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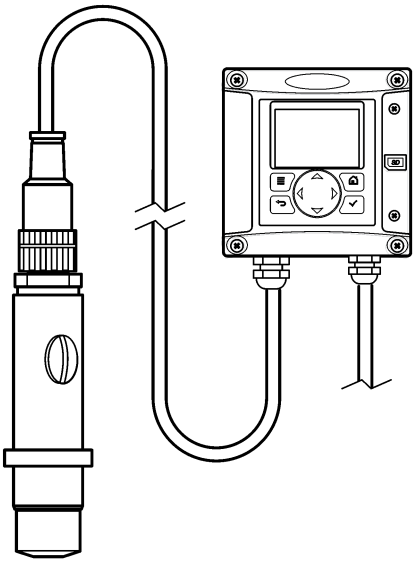
Polymetron 9582 Dissolved Oxygen

02/2020, Edition 5

User Manual



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Section 1 Expanded manual version

For additional information, refer to the expanded version of this manual, which is available on the manufacturer's website.

Section 2 Specifications

Specifications are subject to change without notice.

Sensor

Specification	Details
Sensor body	Noryl
Sensor body with optional immersion	Stainless steel 316L
Dimensions	144 x 144 x 181 mm (5.7 x 5.7 x 7.1 in.)
Weight	1.7 kg (3.75 lb)
Electrode	Cathode: gold; Anode: silver
Membrane	PFA
Membrane holder	Noryl
Sample flow rate	4—10 liters/hour
Sample temperature	-20—60 °C (-4—120 °F)
Sample pressure	Atmospheric pressure
Relative humidity	0—90%
Certifications	EN 61326-1: 2006; EN 61010-1: 2010

Sensor module

Specification	Details
Measuring range	0—2 ppm
Sensitivity	< 0.5 ppb
Repeatability	± 0.5 ppb or ± 2% of measurement whichever is the greater
Detection limit	≤ 1 ppb
Response time	1—40 ppb: < 30 seconds
Sample temperature measurement range	0—45 °C (32—113 °F)

Section 3 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.

3.1 Safety information

NOTICE

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

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.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

3.1.1 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.

3.1.2 Precautionary labels

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

	This is the safety alert symbol. Obey all safety messages that follow this symbol to avoid potential injury. If on the instrument, refer to the instruction manual for operation or safety information.
	This symbol indicates that a risk of electrical shock and/or electrocution exists.
	This symbol indicates the presence of devices sensitive to Electro-static Discharge (ESD) and indicates that care must be taken to prevent damage with the equipment.
	This symbol, when noted on a product, indicates the instrument is connected to alternate current.
	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems. Return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

	Products marked with this symbol indicates that the product contains toxic or hazardous substances or elements. The number inside the symbol indicates the environmental protection use period in years.
	Products marked with this symbol indicates that the product conforms to relevant South Korean EMC standards.

3.1.3 EMC compliance statement (Korea)

Type of equipment	Additional information
A 급 기기 (업무용 방송통신기자재)	이 기기는 업무용 (A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.
Class A equipment (Industrial Broadcasting and Communication Equipment)	This equipment meets Industrial (Class A) EMC requirements. This equipment is for use in industrial environments only.

3.2 Product overview

This single-channel analyzer is used for the measurement of dissolved oxygen in boiler feedwaters, economizers, condensers and in general all thermal equipment using water as a heat transfer liquid.

3.3 Product components

Make sure that all components have been received. If any items are missing or damaged, contact the manufacturer or a sales representative immediately.

Components:

- Controller (contains instructions for controller installation and operation)
- Sensor (contains instructions for sensor installation and operation)
- Sensor cable
- Flow chamber
- Sensor maintenance kit (contains membranes and electrolyte)

Section 4 Installation

⚠ CAUTION	
	Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

4.1 Installation guidelines

- Put the instrument in a location that has access for operation, service and calibration.
- Make sure that there is good view of the display and controls.
- Keep the instrument away from a heat source.
- Keep the instrument away from vibrations.
- Keep the sample tubing as short as possible to minimize the response time.
- Make sure that there is no air in the sample supply line.

4.2 Assemble the sensor

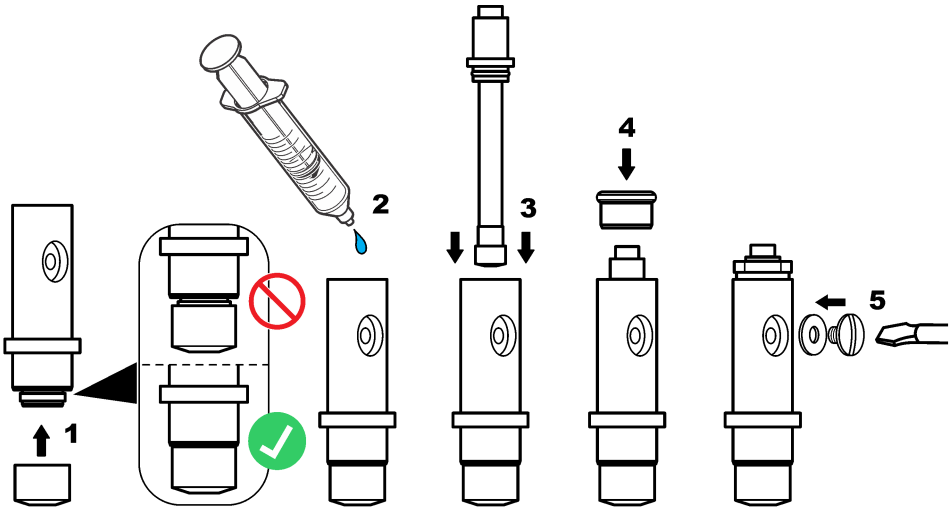
⚠ CAUTION

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.

Electrolyte must be added to the sensor before use. Refer to the steps that follow and Figure 1.

1. Install the membrane on the sensor body by hand as far as it will go.
2. Use the syringe to add 5 mL of electrolyte to the sensor body. Make sure that there are no impurities or bubbles in the electrolyte.
3. Gently push the electrode into the sensor body until there is resistance. Do not force the electrode.
4. Install and tighten the holding nut by hand.
5. Install the gasket and filling screw to prevent electrolyte leakage or external contamination from the sample. Carefully tighten the screw with a screwdriver without using excessive force.

Figure 1 Sensor assembly



4.3 Install the sensor in the process

NOTICE

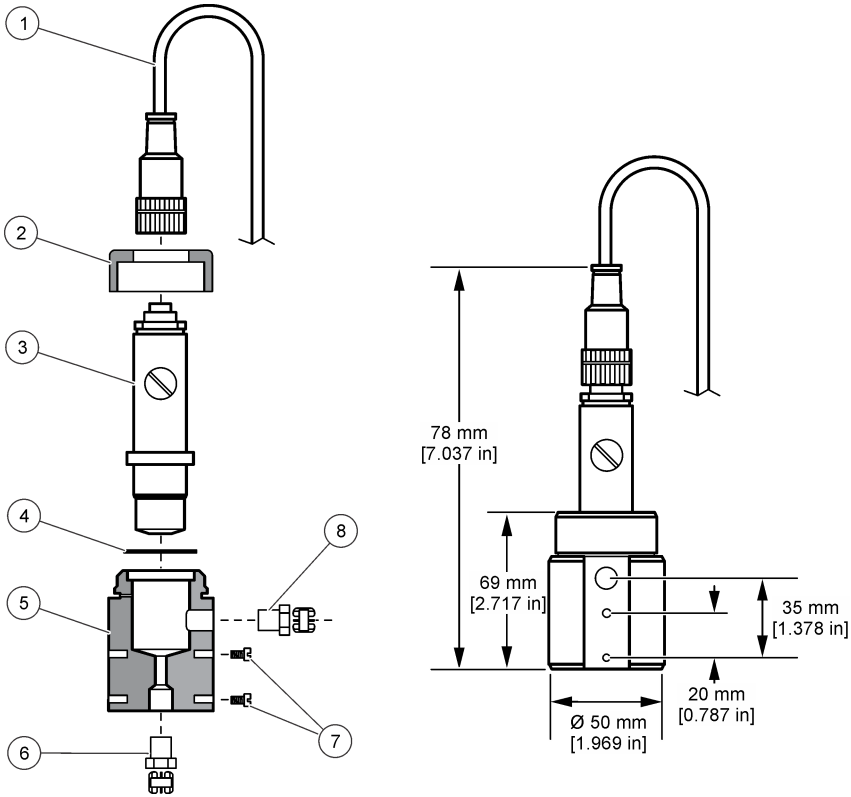
Keep the sensor in a vertical position with the membrane down during mounting and removal. Do not shake the sensor so that oxygen does not contaminate the electrolyte.

Refer to the steps that follow and Figure 2 to mount the sensor in the flow chamber.

1. Connect the sensor cable to the sensor and tighten the connector by hand. Do not turn the cable or the sensor.
2. Put the sensor into the flow chamber and tighten the sensor clamping nut by hand.

3. Connect the sample line to the sample input connector.
4. Connect the sample output to the sample output connector.

Figure 2 Sensor mounting



1 Sensor cable connector	**5** Flow chamber
2 Sensor clamping nut	**6** 1/4" NPT sample input connector (not provided)
3 Assembled sensor	**7** M4 screws (not provided)
4 Gasket	**8** 1/4" NPT sample output connector (not provided)

4.4 Install the controller

Refer to the controller documentation to see mounting and wiring instructions for external controllers.

4.5 Connect the sensor to the controller

⚠ WARNING

Potential Electrocution Hazard. Always disconnect power to the instrument when making electrical connections.

⚠WARNING

Electrocution Hazard. High voltage wiring for the controller is conducted behind the high voltage barrier in the controller enclosure. The barrier must remain in place except when installing modules, or when a qualified installation technician is wiring for power, relays or analog and network cards.

NOTICE

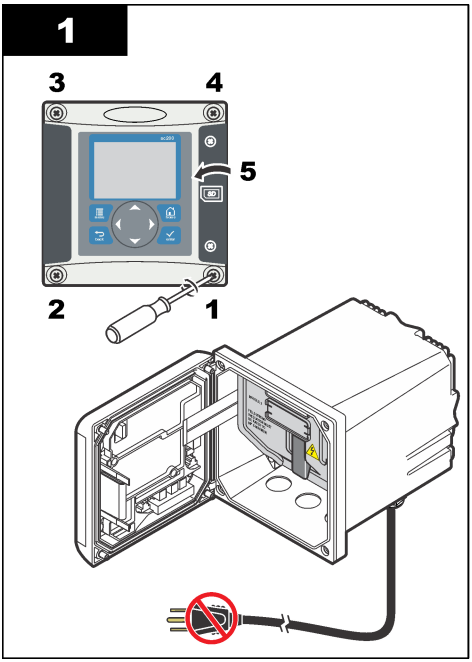
Potential Instrument Damage. Delicate internal electronic components can be damaged by static electricity, resulting in degraded performance or eventual failure.

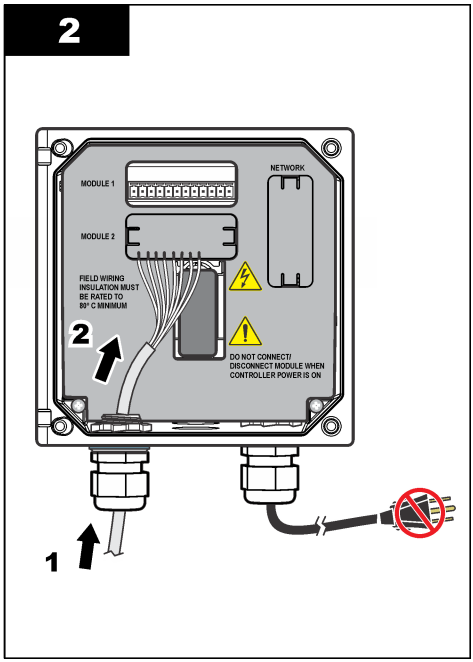
Refer to the illustrated steps that follow and Table 1.

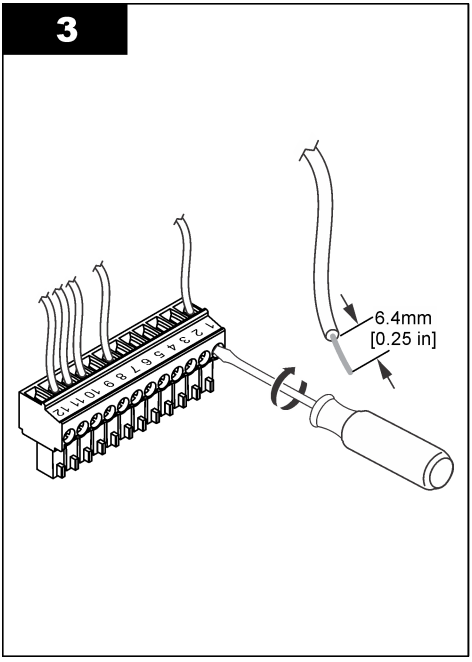
Be sure to connect all sensor ground/shield wires to the controller enclosure grounding screws.
Note: *If the sensor cable is not long enough to reach the controller, an interconnect cable and junction box are required to extend the distance.*

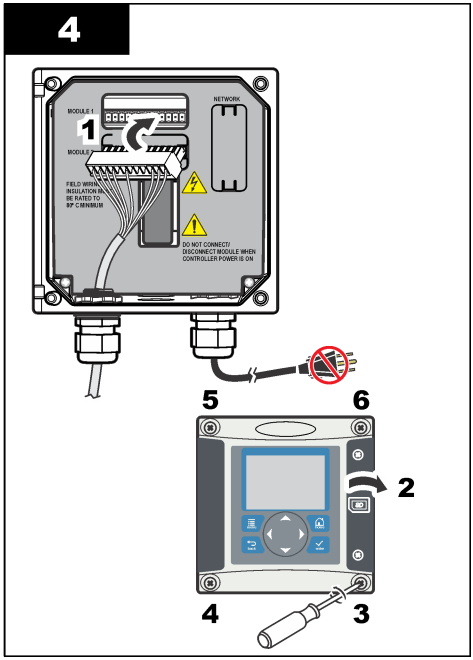
Table 1 Sensor wiring

Terminal	Signal	Sensor wire
1	Temp +	Black
2	Temp –	Blue
3–4	—	—
5	Ground	Green
6	Earth	Yellow
7–8	—	—
9	Working electrode	White
10	Counter electrode	Red
11–12	—	—


1
3
4
5
2
1


2
MODULE 1
NETWORK
MODULE 2
FIELD WIRING
INSULATION MUST
BE RATED TO
80° C MINIMUM
2
DO NOT CONNECT/
DISCONNECT MODULE WHEN
CONTROLLER POWER IS ON
1


3
6.4mm
[0.25 in]


4
1
NETWORK
DO NOT CONNECT/
DISCONNECT MODULE WHEN
CONTROLLER POWER IS ON
5
6
2
4
3

Section 5 Startup

Make sure that the flow rate and pressure do not exceed the values in Specifications on page 3.

1. Open the valve on the sample line to let sample flow through the analyzer.
2. Turn the knob on the flow meter to set the flow rate.
3. Examine the plumbing for leaks and stop any leaks if found.
4. Apply power to the controller.
5. Make the applicable menu selections when the controller starts.

Section 6 User navigation

Refer to the controller documentation for keypad description and navigation information.

Push the **RIGHT** arrow key on the controller multiple times to show more information on the home screen and to show a graphical display.

Section 7 Operation

7.1 System configuration

Refer to the controller documentation for system configuration, general controller settings and setup for outputs and communications.

7.2 Configure the sensor

Use the CONFIGURE menu to enter identification information for the sensor and to change options for data handling and storage.

1. Push the **menu** key, select SENSOR SETUP>CONFIGURE.
2. Use the arrow keys to select an option and push **enter**. To enter numbers, characters or punctuation, push and hold the **up** or **down** arrow keys. Push the **right** arrow key to advance to the next space.

Option	Description
EDIT NAME	Changes the name that corresponds to the sensor on the top of the measure screen. The name is limited to 16 characters in any combination of letters, numbers, spaces or punctuation.
SENSOR S/N	Allows the user to enter the serial number of the sensor, limited to 16 characters in any combination of letters, numbers, spaces or punctuation.
MEAS UNITS	Changes the measurement units—Select the unit from the list available.
PRESSURE UNITS	Sets the units for atmospheric pressure—Select the unit from the list available.
TEMP UNITS	Sets the temperature units to °C (default) or °F
FILTER	Sets a time constant to increase signal stability. The time constant calculates the average value during a specified time—0 (no effect, default) to 60 seconds (average of signal value for 60 seconds). The filter increases the time for the sensor signal to respond to actual changes in the process.
LOG SETUP	Sets the time interval for data storage in the data log—5, 30 seconds, 1, 2, 5, 10, 15 (default), 30, 60 minutes.
RESET DEFAULTS	Sets the configuration menu to the default settings. All sensor information is lost.

7.3 Calibrate the sensor

7.3.1 About sensor calibration

The sensor characteristics slowly shift over time and cause the sensor to lose accuracy. The sensor must be calibrated regularly to maintain accuracy. The calibration frequency varies with the application and is best determined by experience.

7.3.2 Temperature calibration

It is recommended to calibrate the temperature sensor once a year. Calibrate the temperature sensor before calibrating the measurement sensor.

1. Put the sensor in a container of water that is at a known temperature. Under agitation, measure the temperature of the water with an accurate thermometer or independent instrument.
2. Push the **menu** key and select SENSOR SETUP>CALIBRATE.
3. If the pass code is enabled in the security menu for the controller, enter the pass code.
4. Select 1 PT TEMP CAL and push **enter**.
5. The raw temperature value is displayed. Push **enter**.
6. Enter the correct value if different from that displayed and push **enter**.
7. Push **enter** to confirm the calibration. The temperature offset is displayed.

7.3.3 Zero calibration

Because of the stability of the electrode, for most applications this calibration is not required but can be used to define the unique zero point of the sensor.

1. Remove the sensor from the process and rinse in distilled water.
2. Push the **menu** key and select SENSOR SETUP>CALIBRATE.
3. If the pass code is enabled in the security menu for the controller, enter the pass code.
4. Select ZERO CAL and push **enter**.
5. Select the option for the output signal during calibration:

Option	Description
ACTIVE	The instrument sends the current measured output value during the calibration procedure.
HOLD	The sensor output value is held at the current measured value during the calibration procedure.
TRANSFER	A preset output value is sent during calibration. Refer to the controller user manual to change the preset value.

6. Place the clean sensor in a zero concentration solution, push **enter**.
7. Wait for up to one hour for the value to stabilize and push **enter**.
8. Review the calibration result:
   - PASS—the sensor is calibrated and the offset is displayed.
   - FAIL—the calibration is outside of accepted limits. Clean the sensor and retry with a fresh reference solution. Refer to Troubleshooting on page 17 for more information.
9. If the calibration passed, push **enter** to continue.
10. If the option for operator ID is set to YES in the CAL OPTIONS menu, enter an operator ID. Refer to Change calibration options on page 13.
11. On the NEW SENSOR screen, select whether the sensor is new:

Option	Description
YES	The sensor was not calibrated previously with this controller. The days of operation and previous calibration curves for the sensor are reset.
NO	The sensor was calibrated previously with this controller.

12. Return the sensor to the process and push **enter**. The output signal returns to the active state and the measured sample value is shown on the measure screen.
Note: If the output mode is set to hold or transfer, select the delay time when the outputs return to the active state.

7.3.4 Calibration in air

Air calibration is recommended for best accuracy and repeatability.

1. Remove the sensor from the process.
2. Push the **menu** key and select SENSOR SETUP>CALIBRATE.
3. If the pass code is enabled in the security menu for the controller, enter the pass code.
4. Select AIR CAL and push **enter**.
5. Select the option for the output signal during calibration:

Option	Description
ACTIVE	The instrument sends the current measured output value during the calibration procedure.
HOLD	The sensor output value is held at the current measured value during the calibration procedure.
TRANSFER	A preset output value is sent during calibration. Refer to the controller user manual to change the preset value.

6. Using a precision certified barometer, measure the atmospheric pressure where the analyzer is located. Use the arrow keys to enter this value if different from the value displayed and push **enter**.
7. Moisturize the wadding in a calibration cap with a few drops of water. Place the sensor vertically in the calibration cap with the membrane downwards. Tighten the calibration cap and push **enter**.
8. Wait for the value to stabilize and push **enter**.
9. Review the calibration result:
   - PASS—the sensor is calibrated and the calibration factor is displayed.
   - FAIL—the calibration is outside of accepted limits. Repeat the calibration with fresh reference solutions. Refer to Troubleshooting on page 17 for more information.
10. If the calibration passed, push **enter** to continue.
11. If the option for operator ID is set to YES in the CAL OPTIONS menu, enter an operator ID.
12. On the NEW SENSOR screen, select whether the sensor is new:

Option	Description
YES	The sensor was not calibrated previously with this controller. The days of operation and previous calibration curves for the sensor are reset.
NO	The sensor was calibrated previously with this controller.

13. Return the sensor to the process and push **enter**.
The output signal returns to the active state and the measured sample value is shown on the measure screen.
Note: If the output mode is set to hold or transfer, select the delay time when the outputs return to the active state.

7.3.5 Calibration with the process sample

The sensor can remain in the process sample.

1. Push the **menu** key and select SENSOR SETUP>CALIBRATE.
2. If the pass code is enabled in the security menu for the controller, enter the pass code.
3. Select SAMPLE CAL and push **enter**.

4. Select the option for the output signal during calibration:

Option	Description
ACTIVE	The instrument sends the current measured output value during the calibration procedure.
HOLD	The sensor output value is held at the current measured value during the calibration procedure.
TRANSFER	A preset output value is sent during calibration. Refer to the controller user manual to change the preset value.

5. With the sensor in the process sample, push **enter**. The measured value is shown. Wait for the value to stabilize and push **enter**.
6. With a certified secondary verification instrument measure the concentration value of the sample. To avoid impurities in the sample take the measurement before the sample enters the flow chamber. Use the arrow keys to enter this value if different from the value displayed and push **enter**.
7. Review the calibration result:
   - PASS—the sensor is calibrated and the calibration factor is displayed.
   - FAIL—the calibration is outside of accepted limits. Clean the sensor and retry. Refer to Troubleshooting on page 17 for more information.
8. If the calibration passed, push **enter** to continue.
9. If the option for operator ID is set to YES in the CAL OPTIONS menu, enter an operator ID. Refer to Change calibration options on page 13.
10. On the NEW SENSOR screen, select whether the sensor is new:

Option	Description
YES	The sensor was not calibrated previously with this controller. The days of operation and previous calibration curves for the sensor are reset.
NO	The sensor was calibrated previously with this controller.

11. With the sensor still in the process push **enter**. The output signal returns to the active state and the measured sample value is shown on the measure screen.
    Note: *If the output mode is set to hold or transfer, select the delay time when the outputs return to the active state.*

7.3.6 Exit calibration procedure

If the **back** key is pushed during a calibration, the user can exit the calibration.

1. Push the **back** key during a calibration. Three options are shown:

Option	Description
QUIT CAL	Stop the calibration. A new calibration must start from the beginning.
BACK TO CAL	Return to the calibration.
LEAVE CAL	Exit the calibration temporarily. Access to other menus is allowed. To return to the calibration, push the **menu** key and select SENSOR SETUP.

2. Use the arrow keys to select one of the options and push **enter**.

7.3.7 Change calibration options

The user can set a calibration reminder or include an operator ID with calibration data from this menu.

1. Push the **menu** key and select SENSOR SETUP>CALIBRATE.
2. If the pass code is enabled in the security menu for the controller, enter the pass code.

3. Select CAL OPTIONS and push **enter**.
4. Use the arrow keys to select an option and push **enter**.

Option	Description
CAL REMINDER	Sets a reminder for the next calibration in days, months or years—select the required delay from the list.
OP ID ON CAL	Includes an operator ID with calibration data—YES or NO (default). The ID is entered during the calibration.

7.4 Standby function

The measuring range of the 9582 is up to a maximum of 2 ppm. If measurements exceed this value for more than 2.5 minutes the standby function is enabled and no more measurements are taken. To exit standby mode push the **menu** key and select SENSOR SETUP>EXIT STANDBY.

Section 8 Maintenance

⚠ WARNING

Multiple hazards. Only qualified personnel must conduct the tasks described in this section of the document.

8.1 Membrane replacement

⚠ CAUTION

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.

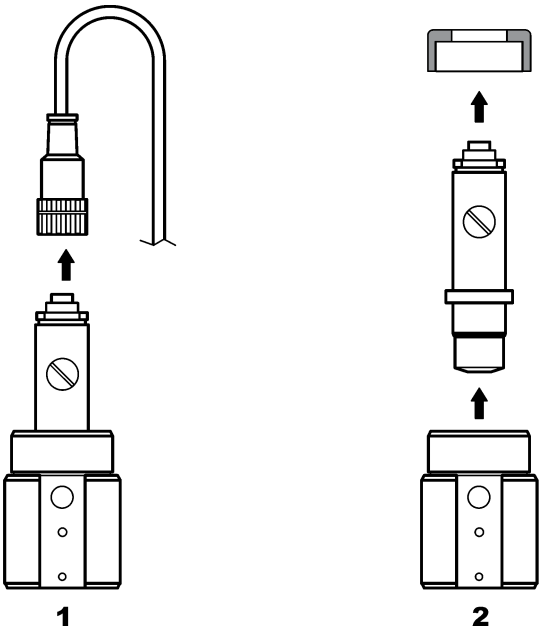
NOTICE

Always remove the electrolyte filling plug before removal of the electrode. Do not touch the membrane with the hands. Do not use a worn membrane.

8.1.1 Remove the sensor

1. Turn off the sample supply.
2. Unscrew the sensor cable connector from the sensor. Do not turn the actual cable or the sensor itself.
3. Unscrew the sensor clamping nut from the flow chamber and remove the sensor (Figure 3).

Figure 3 Remove the sensor

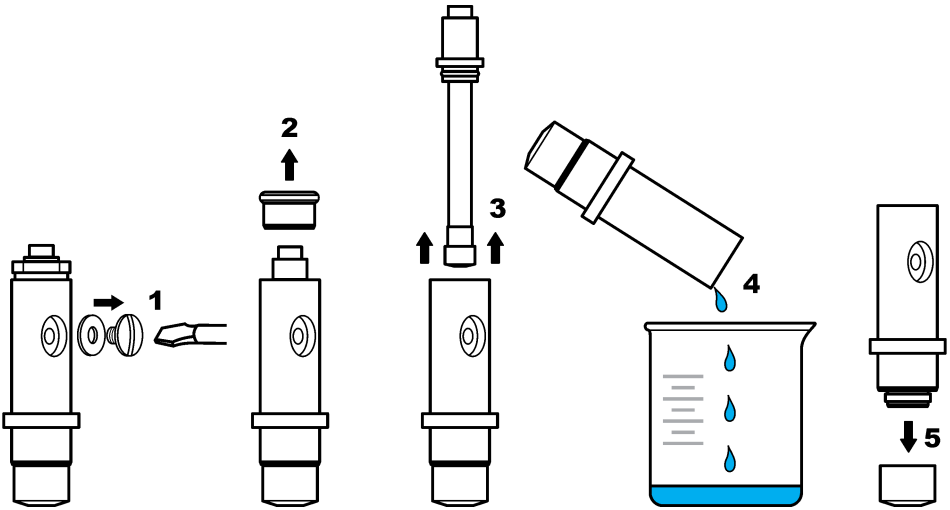


8.1.2 Replace the membrane

Refer to the steps that follow and Figure 4 to replace the sensor membrane.

1. Unscrew the filling screw and remove along with the gasket.
2. Unscrew the holding nut.
3. Carefully remove the electrode from the sensor body.
4. Empty any electrolyte left in the sensor body.
5. Unscrew the old membrane from the sensor body.
6. Install the new membrane. Refer to Assemble the sensor on page 6.

Figure 4 Replace the membrane



8.2 Electrode rejuvenation

After some months of operation (3 to 12 depending on sample oxygen concentration, plant shutdown frequency, etc.), a dark coating of silver bromide (AgBr) may cover part of the silver anode. This coating does not affect the measurement unless more than 90% of the surface is contaminated.

When changing the electrolyte and membrane, visually check the silver anode. If more than 2/3 of the surface is coated with silver bromide then an electrode rejuvenation is required. To do this, very softly polish the areas coated with the deposit using a soft abrasive (N° 400 to 600). After polishing, rinse with demineralized water and wipe dry with a soft cloth. Some of the dark coloring may be left to improve sensor stabilization time.

After cleaning, replace the sensor in the sample and leave for 30 minutes for the measurement to stabilize. Once stable, the sensor must be calibrated.

Section 9 Troubleshooting

9.1 General troubleshooting

Problem	Probable cause	Resolution
Excessive time for stabilization or no stabilization during calibration in air.	The sample temperature is very different from the ambient temperature, e.g. 6 °C (43 °F) in water and 35 °C (95 °F) in air will cause a measurement drift.	Do not wait till the sensor temperature equals the external temperature (use temperature compensation).
	There is an electrolyte leak through the membrane. The current is too high because of an excessive penetration of oxygen.	Change the membrane.
	There is pollution of the electrolyte due to a loose filling screw.	Change the electrolyte. Check there is a gasket in place and tighten the screw using a screwdriver but without using excessive force.
	The electrode is not correctly mounted in the sensor body causing an excessive gap between the membrane and the cathode.	Tighten the electrode holding nut.
	The membrane is incorrectly installed causing a risk of electrolyte pollution.	Change the electrolyte and reinstall the membrane onto the sensor body as far as it will go finger tight.
	Lack of humidity due to high temperature.	Use a calibration cap (see Replacement parts and accessories on page 20).
	There is water or humidity in the sensor cable connector.	Dry the sensor cable connector inside and out, and install finger tight.
	The gold surface is scratched or damaged.	Change the electrode.
	Sludge or particles on the cathode.	Clean the cathode with a soft and absorbent tissue. Rinse the membrane.
	Cable or connections damaged when the sensor has been removed.	Check the sensor connection to the controller module. If correct check the connections to the sensor cable connector.
	The sensor is incorrectly positioned. The electrolyte has leaked and air bubbles have entered the cathode.	Put the sensor in the correct position, head down.
No significant current increase when the sensor is in the air for the calibration.	There is pollution of the electrolyte due to a loose filling screw.	Change the electrolyte. Check there is a gasket in place and tighten the screw using a screwdriver but without using excessive force. Check the sensor is not damaged.
	There is pollution of the electrolyte due to a leaking membrane.	Change the electrolyte and the membrane.
	The membrane is torn.	Change the membrane.
	The electrode is not correctly mounted in the sensor body causing an excessive gap between the membrane and the cathode.	Tighten the electrode holding nut.
	Cable or connections damaged when the sensor has been removed.	Check the connection to the controller module. If correct check the connections to the sensor cable connector.
	The membrane is worn.	Change the membrane.
	There is a dark green deposit of silver bromide (AgBr) on the silver tube.	Polish the tube with a soft abrasive (N° 400 to 600) and replace the membrane.

Problem	Probable cause	Resolution
Important instability in measuring mode.	There is water or humidity in the sensor cable connector.	Dry the sensor cable connector inside and out, and install finger tight.
	Incorrect connection.	Check the sensor connection to the controller module.
	There are bubbles close to the cathode.	Refill with electrolyte and check there are no bubbles at the bottom of the sensor body.
	The sensor has been violently shaken.	Check the fixation and stability of the sensor.
	Electromagnetic interferences close to the sensor or controller cable.	Find a better place for the cable and check the EMC levels.
	Temporary interference with other gases.	Mainly with H_2S.
	Flow rate too low (4 mL/h minimum).	Increase sample flow.
	Sludge from a heterogeneous sample has damaged the membrane.	Install a deflector or change the sensor location.
	Pressure variation in the line.	Make sure the sensor is used at atmospheric pressure.
Lack of accuracy.	The permeability of the membrane has changed (dirt deposits).	Calibrate the analyzer and check if the concentration is back to normal.
	Electrolyte pollution.	Check the screw-in parts (membrane, filling screw) and change the electrolyte and the membrane.
	Electrolyte leaking.	Check the screw-in parts (membrane, filling screw) and change the electrolyte and the membrane.
	Interferences, mainly with H_2S.	If the level of H_2S (or other pollutant) is stable, take its concentration into account to determine the dissolved O_2 concentration.
	Error during calibration or incorrect calibration.	Calibrate again to check the parameters. If the error persists check the calibration current (too high, too low or unstable) and the concentration in air. Refer to the problems described above.
	There are bubbles close to the cathode.	Refill with electrolyte and check there are no bubbles at the bottom of the sensor body.
	Flow rate too low (4 mL/h minimum).	Increase sample flow.
	The sample temperature or pressure is out of specification.	Change the sensor location or modify the sample so that it is within specification.
	Sludge or particles on the cathode.	Clean the cathode with a soft and absorbent tissue. Change the membrane.
The sensor current is null during measurement.	There is no electrolyte in the sensor (leakage).	Check the screw-in parts (membrane, filling screw) and change the electrolyte.
	Sensor cable is disconnected or poorly connected.	Check cable connections on the module and the sensor connector in the controller.

Problem	Probable cause	Resolution
The sensor current is negative.	Connection problem to the anode circuit (loose contact).	Check the connection to the controller module. If correct check the connections to the sensor cable connector.
	There is a dark green deposit of silver bromide (AgBr) on the surface of the silver tube.	Polish the tube with a soft abrasive (N° 400 to 600).
The sample temperature is out of specification.	There may be a short-circuit on the temperature connection.	Check the connection to the controller module. If correct check the connections to the sensor cable connector.
The displayed reading is not numeric.	The measured value is < 0 ppb if negative signs are displayed.	Check the zero calibration.
	The measured value is > 10,000 ppb	Change the display unit.
	The standby function is enabled because the measured value is > 2 ppm.	Exit the standby function from the menu option.

9.2 Sensor diagnostic and test menu

The sensor diagnostic and test menu shows current and historical information about the instrument. Refer to Table 2. To access the sensor diagnostic and test menu, push the **MENU** key and select Sensor Setup, [Select Sensor], DIAG/TEST.

Table 2 Sensor DIAG/TEST menu

Option	Description
MODULE INFORMATION	Shows the version and the serial number for the sensor module.
SENSOR INFORMATION	Shows the name and serial number that was entered by the user.
CAL DAYS	Shows the number of days since the last calibration.
CAL HISTORY	Shows a list of the calibrations and the details for each calibration.
RESET CAL HISTORY	Service use only. Resets the calibration history for the sensor. All previous calibration data is lost.
SENSOR SIGNALS	Shows the current reading in mV and the temperature.
MEMBRANE DAYS	Shows the number of days that the sensor has been in operation.
RESET MEMBRANE	Resets the number of days that the sensor has been in operation.

9.3 Warning and error conditions

Follow the steps below to acknowledge controller warnings.

1. Push the **menu** key and select DIAGNOSTICS.
2. Select the device (controller, sensor, network card) with the warning or error and push **enter**.
3. Select the warning, error or event list and push **enter**.
4. Select YES and push **enter** to acknowledge the warning.
   Note: *Errors cannot be acknowledged.*

9.3.1 Warning list

A warning icon consists of an exclamation point within a triangle. Warning icons appear on the right of the main display below the measurement value. A warning does not affect the operation of menus, relays and outputs. To view warnings, push the **menu** key and select DIAGNOSTICS. Then select the device to view any problems associated with that device. The warning icon will no longer be displayed once the problem has been corrected or acknowledged.

A list of possible warnings is shown in Table 3.

Table 3 Warning list for dissolved oxygen sensors

Warning	Description	Resolution
DO TOO HIGH	The measured value is > 40 ppm	Make sure that the DO level in the process water is within the operating limits of the sensor. Calibrate or replace the sensor.
DO TOO LOW	The measured value is < 0 ppb	Calibrate or replace the sensor.
TEMP TOO HIGH	The measured temperature is > 50 °C	Reduce sample temperature.
TEMP TOO LOW	The measured temperature is < 0 °C	Increase sample temperature.
CURRENT TOO HIGH	The measured current > 200 µA	Make sure that the DO level in the process water is within the operating limits of the sensor. Calibrate or replace the sensor.
CURRENT TOO LOW	The measured current < -0.5 mA	Calibrate or replace the sensor.
CAL OVERDUE	The Cal Reminder time has expired	Calibrate the sensor.
REPLACE SENSOR	The sensor has been in operation > 365 days	Replace the sensor cartridge and calibrate the sensor. If the calibration result is pass, reset the membrane days in the DIAG/TEST menu.
NOT CALIBRATED	The sensor has not been calibrated	Calibrate the sensor.
CAL IN PROGRESS	A calibration was started but not completed	Return to calibration.

9.3.2 Error list

Errors may occur for various reasons. An error icon consists of an exclamation point within a circle. When an error occurs, the error icon and the measurement screen flash alternately in the main display. All outputs are held when specified in the controller menu. To view errors, push the **menu** key and select DIAGNOSTICS. Then select the device to view any problems associated with that device.

A list of possible errors is shown in Table 4.

Table 4 Error list for dissolved oxygen sensors

Error	Description	Resolution
ADC FAILURE	The analog to digital conversion failed	Power off and power on the controller. Call technical support.
TEMP SENSOR MISSING	The temperature sensor is missing or disconnected	Examine the wiring and connections for the sensor and for the module. Make sure that the terminal block is fully inserted into the module.

Section 10 Replacement parts and accessories

Refer to the replacement parts and accessories section of the controller documentation for controller 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 and accessories

Description	Item no.
Box of 4 pre-mounted membranes	09185=A=3500
Calibration cap	09182=A=1200
Electrolyte filling screw	09078=C=1030
Electrolyte filling washer	09078=C=1020
Oxygen electrode without sensor body ppb	09182=A=1000
Oxygen sensor body ppb	09078=C=1010
Reference electrolyte 25 mL	09181=A=3600
Stainless steel flow cell	09078=A=2000
Syringe	460150,21951

Section 11 Material safety data sheets (MSDS)

11.1 MSDS - Electrolyte

The information listed below corresponds to our current state of knowledge. They serve as a description of the products in regard to necessary safety measures and do not guarantee the described chemical properties. These indications describe the safety precautions to take against the related product and they are not a guaranty of the described product properties.

1. IDENTIFICATION OF THE SUBSTANCE
Product code: 09181=A=3600
Product name: Electrolyte

2. COMPOSITION / INFORMATION ON INGREDIENTS
Water >90%: CAS No 108-18-9
Potassium bromide <10%: CAS No 7758-02-3
Caustic potash, potassium hydroxide <5%: CAS No 1310-58-3 • 1310-58-3: C - Corrosive, Xn - Harmful R22-35 • 019-002-00-8: Acute Tox. 4, Skin Corr. 1A; H302 H314 ***Note:*** *For full text of R and H phrases see Section 16.*

3. HAZARDS IDENTIFICATION
Hazardous components which must be listed on the label: Caustic potash; Potassium hydroxide
R34: Causes burns.
S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S45: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S36/37/39: Wear suitable protective clothing, gloves and eye/face protection.
Additional advice on labelling: Classification according to European directive on classification of hazardous preparations 1999/45/EC.

4. FIRST AID MEASURES
General information: Take off all contaminated clothing immediately.
After inhalation: Move to fresh air.
After contact with skin: Wash off immediately with plenty of water.
After contact with eyes: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.
After ingestion: Clean mouth with water and drink afterwards plenty of water.

5. FIRE FIGHTING MEASURES
Suitable extinguishing media: Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. The product itself does not burn.
Special hazards arising from the substance or mixture: Fire may liberate hazardous vapours.
Advice for firefighters: In the event of fire, wear self-contained breathing apparatus. Use personal protective equipment.
Additional information: Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

6. MEASURES IN CASE OF ACCIDENTAL SPILLAGE
Personal precautions, protective equipment and emergency procedures: Use personal protective equipment.
Environmental precautions: Do not flush into surface water or sanitary sewer system.
Methods and material for containment and cleaning up: Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust).

7. HANDLING AND STORAGE
Handling: Use only in well-ventilated areas. Wear personal protective equipment.
Storage: Keep in a dry, cool place.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION
Protective and hygiene measures: • The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. • Wash hands before breaks and after work.

Hand protection:
• Use barrier skin cream.
• Chemical resistant gloves made of butyl rubber or nitrile rubber category III according to EN 374.
  • In full contact: Gloves material: Viton, Layer thickness: 0.70 mm, Breakthrough time: >480 min.
  • In splash contact: Glove material: Nitrile rubber, Layer thickness 0,20 mm, Breakthrough time: > 30 min

Eye protection: Safety glasses with side-shields.
Skin protection: Remove and wash contaminated clothing before re-use.

9. PHYSICAL AND CHEMICAL PROPERTIES
Physical state: Viscous
Color: Colorless
Odor: Odorless
pH value (20 °C): >13
Flash point: N/A
Explosion limits: N/A

10. STABILITY AND REACTIVITY
Conditions to avoid: No dangerous reaction known under conditions of normal use.
Incompatible materials: No dangerous reaction known under conditions of normal use.
Hazardous decomposition products: No decomposition if stored and applied as directed.

11. TOXICOLOGICAL INFORMATION
Acute toxicity: No data is available on the product itself.
Specific effects in experiment on an animal: No data is available on the product itself.

12. ECOLOGICAL INFORMATION
Toxicity: No data is available on the product itself. Do not flush into surface water or sanitary sewer system.

13. DISPOSAL CONSIDERATIONS
Advice on disposal: In accordance with local and national regulations.

14. TRANSPORT INFORMATION

Land transport (ADR/RID):
• UN number: 1814
• UN proper shipping name: POTASSIUM HYDROXIDE SOLUTION
• Transport hazard class(es): 8
• Packing group: II
  • Hazard label: 8
  • Classification code: C5
  • Limited quantity: LQ22
  • Hazard No: 80
  • Tunnel restriction code: E
• Excepted Quantities: E2
• Transport Category: 2

Inland waterways transport (ADN): • UN proper shipping name: Not tested

14. TRANSPORT INFORMATION

Marine transport (IMDG):

- UN number: 1814
- UN proper shipping name: POTASSIUM HYDROXIDE SOLUTION
- Transport hazard class(es): 8
- Packing group: II
  - Hazard label: 8
  - Limited quantity: 1 L
  - EmS: F-A, S-B
- Excepted Quantities: E2

Air transport (ICAO):

- UN number: 1814
- UN proper shipping name: POTASSIUM HYDROXIDE SOLUTION
- Transport hazard class(es): 8
- Packing group: II
  - Hazard label: 8
  - Limited quantity - Passenger: 0.5 L
  - IATA-packing instructions - Passenger: 809
  - IATA-max. quantity - Passenger: 1 L
  - IATA-packing instructions - Cargo: 813
  - IATA-max. quantity - Cargo: 30 L
- Excepted Quantities: E2
- Passenger-LQ: Y809
- Special Provisions A3

15. REGULATORY INFORMATION

EU regulatory information: The product does not need to be labelled in accordance with EC directives or respective national laws.

National regulatory information: Water contaminating class (D): 1 - slightly water contaminating

16. OTHER INFORMATION

Full text of R phrases:

- 22 - Harmful if swallowed.
- 34 - Causes burns.
- 35 - Causes severe burns.

Full text of H statements:

- H302 - Harmful if swallowed.
- H314 - Causes severe skin burns and eye damage.

The above-mentioned data correspond to our current state of knowledge. They serve as a description of the products in regard to necessary safety measures and do not guarantee the described chemical properties. These indications describe the safety precautions to take against the related product and they are not a guaranty of the described product properties.

HACH COMPANY World Headquarters
P.O. Box 389, Loveland, CO 80539-0389 U.S.A.
Tel. (970) 669-3050
(800) 227-4224 (U.S.A. only)
Fax (970) 669-2932
orders@hach.com
www.hach.com

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

HACH LANGE Sàrl
6, route de Compois
1222 Vésenaz
SWITZERLAND
Tel. +41 22 594 6400
Fax +41 22 594 6499