DOC023.52.03250

5740 sc Galvanic Membrane Dissolved Oxygen Sensor

User Manual

08/2016, Edition 2

Table of Contents

Section 1 Specifications

Specifications are subject to change without notice.

Components	Corrosion-resistant materials, fully-immersible probe with 10 m (30 ft) cable
Measuring Range (Dissolved Oxygen)	0 to 40 ppm (0 to 40 mg/L) or 200 % saturation
Measuring Range (Temperature)	– 5 to 50 °C (23–120 °F)
Probe Operating Temperature	– 5 to 50 °C (23–120 °F)
Probe Storage Temperature	– 5 to 70 °C (23–158 °F); 95 % relative humidity, non-condensing
Response Time at 20 °C	120 seconds to 90 % of value upon step change
Measurement Accuracy	± 2 % of span
Temperature Accuracy	± 0.2 °C
Temperature Compensator	30K NTC Thermistor
Repeatability	± 0.5 % of span
Sensitivity	± 0.5 % of span
Calibration	Air/Sample
Maximum Pressure	10 bar (145 psi)
Probe Cable Length	Integral 33 ft (10 m)
Probe Weight	0.26 kg (9.1 oz)
Probe Dimensions	See Figure 3 Probe Dimensions on page 8.
Wetted Materials	Noryl, PVC, Viton, Polypropylene, Nylon
Electrode Materials	Nickel-chrome and lead
Minimum Flow Rate	0.5 cm/s (0.016 ft/s)
Measuring Principle	Galvanic

Section 2 General Information

2.1 Safety Information

Please read this entire manual before unpacking, setting up, or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Do not use or install this equipment in any manner other than that specified in this manual.

2.1.1 Use of Hazard Information

DANGER
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.

Important Note: *Information that requires special emphasis.*

Note: *Information that supplements points in the main text.*

2.1.2 Precautionary Labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists.
	This symbol, if noted on the product, indicates the need for protective eye wear.
	This symbol, when noted on the product, identifies the location of the connection for Protective Earth (ground).
	This symbol, when noted on the product, identifies the location of a fuse or current limiting device.
	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 all electrical products (marked or unmarked) which are supplied or produced by Hach-Lange, please contact the local Hach-Lange sales office for instructions for proper disposal.*

2.2 General Sensor Information

The Galvanic Membrane Dissolved Oxygen Sensor allows aqueous samples to be easily and accurately analyzed for dissolved oxygen concentration. The system consists of a controller with an integrated display and a sensor for in-situ measurement.

Optional equipment, such as mounting hardware for the probe, is supplied with instructions for all user installation tasks. Several mounting options are available, allowing the probe to be adapted for use in many different applications.

Typical applications include aeration basins, nutrient removal in equalization basins, aerobic and anaerobic digesters, effluent streams, rivers, lakes, and fish ponds.

2.3 Theory of Operation

This galvanic oxygen sensor operates as a battery generating a voltage. The resulting voltage is directly proportional to the dissolved oxygen concentration. The cell is constructed with a fine wire coil cathode wrapped around a lead anode. A salt solution fills the void between the anode and cathode. The sensor is contained by a cylindrical membrane held in close proximity to the wire coil.

Oxygen from the solution to be tested enters the cell by diffusion through the membrane and then across the thin electrolyte layer to the cathode. The oxygen is reduced at the cathode as shown in reaction 1.

1. $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$

The cathode is at such a negative potential that it reduces all the oxygen that diffuses to its surface. The lead anode is oxidized to give an overall reaction that produces lead hydroxide as shown in reaction 2.

2. $2Pb + 4OH^- \rightarrow 2Pb(OH)_2 + 4e^-$

The overall result of this reaction is the consumption of the lead anode as current flows, yielding a very sensitive electrode that can detect changes at the microvolt level.

Section 3 Installation

DANGER
Only qualified personnel should conduct the installation tasks described in this section of the manual.

3.1 Connecting the Sensor to an sc Controller

3.1.1 Attaching a sc Sensor with a Quick-connect Fitting

The sensor cable is supplied with a keyed quick-connect fitting for easy attachment to the controller (Figure 1). Retain the connector cap to seal the connector opening in case the sensor must be removed. Optional extension cables may be purchased to extend the sensor cable length. If the total cable length exceeds 100 m (300 ft), a termination box must be installed.

Note: *Use of a load termination box other than Cat. No. 5867000 may result in a hazard.*

Figure 1 Attaching the Sensor using the Quick-connect Fitting

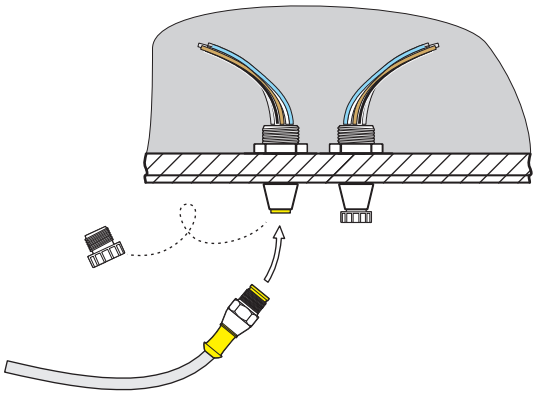
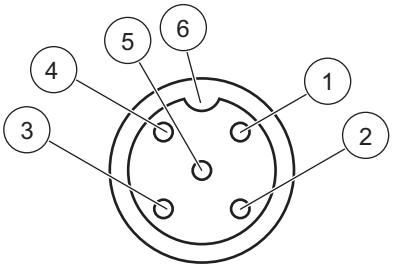


Figure 2 Quick-connect Fitting pin assignment



Number	Designation	Wire Color
1	+12 VDC	Brown
2	Circuit Common	Black
3	Data (+)	Blue
4	Data (–)	White
5	Shield	Shield (grey wire in existing quick-disconnect fitting)
6	Groove	

3.2 Installing the Sensor in the Sample Stream

Each sensor is supplied with a sensor lockring for use with flow tee installations. Replace the sensor protector with the lockring for those applications.

3.2.1 Sensor Installation Requirements

- Install the sensor so that the sample contacting it is representative of the entire process.
- Mount the sensor at least 500 mm (20 inches) from the aeration basin wall, and immerse it at least 500 mm (20 inches) into the process.
- Install the sensor so that its membrane will not be exposed to the atmosphere for more than 24 hours.
- Do not install the sensor directly over aerators or air diffusers when located in an aeration basin.
- Install the sensor near the outfall from an aeration basin for most effective aeration process monitoring and control.

Install the sensor using the instructions supplied with the installation apparatus.

See Figure 3 for sensor dimensions and Figure 4 for suggested mounting configurations.

Figure 3 Probe Dimensions

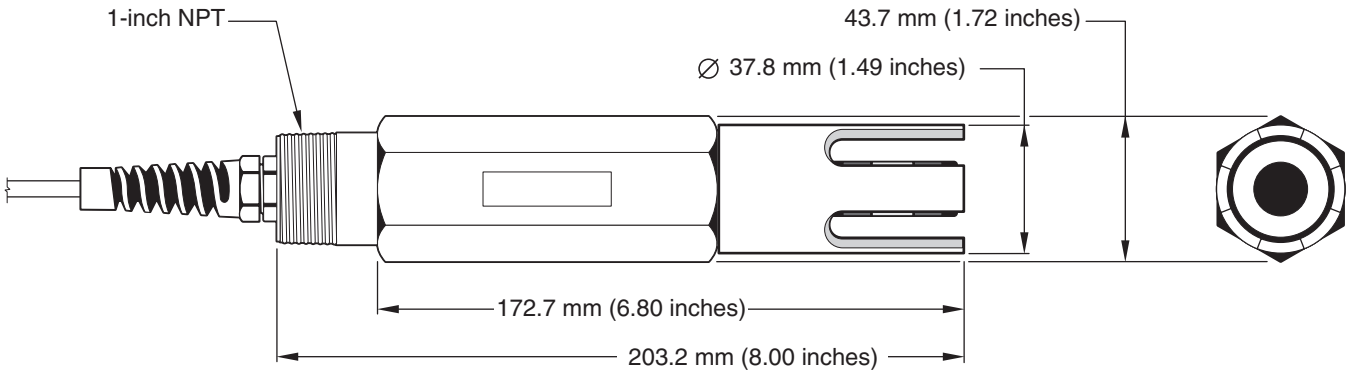
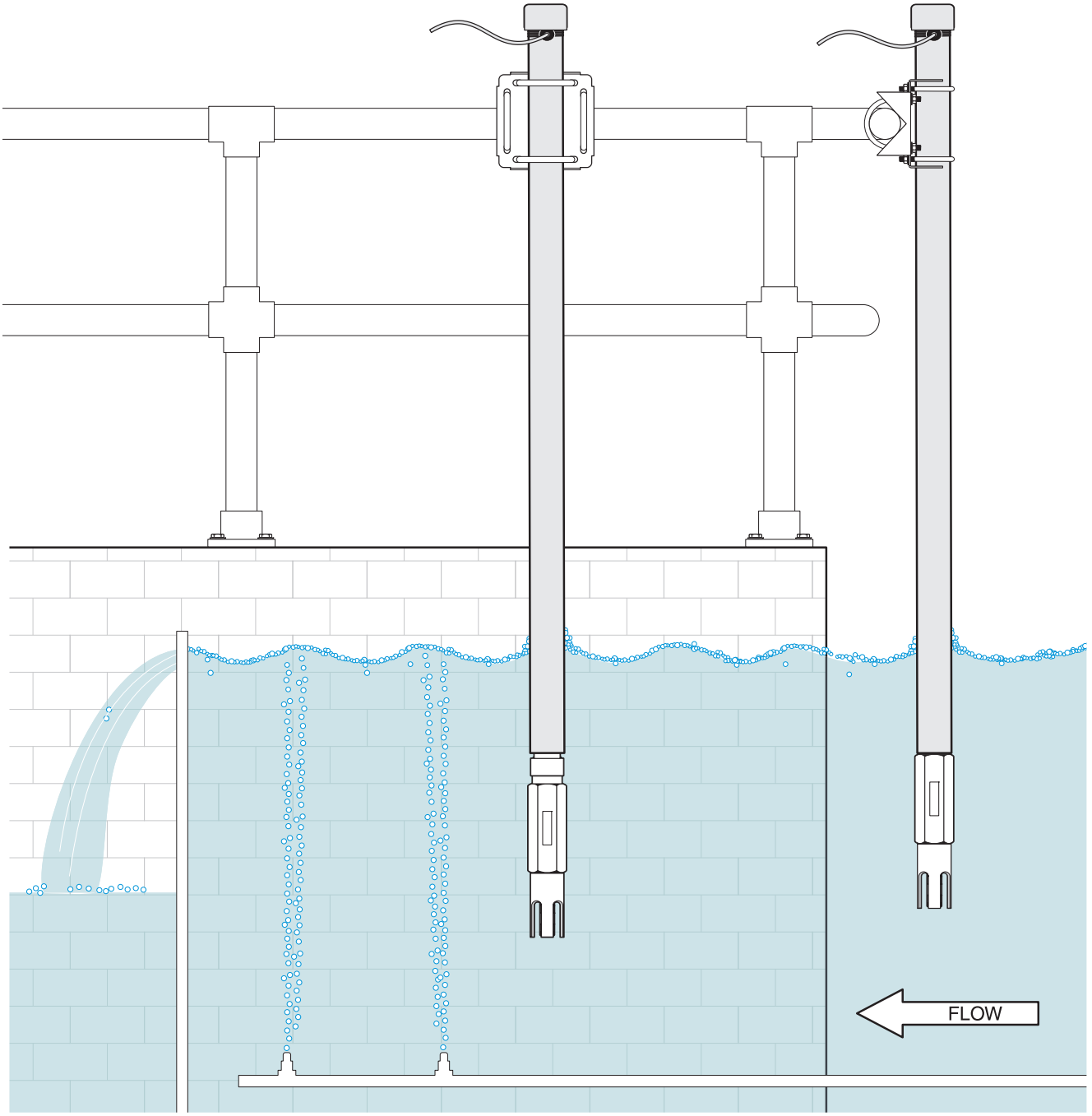


Figure 4 Sensor Installation Examples



Section 4 Operation

4.1 Using an sc Controller

Before using the sensor in combination with an sc controller make yourself familiar with the operating mode of the controller. Refer to the controller user manual and learn how to use and navigate the menu functions.

4.2 Sensor Setup

When a sensor is initially installed, the serial number of the sensor will be displayed as the sensor name. To change the sensor name refer to the following instructions:

1. Select the Main Menu.
2. From the Main Menu, select SENSOR SETUP and confirm.
3. Select the appropriate sensor if more than one sensor is attached and confirm.
4. Select CONFIGURE and confirm.
5. Select EDIT NAME and edit the name. Confirm or cancel to return to the Sensor Setup menu.

4.3 Sensor Data Logging

The sc controller provides one data log and one event log for each sensor. The data log stores the measurement data at selected intervals. The event log stores a variety of events that occur on the devices such as configuration changes, alarms, warning conditions, etc. The data log and the event log can be read out in a CSV format. For downloading the logs please refer to the controller user manual.

4.4 Pressure and Elevation

Note: *If the barometric pressure from Table1 is entered in the meter, the altitude entered in combination with this value must be 0 feet.*

Table 1 can be used to estimate the true barometric pressure at certain elevations. The correspondence is based on the assumption that at sea level the barometric pressure is 760 mm Hg. After determining the barometric pressure from the table or obtaining it from a local weather service, enter this value into the instrument.

Table 1 Elevation Barometric Pressure

Elevation in feet (m)	Barometric pressure in mm Hg (hPa)	Elevation in feet (m)	Barometric pressure in mm Hg (hPa)
0	760 (1013)	6000 (1829)	613 (817)
500 (152)	746 (995)	6500 (1981)	601 (801)
1000 (305)	733 (977)	7000 (2134)	590 (787)
1500 (457)	720 (960)	7500 (2286)	579 (772)
2000 (610)	708 (944)	8000 (2438)	568 (757)
2500 (762)	695 (927)	8500 (2591)	559 (745)
3000 (914)	683 (911)	9000 (2743)	548 (731)
3500 (1067)	671 (895)	9500 (2896)	538 (717)
4000 (1219)	659 (879)	10000 (3048)	527 (703)

Table 1 Elevation Barometric Pressure

Elevation in feet (m)	Barometric pressure in mm Hg (hPa)	Elevation in feet (m)	Barometric pressure in mm Hg (hPa)
4500 (1372)	647 (863)	10500 (3200)	517 (689)
5000 (1524)	635 (847)	11000 (3353)	506 (675)
5500 (1676)	624 (832)		

4.4.1 Selecting Atmospheric Pressure

1. Select the Main Menu.
2. From the Main Menu, select SENSOR SETUP and confirm.
3. Select the appropriate sensor if more than one sensor is attached and confirm.
4. Select CONFIGURE and confirm.
5. Select AIR PRESS/ALT UNITS and select the appropriate units from the list box. Confirm the selection.
6. Select AIR PRESS/ALT and tap on the dark-blue highlighted are to the far-right. Change the value and confirm the selection.

Note: *AirPress/Alt must be correct for proper measurement of % saturation and operation of air calibration.*

4.5 SENSOR STATUS Menu

SENSOR STATUS	Select Sensor (if more than one sensor is attached)
ERROR LIST	See section 6.1 on page 21.
WARNING LIS	See section 6.2 on page 21.

4.6 SENSOR SETUP Menu

SENSOR SETUP	Select Sensor (if more than one sensor is attached)
CALIBRATE	
AIR CAL	Perform an air calibration of the sensor (slope calibration). See section 4.7.1 on page 14.
SAMPLE CAL	Enter a value for the DO concentration as determined by another sensor or independent method. The instrument performs an offset calibration based on the entered value. See section 4.7.2 on page 15.
TEMP ADJUST	Displays the measured temperature and allows the user to adjust the temperature by ±15 °C.
DEFAULT SETUP	Restores the gain and offset values to 1.0 and 0.0, respectively, and restores the sensor code to default.

4.6 SENSOR SETUP Menu (continued)

SENSOR SETUP	Select Sensor (if more than one sensor is attached)
CONFIGURE	
EDIT NAME	Enter up to a 10-digit name in any combination of symbols and alpha or numeric characters.
MEAS UNITS	Select the appropriate measurement units to display. Choose from: mg/L, ppm, or percent. Default: ppm
TEMP UNITS	Select Celsius (°C) or Fahrenheit (°F); Default: °C
AC FREQUENCY	Choose 50 or 60 Hz depending on the power line frequency for optimal noise rejection. Default is 60 Hz.
FILTER	Specify the number of seconds for signal averaging (0–60). Default: 0 seconds.
PRESSURE UNITS	Choose pressure units in mmHg, feet, meters. Default: mmHg
SET PRESSURE	Enter either altitude or air pressure. Correlates to the pressure units setting. Range: –5000 to 15000. Default: 760 mmHg
SALINITY UNITS	Choose from mS/cm, mMol/L, ppt, or mg/L. Default: mS/cm
SET SALINITY	User-entered value. Default: 0.00 µS/cm
LOG SETUP	Disable or choose the datalogging interval for sensor and temperature measurements. Use the arrow keys to move through the available choices for each. Default: Disabled
TEMP ELEMENT	Choose SELECT TYPE to specify the temperature sensor that is integrated into the sensor or choose SET MANUAL to disable automatic temperature compensation. Default temperature sensor: NTC 30K
CAL DAYS	Shows the number of days since the last calibration. Default reminder at 60 days.
SENSOR DAYS	Shows the number of days the sensor has been in service. Automatically reminds the user to replace the sensor after a set period of time. Default reminder at 365 days. Reset counter in DIAG/TEST/RESET SENSOR menu.
DEFAULT SETUP	Resets the sensor software to default settings.
DIAG/TEST	
PROBE INFO	
SENSOR NAME	Displays the entered name of the sensor. Default is the sensor serial number.
SERIAL NUMBER	Serial number of the sensor.
SOFTWARE VERS	Displays the software version number.
DRIVER VERS	Displays the sensor driver version number.
CAL DATA	
CAL Q VALUE	Display for service diagnostics only.
OFFSET CORR	User editable—to change the calibration offset.
LAST CAL DATE	Shows the date of the last calibration. Default: 1-1-00
SIGNALS	
SENSOR SIGNAL	Displays the sensor output in mV.
SENSOR ADC COUNTS	Raw data for sensor ADC counts. Comparable to A/D counts.
TEMP ADC CNTS	Raw data for temperature ADC counts. Comparable to A/D counts.
COUNTERS	
SENSOR DAYS	Cumulative days the sensor has been in use.
RESET SENSOR	Resets sensor counter.

4.7 Calibration

The dissolved oxygen sensor has been calibrated at the factory to the specifications listed on Specifications on page 3. Due to the inherent accuracy and stability of the luminescent dissolved oxygen technology, sensor calibration is seldom or never necessary. The calibration procedures will result in an instrument offset or gain correction and may be performed if required by regulatory agencies. The air calibration is the most accurate method. The calibration by comparison method is the least accurate and is therefore not recommended.

For continued accuracy and repeatability, the manufacturer recommends replacing the sensor cap after one year of operation.

4.7.1 Calibration in Air

1. Remove the sensor from the process stream and wipe with a wet cloth to remove debris and biological growth.
2. Place the sensor in the supplied Calibration Bag, add a small amount of water (25–50 mL) and secure the bag to the sensor body.
3. Lay the bagged probe on a flat surface where it will not be exposed to a heat source.
4. Select the Main Menu.
5. From the Main Menu, select SENSOR SETUP and confirm.
6. Select the appropriate sensor if more than one is attached and confirm.
7. Select CALIBRATE and confirm.
8. Select AIR CAL.
9. Select the available Output Mode (Active, Hold, or Transfer) and confirm.
10. “MOVE THE SENSOR TO AIR” will be displayed if the sensor is moved to air (in the calibration bag).
11. The Air Calibration procedure will begin and “WAIT TO STABILIZE” will be displayed. The current DO and temperature readings will be displayed. Confirm to continue.
12. The calibration will automatically occur when the reading stabilizes or when Confirmation is selected to base the calibration on the currently displayed value. Two to three minutes for the reading to stabilize is typical, however, if it has not stabilized after 45 minutes, the display will ready “UNABLE TO CALIBRATE”. After calibration, one of the responses in Table 2 Calibration Response on page 17 will be displayed.
13. Follow the prompts to return the sensor to the process.

4.7.2 Sample Cal—Calibration by Comparison to a Winkler Titration

1. Select the Main Menu.
2. From the Main Menu, select SENSOR SETUP and confirm.
3. Select the appropriate sensor if more than one is attached and confirm.
4. Select CALIBRATE and confirm.
5. Select SAMPLE CAL an confirm.
6. Select the available Output Mode (Active, Hold, or Transfer) and confirm.

Note: *An output that has been placed in Hold or Transfer status will be automatically released when the calibration is complete.*

7. Remove the sensor from the process stream and gently wipe with a wet cloth to remove all debris and biological growth. Remaining debris will affect the Winkler Method of analysis.
8. Measure 1000 mL of deionized water. Allow the water to come to the thermal and dissolved oxygen equilibrium (approximately 20 minutes).
9. Fill a standard BOD bottle and then place the sensor in a beaker containing the remainder of the deionized water.
10. Perform the Winkler Tritration using Cat. No. 1469-00 Winkler Test Kit on the deionized water in the BOD bottle while waiting for the process sensor to stabilize.
11. Move the sensor to the sample.
12. The display will show “PRESS ENTER WHEN STABILIZED” and the current DO and temperature readings. After confirmation or when the reading has been accepted as stable, the display will change to an entry screen. Without confirmation, the sensor will determine when the reading is stable. Two to three minutes for the reading to stabilize is typical, however, if it has not stabilized after 45 minutes, the display will show “UNABLE TO CALIBRATE”.
13. When a stable reading has been accepted, the display will show “SAMPLE CAL” and an area for entry of the value obtained from the comparison method. When the entry screen is displayed, enter the value from the hand-held or winkler titration and confirm.
14. After calibration, one of the responses in Table 2 on page 17 will be displayed.

4.7.3 Sample Cal—Calibration by Comparison to a Hand-held DO Analyzer

1. Place the dissolved oxygen sensor as close to the DO sensor as possible.
2. Wait for the hand-held DO analyzer to stabilize.
3. Select the Main Menu.
4. From the Main Menu, select SENSOR SETUP and confirm.
5. Select the appropriate sensor if more than one is attached and confirm.
6. Select CALIBRATE and confirm
7. Select SAMPLE CAL.
8. Select the available Output Mode (Active, Hold, or Transfer) from the list box and confirm.
9. The display will show “PRESS ENTER WHEN STABILIZED” and the current DO and temperature readings. After confirmation or when the reading has been accepted as stable, the display will change to an entry screen. Without confirmation, the sensor will determine when the reading is stable. Two to three minutes for the reading to stabilize is typical, however, if it has not stabilized after 45 minutes, the display will show “UNABLE TO CALIBRATE”.
10. When a stable reading has been accepted, the display will show “SAMPLE CAL” and an area for entry of the value obtained from the Winkler Titration.
11. Change the displayed reading to match the hand-held DO analyzer memory.
12. After calibration, one of the responses in Table 2 on page 17 will be displayed.

4.7.4 Concurrent Calibration of Two Sensors

1. Begin a calibration on the first sensor and proceed when “WAIT TO STABILIZE” is displayed.
2. Select the BACK button, then LEAVE. The display will return to the Main Measurement screen.
3. Begin the calibration for the second sensor and continue until “WAIT TO STABILIZE” is displayed.
4. Select the BACK button, then LEAVE. The display will return to the Main Measurement screen and the reading for both sensors will be flashing.
5. To return to the calibration of either sensor, select the Main Menu button. Select SENSOR SETUP and confirm. Select the appropriate sensor and confirm.
6. The calibration in progress will be displayed. Continue with the calibration.

Table 2 Calibration Response

Calibration Response	Explanation
CAL COMPLETE	Indicates the Calibration is complete.
CAL FAIL, OFFSET HIGH	Indicates the air calibration has failed due to an excessively high calculated gain value. Repeat the calibration.
CAL FAIL, OFFSET LOW	Indicates the air calibration has failed due to too low of a calculated gain value. Repeat the calibration.
CAL FAIL, UNSTABLE	Indicates the air calibration has failed because the readings did not stabilize during the maximum allowed calibration time interval. Repeat the calibration.
UNABLE TO CALIBRATE	Indicates the Calibration has failed.

Section 5 Maintenance

DANGER
Only qualified personnel should conduct the tasks described in this section of the manual.

5.1 Maintenance Schedule

Maintenance Task	90 days	120 days	365 days
Clean the sensor[1]	**x**		
Inspect sensor for damage	**x**		
Replace sensor			**x**
Replace sensor O-rings		**x**	
Calibrate Sensor (as required by regulatory agency)	**Per the schedule mandated by your regulatory agency.**		

[1] Cleaning frequency is application dependent. More or less frequent cleaning will be appropriate in some applications.

5.2 Cleaning the Sensor

Clean the exterior of the sensor with a stream of water. If debris remains, wipe with a soft, wet cloth.

5.2.1 Cleaning the Galvanic Sensor

Clean the sensor membrane before each calibration to ensure best results. Clean and calibrate monthly or until operating experience determines appropriate intervals.

Using a soft wet cloth and mild soap solution, remove all debris from the membrane surface. Rinse thoroughly with distilled water.

Note: *While cleaning the sensor membrane, be careful not to puncture it.*

5.3 Preventing the Sensor Membrane from Drying Out

When the sensor is removed from the process solution, its membrane immediately begins drying out. After more than 24 hours, the electrolyte behind the membrane may become depleted due to evaporation. If the sensor is returned to operation after this has occurred, measurement readings may be inaccurate.

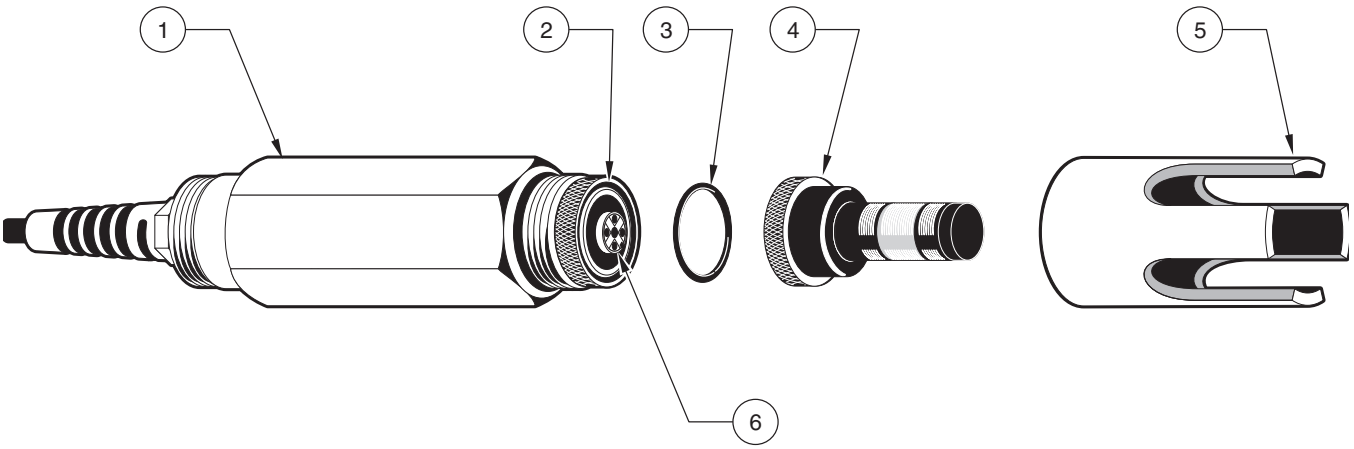
Membrane dry-out and electrolyte evaporation can be avoided by temporarily placing the sensor in a container of clean drinking water until it can be put back into operation.

5.4 Replacing the Sensor Assembly

The sensor assembly consists of a pre-installed membrane, electrolyte, and electrode.

1. Unscrew the sensor guard or optional lock ring and remove the spent or damaged sensor assembly.
2. Install the o-ring onto the groove in the probe body, see item 2 and 3 in Figure 5.
3. Align the sensor assembly connector with the probe body socket, see item 6 in Figure 5.
4. Reinstall the sensor guard or lock ring.
5. Condition the new sensor before taking measurements. See 4.2 Sensor Setup on page 11.

Figure 5 Replacing the Sensor Assembly



1.	Probe Body	**4.**	Sensor Assembly
2.	Item 3 seats in groove.	**5.**	Sensor Guard (if sensor guard is not used, install the optional lock ring)
3.	O-ring, (Cat. No. 1857100)	**6.**	Check for connector orientation during assembly.

Section 6 Troubleshooting

6.1 Error Codes

When a sensor is experiencing an error condition, the sensor reading on the measurement screen will flash and all relays and analog outputs associated with this sensor will be held. The following conditions will cause the sensor reading to flash:

- Sensor calibration
- Relay timer washing cycle
- Loss of communication

Select the SENSOR STATUS menu and confirm. Select ERRORS and confirm to determine the cause of the error. Errors are defined in Table 3.

Table 3 Error Codes

Displayed Error	Definition	Resolution
ADC FAILURE	A/D conversion fails.	Call the Service Department.
SENSOR PUNC	Sensor punctured.	Replace sensor cartridge.[1]

[1] Replacement of the cartridge will reset the read out.

6.2 Warnings

A sensor warning will leave all menus, relays, and outputs functioning normally, but will cause a warning icon to flash on the right side of the display. Select WARNINGS and confirm to determine the cause of the warning.

A warning may be used to trigger a relay and users can set warning levels to define the severity of the warning.Warnings are defined in Table 4.

Table 4 Warning Codes

Displayed Warning	Definition	Resolution
PROBE OUT RANGE	No probe connected or measurement reading is out of range.	Check the DO range and ensure that it is within 0–40 ppm.
TEMP OUT RANGE	No temperature element connected or temperature reading is out of range.	Check the temperature range and ensure that it is within –20 °C to 200 °C.
FLASH FAILURE	Cannot write flash memory.	Call the Service Department.
CAL REQUIRED	Past the calibration days since last calibration date.	Calibrate the sensor.
REPLACE SENSOR	Past the total days of current sensor in use.	Install new sensor.

6.3 Sensor Troubleshooting

Table 5 Sensor Troubleshooting

Problem	Cause	Resolution
Sensor reading remains at 0 or max. value for 24 hours or more	Membrane is punctured	Compare reading to measurement obtained by a hand-held DO sensor. If different, Replace sensor cartridge. Call Customer Service.
Cannot calibrate the sensor	Sensor module or sensor membrane is bad.	Replace sensor cartridge. Recalibrate the sensor. Call Customer Service.

Section 7 Replacement Parts

7.1 Replacement Items

Description	QTY	Catalog Number
5740 sc Galvanic Membrane Dissolved Oxygen Sensor	1	5740D0B
Calibration bags		276M1210
Instruction manual, DO System, English	1	DOC023.52.03250
O-ring, DO probe (0.070 x 0.926 ID)	1	1857100
Sensor Cartridge, replacement, galvanic membrane DO w/thermistor	1	6126700

7.2 Accessories

Description	QTY	Catalog Number
Air blast cleaning head for 5740 sc galvanic membrane dissolved oxygen sensor	1	6130500
Air blast cleaning system, 115 V, does not include head, order separately	1	6136100
Air blast cleaning system, 230 V, does not include head, order separately	1	6136200
Cable, sensor extension, 0,35 m	1	LZX847
Cable, sensor extension, 5 m	1	LZX848
Cable, sensor extension, 10 m	1	LZX849
Cable, sensor extension, 15 m	1	LZX850
Cable, sensor extension, 20 m	1	LZX851
Cable, sensor extension, 30 m	1	LZX852
Cable, sensor extension, 50 m	1	LZX853
Electrolyte Solution (60 mL bottle)	1	25M7A1002-105
Technical Data, Tank Rim Mount LZX914.99.xxxxx	1	DOC053.99.03262
Mounting hardware kit, pipe	1	5794400
Mounting hardware kit, ball float	1	5794300
Plug, sealing, conduit opening	1	5868700
Strain relief, Heyco	1	16664
Termination Box	1	5867000
Winkler titration kit	1	146900

Section 8 Warranty, liability and complaints

HACH LANGE GmbH warrants that the product supplied is free of material and manufacturing defects and undertakes the obligation to repair or replace any defective parts at zero cost.

The warranty period for instruments is 24 months. If a service contract is taken out within 6 months of purchase, the warranty period is extended to 60 months.

With the exclusion of the further claims, the supplier is liable for defects including the lack of assured properties as follows: all those parts that can be demonstrated to have become unusable or that can only be used with significant limitations due to a situation present prior to the transfer of risk, in particular due to incorrect design, poor materials or inadequate finish will be improved or replaced, at the supplier's discretion. The identification of such defects must be notified to the supplier in writing without delay, however at the latest 7 days after the identification of the fault. If the customer fails to notify the supplier, the product is considered approved despite the defect. Further liability for any direct or indirect damages is not accepted.

If instrument-specific maintenance and servicing work defined by the supplier is to be performed within the warranty period by the customer (maintenance) or by the supplier (servicing) and these requirements are not met, claims for damages due to the failure to comply with the requirements are rendered void.

Any further claims, in particular claims for consequential damages cannot be made.

Consumables and damage caused by improper handling, poor installation or incorrect use are excluded from this clause.

HACH LANGE GmbH process instruments are of proven reliability in many applications and are therefore often used in automatic control loops to provide the most economical possible operation of the related process.

To avoid or limit consequential damage, it is therefore recommended to design the control loop such that a malfunction in an instrument results in an automatic change over to the backup control system; this is the safest operating state for the environment and the process.

8.1 Compliance Information

Hach LANGE GmbH certifies this instrument was tested thoroughly, inspected and found to meet its published specifications when it was shipped from the factory.

The **Galvanic Membrane Dissolved Oxygen Probe with the sc100 and sc1000** has been tested and is certified as indicated to the following instrumentation standards:

Product Safety

UL 61010A-1 (ETL Listing # 65454)
CSA C22.2 No. 1010.1 (ETLc Certification # 65454)
Certified by Hach Co. to EN 61010-1 Amds. 1 & 2 (IEC1010-1) per 73/23/EEC, supporting test records by Intertek Testing Services.

Immunity

This equipment was tested for industrial level EMC per:

EN 61326 (EMC Requirements for Electrical Equipment for Measurement, Control and Laboratory Use) **per 89/336/EEC EMC:** Supporting test records by Hach Company, certified compliance by Hach Company.

Standards include:

IEC 1000-4-2:1995 (EN 61000-4-2:1995) Electrostatic Discharge Immunity (Criteria B)
IEC 1000-4-3:1995 (EN 61000-4-3:1996) Radiated RF Electromagnetic Field Immunity (Criteria A)
IEC 1000-4-4:1995 (EN 61000-4-4:1995) Electrical Fast Transients/Burst (Criteria B)
IEC 1000-4-5:1995 (EN 61000-4-5:1995) Surge (Criteria B)
IEC 1000-4-6:1996 (EN 61000-4-6:1996) Conducted Disturbances Induced by RF Fields (Criteria A)
IEC 1000-4-11:1994 (EN 61000-4-11:1994) Voltage Dip/Short Interruptions (Criteria B)

Additional Immunity Standard/s include:

ENV 50204:1996 Radiated Electromagnetic Field from Digital Telephones (Criteria A)

Emissions

This equipment was tested for Radio Frequency Emissions as follows:

Per **89/336/EEC** EMC: **EN 61326:1998** (Electrical Equipment for measurement, control and laboratory use—EMC requirements) Class “A” emission limits. Supporting test records by Hewlett Packard, Fort Collins, Colorado Hardware Test Center (A2LA # 0905-01) and certified compliance by Hach Company.

Standards include:

EN 61000-3-2 Harmonic Disturbances Caused by Electrical Equipment
EN 61000-3-3 Voltage Fluctuation (Flicker) Disturbances Caused by Electrical Equipment

Additional Emissions Standard/s include:

EN 55011 (CISPR 11), Class “A” emission limits

Section 9 Adresses

HACH Company
World Headquarters
P.O. Box 389
Loveland, Colorado
80539-0389 U.S.A.
Tel (800) 227-HACH
(800) -227-4224
(U.S.A. only)
Fax (970) 669-2932
orders@hach.com
www.hach.com

Repair Service in the United States:
HACH Company
Ames Service
100 Dayton Avenue
Ames, Iowa 50010
Tel (800) 227-4224
(U.S.A. only)
Fax (515) 232-3835

Repair Service in Canada:
Hach Sales & Service
Canada Ltd.
1313 Border Street, Unit 34
Winnipeg, Manitoba
R3H 0X4
Tel (800) 665-7635
(Canada only)
Tel (204) 632-5598
Fax (204) 694-5134
canada@hach.com

Repair Service in Latin America, the Caribbean, the Far East, Indian Subcontinent, Africa, Europe, or the Middle East:
Hach Company World Headquarters,
P.O. Box 389
Loveland, Colorado,
80539-0389 U.S.A.
Tel +001 (970) 669-3050
Fax +001 (970) 669-2932
intl@hach.com

HACH LANGE GMBH
Willstätterstraße 11
D-40549 Düsseldorf
Tel. +49 (0)2 11 52 88-320
Fax +49 (0)2 11 52 88-210
info@hach-lange.de
www.hach-lange.de

HACH LANGE LTD
Pacific Way
Salford
GB-Manchester, M50 1DL
Tel. +44 (0)161 872 14 87
Fax +44 (0)161 848 73 24
info@hach-lange.co.uk
www.hach-lange.co.uk

HACH LANGE LTD
Unit 1, Chestnut Road
Western Industrial Estate
IRL-Dublin 12
Tel. +353(0)1 460 2522
Fax +353(0)1 450 9337
info@hach-lange.ie
www.hach-lange.ie

HACH LANGE GMBH
Hütteldorfer Str. 299/Top 6
A-1140 Wien
Tel. +43 (0)1 912 16 92
Fax +43 (0)1 912 16 92-99
info@hach-lange.at
www.hach-lange.at

HACH LANGE GMBH
Rorschacherstrasse 30a
CH-9424 Rheineck
Tel. +41 (0)848 55 66 99
Fax +41 (0)71 886 91 66
info@hach-lange.ch
www.hach-lange.ch

HACH LANGE FRANCE S.A.S.
8, mail Barthélémy Thimonnier
Lognes
F-77437 Marne-La-Vallée
cedex 2
Tél. +33 (0) 820 20 14 14
Fax +33 (0)1 69 67 34 99
info@hach-lange.fr
www.hach-lange.fr

HACH LANGE NV/SA
Motstraat 54
B-2800 Mechelen
Tel. +32 (0)15 42 35 00
Fax +32 (0)15 41 61 20
info@hach-lange.be
www.hach-lange.be

DR. LANGE NEDERLAND B.V.
Laan van Westroijen 2a
NL-4003 AZ Tiel
Tel. +31(0)344 63 11 30
Fax +31(0)344 63 11 50
info@hach-lange.nl
www.hach-lange.nl

HACH LANGE APS
Åkandevej 21
DK-2700 Brønshøj
Tel. +45 36 77 29 11
Fax +45 36 77 49 11
info@hach-lange.dk
www.hach-lange.dk

HACH LANGE AB
Vinthundsvägen 159A
SE-128 62 Sköndal
Tel. +46 (0)8 7 98 05 00
Fax +46 (0)8 7 98 05 30
info@hach-lange.se
www.hach-lange.se

HACH LANGE S.R.L.
Via Rossini, 1/A
I-20020 Lainate (MI)
Tel. +39 02 93 575 400
Fax +39 02 93 575 401
info@hach-lange.it
www.hach-lange.it

HACH LANGE SPAIN S.L.U.
Edificio Seminario
C/Larrauri, 1C- 2ª Pl.
E-48160 Derio/Bizkaia
Tel. +34 94 657 33 88
Fax +34 94 657 33 97
info@hach-lange.es
www.hach-lange.es

HACH LANGE LDA
Av. do Forte nº8
Fracção M
P-2790-072 Carnaxide
Tel. +351 214 253 420
Fax +351 214 253 429
info@hach-lange.pt
www.hach-lange.pt

HACH LANGE SP. ZO.O.
ul. Krakowska 119
PL-50-428 Wrocław
Tel. +48 71 717 77 77
Fax +48 71 717 77 78
info@hach-lange.pl
www.hach-lange.pl

HACH LANGE S.R.O.
Zastrčená 1278/8
CZ-141 00 Praha 4 - Chodov
Tel. +420 272 12 45 45
Fax +420 272 12 45 46
info@hach-lange.cz
www.hach-lange.cz

HACH LANGE S.R.O.
Roľnícka 21
SK-831 07 Bratislava – Vajnory
Tel. +421 (0)2 4820 9091
Fax +421 (0)2 4820 9093
info@hach-lange.sk
www.hach-lange.sk

HACH LANGE KFT.
Vöröskereszt utca. 8-10.
H-1222 Budapest XXII. ker.
Tel. +36 1 225 7783
Fax +36 1 225 7784
info@hach-lange.hu
www.hach-lange.hu

HACH LANGE S.R.L.
Str. Căminului nr. 3,
et. 1, ap. 1, Sector 2
RO-021741 Bucureşti
Tel. +40 (0) 21 205 30 03
Fax +40 (0) 21 205 30 17
info@hach-lange.ro
www.hach-lange.ro

HACH LANGE
8, Kr. Sarafov str.
BG-1164 Sofia
Tel. +359 (0)2 963 44 54
Fax +359 (0)2 866 15 26
info@hach-lange.bg
www.hach-lange.bg

HACH LANGE SU ANALİZ SİSTEMLERİ LTD.ŞTİ.
Ilkbahar mah. Galip Erdem
Cad. 616 Sok. No:9
TR-Oran-Çankaya/ANKARA
Tel. +90312 490 83 00
Fax +90312 491 99 03
bilgi@hach-lange.com.tr
www.hach-lange.com.tr

HACH LANGE D.O.O.
Fajfarjeva 15
SI-1230 Domžale
Tel. +386 (0)59 051 000
Fax +386 (0)59 051 010
info@hach-lange.si
www.hach-lange.si

HACH LANGE E.Π.E.
Ηρακλείτου 3
GR-15235 Χαλάνδρι
Τηλ. +30 210 7777038
Fax +30 210 7777976
info@hach-lange.gr
www.hach-lange.gr

HACH LANGE D.O.O.
Ivana Severa bb
HR-42 000 Varaždin
Tel. +385 (0) 42 305 086
Fax +385 (0) 42 305 087
info@hach-lange.hr
www.hach-lange.hr

HACH LANGE MAROC SARLAU
Villa 14 – Rue 2 Casa Plaisance
Quartier Racine Extension
MA-Casablanca 20000
Tél. +212 (0)522 97 95 75
Fax +212 (0)522 36 89 34
info-maroc@hach-lange.com
www.hach-lange.ma

ООО «ХАХ ЛАНГЕ»
Бизнес-центр
«Петровский форт»
194044, Санкт-Петербург,
Финляндский пр., д. 4А,
оф. 803
Тел. +7 (812) 458 56 00
Факс. +7 (812) 458 56 00
info.russia@hach-lange.com
ru.hach-lange.com

Appendix A Modbus Register Information

Table 6 Sensor Modbus Registers

Group Name	Tag Name	Register #	Data Type	Length	R/W	Description
Tags	SensorMeasTag	40001	Integer	1	R	Sensor Measurement Tag
Measurements	DOMeas	40002	Float	2	R	DO Measurement
Tags	TempMeasTag	40004	Integer	1	R	Temperature Measurement Tag
Measurements	TempDegCMeas	40005	Float	2	R	Temperature Measurement
Configuration	SensorName	40007	String	6	R/W	Sensor Name
Tags	FuncCode	40013	Integer	1	R/W	Function Code tag
Tags	NextState	40014	Integer	1	R/W	Next State Tag
Configuration	TempUnits	40015	Integer	1	R/W	Temperature Units—C or F
Configuration	Filter	40016	Integer	1	R/W	Sensor Filter
Configuration	TempElementType	40017	Integer	1	R/W	Temperature Element Type
Tags	TempUserValueTag	40018	Integer	1	R	Temperature User Value Tag
Configuration	TempUserDegCValue	40019	Float	2	R/W	Temperature User Value
Configuration	PressureUnits	40021	Integer	1	R/W	Pressure Units
Configuration	SalinityUnits	40022	Integer	1	R/W	Salinity Units
Tags	PressureTag	40023	Integer	1	R	Pressure Tag
Configuration	Pressure	40024	Float	2	R/W	Pressure
Tags	SalinityTag	40026	Integer	1	R	Salinity Units
Configuration	Salinity	40027	Float	2	R/W	Salinity
Configuration	MeasUnits	40029	Integer	1	R/W	Measurement Units
Calibration	OutputMode	40030	Integer	1	R/W	Output Mode
Calibration	CalLeave	40031	Integer	1	R/W	Cal Leave Mode
Calibration	CalAbort	40032	Integer	1	R/W	Cal Abort Mode
Tags	CalEditValueTag	40033	Integer	1	R	Cal Edit Value Tag
Calibration	CalEditDOValue	40034	Float	2	R/W	Cal Edit Value
Diagnostics	SoftwareVersion	40036	String	6	R	Software Version
Diagnostics	SerialNumber	40042	String	6	R	Serial Number
Diagnostics	CalQValue	40048	Float	2	R	DO Cal Q Value
Calibration	CalCode	40050	Integer	1	R	Cal Code
Configuration	SensorLogInterval	40051	Integer	1	R/W	Sensor Data Log Interval
Configuration	TempLogInterval	40052	Integer	1	R/W	Temperature Data Log Interval
Diagnostics	DOmV	40053	Float	2	R	DO mV
Diagnostics	ProdDate	40055	Date	2	R/W	Production Date
Diagnostics	LastCalDate	40057	Date	2	R	Last Calibration Date
Diagnostics	SensorDays	40059	Integer	1	R	Sensor Run\ning Days
Configuration	RejectFrequency	40060	Integer	1	R/W	Reject Frequency
Diagnostics	DeviceDriver	40061	String	5	R	Device Driver
Configuration	CalWarningDays	40066	Integer	1	R/W	Calibration Warning Days
Configuration	SensorWarningDays	40067	Integer	1	R/W	Sensor Warning Days

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