

PERFORM Operating Document

Use and maintenance of pH meter

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Version	Reason for Revision	Date
04	Condense version	09-Jun-2020

I. Introduction

The content of this PERFORM Operating Document (POD) provides guidelines for the use and maintenance of the pH meter.

The Fisherbrand™ accumet™ polymer pH electrode (Cat No. I3620221) has a pH range from 0 to 14 and temperature range of -5°C to 100°C. The accumet® Tris compatible combination electrodes are designed to give rapid and accurate results for a wide variety of applications. It is ideal for measurements in small containers or with small samples.

The Thermo Scientific Orion Star LogR meter (Cat. No. 3115001) includes a temperature measurement function, which automatically provides temperature compensated readings directly from the pH electrode. This pH meter is equipped with a stirrer and an automatic temperature compensation (ATC) probe to measure the temperature of the solution during measurement.

1.1 Training Requirements

Prior to using the pH meter individuals should:

- Read and sign this POD.
- Undergo appropriate training prior to use.

1.2 Relevant Documents

- accumet® Tris Compatible Combination Electrode Instruction Manual
- Orion Star™ LogR Meter User Guide

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2. Definition of Terms and Abbreviations

Cat. No.	Catalogue Number
M	Molar
HCl	Hydrogen Chloride
KCl	Potassium Chloride
ATC	Automatic Temperature Compensation
KOH	Potassium Hydroxide

3. Procedure

3.1 General Recommendations

- Polymer electrodes should not be used in non-aqueous solvents, concentrated acetic acid or concentrated oxidizing agents.
- The electrode should be immersed at least 2.5 cm into the solution that is being measured. It may further be immersed as long as the level of electrolyte in the reference side is above the level of the solution being measured.
- The electrolyte in the reference side should be maintained at a minimum of a ¼ inch below the fill hole. Add more solution of saturated KCl as needed.
- The level of electrolyte in the reference side must be kept above the end of the reference pack for the electrode to function.
- When transferring the electrode from one solution to another, always rinse the electrode with distilled water and blot dry with kimwipe before immersing into the next solution. An alternative would be to condition the electrode with a small amount of the next sample to be measured.
- When taking measurements in strong alkaline solutions, keep the electrode immersed only as long as necessary to take a reading.
- Never store the electrode in distilled or deionized water as this may lead to a slow sluggish response. Always store in the ROSS storage solution.
- Between sample measurements, keep the electrode in a buffer solution (pH 4 or 7 is preferred) and keep the fill hole open to avoid contamination of the electrolyte from the buffer solution.
- Keep the fill hole closed when the electrode is not in use.

3.2 pH Electrode Preparation

The following is a general procedure for preparing pH electrode:

- Remove the protective shipping cap from the electrode pH-sensing bulb and save the cap for longer storage of the electrode. Clean any salts deposits from the electrode exterior by rinsing it with distilled water.
- Twist the cap ring hole from closed to open position and add the reference electrode filling solution (Cat No. 810007) to the electrode up to the fill

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hole. To maintain an adequate flow rate, the level of filling solution must always be above the reference junction and at least 1/4 inch below the fill hole. Refer to the accumet® electrode manual for detailed instructions on dispensing the filling solution.

- The fill hole should be open whenever the electrode is in use and close if unused.
- Gently shake the electrode downward (similar to a clinical thermometer) to remove any air bubbles that may be trapped inside the electrode.
- Soak the electrode in the electrode storage solution Cat. No. 810001 .
- Select at least two pH buffers that bracket the expected sample pH that will be used.

3.3 pH Electrode Calibration

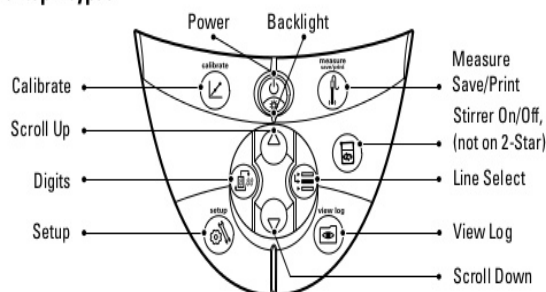
- Turn on the meter. (Note: To turn off press and hold for 3 seconds). Select two buffers that bracket the expected sample pH. The first buffer should be near the electrode isopotential point (pH 7) and the second should be near the expected sample pH (pH 4 or pH 10). Calibration buffer should be at same temperature as the sample.
- Verify weekly that the electrode slope is greater than 95 %.
- Rinse the electrode with distilled water between buffers.
- To reduce the chance of error due to polarization, avoid rubbing or wiping the electrode bulb. Use a kim wipe and gently blot the bulb.
- Handle the micro pH electrodes with care. Do not touch the pH bulb and stem against the bottom or walls of the sample containers.

3.4 pH Calibration

This procedure is recommended at least once per week for precise measurement.

- Verify that the pH electrode was prepared correctly and connect the electrode to the meter.
- In the measurement mode, press line select button (keypad picture below) until the arrow icon points to the top line, press scroll up button until pH icon is shown and press calibrate button to begin the calibration (consult meter user guide, section pH calibration).

Benchtop Keypad



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- Rinse the electrode, ATC probe and stirrer probe with distilled water and blot dry with a lint free tissue e.g. kim wipe.
- Wait for the pH icon to stop flashing.
 - a. Automatic buffer recognition – when the **pH** icon stops flashing the meter will display the temperature-corrected pH value for the buffer.
 - b. Manual calibration – When the **pH** icon stops flashing the meter will display the actual pH value read by the electrode. Press digit icon until the first digit to be changed is flashing, press narrow up and down to change value of the flashing digit and continue to change the digits until the meter displays the temperature-corrected pH value of the buffer. Once the pH buffer is set, press digit icon until the decimal point is in the correct location.
- Press Calibrate icon to proceed to the next calibration point and repeat steps above or press save and end the calibration.
- The actual electrode slope, in percent, will be displayed in the main field and SLP will be displayed in the lower field.

3.5 pH Measurement Procedure

- Rinse the electrode with distilled water and blot it dry with a lint-free tissue.
- Place the electrode into the sample.
- If the meter is in continuous measurement mode, it will start reading immediately and continuously update the display. The **pH** icon will flash until the reading is stable. Once the reading is stable, log the measurement and freeze display by pressing measure save. Press the stirrer icon on if needed.
- If the meter is in the AUTO-READ measurement mode, press measure to start the reading. The **AR** icon will flash until the reading is stable. Once the reading is stable, the meter will log the measurement and freeze the display. If a bench top meter is used and the stirrer is enabled, the stirrer will turn on when the measure button is pressed and turn off when the reading is stable.
- If the meter is in timed measurement mode, it will start reading immediately and continuously update the display. The meter will log the measurement at the frequency specified in the setup menu. If a bench top meter is used and the stirrer is enabled, press stirrer icon to start. Press stirrer icon again to turn off the stirrer before removing the electrode.
- Remove the electrode from the sample, rinse it with distilled or deionized water, blot it dry, place in the next sample and repeat step above.
- If dirty or viscous samples are used for measurement or the electrodes responses become sluggish, empty the electrode completely and hold the junction open under running water. Empty any water from the electrode

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and refill it with fresh ROSS fill solution. For a thorough cleaning method, refer to the accumet® Instruction Manual.

3.6 Temperature Display

- The most common cause of error in pH measurements is temperature. Therefore, calibration and measurements should be performed at the same temperature and pH values should be reported with temperature.
- Orion Star Plus LogR meters allow the temperature to be viewed on individual measurement lines in addition to the temperature display on the top, left of the screen.
- To view the temperature for the pH measurement line:
In the measurement mode, press line select icon to select the top display line. The arrow icon will point to the selected line. Press narrow up and down to change the value on the selected line. The top line can be changed to display pH, millivolts, temperature or a blank line.

4. Maintenance

4.1 Meter Maintenance

- For routine meter maintenance, dust and wipe the meter with a damp cloth. If necessary, warm water or a mild water-based detergent can be used. Perform meter maintenance on a daily, weekly or monthly basis.

4.2 pH Electrode Maintenance

- On a weekly basis, inspect the pH electrode for scratches, cracks, salt crystal build-up, or membrane/junction deposits.
- Rinse off any salt build-up with distilled water. Remove any membrane/junction deposits by soaking the electrode in a 0.1 M HCl solution for 15 seconds, rinse with distilled water, then immerse into 0.1 M KOH for 15 seconds. Repeat these steps several times by cycling the electrode in these solutions before rechecking the electrode performance. If the problem is not resolved, immerse the electrode tip into 20% ammonium bifluoride solution for 30 seconds. Rinse thoroughly with distilled water before immersing the tip of the electrode into concentrated HCl for 30 seconds and rinse with distilled water again. Finally, soak the electrode in buffer pH 4 for at least 1 hour before checking electrode performance.

CAUTION: The above fluoride solutions are very corrosive and hazardous, proper handling of these solutions should be observed.

- Drain the reference chamber, flush it with distilled water until all of the salt crystal build-up inside of the electrode is removed, flush it with fresh filling solution and fill the reference chamber with fresh filling solution.

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- Soak the electrode in ROSS® pH electrode storage solution, Cat. No. 810001, for 1 hour. The ROSS pH electrode storage solution is recommended for enhanced electrode performance.

4.3 Recommended Shelf Life for Buffers and Solutions

Unopened Thermo Scientific pH buffers and electrode filling solutions have an expiration date of two years from the date of manufacturing. Certificates of analysis, which include the expiration date, are available online. Visit <https://www.thermofisher.com/order/catalog/product/910104> and enter the product catalog number (i.e. 910104) into the search box. The search results will include a link to the certificates of analysis for the product. Select the link and the certificates of analysis will be listed by lot code. The lot code is printed on the bottom or side the solution bottle and consists of two letters followed by a number (i.e. LQ1). Select the lot code that is printed on the bottle to display the certificate of analysis.

Once a pH buffer or electrode filling solution is opened, discard the unused portion after 2 to 3 months. Once pH 10 buffer is opened, discard the unused portion after 1 month, since pH 10 buffer is vulnerable to carbon dioxide contamination. Never pour used pH buffers or electrode filling solutions back into the bottle.