

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 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, Dissolved Oxygen in Water, 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.

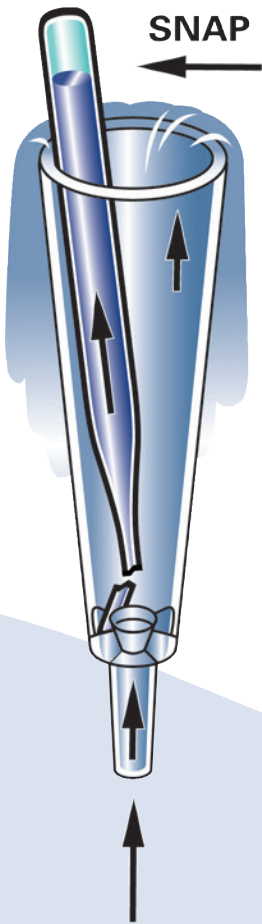
Test kits for environmental and drinking water applications (ppm range) employ the indigo carmine method. The reduced form of indigo carmine reacts with D.O. to form a blue product. The indigo carmine methodology is not subject to interferences from temperature, salinity, or dissolved gases such as sulfide, which plague users of D.O. meters. Results are expressed as ppm (mg/L) O₂.

The Rhodazine D™ Method

References: Developed by CHEMetrics. ASTM Power Plant Manual, 1st. ed. p. 169 (1984). ASTM D 5543-15, Low Level Dissolved Oxygen in Water. Department of the Navy, Final Report of NAVSECPHILADIV Project A-1598, Evaluation of CHEMetrics Feedwater Dissolved Oxygen Test Kit (1975).

Test kits for boiler waters and applications requiring trace levels of D.O. (ppb range) employ the Rhodazine D methodology. Developed by CHEMetrics., 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) O₂.

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. A video illustrating this sampling procedure is posted on the Dissolved Oxygen analyte page of our website.



Visual Kits

Range: 0-20 ppb MDL: 2 ppb / Method: Rhodazine D	
ULR CHEMets Kit	Cat# K-7511
ULR CHEMets Refill, 30 ampoules	R-7511
Comparator 0, 2, 4, 6, 8, 12, 16, 20 ppb	C-7511
Kit comes in a cardboard box and contains everything needed to perform 30 tests: Refill, Comparator, adhesive mounting clamp, permanent mounting clamp, sampling tube and instructions.	

Range: 0-40 ppb MDL: 2.5 ppb / Method: Rhodazine D	
CHEMets Kit	Cat# K-7540
CHEMets Refill, 30 ampoules	R-7540
Comparator 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 and instructions.	

Range: 0-100 ppb MDL: 5 ppb / Method: Rhodazine D	
CHEMets Kit	Cat# K-7599
CHEMets Refill, 30 ampoules	R-7540
Comparator 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 and instructions.	

Range: 5-180 ppb MDL: 5 ppb / Method: Rhodazine D	
CHEMets Kit	Cat# K-7518
CHEMets Refill, 30 ampoules, Shelf life 12 months	R-7518
Comparator 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 and instructions.	

Range: 0-1 ppm MDL: 0.025 ppm / Method: Rhodazine D	
CHEMets Kit	Cat# K-7501
CHEMets Refill, 30 ampoules	R-7501
Comparator 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 and instructions.	

Range: 1-12 ppm MDL: 1 ppm / Method: Indigo Carmine	
CHEMets Kit	Cat# K-7512
CHEMets Refill, 30 ampoules	R-7512
Comparator 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 and instructions.	

Instructions and SDSs are posted on our website.
If no shelf life is listed for a product, then the shelf life is at least 1 year.



⚠ WARNING! These products employing the Rhodazine D method can expose you to chemicals including methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

 Instrumental Kits

Multi-Analyte Photometers
V-2000 / V-3000
(See page 14 for instrumental features)

Range: 0-1.000 ppm
Method: Rhodazine D

Vacu-vials Kit	Cat# K-7553
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 and instructions.	

Range: 0-15.0 ppm
Method: Indigo Carmine

Vacu-vials Kit, Shelf life 18 months	Cat# K-7513
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, 25 mL sample cup, ampoule blank and instructions.	

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

SAM Single Analyte Photometers
(See page 16 for instrumental features)

Range: 0-15.0 ppm
Method: Indigo Carmine

SAM Kit	Cat# I-2002
Vacu-vials Kit, 30 ampoules, 25 mL sample cup, ampoule blank and instructions, Shelf life 18 months	
K-7513	
SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, 4 AAA batteries, screwdriver, light shield, and instructions.	

Components and Accessories	
Description	Cat#
Comparator Light Source (CLS)	A-0004
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
* Sample Zeroing Accessory Pack	A-0503

* For use when testing colored or turbid samples. See page 13 for details.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.

 **WARNING!** The product employing the Rhodazine D method can expose you to chemicals including methanol, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.



Ozone

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 and sterilization processes in the food & beverage and pharmaceutical industries.

The DPD Method

References: USEPA Methods for Chemical Analysis of Water and Wastes, Method 330.5 (1983). APHA Standard Methods, 23rd ed., Method 4500-Cl G-2000.

Potassium iodide is added to the sample before analysis. Ozone reacts with the iodide to liberate iodine. The iodine reacts with DPD (N, N-diethyl-p-phenylenediamine) to form a pink color. Results are expressed as ppm (mg/L) O₃.

The Indigo Method

References: Bader H. and J. Hoigné, Determination of Ozone in Water by the Indigo Method,” Water Research Vol. 15, pp. 449-456, 1981. APHA Standard Methods, 23rd ed., Method 4500-O₃ B – 1997.

With the indigo method, indigo trisulfonate dye immediately reacts with ozone. The color of the blue dye decreases in intensity in proportion to the amount of ozone present in the sample. The test reagent is formulated with malonic acid to prevent interference from up to at least 10 ppm chlorine. Results are expressed as ppm (mg/L) O₃.

The CHEMetrics Ozone (indigo) Vacu-vials Kit employs an innovative “self-zeroing” feature to eliminate the need to generate a reagent blank. Each Vacu-vials ampoule is measured before and after being snapped in sample. The change in color intensity, measured in absorbance, between reagent in the unsnapped and snapped ampoule is used to determine the ozone concentration of the sample.

 Visual Kit

Range: 0-0.60 & 0.6-3.0 ppm
MDL: 0.025 ppm / Method: DPD

CHEMetrics Kit	Cat# K-7404
CHEMetrics Refill, 30 ampoules	R-7404
Activator Solution Pack, six 10 mL bottles	A-7400 ¹
Low Range Comparator 0, 0.05, 0.10, 0.20, 0.30, 0.40, 0.50, 0.60 ppm	C-7404
High Range Comparator 0.6, 0.8, 1.0, 1.25, 1.5, 1.75, 2.0, 2.5, 3.0 ppm	C-7405
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 and instructions.	

 Instrumental Kits

Multi-Analyte Photometers
V-2000 / V-3000
(See page 14 for instrumental features)

Range: 0-5.00 ppm
Method: DPD

Vacu-vials Kit	Cat# K-7423
Kit comes in a cardboard box and contains everything needed to perform 30 tests: thirty ampoules, Activator Solution, 25 mL sample cup, ampoule blank and instructions.	

Vacu-vials Kits require the use of a CHEMetrics Direct-Readout Photometer (photometers sold separately) or a spectrophotometer capable of accepting a 13 mm diameter round cell. See page 14 for details.

SAM Single Analyte Photometer
(See page 16 for instrumental features)

Range: 0-0.75 ppm
Method: Indigo

SAM Kit	Cat# I-2022
Vacu-vials Kit, 30 ampoules, 25 mL sample cup, ampoule blank and instructions. Shelf life 12 months.	
K-7433	
SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, light shield, 4 AAA batteries, screwdriver, certificate and instructions.	

Range: 0-5.00 ppm
Method: DPD

SAM Kit	Cat# I-2019
Vacu-vials Kit, 30 ampoules, Activator Solution, 25 mL sample cup, ampoule blank and instructions.	
K-7423	
SAM Kit comes in a plastic case and contains everything needed to perform 30 tests: Vacu-vials Kit, SAM Photometer, light shield, 4 AAA batteries, screwdriver, and instructions.	

Components and Accessories	
Description	Cat#
Sample Cup Pack, 25 mL (6 ea)	A-0013
Ampoule Blank Pack (5 ea)	A-0023
* Sample Zeroing Accessory Pack	A-0025

* For use when testing colored or turbid samples. See page 13 for details.

¹ The accessory pack supplies enough solution to perform at least 200 tests.

Instructions and SDSs are posted on our website.

If no shelf life is listed for a product, then the shelf life is at least 1 year.