HORIBA Scientific

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LAQUA

Technical Tips

A number of application notes based on citation articles written by indepndent researchers and scientists and technical tips covering product usage, maintenance, and troubleshooting are available for download from our website to help our customers become experts in their measurements.

Electrodes
Technical Tips

pH Electrode Care and Maintenance Procedures

Your pH electrode will eventually reach the end of its useful life as its performance naturally degrades over time. To maximize the performance of your pH electrode and extend its life span, proper care and regular maintenance are equally required.

- Part no. 3014028653 Cleaning Solution 220 - contains 10% thiourea and 1% hydrochloric acid (HCl) for removing inorganic residues on glass membrane and junction

- Part no. 3200366771 Cleaning Solution 250 - contains less than 0.5% enzyme protease, less than 0.1% sodium azide, and other ingredients (See SDS) for removing protein residues on glass membrane and junction

- Part no. 3999960023 525-3 3.33M KCl pH electrode filling solution (for liquid-filled electrodes)

- Part no. 3999960031 500-7 pH 7.00 buffer

- Part no. 3999960029 500-4 pH 4.00 buffer

- Clean water (e.g., tap, distilled or deionized water) in a squirt bottle

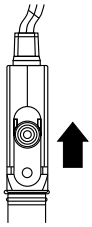
- Mild detergent

- Soft lint-free tissue

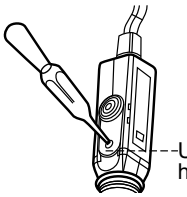
Refer to the safety data sheet (SDS) of the chemical solution to be used in cleaning and wear the appropriate personal protective equipment for safe handling. Download the SDSs of HORIBA solutions at www.horiba-laqua.com.

Refilling

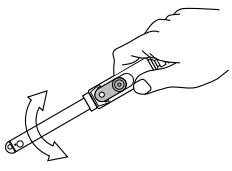
The pH electrode may be filled with either an ionic liquid solution (refillable or liquid-filled pH electrode) or ionic gel solution (sealed or gel-filled pH electrode). Gel-filled pH electrodes do not require routine refilling and typically require less maintenance than liquid-filled electrodes. Liquid-filled pH electrodes are constructed with refilling port, which is securely covered with a slider. The refilling port allows you to fill or empty the reference chamber.



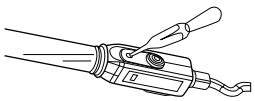
- To top up or re-fill the reference chamber of liquid-filled pH electrode, push the slider upward to uncover the refilling port and insert a dropper containing fresh 3.33M potassium chloride (KCl) solution. The filling solution should reach the bottom of the refilling port.



- The filling solution level must be maintained just below the refilling port and higher than the pH buffer or sample level during calibration and measurement. This creates a positive head pressure forcing the filling solution to leak into pH buffer or sample through the junction and preventing the reverse.



- Bubbles may form and get trapped within the solution of the sensing tip or reference chamber during transportation. This can affect the operation of your pH electrode. To dislodge the bubbles, gently shake the electrode body.



- If the filling solution inside the reference chamber gets contaminated with sample or microbial growth or the reading is drifting, change the filling solution. Tilt the pH electrode, uncover the refilling port, and draw out the old solution using a dropper before refilling it with fresh 3.33M KCl solution.

Conditioning

Nowadays, combination and 3-in-1 pH electrodes are commonly available. Both types of pH electrodes consist of glass electrode and reference electrode built in one body, but the latter is integrated with temperature sensor for detecting the temperature of the solution being measured.

The glass electrode has a silver-based electrical wire suspended in a neutral solution with KCl contained inside a special glass. The surface of the glass bulb or membrane at the tip of the electrode must be hydrated to function properly. This can be accomplished by immersing the glass membrane in an aqueous solution, where a hydrated layer that is responsible for the pH response of the glass, is developed.

Another component of the pH electrode that must remain hydrated is the junction of the reference electrode. The junction is made of porous material such as ceramic or sintered polyethylene, which allows filling solution of the electrode to leak into the solution being measured. Keeping the reference junction hydrated will prevent precipitation of KCl from the filling solution which may clog it and cause erratic or slow electrode response.

- All pH electrodes come with white protective cap. A sponge wet with pure water is positioned at the bottom of the cap to keep the glass membrane and junction moist. If you find KCl salts formed on the junction or refilling port of your pH electrode, simply rinse off using clean water. This KCl creep from the filling solution is normal.

Scan QR code with your mobile device to know more about the LAQUAtwin Pocket pH Meters

LAQUAtwin pH Sensor Maintenance Procedures

Proper usage and maintenance of the LAQUAtwin pH meter, especially the pH sensor that comes in contact with samples, is important to maintain the accuracy and prolong the life span of the instrument.

Materials Needed

pH 7.00 buffer (Part no. 3999960109)

Clean water (e.g. distilled, deionized, tap)

Cotton buds

Soft tissue

Cleaning Solution 220 (Part no. 3014028653) - contains 10% thiourea and 1% hydrochloric acid (HCl) for removing inorganic residues on sensing membrane and junction

Cleaning Solution 250 (Part no. 3200366771) – contains < 0.5% enzyme protease, < 0.1% sodium azide, and other ingredients (See SDS) for removing protein residues on sensing membrane and junction

Conditioning

A dry pH sensor may give erratic reading or slow response. Condition the pH sensor before using it for the first time and after storing it dry. If there is white powder or salt buildup on the junction after dry storage, simply rinse off with water. This is normal.

1. Place few drops of pH 7.00 buffer onto the pH sensor. Make sure that the whole flat sensor is covered with the solution.
2. Leave the pH buffer for at least 1 hour to allow the solution to hydrate the pH sensor.
3. Rinse the pH sensor with water and blot it dry with soft tissue.
4. Perform calibration with fresh pH buffers prior to sample measurement.

Cleaning

A clean pH sensor is necessary for performing an accurate pH measurement. The cleaning solution will depend on what sample was tested with the sensor.

Read the safety data sheet (SDS) of the cleaning solution to be used and wear the proper personal protective equipment before handling. Download the SDSs of HORIBA cleaning solutions at www.horiba-laqua.com.

1. Remove unwanted sample residues left on the pH sensor by using an appropriate cleaning solution. For most samples, use mild detergent and clean water. For samples containing oil, proteins, and stain-causing substances, use the indicated cleaning solutions below.
   - Oils – place few drops of warm water and mild detergent solution onto the sensor. Never use any organic solvent (e.g., acetone, ethanol, etc.) to clean the pH sensor as it may cause damage and shorten the sensor lifespan. This usage will also void the sensor warranty.
   - Proteins – place few drops of cleaning solution 250 onto the sensor and leave for 30 minutes.
   - Stains - place few drops of cleaning solution 220 or 0.1 M HCl onto the sensor and leave for 30 minutes.
2. Gently, wipe the sensor using a cotton bud. Avoid applying pressure and repeat step 1, if needed.
3. Rinse the pH sensor with water and condition it (See Conditioning).

If calibration with fresh buffers failed repeatedly and cleaning did not restore the pH sensor performance, replace the pH sensor with a new one (Model S010, Part no. 3200459834). The pH sensor is a consumable product and its performance deteriorates over time even under normal operating condition.

If disinfection is needed, wipe the surface of meter body and sensor with a clean cloth wet with ethanol or use alcohol wipes. For the flat sensor, place drops of 5% sodium hypochlorite (NaClO) solution for 5 to 30 minutes then rinse thoroughly with sterile water.

Storage

Store the clean pH sensor in dry condition. Never leave distilled or deionized water on the pH sensor for long period as salts may leach out and reduce sensor life. Condition the pH sensor prior to next use (See Conditioning).

Pocket Meters
Technical Tips

Troubleshooting Guide for LAQUAtwin pH Pocket Meters

Most problems associated with LAQUAtwin pH pocket meters are attributed to dry, dirty, or damaged sensors, which come in direct contact with samples. Please refer to the following table for the problems and their corresponding possible causes and solutions encountered with LAQUAtwin pH-11, pH-22, pH-33 pocket meters and flowchart for troubleshooting the LAQUAtwin S010 sensor.

The meter and sensor are warranted against manufacturing defects for 24 months and 6 months, respectively, from the date of purchase. Problems arising from mishandling and application are not covered in the warranty.

Problem	Possible Cause	Solution
Same pH value	Damaged sensor – cracked or broken membrane (Figure 1.2)	Replace the sensor.
	Auto hold mode – the meter is set to auto hold	Press MEAS key to refresh the reading.
Error 1, 2, 3	Defective meter internal IC	Reset the meter. If problem persists, replace the meter.
Error 4	Dry sensor - the sensor is new or stored for long period making it dehydrated.	Condition the sensor by soaking with pH 7.00 buffer for at least 1 hr. Clear the existing calibration data or reset the meter then calibrate.
	Wrong pH buffer group – the pH buffer group selected in the set-up mode does not match the set of pH buffers in use.	If NIST pH buffer group is desired, select NIST in the set-up mode, clear the existing calibration data, and calibrate. If USA pH buffer group is desired, reset the meter and calibrate. • USA - 1.68, 4.01, 7.00, 10.01, & 12.46 pH buffers • NIST – 1.68, 4.01, 6.86, 9.18, & 12.46 pH buffers
	Interfering old calibration data – the meter overrides one existing calibration point during calibration and uses other existing calibration point in the meter to compute slope.	Clear the existing calibration data or reset the meter and calibrate.
	Readings are out of the calibration window or acceptable slope range – measure the mV readings of pH 4.01 and 7.00 buffers with the meter	Clean and condition the sensor and reset the meter. Calibrate. If problem persists, replace the sensor.
Blinking Or (Over range) / Ur (Under range)	The measured pH of sample is not within pH 0-14 range.	Measure a pH buffer. If the meter shows the expected value of the pH buffer, it confirms that the meter is not able to measure the sample's pH. Use a laboratory pH electrode and meter.
	Damaged sensor and/or meter – e.g. deformed sensor contact sheet (Figure 2.1) and/or bent or broken meter pins (Figure 3.1)	Visually inspect the sensor and meter and substitute the part in question with known good working one. Replace the sensor and/or meter, whichever is found damaged.
Blinking °C	The measured temperature of sample is not within 5 to 40°C range.	Measure a pH buffer at room temperature. If the meter shows the expected temperature of the pH buffer, it confirms that the sample's temperature is not within the range. Allow the sample temperature to fall within the range or use a laboratory pH electrode and meter.
	Damaged sensor and/or meter – e.g. deformed sensor contact sheet (Figure 2.1) and/or bent or broken meter pins (Figure 3.1)	Visually inspect the sensor and meter and substitute the part in question with known good working one. Replace the sensor and/or meter, whichever is found damaged.
Meter does not power on.	Batteries are drained or not properly inserted.	Re-insert or replace both batteries. If problem persists, replace the meter.

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Scan QR code with your mobile device to know more about the LAQUAtwin Pocket pH Meters

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Figure 1: Normal sensor

Figure 1.1: KCl salts build-up on the sensors is a normal occurence

Figure 1.2: Sensor with cracked or broken membrane

Figure 2: Normal contact sheet inside the sensor

Figure 2.1: Deformed contact sheet inside the sensor

Figure 3: Normal pins inside the meter

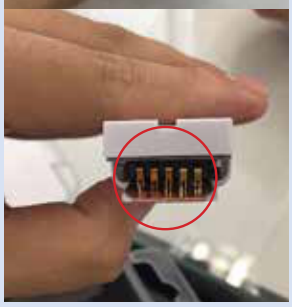
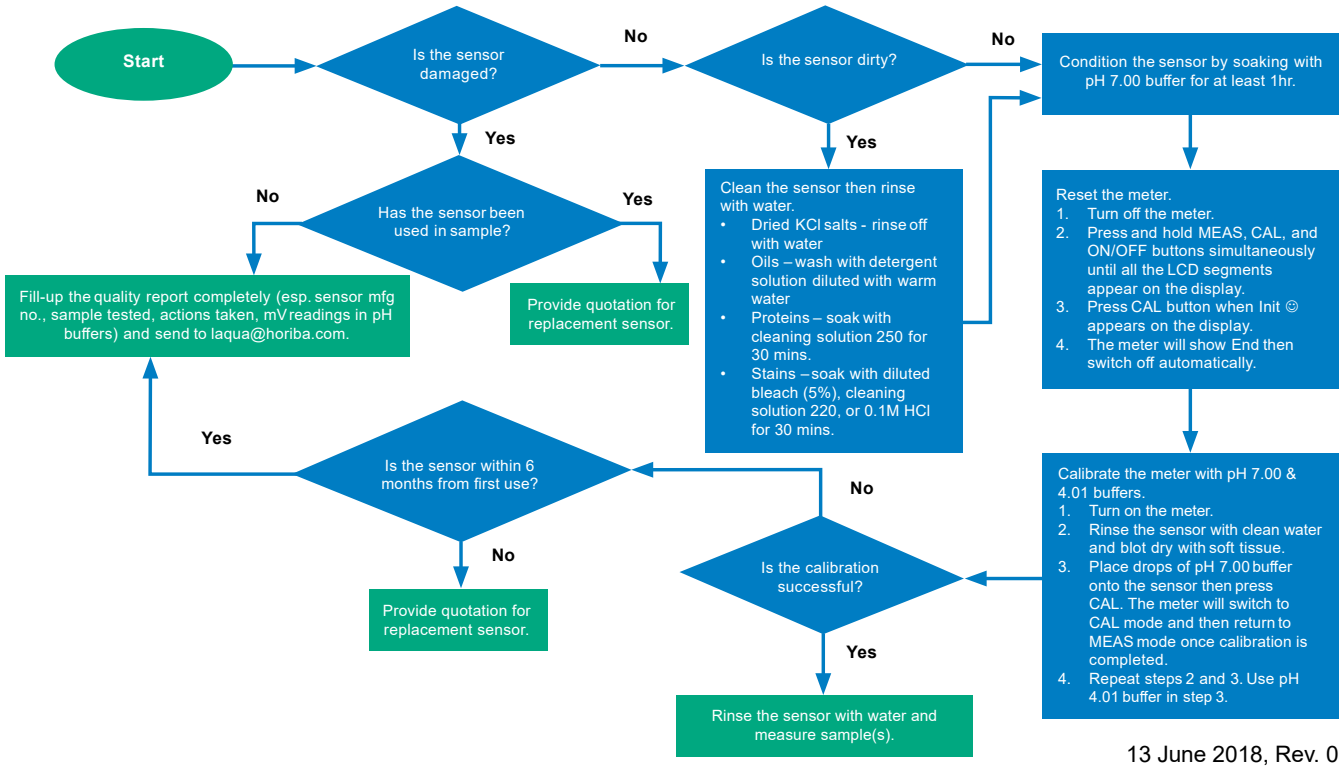


Figure 3.1: Bent pins inside the meter

Troubleshooting Guide for LAQUAtwin pH Sensor



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LAQUAtwin Conductivity Sensor Maintenance Procedures

Proper usage and maintenance of the LAQUAtwin conductivity meter, especially the conductivity sensor that comes in contact with samples, is important to maintain the accuracy and prolong the life span of the instrument.

Materials Needed

Conditioning Solution (Part no. 3999960114) - contains 5% surfactant for removing dirt on sensor surface

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Clean water (e.g. distilled, deionized, tap)

Soft tissue

Cleaning Solution 220 (Part no. 3014028653) - contains 10% thiourea and 1% hydrochloric acid (HCl) for removing stubborn deposits on sensor surface

Mild detergent solution (5ml liquid detergent diluted to 100ml with water)

Conditioning

Condition the conductivity sensor before using it for the first time.

1. Place few drops of the conditioning solution onto the conductivity sensor. Make sure that the whole sensor is covered with the solution and there are no bubbles formed or trapped on the sensor.
2. Leave the conditioning solution for 10 to 30 minutes.
3. Rinse the conductivity sensor with water and blot it dry with soft tissue.
4. Perform calibration with fresh conductivity standard solutions prior to sample measurement.

Cleaning

A clean conductivity sensor is necessary for performing an accurate conductivity measurement. If the meter reading is incorrect or an error appeared on the display, the conductivity sensor requires cleaning.

1. Remove dirt or unwanted sample residues on the sensor by performing the conditioning procedure above. If conditioning solution is not available, a diluted detergent solution (e.g., 5ml liquid detergent diluted to 100ml with water) can be used.
2. If the conditioning procedure failed to restore the sensor performance and there are stubborn deposits on the sensor surface, use a stronger cleaning solution such as cleaning solution 220 and follow the procedure above.
   - Download and read the safety data sheet (SDS) of cleaning solution 220 at www.horiba-laqua.com before handling.
   - Never use any organic solvent (e.g., acetone, ethanol, etc.) to clean the conductivity sensor as it may cause damage and shorten the sensor lifespan. This usage will also void the sensor warranty.
3. If calibration with fresh conductivity standard solutions failed repeatedly and cleaning did not restore the conductivity sensor performance, replace the sensor with a new one (Model S070, Part no. 3200459672). The conductivity sensor is a consumable product and its performance deteriorates over time even under normal operating condition.
4. If disinfection is needed, wipe the surface of meter body and sensor with a clean cloth wet with ethanol or use alcohol wipes. For the flat sensor, place drops of 5% sodium hypochlorite (NaClO) solution for 5 to 30 minutes then rinse thoroughly with sterile water.

Storage

Store the clean conductivity sensor in dry condition.

Pocket Meters
Technical Tips

Scan QR code with your mobile device to know more about LAQUAtwin Ion Pocket Meters

LAQUAtwin Ion Sensor Maintenance Procedures

Proper usage and maintenance of the LAQUAtwin Ion meter, especially the ion sensor that comes in contact with samples, is important to maintain the accuracy and prolong the life span of the instrument.

Materials Needed

2000ppm Ion Standard Solution

Clean water (e.g. distilled, deionized, tap)

Cotton buds

Soft tissue

Household bleach (< 5% sodium hypochlorite or NaClO)

Mild detergent

Conditioning

A dry ion sensor may give erratic reading or slow response. Condition the ion sensor before using it for the first time and after storing it dry. If there is white powder or salt buildup on the junction after dry storage, simply rinse off with water. This is normal.

1. Place few drops of 2000ppm ion standard solution onto the ion sensor. Make sure that the whole flat sensor is covered with the solution.
2. Leave the standard solution on the ion sensor for 10 minutes to 1 hour.
3. Rinse the ion sensor with water and blot it dry with soft tissue.
4. Perform calibration with fresh ion standard solutions prior to sample measurement.

Cleaning

The performance of the ion sensor may deteriorate, especially when it is used in testing dirty samples such as soil, plant tissue sap, etc. To restore the performance of the ion sensor, remove any unwanted sample residues on the flat sensor surface by cleaning it with mild detergent and water. If there are stains or stubborn deposits left, perform the following:

1. Place few drops of household bleach with less than 5% sodium hypochlorite onto the sensor and leave for 5 to 30 minutes (maximum).
2. Gently, wipe the sensor using a cotton bud. Avoid applying pressure and repeat step 1, if needed.
3. Rinse the ion sensor with water and condition it (See Conditioning).

Sodium hypochlorite (NaClO) salt is the active ingredient of bleach, which is often used in disinfection and stain removal. Generally, household bleach in the market contains 3 to 8% NaClO. For cleaning the sensor, a cleaning solution with less than 5% NaClO is recommended, so dilute bleach if necessary. Never use any organic solvent (e.g., acetone, ethanol, etc.,) to clean the sensor as it may cause damage and shorten the sensor lifespan. This usage will also void the sensor warranty.

If disinfection is needed, wipe the surface of meter body and sensor with a clean cloth wet with ethanol or use alcohol wipes. For the flat sensor, rinse it thoroughly with sterile water after cleaning with NaClO.

If calibration with fresh ion standard solutions failed repeatedly and cleaning did not restore the ion sensor performance, replace the sensor with a new one (See Part Numbers below). The ion sensor is a consumable product and its performance deteriorates over time even under normal operating condition.

- S022 Part no. 3200459867 – Sodium Ion Sensor
- S030 Part no. 3200459868 – Potassium Ion Sensor
- S040 Part no. 3200459870 – Nitrate Ion Sensor
- S050 Part no. 3200459869 – Calcium Ion Sensor

Storage

Store the clean ion sensor dry. Make sure to condition the sensor prior to next use (See Conditioning).

Procedure for Setting mmol/L Unit in LAQUAtwin Ion Pocket Meters

1. Press ON/OFF button to switch off the meter.

2. Press and hold MEAS, CAL, and ON/FF buttons simultaneously for 3 seconds.

3. Wait for the meter to display Init.

4. Press and hold MEAS button for 5 seconds. The meter will display ON and switch off automatically.

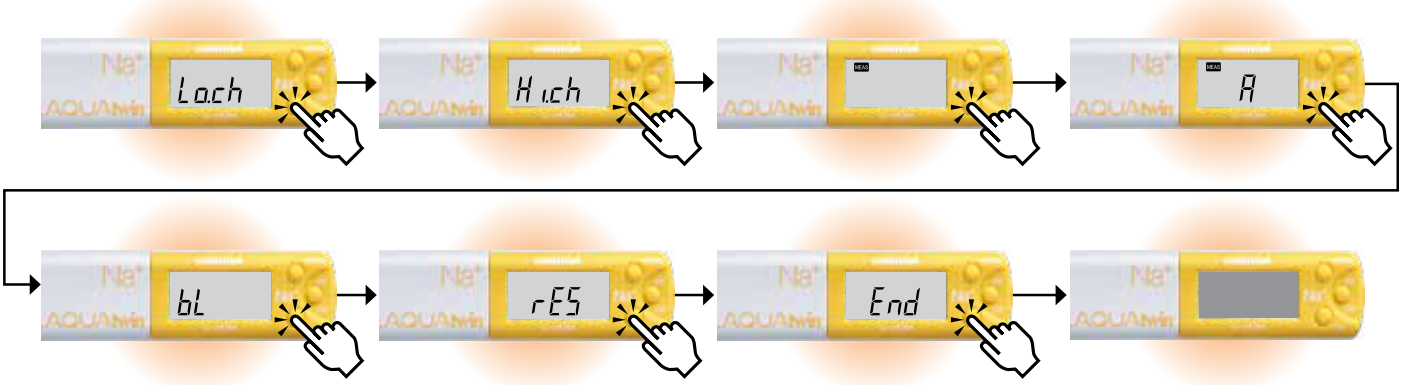
5. Press MEAS and ON/OFF buttons simultaneously for 3 seconds.

6. Wait for the meter to display unit setting.

7. Press MEAS button repeatedly until both ppm and mg/L units disappear and Unit alone is displayed.

This indicates mmol/L unit but does not display mmol/L on the LCD

8. Press CAL button repeatedly until the meter switches off.



This procedure is only applicable for LAQUAtwin Na-11, K-11, NO3-11, and Ca-11 models, which have special set-up mode to show reading in mmol/L unit. Note that the mmol/L unit itself is not indicated in the special set-up mode and will not appear on the LCD after following this procedure.

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Notes

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