DOH-247-KIT

Dissolved Oxygen Meter

OMEGA®

An OMEGA Technologies Company

Operator's Manual

TABLE OF CONTENTS

DOH-247-KIT

SECTION	DESCRIPTION	PAGE
1	Introduction	1
	Description	1
	Unpacking	1
	Installing the Battery	2
	Setting Up the Probe	3
2	Calibration and Measurement	4
3	Use of the Recorder Output	6
4	Troubleshooting	7
	Maintenance	8
	Storage	8
5	Accessories	9
6	Specifications	10
-	Appendix 1: Oxygen Solubility	11

SECTION 1

Introduction

Description

The OMEGA® DOH-247 Dissolved Oxygen Meter is a high accuracy, portable instrument, complete with polarographic cell. Features include dissolved oxygen measurement in % saturation or ppm with automatic temperature compensation, µA and temperature measurement.

Unpacking

Remove the Packing List and verify that you have received all equipment. If you have any questions about the shipment, please call the OMEGA Customer Service Department at 1-800-622-2378 or (203) 359-1660.

When you receive the shipment, inspect the container and equipment for any signs of damage. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

Note

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material in the event that re-shipment is necessary.

The following items are packed in the box:

- DOH-247 Dissolved Oxygen Meter
- PHOX-247 Dissolved Oxygen Probe
- (2) Replacement Membranes
- Electrolyte Fill Solution
- Stirrer Bar
- Guard Shield assembly
- Carrying case
- 9V Battery
- Operator's Manual

Installing the Battery

REFER TO FIGURE 1

- The instrument is supplied with a 9V battery. The battery will afford the user approximately 35 hours of continuous use. When the battery needs changing, the word BAT will appear on the display.
- To install or replace the battery, slide the back cover off.
- Remove the old battery and insert a new one, making sure the polarity orientation is correct.
- Replace back cover.

NOTE

Any calibration data will be retained even when instrument is turned off or there is no battery installed.

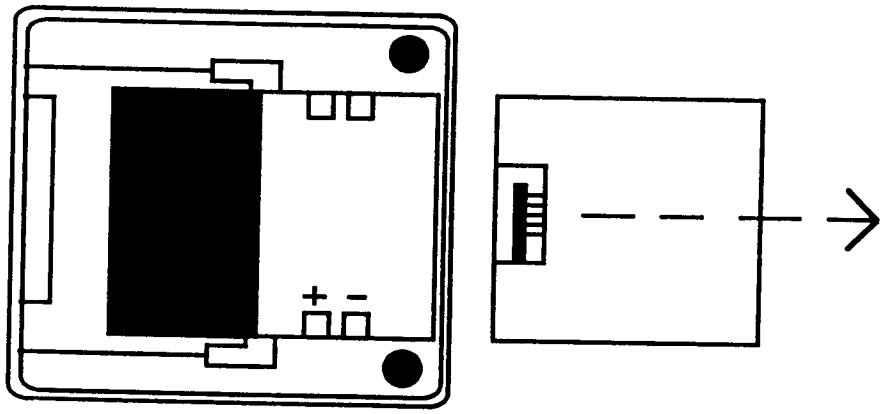


Figure 1. Battery Installation

Setting Up the Probe

The system determines the dissolved oxygen content of a sample by means of a polarographic or Clark electrode or probe. The probe is composed of an inert gold cathode and silver anode.

The cell reactions are as follows:

At the silver anode: $4Ag^{\circ} + 4Cl^{-} \rightarrow 4AgCl + 4e^{-}$

At the gold cathode: $O_2 + 2H_2O + 4e^{-} \rightarrow 4OH^{-}$

Overall cell reaction:

$$4Ag^{\circ} + 4Cl^{-} + O_2 + 2H_2O \rightarrow 4Ag\,Cl + 4OH^{-}$$

1. Remove the protective plastic cap and rinse the probe in de-ionized water. Fill one of the membrane caps with the electrolyte solution supplied.

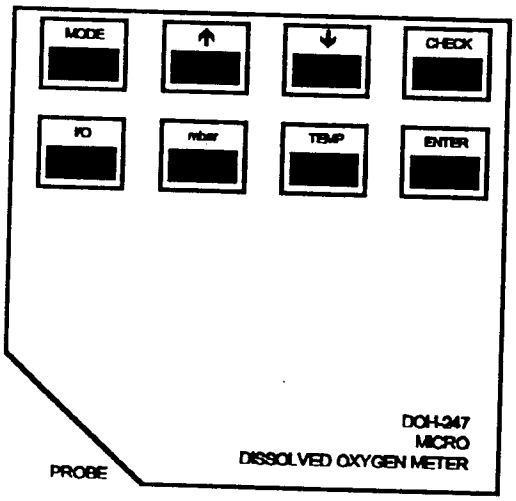
2. Hold the probe vertically and screw the membrane tightly onto the probe body, taking care not to trap any air bubbles.

Connect the probe to the meter and switch on by pressing the I/0 key. The probe will be ready for use after about 2 minutes. (That is, polarization will have been achieved in this time).

SECTION 2

Calibration and Measurement

Figure 2: Front panel



Adjusting For Barometric Pressure

Changes in barometric pressure may be manually adjusted for. The following procedure should be carried out before calibration.

1. Press the mbar key to display pressure mode.
2. Adjust the reading using the ⇧ ⇩ Keys.
3. Return to % sat mode via the Mode key and calibrate as described below.

Stirring

- The movement of water past the probe should be between 15 and 20 cm/second
- When taking measurements in the laboratory, clip on the stirrer bar supplied with the probe and place the sample vessel on a magnetic stirrer.
- For field measurements, either move the probe back and forth at a speed of about 15 to 20 cm/second or utilize the natural flow of water, provided that it is greater than 15cm/second.

Calibration and Measurement

The dissolved oxygen probe is virtually free of zero current, which means it is only necessary to carry out a single point calibration. The meter may be calibrated in air saturated water or water saturated air. All calibrations are automatically temperature compensated.

With Air Saturated Water

1. Clear any existing calibration data by pressing the Clear key for 5 seconds
2. Fill a suitable container with clean (non-saline), fully aerated water. This may be achieved by using a magnetic stirrer or aquarium pump and aerate stone.
3. Select %sat mode via the Mode key. Immerse the probe in the solution and allow the reading to stabilize.
4. Using the ⇧⇩ keys, adjust the reading to 100.0%. (The CAL will flash). Press Enter. (The CAL will stop flashing).
5. Dissolved oxygen measurements may now be made by immersing the probe in the sample and recording the stabilized reading.
6. ppm or μA(DO) measurements may be made at any time by pressing the mode key until the appropriate flag is displayed.
7. Temperature measurements may be made by pressing the Temp key.

With Water Saturated Air.

1. Clear any existing calibration data by pressing the Clear key for 5 seconds
2. Immerse the probe in water before calibration. remove and shake off any water droplets from the membrane. Select %sat mode via the Mode key. With the probe in air, allow the reading to stabilize.
3. Using the ⇧⇩ keys, adjust the reading to 102.0%. (The CAL will flash). Press Enter. (The CAL will stop flashing).
4. Dissolved oxygen measurements may now be made by immersing the probe in the sample and recording the stabilized reading.
5. ppm or μA(DO) measurements may be made at any time by pressing the Mode key until the appropriate flag is displayed.
6. Temperature measurements may be made by pressing the Temp key.

SECTION 3

Use of the Recorder Output

REFER TO THE RECORDER INSTRUCTIONS

Connect the recorder via the red and black 4mm sockets at the top of the meter. Red + (positive), Black - (negative)

Ensure that the recorder is set for the appropriate range, ie:

MODE	RANGE (mV)	DISPLAY	RECORDER
%Sat	0 - 200	100DO%	100.0mV
ppm	0 - 200	14ppm	14.0mV
µA	0 - 200	1DO	1.0mV
°C	±200	25°C	25.0mV

SECTION 4

Troubleshooting

Symptom	Probable Cause(s)
No Display	**-Battery is flat or not installed**
"BAT" flag displayed	**-Battery is low**
Wildly erratic readings or display reads	**-Electrode disconnected**
-- on left hand side	-Membrane cap not tight.
	-Anode/cathode need polishing.
Drifting readings	**-Inconsistent (or lack of) stirring**

In the event of a malfunction, it is important to pinpoint the problem to either the meter or the probe. If a spare probe is available, substitute it for the one in use.

There are no user serviceable parts in this instrument. Please ensure that the instrument, together with all accessories is returned to OMEGA Engineering Inc. with a full description of the symptoms of the problem. No attempt should be made to repair the meter.

Maintenance

The membrane may be damaged by shock or solid particles in the sample. Remov the membrane capsule, carefully discard the filling solution and inspect the membran If the membrane is damaged, discard the capsule. Rinse the electrode with de-ionize water, fill a new membrane capsule with fresh filling solution and screw tightly ont electrode body.

If the electrode response becomes slow or erratic, gently re-polish the gold tip an silver anode surface using the fine abrasive paper provided.

Storage

The probe body and sensing membrane should be stored dry. Remove the membran capsule, empty out the filling solution and flush with de-ionized water. Store dr Cover the end of the probe with the protective cap provided and store dry.

SECTION 5

Accessories

Available from OMEGA Engineering Inc.

PHOX-247	Polarographic dissolved oxygen probe
PHAC-247	Set of 5 membranes for use with PHOX-247

SECTION 6

Specifications

% Saturation	Range:	0 -199.9%
	Resolution:	0.1%
	Accuracy:	±2%
		Within ±10°C of calibration temperature
ppm	Range:	0 - 19.9 ppm
	Resolution:	0.1ppm
	Accuracy:	±0.2ppm
°C	Range:	-5 to +50°C
	Resolution:	0.1°C
	Accuracy:	±0.5°C
Temperature Compensation:		0 - 50°C
Recorder Output:		±200mV, 2x 4mm sockets
Power:		9V battery
Instrument size:		5.7" x 3.15" x 1.52"
Instrument weight:		0.76lb

Appendix 1

Oxygen Solubility

In Pure Water

REFER TO TABLE 1

Table 1 shows oxygen solubility in mg/L (ppm). The values relate to pure water vapor-saturated normal air at standard atmospheric pressure.

In Saline Waters

REFER TO TABLE 1

Table 1 incorporates salinity correction values. These may be used to determine oxygen solubility in Sea water or Estuarine waters over the temperature range 0 to 35°C. The value given should be SUBTRACTED from the pure water solubility column for each degree of salinity, expressed in parts per thousand (ppt).

Example:

For a water of salinity 20ppt at a temperature of 15°C the oxygen solubility is:

10.07 mg/L - 20 (0.0546) mg/L

10.07 mg/L - 1.09 mg/L

8.98 mg/L

Table 1: Oxygen Solubility*

Temperature °C	Solubility in Pure Water mg/L	Salinity Correction mg/L
0	14.59	0.0875
1	14.19	0.0843
2	13.81	0.0818
3	13.44	0.0789
4	13.08	0.0760
5	12.75	0.0739
6	12.42	0.0714
7	12.12	0.0693
8	11.82	0.0671
9	11.54	0.0650
10	11.27	0.0632
11	11.01	0.0614
12	10.75	0.0593
13	10.52	0.0582
14	10.28	0.0561
15	10.07	0.0546
16	9.85	0.0532
17	9.64	0.0514
18	9.44	0.0500
19	9.25	0.0489
20	9.07	0.0475

Table 1: Oxygen Solubility (continued)

Temperature °C	Solubility in Pure Water mg/L	Salinity Correction mg/L
21	8.90	0.0464
22	8.73	0.0453
23	8.55	0.0443
24	8.40	0.0432
25	8.24	0.0421
26	8.08	0.0407
27	7.94	0.0400
28	7.80	0.0389
29	7.66	0.0382
30	7.54	0.0371
31	7.41	0.0364
32	7.28	0.0353
33	7.15	0.0346
34	7.04	0.0339
35	6.93	0.0328

** The pure water solubility values are from Table IVb of "International Oceanographic Tables", Volume 2, National Institute of Oceanography of Great Britain and UNESCO, 1973. The salinity corrections are derived from the saline water solubility values given in the same Table.*

WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that our customers receive maximum coverage on each product. If the unit should malfunction, it must be returned to the factory for evaluation. Our Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

We are glad to offer suggestions on the use of our various products. Nevertheless, OMEGA only warrants that the parts manufactured by it will be as specified and free of defects.

OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.

LIMITATION OF LIABILITY: The remedies of buyer set forth herein are exclusive and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

Every precaution for accuracy has been taken in the preparation of this manual; however, OMEGA ENGINEERING, INC. neither assumes responsibility for any omissions or errors that may appear nor assumes liability for any damages that result from the use of the products in accordance with the information contained in the manual.

SPECIAL CONDITION: Should this equipment be used in or with any nuclear installation or activity, buyer will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the equipment in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA ENGINEERING Customer Service Department. Call toll free in the USA and Canada: 1-800-622-2378, FAX: 203-359-7811; International: 203-359-1660, FAX: 203-359-7807.

BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, YOU MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OUR CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems you are having with the product.

FOR **NON-WARRANTY** REPAIRS OR **CALIBRATION,** consult OMEGA for current repair/calibration charges. Have the following information available BEFORE contacting OMEGA:

1. P.O. number to cover the COST of the repair/ calibration,
2. Model and serial number of product, and
3. Repair instructions and/or specific problems you are having with the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

TEMPERATURE

- Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors
- Infrared Pyrometers

PRESSURE/STRAIN FORCE

- Transducers & Strain Gages
- Load Cells & Pressure Gauges
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

DATA ACQUISITION

- Data Acquisition and Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Datalogging Systems
- Recorders, Printers & Plotters

HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments

M1883/0894