

pHoenix XL User Guide



Part No. 36-00087 Rev. H

For Use with Firmware v2.8 or Later

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Warnings

- This device is not suitable for use in a potentially explosive environment and cannot be used in an oxygen tent.
- Dispose of this device properly. It should not be disposed of in a landfill.
- Use of the meter with fluid temperatures above 60°C may cause injury.
- The Measurement Module has a calibration interval (expiry) of 1 year and should be replaced with a new Module only from Mesa Labs. Modules are disposable and not serviceable.
- When measuring dialysate, do not expel back into the dialysis machine.
- Use only NaCl based solutions for Mesa meter calibration.
- The user can be exposed to the following materials when using this device:
 - Polyester
 - Stainless Steel
 - Silicone
 - ABS Plastic
 - Polycarbonate Plastic
 - Copolyester Plastic
 - Powder Coat Paint

Caution

When used as a medical device, Federal (US) law restricts this device to sale by or on the order of a physician.

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A. Description

The Mesa Labs pHOenix XL Meter is designed to help you quickly and easily check the conductivity, pH and temperature of liquids.

Applications for Use

Conductivity, temperature and pH are key indicators of many systems' performance that require periodic monitoring and adjustment to achieve optimum results. Mesa Labs hand-held test instruments may be used to test liquids in a variety of settings including medical, environmental, industrial, laboratory, and commercial applications.

Indications for Use

This device is designed for use by hemodialysis professionals to verify the conductivity, temperature, and pH of solutions in the hemodialysis setting.

Principles of Operation

The instrument handle contains the electronic circuitry, battery, and graphic display. The Measurement Module contains a flow cell and measurement circuitry. A syringe attaches to the unit with Luer connectors and is used to draw liquids through the flow cell.

The switches on the front label are used to turn on the instrument, to freeze the readings on the display for easy recording, and to select modes during instrument configuration and calibration. All readings are shown simultaneously on the graphic display. Units of measure for conductivity and temperature are selectable by the user, as is the time for the Auto-Off function.

Three methods for sampling the liquid are provided (see pg. 15 for details):

- Direct sampling of the dialysate from a hemodialysis delivery system prior to patient connection to that system.
- Sampling by use a sample tube.
- Sampling through an attached sample cup.

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B. Safety

Cautions

Verify accurate function of your pHoenix XL Meter before taking measurements or whenever inaccurate readings are suspected. To verify function, use standard solutions traceable to the National Institute of Standards and Technology (NIST) or an equivalent standards organization. For temperature, use a NIST-traceable thermometer having a resolution of 0.1°C.

Use sodium chloride (NaCl) standard solution for instrument calibration. Each instrument is temperature-compensated for sodium chloride (NaCl) solution. Using other solutions, such as potassium chloride (KCl) may result in inaccurate calibration.

Use sodium chloride (NaCl) standard solution for instrument verification. Each instrument is temperature-compensated for sodium chloride (NaCl) solution. Using other solutions, such as potassium chloride (KCl) may result in inaccurate readings.

Discard used liquid samples into an appropriate waste container. **DO NOT** re-introduce the sample into the system being tested.

NEVER submerge your instrument in liquids.

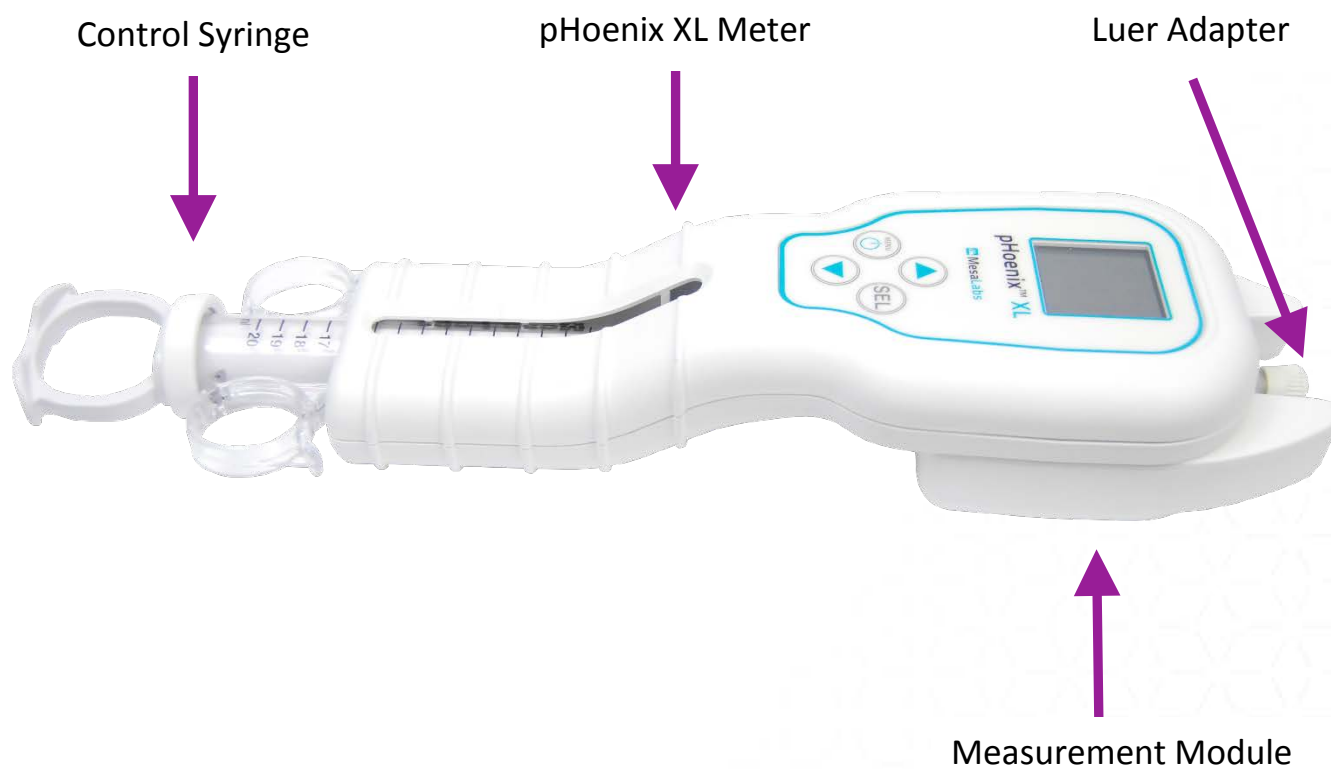
NEVER place your instrument under running water.

ONLY use a damp cloth to clean your instrument.

ONLY open the battery compartment to replace the battery.

DO store your instrument away from extreme temperatures. Use of the meter with fluid temperatures above 60°C may cause injury.

C. Features and Controls

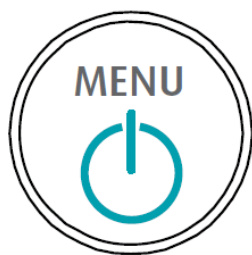




Front Label of pHoenix XL Meter



Control Buttons



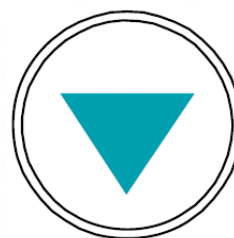
Power/Function Button



Select Button



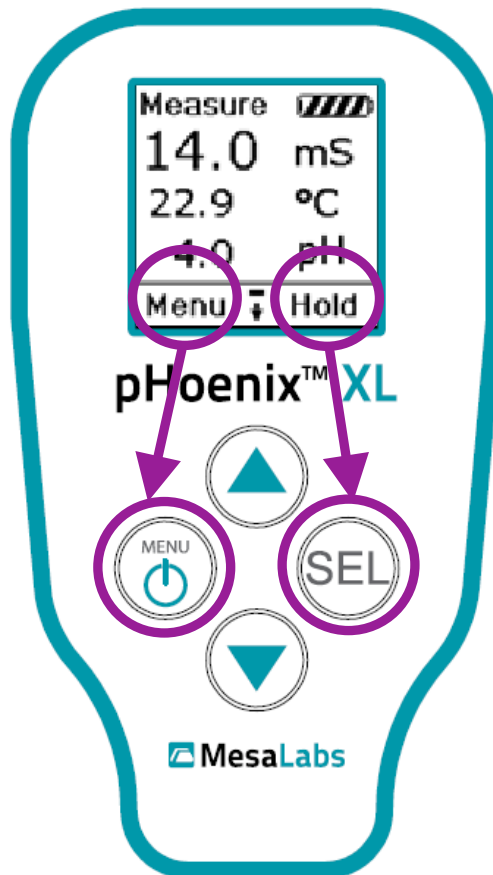
Moves Cursor Up



Moves Cursor Down

The four indicators located along the bottom of the graphic display indicate the function of the button associated with that position on the keypad.

A “-” (dash symbol) or a blank indicates no function for the associated button during that function.









In this example:

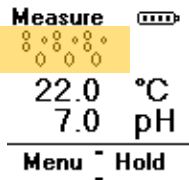


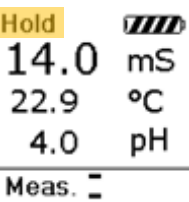
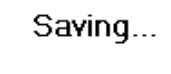
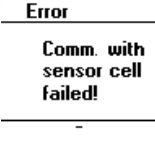
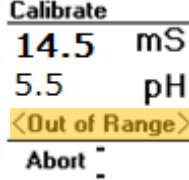
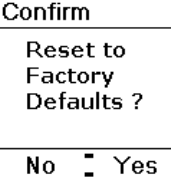


The  button corresponds to the **Menu** function

while the  button corresponds to the **Hold** function.

D. User Screens

Display Definitions

| Description | Screen Displayed |
|---|---|
| Power on Screen | <p>pHoenix XL</p> <hr/> <p>Version 2.8</p> |
| Measurement Screen <i>Referred to as 'Home' screen in later instructions.</i> Actual measured values may be different than those shown here. | Measure  14.0 mS 22.9 °C 4.0 pH <hr/> Menu ↓ Hold |
| Battery Level Indicator The Battery Level Indicator shows the estimated remaining battery life. | Measure  14.0 mS 22.9 °C 4.0 pH <hr/> Menu ↓ Hold |
| Function Indicator Displays the current operational mode. | Measure  14.0 mS 22.9 °C 4.0 pH <hr/> Menu ↓ Hold |
| Conductivity Measurement Units of measure can be displayed as mS, µS, or ppm. | Measure  14.0 mS 22.9 °C 4.0 pH <hr/> Menu ↓ Hold |
| Temperature Measurement Units of measure can be displayed as °C or °F. | Measure  14.0 mS 22.9 °C 4.0 pH <hr/> Menu ↓ Hold |
| pH Measurement Displayed as pH units, these units of measure are not adjustable. | Measure  14.0 mS 22.9 °C 4.0 pH <hr/> Menu ↓ Hold |

| Description | Screen Displayed |
|--|---|
| Bubbles in Conductivity Indicates there is air in the measurement cell. To correct this, flush the fluid being measured rapidly in and out once or twice to dislodge any trapped air bubbles. Then proceed as normal. |  |
| Measurement Hold Readings freeze.  , exit by pressing  . Verify Hold function is not selected while taking measurements. |  |
| Saving... Meter is currently saving last action to memory. Actions include calibrations and changes to units of measure. |  |
| Communication Error Meter has lost communication with the Measurement Module. |  |
| <Out of Range> If this warning appears while in the Calibration mode it means that one or both of the values are out of range and the meter cannot be properly calibrated. Actual readings may be different. Confirm the calibration solution is correct. If using Combination solution, use separate calibration modes for pH and Conductivity. |  |
| Reset Factory Defaults Meter will adjust calibration settings to last known factory calibration defaults. (See “Reset the Calibrations to Factory Defaults” Section, pg. 28) |  |
| Shutdown Display  Occurs during Auto-Off, or, if the meter is shut off manually by holding down for approximately 3 seconds. |  |

E. Verifying Instrument Performance

Verify the accuracy of the conductivity and pH functions before use or whenever inaccurate readings are suspected. Verify all functions after measurement module replacement.

The Total Dissolved Solids (TDS) values displayed on the pHoenix XL Meter are calculated from the conductivity measurement. The TDS function cannot be calibrated by the user.

Check the temperature function of the instrument to confirm accurate temperature readings if they are suspected to be inaccurate.

CAUTION: Use only sodium chloride (NaCl) standard solution. Each instrument is temperature-compensated for NaCl solution only. Other solutions, such as potassium chloride (KCl), may result in inaccurate calibration or readings!

About the Care and Calibration Station

Mesa Labs Care and Calibration Stations provide a fast, convenient means for rinsing, disinfecting, verifying, and calibrating your instruments. One-way check valves prevent evaporation and contamination of your standard solutions while minimizing waste. Used solution is expelled through the check valve to a sink or waste container via a drainage tube. An available laminated wall chart provides step-by-step instructions (Mesa P/N 36-00118). See “Replacement Parts and Accessories” section, pg. 33.



Checking the Accuracy of the Conductivity and pH Functions

You will need one of the following:

- ✓ Care and Calibration Station
- ✓ Sample collection cup with sample tube accessory

And

- ✓ Combined Standard Solution

Or

- ✓ 14.0 mS Conductivity standard solution
- ✓ 7.00 pH buffer solution

Verifying pH and Conductivity Values:

1. Acquire Solution

- a. If using a calibration station, connect the port of the pHoenix XL to the standard solution bottle using the provided male/female luer tube. Don't overtighten.



- b. If using a sample tube, rinse a container with some of the standard solution and dispose of the rinse to eliminate any contaminants. Pour at least 50 ml of fresh solution into the rinsed container. Connect a sample tube to the meter and place the end of the tube into the container.



- c. If using a sample collection cup (Mesa P/N 98-0021), rinse the cup with some of the standard solution and dispose of the rinse to eliminate any contaminants. Fill the cup at least halfway. Connect a male slip Luer to the meter and push the sample cup onto the slip connection.



2. Hold the meter so that the syringe is above the screen and rapidly pull the syringe back about halfway, or to the 10 ml mark. Expel the solution (into a separate waste container or sink if using sample tube or sample cup method). Next, pull solution back into the syringe more slowly, and evaluate the readings on the display for stability (A stable reading is when the value no longer changes whether flowing slowly or stopped).



3. Repeat as necessary until readings stabilize. If the display reads the value of the standard solution being measured is within tolerances (see pg. 38), calibration is not necessary. Otherwise, a calibration is necessary, refer to the “Calibrating Your Instrument” section (pg. 18). Expel the solution.

Best Practices

- When drawing a sample into the meter, hold the meter so that the syringe is above the screen. This helps remove air and bubbles from the Measurement Module, thereby improving measurement stability.
 - Trapped bubbles will cause bad or unstable readings.
- When expelling a sample from the meter, and air is observed in the syringe, avoid pushing that air back into the measurement module.
- Try not to overtighten Luers or adapters to the sample port.
- Do not pull the syringe plunger all the way full. This may result in the syringe leaking and uses excessive solution volume.

Functions Testing and Error Conditions

Checking Calibration of the Temperature Function

The meter's temperature circuit is very stable and is not adjustable by the user. Should verification of the temperature accuracy be desired, submerge a NIST-traceable thermometer with a resolution of 0.1°C or better in a temperature-controlled bath (filled with RO or DI water) at a temperature close to room temperature (25° C). Connect a clean sample tube to the port of the instrument. Draw the solution through the cell. Solution should be flowing while the temperature measurement is taken for best measurement accuracy. Observe the reading on the display while the solution is flowing. If the measured reading is different by 0.5°C from the value shown on the NIST-traceable thermometer the temperature function may be malfunctioning and may need service.

Module Communication Error

If the display indicates "Comm. with sensor cell failed", try removing and re-seating the measurement module (see instructions in "Replacing the Measurement Module" section, pg. 31); if this fails to correct the problem, the module will require replacement.

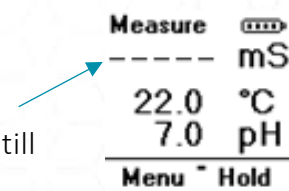
Air Bubbles in the Flow Cell

Bubbles in Conductivity field indicates there is air in the measurement cell. To correct this, flush the fluid being measured rapidly in and out once or twice to dislodge any trapped air bubbles. Then proceed as normal.



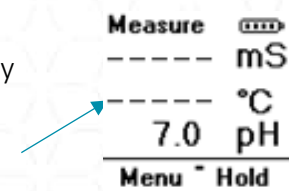
Open Conductivity Electrode

When the pHoenix XL unit detects something wrong in the module conductivity flow cell or there is air in the flow cell, the unit will display dashes in place of the conductivity. If there is solution in the flow cell, and dashes are still displayed, the meter or module may need to be replaced.



Temperature Error

If the pHoenix XL unit displays dashes for both the temperature and conductivity readings, this means that the unit cannot read the fluid temperature. This means that the module may need to be replaced.




F. Taking Measurements


CAUTION: Verify calibration of your instrument before taking measurements.

See “Verifying Instrument Performance” section E.



Press and release  to turn the meter on. Choose one of the following 3 measurement methods:


A. Sample directly from the Hemodialysis delivery system:

1. Connect to Dialysis Machine
 - a. If using a slip Luer, place a slip Luer on the meter’s port and push the slip connection into the dialysate port.
 - b. If using a sample tube, connect a sampling tube to the port of the instrument, and the other side to the delivery system (add Luer fitting to the sample tube as needed).
2. Pull the syringe out about halfway to create a vacuum.
3. While holding the syringe in place with one hand, open the dialysate port valve (or push button) to deliver solution into the meter. You will feel the pull of the vacuum cease as the syringe fills.
4. Close the valve, disconnect from the dialysis system, and expel the solution into a waste container.
5. Repeat the above process, and once the syringe has filled, press the  (Hold) button to freeze the readings on the display.
6. Close the valve, disconnect from the dialysis system and record the readings.
7. See Final Steps on Page 17.


Note: The Initial rinse is required to warm up the flow cell so as to obtain a temperature measurement representative of the flowing dialysis solution.

B. Using a sample tube and cup:




1. Connect a clean sampling tube to the port of the instrument via the Luer adapter.
2. Rinse the tube and cup with fluid to be measured and discard the rinse.
3. Fill the sample cup with at least halfway. Place the end of the sample tube into the test solution.
4. Rapidly pull the syringe back approximately halfway.
5. Expel the solution into waste receptacle and redraw again. Holding the syringe side of the meter upwards while drawing solution, or downward while expelling it will help eliminate air bubbles from the cell and result in quicker stabilization.
6. Repeat as necessary until readings stabilize (the displayed value doesn't change anymore, whether the fluid is flowing slowly or stopped).
7. When the readings stabilize, press the  (Hold) button to freeze the readings on the display and record the readings.
8. See Final Steps, Page 17.

C. Using a sample collection cup:

1. Start with a clean and dry sample collection cup
2. Connect a male slip Luer to the meter and push the sample cup onto the slip connection.
3. Rinse the cup with fluid to be measured and discard the rinse.
4. Fill the sample cup approximately 80% full with fluid.
5. Pull the syringe back approximately halfway.
6. Expel solution into a waste receptacle and draw solution again.
7. Repeat as necessary until the readings stabilize (the displayed value doesn't change anymore, whether the fluid is flowing slowly or stopped).
8. When the readings stabilize, press the  (Hold) button to freeze the readings on the display and record the readings.



Final steps:

1. Press the  button to deactivate the hold feature and begin normal measurements (once "HOLD" has been activated, it will appear in the function indicator on the display).
2. Rinse the sample cup/tube thoroughly with treated water when finished. Rinse the meter cell and syringe interior thoroughly with treated water prior to storage. For storage instructions see page 30.

WARNING: Use of the HOLD function will no longer allow the meter to respond to new solutions. The user should deactivate the HOLD feature after readings are observed and recorded.

CAUTION: Discard ALL used liquid samples into an appropriate waste container and ***DO NOT*** re-introduce any used fluid into the system being tested!

G. Calibrating Your Instrument

When to Calibrate

Mesa recommends that users verify meter values against NIST-traceable solutions daily and calibrate (adjust) the meter when these verifications are out of tolerance. The daily verifications and calibrations are to be done at 14.0 mS and 7.0 pH.

Extended range calibrations are used to verify and adjust high and low pH and conductivity values. Mesa recommends performing extended verification and calibration if needed on a monthly basis (at pH 4.0, pH 10.0, 100 mS, 1 mS, 150 μ S).

If the meter is to be used for water quality verification or TDS measurement, Mesa recommends the 150 μ S conductivity range be verified and calibrated as needed prior to use.

Measurement Module

Under normal meter usage and storage conditions, the pH component is expected to last for 12 months. The length of time can be greater than 12 months or it can be shorter than 12 months if the measurement module is not rinsed and stored as directed after use. The pH function of the pHoenix XL relies upon a component in the measurement module which contains undissolved potassium chloride. As the measurement module is used during daily verifications, the amount of this salt will decline overtime.

When the potassium chloride in the measurement module component is depleted, the result is an unstable pH reading and inability to properly calibrate and/or verify pH with the meter. This result indicates a replacement measurement module should be installed on the pHoenix XL handle.

Instructions on proper meter and measurement module cleaning and storage are outlined in Section I.

The meter should be verified daily and calibrated as recommended above. The measurement module can continue to be utilized provided the meter results meet the requirements set forth in the User's Guide. At such time that the results do not meet these requirements, the pHoenix XL measurement module should be replaced.

Use the Proper Laboratory Standard

For verification of accurate conductivity and pH function, use a conductivity standard solution and pH buffer solution traceable to the National Institute of Standards and Technology (NIST) or an equivalent standards organization. Do not use solutions beyond their expiration date.

CAUTION: Only use sodium chloride (NaCl) based conductivity standard solutions of the values described above.

Using other solutions will result in inaccurate calibration.

Sample Cup Calibration Methods

When using a Sample Tube and Sample Cup (container) with the Conductivity Standard Solutions and pH Buffer Solutions, first rinse the Sample Cup (container) with the solution being used. Discard the rinse solution. Pour fresh solution into the rinsed Sample Cup (container). Measurements should be taken immediately after pouring, as evaporation of the solution could cause errors. Proper use of a Cal-Station or Super Station (see Accessories section, pg. 33) will eliminate these concerns.

Calibration Technique

USE THE METHODS DESCRIBED IN SECTION E “VERIFYING INSTRUMENT PERFORMANCE” to rapidly achieve readings stability.

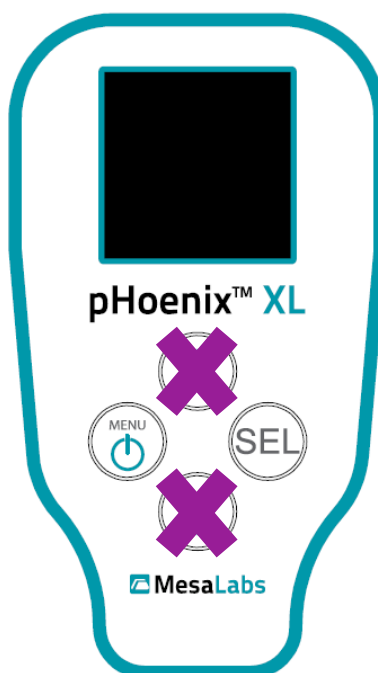
Differences Between the pHoenix XL and the Older pHoenix Meter

The pHoenix XL meter does not use Level 1 and Level 2 calibrations.

- The older pHoenix meter process called a Level 1 calibration is now a daily verification or calibration at 14.0 mS and 7.0 pH.
- The older pHoenix meter process called a Level 2 calibration is now the extended range calibrations, to be performed monthly or as needed.

The pHoenix XL **DOES NOT** use the UP and DOWN arrows to manually adjust the calibration.

- The new process is to select the calibration reference value from the menus, expose the meter to the calibration solution, and CAL it, causing the new meter to instantly change its calibration.



**DO NOT USE UP /
DOWN ARROWS
FOR CALIBRATION
OR MEASUREMENT**

The new pHoenix XL performs calibration range checking.

- If the measured value during calibration is significantly different from the menu selection, the new meter will indicate an “Out of Range” condition.






Combined pH and Conductivity Calibration


14.0 mS and 7.00 pH using Combined Standard Solution

CAUTION: USE ONLY MESA LABORATORIES COMBINED CALIBRATOR SOLUTION FOR THIS STEP. USE OF OTHER SOLUTIONS MAY RESULT IN INCORRECT CALIBRATION

Materials Needed:

- ✓ Care and Calibration Station, or a clean 100 ml container (sample cup) and sample tube
- ✓ Combined Calibrator Solution (14.0 mS & 7.00 pH) (Mesa P/N 02.0062 or 02.0070)

| Step | Starting Screen | Action | Screen Displayed |
|------|---|--|--|
| 1E | Measure  14.0 mS 22.9 °C 4.0 pH Menu ▾ Hold | From the 'Home' screen, press  . | Select Menu → Calibrate Units Other Meas. ⬆ Select |
| 2E | Select Menu → Calibrate Units Other Meas. ⬆ Select | Move cursor to the 'Calibration selection and press  . | Calibrate Menu → Both (14-7) Conductivity pH Meas. ⬆ Select |
| 3E | Calibrate Menu → Both (14-7) Conductivity pH Meas. ⬆ Select | Move cursor to the 'Both (14-7)' selection and press  . | Calibrate 14/7.0 14.2 mS 6.8 pH Abort ▢ Cal |
| 4E | Calibrate 14/7.0 14.2 mS 6.8 pH Abort ▢ Cal | Hold the meter with the syringe over the screen. Draw the Combination Solution slowly into the meter. In order to make an accurate measurement, the solution must be flowing through the meter at the time the calibration is taken. | Calibrate 14/7.0 14.0 mS 7.0 pH Abort ▢ Cal |
| 5E | Calibrate 14/7.0 14.0 mS 7.0 pH Abort ▢ Cal | When the reading is stable, while still drawing solution slowly into the meter, press  to apply the new calibration settings. | Saving... |




























Note: To ease the calibration process using the Combined Calibrator Solution (Mesa P/N 02.0062 or 02.0070), the meter has a 'Hot Button' that will bring the user to the 14.00 mS and 7.0 pH calibration screen automatically. From the Home screen, simply press , and the 14.00 mS and 7.0 pH calibration screen shown above will appear. Continue with the calibration from this point as instructed.

High Conductivity Calibrations

14.0 mS, 100 mS and 50 mS using Conductivity Calibration Solution

Materials Needed:

- ✓ Care and Calibration Station, or a clean 100 ml container (sample cup) and sample tube
- ✓ 14.0 mS Conductivity Standard Solution (Mesa P/N 02.0014* or 02.0027*)

| Step | Starting Screen | Action | | Screen Displayed |
|------|---|--|--|---|
| 1F | Measure  14.0 mS 22.9 °C 4.0 pH Menu  Hold | From the 'Home' screen, press  . | | Select Menu → Calibrate Units Other Meas.  Select  |
| 2F | Select Menu → Calibrate Units Other Meas.  Select  | Move cursor to the 'Calibrate' selection and press  . | | Calibrate Menu → Both (14-7) Conductivity pH Meas.  Select  |
| 3F | Calibrate Menu Both (14-7) → Conductivity pH Meas.  Select  | Move cursor to the 'Conductivity' selection and press  . | | Calibrate Menu → High Low Meas.  Select  |
| 4F | Calibrate Menu → High Low Meas.  Select  | Move cursor to the 'High' selection and press  . | | Calibrate Menu → 14.0 mS 100 mS 50 mS (opt.) Meas.  Select  |
| 5F | Calibrate Menu → 14.0 mS 100 mS 50 mS (opt.) Meas.  Select  | Move cursor to the '14.0 mS' selection and press  . Hold the meter with the syringe over the screen. Draw the 14.0 mS Conductivity Standard Solution slowly into the meter. In order to make a conductivity measurement, the solution must be flowing through the meter at the time the calibration is taken. | | Calibrate 14 mS 14.2 mS Abort  Cal |
| 6F | Calibrate 14 mS 14.2 mS Abort  Cal | When the reading is stable, while still drawing solution slowly into the meter, press  to apply the new calibration settings. A post calibration screen will display the calibration value followed by the saving display. | | Calibrate 14 mS 14.0 mS Abort  Cal Saving... |

To calibrate the 100 mS Conductivity Range, use Steps 1F – 6F, choosing 100 mS in Step 5F, and use 100 mS Conductivity Standard Solution (Mesa P/N 02.0036*).

To calibrate the 50 mS Conductivity Range, use Steps 1F – 6F, choosing 50 mS in Step 5F, and use 50 mS Conductivity Standard Solution (Mesa P/N 02.0071 or equivalent).

Low Conductivity Calibrations

150 μ S and 1.0 mS using Conductivity Standard Solution

Use this method when calibrating for TDS measurements

Materials Needed:

- ✓ Care and Calibration Station, or a clean 100 ml container (sample cup) and sample tube
- ✓ 150.0 μ S (P/N 02.0045*) or 1.0 mS (P/N 02.0037*) Conductivity Standard Solution

| Step | Starting Screen | Action | Screen Displayed |
|------|--|--|--|
| 1G | Measure 14.0 mS 22.9 °C 4.0 pH Menu Hold | From the 'Home' screen, press the button. | Select Menu → Calibrate Units Other Meas. Select |
| 2G | Select Menu → Calibrate Units Other Meas. Select | Move cursor to the 'Calibration' selection and press . | Calibrate Menu Both (14-7) → Conductivity pH Meas. Select |
| 3G | Calibrate Menu Both (14-7) → Conductivity pH Meas. Select | Move cursor to the 'Conductivity' selection and press . | Calibrate Menu → High Low Meas. Select |
| 4G | Calibrate Menu → High Low Meas. Select | Move cursor to the 'Low' selection and press . | Calibrate Menu → 150 μ S 1000 μ S Meas. Select |
| 5G | Calibrate Menu 150 μ S → 1000 μ S Meas. Select | Move cursor to the '1000 μ S' selection and press . Hold the meter with the syringe over the screen. Draw the 1000 μ S Conductivity Standard Solution slowly into the meter. In order to make a conductivity measurement, the solution must be flowing through the meter at the time the calibration is taken. | Calibrate 1 mS 1006 μ S Abort Cal |
| 6G | Calibrate 1 mS 1000 μ S Abort Cal | When the reading is stable, while still drawing solution slowly into the meter, press to apply the new calibration settings. | Saving... |

To calibrate the 150 μ S Conductivity Range, use Steps 1G – 6G, choosing 150 μ S in Step 5G, and use 150.0 μ S Calibration Solution (Mesa P/N 02.0045 or equivalent).

pH Calibration

4.0, 7.0, and 10.0 pH using pH calibration solutions

Materials Needed:

- ✓ Care and Calibration Station, or a clean 100 ml container (sample cup) and sample tube
- ✓ pH 7.00 Buffer Solution (Mesa P/N 02.0030 or 02.0031*)

| Step | Starting Screen | Action | Screen Displayed |
|------|--|---|--|
| 1H | Measure 14.0 mS 22.9 °C 4.0 pH Menu ↓ Hold | From the 'Home' screen, press the button. | Select Menu → Calibrate Units Other Meas. ↑ Select |
| 2H | Select Menu → Calibrate Units Other Meas. ↑ Select | Move cursor to 'Calibrate' selection and press . | Calibrate Menu Both (14-7) Conductivity → pH Meas. ↑ Select |
| 3H | Calibrate Menu Both (14-7) Conductivity → pH Meas. ↑ Select | Move cursor to the 'pH' selection and press . | Calibrate pH → pH 7.0 pH 4.0 pH 10.0 Meas. ↑ Select |
| 4H | Calibrate pH → pH 7.0 pH 4.0 pH 10.0 Meas. ↑ Select | Move cursor to the 'pH 7.0' selection and press . Hold the meter with the syringe over the screen. Draw the 7.0 pH buffer solution slowly into the meter. | Calibrate pH 7 6.8 pH Abort ⏏ Cal |
| 5H | Calibrate pH 7 7.0 pH Abort ⏏ Cal | When the reading is stable, while still drawing solution slowly into the meter, press to apply the new calibration settings. | Saving... |

To calibrate the 4.0 pH and the 10.0 pH Ranges, use Steps 1H – 5H, choosing either 4.0 pH or 10.0 pH in Step 4H, and use the 4.0 pH Buffer Solution (Mesa P/N 02.0032*) or 10.0 pH Buffer Solution (Mesa P/N 02.0034 or equivalent) (respectively).

H. User Selections






To Change Conductivity Units of Measure

| Step | Starting Screen | Action | Screen Displayed |
|------|--|---|--|
| 1A | Measure 14.0 mS 22.9 °C 4.0 pH Menu ↓ Hold | From the 'Home' screen, press . | Select Menu Calibrate →Units Other Meas. ↑↓ Select |
| 2A | Select Menu Calibrate →Units Other Meas. ↑↓ Select | Move cursor to the 'Units' selection and press . | Select Units →Low Cond. Temperature Meas. ↑↓ Select |
| 3A | Select Units →Low Cond. Temperature Meas. ↑↓ Select | Move cursor to the 'Low Cond.' Selection and press . | Low Units →mS μS ppm Meas. ↑↓ Select |
| 4A | Low Units →mS μS ppm Meas. ↑↓ Select | Move cursor to desired Conductivity Units of . Measure and press . Home screen will reflect changes made. | Saving... |

Changing the Units of Measure for conductivity will result in both the range as well as the measurement units being displayed differently. See Chart below for more details.

| | mS Selected | μS Selected | ppm Selected |
|----------------|-----------------------|---------------|--------------------------------|
| Values Between | Will Be Displayed as: | | |
| 0 – 0.09 mS | 0 – 0.09 mS | 0 – 99 μS | 0 – 49 ppm |
| 0.10 – 1.99 mS | 0.10 – 1.99 mS | 100 – 1999 μS | 50 – 650 ppm 1.40 – 1.99 mS |
| 2.0 -19.9 mS | 2.0 -19.9 mS | 2.0 -19.9 mS | 2.0 -19.9 mS |
| 20 – 210 mS | 20 – 210 mS | 20 – 210 mS | 20 – 210 mS |

To Change Temperature Units of Measure

| Step | Starting Screen | Action | Screen Displayed |
|------|--|--|--|
| 1B | Measure  14.0 mS 22.9 °C 4.0 pH Menu ▾ Hold | From the 'Home' screen, press  . | <u>Select Menu</u> Calibrate →Units Other Meas. ↑ Select |
| 2B | <u>Select Menu</u> Calibrate →Units Other Meas. ↑ Select | Move cursor to the 'Units' selection and press  . | <u>Select Units</u> Low Cond. →Temperature Meas. ↑ Select |
| 3B | <u>Select Units</u> Low Cond. →Temperature Meas. ↑ Select | Move cursor to the 'Temperature.' Selection and press  . | <u>Select Units</u> →°C °F Meas. ↑ Select |
| 4B | <u>Select Units</u> →°C °F Meas. ↑ Select | Move cursor to desired Temperature Units of Measure and press  . Home screen will reflect changes made. | <u>Saving...</u> |

To Change the Auto-Off Delay

| Step | Starting Screen | Action | Screen Displayed |
|------|---|--|---|
| 1C | Measure 14.0 mS 22.9 °C 4.0 pH Menu ↓ Hold | From the 'Home' screen, press . | Select Menu Calibrate Units → Other Meas. ↑ Select |
| 2C | Select Menu Calibrate Units → Other Meas. ↑ Select | Move cursor to the 'Other' selection and press . | Select Menu → Auto-Off New Battery Factory Set Meas. ↑ Select |
| 3C | Select Menu → Auto-Off New Battery Factory Set Meas. ↑ Select | Move cursor to the 'Auto-Off.' Selection and press . | Select Auto-Off → 2 min. 5 min. 10 min. Meas. ↑ Select |
| 4C | Select Auto-Off → 2 min. 5 min. 10 min. Meas. ↑ Select | Move cursor to desired time for the Auto-Off Feature and press . Meter will automatically power off after selected number of minutes. | Saving... |

- The Auto-Off delay will shut the meter power off in order to save battery life after the selected time, if no buttons are pressed.
- Any button press will reset the Auto-Off timer.
- If the meter temperature reading remains above 30 degrees C the Auto-Off is disabled.
- If ambient temperature is above 30 degrees C the unit should be manually powered off after use by holding the Menu/Power button down for 3 seconds.

To Reset the On-Screen Battery Indicator







(Note: This should be done **ONLY** when replacing the battery!)

| Step | Starting Screen | Action | Screen Displayed |
|------|---|--|---|
| 1D | Measure 14.0 mS 22.9 °C 4.0 pH Menu ▾ Hold | From the 'Home' screen, press . | Select Menu Calibrate Units → Other Meas. ↑ Select |
| 2D | Select Menu Calibrate Units → Other Meas. ↑ Select | Move cursor to the 'Other' selection and press . | Select Menu Auto-Off → New Battery Factory Set Meas. ↑ Select |
| 3D | Select Menu Auto-Off → New Battery Factory Set Meas. ↑ Select | Move cursor to the 'New Battery' selection and press . | Confirm New Battery installed? No Yes |
| 4D | Confirm New Battery installed? No Yes | Press for 'Yes', or for 'No' if a new battery was not installed. (Note: If 'Yes' is selected, the onscreen battery indicator will reset to full on the home screen.) | Saving... |

CAUTION: The instrument requires a special 3.6 V Lithium Ion battery. Use only Mesa Labs Battery P/N 210427-001; battery is not rechargeable and may explode if recharged.

To Reset the Calibrations to Factory Defaults

CAUTION: Operators must verify accurate function of your pPhoenix XL Meter before taking measurements

| Step | Starting Screen | Action | Screen Displayed |
|------|--|---|--|
| 1D | Measure  14.0 mS 22.9 °C 4.0 pH Menu ↓ Hold | From the 'Home' screen, press  . | <u>Select Menu</u> Calibrate Units → Other Meas. ↑ Select |
| 2D | <u>Select Menu</u> Calibrate Units → Other Meas. ↑ Select | Move cursor to the 'Other' selection and press  . | <u>Select Menu</u> Auto-Off New Battery → Factory Set Meas. ↑ Select |
| 3D | <u>Select Menu</u> Auto-Off New Battery → Factory Set Meas. ↑ Select | Move cursor to the 'Factory Set' selection and press  . | <u>Confirm</u> Reset to Factory Defaults ? No [] Yes |
| 4D | <u>Confirm</u> Reset to Factory Defaults ? No [] Yes | Press  for 'Yes', or  for 'No' if you want to keep the last user calibration. | <u>Saving...</u> |

- This function restores the meter to the last factory calibration operating point
- Reset should only be used to recover a meter which is not calibrating properly.
- Always perform a user calibration and verify accuracy after restoring factory defaults.

I. Cleaning your Instrument

General External Cleaning Recommendations

1. For meters in use, use a damp cloth to wipe the exterior of the instrument daily with a mild soap solution or the bleach solution described in the “Disinfecting Recommendations” section if disinfection is required. **Do not submerge meter.**
2. Clean the sample collection cup and sample tube after use with soapy water. Rinse thoroughly with dialysis quality water and dry with a soft cloth.

CAUTION: DO NOT submerge! DO NOT put under running water or allow liquid to enter the meter case. DO NOT use abrasive materials or harsh chemicals as they may damage the case and/or syringe and void the warranty.

Rinsing Recommendations

It is recommended that treated water (RO, DI, or Distilled water) be the only choice for rinsing meters.

Disinfecting Recommendations - Measurement Module and Syringe

If disinfection of the meter is required (other than those meters in storage), we recommend that you follow these steps daily before the first use of the meter:

1. Draw 1% bleach solution (one-part bleach to ninety-nine parts dialysis quality water) mixed fresh daily, into the meter to the 10 mL line. Seal the Measurement Module with an Air-Tight Luer Cap.
2. Let the solution sit in the meter for approximately ten minutes. After the dwell time expel the bleach solution.
3. Rinse thoroughly by rapidly flushing at least three times with dialysis quality water.
4. Verify the values of the meter at 7.0 pH and 14.0 conductivity. Verify other values if you are measuring extended ranges.

CAUTION: Diluted bleach solution must not remain in the meter for longer than 10 minutes. Dwell times longer than 10 minutes will cause premature deterioration of the Measurement Module. Thoroughly rinse with treated water to remove any residual bleach before taking readings. NEVER use bleach solution for overnight storage.

NOTE: If the meter is to be stored for long periods (days to months), it is not necessary to disinfect the meter daily.

Cleaning and Storage Recommendations

Measurement Module Cleaning Recommendations

Mesa Laboratories NEO-CARE Cell Cleaning Solution is ideal for the pHoenix XL Meter. To clean meters which are being used, follow these easy steps:

1. Rinse Flush the meter with three rapid 3 to 5 mL flushes of NEO-CARE Cell Cleaning Solution.
2. Draw NEO-CARE into the meter to the 10 mL line. Seal the Measurement Module with an Air-Tight Luer Cap.
3. Let the NEO-CARE sit in the meter for approximately 10 minutes. After the dwell time expel the NEO-CARE.
4. Rinse thoroughly by rapidly flushing several times with dialysis quality water.

NOTE: The regular use of NEO-CARE will minimize hard deposits and bacterial film from forming on the flow cell sensors. *Deposits on the flow cell sensors may cause inaccurate readings and will lead to premature failure of the flow cell components.*

CAUTION: Cleaning the meter after verifying calibration may result in improper readings. It is recommended that after cleaning, the user verify calibration prior to subsequent use.

Storage Recommendations

Mesa Laboratories NEO-CARE Cell Cleaning Solution is ideal for the pHoenix XL Meter. For storing meters overnight or long-term, follow these steps:

1. Flush the meter with three rapid 3 to 5 mL flushes of NEO-CARE Cell Cleaning Solution.
2. Disconnect the meter from the solution. Purge remaining fluid by rapidly pumping the syringe several times into a waste receptacle.
3. Seal the Measurement Module with an Air-tight Luer Cap.
4. The Measurement Module is to be damp only during storage, never full of fluid. **Always** seal the Measurement Module to prevent residual NEO-CARE in the cell and syringe from drying out.
5. The Measurement Module can be stored in this condition up to six months at room temperature or two months at extreme temperatures.

Please follow Mesa's storage recommendations when shipping unit back to Mesa for repair or service.

J. Replacement Procedures and Parts

Replacement syringes, accessories and standard solutions are available from Mesa Labs or your local distributor.

Replacing the Syringe

When moving the plunger in and out of the barrel becomes difficult, it is time to replace the syringe. To replace the syringe:

1. Expel any fluid from the meter.
2. Using your fingers, turn the Luer connector counterclockwise to disconnect the syringe.
3. Pull the syringe straight back out of the instrument handle.
4. Install a new syringe by sliding it into the handle. Turn the Luer connector clockwise to secure it to the fluid port.



Measurement Module

Under normal meter usage and storage conditions, the pH component is expected to last for 12 months. The length of time can be greater than 12 months or it can be shorter than 12 months if the measurement module is not rinsed and stored as directed after use. The pH function of the pHoenix XL relies upon a component in the measurement module which contains undissolved potassium chloride. As the measurement module is used during daily verifications, the amount of this salt will decline overtime.

When the potassium chloride in the measurement module component is depleted, the result is an unstable pH reading and inability to properly calibrate and/or verify pH with the meter. This result indicates a replacement measurement module should be installed on the pHoenix XL handle.

Instructions on proper meter and measurement module cleaning and storage are outlined in Section I.

The meter should be verified daily and calibrated as recommended above. The measurement module can continue to be utilized provided the meter results meet the requirements set forth in the User's Guide. At such time that the results do not meet these requirements, the pHoenix XL measurement module should be replaced.

Replacing the Measurement Module

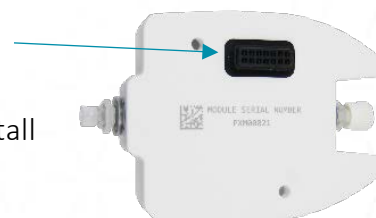
1. Expel any fluid from the meter. Power unit off and remove the Syringe following Steps 1 to 3 from “Replacing the Syringe”.
2. Remove the two screws securing the Measurement Module to the Handle. Retain the screws for re-use.



3. Remove the Measurement Module by simply pulling it straight off of the back of the Handle.



4. Install a new Measurement Module using care to ensure contact pins are aligned correctly. Once aligned, press the Measurement Module firmly onto the back of the Handle. Reinstall the two screws.



5. Reinstall the Syringe and calibrate unit for Conductivity and pH as detailed in section H.

Replacing the Battery

When the low battery indicator appears on the display, replace the battery as soon as possible. The instrument will continue to function normally until the battery voltage drops below a critical limit.

1. Expel any fluid from the meter. Remove the Syringe and Measurement Module by following steps 1-3 of “Replacing the Syringe” and steps 2-3 of “Replacing the Module”.
2. Loosen the three battery cover screws and remove the battery cover. Retain the screws for re-use.
3. Remove the battery and dispose of properly. Replace it with a new one, observing the proper polarity.








CAUTION: DO NOT replace the battery with a standard AA Alkaline Battery, as the instrument will not function properly. The instrument requires a special 3.6 V Lithium Ion battery. Use only Mesa Labs Battery P/N 210427-001; battery is not rechargeable and may explode if recharged.






4. Replace the battery cover and reinstall the Measurement Module and Syringe.
5. Reset On-Screen Battery Indicator. (See 'To Reset the On-Screen Battery Indicator' section on page 27).

Replacement Parts and Accessories

The following replacement parts and accessories are available from Mesa Labs Inc.

| Description | Quantity | Mesa P/N |
|---|----------|----------|
| Sample Tube  | 10 | 93.0006 |
| Sample Collection Cup Assembly  | 4 | 98-0021 |
| Control Syringe  | 2 | 93-0015 |
| Male Slip Luer Adapter  | 20 | 93.0003 |
| Calibration Labels  | 500 | 93.0002 |

| Description | Quantity | Mesa P/N |
|---|------------------------|----------------------------|
| 10" Male-Female Luer Adapter  | 10 | 36-00130 |
| 4" Male-Female Luer Adapter  | 10 | 93.0007 |
| Male-Male Luer Adapter  | 10 | 94-0013 |
| Replacement Battery and 3 Battery Door Screws  | 1 Battery alone | 36-00150 210427-001 |
| Replacement Measurement Module  | 1 | 36-00310 |

| Description | Quantity | Mesa P/N |
|---|--|------------------------|
|  <p>Super Station Assembly</p> | Without Solutions Including Solutions | 04-0025 04-0026 |
|  <p>Cal Station 4-Bottle Kit</p> | 1 | 04-0023 |
|  <p>Rinsing Station 3-Bottle Kit</p> | 1 | 04-0022 |
|  <p>Mini Station Assembly</p> | 1 | 04-0024 |
|  <p>Single Station Assembly</p> | 1 | 04-0016 |

*Part Numbers 04-0025, 04-0026, 04-0023, 04-0022 include an instrument holder rack able to accommodate up to 3 pHoenix or pHoenix XL meters.

K. Specifications

Performance

| pHoenix XL | Conductivity | | | | | | Temp. | pH |
|--------------------------|---|------------------------------|-------------------------|--------------------------|-------------------------|------------------------|--------------|------------------|
| Range | 0 μ S/cm to 99 μ S/cm | 100 μ S/cm to 1.99 mS/cm | 2.0 mS/cm to 19.9 mS/cm | 20.0 mS/cm to 79.9 mS/cm | 80.0 mS/cm to 119 mS/cm | 120 mS/cm to 200 mS/cm | 15°C to 90°C | 2 to 12 pH Units |
| Accuracy | +/- 5 μ S/cm | +/- 10 μ S/cm | +/- 0.1 mS/cm | +/- 1 mS/cm | +/- 2 mS/cm | +/- 5 mS/cm | +/- 0.5°C | +/- 0.1 pH Units |
| Resolution | 1 μ S/cm | 10 μ S/cm | 0.1 mS/cm | 1 mS/cm | 1 mS/cm | 1 mS/cm | 0.1°C | 0.1 pH Units |
| Temperature Compensation | 15°C to 45°C | | | | | | N/A | N/A |
| Units of Measure | μ S*, mS*, ppm (Na ₂ CO ₃) | | | | | | °C, °F | pH Units |

*Unit displays μ S representing μ S/cm and mS representing mS/cm.

Physical

Dimensions: H 11.0" x D 1.625" x W 2.875" (28 cm x 4.1 cm x 7.3 cm)

Weight: 8.8 oz. (249 gm)

Power: Battery

Battery Type: 3.6V Lithium (P/N 210427-001)

L. Limited Warranty

Mesa Laboratories, Inc. (Mesa Labs) warrants to the original purchaser of the pHoenix XL Meter that it will repair or replace, at its option, any malfunctioning or defective meter handle part without charge for 12 months from the original purchase date and such replacement parts are warranted for the remainder of the original warranty period. Mesa Labs will provide labor without charge to the original purchaser for a meter handle warranty repair.

To obtain warranty service, the original purchaser must deliver, at its own expense, the product to Mesa Labs at the address below:

Mesa Laboratories, Inc.
12100 W. 6th Avenue
Lakewood, Colorado 80228 USA

This Warranty Does Not Cover:

- 1) The battery and Measurement Module after the first 90 days following the original purchase date;
- 2) The control syringe;
- 3) Routine calibration or cell cleaning;
- 4) Defects caused by:
 - a) Modification, alteration, repair or service of the product by anyone other than Mesa Labs or an authorized service center of Mesa Labs;
 - b) Misuse due to neglect, accident, or physical damage including, but not limited to, a drop or fall, or disallowed exposure (to moisture, liquid, harsh chemicals, extreme temperature or other environmental conditions)
 - c) Operation or maintenance of the product in a manner contrary to the Manufacturer's instructions.

The foregoing warranty is in lieu of all other warranties, express or implied including but not limited to any implied warranties of merchantability and fitness for any particular purpose. Under no circumstances shall Mesa Labs be liable to the original purchaser or to any other person for any special, consequential, incidental, or punitive damages of any nature, whether arising out of breach of warranty, breach of contract, or otherwise. For further warranty information, contact Mesa Labs.

M. Service and Support

Mesa Labs offers full repair services at its corporate headquarters in Lakewood, Colorado.

Dispose of the pHOenix XL meter and measurement modules properly at the end of their service life. Mesa recommends that the meter and measurement modules should be disposed of or recycled in accordance with your local regulations for electronic devices.

DO NOT attempt to repair or modify the instrument, as this will void the warranty. There are no user serviceable parts inside the meter. Any service required other than replacement of the battery, the Measurement Module, or the syringe, must be referred to Mesa Labs.

Please contact Mesa Labs for further information.

| | |
|--------------------|---|
| Write to: | Mesa Labs 12100 W. 6 th Avenue Lakewood, Colorado 80228 USA |
| Telephone: | 1-800-992-6372 Toll-free USA/Canada 1-303-987-8000 |
| Fax: | 1-303-987-8989 |
| Customer Service: | customerservice@mesalabs.com |
| Technical Support: | DGsupport@mesalabs.com |
| Hours: | 8:00 am – 5:00 pm, Mountain Standard Time, Monday-Friday (excluding holidays) |
| Websites: | dialyguard.mesalabs.com mesalabs.com |



Protecting the Vulnerable™

12100 W. 6th Avenue
Lakewood, Colorado 80228

mesalabs.com

FDA Class II Medical Device - Indications for Use: This device is designed for use by hemodialysis professionals to verify the conductivity, temperature, and pH of solutions in the hemodialysis setting. ©2023 Mesa Labs. All rights reserved.