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, 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) O_2.

The Rhodazine D™ Method

References: Developed by CHEMetrics, Inc. 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, 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_2.

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

	Cat#
ULR CHEMets Kit	**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: 5-180 ppb
MDL: 5 ppb / Method: Rhodazine D

	Cat#
CHEMets Kit	**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: 0-40 ppb
MDL: 2.5 ppb / Method: Rhodazine D

	Cat#
CHEMets Kit	**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: 0-1 ppm
MDL: 0.025 ppm / Method: Rhodazine D

	Cat#
CHEMets Kit	**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: 0-100 ppb
MDL: 5 ppb / Method: Rhodazine D

	Cat#
CHEMets Kit	**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: 1-12 ppm
MDL: 1 ppm / Method: Indigo Carmine

	Cat#
CHEMets Kit	**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 2 years.

Instrumental Kits

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

Range: 0-1.000 ppm
Method: Rhodazine D

	Cat#
Vacu-vials Kit	**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: 0-2.00 ppm
Method: Indigo Carmine

	Cat#
Vacu-vials Kit, Shelf-life 18 months	**K-7503**

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 and instructions.

Range: 0-15.0 ppm
Method: Indigo Carmine

	Cat#
Vacu-vials Kit, Shelf-life 18 months	**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 17 for instrumental features)

Range: 0-15.0 ppm
Method: Indigo Carmine

	Cat#
SAM Kit	**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.

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