

PERFORM Operating Document

Use and maintenance of pH meter PC-POD-CA-002-v03

Revision History

Version	Reason for Revision	Date
01	New POD	9-Apr-2013
02	New pH electrode.	20-April-2016
03	Revision to reflect current practices	26-April-2018

Summary

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

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APPENDIX I: POD TRAINING RECORD FORM

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1. Definition of Terms and Abbreviations

PERFORM operating document (POD)	Operating documents that are specific to an instrument or technique.
Cat. No.	Catalogue Number
mV	Millivolts
HCl	Hydrogen Chloride
KCl	Potassium Chloride
ATC	Automatic Temperature Compensation (ATC)
HNO ₃	Nitric Acid

2. Introduction

Orion star LogR pH meter (Cat No. 8165BNWP) have a pH range from 0 to 14, pH precision of 0.01 and temperature range of 0 to 100°C. The electrode includes a temperature measurement function which provides automatically temperature compensated readings directly from the pH electrode. This pH meter is equipped with a stirrer and a probe to measure the temperature of the solution during measurement.

2.1 Training requirements

Prior to using the pH meter individuals should:

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

2.2 Relevant documents

- Thermo Scientific Orion. ROSS pH electrodes user Manual
- Orion Star Log R Meter User Guide

3. Procedure

3.1 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

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- Uncover the fill hole and add the reference electrode filling solution (Cat No. 810007) to the electrode up to the fill hole. To maintain an adequate flow rate, the level of filling solution must always be above the reference junction and at least one inch above the sample level
- 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
- Connect the electrode to the meter
- Select at least two pH buffers that bracket the expected sample pH and will be used

3.2 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 between 92 to 102 % (54.43 to 60.34 mV per pH unit)
- 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.

3.3 pH Calibration

This procedure is recommended 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 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).
- 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

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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.

3.4 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 at on if needed.
- If the meter is in the AUTO-READ measurement mode, press measure save to start the reading. The **AR** icon will flash until the reading is stable. Once the reading is stable, the meter will log and print the measurement and freeze the display. If a benchtop 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 and print the measurement at the frequency specified in the setup menu. If a benchtop 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 and refill it with fresh ROSS fill solution. For a thorough cleaning method, refer to the Electrode Cleaning Procedures section.

3.5 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:

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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 or 0.1 M HNO₃ solution for 30 minutes. For cleaning oil or grease, prepare a 0.1% to 0.5% liquid detergent solution mixed with hot water. For cleaning bacterial contaminants, prepare a 1:10 dilution household laundry bleach. If the electrode is dirty, clogged or coated, refer to the pH Electrode Cleaning Procedures section for a more thorough electrode cleaning procedure.
- If a refillable electrode is used, 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.
- 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. 910107) 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

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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.

APPENDIX I

POD Training Record Form

Use and Maintenance of pH meter

Ownership	Document type	Area	SOP Number	Version
PC	POD	CA	002	V03

Training Record

Full Name	
Institution	
Contact (email or phone number)	

Signature

Sign here

Date