


BOD LDO® Probe: Model LBOD10101

Safety information

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.

	<p>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.</p> <p>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.</p>
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Specifications

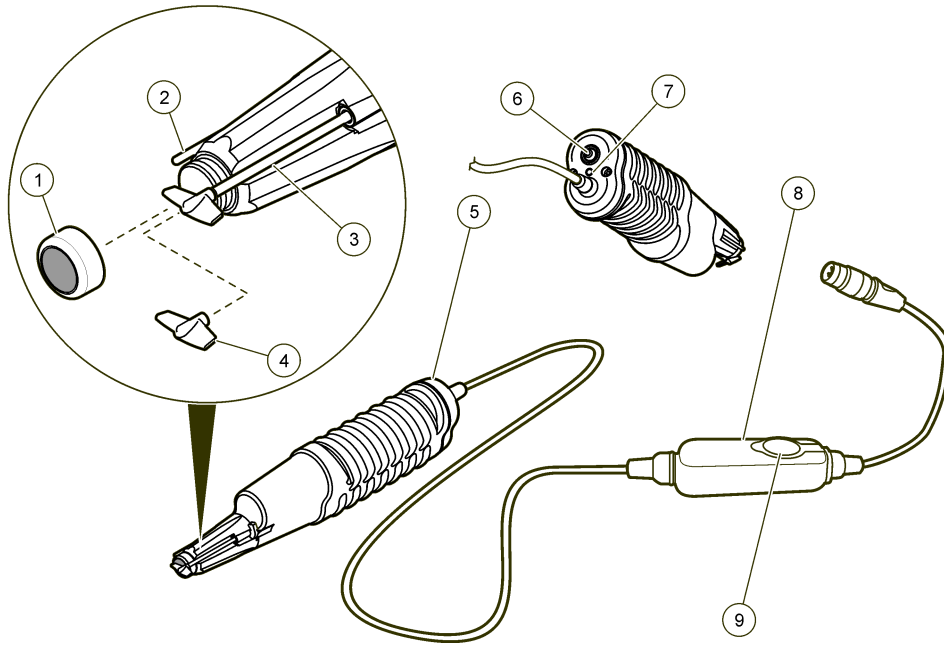
Note: Specifications are subject to change without notice.

Specifications	Details
Probe type	Luminescent dissolved oxygen (LDO) sensor with integrated stirring system
% saturation resolution	0.1%
% saturation accuracy	±0.59% of reading
Dissolved oxygen range	0.05 to 20.0 mg/L (ppm) 1 to 200% saturation
Dissolved oxygen accuracy	±0.05 mg/L for 0.0 to 10 mg/L ±0.1 mg/L for greater than 10 mg/L
Stabilization time	T90% at 10 seconds (when stirred)
Temperature resolution	0.1 °C (0.18 °F)
Temperature accuracy	±0.3 °C (±0.54 °F)
Pressure resolution	5 mbar (0.5 kPa)
Pressure accuracy	±3 mbar (0.3 kPa)
Operating temperature range	0 to 50 °C (32 to 122 °F)
Storage temperature range	5 to 40 °C (41 to 104 °F)
Minimum sample depth	10 mm (0.394 in.)
Dimensions	Diameter: 15.875 mm (0.625 in.) Length: 215 mm (8.46 in.) Cable length: 1.8 m (5.91 ft)
Cable connection	M12 digital output and connector compatible with HQd meters

Product overview

The LBOD10101 probe is a luminescent dissolved oxygen (LDO®) sensor with an integrated stirring system (Figure 1). The LBOD10101 measures the dissolved oxygen for BOD (Biochemical Oxygen Demand) determination in BOD bottles. The probe uses the luminescent dissolved oxygen (LDO) technology (no membranes) and features a replaceable self-stirring assembly and a 1.8 meter (5.91 ft) cable.

Figure 1 Probe overview



1 Probe cap and seal	6 Stirrer On/Off switch
2 Thermistor	7 Power indicator LED
3 Stirrer assembly	8 Pressure sensor module
4 Stirrer paddle	9 iButton® compartment ¹
5 Probe body with integrated stirrer	

¹ iButton is a registered trademark of Maxim Integrated Products, Inc.

Preparation for use

Note: Do not touch the probe cap with a hand, fingers or any surface that can scratch the cap.

Prepare the probe for use before calibration or sample measurement.

1. Make sure that the probe cap and iButton are installed correctly. The iButton label should be up.
2. Make sure that the probe cap and iButton have the same lot code.
3. Rinse the probe cap with deionized water. Blot dry with a lint-free cloth.

Calibration

Before calibration:

The probe must have the correct service-life time stamp. Set the date and time in the meter before the probe is attached.

It is not necessary to recalibrate when moving a calibrated probe from one HQd meter to another if the additional meter is configured to use the same calibration options.

To view the current calibration, push , select View Probe Data, then select View Current Calibration.

If any two probes are connected, push the **UP** or **DOWN** arrow to change to the single display mode in order to show the Calibrate option.

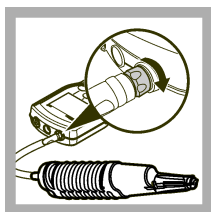
Prepare the probe for use (refer to [Preparation for use](#) on page 2).

Calibration notes:

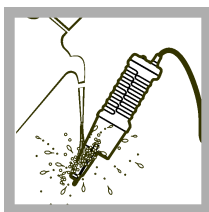
- Measure samples as soon as possible after collection.

- % saturation or mg/L calibration methods are available in the Modify Current Settings menu.
- The slope value is the comparison between the latest calibration and the factory calibration shown as a percentage.
- The calibration is recorded in the probe and the data log. The calibration is also sent to a PC, printer or flash memory stick if connected.
- Air bubbles under the sensor tip when submerged can cause slow response or error in measurement. If bubbles are present, gently shake the probe until bubbles are removed.
- If a calibration error occurs, put the probe back in the BOD bottle and allow additional time for the air environment to become saturated with water. Push **Read**. Refer to [Troubleshooting](#) on page 9.

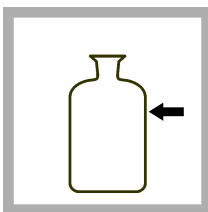
Water-saturated air (100%) calibration procedure:



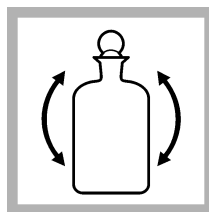
1. Connect the probe to the meter. Make sure that the cable locking nut is securely connected to the meter. Turn on the meter.



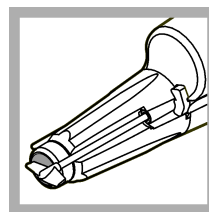
2. Rinse the probe cap with deionized water.



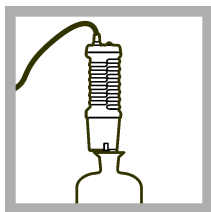
3. Fill a BOD bottle approximately $\frac{3}{4}$ full with water (225 mL).



4. Put a stopper in the bottle and shake the bottle vigorously for approximately 30 seconds to saturate the entrapped air with water.



5. Carefully dry the probe sensor surface with a non-abrasive cloth.



6. Remove the stopper. Put the probe in the bottle and wait approximately 10 minutes for the contents to equilibrate to room temperature.



7. Push **Calibrate**.



8. Push **Read**. The display shows "Stabilizing" and a progress bar as the probe stabilizes. The display shows the standard value when the reading is stable. Continue with zero point calibration if necessary (refer to [Zero point calibration procedure](#): on page 4).



9. Push **Done** to view the calibration summary.



10. Push **Store** to accept the calibration and return to the measurement mode.

Zero point calibration procedure:

Note: It may take up to 30 minutes for a 0 mg/L point to be observed. A negative dissolved oxygen concentration value indicates that a 0 mg/L has not yet been met.



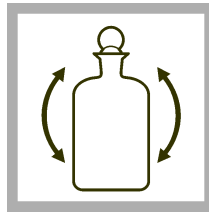
1. Fill a BOD bottle full with deionized water.



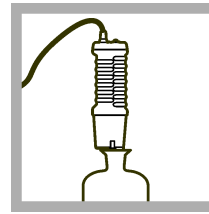
2. Add 300 mg of sodium sulfite to the bottle.



3. Add 2 mL of cobalt chloride solution to the bottle. The cobalt chloride acts as a reaction catalyst.



4. Put the stopper in the bottle and turn the bottle over several times to mix the chemicals.



5. Remove the stopper. Put the LBOD probe in the bottle and start the stirrer.



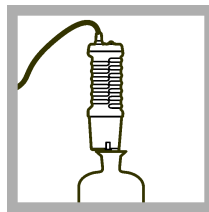
6. Push **Read**. The display shows "Stabilizing" and a progress bar as the probe stabilizes. The display shows the standard value when the reading is stable.



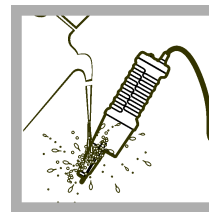
7. Push **Done** to view the calibration summary.



8. Push **Store** to accept the calibration and return to the measurement mode.



9. After the 0 saturated value is shown on the display, put the probe in a BOD bottle full of deionized water. Start the stirrer and run for 10 minutes to remove sulfite residue from the probe.



10. Remove the probe from the bottle and rinse thoroughly with deionized water.

Measurement

Before measurement:

The probe must have the correct service-life time stamp. Set the date and time in the meter before the probe is attached.

If complete traceability is necessary, enter a sample ID and operator ID before measurement. Refer to the HQd meter manual for more information.

Regular calibration is required for the best measurement accuracy (refer to [Calibration](#) on page 2).

Prepare the probe for use (refer to [Preparation for use](#) on page 2).

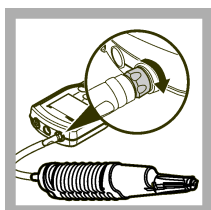


Do not submerge the pressure sensor module.

Measurement notes:

- High concentrations (over 1 molar) of bases or acids will decrease the service life of the probe cap.
- The magnetic-based motor of the probe makes more noise than a conventional-based stirrer.
- Salinity affects the concentration of dissolved oxygen in the sample. To correct for salinity effects, refer to [Advanced operation](#) on page 5.
- Data is automatically stored in the data log when **Press to Read** or **Interval** is selected in the Measurement Mode. When **Continuous** is selected, data will only be stored when **Store** is selected.
- Air bubbles under the sensor tip when submerged can cause slow response or error in measurement. If bubbles are present, gently shake the probe until bubbles are removed.
- If a measurement error occurs, refer to [Troubleshooting](#) on page 9.

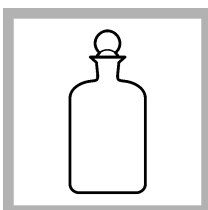
Measurement procedure:



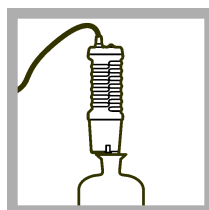
1. Connect the probe to the meter. Make sure that the cable locking nut is securely connected to the meter. Turn on the meter.



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



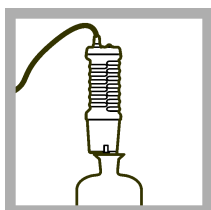
3. Fill the BOD bottle with sample. Make sure that there are no air bubbles.



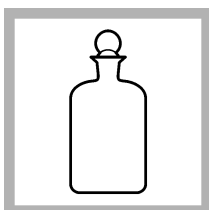
4. Put the probe in the sample. Turn on the stir paddle by pushing the button on top of the probe.



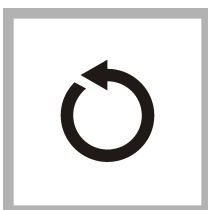
5. Push **Read**. The display will show "Stabilizing" and a progress bar as the probe stabilizes in the sample. The display will show the lock icon when the reading stabilizes. Record the value.



6. Turn off the stir paddle. Remove the probe from the bottle. Be careful not to catch the stir paddle on the inside lip of the bottle.



7. Carefully put the stopper in the bottle. Make sure there are no air bubbles in the bottle.



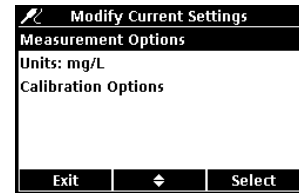
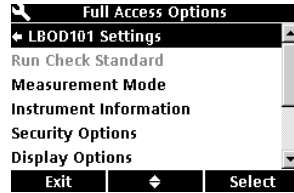
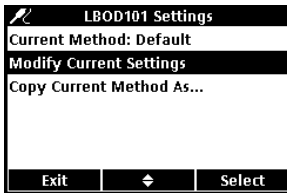
8. Repeat steps 2-7 for additional measurements.



9. When measurements are done, store the probe in a BOD bottle partially filled ($\frac{1}{4}$ minimum) with water.

Advanced operation

Parameter-specific settings can be changed through the Full Access Options menu. Details about menu navigation, available options and how to change them are given in the screens, tables and procedures throughout this section.



The settings that can be changed are shown in [Table 1](#).

Table 1 Parameter-specific settings

Setting	Options	Description
Measurement Options	Resolution	Defines measurement resolution
	Measurement Limits	Upper and lower measurement limits
	Salinity Correction	Value for salinity correction
	Pressure Units	Atmospheric pressure units
	Averaging Interval	How often the meter calculates an average readings
Units	mg/L %	Primary unit of measurement
Calibration Options	Calibration	<ul style="list-style-type: none"> User 100% User 100% with 0 User mg/L User mg/L with 0
	Calibration Reminder	Reminder Repeat—Off, 8 h, 12 h, 1 d, 2 d, 5 d or 7 d Expires—Immediately, Reminder + 30 m, Reminder + 1 h, Reminder + 2 h or Continue Reading

Change measurement options

Methods are groups of default or user-defined settings relevant to specific applications. If the meter is set to the default method and the Modify Current Settings option is chosen, a prompt for a new name is shown after the changes are entered. The settings are saved with this name to distinguish them from the default method settings, which cannot be changed. A saved method can be used instead of multiple adjustments to the individual settings. Changes made to a user defined method are automatically saved with the existing name. Multiple methods can be saved for the same probe on each meter.

1. Make sure a probe is connected to the meter.
2. Push and select LBOD101 Settings.
3. Select Modify Current Settings.
4. Select Units. Select mg/L (default) or %.
5. Select Measurement Options and update the settings:


Option	Description
Resolution	Sets the resolution: <ul style="list-style-type: none"> • 0.1—Fast (0.35 mg/L)/min • 0.01—Fast (0.35 mg/L)/min • 0.01—Medium (0.15 mg/L)/min (default), or • 0.01—Slow (0.05 mg/L)/min

The resolution affects the number of decimal places and the stabilization time. Higher resolution measurements take more time to stabilize.

Option	Description
Measurement Limits	<p>Set the measurement limits—Lower limit (default: 0.0 mg/L; 0%) or Upper limit (default: 20.0 mg/L; 200%).</p> <p>The measurement limits can be set to match the acceptable values for the sample. When the measurement is above the upper limit setting or below the lower limit setting, the meter shows an "Out of limits" message. This message is an alert to a potential problem with the process conditions.</p>
Salinity Correction	<p>Sets the salinity correction—Off (default), Manual.</p> <p>Salinity lowers the solubility of dissolved oxygen in water. To correct for salinity in the sample, set salinity correction to manual and then enter the salinity value.</p>
Salinity Value	<p>Sets the salinity value—‰ (default: 35.0 ‰).</p> <p>When salinity correction is set to manual, sets the salinity value of the sample. Salinity can be measured with a conductivity probe.</p>
Pressure Units	<p>Sets the pressure units—hPa, mBar, inHg or mmHg.</p> <p>The meter shows the atmospheric pressure at the current elevation, which is necessary for accurate measurements.</p> <p>Note: <i>This pressure reading will not agree with readings from sources such as weather stations, which report atmospheric pressure at sea level.</i></p>
Averaging Interval	<p>Sets the averaging interval—Off, 30, 60, 90 seconds, 3, 5 minutes.</p> <p>The averaging interval is useful for samples that contain a lot of air bubbles, for example in an aeration basin. The air bubbles cause the dissolved oxygen readings to vary greatly from one reading to the next. To make the readings more consistent, increase the averaging interval. The meter will take measurements at the same frequency but show only the average over a longer interval.</p> <p>Note: <i>Labels and options may vary depending on the units selected.</i></p>

- If prompted, enter a name for the new method settings. Additional changes made to the settings of an existing method are automatically saved with the same method name.
- Push **EXIT** until the meter returns to the measurement mode.

Change calibration options

- Make sure that a probe is connected to the meter.
- Push  and select LBOD101 Settings.
- Select Modify Current Settings.
- Select Calibration Options and update the settings:

Option	Description
Calibration	<ul style="list-style-type: none"> User—100% (water-saturated air (100%) calibration) User—100% with 0 (water-saturated air (100%) calibration with 0 point) User—mg/L (calibration with a specified dissolved oxygen concentration (mg/L) solution) User—mg/L with 0 (calibration with a specified dissolved oxygen concentration (mg/L) solution with 0 point)
Standard Value	<p>When Calibration is set to mg/L or mg/L with 0, sets the concentration of the solution that will be used for calibration—2.00 to 20.00 mg/L (default=7.00 mg/L)</p>

5. Select Calibration Reminder and update the settings:

Option	Description
Reminder Repeat	Meter will make an audible sound when calibration is due and repeat the sound at selected interval—Off, 8 h, 12 h, 1 d, 2 d, 5 d or 7 d.
Expires	Calibration expires after the selected time—Immediately, Reminder + 30 min, Reminder + 1 h, Reminder + 2 h or Continue Reading. Note: <i>The meter cannot be used to read samples after calibration has expired unless Continue Reading is selected.</i>

6. If prompted, enter a name for the new method settings. Additional changes made to the settings of an existing method are automatically saved with the same method name.
7. Push **EXIT** until the meter goes back to the measurement mode.

Maintenance

Clean the probe

Keep the probe cap free of deposits for the best measurements.

Note: *Do not touch the black colored substrate of the probe cap. Do not use alcohol or other organic solvents to clean the black colored substrate of the probe cap. These solvents cause damage to the probe cap.*

1. Gently clean the probe cap with a mild detergent, water and a soft cloth or cotton swab. Do not remove the black colored substrate from the probe cap. Do not scrub the probe cap or lens. The stirrer does not need to be removed.

Replace the probe cap and iButton®

1. Remove the used probe cap (Figure 1 on page 2). Pull straight down on the rubber sides of the cap. Discard the used probe cap. Do not touch or soil the exposed, clear probe lens with oils from fingers.
Note: *If the probe lens is soiled, rinse with dilute isopropyl alcohol (10% or less) or deionized water and blot dry with a non-abrasive cloth. Do not wipe the lens or use abrasive cleaners.*
2. Push the new probe cap on the probe until the rubber seal is firmly against the probe cap. Make sure that the rubber seal is firmly seated.
Note: *Do not touch the black colored substrate of the probe cap. Do not use alcohol or other organic solvents to clean the black colored substrate of the probe cap. These solvents cause damage to the probe cap.*
3. Pull to open the iButton® cover on the pressure-sensor module (Figure 1 on page 2). Turn the module over to remove the iButton.
4. Put the new iButton in the sensor module with the label facing up.
5. Close the iButton cover and push down on it until the cover seats against the surface of the module housing. The cover must be closed completely to make sure that the electrical contact with the iButton is present and to make sure that the cap is sealed.

Storage

Store the probe in a BOD bottle partially filled ($\frac{1}{4}$ minimum) with water when not in use.

Troubleshooting

Message or symptom	Possible cause	Action
Probe not supported	Software not updated	To download the most current version of the software, refer to the applicable product page on the manufacturer's website. Refer to the HQd Series meter manual for specific instructions for the meter model.
	HQd meter does not support IntelliCAL [®] probe	Contact a Technical Support Representative.
Connect a probe or probe requires service	Probe not connected correctly	Disconnect, then connect the probe. Tighten the locking nut.
	Software not updated	To download the most current version of the software, refer to the applicable product page on the manufacturer's website. Refer to the HQd Series meter manual.
	Large number of methods stored on the probe	Continue to let the probe connect. Do not disconnect the probe.
	Damaged probe	Make sure there is connectivity with another probe or meter to confirm isolated issue with probe. Contact a Technical Support Representative.
Out of range	Probe cap loose, scratched or damaged	Reposition or replace the probe cap.
	Temperature and/or pressure sensor error	Make sure that the temperature and pressure sensors are both reading correctly. ¹
	Damaged probe	Make sure that the blue and red LEDs are both illuminated on the probe. If not, replace the probe or contact a Technical Support Representative.
	Sample outside of specifications	Make sure that the sample concentration, temperature and pressure are within the range of the probe.
	iButton number does not match probe cap lot number	Replace the iButton or probe cap or do a user calibration.
	Bubbles trapped under probe tip	Gently shake the probe until bubbles are removed.
Slope out of range	Probe not prepared for sample	Let the probe reach equilibrium in a water-saturated air environment and do the calibration again.
	Calibration method settings	Make sure that the calibration standards in the method are correct.
	Probe cap loose, scratched or damaged	Locate and install the iButton that matches the probe cap and replace the probe cap.
	Temperature and pressure errors	Make sure that the temperature and pressure sensors are both reading accurately. Contact a Technical Support Representative. ¹
	LED lights do not function	Contact a Technical Support Representative.
	Bubbles trapped under probe tip	Gently shake the probe until bubbles are removed.

Message or symptom	Possible cause	Action
Stirrer assembly not rotating	AC power is not connected	Connect AC power.
	Switch in OFF position	Push the ON/OFF switch and verify that the indicator light is illuminated.
	Bent stirrer assembly	Remove the bearing clip and change the location of the bearing position in the bearing pocket. If still noisy, replace the stirrer assembly.
Stirrer assembly noisy (> 70 dB Tested 1 inch from source in < 5 dB background)	Bent stirrer assembly	Remove the bearing clip and change the location of the bearing position in the bearing pocket. If still noisy, replace the stirrer assembly.
	Stirrer assembly contacting BOD container	Change the location of the stirrer assembly in the BOD bottle or replace the stirring assembly.
O2 Sensor 0 days remaining	There are 0 days remaining in the life of the probe cap	Replace the probe cap. Calibration will be allowed, however the calibration icon and question mark will be shown on the measurement screen even if the calibration has passed.
	Meter set to incorrect date and time	Disconnect the probe from the meter. Set the correct date and time in the Meter Options menu. Connect the probe and make sure that the message has been removed.
	Software not updated	Update the HQd software to the latest version and test again.
O2 Sensor ## of days remaining	There are 30 days or fewer remaining in the life of the probe cap.	Replace the probe cap soon.
Calibration failed: outside of acceptance criteria/Temperature out of range/Offset out of limits	Water Saturated air equilibration not reached	Allow longer equilibration time.
	Probe cap loose, scratched, or damaged	Change the location of the probe cap or replace the probe cap.
	Temperature and/or pressure sensor error	Make sure that the temperature and pressure sensors are both reading correctly and within range. ¹
	Damaged probe	Make sure that the blue and red LEDs are both illuminated on the probe. If not, replace the probe or contact a Technical Support Representative.

¹ The pressure as measured by the probe is what is referred to as atmospheric pressure and is not corrected to sea level. Weather station pressures are reported at sea level and commonly referred to as mean sea level pressure. As a result the probe will not read the same as most household or professional barometers or weather station reports (which are compensated) unless reported at sea level. In order to compare the pressure results obtained from the probe barometer and these compensated barometers, it is necessary to first compensate the pressure reported by the probes mathematically.

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