



Standard Test Method for Low-Level Dissolved Oxygen in Water¹

This standard is issued under the fixed designation D5543; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the rapid determination of low-level ($<100 \mu\text{g/L}$) dissolved oxygen in thermal-cycle steam condensate, deaerated boiler feedwater, boiler water, and deaerated deionized water. Color comparators allow the estimation of concentrations ranging from 0 to $100 \mu\text{g/L}$ (ppb) oxygen.

1.2 This test method may be applicable to electronic-grade, pharmaceutical-grade, and other high-purity waters, although these were not addressed in the collaborative study.

1.3 It is the user's responsibility to ensure the validity of this test method for waters of untested matrices.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D1066 Practice for Sampling Steam

D1129 Terminology Relating to Water

D1193 Specification for Reagent Water

D2777 Practice for Determination of Precision and Bias of Applicable Test Methods of Committee D19 on Water

D3370 Practices for Sampling Water from Closed Conduits

D5463 Guide for Use of Test Kits to Measure Inorganic Constituents in Water

¹ These test methods are under the jurisdiction of ASTM Committee D19 on Water and are the direct responsibility of Subcommittee D19.03 on Sampling Water and Water-Formed Deposits, Analysis of Water for Power Generation and Process Use, On-Line Water Analysis, and Surveillance of Water.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, refer to Terminology D1129.

4. Summary of Test Method

4.1 The tip of a partially evacuated sealed ampoule is broken while submerged in a flowing water sample. The sample is drawn into the ampoule where it reacts instantaneously with the oxygen-sensitive indicator (leuco form of Rhodazine D) to produce a reddish violet color whose intensity is proportional to the concentration of dissolved oxygen.³

5. Significance and Use

5.1 Dissolved oxygen is detrimental in certain boiler and steam cycles because it may accelerate corrosion. Concentrations above $10 \mu\text{g/L}$ are unacceptable in many high-pressure boiler systems. The efficiency of dissolved oxygen removal from boiler feedwater by chemical or mechanical means, or both, is determined by measuring the concentration before and after the process. The measurement is also made to check for air leakage into the boiler system.

5.2 The oxygen treatment method for boiler corrosion reduction requires injection of oxygen into the boiler feedwater. The resulting oxygen level is monitored for control purposes.

6. Interferences

6.1 Color, turbidity, and oxidizing impurities interfere in this test method to yield high results. If the sample is colored or turbid or contains oxidizing impurities, the amount of interference that may be contributed by such effects must be determined independently prior to using this test method.

6.2 Easily reduced metal ions may interfere in this test method to cause high results. For example, $100 \mu\text{g/L}$ (ppb) Cu^{+2} may appear as $5 \mu\text{g/L}$ (ppb) dissolved oxygen, and $100 \mu\text{g/L}$ Fe^{+3} may appear as $7 \mu\text{g/L}$ dissolved oxygen. However, less than $50 \mu\text{g/L}$ Cu^{+2} or Fe^{+3} cause less than $1 \mu\text{g/L}$ interference.

³ Spokes, G. N., *Dissolved Oxygen in Water Measurement and Standardization*, EPRI PWR Plant Chemists' Meeting, San Diego, CA, Nov. 17–20, 1992. Copies obtainable from CHEMetrics Inc., 4295 Catlett Rd., Midland, VA 22728, <https://www.chemetrics.com>.