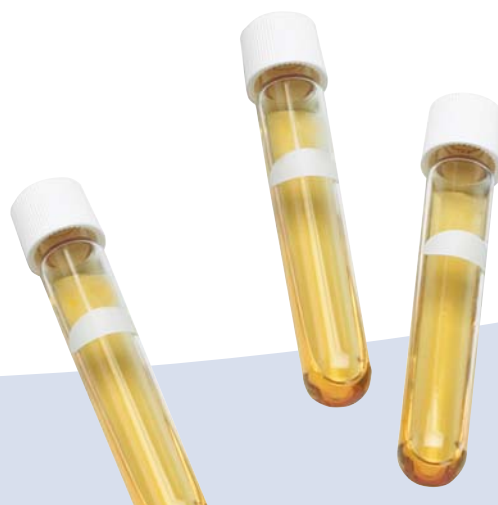
| Description  | Cat#                |
|--|---------------------|
| Vial Rack (holds 40 vials)                                     | A-0107              |
| Digester Block (115/230 Volt, 12 cells)                        | A-0111              |
| Calibration Standard, 1000 ppm (200 mL), Shelf-life 8 months   | A-7301 <sup>1</sup> |
| Calibration Standard, 10,000 ppm (200 mL), Shelf-life 8 months | A-7310 <sup>1</sup> |
| COD Photometer (20-150 ppm)                                    | A-7320              |
| COD Photometer (100-1500 & 1000-15,000 ppm)                    | A-7325              |

<sup>1</sup>*This product must be refrigerated.*

*Instructions are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

*\*Contains mercury. Dispose according to local, state or federal laws.*



## Methods

Chloride is the most common inorganic anion found in water and wastewater. The Maximum Secondary Contaminant Level for drinking water for chloride is 250 mg/L. Natural sources of salt are the ocean and various salt deposits above and below ground.

Chloride is very corrosive to most metals in systems with elevated pressures and temperatures such as boilers and oil-drilling equipment.

### The Mercuric Nitrate Method

References: APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-68, Method 4500-Cl<sup>-</sup> C (1998). ASTM D 512-04, Chloride Ion in Water, Test Method A. USEPA Methods for Chemical Analysis of Water and Wastes, Method 325.3 (1983).

CHEMetrics employs a mercuric nitrate titrant in acid solution with diphenylcarbazone as the end point indicator. Results are expressed as ppm (mg/L) Cl<sup>-</sup>.

### The Ferric Thiocyanate Method

Reference: APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-70, 4500-Cl<sup>-</sup>E (1998). D. Zall, D. Fisher, M. Garner, "Photometric Determination of Chlorides in Water," *Analytical Chemistry*, Vol 28, No. 11, pp. 1665-1668, November 1956. J. O'Brien, "Automatic Analysis of Chlorides in Sewage," *Wastes Engineering*, pp. 670-672, December 1962.

The Chloride Vacu-vials<sup>®</sup> test employs the ferric thiocyanate chemistry. Chloride reacts with mercuric thiocyanate to liberate thiocyanate ion. Ferric ion reacts with thiocyanate ion to produce an orange-brown thiocyanate complex in proportion to the chloride concentration. Results are expressed as ppm (mg/L) Cl<sup>-</sup>.

## Visual Kits

**Range: 2-20 ppm**  
MDL: 2.0 ppm / Method: Mercuric Nitrate

**Titrets Kit**, Shelf-life 6 months **Cat#**  
**\*K-2002**

Increments:  
2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.6, 4.0, 5.0, 6.0, 7.0, 8.0, 10, 14, 20 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Acidifier Solution, Normalizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 20-200 ppm**  
MDL: 20 ppm / Method: Mercuric Nitrate

**Titrets Kit** **Cat#**  
**\*K-2020**

Increments:  
20, 22, 24, 26, 28, 30, 32, 36, 40, 50, 60, 70, 80, 100, 140, 200 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 50-500 ppm**  
MDL: 50 ppm / Method: Mercuric Nitrate

**Titrets Kit** **Cat#**  
**\*K-2050**

Increments:  
50, 55, 60, 65, 70, 75, 80, 90, 100, 125, 150, 175, 200, 250, 350, 500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

\*Contains mercury. Dispose according to local, state or federal laws.



**Range: 250-2500 ppm**  
MDL: 250 ppm / Method: Mercuric Nitrate

**Cat#**  
**\*K-2051**

**Titrets Kit**

Increments:  
250, 275, 300, 325, 350, 375, 400, 450, 500, 625, 750, 875, 1000, 1250, 1750, 2500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 1000-10,000 ppm**  
MDL: 1000 ppm / Method: Mercuric Nitrate

**Cat#**  
**\*K-2055**

**Titrets Kit**

Increments:  
1000, 1100, 1200, 1300, 1400, 1500, 1600, 1800, 2000, 2500, 3000, 3500, 4000, 5000, 7000, 10,000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 10,000-100,000 ppm**  
MDL: 10,000 ppm / Method: Mercuric Nitrate

**Cat#**  
**\*K-2070**

**Titrets Kit**

Increments:  
10,000, 11,000, 12,000, 13,000, 14,000, 15,000, 16,000, 18,000, 20,000, 25,000, 30,000, 35,000, 40,000, 50,000, 70,000, 100,000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

 **Instrumental Kit**

**V-2000 Multi-Analyte Photometer**  
(See page 12 for instrumental features)

**Range: 2.5-40.0 ppm**  
Method: Ferric Thiocyanate

**Cat#**  
**\*K-2103<sup>1</sup>**

**Vacu-vials Kit**

Kit comes in a cardboard box and contains everything needed to perform up to 29 tests (except distilled water): thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, 1.0 mL syringe, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

<sup>1</sup>Although the test kit contains 30 ampoules, a fresh reagent ampoule blank must be prepared for each series of tests; therefore, the number of samples that can be tested with each kit will vary from a maximum of 29 to a minimum of 15.

\*Contains mercury. Dispose according to local, state or federal laws.

| Kit Components common to Chloride |        |
|-----------------------------------|--------|
| Description                       | Cat#   |
| Sample Cup Pack, 25 mL (6 ea)     | A-0013 |
| Ampoule Blank Pack (5 ea)         | A-0023 |
| Syringe Pack, 1.0 mL (6 ea)       | A-0027 |
| Titrettor Pack (1 ea)             | A-0053 |

**Instructions are posted on our website.**  
*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*





## Visual Kits

### Methods

Because of its strong oxidizing properties, chlorine is an excellent biocide used to treat potable waters, municipal wastes, and swimming pools. When used to treat potable water, chlorine helps alleviate the adverse effects of iron, manganese, ammonia, and sulfide. The Maximum Residual Disinfectant Level for chlorine is 4 mg/L in drinking water.

#### The DPD Method

**References:** USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983).  
 APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-63, Method 4500-Cl G (1998).



In the USEPA-approved DPD methodology, free chlorine reacts with DPD to form a pink product. When ammonia or amines are present,

some of the chlorine may exist as combined chlorine. Combined chlorine will not interfere with the free chlorine results, provided the readings are taken at one minute. To determine total chlorine (the sum of free and combined), use the A-2500 Activator Solution (potassium iodide) supplied in the kit. Results are expressed as ppm (mg/L) Cl<sub>2</sub>.

#### The DDPD Method

**Reference:** Developed by CHEMetrics, Inc.

The DDPD method is derived from the DPD method. Test kits that employ this chemistry are well suited for use where biocides and chromate corrosion inhibitors are used simultaneously. DDPD reacts with free chlorine to form a purple product. When ammonia or amines are present in the sample, some of the chlorine may exist as *combined chlorine*. To determine total chlorine (the sum of free and combined), use the A-2500 Activator Solution (potassium iodide) that is supplied in the kit. Results are expressed as ppm (mg/L) Cl<sub>2</sub>.

CHEMetrics' DDPD method is also applicable to the direct determination of hypochlorite concentrations in various cleaning preparations and disinfectants prior to their dilution. The DDPD compound reacts with hypochlorite ions to form a purple color. Results are expressed as percent (%) NaOCl.

| Range: 0-0.20 ppm<br>MDL: 0.04 ppm / Method: DDPD   |                     |
|---|---------------------|
|   | Cat#                |
| <b>Chlorine (free &amp; total) ULR CHEMets Kit</b>  | <b>K-2511</b>       |
| ULR CHEMets Refill, 30 ampoules   | R-2511              |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-2500 <sup>1</sup> |
| Neutralizer Solution Pack, six 20 mL bottles, Shelf-life 2 years  | A-2501 <sup>1</sup> |
| Comparator, Shelf-life 2 years:<br>0, 0.04, 0.06, 0.08, 0.10, 0.12, 0.16, 0.20 ppm  | C-2511              |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, Activator Solution, Neutralizer Solution, 25 mL sample cup, instructions, and MSDS. |                     |

| Range: 0-1 & 1-5 ppm<br>MDL: 0.05 ppm / Method: DPD   |                     |
|---|---------------------|
|   | Cat#                |
| <b>Chlorine (free &amp; total) CHEMets Kit</b>  | <b>K-2504</b>       |
| CHEMets Refill, 30 ampoules   | R-2500              |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-2500 <sup>1</sup> |
| Low Range Comparator, Shelf-life 1 year:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm  | C-2504              |
| High Range Comparator, Shelf-life 1 year:<br>1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 ppm  | C-2506              |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS. |                     |

| Range: 0-1 & 1-5 ppm<br>MDL: 0.05 ppm / Method: DDPD  |                     |
|---|---------------------|
|   | Cat#                |
| <b>Chlorine (free &amp; total) CHEMets Kit</b>  | <b>K-2505</b>       |
| CHEMets Refill, 30 ampoules   | R-2505              |
| Activator Solution Pack, six 10 mL bottles, 2 years   | A-2500 <sup>1</sup> |
| Neutralizer Solution Pack, six 20 mL bottles, Shelf-life 2 years  | A-2501 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm   | C-2501              |
| High Range Comparator, Shelf-life 2 years:<br>1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 ppm   | C-2505              |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, Neutralizer Solution, 25 mL sample cup, instructions, and MSDS. |                     |

| Range: 0-30 & 30-150 ppm<br>MDL: 5 ppm / Method: DDPD  |                     |
|--|---------------------|
|  | Cat#                |
| <b>Chlorine (free &amp; total) VACUettes Kit</b>   | <b>K-2505D</b>      |
| VACUettes Refill, 30 ampoules  | R-2505D             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years   | A-2500 <sup>1</sup> |
| Neutralizer Solution Pack, six 20 mL bottles, Shelf-life 2 years   | A-2501 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 5, 7.5, 10, 15, 20, 25, 30 ppm   | C-2501D             |
| High Range Comparator, Shelf-life 2 years:<br>30, 45, 60, 75, 87.5, 100, 112.5, 125, 150 ppm   | C-2505D             |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, Neutralizer Solution, dilutor snapper cup, micro test tube, instructions, and MSDS. |                     |

\*Approved for drinking and wastewater using CHEMetrics instrumental DPD Vacu-ials products. Please contact us for a copy of the USEPA approval letter.

**Range: 0-60 & 60-300 ppm**  
MDL: 10 ppm / Method: DDPD

|   | Cat#                |
|---|---------------------|
| <b>Chlorine (free &amp; total) VACUettes Kit</b>  | <b>K-2505A</b>      |
| VACUettes Refill, 30 ampoules   | R-2505A             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years                              | A-2500 <sup>1</sup> |
| Neutralizer Solution Pack, six 20 mL bottles, Shelf-life 2 years                            | A-2501 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 10, 15, 20, 30, 40, 50, 60 ppm              | C-2501A             |
| High Range Comparator, Shelf-life 2 years:<br>60, 90, 120, 150, 175, 200, 225, 250, 300 ppm | C-2505A             |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, Neutralizer Solution, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-120 & 120-600 ppm**  
MDL: 20 ppm / Method: DDPD

|   | Cat#                |
|---|---------------------|
| <b>Chlorine (free &amp; total) VACUettes Kit</b>  | <b>K-2505B</b>      |
| VACUettes Refill, 30 ampoules   | R-2505B             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years                                | A-2500 <sup>1</sup> |
| Neutralizer Solution Pack, six 20 mL bottles, Shelf-life 2 years                              | A-2501 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 20, 30, 40, 60, 80, 100, 120 ppm              | C-2501B             |
| High Range Comparator, Shelf-life 2 years:<br>120, 180, 240, 300, 350, 400, 450, 500, 600 ppm | C-2505B             |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, Neutralizer Solution, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-1000 & 1000-5000 ppm**  
MDL: 100 ppm / Method: DDPD

|  | Cat#                |
|--|---------------------|
| <b>Chlorine (free &amp; total) VACUettes Kit</b>   | <b>K-2505C</b>      |
| VACUettes Refill, 30 ampoules  | R-2505C             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years   | A-2500 <sup>1</sup> |
| Neutralizer Solution Pack, six 20 mL bottles, Shelf-life 2 years                                       | A-2501 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 100, 200, 300, 400, 600, 800, 1000 ppm                 | C-2501C             |
| High Range Comparator, Shelf-life 2 years:<br>1000, 1500, 2000, 2500, 3000, 3500, 4000, 4500, 5000 ppm | C-2505C             |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, Neutralizer Solution, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0.3-1.6% as NaOCl**  
MDL: 0.3% / Method: DDPD

|  | Cat#          |
|--|---------------|
| <b>Chlorine (hypochlorite) VACUettes Kit</b>   | <b>K-5805</b> |
| VACUettes Refill, 30 ampoules  | R-5805        |
| Comparator, Shelf-life 2 years:<br>0.3, 0.45, 0.6, 0.75, 0.95, 1.15, 1.3, 1.45, 1.6% | C-5805        |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, dilutor snapper cup, 1.0 mL syringe, micro test tube, instructions, and MSDS.

**Range: 2.5-12% as NaOCl**  
MDL: 2.5% / Method: DDPD

|   | Cat#          |
|---|---------------|
| <b>Chlorine (hypochlorite) VACUettes Kit</b>                                      | <b>K-5812</b> |
| VACUettes Refill, 30 ampoules   | R-5812        |
| Comparator, Shelf-life 2 years:<br>2.5, 3.5, 4.5, 6.0, 7.0, 8.5, 9.5, 10.5, 12.0% | C-5812        |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, 25 mL sample cup, dilutor snapper cup, 1.0 mL syringe, micro test tube, instructions, and MSDS.

 **Instrumental Kits**

**V-2000 Multi-Analyte Photometer**  
(See page 12 for instrumental features)

**Range: 0.40-5.00 ppm**  
Method: DPD

|  | Cat#          |
|--|---------------|
| <b>Chlorine (free) Vacu-vials Kit (USEPA Approved)</b> | <b>K-2523</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

**Range: 0.40-5.00 ppm**  
Method: DPD

|  | Cat#          |
|--|---------------|
| <b>Chlorine (free &amp; total) Vacu-vials Kit (USEPA Approved)</b> | <b>K-2513</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

**SAM Single-Analyte Photometer**  
(See page 15 for instrumental features)

**Range: 0.40-5.00 ppm**  
Method: DPD

|  | Cat#          |
|--|---------------|
| <b>Chlorine (free &amp; total) SAM Kit</b> | <b>I-2001</b> |

Vacu-vials Kit, 30 ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, 2 AA batteries, and instructions.

*Vacu-vials Kits require the use of the V-2000 Photometer, or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests. The Activator Solution, A-2500, is used to determine Total Chlorine.

**Kit Components common to Chlorine**

| Description                     | Cat#   |
|---------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea)   | A-0013 |
| Micro Test Tube Pack (10 ea)    | A-0015 |
| Dilutor Snapper Cup Pack (6 ea) | A-0018 |
| Ampoule Blank Pack (5 ea)       | A-0023 |
| Syringe Pack, 1.0 mL (6 ea)     | A-0027 |

**Instructions are posted on our website.**

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

## Method

**References:** USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983). APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-76, Method 4500-ClO<sub>2</sub> D and pp. 4-63 Method 4500-Cl G (1998).

Chlorine dioxide is used as an oxidizing microbicide in industrial cooling water treatment, the dairy industry, the meat industry, and many other food and beverage industry applications. It is used as a bleaching agent in the pulp and paper industry, and as a disinfectant in municipal water treatment. Industrial waste treatment facilities use chlorine dioxide because of its selectivity for certain compounds, including phenols, sulfides, cyanides, thiosulfates, and mercaptans. The oil and gas industry uses chlorine dioxide for downhole applications and as a stimulation enhancement additive. The Maximum Residual Disinfectant Level for chlorine dioxide is 0.8 mg/L in drinking water.

In the standard DPD methodology, chlorine dioxide reacts with DPD (N, N-diethyl-p-phenylenediamine) to form a pink product. Interference from free Cl<sub>2</sub> is prevented (up to 6 ppm Cl<sub>2</sub>) by the addition of glycine to the sample. Results are expressed as ppm (mg/L) ClO<sub>2</sub>.

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: 0.80-11.00 ppm**  
Method: DPD

|   | Cat#          |
|---|---------------|
| <b>Vacu-vials Kit</b> , Shelf-life 8 months | <b>K-2703</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Neutralizer Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### SAM Single-Analyte Photometer

(See page 15 for instrumental features)

**Range: 1.0-11.00 ppm**  
Method: DPD

|                | Cat#          |
|----------------|---------------|
| <b>SAM Kit</b> | <b>I-2005</b> |

Vacu-vials Kit, 30 ampoules, Neutralizer Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS, Shelf-life 8 months.

K-2703

SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, 2 AA batteries, and instructions.

## Visual Kit

**Range: 0-2 & 2-10 ppm**  
MDL: 0.1 ppm / Method: DPD

|  | Cat#                |
|--|---------------------|
| <b>CHEMets Kit</b>   | <b>K-2705</b>       |
| CHEMets Refill, 30 ampoules  | R-2705              |
| Neutralizer Solution Pack, six 10 mL bottles, Shelf-life 8 months                    | A-2700 <sup>1</sup> |
| Low Range Comparator, Shelf-life 1 year:<br>0, 0.2, 0.4, 0.6, 0.8, 1.2, 1.6, 2.0 ppm | C-2702              |
| High Range Comparator, Shelf-life 1 year:<br>2, 3, 4, 5, 6, 7, 8, 9, 10 ppm          | C-2710              |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Neutralizer Solution, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Chlorine Dioxide

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Ampoule Blank Pack (5 ea)     | A-0023 |

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

*Instructions are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

**References:** APHA Standard Methods, 20<sup>th</sup> ed., pp. 3-66, Method 3500-Cr B (1998). ASTM D 1687-02, Chromium in Water, Test Method A.

Hexavalent chromium salts are used in numerous industrial processes. They are also used extensively as corrosion inhibitors in open and closed cooling water systems.

With the chromate test method, hexavalent chromium reacts with diphenylcarbazide under acid conditions to form a red-violet color. Results are quantified photometrically or by visual comparison with standards that are calibrated in ppm (mg/L) CrO<sub>4</sub>.



## Visual Kits

**Range: 0-1 & 1-10 ppm**  
MDL: 0.05 ppm / Method: Diphenylcarbazide

|   | <b>Cat#</b>         |
|---|---------------------|
| <b>CHEMets Kit</b>  | <b>K-2810</b>       |
| CHEMets Refill, 30 ampoules   | R-2810              |
| Acidifier Solution Pack, six 10 mL bottles, Shelf-life 2 years                        | A-2800 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm | C-2801              |
| High Range Comparator, Shelf-life 2 years:<br>1, 2, 3, 4, 5, 6, 7, 8, 10 ppm          | C-2810              |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Acidifier Solution, 25 mL sample cup, instructions, and MSDS.

**Range: 0-30 & 30-300 ppm**  
MDL: 5 ppm / Method: Diphenylcarbazide

|  | <b>Cat#</b>         |
|--|---------------------|
| <b>VACUettes Kit</b>   | <b>K-2810D</b>      |
| VACUettes Refill, 30 ampoules  | R-2810D             |
| Acidifier Solution Pack, six 10 mL bottles, Shelf-life 2 years                             | A-2800 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 5, 7.5, 10, 15, 20, 25, 30 ppm             | C-2801D             |
| High Range Comparator, Shelf-life 2 years:<br>30, 60, 90, 120, 150, 175, 200, 250, 300 ppm | C-2810D             |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Acidifier Solution, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-60 & 60-600 ppm**  
MDL: 10 ppm / Method: Diphenylcarbazide

|  | <b>Cat#</b>         |
|--|---------------------|
| <b>VACUettes Kit</b>   | <b>K-2810A</b>      |
| VACUettes Refill, 30 ampoules  | R-2810A             |
| Acidifier Solution Pack, six 10 mL bottles, Shelf-life 2 years                               | A-2800 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 10, 15, 20, 30, 40, 50, 60 ppm               | C-2801A             |
| High Range Comparator, Shelf-life 2 years:<br>60, 120, 180, 240, 300, 350, 400, 500, 600 ppm | C-2810A             |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Acidifier Solution, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-120 & 120-1200 ppm**  
MDL: 20 ppm / Method: Diphenylcarbazide

|   | <b>Cat#</b>         |
|---|---------------------|
| <b>VACUettes Kit</b>  | <b>K-2810B</b>      |
| VACUettes Refill, 30 ampoules   | R-2810B             |
| Acidifier Solution Pack, six 10 mL bottles, Shelf-life 2 years                                  | A-2800 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 20, 30, 40, 60, 80, 100, 120 ppm                | C-2801B             |
| High Range Comparator, Shelf-life 2 years:<br>120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm | C-2810B             |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Acidifier Solution, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-1200 & 1200-12,000 ppm**  
MDL: 200 ppm / Method: Diphenylcarbazide

|  | <b>Cat#</b>         |
|--|---------------------|
| <b>VACUettes Kit</b>   | <b>K-2810C</b>      |
| VACUettes Refill, 30 ampoules  | R-2810C             |
| Acidifier Solution Pack, six 10 mL bottles, Shelf-life 2 years   | A-2800 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 200, 300, 400, 600, 800, 1000, 1200 ppm                    | C-2801C             |
| High Range Comparator, Shelf-life 2 years:<br>1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm | C-2810C             |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Acidifier Solution, dilutor snapper cup, micro test tube, instructions, and MSDS.

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

 Instrumental Kits

**V-2000 Multi-Analyte Photometer**

(See page 12 for instrumental features)

**Range: 0.20-3.50 ppm**  
Method: Diphenylcarbazide

|   | Cat#          |
|---|---------------|
| <b>Vacu-vials Kit</b>   | <b>K-2803</b> |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Acidifier Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS. |               |

**Range: 0.70-13.00 ppm**  
Method: Diphenylcarbazide

|   | Cat#          |
|---|---------------|
| <b>Vacu-vials Kit</b>   | <b>K-2823</b> |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Acidifier Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS. |               |

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

| Kit Components common to Chromate |        |
|-----------------------------------|--------|
| Description                       | Cat#   |
| Sample Cup Pack, 25 mL (6 ea)     | A-0013 |
| Micro Test Tube Pack (10 ea)      | A-0015 |
| Dilutor Snapper Cup Pack (6 ea)   | A-0018 |
| Ampoule Blank Pack (5 ea)         | A-0023 |

*Instructions are posted on our website.  
If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*





## Method

Conductivity (or Specific Conductance) is the measure of the electrical current carrying capacity of a solution. Ionized dissolved solids in water have the ability to conduct an electric current. The conductivity of pure water is very low and increases proportionally to the level of contamination present. Accurate conductivity measurement is extremely important in industrial water treatment applications, as it allows for the calculation of total dissolved solids in raw water, boiler water, condensate, and other process waters. Conductivity is also frequently tested for in environmental applications.

### Method of Operation.

To operate the CHEMetrics Conductivity Meter, switch unit on, remove the electrode cap, immerse the probe into the sample, making sure that the sensor is fully covered. Wait for the readings to stabilize (Automatic Temperature compensation corrects for temperature changes). Take measurement. To clean the probe, simply mix it in tap water.

## FEATURES

**Range:** 0 to 1990  $\mu$ S.

**Resolution:** 10  $\mu$ S.

**Accuracy:**  $\pm$ 2% full scale.

**Operating Temperature:** 0 to 50°C (32 to 122°F).

**Power and battery life:** Four 1.5 V alkaline batteries (supplied). 100 hrs. continuous use (approx).

**Pocket-sized:** 6.5" length x 1.5" diameter

**Weight:** 3.25 oz.(90 g)



**Range: 0-1990  $\mu$ S**

**Conductivity Meter**

**Cat#  
I-1200**

Instrument comes in a plastic storage case and includes an electrode and cap, four 1.5 V alkaline batteries, and instructions.

### Accessories

#### Description

Electrode for TDS and Conductivity

**Cat#**

A-0176

Conductivity/TDS *Singles*, 447  $\mu$ S, Shelf-life 3 months

A-0177

Conductivity/TDS *Singles*, 1413  $\mu$ S, Shelf-life 3 months

A-0178

Carrying Case

(holds two pH I-1000, TDS I-1100, or Conductivity I-1200 meters)

A-0179

*Instructions are posted on our website.*



### FEATURES

- Replaceable electrode
- Waterproof, dustproof
- Push-button calibration
- Automatic temperature compensation (ATC)
- Auto-shutoff

## Method

Reference: APHA Standard Methods, 20<sup>th</sup> ed., pp. 3-73, Method 3500-Cu C (1998).

Copper is naturally present in the earth's crust and in seawater. Copper-containing fungicides are used to control biological growth in water supplies.

The Maximum Contaminant Level Goal for copper is 1.3 mg/L in drinking water.

The measurement of copper is an important means of monitoring the corrosion of condensate systems and heat exchangers.

CHEMetrics' test kits employ the bathocuproine reagent. Bathocuproine disulfonate forms an orange-colored chelate with copper. The method measures total soluble copper as ppm (mg/L) Cu. The test kits are applicable for analysis of drinking water, surface waters, groundwater, wastewater and seawater.

## Visual Kit

**Range: 0-1 & 1-10 ppm**  
MDL: 0.05 ppm / Method: Bathocuproine

|   | Cat#          |
|---|---------------|
| <b>CHEMetrics Kit</b>   | <b>K-3510</b> |
| CHEMetrics Refill, 30 ampoules  | R-3510        |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm | C-3501        |
| High Range Comparator, Shelf-life 2 years:<br>1, 2, 3, 4, 5, 6, 7, 8, 10 ppm          | C-3510        |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, 25 mL sample cup, instructions, and MSDS

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: V-2000: 0.50-12.00 ppm / Spec: 0.25-7.00 ppm**  
Method: Bathocuproine

|                       | Cat#          |
|-----------------------|---------------|
| <b>Vacu-vials Kit</b> | <b>K-3503</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to Copper

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Ampoule Blank Pack (5 ea)     | A-0023 |

**Instructions are posted on our website.**

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

Cyanide is used in many chemical and refining processes. It is found in effluent from electroplating and metal cleaning operations, coke ovens, steel manufacturing facilities, and gas scrubbers. Although cyanide can be safely removed by alkaline chlorination, its acute toxicity to aquatic life necessitates routine monitoring of effluents. The Maximum Contaminant Level for free cyanide in drinking water is 0.2 mg/L.

CHEMetrics' cyanide test kits are applicable to the monitoring of effluents and surface water supplies. It is recommended, however, that the sample be distilled and hydrogen sulfide be removed prior to analysis.

### The Isonicotinic-Barbituric Acid Method

**Reference:** S. Nagashima, *Spectrophotometric Determination of Cyanide with Isonicotinic Acid and Barbituric Acid, International Journal of Environ. Anal. Chem., 1981, Vol. 10, pp. 99-106.*

With CHEMetrics' method based on the isonicotinic/barbituric acid procedure, chlorine is added to a sample that has been buffered to pH 6. The resulting cyanogen chloride reacts with isonicotinic and barbituric acids to form a blue color. Results are expressed as ppm (mg/L) CN.

This chemistry provides two advantages over the more commonly used pyridine methods: (1) The shelf-life of the reagent is extended, and (2) the analyst is not exposed to noxious and hazardous fumes from the pyridine reagent.

### The Silver Nitrate Method

**Reference:** APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-38, Method 4500-CN<sup>-</sup> D (1998).

CHEMetrics employs silver nitrate as the titrant and 5-(p-dimethylaminobenzylidene) rhodanine as the indicator. A color change from orange to yellow signals the end of the titration. Results are expressed as ppm (mg/L) CN.



## Visual Kits

| Range: 0-0.1 & 0.1-1 ppm<br>MDL: 0.005 ppm / Method: Isonicotinic-Barbituric Acid  |                     |
|--|---------------------|
| CHEMetrics Kit   | Cat#                |
| CHEMetrics Refill, 30 ampoules   | R-3810              |
| Neutralizer Solution Pack, six 20 mL bottles, Shelf-life 2 years   | A-3800 <sup>1</sup> |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 8 months  | A-3801 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.01, 0.02, 0.03, 0.04, 0.06, 0.08, 0.10 ppm   | C-3801              |
| High Range Comparator, Shelf-life 2 years:<br>0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 1.0 ppm  | C-3810              |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Neutralizer Solution, Activator Solution, 5 mL sample cup & top, instructions, and MSDS. |                     |

| Range: 5-50 ppm<br>MDL: 5.0 ppm / Method: Silver Nitrate   |        |
|--|--------|
| Titrets Kit  | Cat#   |
| Increments:<br>5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 9.0, 10.0, 12.5, 15.0, 17.5,<br>20.0, 25.0, 35.0, 50.0 ppm   | K-3815 |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, titrettor, 25 mL sample cup, instructions, and MSDS. |        |



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

| Range: 0.020-0.400 ppm<br>Method: Isonicotinic-Barbituric Acid  |        |
|---|--------|
| Vacu-vials Kit, Shelf-life 8 months   | Cat#   |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Neutralizer Solution, Activator Solution, 25 mL sample cup, 3.0 mL syringe, ampoule blank, instructions, calibration table, and MSDS. | K-3803 |

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

| Kit Components common to Cyanide   |        |
|------------------------------------|--------|
| Description                        | Cat#   |
| Sample Cup Pack, 25 mL (6 ea)      | A-0013 |
| Ampoule Blank Pack (5 ea)          | A-0023 |
| Titrettor Pack (1 ea)              | A-0053 |
| Syringe Pack, 3.0 mL (6 ea)        | A-0063 |
| Sample Cup & Top Pack, 5 mL (6 ea) | A-0105 |

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

Instructions are posted on our website.

## Methods

Dissolved oxygen in boiler system water causes corrosion and pitting of metal surfaces, which can lead to boiler inefficiency, equipment failure, and system downtime. DEHA (N, N-Diethylhydroxylamine) is added to boiler system water as an oxygen scavenger to keep the dissolved oxygen levels as low as possible.

### The PDS Method

**Reference:** J. A. Tetlow and A. L. Wilson, "Determination of Iron in Boiler Feedwater," *Analyst*, 1958.

The test kits employ the PDS chemistry, in which DEHA reduces iron III (ferric state) to iron II (ferrous state), which readily reacts with PDS (3-(2-pyridyl)-5,6-bis(4-phenylsulfonic acid)-1,2,4-triazine disodium salt) to form a pink-purple colored complex in direct proportion to the DEHA concentration. Test results are expressed in ppb ( $\mu\text{g/L}$ ) or ppm ( $\text{mg/L}$ ) DEHA.

### The Ceric Sulfate Titrimetric Method

**Reference:** Developed by CHEMetrics, Inc.

CHEMetrics developed a titrimetric method that employs a ceric sulfate titrant and ferroin end point indicator. DEHA reduces ferric iron to the ferrous state, and the resulting ferrous iron is titrated with the ceric sulfate titrant. Test results are expressed in ppm ( $\text{mg/L}$ ) DEHA.

## Visual Kits

**Range: 0-400 & 400-3000 ppb**  
MDL: 15 ppb / Method: PDS

|   | Cat#                |
|---|---------------------|
| <b>CHEMets Kit</b>  | <b>K-3902</b>       |
| CHEMets Refill, 30 ampoules   | R-3902              |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years                                      | A-3900 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 30, 60, 100, 150, 200, 300, 400 ppb                 | C-3901              |
| High Range Comparator, Shelf-life 2 years:<br>400, 600, 800, 1000, 1200, 1600, 2000, 2500, 3000 ppb | C-3902              |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparator, Activator Solution, 25 mL sample cup, instructions and MSDS.

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

**Range: 25-250 ppm**  
MDL: 25 ppm / Method: Ceric Sulfate Titrant with Ferroin Indicator

|                    | Cat#          |
|--------------------|---------------|
| <b>Titrets Kit</b> | <b>K-3925</b> |

Increments:  
25, 27.5, 30, 32.5, 35, 37.5, 40, 45, 50, 62.5, 75, 87.5, 100, 125, 175, 250 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Activator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

*(See page 12 for instrumental features)*

**Range: 0.15-2.00 ppm**  
Method: PDS

|                       | Cat#          |
|-----------------------|---------------|
| <b>Vacu-vials Kit</b> | <b>K-3903</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to DEHA

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Ampoule Blank Pack (5 ea)     | A-0023 |
| Titrettor Pack (1 ea)         | A-0053 |

*Instructions are posted on our website.*

## Method

**References:** USEPA Methods for Chemical Analysis of Water and Wastes, Method 425.1 (1983). APHA Standard Methods, 20<sup>th</sup> ed., pp. 5-47, Method 5540 C (1998). ASTM D 2330-02, Methylene Blue Active Substances.

Detergents can be introduced into the water supply by industry, soap manufacturers, and private households. Environmental analysts often include a determination of anionic detergents when assessing surface water pollution.

The methylene blue active substances (MBAS) method is used in a 3-minute procedure to measure anionic detergents in the 0-3 ppm (mg/L) range. The procedure features a unique extraction/sampling technique that eliminates several steps required in other test procedures and provides increased sensitivity.

Anionic detergents react with methylene blue to form a blue-colored complex that is extracted into an immiscible organic solvent. Results are expressed in ppm (mg/L) as linear alkylbenzene sulfonate (LAS), equivalent weight 325.

**Shelf-life:** eight months. We recommend stocking quantities that will be used within seven months.

## Visual Kit

**Range: 0-3 ppm**  
MDL: 0.125 ppm / Method: Methylene Blue

|  | Cat#          |
|--|---------------|
| <b>CHEMets Kit</b>   | <b>K-9400</b> |
| CHEMets Refill, 20 ampoule sets, Shelf-life 8 months                           | R-9400        |
| Comparator, Shelf-life 2 years:<br>0, 0.25, 0.50, 0.75, 1.0, 1.5, 2.0, 3.0 ppm | C-9400        |

Kit comes in a cardboard box and contains everything needed to perform 20 tests: Refill, Comparator, reaction tube with lid, tip breaking tool, ampoule caps, instructions, and MSDS.



## Instrumental Kits

**Range: 0.15-1.00 ppm**  
Method: Methylene Blue

|   | Cat#          |
|---|---------------|
| <b>Instrumental Kit</b> , Shelf-life 8 months | <b>K-9403</b> |

Kit comes in a cardboard box and contains everything needed to perform 20 tests: twenty double-point ampoules, twenty one test tubes, dropper bottle with cap, tip-breaking tool, instructions, and MSDS.

*This kit cannot currently be used with CHEMetrics' V-2000 Photometer. This kit may be used with a spectrophotometer capable of accepting a 13 mm diameter round cell. A calibration table is included with this kit.*

## SAM Single-Analyte Photometer\*

(See page 15 for instrumental features)

**Range: 0.25-2.50 ppm**  
Method: Methylene Blue

|                           | Cat#          |
|---------------------------|---------------|
| <b>Detergents SAM Kit</b> | <b>I-2017</b> |

Instrumental Kit, 20 double-point ampoules, 21 test tubes, dropper bottle with cap, tip-breaking tool, instructions, and MSDS.  
Shelf-life 8 months.

**K-9403**

SAM Kit comes in a plastic case and contains everything needed to perform 20 tests: Instrumental Kit, SAM Photometer, 2 AA batteries, and instructions.

## Kit Components common to Detergents

| Description                            | Cat#   |
|--|--------|
| Tip Breaking Tool Pack (1 ea)          | A-0079 |
| Reaction Tube w/Lid, Detergents (1 ea) | A-0087 |
| Ampoule Caps Pack (100 ea)             | A-0095 |

*Instructions are posted on our website.*

*\* Available 2<sup>nd</sup> quarter 2008*



## Method

Reference: ASTM D 2327-80, Mono- and Dioctadecylamines in Water.

Filming amines are fed continuously into boiler feed-water to protect metal surfaces from corrosion caused by dissolved oxygen and carbon dioxide in condensate water. The amine forms a thin film on the surfaces that repels the potentially corrosive water.

CHEMetrics' 3-minute procedure uses the standard methyl orange chemistry and features a unique extraction technique. The extraction eliminates several steps required in other procedures and provides increased sensitivity.

The filming amine compound reacts with methyl orange to form a yellow-colored complex that is extracted into an immiscible organic solvent. Results are expressed in ppm (mg/L) octadecylamine.

## Visual Kit

**Range: 0-1 ppm**  
MDL: 0.025 ppm / Method: Methyl Orange

|   | Cat#          |
|---|---------------|
| <b>CHEMetrics Kit</b>   | <b>K-1001</b> |
| CHEMetrics Refill, 20 ampoule sets  | R-1000        |
| Comparator, Shelf-life 2 years:<br>0, 0.05, 0.10, 0.15, 0.25, 0.50, 0.75, 1.0 ppm | C-1001        |

Kit comes in a cardboard box and contains everything needed to perform 20 tests: Refill, Comparator, reaction tube with lid, tip breaking tool, ampoule caps, instructions, and MSDS.

### Kit Components common to Filming Amine

| Description                               | Cat#    |
|---|---------|
| Tip Breaking Tool Pack (1 ea)             | A-0079  |
| Reaction Tube w/Lid, Filming Amine (1 ea) | A-0087F |
| Ampoule Caps Pack (100 ea)                | A-0095  |

**Instructions are posted on our website.**

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

References: APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-82, Method 4500 F<sup>-</sup> D (1998). USEPA Methods for Chemical Analysis of Water and Wastes, Method 340.1 (1974, 1978). Thomas and Chamberlain, 1974, Colorimetric Chemical Analytical Methods, 8<sup>th</sup> ed., pp. 186-193.

Fluoride can occur naturally in water, and may also be added in controlled amounts. Accurate determination of fluoride concentrations has become increasingly important as the practice of fluoridation of drinking water supplies as a public health measure has increased.

Monitoring and maintaining optimum fluoride levels is essential to maintain effectiveness and safety of the fluoridation process. The Maximum Contaminant Level for fluoride in drinking water is 4.0 mg/L. Fluoride compounds are also involved in the production of aluminum, steel, uranium, cement, enamel, and plastics.

The Fluoride Vacu-vials<sup>®</sup> test method is based on the reaction between fluoride and a red zirconium-dye lake that has been formed with SPADNS. The loss of color resulting from the reaction of the fluoride with the dye lake is a function of the fluoride concentration. Results are expressed in ppm (mg/L) F<sup>-</sup>.

This method is approved by the USEPA for NPDES and NPDWR reporting purposes when the samples have been distilled from an acid solution. Seawater and wastewater samples must be pre-distilled. Distillation removes most contaminating interferences except chlorine. Sodium Arsenite has been added to remove up to 5 mg/L chlorine.

## Instrumental Kit

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

Range: 0.30-2.00 ppm  
Method: SPADNS

|                | Cat#                |
|----------------|---------------------|
| Vacu-vials Kit | K-4003 <sup>1</sup> |

Kit comes in a cardboard box and contains everything needed to perform up to 29 tests (except distilled water): thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration tables, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Components common to Fluoride

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Ampoule Blank Pack (5 ea)     | A-0023 |

<sup>1</sup>Although the test kit contains 30 ampoules, a fresh reagent ampoule blank must be prepared for each series of tests; therefore, the number of samples that can be tested with each kit will vary from a maximum of 29 to a minimum of 15.

Instructions are posted on our website.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

Formaldehyde, a toxic substance, is used in the following applications: metal plating baths, textile treatments, biological specimen preservatives, and disinfectants of medical equipment. Commercial formaldehyde gas is readily soluble in water.

### The Purpald Method

**Reference: Purpald® developed by Aldrich Chemical Co.**

Purpald® is subject to fewer interferences than Shiffs' reagent or chromotropic acid procedures. A purple-colored complex is formed when Purpald in alkaline solution reacts with formaldehyde. Results are expressed as ppm (mg/L) CH<sub>2</sub>O.

Shelf-life of the Purpald Reagent: six months. We recommend stocking quantities that will be used within five months. **Refrigeration will dramatically extend the shelf-life of these products.**

### The Acid Titrimetric Method

**Reference: ASTM D 2194-79, Concentration of Formaldehyde Solutions.**

CHEMetrics offers a titrimetric method for formaldehyde, which uses sulfuric acid and sodium sulfite. The end point indicator, thymolphthalein, provides a sharp color change from colorless to bright blue. Results are expressed as percent (%) formaldehyde.



**Range: 0-1 & 1-5 ppm**  
MDL: 0.05 ppm / Method: Purpald

|   | <b>Cat#</b>           |
|---|-----------------------|
| <b>CHEMets Kit</b>  | <b>K-4605</b>         |
| CHEMets Refill, 30 ampoules, Shelf-life 6 months  | R-4605 <sup>2</sup>   |
| Activator Solution Pack, six 20 mL bottles  | A-4201 <sup>1,3</sup> |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-4202 <sup>1</sup>   |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm   | C-4601                |
| High Range Comparator, Shelf-life 2 years:<br>1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 ppm   | C-4605                |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solutions, 25 mL sample cup, instructions, and MSDS. |                       |

**Range: 0-30 & 30-150 ppm**  
MDL: 5 ppm / Method: Purpald

|   | <b>Cat#</b>           |
|---|-----------------------|
| <b>VACUettes Kit</b>  | <b>K-4605D</b>        |
| VACUettes Refill, 30 ampoules, Shelf-life 6 months  | R-4605D <sup>2</sup>  |
| Activator Solution Pack, six 20 mL bottles  | A-4201 <sup>1,3</sup> |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-4202 <sup>1</sup>   |
| Low Range Comparator, Shelf-life 2 years:<br>0, 5, 7.5, 10, 15, 20, 25, 30 ppm  | C-4601D               |
| High Range Comparator, Shelf-life 2 years:<br>30, 45, 60, 75, 87.5, 100, 112.5, 125, 150 ppm  | C-4605D               |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solutions, dilutor snapper cup, micro test tube, instructions, and MSDS. |                       |

**Range: 0-60 & 60-300 ppm**  
MDL: 10 ppm / Method: Purpald

|   | <b>Cat#</b>           |
|---|-----------------------|
| <b>VACUettes Kit</b>  | <b>K-4605A</b>        |
| VACUettes Refill, 30 ampoules, Shelf-life 6 months  | R-4605A <sup>2</sup>  |
| Activator Solution Pack, six 20 mL bottles  | A-4201 <sup>1,3</sup> |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-4202 <sup>1</sup>   |
| Low Range Comparator, Shelf-life 2 years:<br>0, 10, 15, 20, 30, 40, 50, 60 ppm  | C-4601A               |
| High Range Comparator, Shelf-life 2 years:<br>60, 90, 120, 150, 175, 200, 225, 250, 300 ppm   | C-4605A               |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solutions, dilutor snapper cup, micro test tube, instructions, and MSDS. |                       |

**Range: 0-120 & 120-600 ppm**  
MDL: 20 ppm / Method: Purpald

|   | <b>Cat#</b>           |
|---|-----------------------|
| <b>VACUettes Kit</b>  | <b>K-4605B</b>        |
| VACUettes Refill, 30 ampoules, Shelf-life 6 months  | R-4605B <sup>2</sup>  |
| Activator Solution Pack, six 20 mL bottles  | A-4201 <sup>1,3</sup> |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-4202 <sup>1</sup>   |
| Low Range Comparator, Shelf-life 2 years:<br>0, 20, 30, 40, 60, 80, 100, 120 ppm  | C-4601B               |
| High Range Comparator, Shelf-life 2 years:<br>120, 180, 240, 300, 350, 400, 450, 500, 600 ppm   | C-4605B               |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solutions, dilutor snapper cup, micro test tube, instructions, and MSDS. |                       |

<sup>1</sup> The accessory pack supplies enough solution to perform at least **200 tests**.

<sup>2</sup> This shelf-life can be extended by **18 months** if the ampoules are stored in the refrigerator when not in use.

<sup>3</sup> The Activator Solution, A-4201, is supplied as a dry chemical with **NO expiration date**. Once reconstituted, it has a shelf-life of **6 weeks** that can be extended to **4 months** if stored in the refrigerator when not in use.



**Range: 0-1200 & 1200-6000 ppm**  
MDL: 200 ppm / Method: Purpald

| VACUettes Kit  | Cat#<br>K-4605C       |
|--|-----------------------|
| VACUettes Refill, 30 ampoules, Shelf-life 6 months   | R-4605C <sup>2</sup>  |
| Activator Solution Pack, six 20 mL bottles   | A-4201 <sup>1,3</sup> |
| Activator Solution, six 10 mL bottles, Shelf-life 2 years  | A-4202 <sup>1</sup>   |
| Low Range Comparator, Shelf-life 2 years:<br>0, 200, 300, 400, 600, 800, 1000, 1200 ppm                | C-4601C               |
| High Range Comparator, Shelf-life 2 years:<br>1200, 1800, 2400, 3000, 3500, 4000, 4500, 5000, 6000 ppm | C-4605C               |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solutions, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0.5-5%**  
MDL: 0.50% / Method: Acid Titrant with Thymolphthalein Indicator

| Titrets Kit  | Cat#<br>K-4250 |
|--|----------------|
| Increments:<br>0.5, 0.55, 0.6, 0.65, 0.7, 0.75, 0.8, 0.9, 1.0, 1.25, 1.5, 1.75, 2.0, 2.5, 3.5, 5.0 %   |                |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, titrettor, 25 mL sample cup, instructions, and MSDS. |                |



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: 0.40-8.00 ppm**  
Method: Purpald

| Vacu-vials Kit, Shelf-life 6 months   | Cat#<br>K-4203 <sup>2,3</sup> |
|---|-------------------------------|
| Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules, Activator Solutions, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS. |                               |

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to Formaldehyde

| Description                     | Cat#   |
|---------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea)   | A-0013 |
| Micro Test Tube Pack (10 ea)    | A-0015 |
| Dilutor Snapper Cup Pack (6 ea) | A-0018 |
| Ampoule Blank Pack (5 ea)       | A-0023 |
| Titrettor Pack (1 ea)           | A-0053 |

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

<sup>2</sup>This shelf-life can be extended by 18 months if the ampoules are stored in the refrigerator when not in use.

<sup>3</sup>The Activator Solution, A-4201, is supplied as a dry chemical with NO expiration date. Once reconstituted, it has a shelf-life of 6 weeks that can be extended to 4 months if stored in the refrigerator when not in use.

Instructions are posted on our website.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Method

**References:** Method developed by CHEMetrics based on ASTM D 2194-79, Concentration of Formaldehyde Solutions.

Glutaraldehyde-based disinfectants are used throughout the healthcare industry for cleaning and sterilizing. Many surfaces found in the medical, surgical, and dental environments are cleaned by dipping, wiping, or rinsing with glutaraldehyde solutions.

Glutaraldehyde-based disinfectants are also used to clean dialysis machines and reusable dialyzers.

In CHEMetrics' test, glutaraldehyde concentrations are determined by titration with sulfuric acid in the presence of sodium sulfite. Phenolphthalein is used as the end point indicator. A color change from colorless to pink signals the end of the titration. Results are expressed in percent (%) glutaraldehyde.

## Visual Kit

**Range: 0.1-1%**  
MDL: 0.10% / Method: Acid Titrant with Phenolphthalein Indicator

| Titrets Kit | Cat#   |
|-------------|--------|
|             | K-4302 |

Increments:  
0.10, 0.11, 0.12, 0.13, 0.14, 0.15, 0.16, 0.18, 0.20, 0.25, 0.30, 0.35, 0.40, 0.50, 0.70, 1.0%

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Glutaraldehyde

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Titrettor Pack (1 ea)         | A-0053 |

Instructions are posted on our website.



## Method

**References:** Purpald® developed by Aldrich Chemical Company.

Ethylene glycol and propylene glycol are the primary ingredients in commercially-available antifreezes. They are used with various corrosion inhibitors to protect metal surfaces in cooling water systems.

CHEMetrics' glycol test kits, which employ a chemistry perfected by CHEMetrics, are used to monitor potable waters for contamination from glycol originating in cooling systems.

Stricter limits for stormwater effluent glycol discharges are expected from the USEPA. In addition to the glycol recycling operations, monitoring the efficiency of recovery and collection systems is crucial.

In the colorimetric chemistry, periodic acid oxidizes ethylene glycol and/or propylene glycol to formaldehyde, which reacts with Purpald in alkaline solution. Visual and instrumental test kits are available that report test results in either ppm (mg/L) ethylene or propylene glycol. Correction factors are supplied with all kits to convert test results to the alternate glycol form.

This test requires much less time to perform and involves fewer manipulations than the standard chromotropic acid procedure.

Shelf-life: six months. We recommend stocking quantities that will be used within five months. **Refrigeration will dramatically increase the shelf-life of these products.**

## Visual Kits

**Range: 1-15 ppm as ethylene glycol**  
**MDL: 1 ppm / Method: Purpald-Periodate**

| CHEMetrics Kit   | Cat#                  |
|--|-----------------------|
| CHEMetrics Refill, 30 ampoules, Shelf-life 6 months                | R-4815 <sup>2</sup>   |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years     | A-4400 <sup>1</sup>   |
| Activator Solution Pack, six 20 mL bottles                         | A-4401 <sup>1,3</sup> |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years     | A-4402 <sup>1</sup>   |
| Comparator, Shelf-life 2 years:<br>1, 2, 3, 4, 5, 6, 8, 10, 15 ppm | C-4815                |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Activator Solutions, 25 mL sample cup, sample cup top, instructions, and MSDS.

**Range: 1000-15,000 ppm as ethylene glycol**  
**MDL: 1000 ppm / Method: Purpald-Periodate**

| VACUettes Kit   | Cat#                  |
|---|-----------------------|
| VACUettes Refill, 30 ampoules, Shelf-life 6 months  | R-4815C <sup>2</sup>  |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 1 year                                   | A-4404 <sup>1</sup>   |
| Activator Solution Pack, six 20 mL bottles  | A-4401 <sup>1,3</sup> |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years                                  | A-4402 <sup>1</sup>   |
| Comparator, Shelf-life 2 years:<br>1000, 2000, 3000, 4000, 5000, 6000, 8000, 10,000, 15,000 ppm | C-4815C               |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Activator Solutions, dilutor snapper cup, micro test tube, instructions, and MSDS.



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: 0.60-10.00 ppm as ethylene glycol**

Method: Purpald-Periodate

**Vacu-vials Kit**, Shelf-life 6 months **Cat# K-4403<sup>2,3</sup>**

Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules, Activator Solutions, 25 mL sample cup, sample cup top, ampoule blank, instructions, calibration table, and MSDS.

**Range: 5-65 ppm as propylene glycol**

Method: Purpald-Periodate

**Vacu-vials Kit**, Shelf-life 6 months **Cat# K-4423<sup>2,3</sup>**

Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules, Activator Solutions, Stabilizer Solution, 25 mL sample cup, sample cup top, ampoule blank, instructions, calibration table and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to Glycol

| Description                              | Cat#   |
|--|--------|
| Sample Cup Pack, 25 mL (6 ea)            | A-0013 |
| Sample Cup Top Pack for 25 mL Cup (6 ea) | A-0014 |
| Micro Test Tube Pack (10 ea)             | A-0015 |
| Dilutor Snapper Cup Pack (6 ea)          | A-0018 |
| Ampoule Blank Pack (5 ea)                | A-0023 |
| Sample Cup & Cap Pack, 50 mL (6 ea)      | A-0058 |
| Syringe Pack, 10 mL (6 ea)               | A-0104 |

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

<sup>2</sup>This shelf-life can be extended by 18 months if the ampoules are stored in the refrigerator when not in use.

<sup>3</sup>The Activator Solution, A-4401, is supplied as a dry chemical with NO expiration date. Once reconstituted, it has a shelf-life of 6 weeks that can be extended to 4 months if stored in the refrigerator when not in use.

*Instructions are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

### Hardness (calcium)

Reference: West, T. S., DSC, Ph.D., *Complexometry with EDTA and Related Reagents*, 3<sup>rd</sup> ed., pp. 46, 164 (1969).

The EGTA method is specific for calcium hardness. The EGTA titrant in alkaline solution is employed with a zincon indicator. Results are expressed as ppm (mg/L) CaCO<sub>3</sub>.

Shelf-life: eight months. Although the reagent itself is stable, the end point indicator has a limited shelf-life. We recommend stocking quantities that will be used within seven months.

### Hardness (total)

References: APHA Standard Methods, 20<sup>th</sup> ed., pp. 2-37, Method 2340 C (1998). USEPA Methods for Chemical Analysis of Water and Wastes, Method 130.2 (1983).

The total hardness method is applicable to drinking, surface, boiler, and brine waters.

The EDTA titrant is employed in alkaline solution with a calmagite indicator. This method determines the combined calcium and magnesium concentration of a sample. If no magnesium is present, the end point of the titration normally appears sluggish. However, the reagent has been specially formulated to ensure a sharp end point regardless of the presence of magnesium. Results are expressed as ppm (mg/L) CaCO<sub>3</sub>.

## Visual Kits

Range: 50-500 ppm as CaCO<sub>3</sub>  
MDL: 50 ppm / Method: EGTA

Hardness (calcium) Titrets Kit, Shelf-life 8 months Cat# K-1705

Increments:  
50, 55, 60, 65, 70, 75, 80, 90, 100, 125, 150, 175, 200, 250, 350, 500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

Range: 100-1000 ppm as CaCO<sub>3</sub>  
MDL: 100 ppm / Method: EGTA

Hardness (calcium) Titrets Kit, Shelf-life 8 months Cat# K-1710

Increments:  
100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Indicator Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

Range: 2-20 ppm as CaCO<sub>3</sub>  
MDL: 2.0 ppm / Method: EDTA

Hardness (total) Titrets Kit Cat# K-4502

Increments:  
2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.6, 4.0, 5.0, 6.0, 7.0, 8.0, 10, 14, 20 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

Range: 20-200 ppm as CaCO<sub>3</sub>  
MDL: 20 ppm / Method: EDTA

Hardness (total) Titrets Kit Cat# K-4520

Increments:  
20, 22, 24, 26, 28, 30, 32, 36, 40, 50, 60, 70, 80, 100, 140, 200 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

Range: 100-1000 ppm as CaCO<sub>3</sub>  
MDL: 100 ppm / Method: EDTA

Hardness (total) Titrets Kit Cat# K-4585

Increments:  
100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

Range: 250-2500 ppm as CaCO<sub>3</sub>  
MDL: 250 ppm / Method: EDTA

Hardness (total) Titrets Kit Cat# K-4530

Increments:  
250, 275, 300, 325, 350, 375, 400, 450, 500, 625, 750, 875, 1000, 1250, 1750, 2500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Hardness

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Titrettor Pack (1 ea)         | A-0053 |

Instructions are posted on our website.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

# Hydrazine

## Method

References: ASTM D 1385-01, Hydrazine in Water. L. C. Thomas and G. J. Chamberlin, Colorimetric Chemical Analytical Methods, 8<sup>th</sup> ed., pp. 194-195, Method I (1974).

Hydrazine is a powerful reducing agent that is used in various chemical processes and in boiler water as an oxygen scavenger. To control corrosion, residual hydrazine typically is maintained in the 0.05 to 0.1 mg/L range. Higher levels may be used to guard against corrosion when the boiler is out of service for an extended period.

CHEMetrics' hydrazine test kits employ the PDMAB, paradimethylaminobenzaldehyde chemistry. PDMAB in acid solution reacts with hydrazine to form a yellow product. Results are expressed as ppm (mg/L)  $N_2H_4$ .



## Visual Kits

**Range: 0-50 ppb**  
MDL: 2 ppb / Method: PDMAB

|   | Cat#          |
|---|---------------|
| <b>ULR CHEMets Kit</b>  | <b>K-5011</b> |
| ULR CHEMets Refill, 30 ampoules   | R-5011        |
| Comparator, Shelf-life 2 years:<br>0, 2, 5, 10, 20, 30, 40, 50 ppb  | C-5011        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS. |               |

**Range: 0-0.5 ppm**  
MDL: 0.005 ppm / Method: PDMAB

|   | Cat#          |
|---|---------------|
| <b>CHEMets Kit</b>  | <b>K-5005</b> |
| CHEMets Refill, 30 ampoules   | R-5005        |
| Comparator, Shelf-life 2 years:<br>0, 0.01, 0.03, 0.05, 0.07, 0.1, 0.3, 0.5 ppm   | C-5005        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS. |               |

**Range: 0-12.5 ppm**  
MDL: 0.25 ppm / Method: PDMAB

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-5005D</b> |
| VACUettes Refill, 30 ampoules  | R-5005D        |
| Comparator, Shelf-life 2 years:<br>0, 0.25, 0.75, 1.25, 1.75, 2.5, 7.5, 12.5 ppm   | C-5005D        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS. |                |

**Range: 0-25 ppm**  
MDL: 0.5 ppm / Method: PDMAB

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-5005A</b> |
| VACUettes Refill, 30 ampoules  | R-5005A        |
| Comparator, Shelf-life 2 years:<br>0, 0.5, 1.5, 2.5, 3.5, 5, 15, 25 ppm  | C-5005A        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS. |                |

## Instrumental Kits

**Range: 0-50 ppm**  
MDL: 1 ppm / Method: PDMAB

| VACUettes Kit  | Cat#    |
|--|---------|
| VACUettes Refill, 30 ampoules  | R-5005B |
| Comparator, Shelf-life 2 years:<br>0, 1, 3, 5, 7, 10, 30, 50 ppm   | C-5005B |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS. |         |

**Range: 0-500 ppm**  
MDL: 10 ppm / Method: PDMAB

| VACUettes Kit  | Cat#    |
|--|---------|
| VACUettes Refill, 30 ampoules  | R-5005C |
| Comparator, Shelf-life 2 years:<br>0, 10, 30, 50, 70, 100, 300, 500 ppm  | C-5005C |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS. |         |

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: V-2000: 0.10-1.20 ppm / Spec: 0.070-0.700 ppm**  
Method: PDMAB

| Vacu-vials Kit  | Cat#   |
|---|--------|
| Vacu-vials Kit  | K-5003 |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS. |        |

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Components common to Hydrazine

| Description                     | Cat#   |
|---------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea)   | A-0013 |
| Micro Test Tube Pack (10 ea)    | A-0015 |
| Dilutor Snapper Cup Pack (6 ea) | A-0018 |
| Ampoule Blank Pack (5 ea)       | A-0023 |

**Instructions are posted on our website.**

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



# Hydrogen Peroxide

## Methods

Hydrogen peroxide is a strong oxidizing agent with a variety of uses. Applications include the treating of industrial effluents and domestic waste and serving as a disinfectant in aseptic packaging.

For the food and beverage industry, CHEMetrics Hydrogen Peroxide CHEMets® and Vacu-vials® products are used extensively to monitor sterilization solutions in the packaging and sanitizing processes.

### The Ferric Thiocyanate Method

**Reference:** D. F. Boltz and J. A. Howell, eds., *Colorimetric Determination of Nonmetals*, 2<sup>nd</sup> ed., Vol. 8, p. 304 (1978).

The ferric thiocyanate method consists of ammonium thiocyanate and ferrous iron in acid solution. Hydrogen peroxide oxidizes ferrous iron to the ferric state, resulting in the formation of a red thiocyanate complex. Chlorine will not interfere with this method. Ferric iron will interfere. Results are expressed as ppm (mg/L) H<sub>2</sub>O<sub>2</sub>.

### The DDPD Method

**Reference:** Developed by CHEMetrics, Inc.

With the DDPD Method, hydrogen peroxide reacts with DDPD in the presence of ammonium molybdate to form a purple product. Results are expressed as ppm (mg/L) H<sub>2</sub>O<sub>2</sub>.

### The Ceric Sulfate Titrimetric Method

**Reference:** Developed by CHEMetrics, Inc.

CHEMetrics developed a titrimetric method using ceric sulfate as the titrant and ferroin as the end point indicator. A color change from green to orange signals the end of the titration. Results are expressed as percent (%) H<sub>2</sub>O<sub>2</sub>.

### The Ceric Sulfate Go-No-Go Method

**Reference:** Developed by CHEMetrics, Inc.

Developed for clinical applications where hydrogen peroxide in sterilizing/disinfecting solutions with a MEC (minimum effective concentration) of 6.0 ± 1.0% must be monitored for efficacy. A single, small dose of sample is added to a screw cap vial containing ceric sulfate and the endpoint indicator ferroin.

An immediate color change occurs to signal that the hydrogen peroxide level in the sample is either above or below 6.0%.

## Visual Kits

**Range: 0-0.50 ppm**

MDL: 0.025 ppm / Method: DDPD

| CHEMetrics Kit   | Cat#                |
|--|---------------------|
| CHEMetrics Refill, 30 ampoules   | R-5504              |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years                     | A-2500 <sup>1</sup> |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years                     | A-5500 <sup>1</sup> |
| Comparator, Shelf-life 2 years:<br>0, 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.50 ppm | C-5504              |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, Activator Solutions, 25 mL sample cup, instructions, and MSDS.

**Range: 0-1 & 1-10 ppm**

MDL: 0.05 ppm /Method: Ferric Thiocyanate

| CHEMetrics Kit  | Cat#   |
|---|--------|
| CHEMetrics Refill, 30 ampoules  | R-5510 |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm | C-5501 |
| High Range Comparator, Shelf-life 2 years:<br>1, 2, 3, 4, 5, 6, 7, 8, 10 ppm          | C-5510 |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, 25 mL sample cup, instructions, and MSDS.

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.





**Range: 0-30 & 30-300 ppm**  
MDL: 5 ppm / Method: Ferric Thiocyanate

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-5510D</b> |
| VACUettes Refill, 30 ampoules  | R-5510D        |
| Low Range Comparator, Shelf-life 2 years:<br>0, 5, 7.5, 10, 15, 20, 25, 30 ppm             | C-5501D        |
| High Range Comparator, Shelf-life 2 years:<br>30, 60, 90, 120, 150, 175, 200, 250, 300 ppm | C-5510D        |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-1200 & 1200-12,000 ppm**  
MDL: 200 ppm / Method: Ferric Thiocyanate

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-5510C</b> |
| VACUettes Refill, 30 ampoules  | R-5510C        |
| Low Range Comparator, Shelf-life 2 years:<br>0, 200, 300, 400, 600, 800, 1000, 1200 ppm                    | C-5501C        |
| High Range Comparator, Shelf-life 2 years:<br>1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm | C-5510C        |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-60 & 60-600 ppm**  
MDL: 10 ppm / Method: Ferric Thiocyanate

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-5510A</b> |
| VACUettes Refill, 30 ampoules  | R-5510A        |
| Low Range Comparator, Shelf-life 2 years:<br>0, 10, 15, 20, 30, 40, 50, 60 ppm               | C-5501A        |
| High Range Comparator, Shelf-life 2 years:<br>60, 120, 180, 240, 300, 350, 400, 500, 600 ppm | C-5510A        |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 2-20%**  
MDL: 2.0% Method: Ceric Sulfate Titrant with Ferroin Indicator

|   | Cat#          |
|---|---------------|
| <b>Titrets Kit</b>  | <b>K-5530</b> |
| Increments:<br>2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.6, 4.0, 5.0, 6.0, 7.0, 8.0, 10, 14, 20% |               |

Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules with valve assemblies, dropper, titrettor, 50 mL sample cup, instructions, and MSDS.

**Range: 0-120 & 120-1200 ppm**  
MDL: 20 ppm / Method: Ferric Thiocyanate

|   | Cat#           |
|---|----------------|
| <b>VACUettes Kit</b>  | <b>K-5510B</b> |
| VACUettes Refill, 30 ampoules   | R-5510B        |
| Low Range Comparator, Shelf-life 2 years:<br>0, 20, 30, 40, 60, 80, 100, 120 ppm                | C-5501B        |
| High Range Comparator, Shelf-life 2 years:<br>120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm | C-5510B        |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 6.0% Control Point**  
Method: Ceric Sulfate Titrant with Ferroin Indicator

|                     | Cat#           |
|---------------------|----------------|
| <b>Go-No-Go Kit</b> | <b>K-5500C</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty 16-mm vials with caps, thirty pipettor tips, 100 uL pipettor, Indicator Solution, instructions, and MSDS.

## Go-No-Go Kit



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: 0.20-2.00 ppm**

Method: DDPD

|                | Cat#   |
|----------------|--------|
| Vacu-vials Kit | K-5503 |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solutions, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

**Range: V-2000: 0.15-6.00 ppm /Spec: 0.15-4.00 ppm**

Method: Ferric Thiocyanate

|                | Cat#   |
|----------------|--------|
| Vacu-vials Kit | K-5543 |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

### SAM Single-Analyte Photometer

(See page 15 for instrumental features)

**Range: 0.15-6.00 ppm**

Method: Ferric Thiocyanate

|                           | Cat#   |
|---------------------------|--------|
| Hydrogen Peroxide SAM Kit | I-2016 |

Vacu-vials Kit, 30 ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

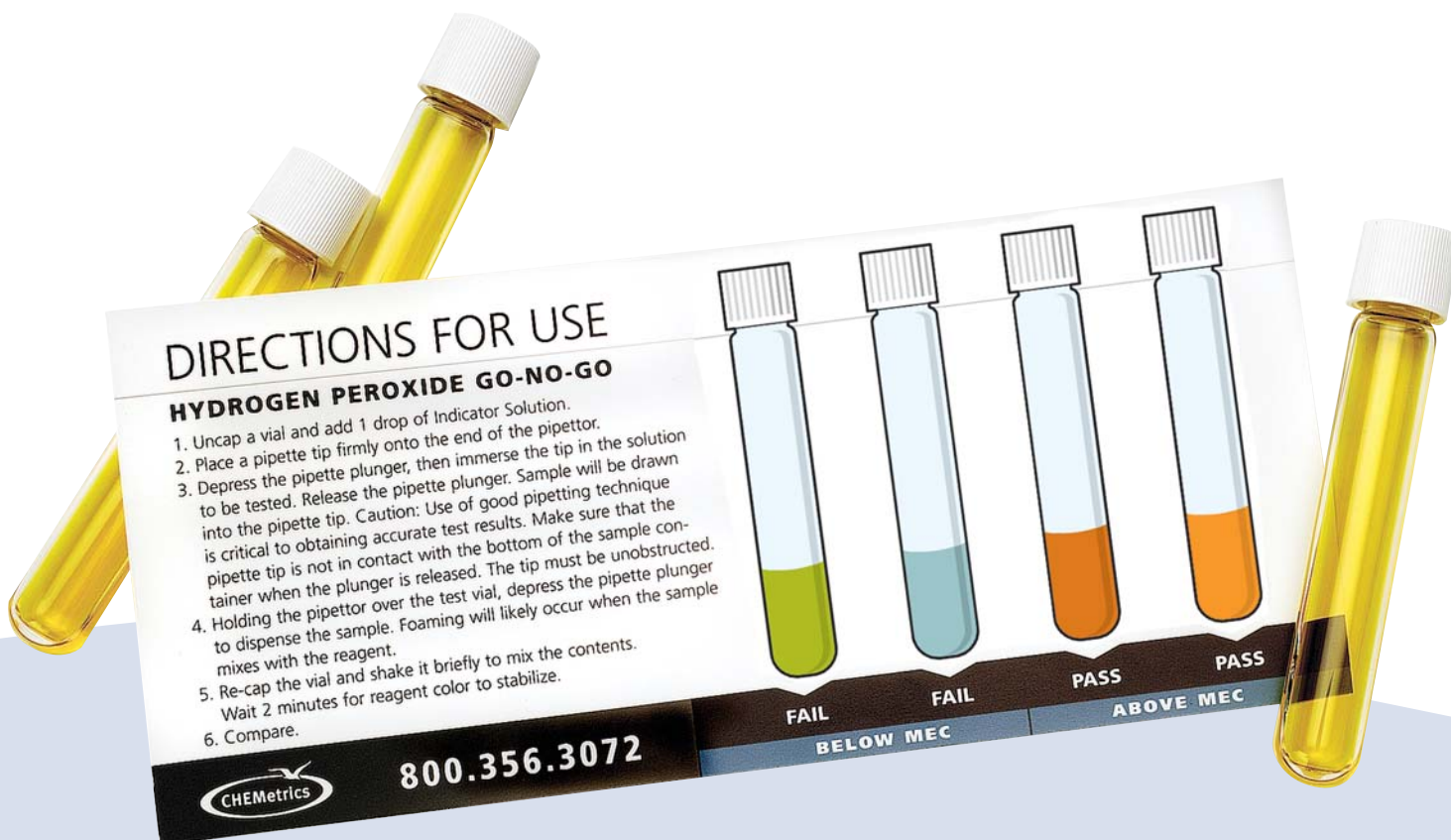
K-5543

SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, 2 AA batteries, and instructions.

#### Kit Components common to Hydrogen Peroxide

| Description                         | Cat#   |
|-------------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea)       | A-0013 |
| Mico Test Tube Pack (10 ea)         | A-0015 |
| Dilutor Snapper Cup Pack (6 ea)     | A-0018 |
| Ampoule Blank Pack (5 ea)           | A-0023 |
| Dropper Pack, 0.25 mL (10 ea)       | A-0029 |
| Titrettor Pack (1 ea)               | A-0053 |
| Sample Cup & Cap Pack, 50 mL (6 ea) | A-0058 |
| Pipettor Pack, 100 µL (1 ea)        | A-0170 |
| Pipettor Tips Pack, (30 ea)         | A-0171 |

*Instructions are posted on our website.*



**DIRECTIONS FOR USE**  
**HYDROGEN PEROXIDE GO-NO-GO**

1. Uncap a vial and add 1 drop of Indicator Solution.
2. Place a pipette tip firmly onto the end of the pipettor.
3. Depress the pipette plunger, then immerse the tip in the solution to be tested. Release the pipette plunger. Sample will be drawn into the pipette tip. Caution: Use of good pipetting technique is critical to obtaining accurate test results. Make sure that the pipette tip is not in contact with the bottom of the sample container when the plunger is released. The tip must be unobstructed.
4. Holding the pipettor over the test vial, depress the pipette plunger to dispense the sample. Foaming will likely occur when the sample mixes with the reagent.
5. Re-cap the vial and shake it briefly to mix the contents. Wait 2 minutes for reagent color to stabilize.
6. Compare.

**800.356.3072**

**CHEMetrics**

**FAIL** **FAIL** **PASS** **PASS**

**BELOW MEC** **ABOVE MEC**

## Methods

### Iron (total & soluble; total & ferrous)

References: APHA Standard Methods, 20<sup>th</sup> ed., pp. 3-76, Method 3500-Fe B (1998). ASTM D 1068-77, Iron in Water, Test Method A.

Iron is present in nature in the form of its oxides, or in combination with silicon or sulfur. The soluble iron content of surface waters rarely exceeds 1 mg/L, while ground waters often contain higher concentrations. The National Secondary Drinking Water Standard for iron is 0.3 mg/L, as iron concentrations in excess of 0.3 mg/L impart a foul taste and cause staining. High concentrations in surface waters can indicate the presence of industrial effluents or runoff.

With the CHEMetrics tests, ferrous iron reacts with 1,10-phenanthroline to form an orange-colored chelate. To determine total iron, thioglycolic acid solution is added to reduce ferric iron to the ferrous state. The reagent formulation minimizes interferences from various metals. Results are expressed as ppm (mg/L) Fe.

### Iron (total)

Reference: J. A. Tetlow and A. L. Wilson, "Determination of Iron in Boiler Feedwater," *Analyst*, 1958.

CHEMetrics' colorimetric method for determining total iron uses thioglycolic acid to dissolve particulate iron and to reduce iron from the ferric to the ferrous state. Ferrous iron then reacts with PDTs (3-(2-pyridyl)-5,6-bis(4-phenylsulfonic acid)-1,2,4-triazine disodium salt) in acid solution to form a purple-colored chelate. Results are expressed as ppm (mg/L) Fe.

### Iron in Brine

Reference: D. F. Boltz and J. A. Howell, eds., *Colorimetric Determination of Nonmetals*, 2<sup>nd</sup> ed., Vol. 8, p. 304 (1978).

Iron contamination in oil field brines are typically a result of corrosion processes of iron-containing metallic components and equipment. Accumulation of insoluble iron salts in a brine completion fluid can result in substantial formation damage and can significantly affect the productivity of an oil well. Quantifying total iron in brine is critical.

The Iron in Brine test method employs the ferric thiocyanate chemistry. In an acidic solution, hydrogen peroxide oxidizes ferrous iron. The resulting ferric iron reacts with ammonium thiocyanate forming a red-orange colored thiocyanate complex, in direct

proportion to the iron concentration.

The method expresses total iron content in units of mg/L. By simply dividing the measured mg/L by the density of the brine expressed in units of kg/L, the ppm value can be obtained in mg/kg.

## Visual Kits

**Range: 0-1 & 1-10 ppm**  
MDL: 0.05 ppm / Method: Phenanthroline

|   | Cat#                |
|---|---------------------|
| <b>Iron (total &amp; ferrous) CHEMetrics Kit</b>  | <b>K-6210</b>       |
| CHEMetrics Refill, 30 ampoules  | R-6201              |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-6000 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm   | C-6001              |
| High Range Comparator, Shelf-life 2 years:<br>1, 2, 3, 4, 5, 6, 7, 8, 10 ppm  | C-6010              |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS. |                     |

**Range: 0-1 & 1-10 ppm**  
MDL: 0.05 ppm / Method: Phenanthroline

|   | Cat#                |
|---|---------------------|
| <b>Iron (total &amp; soluble) CHEMetrics Kit</b>  | <b>K-6010</b>       |
| CHEMetrics Refill, 30 ampoules  | R-6001              |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-6000 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm   | C-6001              |
| High Range Comparator, Shelf-life 2 years:<br>1, 2, 3, 4, 5, 6, 7, 8, 10 ppm  | C-6010              |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS. |                     |

**Range: 0-30 & 30-300 ppm**  
MDL: 5 ppm / Method: Phenanthroline

|   | Cat#                |
|---|---------------------|
| <b>Iron (total &amp; soluble) VACUettes Kit</b>   | <b>K-6010D</b>      |
| VACUettes Refill, 30 ampoules   | R-6001D             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-6000 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 5, 7.5, 10, 15, 20, 25, 30 ppm  | C-6001D             |
| High Range Comparator, Shelf-life 2 years:<br>30, 60, 90, 120, 150, 175, 200, 250, 300 ppm  | C-6010D             |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, 5 mL sample cup and top, instructions, and MSDS. |                     |

## Iron Continued

| Range: 0-60 & 60-600 ppm<br>MDL: 10 ppm / Method: Phenanthroline  |                         |
|---|-------------------------|
| <b>Iron (total &amp; soluble) VACUettes Kit</b>   | <b>Cat#<br/>K-6010A</b> |
| VACUettes Refill, 30 ampoules   | R-6001A                 |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-6000 <sup>1</sup>     |
| Low Range Comparator, Shelf-life 2 years:<br>0, 10, 15, 20, 30, 40, 50, 60 ppm  | C-6001A                 |
| High Range Comparator, Shelf-life 2 years:<br>60, 120, 180, 240, 300, 350, 400, 500, 600 ppm  | C-6010A                 |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, 5 mL sample cup and top, instructions, and MSDS. |                         |

| Range: 0-1200 & 1200-12,000 ppm<br>MDL: 200 ppm / Method: Phenanthroline  |                         |
|---|-------------------------|
| <b>Iron (total &amp; soluble) VACUettes Kit</b>   | <b>Cat#<br/>K-6010C</b> |
| VACUettes Refill, 30 ampoules   | R-6001C                 |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-6000 <sup>1</sup>     |
| Low Range Comparator, Shelf-life 2 years:<br>0, 200, 300, 400, 600, 800, 1000, 1200 ppm   | C-6001C                 |
| High Range Comparator, Shelf-life 2 years:<br>1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm  | C-6010C                 |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, 5 mL sample cup and top, instructions, and MSDS. |                         |

| Range: 0-120 & 120-1200 ppm<br>MDL: 20 ppm / Method: Phenanthroline   |                         |
|---|-------------------------|
| <b>Iron (total &amp; soluble) VACUettes Kit</b>   | <b>Cat#<br/>K-6010B</b> |
| VACUettes Refill, 30 ampoules   | R-6001B                 |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-6000 <sup>1</sup>     |
| Low Range Comparator, Shelf-life 2 years:<br>0, 20, 30, 40, 60, 80, 100, 120 ppm  | C-6001B                 |
| High Range Comparator, Shelf-life 2 years:<br>120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm   | C-6010B                 |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, 5 mL sample cup and top, instructions, and MSDS. |                         |

| Range: 0-100 & 100-1000 mg/L<br>MDL: 5 mg/L / Method: Ferric Thiocyanate   |                        |
|--|------------------------|
| <b>Iron in Brine CHEMets Kit</b>   | <b>Cat#<br/>K-6002</b> |
| CHEMets Refill, 30 ampoules  | R-6002                 |
| Acidifier Solution Pack, six 60 mL bottles, Shelf-life 2 years   | A-6001 <sup>1</sup>    |
| Activator Solution Pack, six 20 mL bottles, Shelf-life 2 years   | A-6002 <sup>1</sup>    |
| Low Range Comparator, Shelf-life 2 years:<br>0, 10, 20, 30, 40, 60, 80, 100 mg/L   | C-6002                 |
| High Range Comparator, Shelf-life 2 years:<br>100, 200, 300, 400, 500, 600, 700, 800, 1000 mg/L  | C-6012                 |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Acidifier Solution, Activator Solution, 50 mL sample cup with cap, 1.0 mL syringe (2 ea), instructions, and MSDS. |                        |

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*





## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: 0.10-2.50 ppm**  
Method: PDTs

**Iron (total) Vacu-vials Kit**

**Cat#**  
**K-6023**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

**Range: 0.20-6.00 ppm**  
Method: Phenanthroline

**Iron (total & ferrous) Vacu-vials Kit**

**Cat#**  
**K-6203**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

**Range: 0.20-6.00 ppm**  
Method: Phenanthroline

**Iron (total & soluble) Vacu-vials Kit**

**Cat#**  
**K-6003**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

**Range: 1.0-25.0 ppm**  
Method: Phenanthroline

**Iron (total & soluble) Vacu-vials Kit**

**Cat#**  
**K-6013**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Components common to Iron

| Description                         | Cat#   |
|-------------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea)       | A-0013 |
| Micro Test Tube Pack (10 ea)        | A-0015 |
| Dilutor Snapper Cup Pack (6 ea)     | A-0018 |
| Ampoule Blank Pack (5 ea)           | A-0023 |
| Syringe Pack, 1.0 mL (6 ea)         | A-0027 |
| Sample Cup & Cap Pack, 50 mL (6 ea) | A-0058 |
| Sample Cup & Top Pack, 5 mL (6 ea)  | A-0105 |

**The accessory pack supplies enough solution to perform at least 200 CHEMet or Vacu-vial tests and 42 VACUette tests. A-6000, Activator Solution, is required for total iron analysis only.**

*Instructions are posted on our website.*



# Manganese

## Method

**Reference:** APHA Standard Methods, 14<sup>th</sup> ed. p. 227, Method 314 C (1975).

Surface and ground waters rarely contain more than 1 mg/L of soluble or suspended manganese. Manganese can act as an oxidizing or a reducing agent depending on its valence state. Manganese is also used in the manufacture of batteries and as an alloying metal in the manufacture of steel and aluminum. The National Secondary Drinking Water Standard for manganese is 0.05 mg/L, as higher concentrations will impart a foul taste to water and discolor laundry and porcelain surfaces.

CHEMetrics' tests employ the periodate chemistry that measures soluble manganese compounds but does not differentiate the various valence states. Results are expressed as ppm (mg/L) Mn.

## Visual Kits

**Range: 0-2 ppm**  
MDL: 0.15 ppm / Method: Periodate

|   | Cat#                |
|---|---------------------|
| <b>CHEMets Kit</b>  | <b>K-6502</b>       |
| CHEMets Refill, 30 ampoules   | R-6502              |
| Activator Solution Pack, six 20 mL bottles, Shelf-life 2 years  | A-6500 <sup>1</sup> |
| Comparator, Shelf-life 1 year:<br>0, 0.3, 0.6, 0.8, 1.0, 1.5, 1.8, 2.0 ppm  | C-6502              |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, Activator Solution, 5 mL sample cup with top, instructions, and MSDS. |                     |

**Range: 0-50 ppm**  
MDL: 7.5 ppm / Method: Periodate

|  | Cat#                |
|--|---------------------|
| <b>VACUettes Kit</b>   | <b>K-6502D</b>      |
| VACUettes Refill, 30 ampoules  | R-6502D             |
| Activator Solution Pack, six 20 mL bottles, Shelf-life 2 years   | A-6500 <sup>1</sup> |
| Comparator, Shelf-life 1 year:<br>0, 7.5, 15, 20, 25, 37.5, 45, 50 ppm   | C-6502D             |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, Activator Solution, dilutor snapper cup, micro test tube, instructions, and MSDS. |                     |

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: 1.0-30.0 ppm**  
Method: Periodate

|                       | Cat#          |
|-----------------------|---------------|
| <b>Vacu-vials Kit</b> | <b>K-6503</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, 1.0 mL syringe, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to Manganese

| Description                          | Cat#   |
|--------------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea)        | A-0013 |
| Micro Test Tube Pack (10 ea)         | A-0015 |
| Dilutor Snapper Cup Pack (6 ea)      | A-0018 |
| Ampoule Blank Pack (5 ea)            | A-0023 |
| Syringe Pack, 1.0 mL (6 ea)          | A-0027 |
| Sample Cup and Top Pack, 5 mL (6 ea) | A-0105 |

*Instructions are posted on our website.*



# Mercaptobenzothiazole (MBT)

## Method

**Reference:** Developed by CHEMetrics, Inc.

Mercaptobenzothiazole (MBT) is formulated with various water treatment products to prevent corrosion of copper and copper-containing metals. These tests are particularly well suited to the monitoring of closed-loop cooling water systems and utility condensers where high MBT concentrations are usually maintained.

CHEMetrics employs a titrimetric chemistry in which MBT is titrated with potassium permanganate in an acidic medium. No additional end point indicator is required. A color change from dark pink to colorless signals the end of the titration. Results are expressed as ppm (mg/L) MBT.



## Visual Kits

**Range: 50-500 ppm**  
MDL: 50 ppm Method: Permanganate

|                    | Cat#          |
|--------------------|---------------|
| <b>Titrets Kit</b> | <b>K-6810</b> |

Increments:  
50, 55, 60, 65, 70, 75, 80, 90, 100, 125, 150, 175, 200, 250, 350, 500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to MBT

| Description                    | Cat#   |
|--------------------------------|--------|
| Sample Cup Pack , 25 mL (6 ea) | A-0013 |
| Titrettor Pack (1 ea)          | A-0053 |

*Instructions are posted on our website.*

# Molybdate

## Method

References: G. P. Haight and V. Paragamian, *Analytical Chemistry*, pp. 32, 642 (1960). H. Onishi and E. B. Sandell, *Photometric Determination of Trace Metals*, 4<sup>th</sup> ed., Part 1, p. 295 (1978).

Molybdate is used throughout the industrial water treatment and power generation industries as a corrosion inhibitor in both open- and closed-loop cooling water systems. In solution, molybdate anions complex with oxidized iron to form a protective film of molybdate and ferric-oxide. Molybdate is considered an effective, environmentally acceptable alternative to chromate treatment. Unlike many other transition elements, molybdenum exhibits low or even negligible toxicity.

The molybdate test method employs the catechol chemistry. In a mildly reducing alkaline solution, catechol reacts with hexavalent molybdenum to form a yellow-orange colored chelate in direct proportion to the hexavalent molybdenum concentration. Test results are expressed in ppm (mg/L) molybdenum (Mo).

## Visual Kits

**Range: 0-7 ppm as Mo**  
MDL: 0.5 ppm / Method: Catechol

|   | Cat#          |
|---|---------------|
| <b>CHEMets Kit</b>  | <b>K-6701</b> |
| CHEMets Refill, 30 ampoules                                   | R-6702        |
| Comparator, Shelf-life 2 years:<br>0, 1, 2, 3, 4, 5, 6, 7 ppm | C-6701        |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.

**Range: 2-24 ppm as Mo**  
MDL: 2 ppm / Method: Catechol

|   | Cat#          |
|---|---------------|
| <b>CHEMets Kit</b>  | <b>K-6702</b> |
| CHEMets Refill, 30 ampoules   | R-6702        |
| Comparator, Shelf-life 2 years:<br>2, 4, 6, 8, 10, 12, 16, 20, 24 ppm | C-6702        |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.

**Range: 20-200 ppm as Mo**  
MDL: 20 ppm / Method: Catechol

|  | Cat#          |
|--|---------------|
| <b>CHEMets Kit</b>   | <b>K-6720</b> |
| CHEMets Refill, 30 ampoules  | R-6720        |
| Comparator, Shelf-life 2 years:<br>20, 40, 60, 80, 100, 120, 140, 160, 200 ppm | C-6720        |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.

## Instrumental Kits

**V-2000 Multi-Analyte Photometer**  
(See page 12 for instrumental features)

**Range: 1.0-25.0 ppm as Mo**  
Method: Catechol

|                       | Cat#          |
|-----------------------|---------------|
| <b>Vacu-vials Kit</b> | <b>K-6703</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

## Kit Components common to Molybdate

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Ampoule Blank Pack (5 ea)     | A-0023 |

**Instructions are posted on our website.**

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*





# Nitrate

## Methods

Nitrate is the most completely oxidized form of nitrogen. It is formed during the final stages of biological decomposition, either in wastewater treatment facilities or in natural water supplies. Low-level nitrate concentrations may be present in natural waters. However, a Maximum Contaminant Level of 10 ppm nitrate-nitrogen has been established for drinking water by the USEPA.

### The Cadmium Reduction Method

References: ASTM D 3867-04, Nitrate-Nitrite in Water, Test Method B. APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-117, Method 4500-NO<sub>3</sub><sup>-</sup> E (1998). USEPA Methods for Chemical Analysis of Water and Wastes, Method 353.3 (1983).

Nitrate is reduced to nitrite using cadmium as the reducing agent. The resulting nitrite concentration is then determined colorimetrically. This method is applicable to drinking and surface waters, as well as domestic and industrial wastes. Nitrite will interfere with this test. Results are expressed as ppm (mg/L) NO<sub>3</sub>-N or NO<sub>3</sub>.



## Visual Kits

**Range: 0-3.0 ppm as N**  
MDL: 0.25 ppm / Method: Cadmium Reduction

|  | Cat#          |
|--|---------------|
| <b>CHEMets Kit</b>   | <b>K-6904</b> |
| CHEMets Refill, 30 ampoules and 30 cadmium foil packs  | R-6902        |
| Comparator, Shelf-life 2 years:<br>0, 0.25, 0.5, 0.75, 1.0, 1.25, 1.5, 2.0, 3.0 ppm  | C-6904        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, reaction tube, instructions, and MSDS. |               |

**Range: 0-90 ppm as N**  
MDL: 7.5 ppm / Method: Cadmium Reduction

|   | Cat#           |
|---|----------------|
| <b>VACUettes Kit</b>  | <b>K-6904D</b> |
| VACUettes Refill, 30 ampoules and 30 cadmium foil packs   | R-6902D        |
| Comparator, Shelf-life 2 years:<br>0, 7.5, 15, 22.5, 30, 37.5, 45, 60, 90 ppm   | C-6904D        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, 5 mL sample cup with top, instructions, and MSDS. |                |

**Range: 0-180 ppm as N**  
MDL: 15 ppm / Method: Cadmium Reduction

|   | Cat#           |
|---|----------------|
| <b>VACUettes Kit</b>  | <b>K-6904A</b> |
| VACUettes Refill, 30 ampoules and 30 cadmium foil packs   | R-6902A        |
| Comparator, Shelf-life 2 years:<br>0, 15, 30, 45, 60, 75, 90, 120, 180 ppm  | C-6904A        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, 5 mL sample cup with top, instructions, and MSDS. |                |

**Range: 0-360 ppm as N**  
MDL: 30 ppm / Method: Cadmium Reduction

|   | Cat#           |
|---|----------------|
| <b>VACUettes Kit</b>  | <b>K-6904B</b> |
| VACUettes Refill, 30 ampoules and 30 cadmium foil packs   | R-6902B        |
| Comparator, Shelf-life 2 years:<br>0, 30, 60, 90, 120, 150, 180, 240, 360 ppm   | C-6904B        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, 5 mL sample cup with top, instructions, and MSDS. |                |

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: 0.20-1.50 ppm as N**  
Method: Cadmium Reduction

**Vacu-vials Kit** **Cat#**  
**K-6903**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, thirty cadmium foil packs, 25 mL sample cup, sample cup top, ampoule blank, instructions, calibration table, and MSDS.

**Range: 0.20-3.00 ppm as N**  
Method: Cadmium Reduction

**Vacu-vials Kit** **Cat#**  
**K-6923**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, thirty cadmium foil packs, 25 mL sample cup, sample cup top, ampoule blank, instructions, calibration table, and MSDS.

**Range: 10.0-60.0 ppm as NO<sub>3</sub>**  
Method: Cadmium Reduction

**Vacu-vials Kit** **Cat#**  
**K-6933**

Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules, thirty cadmium foil packs, 25 mL sample cup, sample cup top, 3.0 mL syringe, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to Nitrate

| Description                              | Cat#   |
|--|--------|
| Sample Cup Pack, 25 mL (6 ea)            | A-0013 |
| Sample Cup Top Pack for 25 mL Cup (6 ea) | A-0014 |
| Dilutor Snapper Cup Pack (6 ea)          | A-0018 |
| Ampoule Blank Pack (5 ea)                | A-0023 |
| Syringe Pack, 3.0 mL (6 ea)              | A-0063 |
| Sample Cup & Top Pack, 5 mL (6 ea)       | A-0105 |
| Reaction Tube Pack, (6 ea)               | A-0187 |

*Instructions are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Methods

Nitrite, an intermediate in the nitrogen cycle, is formed during the decomposition of organic matter but readily oxidizes to form nitrate. These processes occur in wastewater treatment plants, water distribution systems, and natural waters. Nitrites are useful as corrosion inhibitors, preservatives, pigments, and in manufacturing many organic preservative chemicals. A Maximum Contaminant Level of 1 mg/L has been established by the USEPA for nitrite-nitrogen in drinking water.

### Azo Dye Formation Method

**Reference:** APHA Standard Methods, 20<sup>th</sup>. ed., pp. 4-112, Method 4500-NO<sub>2</sub><sup>-</sup>B (1998). USEPA Methods for Chemical Analysis of Water and Wastes, Method 354.1 (1983).

Test kits containing CHEMets<sup>®</sup>, VACUettes<sup>®</sup>, or Vacu-vials<sup>®</sup> ampoules are based on a colorimetric chemistry in which nitrite reacts to form a pink azo dye. The intensity of the color is directly proportional to the concentration of nitrite in the sample. Nitrate will **not** interfere. Results are expressed as ppm (mg/L) NO<sub>2</sub>-N.

### The Ceric Sulfate Titrimetric Method

**Reference:** Developed by CHEMetrics, Inc.

CHEMetrics' method is particularly applicable to systems that contain nitrite corrosion inhibitors in the presence of glycol. Ceric sulfate is the titrant and ferroin is the end point indicator. The method is free from glycol interference in samples that contain up to 75% glycol. Results are expressed as ppm (mg/L) NaNO<sub>2</sub>.



## Visual Kits

**Range: 0-2 ppm as N**  
MDL: 0.25 ppm / Method: Azo Dye Formation

|   | Cat#          |
|---|---------------|
| <b>CHEMets Kit</b>  | <b>K-7004</b> |
| CHEMets Refill, 30 ampoules   | R-7002        |
| Comparator, Shelf-life 2 years:<br>0, 0.25, 0.5, 0.75, 1.0, 1.25, 1.5, 1.75, 2.0 ppm  | C-7004        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS. |               |

**Range: 0-55 ppm as N**  
MDL: 8 ppm / Method: Azo Dye Formation

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-7004D</b> |
| VACUettes Refill, 30 ampoules  | R-7002D        |
| Comparator, Shelf-life 2 years:<br>0, 8, 15, 22.5, 30, 37.5, 45, 50, 55 ppm  | C-7004D        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS. |                |

**Range: 0-110 ppm as N**  
MDL: 15 ppm / Method: Azo Dye Formation

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-7004A</b> |
| VACUettes Refill, 30 ampoules  | R-7002A        |
| Comparator, Shelf-life 2 years:<br>0, 15, 30, 45, 60, 75, 90, 100, 110 ppm   | C-7004A        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS. |                |

**Range: 0-220 ppm as N**  
MDL: 30 ppm / Method: Azo Dye Formation

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-7004B</b> |
| VACUettes Refill, 30 ampoules  | R-7002B        |
| Comparator, Shelf-life 2 years:<br>0, 30, 60, 90, 120, 145, 170, 195, 220 ppm  | C-7004B        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS. |                |

## Instrumental Kits

|  |                     |
|--|---------------------|
| <b>Range: 0-2200 ppm as N</b><br>MDL: 300 ppm / Method: Azo Dye Formation  |                     |
| <b>VACUettes Kit</b>   | <b>Cat# K-7004C</b> |
| VACUettes Refill, 30 ampoules  | R-7002C             |
| Comparator, Shelf-life 2 years:<br>0, 300, 600, 900, 1200, 1450, 1700, 1950, 2200 ppm  | C-7004C             |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Comparator, dilutor snapper cup, micro test tube, instructions, and MSDS. |                     |

|  |                    |
|--|--------------------|
| <b>Range: 250-2500 ppm as NaNO<sub>2</sub></b><br>MDL: 250 ppm / Method: Ceric Sulfate Titrant with Ferroin Indicator  |                    |
| <b>Titrets Kit</b>   | <b>Cat# K-7025</b> |
| Increments:<br>250, 275, 300, 325, 350, 375, 400, 450, 500, 625, 750, 875, 1000, 1250, 1750, 2500 ppm  |                    |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS. |                    |

|  |                    |
|--|--------------------|
| <b>Range: 500-5000 ppm as NaNO<sub>2</sub></b><br>MDL: 500 ppm / Method: Ceric Sulfate Titrant with Ferroin Indicator  |                    |
| <b>Titrets Kit</b>   | <b>Cat# K-7050</b> |
| Increments:<br>500, 550, 600, 650, 700, 750, 800, 900, 1000, 1250, 1500, 1750, 2000, 2500, 3500, 5000 ppm  |                    |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS. |                    |

### V-2000 Multi-Analyte Photometer (See page 12 for instrumental features)

**Range: 0.080-0.800 ppm as N**  
Method: Azo Dye Formation

**Vacu-vials Kit** **Cat# K-7003**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

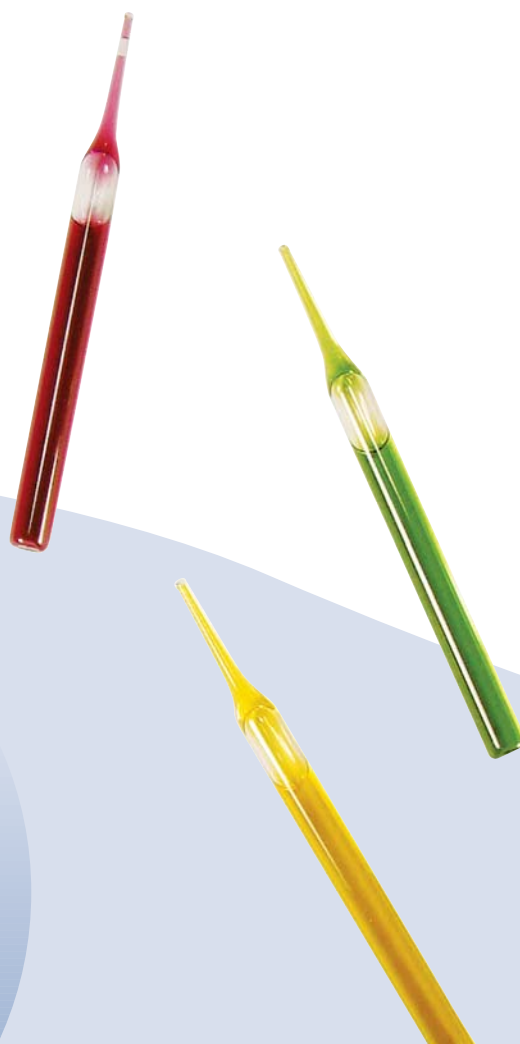
*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Components common to Nitrite

| Description                     | Cat#   |
|---------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea)   | A-0013 |
| Micro Test Tube Pack (10 ea)    | A-0015 |
| Dilutor Snapper Cup Pack (6 ea) | A-0018 |
| Ampoule Blank Pack (5 ea)       | A-0023 |
| Titrettor Pack (1 ea)           | A-0053 |

*Instructions are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



# Oxygen (dissolved)

## Methods

The level of dissolved oxygen in natural waters is often a direct indication of quality, since aquatic plants produce oxygen, while microorganisms generally consume it as they feed on pollutants. At low temperatures the solubility of oxygen is increased; during summer, saturation levels can be as low as 4 ppm. Dissolved oxygen (D.O.) is essential for the support of fish and other aquatic life and aids in the natural decomposition of organic matter. Waste treatment plants that employ aerobic digestion must maintain a level of at least 2 ppm dissolved oxygen.

At elevated temperatures, oxygen is highly corrosive to metals, causing *pitting* in ferrous systems such as high-pressure boilers and deep well oil recovery equipment. To prevent costly corrosion damage, the liquids in contact with the metal surfaces must be treated, usually by a combination of physical and chemical means. Deaeration can reduce the dissolved oxygen concentration of boiler feedwater from several ppm to a few ppb. Chemical reducing agents such as hydrazine, DEHA, or sodium sulfite, may be used instead of or in conjunction with deaeration.

### The Indigo Carmine Method

References: ASTM D 888-87, Colorimetric Indigo Carmine, Test Method A. Gilbert, T. W., Behymer, T. D., Castañeda, H. B., "Determination of Dissolved Oxygen in Natural and Wastewaters," *American Laboratory*, March 1982, pp. 119-134.

Test kits for environmental and drinking water applications (ppm range) employ the indigo carmine method. The reduced form of indigo carmine reacts with D.O. to form a blue product. The indigo carmine methodology is not subject to interferences from temperature, salinity, or dissolved gases such as sulfide, which plague users of D.O. meters. Results are expressed as ppm (mg/L) O<sub>2</sub>.

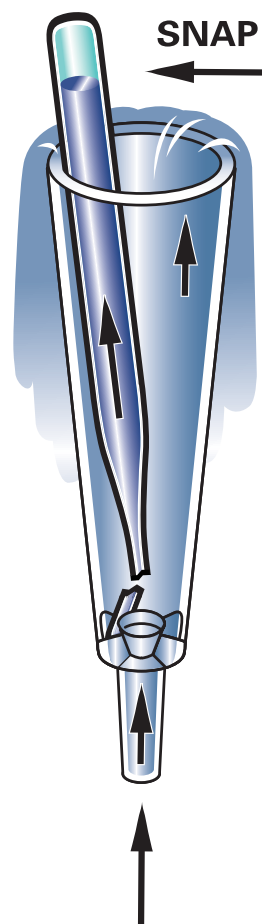
### The Rhodazine D™ Method

References: Developed by CHEMetrics, Inc. ASTM Power Plant Manual, 1<sup>st</sup> ed. p. 169 (1984). ASTM D 5543-94 (2005), Low Level Dissolved Oxygen in Water, Test Method A.

Test kits for boiler waters and applications requiring trace levels of D.O. (ppb range) employ the Rhodazine D methodology. Developed by CHEMetrics, Inc., and

approved by ASTM as the reference method for ppb D.O. determination, the Rhodazine D compound in reduced form reacts with dissolved oxygen to form a bright pink reaction product. The method is not subject to salinity or dissolved gas interferences. Oxidizing agents, including benzoquinone, can cause high results. Reducing agents such as hydrazine and sulfite do not interfere. Results are expressed as ppm (mg/L) or ppb (µg/L) O<sub>2</sub>.

Low-range dissolved oxygen test kits include a special *sampling tube* (diagram) for use with boiler feedwater. This device allows the user to break the tip of the ampoule in a flowing sample stream in order to preclude error from contamination by atmospheric oxygen.



## Visual Kits

| Range: 0-20 ppb<br>MDL: 1 ppb / Method: Rhodazine D   |               |
|---|---------------|
|   | <b>Cat#</b>   |
| <b>ULR CHEMets Kit</b>  | <b>K-7511</b> |
| ULR CHEMets Refill, 30 ampoules   | R-7511        |
| Comparator, Shelf-life 2 years:<br>0, 2, 4, 6, 8, 12, 16, 20 ppb  | C-7511        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, adhesive mounting clamp, permanent mounting clamp, sampling tube, instructions, and MSDS. |               |

| Range: 5-180 ppb<br>MDL: 5 ppb / Method: Rhodazine D  |               |
|---|---------------|
|   | <b>Cat#</b>   |
| <b>CHEMets Kit</b>  | <b>K-7518</b> |
| CHEMets Refill, 30 ampoules   | R-7518        |
| Comparator, Shelf-life 2 years:<br>5, 20, 40, 60, 80, 110, 140, 180 ppb   | C-7518        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, adhesive mounting clamp, permanent mounting clamp, sampling tube, instructions, and MSDS. |               |

| Range: 0-40 ppb<br>MDL: 2.5 ppb / Method: Rhodazine D   |               |
|---|---------------|
|   | <b>Cat#</b>   |
| <b>CHEMets Kit</b>  | <b>K-7540</b> |
| CHEMets Refill, 30 ampoules   | R-7540        |
| Comparator, Shelf-life 2 years:<br>0, 5, 10, 15, 20, 25, 30, 40 ppb   | C-7540        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, adhesive mounting clamp, permanent mounting clamp, sampling tube, instructions, and MSDS. |               |

| Range: 0-1 ppm<br>MDL: 0.025 ppm / Method: Rhodazine D  |               |
|---|---------------|
|   | <b>Cat#</b>   |
| <b>CHEMets Kit</b>  | <b>K-7501</b> |
| CHEMets Refill, 30 ampoules   | R-7501        |
| Comparator, Shelf-life 2 years:<br>0, 0.05, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm   | C-7501        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, adhesive mounting clamp, permanent mounting clamp, sampling tube, 25 mL sample cup, instructions, and MSDS. |               |

| Range: 0-100 ppb<br>MDL: 5 ppb / Method: Rhodazine D  |               |
|---|---------------|
|   | <b>Cat#</b>   |
| <b>CHEMets Kit</b>  | <b>K-7599</b> |
| CHEMets Refill, 30 ampoules   | R-7540        |
| Comparator, Shelf-life 2 years:<br>0, 10, 20, 30, 40, 60, 80, 100 ppb   | C-7599        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, adhesive mounting clamp, permanent mounting clamp, sampling tube, instructions, and MSDS. |               |

| Range: 1-12 ppm<br>MDL: 1 ppm / Method: Indigo Carmine  |               |
|---|---------------|
|   | <b>Cat#</b>   |
| <b>CHEMets Kit</b>  | <b>K-7512</b> |
| CHEMets Refill, 30 ampoules   | R-7512        |
| Comparator, Shelf-life 2 years:<br>1, 2, 3, 4, 5, 6, 8, 10, 12 ppm  | C-7512        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS. |               |

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: V-2000: 0.100-1.400 ppm / Spec: 100-800 ppb**  
Method: Rhodazine D

|                       |                              |
|-----------------------|------------------------------|
| <b>Vacu-vials Kit</b> | <b>Cat#</b><br><b>K-7553</b> |
|-----------------------|------------------------------|

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, sampling tube, adhesive mounting clamp, permanent mounting clamp, ampoule blank, instructions, calibration table, and MSDS.

**Range: 0.20-2.00 ppm**  
Method: Indigo Carmine

|                       |                              |
|-----------------------|------------------------------|
| <b>Vacu-vials Kit</b> | <b>Cat#</b><br><b>K-7503</b> |
|-----------------------|------------------------------|

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, sampling tube, adhesive mounting clamp, permanent mounting clamp, ampoule blank, instructions, calibration table, and MSDS.

**Range: 2.0-15.0 ppm**  
Method: Indigo Carmine

|                       |                              |
|-----------------------|------------------------------|
| <b>Vacu-vials Kit</b> | <b>Cat#</b><br><b>K-7513</b> |
|-----------------------|------------------------------|

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### SAM Single-Analyte Photometers

(See page 15 for instrumental features)

**Range: 2.0-15.0 ppm**  
Method: Indigo Carmine

|                |                              |
|----------------|------------------------------|
| <b>SAM Kit</b> | <b>Cat#</b><br><b>I-2002</b> |
|----------------|------------------------------|

Vacu-vials Kit, 30 ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

K-7513

SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, 2 AA batteries, and instructions.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

#### Kit Components common to Oxygen

| Description                           | Cat#   |
|---------------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea)         | A-0013 |
| Sampling Tube Pack (3 ea)             | A-0020 |
| Mounting Clamp Pack, Adhesive (6 ea)  | A-0022 |
| Ampoule Blank Pack (5 ea)             | A-0023 |
| Mounting Clamp Pack, Permanent (6 ea) | A-0034 |

*Instructions are posted on our website.*



## Methods

Ozone is a strong oxidizing agent and is used as an alternative to chlorine as a biocide in the disinfection of drinking water. Ozone is used to remove odor, decolorize, and to control algae and other aquatic growths.

Ozone is also used in various disinfectant/sterilization processes in the food & beverage and pharmaceutical industries.

### The DDPD Method

**Reference:** Developed by CHEMetrics, Inc.

The DDPD chemistry employs a methyl-substituted form of the DPD reagent. The A-7400 activator solution (potassium iodide) is added to the sample before analysis. Ozone reacts with the iodide to liberate iodine. The iodine then reacts with the reagent to give a purple color.

Various free halogens and halogenating agents produce color with the reagent. Chromate in samples below 25 ppm will not interfere with results. Results are expressed as ppm (mg/L) O<sub>3</sub>.

### The Indigo Method

**References:** Bader H. and J. Hoigne, "Determination of Ozone in Water by the Indigo Method," *Water Research Vol. 15*, pp. 449-456, 1981. *APHA Standard Methods, 20<sup>th</sup> ed.*, pp. 4-137, Method 4500-O<sub>3</sub> B (1998).

With the indigo method, indigo trisulfonate reacts instantly and quantitatively with ozone, bleaching the blue color in direct proportion to the amount of ozone present. Malonic acid is included in the ampoule to prevent interference from up to 3 ppm chlorine. Results are expressed as ppm (mg/L) O<sub>3</sub>.



## Visual Kits

**Range: 0-0.6 & 0.6-2.0 ppm**  
MDL: 0.025 ppm / Method: DDPD

|   | Cat#                |
|---|---------------------|
| <b>CHEMetrics Kit</b>   | <b>K-7402</b>       |
| CHEMetrics Refill, 30 ampoules  | R-7402              |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years                                | A-7400 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.05, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6 ppm        | C-7401              |
| High Range Comparator, Shelf-life 2 years:<br>0.6, 0.7, 0.8, 1.0, 1.2, 1.4, 1.6, 1.8, 2.0 ppm | C-7402              |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS.

## Instrumental Kits

### SAM Single-Analyte Photometer

(See page 15 for instrumental features)

**Range: 0.15-1.00 ppm**  
Method: Indigo

|  | Cat#                      |
|--|---------------------------|
| <b>SAM Kit</b>   | <b>I-2015<sup>2</sup></b> |
| Vacu-vials Kit, 30 ampoules, 25 mL sample cup, instructions, calibration table, and MSDS, Shelf-life 8 months. | K-7413                    |

SAM Kit comes in a plastic case and contains everything needed to perform up to 29 tests (except distilled water): Vacu-vials Kit, SAM Photometer, 4 AA batteries, and instructions.

**Range: 0.20-3.00 ppm**  
Method: DDPD

|  | Cat#          |
|--|---------------|
| <b>SAM Kit</b>   | <b>I-2007</b> |
| Vacu-vials Kit, 30 ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS. | K-7403        |

SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, 2 AA batteries, and instructions.

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

<sup>2</sup>Although the test kit contains 30 ampoules, a fresh reagent ampoule blank must be prepared for each series of tests; therefore, the number of samples that can be tested with each refill will vary from a maximum of 29 to a minimum of 15.



**Range: 0.10-0.75 ppm**  
Method: Indigo

|   | Cat#          |
|---|---------------|
| <b>SAM Photometer (Instrument only)</b> | <b>I-2018</b> |

SAM comes in a cardboard box with 4 AA batteries, and instructions.

|   | Cat#          |
|---|---------------|
| <b>TRACE Vacu-vials Kit (for use with I-2018)</b> | <b>K-7463</b> |

Kit comes in a cardboard box and contains 86 TRACE Vacu-vials, instructions and MSDS.

**NOTE: K-7463 TRACE Vacu-vials Kit must be purchased separately from I-2018 photometer.**

## V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: 0.15-1.00 ppm**  
Method: Indigo

|  | Cat#                      |
|--|---------------------------|
| <b>Vacu-vials Kit, Shelf-life 8 months</b> | <b>K-7413<sup>2</sup></b> |

Kit comes in a cardboard box and contains everything needed to perform up to 29 tests (except distilled water): thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

**Range: 0.20-2.50 ppm**  
Method: DDPD

|                       | Cat#          |
|-----------------------|---------------|
| <b>Vacu-vials Kit</b> | <b>K-7403</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to Ozone

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Ampoule Blank Pack (5 ea)     | A-0023 |

<sup>2</sup> Although the test kit contains 30 ampoules, a fresh reagent ampoule blank must be prepared for each series of tests; therefore, the number of samples that can be tested with each kit will vary from a maximum of 29 to a minimum of 15.

**Instructions are posted on our website.**

**If no shelf-life is listed for a product, then the shelf-life is at least 2 years.**



# Peracetic Acid

## Method

**References:** Developed by CHEMetrics, Inc.

Because it is a strong disinfectant, peracetic acid is an excellent sanitizing agent for the food and beverage industry. Peracetic acid is used to disinfect equipment, pasteurizers, tanks, pipelines, evaporators, fillers, and contact surfaces in food processing plants. It is especially effective in eliminating the osmotolerant microbes (e.g. the yeast *Zygosaccharomyces bailii*) in beverage plants producing high-sugar products. The pulp and paper industry uses peracetic acid as a delignification and bleaching agent.

In the Peracetic Acid DDPD test method, the sample is treated with an excess of potassium iodide. Peracetic acid oxidizes the iodide to iodine. The iodine then oxidizes DDPD, a methyl-substituted form of DPD (N, N-diethyl-p-phenylenediamine) to form a purple-colored species that is directly proportional to the peracetic acid concentration in the sample. Results are expressed as ppm (mg/L) peracetic acid.

Various oxidizing agents such as halogens, ozone, ferric ions, and cupric ions will produce high test results. Hydrogen peroxide does **not** interfere if present at levels comparable to the peracetic acid levels.

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: 0.40-4.00 ppm**  
Method: DDPD

|                       | Cat#          |
|-----------------------|---------------|
| <b>Vacu-vials Kit</b> | <b>K-7903</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Components common to Peracetic Acid

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Ampoule Blank Pack (5 ea)     | A-0023 |

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

*Instructions are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

## Visual Kits

**Range: 0-1 & 1-5 ppm**  
MDL: 0.05 ppm / Method: DDPD

|   | Cat#                |
|---|---------------------|
| <b>CHEMets Kit</b>  | <b>K-7905</b>       |
| CHEMets Refill, 30 ampoules   | R-7905              |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years                                | A-7900 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm         | C-7901              |
| High Range Comparator, Shelf-life 2 years:<br>1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0 ppm | C-7905              |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS.



# Permanganate

## Method

**Reference:** Developed by CHEMetrics, Inc.

Potassium permanganate is a very strong oxidizing agent. Its primary use is in the treatment of industrial and domestic water to remove various compounds.

CHEMetrics' permanganate test kits are applicable to monitoring the concentration of permanganate in feed solutions used to treat potable water and wastewaters. The test method employs a titrimetric chemistry in which ferrous ammonium sulfate is the titrant. No additional indicator is required. A color change from clear to red signals the end of the test. Results are expressed as percent (%)  $\text{KMnO}_4$ .

## Visual Kits

**Range:** 0.3-3%

**MDL:** 0.30% / **Method:** Ferrous Ammonium Sulfate

**Titrets Kit**

**Cat#**

**K-7630**

Increments:

0.30, 0.33, 0.36, 0.39, 0.42, 0.45, 0.48, 0.54, 0.60, 0.75, 0.90, 1.05, 1.2, 1.5, 2.1, 3.0 %

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Permanganate

**Description**

**Cat#**

Sample Cup Pack, 25 mL (6 ea)

A-0013

Titrettor Pack (1 ea)

A-0053

**Instructions are posted on our website.**

**If no shelf-life is listed for a product, then the shelf-life is at least 2 years.**



## Method

The measurement of pH is one of the most frequently performed water quality determinations. Water softening, precipitation, disinfection, and corrosion control are some of the many operations that depend on the careful measurement and control of pH. CHEMetrics' pH meter is applicable to the monitoring of drinking water, natural water supplies, boiler waters, make-up waters, condensate returns, swimming pools, aquariums, wastewaters, and similar samples.

CHEMetrics' double-junction pH meter was specifically developed for water conditioning and purification applications.

### Method of Operation.

Turn the meter on. Remove the protective cap from the tip of the probe. Dip the probe into the sample and stir the sample gently with the probe until the display stabilizes.

Calibration should be done regularly, typically everyday that the meter is used.

## FEATURES

**Range:** -1.00 to 15.00 pH

**Resolution:** 0.01 pH.

**Accuracy:**  $\pm 0.01$  pH

**Operating Temperature:** 0 to 50°C (32 to 122°F).

**Power and battery life:** Four 1.5 V alkaline batteries (included). 500 hrs. (approx).

**Pocket-sized:** 6.5" length x 1.5" diameter

**Weight:** 4.5 oz. (135 g)



**Range: -1.00-15.00 pH Units**

|                                 | Cat#          |
|---------------------------------|---------------|
| <b>pH Double Junction Meter</b> | <b>I-1000</b> |

Instrument comes in a plastic storage case and includes an electrode and cap, four 1.5 V alkaline batteries, and instructions.

### Accessories

| Description   | Cat#   |
|---|--------|
| Electrode for pH Meter  | A-0174 |
| pH <i>Singles</i> buffer solution assortment (5 ea), 4.0, 7.0, 10.0, and rinse, Shelf-life 3 months | A-0175 |
| Carrying Case (holds two pH I-1000, TDS I-1100, or Conductivity I-1200 meters)                      | A-0179 |

*Instructions are posted on our website.*



### FEATURES

- Accuracy with push-button three-point calibration
- Temperature readout & compensation
- Replaceable electrode
- Waterproof, dustproof
- Error messages; Hold function
  - Auto-shutoff
- For harsh applications!

## Method

References: APHA Standard Methods, 14<sup>th</sup> ed., p. 574, Method 510 C (1975). ASTM D 1783-01, Phenolic Compounds in Water, Test Method B. USEPA Methods for Chemical Analysis of Water and Wastes, Method 420.1 (1983).

Phenol (hydroxybenzene) is the simplest of a group of similar organic chemicals, which includes cresols, xylenols, and catechols. Phenol itself is a common ingredient of disinfectants. In drinking water, low-level phenolic concentrations impart a foul taste and odor, especially upon chlorination. High phenol concentrations can indicate contamination from industrial effluents or waste discharge.

The method is applicable to the monitoring of phenolic compounds in wastewater.

CHEMetrics' phenols kits employ the well-established 4-aminoantipyrine (4-AAP) method. Phenolic compounds react with 4-AAP in alkaline solution in the presence of ferricyanide to produce a red reaction product. Phenol, meta-, and ortho-substituted phenols, and some para-substituted phenols, under proper pH conditions, are detected with this method. Results are expressed as ppm (mg/L) phenol.



## Visual Kits

**Range: 0-1 & 0-12 ppm**  
MDL: 0.05 ppm / Method: 4-Aminoantipyrine

|  | Cat#          |
|--|---------------|
| <b>CHEMets Kit</b>   | <b>K-8012</b> |
| CHEMets Refill, 30 ampoules  | R-8012        |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm  | C-8001        |
| High Range Comparator, Shelf-life 2 years:<br>0, 1, 2, 3, 4, 6, 8, 10, 12 ppm  | C-8012        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, 25 mL sample cup, instructions and MSDS. |               |

**Range: 0-30 & 0-350 ppm**  
MDL: 5 ppm / Method: 4-Aminoantipyrine

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-8012D</b> |
| VACUettes Refill, 30 ampoules  | R-8012D        |
| Low Range Comparator, Shelf-life 2 years:<br>0, 5, 7.5, 10, 15, 20, 25, 30 ppm   | C-8001D        |
| High Range Comparator, Shelf-life 2 years:<br>0, 30, 75, 100, 150, 200, 250, 300, 350 ppm  | C-8012D        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS. |                |

**Range: 0-60 & 0-700 ppm**  
MDL: 10 ppm / Method: 4-Aminoantipyrine

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-8012A</b> |
| VACUettes Refill, 30 ampoules  | R-8012A        |
| Low Range Comparator, Shelf-life 2 years:<br>0, 10, 15, 20, 30, 40, 50, 60 ppm   | C-8001A        |
| High Range Comparator, Shelf-life 2 years:<br>0, 60, 150, 200, 300, 400, 500, 600, 700 ppm   | C-8012A        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS. |                |

**Range: 0-120 & 0-1400 ppm**  
MDL: 20 ppm / Method: 4-Aminoantipyrine

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-8012B</b> |
| VACUettes Refill, 30 ampoules  | R-8012B        |
| Low Range Comparator, Shelf-life 2 years:<br>0, 20, 30, 40, 60, 80, 100, 120 ppm   | C-8001B        |
| High Range Comparator, Shelf-life 2 years:<br>0, 120, 300, 400, 600, 800, 1000, 1200, 1400 ppm   | C-8012B        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS. |                |

**Range: 0-1000 & 0-12000 ppm**  
MDL: 100 ppm / Method: 4-Aminoantipyrine

|  | Cat#           |
|--|----------------|
| <b>VACUettes Kit</b>   | <b>K-8012C</b> |
| VACUettes Refill, 30 ampoules  | R-8012C        |
| Low Range Comparator, Shelf-life 2 years:<br>0, 100, 200, 300, 400, 600, 800, 1000 ppm   | C-8001C        |
| High Range Comparator, Shelf-life 2 years:<br>0, 1000, 2000, 3000, 4000, 6000, 8000, 10,000, 12,000 ppm  | C-8012C        |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, dilutor snapper cup, micro test tube, instructions, and MSDS. |                |

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: 0.40-8.00 ppm**  
Method: 4-Aminoantipyrine

**Vacu-vials Kit** **Cat#**  
**K-8003**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

**Range: 1.0-20.0 ppm**  
Method: 4-Aminoantipyrine

**Vacu-vials Kit** **Cat#**  
**K-8023**

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

### Kit Components common to Phenols

| Description                     | Cat#   |
|---------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea)   | A-0013 |
| Micro Test Tube Pack (10 ea)    | A-0015 |
| Dilutor Snapper Cup Pack (6 ea) | A-0018 |
| Ampoule Blank Pack (5 ea)       | A-0023 |

*Instructions are posted on our website.*



**No need to dispense.  
The ferricyanide powder  
is right on the tip.**

# Phosphate (reactive, ortho)

## Methods

Phosphorus occurs naturally in rock formations in the earth's crust, usually as phosphate. High phosphate concentrations in surface waters may indicate fertilizer runoff, domestic waste discharge, or the presence of industrial effluents or detergents. Although phosphates from these sources are usually poly-phosphates or organically bound, all will degrade to *ortho* or reactive phosphates with time.

Phosphate measurement is used to control scale and corrosion inhibitor levels in boilers and cooling towers. Both methods described below measure reactive phosphate, which will give a positive reaction prior to hydrolysis, and is usually termed *ortho-phosphate*.

### The Vanadomolybdophosphoric Acid Method

References: ASTM D 515-82, Phosphorous in Water, Test Method C. APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-144, Method 4500-P C (1998).

In test kits employing the vanadomolybdophosphoric acid method, phosphate reacts with ammonium molybdate under acid conditions and in the presence of vanadium to form a yellow-colored product. Results are expressed as ppm (mg/L) PO<sub>4</sub>.

### The Stannous Chloride Method

References: APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-145, Method 4500-P D (1998).

Test kits employing this chemistry utilize a stannous chloride reduction. Phosphate reacts with ammonium molybdate and is then reduced by stannous chloride to form a blue complex. Results are expressed as ppm (mg/L) PO<sub>4</sub>.

## Visual Kits

**Range: 0-1 & 1-10 ppm**  
MDL: 0.05 ppm / Method: Stannous Chloride

| CHEMets Kit   | Cat#                |
|---|---------------------|
| CHEMets Refill, 30 ampoules   | R-8510              |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months                      | A-8500 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm | C-8501              |
| High Range Comparator, Shelf-life 2 years:<br>1, 2, 3, 4, 5, 6, 7, 8, 10 ppm          | C-8510              |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, sample cup top, instructions, and MSDS.

**Range: 2-30 ppm**  
MDL: 2 ppm / Method: Vanadomolybdophosphoric Acid

| CHEMets Kit   | Cat#   |
|---|--------|
| CHEMets Refill, 30 ampoules                                       | R-8515 |
| Comparator, Shelf-life 2 years:<br>2, 4, 6, 8, 10, 15, 20, 30 ppm | C-8530 |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.

**Range: 10-150 ppm**  
MDL: 10 ppm / Method: Vanadomolybdophosphoric Acid

| CHEMets Kit  | Cat#   |
|--|--------|
| CHEMets Refill, 30 ampoules  | R-8515 |
| Comparator, Shelf-life 2 years:<br>10, 20, 30, 40, 60, 80, 100, 120, 150 ppm | C-8515 |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, 25 mL sample cup, instructions, and MSDS.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

## Phosphate (reactive, ortho) Continued

**Range: 0-30 & 30-300 ppm**  
MDL: 5 ppm / Method: Stannous Chloride

|  | Cat#                |
|--|---------------------|
| <b>VACUettes Kit</b>   | <b>K-8510D</b>      |
| VACUettes Refill, 30 ampoules  | R-8510D             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months   | A-8500 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 5, 7.5, 10, 15, 20, 25, 30 ppm   | C-8501D             |
| High Range Comparator, Shelf-life 2 years:<br>30, 60, 90, 120, 150, 175, 200, 250, 300 ppm   | C-8510D             |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS. |                     |

**Range: 0-60 & 60-600 ppm**  
MDL: 10 ppm / Method: Stannous Chloride

|  | Cat#                |
|--|---------------------|
| <b>VACUettes Kit</b>   | <b>K-8510A</b>      |
| VACUettes Refill, 30 ampoules  | R-8510A             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months   | A-8500 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 10, 15, 20, 30, 40, 50, 60 ppm   | C-8501A             |
| High Range Comparator, Shelf-life 2 years:<br>60, 120, 180, 240, 300, 350, 400, 500, 600 ppm   | C-8510A             |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS. |                     |

**Range: 0-120 & 120-1200 ppm**  
MDL: 20 ppm / Method: Stannous Chloride

|  | Cat#                |
|--|---------------------|
| <b>VACUettes Kit</b>   | <b>K-8510B</b>      |
| VACUettes Refill, 30 ampoules  | R-8510B             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months   | A-8500 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 20, 30, 40, 60, 80, 100, 120 ppm   | C-8501B             |
| High Range Comparator, Shelf-life 2 years:<br>120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm  | C-8510B             |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS. |                     |

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

**Range: 0-1200 & 1200-12,000 ppm**  
MDL: 200 ppm / Method: Stannous Chloride

|  | Cat#                |
|--|---------------------|
| <b>VACUettes Kit</b>   | <b>K-8510C</b>      |
| VACUettes Refill, 30 ampoules  | R-8510C             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 20 months   | A-8500 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 200, 300, 400, 600, 800, 1000, 1200 ppm  | C-8501C             |
| High Range Comparator, Shelf-life 2 years:<br>1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm   | C-8510C             |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, sample cup top, micro test tube, instructions, and MSDS. |                     |



### Instrumental Kits

#### V-2000 Multi-Analyte Photometer (See page 12 for instrumental features)

**Range: V-2000: 0.75-8.00 ppm / Spec: 0.20-5.00 ppm**  
Method: Stannous Chloride

|   | Cat#          |
|---|---------------|
| <b>Vacu-vials Kit</b> , Shelf-life 20 months  | <b>K-8513</b> |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, sample cup top, ampoule blank, instructions, calibration table, and MSDS. |               |

**Range: 5.0-40.0 ppm**  
Method: Vanadomolybdophosphoric Acid

|   | Cat#          |
|---|---------------|
| <b>Vacu-vials Kit</b>   | <b>K-8503</b> |
| Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS. |               |

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Components common to Phosphate

| Description                              | Cat#   |
|--|--------|
| Sample Cup Pack, 25 mL (6 ea)            | A-0013 |
| Sample Cup Top Pack for 25 mL Cup (6 ea) | A-0014 |
| Micro Test Tube Pack (10 ea)             | A-0015 |
| Dilutor Snapper Cup Pack (6 ea)          | A-0018 |
| Ampoule Blank Pack (5 ea)                | A-0023 |

**Instructions are posted on our website.**

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



# Quaternary Ammonium Compounds (QACs)

## Method

References: Wang, L. K., Shuster, W. W., "Polyelectrolyte Determination at Low Concentration," *Ind. Eng. Chem., Prod. Res. Dev.*, Vol. 14, No. 4, 1975, pp. 312-314. Parazak, D. P., Burkhardt, C. W., McCarthy, K. J., "Determination of Low Levels of Cationic Polyelectrolytes in Water," *Analytical Chemistry*, Vol. 59, No. 10, May 15, 1987, pp. 1444-1445.

QACs are known for their bactericidal and disinfecting qualities. They are used extensively throughout the healthcare and food processing industries to sanitize, deodorize, and disinfect surfaces and equipment. QACs are also routinely formulated with various water treatments to inhibit algal growth in cooling towers, humidifiers, and swimming pools.

These tests are applicable to the monitoring of QACs in cleaning solutions and cooling waters. CHEMetrics employs a titrimetric chemistry in which stabilized polyvinyl sulfate is the titrant and toluidene blue is the end point indicator.

A color change from purple to navy signals the end of the titration. Results are expressed as ppm (mg/L) QAC.

## Visual Kits

**Range: 100-1000 ppm**  
MDL: 100 ppm / Method: Polyvinyl Sulfate

| Titrets Kit | Cat#   |
|-------------|--------|
|             | K-8810 |

Increments:  
100, 110, 120, 130, 140, 150, 160, 180, 200, 250, 300, 350, 400, 500, 700, 1000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 2000-20,000 ppm**  
MDL: 2000 ppm / Method: Polyvinyl Sulfate

| Titrets Kit | Cat#   |
|-------------|--------|
|             | K-8820 |

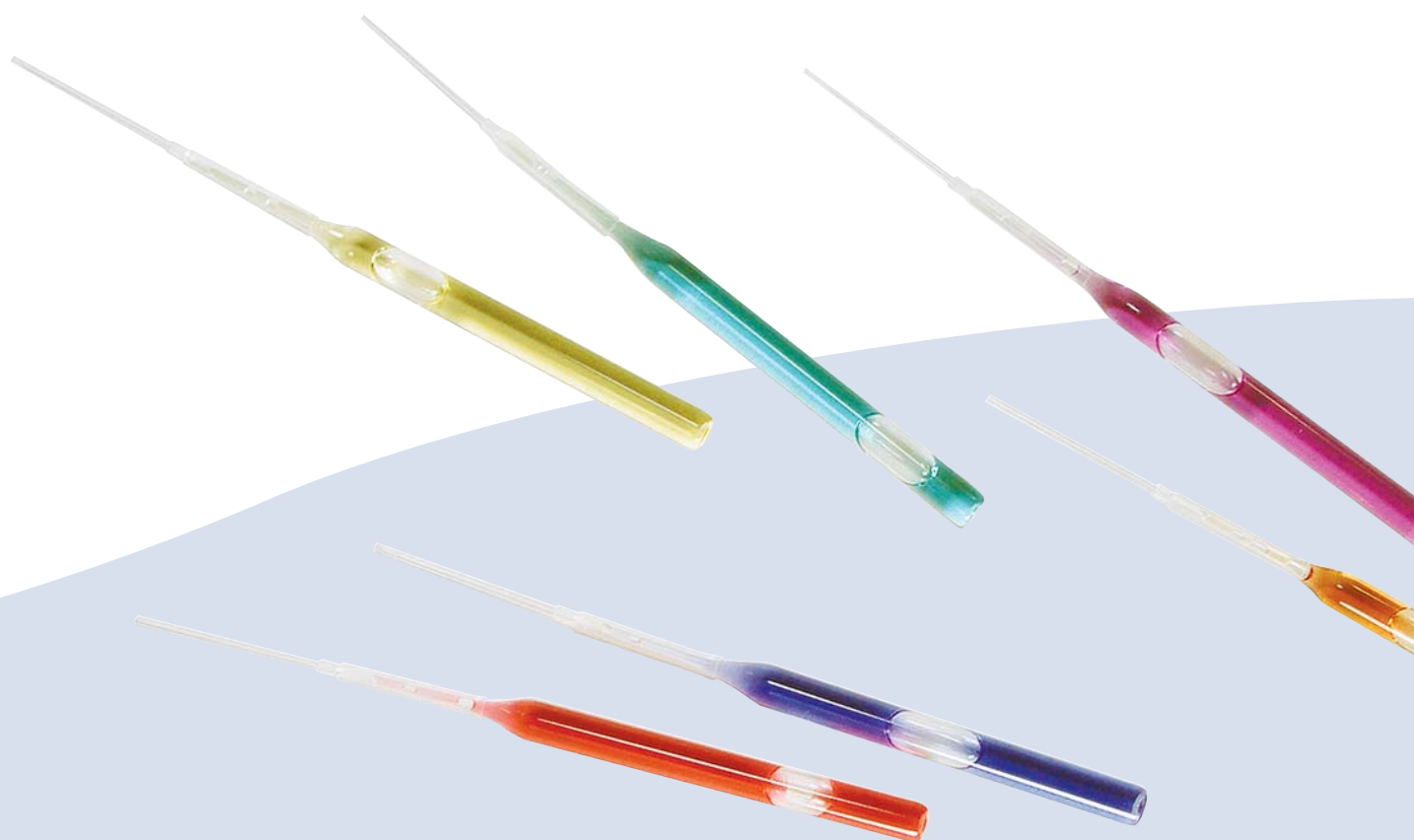
Increments:  
2000, 2200, 2400, 2600, 2800, 3000, 3200, 3600, 4000, 5000, 6000, 7000, 8000, 10,000, 14,000, 20,000 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests (except distilled water): thirty ampoules with valve assemblies, titrettor, 25 mL sample cup, 1.0 mL syringe, instructions, and MSDS.

### Kit Components common to QACs

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Syringe Pack, 1.0 mL (6 ea)   | A-0027 |
| Titrettor Pack (1 ea)         | A-0053 |

Instructions are posted on our website.



## Method

References: APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-158, Method 4500-SiO<sub>2</sub> D (1998). ASTM D 859-05, Silica in Water. USEPA Methods for Chemical Analysis of Water and Wastes, Method 370.1 (1983).

Silica (SiO<sub>2</sub>) is the oxide of silicon, the second most abundant element in the earth's crust. Silica is present as silicates in most natural waters. Typical concentrations lie between 1 and 30 mg/L. Higher concentrations may exist in brackish waters and brines. The silica content of water should be determined prior to its use in a variety of industrial applications. Silica can form a harmful scale on equipment and heat transfer surfaces, particularly steam turbine blades.

CHEMetrics' test method determines *molybdate reactive silica*. The heteropoly blue chemistry is employed. Silica reacts with ammonium molybdate under acidic conditions to produce heteropoly acids, which are then reduced to form a blue color. Phosphate interferences are masked with the addition of citric acid. Results are expressed as ppm (mg/L) SiO<sub>2</sub>.

## Visual Kits

**Range: 0-0.20 ppm**  
MDL: 0.02 ppm / Method: Heteropoly Blue

|  | Cat#                |
|--|---------------------|
| <b>ULR CHEMetrics Kit</b>  | <b>K-9011</b>       |
| ULR CHEMetrics Refill, 30 ampoules, Shelf-life 2 months                            | R-9011 <sup>2</sup> |
| Neutralizer Solution Pack, six 10 mL bottles, Shelf-life 2 years                   | A-9000 <sup>1</sup> |
| Activator Solution Pack, six 20 mL bottles, Shelf-life 2 years                     | A-9001 <sup>1</sup> |
| Comparator, Shelf-life 2 years:<br>0, 0.02, 0.04, 0.06, 0.08, 0.12, 0.16, 0.20 ppm | C-9011              |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Comparator, Neutralizer Solution, Activator Solution, 25 mL sample cup, sample cup top, instructions, and MSDS.

**Range: 0-1 & 1-10 ppm**  
MDL: 0.05 ppm / Method: Heteropoly Blue

|   | Cat#                |
|---|---------------------|
| <b>CHEMetrics Kit</b>   | <b>K-9010</b>       |
| CHEMetrics Refill, 30 ampoules, Shelf-life 11 months                                  | R-9010 <sup>2</sup> |
| Neutralizer Solution Pack, six 10 mL bottles, Shelf-life 2 years                      | A-9000 <sup>1</sup> |
| Activator Solution Pack, six 20 mL bottles, Shelf-life 2 years                        | A-9001 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm | C-9001              |
| High Range Comparator, Shelf-life 2 years:<br>1, 2, 3, 4, 5, 6, 7, 8, 10 ppm          | C-9010              |

Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Neutralizer Solution, Activator Solution, 25 mL sample cup, sample cup top, instructions, and MSDS.

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: V-2000: 0.50-10.00 ppm / Spec: 0.25-4.00 ppm**  
Method: Heteropoly Blue

|                       | Cat#          |
|-----------------------|---------------|
| <b>Vacu-vials Kit</b> | <b>K-9003</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Neutralizer Solution, Activator Solution, 25 mL sample cup, sample cup top, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Components common to Silica

| Description                              | Cat#   |
|--|--------|
| Sample Cup Pack, 25 mL (6 ea)            | A-0013 |
| Sample Cup Top Pack for 25 mL Cup (6 ea) | A-0014 |
| Ampoule Blank Pack (5 ea)                | A-0023 |

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

<sup>2</sup>This shelf-life can be extended by 18 months if the ampoules are stored in the refrigerator when not in use.

Instructions are posted on our website.



## Method

References: APHA Standard Methods, 15<sup>th</sup> ed., p. 436, Method 426 C (1980). USEPA Methods for Chemical Analysis of Water and Wastes, Method 375.4 (1983). ASTM D 516-02, Sulfate Ion in Water.

Sulfate is present at widely varying concentrations in natural waters. The USEPA has established a Secondary Drinking Water Standard of 250 mg/L for sulfate in potable water, as higher concentrations affect odor and taste. Sulfate levels are also measured in the beverage industry due to its effect on odor and taste. Sulfate levels must be monitored in cooling water and ion exchange systems in order to prevent calcium sulfate scale formation.

The Sulfate Vacu-vials<sup>®</sup> test method employs the turbidimetric method. Sulfate ion reacts with barium chloride in an acidic solution to form a suspension of barium sulfate crystals of uniform size. The resulting turbidity is proportional to the sulfate concentration of the sample. Results are expressed as ppm (mg/L) SO<sub>4</sub>.

## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

Range: 8.0-100.0 ppm  
Method: Turbidimetric

|                | Cat#   |
|----------------|--------|
| Vacu-vials Kit | K-9203 |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Acidifier Solution, Activator Powder, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

#### Kit Component common to Sulfate

| Description               | Cat#   |
|---------------------------|--------|
| Ampoule Blank Pack (5 ea) | A-0023 |

*Instructions are posted on our website.*

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



# Sulfide

## Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 376.2 (1983). APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-165, Method 4500-S<sup>2</sup>-D (1998).

Sulfides are naturally present in ground waters as a result of leaching from sulfur-containing mineral deposits. Surface waters do not usually contain high sulfide concentrations. Sulfides result from the decomposition of organic matter, from bacterial sulfate reduction under anaerobic conditions and from various chemical processes.

CHEMetrics test kits measure total acid soluble sulfides and employ the methylene blue methodology. Sulfides react with dimethyl-p-phenylenediamine in the presence of ferric chloride to produce methylene blue. Results are expressed as ppm (mg/L) S.



## Visual Kits

**Range: 0-1 & 1-10 ppm**  
MDL: 0.05 ppm / Method: Methylene Blue

|   | Cat#                |
|---|---------------------|
| <b>CHEMetrics Kit</b>   | <b>K-9510</b>       |
| CHEMetrics Refill, 30 ampoules  | R-9510              |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years  | A-9500 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 0.1, 0.2, 0.3, 0.4, 0.6, 0.8, 1.0 ppm   | C-9501              |
| High Range Comparator, Shelf-life 2 years:<br>1, 2, 3, 4, 5, 6, 7, 8, 10 ppm  | C-9510              |
| Kit comes in a plastic case and contains everything needed to perform 30 tests: Refill, Low and High Range Comparators, Activator Solution, 25 mL sample cup, instructions, and MSDS. |                     |

**Range: 0-30 & 30-300 ppm**  
MDL: 5 ppm / Method: Methylene Blue

|  | Cat#                |
|--|---------------------|
| <b>VACUettes Kit</b>   | <b>K-9510D</b>      |
| VACUettes Refill, 30 ampoules  | R-9510D             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years   | A-9500 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 5, 7.5, 10, 15, 20, 25, 30 ppm   | C-9501D             |
| High Range Comparator, Shelf-life 2 years:<br>30, 60, 90, 120, 150, 175, 200, 250, 300 ppm   | C-9510D             |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, instructions, and MSDS. |                     |

**Range: 0-60 & 60-600 ppm**  
MDL: 10 ppm / Method: Methylene Blue

|  | Cat#                |
|--|---------------------|
| <b>VACUettes Kit</b>   | <b>K-9510A</b>      |
| VACUettes Refill, 30 ampoules  | R-9510A             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years   | A-9500 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 10, 15, 20, 30, 40, 50, 60 ppm   | C-9501A             |
| High Range Comparator, Shelf-life 2 years:<br>60, 120, 180, 240, 300, 350, 400, 500, 600 ppm   | C-9510A             |
| Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, instructions, and MSDS. |                     |



## Instrumental Kits

**Range: 0-120 & 120-1200 ppm**  
MDL: 20 ppm / Method: Methylene Blue

|   | Cat#                |
|---|---------------------|
| <b>VACUettes Kit</b>  | <b>K-9510B</b>      |
| VACUettes Refill, 30 ampoules   | R-9510B             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years                                  | A-9500 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 20, 30, 40, 60, 80, 100, 120 ppm                | C-9501B             |
| High Range Comparator, Shelf-life 2 years:<br>120, 240, 360, 480, 600, 700, 800, 1000, 1200 ppm | C-9510B             |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, instructions, and MSDS.

**Range: 0-1200 & 1200-12,000 ppm**  
MDL: 200 ppm / Method: Methylene Blue

|  | Cat#                |
|--|---------------------|
| <b>VACUettes Kit</b>   | <b>K-9510C</b>      |
| VACUettes Refill, 30 ampoules  | R-9510C             |
| Activator Solution Pack, six 10 mL bottles, Shelf-life 2 years   | A-9500 <sup>1</sup> |
| Low Range Comparator, Shelf-life 2 years:<br>0, 200, 300, 400, 600, 800, 1000, 1200 ppm                    | C-9501C             |
| High Range Comparator, Shelf-life 2 years:<br>1200, 2400, 3600, 4800, 6000, 7000, 8000, 10,000, 12,000 ppm | C-9510C             |

Kit comes in a plastic case and contains everything needed to perform 30 tests (except distilled water): Refill, Low and High Range Comparators, Activator Solution, dilutor snapper cup, micro test tube, instructions, and MSDS.

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

**Range: V-2000: 0.20-3.00 ppm / Spec: 0.10-1.00 ppm**  
Method: Methylene Blue

|                       | Cat#          |
|-----------------------|---------------|
| <b>Vacu-vials Kit</b> | <b>K-9503</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

**Range: 0.60-6.00 ppm**  
Method: Methylene Blue

|                       | Cat#          |
|-----------------------|---------------|
| <b>Vacu-vials Kit</b> | <b>K-9523</b> |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately.*

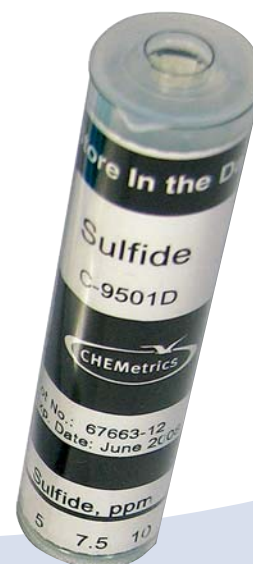
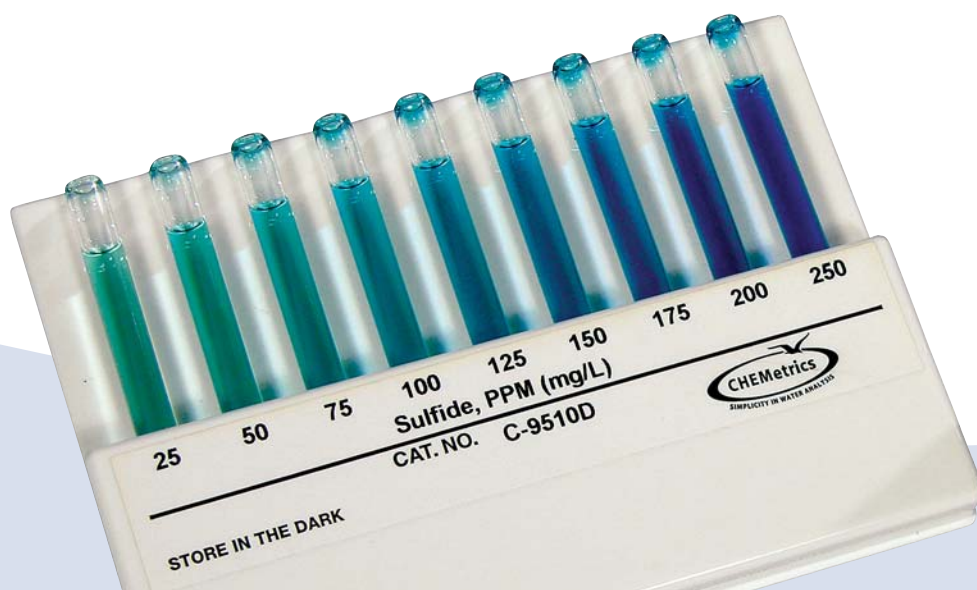
#### Kit Components common to Sulfide

| Description                     | Cat#   |
|---------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea)   | A-0013 |
| Micro Test Tube Pack (10 ea)    | A-0015 |
| Dilutor Snapper Cup Pack (6 ea) | A-0018 |
| Ampoule Blank Pack (5 ea)       | A-0023 |

<sup>1</sup>The accessory pack supplies enough solution to perform at least 200 tests.

Instructions are posted on our website.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



# Sulfite (free)

## Methods

### Sulfite

**References:** ASTM D 1339-84, Sulfite Ion in Water, Test Method C. APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-173, Method 4500-SO<sub>3</sub><sup>2-</sup> B (1998). USEPA Methods for Chemical Analysis of Water and Wastes, Method 377.1 (1983).

Sulfite is not usually present in surface waters. If sulfite is discharged in effluents or from domestic wastewaters, it readily oxidizes to form sulfate. Sodium sulfite is the most common form of sulfite and is an excellent reducing agent with applications as an oxygen scavenger. Sulfite concentrations in boiler and process waters must be monitored routinely to avoid overtreatment. Waste treatment plants that use sulfur dioxide to remove excess chlorine must monitor their effluents for sulfite.

CHEMetrics' sulfite test kits employ the iodometric chemistry in which sulfite is titrated with iodide-iodate titrant in an acid solution using a starch indicator. Thiosulfate will titrate as sulfite. Results are expressed as ppm (mg/L) SO<sub>3</sub>.

### Sulfite in Wine

**References:** ASTM D 1339-84, Sulfite Ion in Water, Test Method C. APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-173, Method 4500-SO<sub>3</sub><sup>2-</sup> B (1998). USEPA Methods for Chemical Analysis of Water and Wastes, Method 377.1 (1983).

Sulfites have been used for centuries to sanitize and preserve foods. They are used worldwide in the wine industry as antioxidant and antimicrobial agents. However, sulfites have been identified as causative agents in certain allergic reactions suffered by asthmatics. As a result, the FDA and the Bureau of Alcohol, Tobacco, and Firearms have mandated that sulfites in foods and beverages, at levels of 10 ppm or higher, be identified on the label.

CHEMetrics' sulfite test kit is based on the *Ripper* method, which the wine industry has used for years as a standard for rapid sulfite analysis. Sulfite is titrated with an iodide-iodate solution, using a starch end point indicator. Phosphoric acid is used to adjust the pH of the sample. Results are quantified using direct-reading titration cells. The test determines free sulfite as ppm (mg/L) SO<sub>2</sub>.

Results for this test kit are acceptable for dry white wines (although they can have an error of up to 10 ppm). This test kit is not recommended for use with red wines or white wines containing ascorbic acid or tannin. These wines often give false high test results.

## Visual Kits

**Range: 2-20 ppm as SO<sub>3</sub>**  
MDL: 2.0 ppm / Method: Iodometric

**Sulfite Titrets Kit** **Cat#**  
**K-9602**

Increments:  
2.0, 2.2, 2.4, 2.6, 2.8, 3.0, 3.2, 3.6, 4.0, 5.0, 6.0, 7.0, 8.0, 10, 14, 20 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 5-50 ppm as SO<sub>3</sub>**  
MDL: 5.0 ppm / Method: Iodometric

**Sulfite Titrets Kit** **Cat#**  
**K-9605**

Increments:  
5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 9.0, 10.0, 12.5, 15.0, 17.5, 20.0, 25.0, 35.0, 50.0 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 10-100 ppm as SO<sub>3</sub>**  
MDL: 10 ppm / Method: Iodometric

**Sulfite Titrets Kit** **Cat#**  
**K-9610**

Increments:  
10, 11, 12, 13, 14, 15, 16, 18, 20, 25, 30, 35, 40, 50, 70, 100 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 50-500 ppm as SO<sub>3</sub>**  
MDL: 50 ppm / Method: Iodometric

**Sulfite Titrets Kit** **Cat#**  
**K-9650**

Increments:  
50, 55, 60, 65, 70, 75, 80, 90, 100, 125, 150, 175, 200, 250, 350, 500 ppm

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solution, titrettor, 25 mL sample cup, instructions, and MSDS.

**Range: 10-100 ppm as SO<sub>2</sub>**  
**MDL: 10 ppm / Method: Ripper**

**Sulfite in Wine Titrets Kit** **Cat#**  
**K-9610W**

Increments:  
10, 11, 12, 13, 14, 15, 16, 18, 20, 25, 30, 35, 40, 50, 70, 100 ppm

Kit comes in a cardboard box and contains everything needed to perform 10 tests: ten ampoules, ten valve assemblies, instructions, and MSDS.

### Kit Components common to Sulfite

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Titrettor Pack (1 ea)         | A-0053 |

**Instructions are posted on our website.**

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



# Thiosulfate

## Method

Reference: APHA Standard Methods, 20<sup>th</sup> ed., pp. 4-173, Method 4500-SO<sub>3</sub><sup>2-</sup> B (1998).

Thiosulfate is an excellent reducing agent. It is used primarily as an *antichlor* or chlorine-removing agent in various chemical processes, including the bleaching of pulp, paper, and textiles.

CHEMetrics' method employs the iodometric chemistry. Although sulfite usually titrates as thiosulfate, the reagent has been formulated to inhibit high-level sulfite interferences. Thiosulfate is titrated with iodide-iodate titrant in acid solution using a starch indicator. Results are expressed as ppm (mg/L) S<sub>2</sub>O<sub>3</sub>.

## Visual Kits

Range: 5-50 ppm  
MDL: 5.0 ppm / Method: Iodometric

| Titrets Kit  | Cat#   |
|--|--------|
| Increments:<br>5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 9.0, 10.0, 12.5, 15.0, 17.5, 20.0,<br>25.0, 35.0, 50.0 ppm | K-9705 |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules with valve assemblies, Neutralizer Solutions, titrettor, 25 mL sample cup, instructions, and MSDS.

### Kit Components common to Thiosulfate

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Titrettor Pack (1 ea)         | A-0053 |

Instructions are posted on our website.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*





# Total Dissolved Solids (TDS)

## Method

In industrial water systems, it is important to accurately measure and control the amount of dissolved solids present, as they can form deposits on the system components and decrease overall system efficiency. The National Secondary Drinking Water Standard for TDS is 500 mg/L.

### Method of Operation.

To operate the CHEMetrics Total Dissolved Solids (TDS) Meter (Cat. No. I-1100), switch unit on, remove the electrode cap, immerse the probe into the sample, making sure that the sensor is fully covered. Wait for the readings to stabilize (Automatic Temperature compensation corrects for temperature changes). Take measurement. To clean the probe, simply mix it in tap water. Tester is factory calibrated. However, to ensure accuracy, calibrate the TDS meter on a regular basis.

## FEATURES

**Range:** 0 to 1990 ppm.

**Resolution:** 10 ppm.

**Accuracy:**  $\pm 2\%$  full scale.

**Operating Temperature:** 0 to 50°C (32 to 122°F).

**Power and battery life:** Four 1.5 V alkaline batteries (supplied). 100 hrs. continuous use (approx.).

**Pocket-sized:** 6.5" length x 1.5" diameter

**Weight:** 3.25 oz.(90 g)



**Range: 0-1990 ppm**

|   | Cat#          |
|---|---------------|
| <b>Total Dissolved Solids (TDS) Meter</b> | <b>I-1100</b> |

Instrument comes in a plastic storage case and includes an electrode and cap, four 1.5 V alkaline batteries, and instructions.

### Accessories

| Description   | Cat#   |
|---|--------|
| Electrode for TDS and Conductivity  | A-0176 |
| Conductivity/TDS Singles, 447 $\mu$ S, Shelf-life 3 months                        | A-0177 |
| Conductivity/TDS Singles, 1413 $\mu$ S, Shelf-life 3 months                       | A-0178 |
| Carrying Case<br>(holds two pH I-1000, TDS I-1100, or Conductivity I-1200 meters) | A-0179 |

*Instructions are posted on our website.*

### FEATURES

- Replaceable electrode
- Waterproof, dustproof
- Push-button calibration
- Automatic temperature compensation (ATC)
- Auto-shutoff



# Total Petroleum Hydrocarbons (TPH) in Soil

## Method

References: U.S. Patent #5,834,655. U.S. Patent #4,992,379. EPO Application #94 302 944. Roberts, R. M. and Khalaf, A. A., Friedel Crafts Alkylation Chemistry: A Century of Discovery, Marcel Dekker, Inc., NY, p. 790 (1984). Schmid, George H., Organic Chemistry, Mosby-Yearbook, Inc., QD251.2S354, p. 935 (1996).

Detection of total petroleum hydrocarbons (TPH) in soil can indicate contamination from leaking underground storage tanks (USTs), petroleum refineries, or other fuel sources.

The RemediAid™ Total Petroleum Hydrocarbon Test Kit is a rapid, simple field test for measuring aromatic petroleum hydrocarbon contamination in soil. The patented test is based upon the Friedel-Crafts Reaction with one fundamental difference—the intermediate that is formed in the solvent is the colored species that is measured.

The RemediAid Kit determines TPH across a wide range of soil types and petroleum products. RemediAid allows the user to analyze for specific fractions, including: BTEX, PAH, diesel fuel, leaded and unleaded gasoline, weathered gasoline, brent crude, and lubricating oil.

In the test method, a pre-measured sample of soil is added to a reaction tube that contains anhydrous sodium sulfate, a drying agent. A pre-measured volume of dichloromethane is then added to the reaction tube. This organic solvent extracts the petroleum hydrocarbons from the soil sample. In order to remove polar hydrocarbons and color interferences, the soil extract is treated with Florisil. Finally, a vacuum-sealed ampoule, containing aluminum chloride, draws in a predetermined volume of the hydrocarbon-containing solvent. The hydrocarbons in the solvent react with the aluminum chloride to produce a soluble colored product directly proportional to the petroleum hydrocarbon concentration in the sample. The absorbance of the sample is measured in a portable, battery-powered, LED-based colorimeter and converted to mg/kg hydrocarbon in the soil by use of a formula.



## Instrumental Kit

### Ranges<sup>1</sup>:

**Unleaded Gasoline: 40-370 mg/kg**

**Weathered Gasoline: 40-360 mg/kg**

**Diesel: 60-880 mg/kg**

**Brent Crude: 60-770 mg/kg**

**Lube Oil: 160-2160 mg/kg**

**BTEX: 20-150 mg/kg**

**Leaded Gasoline: 40-470 mg/kg**

**PAH (18 component mixture): 8-70 mg/kg**

Method: Friedel Crafts

| TPH Kit                     | Cat#   |
|-----------------------------|--------|
| TPH Refill, 16 ampoule sets | K-9310 |
|                             | R-9310 |

Kit comes in a plastic case and contains everything needed to perform 8 tests: eight ampoule sets, TPH photometer, tip breaking tool, pocket scale, 3-channel timer, TPH reaction tube plug/snapper, spatula (8 ea), 80 g bottle of sodium sulfate, reagent blank ampoule, ampoule rack, 2 AA batteries, instruction booklet, instruction card, and MSDS.

### Kit Components common to TPH

| Description                           | Cat#                |
|---------------------------------------|---------------------|
| Tip Breaking Tool (1 ea)              | A-0079              |
| Scale, Pocket (1 ea)                  | A-0156              |
| Timer, 3-Channel (1 ea)               | A-0157              |
| Ampoule Rack, holds 36 (1 ea)         | A-0158              |
| Spatula Pack (50 ea)                  | A-0160              |
| Reagent Blank Ampoule Pack (2 ea)     | A-0161              |
| Sodium Sulfate, 80 g bottle           | A-0162 <sup>2</sup> |
| TPH Reaction Tube Plug/Snapper (1 ea) | A-0168              |
| TPH Photometer (1 ea)                 | A-9310              |

<sup>1</sup>Expected dynamic range of the test in soil sample matrix (The instructions include dilution procedures, if an extended range is required.).

<sup>2</sup>Consumption of this accessory is solely dependent on the moisture content of the soil being tested. If the soil being tested has a moisture content above 10%, the bottle of sodium sulfate will be depleted after approximately 10 tests.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*

# Turbidity

## Method

Designed for portability and durability, the waterproof CHEMetrics Turbidity Meter (Cat. No. I-1300) is ideal for monitoring turbidity in chemical, food, and industrial applications. The microprocessor-based turbidity meter uses an infrared LED light source and delivers unprecedented repeatability and accuracy while offering resolution as low as 0.01 NTU. This light-weight meter is a valuable analytical tool for field-testing and quality control.

## Method of Operation.

The turbidity meter is equipped with an infrared LED as its source of light and meets all testing requirements of ISO-7027 (DIN EN 27027) method (Nephelometric Turbidity Units). The wavelength peaks at 850 nm, which provides the required intensity of diffused light even in samples with low turbidity values and also reduces interference from any colors.

The meter determines the sample turbidity level and automatically adjusts to the appropriate measurement range (0-1000 NTU), eliminating guesswork. Pressing the CAL button initiates the quick and simple calibration procedure. The instrument automatically prompts the user for the next calibration standard. The meter comes with four primary calibration standards (0.02, 20.0, 100, and 800 NTU). The meter also comes with three borosilicate sample cuvettes with light-shield caps.

## FEATURES

**Measurement Range:** 0 to 1000 NTU.

**Automatic Range Selection:** 0.01-19.99 NTU, 20.0-99.9 NTU, 100-1000 NTU.

**Resolution:** 0.01 NTU (0-19.99 NTU), 0.1 NTU (20.0-99.9 NTU), 1 NTU (100-1000 NTU).

**Accuracy:**  $\pm 2\%$  of measurement  $\pm 1$  LSD for 0 to 500 NTU,  $\pm 3\%$  of measurement  $\pm 1$  LSD for 501 to 1000 NTU.

**Light Source:** Infrared-emitting diode (850 nm wavelength).

**Operating Temperature Range:** 32°F to 122°F (0 to 50°C).

**Power Supply:** Four AAA Alkaline batteries (>1200 measurements).

**Dimensions:** 2.7" width x 6.1" length x 1.8" height (6.8 x 15.5 x 4.6 cm)

**Weight:** 7 oz. (200 g)



**Range: 0-1000 NTU**

|                        | Cat#          |
|------------------------|---------------|
| <b>Turbidity Meter</b> | <b>I-1300</b> |

Instrument comes in carrying case with calibration standards, cuvettes, four AAA alkaline batteries, and instructions.

## Accessories

| Description  | Cat#   |
|--|--------|
| Turbidity Calibration Set, Shelf-life 6 months<br>Increments: 0.02, 20.0, 100, and 800 NTU | A-0180 |
| Turbidity Cuvettes Pack (3 ea)   | A-0181 |

*Instructions are posted on our website.*



## FEATURES

- Waterproof
- Auto-Ranging
- Push-button calibration
- Advanced power-supply management
- Auto-shutoff

## Method

References: APHA Standard Methods, 20<sup>th</sup> ed., pp. 3-105, Method 3500-Zn B (1998). ASTM D 1691-84, Zinc in Water, Test Method A.

Zinc deposits are present in much of the earth's crust. The metal provides an effective protective coating for steel (galvanized coatings) and is useful as an alloying agent. Zinc salts are useful as corrosion inhibitors in cooling water treatment formulations. The USEPA has established a Maximum Secondary Drinking Water Standard of 5 mg/L for zinc.

CHEMetrics' method determines soluble zinc in drinking water and wastewater. Zinc reacts with the reagent *zincon* in a buffered alkaline solution to form a blue complex. Interference from other heavy metals can be eliminated by the addition of cyanide. However, for safety, cyanide has not been included in the reagent formulation. Results are expressed as ppm (mg/L) Zn.

Shelf-life: although the reagent in the ampoule is stable, the indicator solution has an eight-month shelf-life. We recommend stocking quantities that will be used within seven months.



## Instrumental Kits

### V-2000 Multi-Analyte Photometer

(See page 12 for instrumental features)

Range: 0.30-3.00 ppm  
Method: Zincon

|                                     | Cat#   |
|-------------------------------------|--------|
| Vacu-vials Kit, Shelf-life 8 months | K-9903 |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Indicator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

Range: 0.60-6.00 ppm  
Method: Zincon

|                                     | Cat#   |
|-------------------------------------|--------|
| Vacu-vials Kit, Shelf-life 8 months | K-9923 |

Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Indicator Solution, 25 mL sample cup, ampoule blank, instructions, calibration table, and MSDS.

*Vacu-vials Kits require the use of the V-2000 Photometer or a spectrophotometer capable of accepting a 13 mm diameter round cell. Instrument sold separately*

### Kit Components common to Zinc

| Description                   | Cat#   |
|-------------------------------|--------|
| Sample Cup Pack, 25 mL (6 ea) | A-0013 |
| Ampoule Blank Pack (5 ea)     | A-0023 |

Instructions are posted on our website.

*If no shelf-life is listed for a product, then the shelf-life is at least 2 years.*



**To Place an Order** ● Write: CHEMetrics, Inc.  
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Calverton, VA 20138  
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1-540-788-9026  
Fax: 1-540-788-4856  
E-Mail: orders@chemetrics.com  
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**Hours** ● 8:00 AM to 4:30 PM Eastern Time, Monday through Friday, except holidays.

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**Quantity Discounts** ● Quantity discounts off list price are as follows for identical items:

| Test Kits, Refills, and Components |          | Instruments |          |
|------------------------------------|----------|-------------|----------|
| Quantity                           | Discount | Quantity    | Discount |
| 50-99                              | 10%      | 5-9         | 5%       |
| 100-199                            | 15%      | 10-19       | 10%      |
| 200 or more                        | 20%      | 20 or more  | 15%      |

**Substantially higher discounts are available for large quantity orders. Contact the Marketing Department for details.**

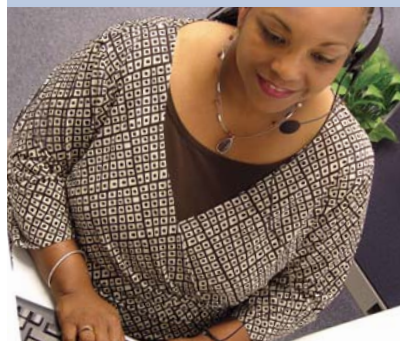
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3,634,038, 4,332,769, 4,537,747,  
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