Thermo Scientific Orion Star A213 Benchtop RDO/DO Meter Calibration and DO Measurement

1. SCOPE AND APPLICATION

   1.1. This method is based on the Thermo Scientific Orion Star A213 Benchtop RDO/DO Meter operating instructions. It is used to calibrate the Thermo Scientific Orion Star A213 and to measure dissolved oxygen (DO).

2. SUMMARY OF METHOD

   2.1. The DO electrode probe is calibrated using the air saturation method. The Thermo Scientific Orion Star A213 can also be calibrated using air-saturated water, Winkler titration and zero-point calibration techniques (see manual for more details).

   2.2. Measurements are made and recorded in appropriate logbooks and LIMS logbooks.

3. EQUIPMENT AND SUPPLIES

   3.1. Thermo Scientific Orion Star A213 with DO Electrode Polarographic Dual Thermistor probe

   3.2. Polarographic electrolyte solution

   3.3. Calibration sleeve or BOD bottle

   3.4. Beakers

   3.5. Deionized water

4. METHOD: INITIAL DO PROBE PREPARATION

   4.1. Unscrew the membrane cap from the probe and remove any remaining electrolyte solution in the cap. Rinse the cap and the probe with DI water, then blot dry.

   4.2. Fill the cap about ¾ full of new electrolyte solution. Screw the cap on until it is secure or hand tight.

   4.3. Polarize the probe by attaching it to the meter and allow it to sit for 30-60 minutes. When the meter is powered on, the attached probe will be continuously polarized.

   4.4. The probe should be stored in the calibration sleeve or in a BOD bottle with DI water.

5. METHOD: AIR CALIBRATION

   5.1. Ensure that the probe is connected to the meter and the meter is plugged in.

   5.2. Turn meter on using the power key and press the **measure** key.

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5.3. In measurement mode, press **F1** (cal). Select the **air** option by using the arrow keypad and press **F3** (select).

5.4. Rinse the DO probe with deionized (DI) water and blot dry with a Kimwipe. Place into calibration sleeve (go to step 5.4.1) or into the BOD bottle (go to step 5.4.2). Allow the probe and water-saturated air to reach equilibrium.

5.4.1. Calibration sleeve

5.4.1.1. To prepare the calibration sleeve, remove the cap from the end of the sleeve, then remove the sponge that is stored inside. Saturate the sponge with distilled water and then squeeze out the excess water. Replace the sponge and the cap.

5.4.1.2. After rinsing the probe, insert the probe into the sleeve and press **F3** (start). Continue to 5.5.

5.4.2. BOD bottle

5.4.2.1. To prepare a BOD bottle, fill the bottle with ~50 mL of DI water. After rinsing the probe, insert the probe into the BOD bottle. Ensure that the probe is suspended half an inch above the DI water and that the probe is not submerged in the water.

5.5. Wait for the dissolved oxygen reading to stabilize and stop flashing. Once the reading is stable the meter will display “Accepting Auto % Sat. Calibration”. The saturation for a polarographic DO probe should read 102.3%.

5.6. Press **F3** (cal done) to export the data. Then press **F1** (meas.) to return to measurement mode.

5.7. To complete a calibration check, take the temperature measurement given on the top left of the screen and refer to the DO saturation table on the wall next to the meter station to find the accepted value for that temperature at 0-ft altitude and 102.3% saturation. The DO reading should be ±0.3 mg/L of accepted value to ensure correct calibration.

6. METHOD: MEASUREMENT OF DISSOLVED OXYGEN

6.1. Rinse probe with DI water and blot dry.

6.2. Place probe into the sample and gently stir. Stir continuously while reading the sample.

6.3. Press **measure** key to begin reading. The **AR** icon should be flashing until it stabilizes. Once the **AR** icon is solid, record the DO in mg/L.

6.4. Remove the probe and rinse with DI water and blot dry between samples.

7. SALINITY ADJUSTMENT

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7.1. When testing a saltwater sample, the salinity must be accounted for when measuring DO. To manually adjust the salinity, press **F3** (setup). Then select the **DO/RDO** channel settings, press **F3** (select) to select.

7.2. Select ”mode setting” by using the arrows and press **F3** (select). This will give a menu of options, scroll down and select “salinity correct” by using the **F3** (select) key. Select **edit** and then **manual**. A number screen will appear. Enter the correct salinity value and press **F2** (done).

7.3. After the salinity is set, press **measure** (esc) to return to the main screen.

8. DATA ARCHIVAL

8.1. Use a black, waterproof pen for all bench sheets and logbooks.

8.2. Record calibration data in the Tox DO section of The Laboratory Logbook in LIMS.

8.3. Record all meter maintenance in the meter calibration and maintenance binder.

8.4. To correct raw data entries, place a single line through the incorrect entry, write the corrected entry near the error and initial the correction. Do not overwrite entries.

8.4.1. The corrected entry is written as near as possible to the error or in the comment box on the appropriate bench sheet.

8.4.2. If the correction requires an explanation, write a comment and reference the error with a letter. Initial and date the explanation. Do not attempt to put all information (correction and comments) into a small space.

8.4.3. Use sequential alphabetical annotation to identify errors and corresponding comments (use A for first error and use A for corresponding explanatory comment; use B for second error, etc.).

8.5. Record information in appropriate logbooks.

9. QUALITY CONTROL

9.1. The DO meter should be recalibrated before use, if not used within two hours of the initial calibration.

9.2. If a problem occurs during the sample processing or testing, the following steps are performed: 1) Lab supervisor is notified. 2) Client is notified (client makes decision for additional testing). 3) Section administrator is notified. 4) A non-conformance report (NCR) is submitted describing the problem and the corrective action.

9.2.1. To create NCR: open LIMS and go to Laboratory/Administrative/Non-Conformance Report. Refer to https://floridadep.gov/dear/quality-assurance/content/dep-sops for sample collection and preservation, and the

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Laboratory Quality Manual for corrective action and handling out-of-control data.

9.3. Refer to manual if temperature needs to be calibrated.

9.4. DO probe maintenance

9.4.1 Unscrew the membrane cap and dispose of the remaining electrolyte solution and membrane cap.

9.4.2 Use a polishing disk to clean the probe by adding a few drops of DI water to the polishing disk and gently wipe the cathode.

9.4.3 Rinse the probe with DI water and blot dry.

9.4.4 Fill a new membrane cap ¾ full of new electrolyte solution. Screw the cap back on until it is secure or hand tight.

9.4.5 Polarize the probe by attaching it to the meter while it is powered on. Let it sit for 30-60 minutes before use.

9.4.6 View other trouble shooting tips in the manual located in B246.

10. REFERENCES

10.1 Instruction manual for Thermo Scientific Orion Star A213 Benchtop RDO/DO Meter Calibration

10.2 User guide for Dissolved Oxygen Probes

10.3 DEP Laboratory Quality Manual

10.4 DEP Laboratory Health and Safety Plan

APPENDIX OF SIGNIFICANT CHANGES

3/25/2020 Updated links. Updated data archival section to include recording records in LIMS and maintenance binder. Changed font from Times New Roman to Calibri.

3/20/2023 Updated links and checked for grammar.

3/12/2024 Updated links and edited for grammar, clarity, and word choice.

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