

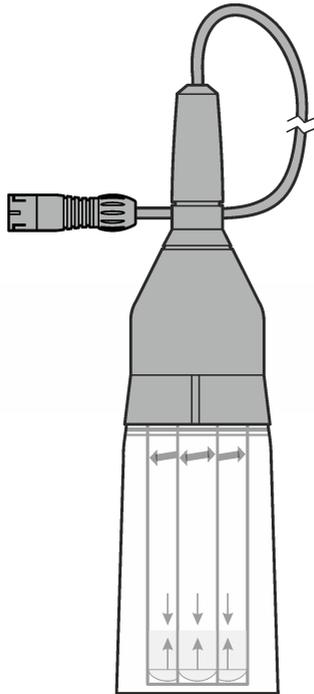


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50 49

08/2013, Edition 1

User Manual



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Specifications

Specifications are subject to change without notice.

Specification	Description
Parameter	pH, conductivity and dissolved oxygen (DO)
Measurement range	pH: 0 to 14, Conductivity: 5 to 30,000 $\mu\text{S}/\text{cm}$, DO: 0.03 mg/L oxygen to saturation, Temperature: 0 to 50 °C (32 to 122 °F)
Temperature sensor	Integrated into conductivity sensor
Sensor	pH: glass membrane (standard), Conductivity: platinum (platinized), DO: polarographic with replaceable membrane
Reference type (pH)	Ag/AgCl
Junction type (pH)	Porous pin
Electrolyte	pH: Non-refillable gel, DO: Hach electrolyte solution 2759123
Storage solution	pH: 3M KCl, Conductivity: distilled water, DO: dry
Number of poles (conductivity sensor)	2
Conductivity cell constant (cm^{-1})	1.0
Meter compatibility	sensION+ MM156 / MM156 DL
Body material	Multisensor body: PVC Probes body: ABS Protective shroud: Polycarbonate
Length	170 mm
Diameter	40 mm total diameter with 12 mm individual sensors (55 mm diameter with protective shroud installed)
Cable	1.5 m
Connector	MP8 ¹

¹ For use with sensION+ MM156 / MM156 DL portable meters only

General information

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

Safety information

Use of hazard information

▲ DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

▲ WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

▲ CAUTION

Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.



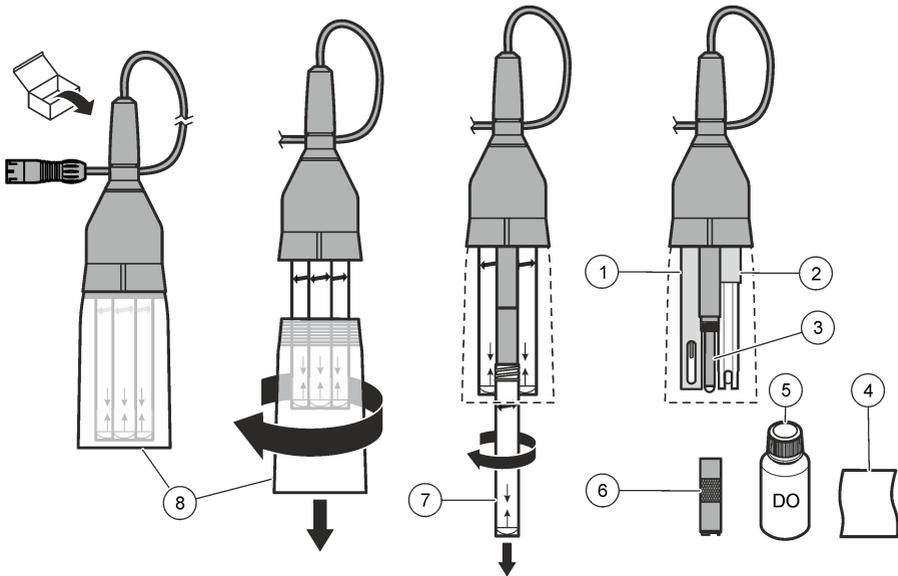
Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of-life equipment to the Producer for disposal at no charge to the user.
Note: For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal.

Product overview

The 50 49 multisensor is used for pH, conductivity and dissolved oxygen measurements in general aqueous samples. The 50 49 multisensor has a built-in temperature sensor within the conductivity probe. Refer to [Figure 1](#). Refer to [Sample requirements](#) on page 9 for limitations on use.

The 50 49 multisensor is used with sensION+ meters. Refer to [Meter compatibility](#) on page 5.

Figure 1 Product overview



1 Conductivity probe	4 DO polishing cloth	7 Probe storage tube
2 pH probe	5 DO electrolyte (membrane filling solution)	8 Protective shroud
3 Dissolved oxygen probe	6 Membrane module (DO probe)	

Meter compatibility

The 50 49 multisensor is compatible with the sensION+ handheld meter models: MM156 and MM156 DL.

Preparation for use

▲ CAUTION



Personal injury hazard. Broken glass can cause cuts. Use tools and personal protective equipment to remove broken glass.

To prepare the probes for calibration or sample measurement:

1. Turn the protective shroud and remove from the multisensor.
2. Turn the probe storage tube(s) and remove from the probe(s). Keep the probe storage tube(s).
3. For conductivity probes: Before initial use, soak the probe sensor in ethanol for 15 seconds.
4. For dissolved oxygen probes: refer to [Polarize the dissolved oxygen probe](#) on page 5.
5. Rinse the probe(s) with deionized water. Blot dry with a lint-free cloth.

Polarize the dissolved oxygen probe

Before calibration or measurement of dissolved oxygen with the multisensor, polarize the dissolved oxygen probe.

The dissolved oxygen probe must be polarized every time the multisensor is disconnected from the meter or the batteries are removed from the meter. The probe is continuously polarized while it is connected to the meter.

1. Fill the DO membrane module. Refer to [Fill the membrane module](#) on page 12
2. Install the membrane module.
3. Connect the multisensor to the meter. Set the meter to on.
4. Let the dissolved oxygen probe to polarize. Refer to [Table 1](#) for the amount of time.
5. Enter the atmospheric pressure and salinity on the meter. Refer to the meter manual.

Table 1 Polarization times

Disconnect time	Polarization time
Less than 5 minutes	10 minutes
5–15 minutes	45 minutes
More than 15 minutes	6 hours

Calibration

Before calibration:

Prepare the probe(s) for use. Refer to [Preparation for use](#) on page 5.

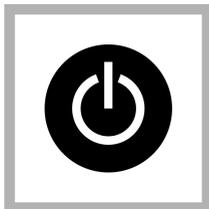
Prepare the meter. Refer to the meter manual.

Calibration notes

- For maximum accuracy, calibrate the probe at least once a day.
- Prepare fresh standard solutions for the calibration.

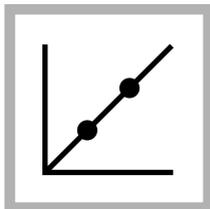
- The calibration and sample measurement conditions must be as similar as possible (e.g., the temperature of the solution, stir procedure, stir rate and position of the probe).
- The temperature sensor is within the conductivity probe. Calibration standards must be at same temperature (ambient temperature is recommended).
- For pH calibration, at least 2 calibration points are necessary.
- For conductivity calibration, use 1-point calibration and select the standard nearest to the expected measurement range. Refer to the meter manual for other conductivity calibration options.
- Calibration of conductivity cells is important as the conductivity cell constant can change with time. The calibration identifies the actual cell constant versus the nominal value.
- Do not dilute conductivity standards or samples.
- For dissolved oxygen calibration, a water-saturated air calibration is recommended. Refer to [Calibration procedure — DO probe, water-saturated \(100%\) air](#) on page 7.
- When the probe is submerged, make sure that there are no air bubbles under the probe sensor tip(s). Gently shake the probe from side to side to remove any air bubbles.
- Make sure that the reference junction of the pH probe is fully immersed in the solution.
- If the stabilization is slow, shake the multisensor from side to side to stir the solution.
- Always hold the multisensor by the handle. Do not hold by the probe tubes to avoid the heating of the solutions.
- If a calibration error occurs, refer to [Troubleshooting](#) on page 13.

Calibration procedure (pH and conductivity)

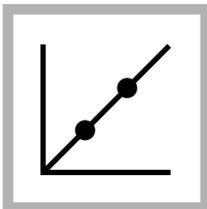


1. Connect the multisensor to the meter. Set the meter to on.

Note: For dissolved oxygen calibration, refer to [Calibration procedure — DO probe, water-saturated \(100%\) air](#) on page 7.

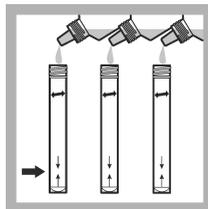


2. Push **Calibrate**. The parameter flashes on the meter display. Use the arrow keys to change the parameter, if applicable.

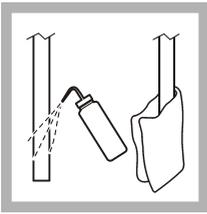


3. Push **Calibrate** to select the parameter. The standard flashes on the meter display. Use the arrow keys to select the applicable standard solution.

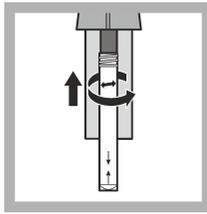
Note: pH buffers are automatically recognized.



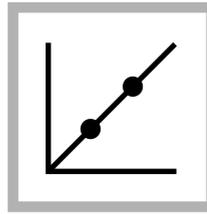
4. Prepare the standard solutions in the probe storage tubes. Add approximately 6.4 mm ($\frac{1}{4}$ inch) of standard.



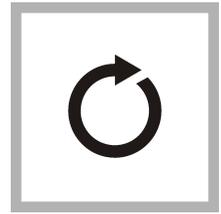
5. Rinse the probe(s) with deionized water. Blot dry with a lint-free cloth.



6. Put the storage tube in the corresponding sensor and turn to tighten.

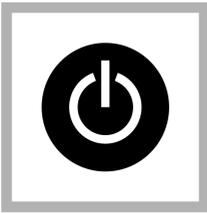


7. Push **Calibrate** to measure the calibration solution.

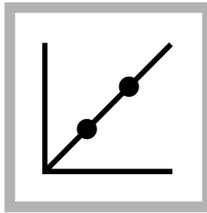


8. When the reading is stable, the meter prompts for the next calibration point. Repeat steps 4–7 for additional standard solutions. The calibration is complete when the last standard solution is read. The meter shows briefly the message "**CAL OK**" if the calibration is accepted.

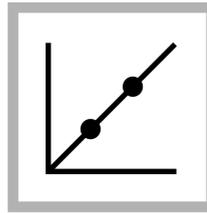
Calibration procedure — DO probe, water-saturated (100%) air



1. Set the meter to on. If the dissolved oxygen probe is not polarized, polarize the probe, refer to [Polarize the dissolved oxygen probe](#) on page 5.

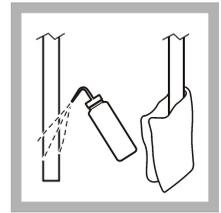


2. Push **Calibrate**. The parameter flashes on the meter display. Use the arrow keys to change the parameter to **DO**.

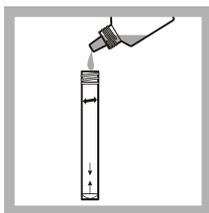


3. Push **Calibrate** again to confirm the DO parameter. "**100.0%**" flashes on the meter display.

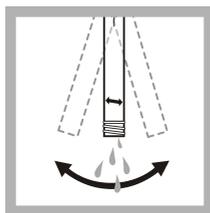
Note: The probe can also be calibrated at zero oxygen standard. Use the arrow keys to select 0% on meter.



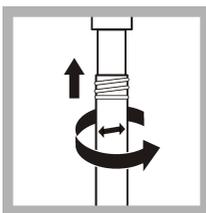
4. Rinse the probe(s) with deionized water. Blot dry with a lint-free cloth.



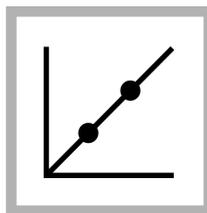
5. Add approximately 6.4 mm (¼ inch) of deionized water to the DO probe storage tube.



6. Invert and shake the DO probe storage tube to remove all water droplets.



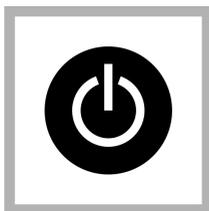
7. Immediately put the DO probe in the storage tube and turn to tighten.



8. Push **Calibrate** to measure the calibration solution. The calibration is complete when the reading is stable. The meter shows briefly the message **CAL OK** if calibration is accepted.

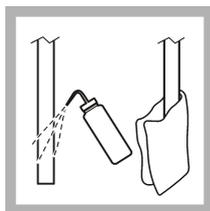
Adjust the calibration (manual calibration)

A single custom standard value can be specified. Adjust the instrument to read a specified solution value for pH, DO and conductivity. Use this procedure to calibrate the probe with a single standard solution.

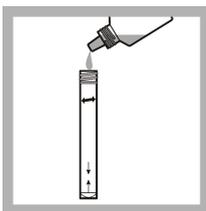


1. Connect the probe to the meter. Set the meter to on.

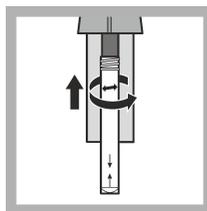
Note: For dissolved oxygen calibration, polarize the probe. Refer to [Polarize the dissolved oxygen probe on page 5](#).



2. Rinse the probe with deionized water. Blot dry with a lint-free cloth.



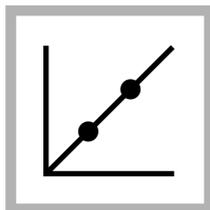
3. Prepare the standard solution in the storage tube. Add approximately 6.4 mm (¼ inch) of solution.



4. Put the storage tube in the corresponding sensor and turn to tighten.



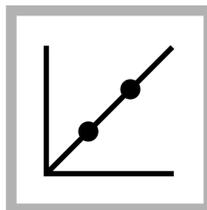
5. Push **Read**. Wait until the reading is stable (stops flashes in the display).



6. Push **Calibrate**. The parameter flashes on the meter display. Use the arrow keys to change the parameter, if applicable.



7. Push and hold **Calibrate**, then push **Read**. The measured value flashes. Use the arrow keys to change the value.



8. Push **Calibrate** to confirm the value. The meter shows "OK".

Sample requirements

The multisensor probes are not compatible with specific sample types. Probe damage can occur if used in non-compatible samples.

- Samples should be aqueous. Measurements may be made in partially aqueous or some water-miscible solvents. The results must be interpreted with caution as the full pH scale is shifted when the solvent system changes.
- The multisensor pH probe is not compatible with solutions that contain silver complexing or binding agents such as TRIS, proteins and sulfides.
- Proteins can collect on the probe sensors. Make sure the probes stay clean when these types of samples are measured.
- Do not use multisensor in solutions that are outside the specified temperature range. Refer to [Specifications](#) on page 3.

Sample measurement

⚠ WARNING



Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

NOTICE

Do not immerse the multisensor if a probe is not connected. Damage to the mini-MP connector will occur.

Before measurement:

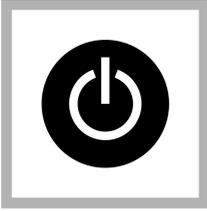
Prepare the probe(s) for use. Refer to [Preparation for use](#) on page 5.

Calibrate the probe(s). Refer to [Calibration](#) on page 5. The manufacturer recommends to calibrate at least once a day for the best measurement accuracy.

Measurement notes

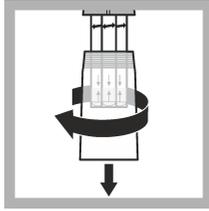
- The calibration and sample measurement conditions must be as similar as possible (e.g., the temperature of the solution, stir procedure, stir rate and position of the probe).
- Do not dilute conductivity standards or samples.
- When the probe is submerged, make sure that there are no air bubbles under the probe tip. Gently shake the probe from side to side to remove any air bubbles.
- Make sure that the reference junction on the pH probe is fully immersed in the solution.
- If necessary, turn the protective shroud and remove it from the probe. The manufacturer recommends to measure with the protective shroud installed. The protective shroud prevents damage to the sensors.
- Do not put the probe on the bottom or sides of the container.
- If the stabilization is slow, shake the multisensor from side to side in the solution.
- Do not use probes in areas where EMF is present (i.e., voltaic cells, thermoelectric devices, electrical generators, resistors and transformers). For use in process units (i.e., spot checking), make sure that the meter is grounded.
- If a measurement error occurs, refer to [Troubleshooting](#) on page 13.

Measurement procedure

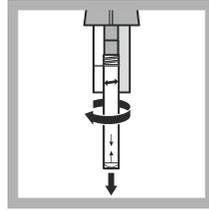


1. Connect the multisensor to the meter. Set the meter to on.

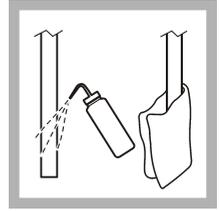
Note: Before dissolved oxygen measurement, polarize the probe if the probe is not polarized.



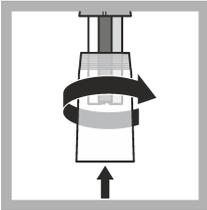
2. Turn the protective shroud and remove it from the multisensor.



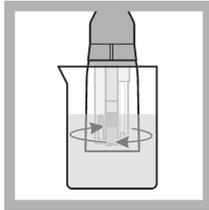
3. Turn the probe storage tubes and remove the tubes from the probes.



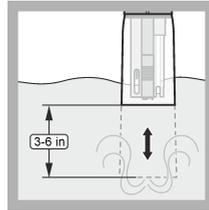
4. Rinse the probe(s) with deionized water. Blot dry with a lint-free cloth.



5. Put the protective shroud on and turn to tighten.



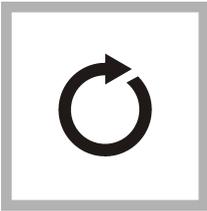
6. Put the multisensor in the sample and stir with the probes or a stir stand and stir bar.



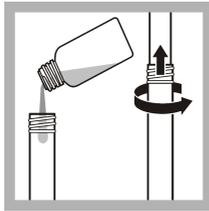
7. To measure bodies of water, move the multisensor up and down approximately 7-15 cm (3-6 inches) to circulate the sample around the probe tips.



8. Push Read.



9. Repeat steps 4-8 for additional measurements.



10. When the measurements are done, prepare the probe for storage. Refer to [Storage](#) on page 13.

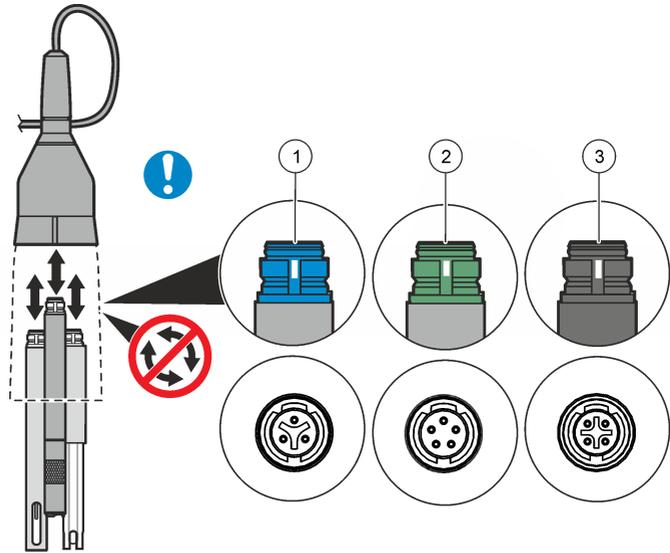
Maintenance

Replace the probes

Each probe of the multisensor has a unique mini-MP connector.

Pull straight to remove or connect the probes. Do not turn the connector. Look to the color coding of the probe and multisensor connectors. Use the white mark to position the probes in the multisensor connectors. Refer to [Figure 2](#) for more details.

Figure 2 Replace the probes



1 Blue connector: Dissolved oxygen probe	2 Green connector: Conductivity probe	3 Black connector: pH probe
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Clean the probes

NOTICE

Do not rub or touch the tip of the pH or dissolved oxygen sensors.

Clean the probe when there is contamination on the sensor. Symptoms of contamination are:

- Readings are not accurate or consistent.
- The stabilization time is slow.
- A calibration error occurs.
- Contamination is visible on the probe (i.e., dirt).

To clean the dissolved oxygen probe of the multisensor, refer to [Dissolved oxygen probe](#) on page 12.

1. For general contaminants, rinse the probe with deionized water. Blot dry with a lint-free cloth.
2. For other contaminants:
 - a. Soak the pH and/or conductivity probes of the multisensor in the applicable cleaning agent. Refer to [Table 2](#).
 - b. Rinse or soak the sensors for 1 minute in deionized water. Blot dry with a lint-free cloth.

Table 2 Cleaning agent

Contaminant	Cleaning agent	Soak time
Mineral deposits	0.1 N HCl	5 minutes (maximum)
Fats, grease and oils	Warm, mild detergent solution	2 hours (maximum)

Dissolved oxygen probe

Clean the probe

NOTICE

Use only deionized water and/or the polishing cloth to clean the anode and cathode.

- Remove the membrane module from the probe:
 - Hold the probe so it is vertical with the tip down.
 - Gently turn the membrane module to remove it from the probe.
- Soak the membrane module in a mild soap solution.
- Rinse the membrane module fully with deionized water.
- Invert the membrane module and shake vigorously to remove any water.
- Rinse the probe with deionized water. Blot dry with a lint-free cloth.
- Rub the anode with the polishing cloth supplied. The anode is the outer metallic stem of the probe that is visible when the membrane module is removed. The polishing cloth removes deposits that can decrease the probe performance.
- Fill the membrane module $\frac{2}{3}$ full with filling solution and assemble the probe. Refer to [Fill the membrane module](#) on page 12.

Replace the membrane module

NOTICE

Carefully touch the membrane modules to prevent damage.

It is necessary to replace the membrane module periodically. Replace the membrane module when it is damaged, the probe reading drifts or the probe has a slow response.

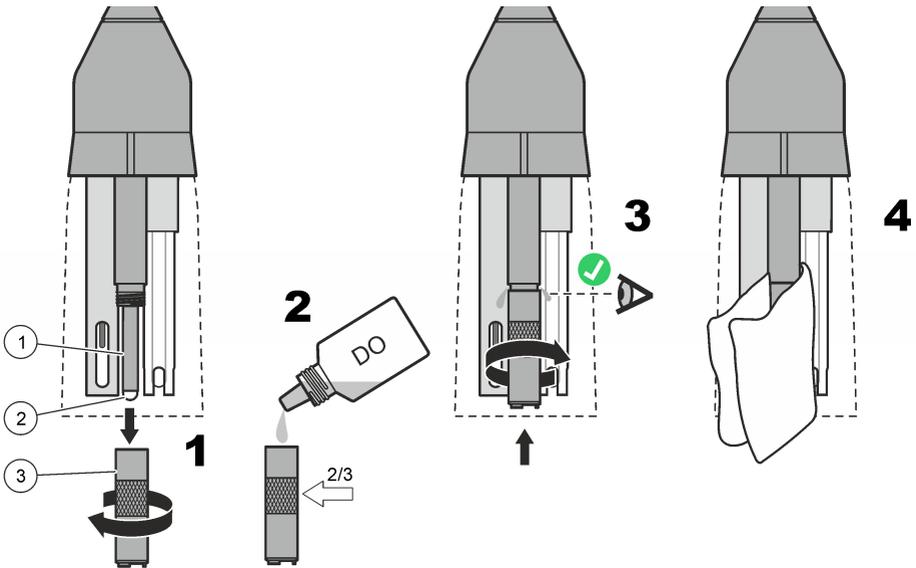
Fill the membrane module

Add filling solution to the membrane module if the level of filling solution in the membrane module is less than $\frac{2}{3}$ full.

- Remove the membrane module from the probe:
 - Hold the probe so it is vertical with the tip down.
 - Gently turn the membrane module to remove it from the probe.
- Add filling solution to the membrane module until it is approximately $\frac{2}{3}$ full.
- Install the membrane module on the probe:
 - Carefully tilt the membrane module to remove the air bubbles in the filling solution.
 - Hold the probe with the tip down and slightly tilted.
 - Slowly put the membrane module on the probe. Some filling solution should come out of the threads of the membrane module. Remove any filling solution on the surface of the probe.
- If no filling solution comes out of the threads, air may be inside the membrane module cap. Add more filling solution to the membrane module and repeat step 3.

- If the probe will be used immediately, polarize the probe. Refer to [Polarize the dissolved oxygen probe](#) on page 5.
- If the probe will not be used immediately, put the probe in storage. Refer to [Storage](#) on page 13.

Figure 3 Fill the membrane module



1 Anode	2 Cathode	3 Membrane module
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Storage

- Fill the probe storage tube with storage solution to the mark. Refer to [Specifications](#) on page 3 for the applicable storage solution.
- Put the probe in the storage tube and turn to tighten.

Rehydrate the pH probe

NOTICE

Do not clean the dissolved oxygen probe of the multisensor with HCl because damage to the membrane will occur.

If the pH sensor of a probe becomes dry, rehydrate the probe. A dry pH probe will not operate correctly.

- Soak the dry probe in a dilute HCl solution for several hours.
- Rinse the probe with deionized water. Blot dry with a lint-free cloth.
- Calibrate the probe. Refer to [Calibration procedure \(pH and conductivity\)](#) on page 6.

Troubleshooting

Refer to the table that follows for common problem messages or symptoms, possible causes and corrective actions.

Error/Warning	Description	Solution
<p>nnnn</p> <p>uuuu</p>	Measurement out of range	<ul style="list-style-type: none"> • Insert the probe into the applicable standard and read again. • Clean the probes. • Make sure that there are no air bubbles in the probe's sensors. • Disconnect the multisensor and then connect the multisensor again. • Connect a different probe to make sure if problem is with probe or meter.
E1	Unstable reading during a stability measurement or during calibration.	Make sure that the probes are properly immersed in the sample.
E2	Probe current: more than upper limit during measurement ≥ 250 nA.	<ul style="list-style-type: none"> • Clean the pH probe and the membrane. • Make sure that there are no air bubbles in the membrane.
	pH probe sensitivity out of range (accepted values 70–105%).	<ul style="list-style-type: none"> • Make sure that the buffer that is used is specified in configuration. • Replace the buffer solution. • Clean the pH probe.
	Conductivity calibration error	<ul style="list-style-type: none"> • Insert the conductivity probe into the applicable standard and read again. • Clean the conductivity probe. • Examine for damage at the conductivity probe sensor, replace if necessary.
E3	Conductivity calibration error: cell constant is $< 0.05 \text{ cm}^{-1}$.	<ul style="list-style-type: none"> • Insert the conductivity probe into the applicable standard and read again. • Clean the conductivity probe. • Examine for damage at the conductivity probe sensor, replace if necessary.
	Offset out of range (accepted values ± 58 mV).	<ul style="list-style-type: none"> • Clean the probe. • Make sure that there are no air bubbles in the sensors. • Connect a new probe.
E4	Buffer solution not recognized.	<ul style="list-style-type: none"> • Clean the probe. • Make sure that there are no air bubbles in the sensors. • Make sure that the buffer that is used is specified in configuration. • Replace the buffer solution. • Make sure of the temperature specification in configuration.
	Salinity cannot be calculated TC=0	Change the TC (Temperature Coefficient). Introduce the TC value at the meter setup to be able to calculate the salinity value. Refer to meter manual.
E5	The standards used for calibration are identical.	<ul style="list-style-type: none"> • Make sure that the buffer that is used is specified in configuration. • Replace the buffer solution. • Make sure of the temperature specification in configuration.

Error/Warning	Description	Solution
E6	The calibration solutions have different temperatures.	Make sure that the calibration solutions have the same temperature.
ErA	Salinity is set to automatic and measured value > 50 g/L.	Change the TC value from automatic to the correct value. Refer to meter manual.

Troubleshooting notes

For the best performance, make sure to:

- Prepare the probe(s) for use before calibration or measurement.
- Obey the calibration and measurement notes.
- Obey the calibration and measurement procedures.

Troubleshooting notes:

- Magnetic stirrers may supply sufficient heat to change solution temperature. Put a piece of insulating material between the stirrer and beaker.
- Protect the sensing element from direct light during measurement.
- Set the meter to off. Disconnect and then connect the probe again.
- Connect a different probe to identify if the problem is with the probe or the meter.

Refer to [Troubleshooting](#) on page 13 for calibration and measurement warnings and errors.

Examine the probes

Note: *The lower the sample temperature or the larger the temperature difference between the samples, the longer the stabilization time will be.*

1. Examine the platinized layer of the conductivity probe. Replace the probe if the platinized layer has been damaged and/or removed.
2. Clean the probes. Replace the DO probe membrane module if necessary.
3. If the DO probe fill solution is contaminated, drain and replace with fresh filling solution.
4. Rinse the pH probe reference junction diaphragm with deionized water. Then, shake the probe downwards (like a thermometer) to remove any air bubbles in the bulb.

Replacement parts and accessories

Note: *Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.*

Replacement parts

Description	Item no.
pH electrode for 50 49 multisensor	LZW9171.99
Conductivity cell for 50 49 multisensor	LZW9172.99
DO sensor for 50 49 multisensor	LZW9173.99
Handle for 50 49 multisensor	LZW9179.99

Accessories

Description	Item no.
Set of 3 x 10 mL printed tubes for portable pH calibration	LZW9137.97
Set of 3 x 10 mL printed tubes for portable conductivity calibration	LZW9138.99
Electrode storage protector, polypropylene	LZW9161.99
Electrode measurement protector, polypropylene	LZW9162.99
Tube for DO probe calibration	LZW5123.99
Service kit for DO probe (contains two membrane modules and DO filling solution)	5196800



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