Standard Operating Procedure for:
YSI MultiLab 4010-1 Meter Calibration and YSI IDS ProOBOD DO Probe Maintenance

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LABORATORY
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1. SCOPE AND APPLICATION

    1.1. This method is based on the YSI MultiLab 4010-1 meter operating instructions. It is used to calibrate the YSI MultiLab 4010-1 meter and probe and to measure dissolved oxygen (DO).

2. SUMMARY OF METHOD

    2.1. The DO probe is calibrated using the air saturation method. Measurements are made and recorded in appropriate logbooks and LIMS logbooks.

3. EQUIPMENT AND SUPPLIES

    3.1. Calibration

        3.1.1. YSI MultiLab 4010-1 meter (S/N 20061905)

        3.1.2. YSI IDS ProOBOD probe

        3.1.3. BOD bottle

        3.1.4. Computer with access to the Laboratory Information Management System (LIMS)

    3.2. Maintenance

        3.2.1. New optical calibration cap kit that contains a cap, O-ring, grease, and sponge

4. REAGENTS AND STANDARDS

    4.1. Deionized water

5. METHOD: INITIAL DO PROBE PREPARATION

    5.1. Prior to use, the analyst must read the YSI IDS ProOBOD probe and Multi-Lab 4010-1-meter manuals located in \\floridadep\data\DEAR\Labs\Lab5\Biology\BenchCommon\ToxCommon\Manuals\Meter Manuals

    5.2. Make sure the probe and cap are dry and place in a BOD bottle containing at least 1 inch of water the night before calibration. The environment for the cap should be humid, but do not submerge the sensor in water prior to calibration.

6. METHOD: AIR CALIBRATION

    6.1. Turn on the YSI Multi-Lab 4010-1 meter by pressing the on-button and allow it to stabilize until the ”O2” icon in upper left corner stops flashing. The optical probe does not require any additional warm-up time.

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6.2. Ensure that the salinity setting is turned off by pressing **Enter** from the measurement screen to access the settings. Return to the measurement screen. Press **M** to change the setting to mg/L if needed.

6.3. Press the **CAL** button and then **Enter**. The meter will perform a calibration and beep when it is done.

6.3.1. The display will show the calibration results including date/time and number of + signs. Three plus signs indicate an excellent calibration curve with a relative slope between 0.94 and 1.06. Two + signs indicate a relative slope of 0.92 to 0.94 or 1.06 to 1.08. One + sign indicates a relative slope of 0.90 to 0.92 or 1.08 to 1.10. If an "error" message appears, determine the cause and re-calibrate. Select **Exit** to go back to the measurement screen.

6.4. Select **Continue**. Press **F1** to verify calibration. If it passes, place probe in cup to be measured.

6.4.1. Do not keep probe in the rinse cup. Place back into BOD bottle between use. It does not need to be dried before being placed in the BOD bottle. **Never submerge the probe in a liquid sample past the point where the metal rods meet the ledge.**

6.5. Once the flashing "O2" in the top left corner of the screen is no longer flashing, the probe is stable. This reading is the calibration value.

6.6. Enter the temperature using an annually calibrated temperature probe.

6.7. Compare the reading to a DO Saturation table (theoretical value) and record measurements. If the reading differs by more than 0.30 mg/L from the measurement given in the DO saturation table, check the probe and re-calibrate.

6.8. Refer to steps 6.1-6.8 of SOP TA-06.42 for putting morning verification into LIMS.

7. METHOD: MEASUREMENT OF DISSOLVED OXYGEN

7.1. When reading samples, turn on the stirrer toggle switch located on top of the probe. Never submerge the probe too far into a water sample. The flashing "O2" will stop flashing when the reading is stable. The probe should be rinsed between different tests or descending conductivities.

7.2. To salinity adjust, push **Enter**. Scroll to **Salinity** and press **Enter**. Adjust to needed salinity and press **Enter**.

7.2.1. You can hold down the button.

7.3. Push **M** to go back to measuring. Remember for EOD check, adjust salinity back to "0".

7.4. Refer to steps 6.9-6.10 of SOP TA-06.42 for putting samples into LIMS. Refer to step 6.11-6.14 of SOP TA-06.42 for EOD check.

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8. PROBE MAINTENANCE AND TROUBLESHOOTING

8.1. The DO probe should be checked after each use for cracks or scratches in the sensor cap. It should also be checked if the meter fails to calibrate or readings are erratic and unstable. Sensor caps should be changed every 12 months depending on use if the probe is turned on for approximately 5 hours per day of the week. The probe has a lifetime luminescence that depletes over time as the meter is left on.

8.2. The sensor must remain in a humid environment. If it is not stored in a BOD bottle containing at least 1 inch of water, it must be rehydrated before use. Readings will be erratic, and the calibration may drift. To rehydrate, soak the sensor in tap water for 24-hours prior to calibration. Blot dry before calibration.

8.3. Check the sensor cap daily for biofilm build-up. The cap should be rinsed well at the end of each use and excess water gently dried. If dirt or residue is visible anywhere on the probe or cap, clean the probe and sensor cap. Make a 1% Liquinox solution and gently clean the sensor cap with a soft lens cloth weekly or more frequently if necessary. DO NOT use anything abrasive such as a brush or scrub pad. DO NOT use any other cleaning agents (such as ethanol or bleach) because it will strip the paint coating. The paint coating is the diffusion layer, and if affected, the probe will yield erroneous readings.

8.4. If the paint coating or the clear part of the cap is chipped or scratched, replace the cap. Replace the cap by twisting off the damaged cap. Remove the old O-ring, and replace with a new one. Add some grease to the O-ring and wipe the grease around the O-ring to secure a proper seal. Gently wipe off excess grease. Do not touch any of the optical parts. Use a lens cleaning cloth to remove any grease residue. Place the sensor cap on and twist to tighten. Remove any grease that gets on the probe.

8.5. Enter the new calibration cap coefficients into the meter in settings. The cap has a suggested lifetime of one year. The meter will display a notice of the upcoming cap expiration date. Do not use a cap past its expiration date.

8.6. Most of the time, erroneous readings are due to a damaged cap since the internal optical components are protected by the cap. However, if it is suspected that any internal optical components or the stir bar/shaft and motor are damaged due to dropping or mishandling, install a new probe.

8.7. Note: Always re-calibrate after changing the cap or probe before taking measurements.

9. DATA ARCHIVAL

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

9.2. Record any maintenance or problems with the probe or meter in the *Meter Maintenance Logbook*

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

9.3.1. The corrected entry is written as near its appropriate space as possible or else in the comment box on the appropriate bench sheet.

9.3.2. If the correction requires an explanation, write a comment and reference the error. Initial and date the explanation.

9.3.3. 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.).

10. QUALITY CONTROL

10.1. 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.

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

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

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

11. SAFETY/HAZARDOUS WASTE MANAGEMENT

11.1. Proper laboratory protection, including lab hood or ventilation system, lab coat, gloves and safety glasses, is required when working with chemicals and unprocessed samples.

11.2. Refer to the Laboratory Quality Manual for sample disposal.

11.3. Refer to the Laboratory Health and Safety Manual and Hazardous Waste Management.

12. REFERENCES

12.1. YSI Multi-Lab 4010-1 Instruction Manual

12.2. YSI IDS ProOBOD User's Manual

12.3. DEP SOP TA-06.42, LIMS Entry for Laboratory Parameters

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12.4. FDEP Laboratory Quality Manual

12.5. Laboratory Health and Safety Plan

APPENDIX OF CHANGES

03/12/2024 Updated links and added missing references; changed font to Calibri; edited for grammar, clarity, and word choice; and added Quality Control Section and Safety/Hazardous Waste Management section.

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