

QAM-I-113

**Operation and Calibration  
of the Dissolved Oxygen Meter**

Revision 7

Approval:

  
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Laboratory Manager

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## Operation and Calibration of the Dissolved Oxygen Meter

**1.0 Applicability and Purpose**

- i. This procedure applies to the operation and calibration of the YSI Model 5100 dissolved oxygen meter or equivalent and associated probe. By performing the calibration procedure prior to any analysis that uses this meter, the technician reduces anomalies due to instrument sensitivity fluctuations. The operation of this instrument allows the analyst to determine the level of specific conductance of water samples received by the TIAER chemistry laboratory.

**2.0 Definitions**

- i. Dissolved oxygen (DO)- gaseous oxygen solubilized in water
- ii. Standard QA/QC definitions are found in QAM-Q-101, "Laboratory Quality Control".

**3.0 Equipment and Reagents**

- i. Equipment
  - a. YSI Model 5100 Dissolved Oxygen Meter or equivalent
  - b. YSI Model 5906 BOD Probe or equivalent with associated membrane cap kit
  - c. BOD bottles
  - d. Aquarium aerator with bubbling stone
  - e. Barometer, NIST traceable
  - f. "C" batteries, if needed
- ii. Reagents
  - a. Deionized water (DI) - water that has passed through ion exchange resin and meets Type II criteria (specific conductance < 1.0  $\mu\text{S}/\text{cm}$ ).
- iii. Standards
  - a. Potassium chloride (KCl), half-saturated, included in the cap kit. Add DI to the bottle up to the neck and shake several times to dissolve.

**4.0 Procedure**

- i. Meter Setup
  - a. Ensure the meter has good batteries, if not plugged in.
  - b. Plug in the power supply.
  - c. Turn to "on".

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- d. Ensure the probe is connected to the meter.
- ii. DO Probe Setup
  - a. Remove the membrane O-ring assembly cap from the cap kit supply.
  - b. Using the sand paper circle from the cap kit, gently sand the gold probe end and the silver reference anode side (if present) with a couple of strokes to make shiny.
  - c. Fill the membrane cap with the KCl solution and replace.
  - d. Rinse the probe and place in DI in the BOD bottle. Let soak about 30 minutes.
  - e. The membrane is replaced and filled with fresh KCl either monthly or each time it is used (if not used monthly).
- iii. Calibration
  - a. Air calibration
    - i. Place the probe in air at 100% relative humidity. This is done by filling the BOD bottle to about 1" with DI and shaking.
    - ii. Do not turn on the stirrer when air calibrating.
  - b. Air-saturated water calibration
    - i. Air-saturate a volume of water for at least 15 minutes with the aquarium aerator.
    - ii. Place the probe into a BOD bottle full of aerated water and stir.
  - c. Auto Cal
    - i. Allow the probe and meter to stabilize for at least 15 minutes in the air or water.
    - ii. Press CALIBRATE and allow the display readings to stabilize.
    - iii. Take the NIST barometer reading and record in the log. Also record the DO saturation and temperature.
    - iv. If the instrument barometer reading is the same as the NIST barometer reading, press AUTOCAL to calibrate.
    - v. If the instrument differs from the barometer, enter the decimal saturation into the instrument using the up or down arrow keys. And press DO CAL to calibrate.

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- vi. Press MODE to return to the main screen.
- iv. Operation
  - a. Ensure the instrument has been calibrated and enter the main mode screen.
  - b. Place the probe in the appropriate BOD bottle of sample.
  - c. Turn on the stirrer and allow reading to stabilize.
  - d. Ensure that the sample temperature is within 2° C of room temperature, or the temperature that the meter was calibrated to.
  - e. Read and record the DO.
  - f. Rinse the probe with DI prior to placing in another sample.
  - g. When all samples are read, measure air-saturated water or 100% humidity air and record the reading in the log. This serves as the closing calibration verification (CCV), though it is not actually a standard.
    - i. The CCV is within 5% of the initial calibration reading or corrective action is initiated.
    - ii. No LCS, LCSD or blank is appropriate for this procedure. However, SOP-C-101, "Determination of BOD" requires such standards, blanks and other QC controls.
- v. Maintenance
  - a. Store the probe in DI water when not in use. Ensure the stirrer is off.
  - b. Do not leave batteries in the meter for extended periods if it is not in use. Battery acid may leak and corrode the inside panel. Replace batteries if "LOW BATT" message appears.
  - c. Consult the instrument manual for diagnostic and troubleshooting details.

**5.0 Quality Control and Safety Aspects**

- i. All aspects of this procedure comply with QAM-Q-101, "Laboratory Quality Control", and QAM-S-101, "Laboratory Safety".
- ii. The accuracy and precision of sample measurements are dependent upon a stable reading.

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- iii. Membrane electrodes exhibit a high dependency on temperature due to permeability. Ensure all measurements are made at room temperature, even though the meter is automatically temperature compensated.
- iv. DO measured by this membrane method may be confirmed by other methods, including Winkler titration (SM 4500-O d).
- v. Heavy residue, oils, chlorine, acids and bases can attack or cause filming on the probe membrane and sensor anodes.
- vi. For highly saline waters (above about 40,000 ppm), consult the instrument manual to apply corrections.
- vii. The analyst consults the MSDS files if he/she has any question as to the safe handling of any reagent required by this procedure for analysis.
- viii. Safety glasses, at a minimum, are worn at all times when performing this procedure.
- ix. Record all lot numbers of reagents used in the log (E-log).

**6.0 References**

- i. YSI Model 5100 Operations Manual, YSI Incorporated, Yellow Springs, Ohio.
- ii. Standard Methods for the Examination of Water and Wastewater, latest online edition, Washington D.C., Method 4500-O (approved 2011).
- iii. The National Environmental Laboratory Accreditation Conference Institute (TNI) standard, 2016.

**7.0 Attachments**

none