

Instruction Manual

HI 9147

Portable, Water-resistant Dissolved Oxygen Meter with Galvanic Probe



WARRANTY

HI 9147 meter is guaranteed for two years against defects in workmanship and materials when used for their intended purpose and maintained according to instructions. The probes are guaranteed for one year.

This warranty is limited to repair or replacement free of charge. Damage due to accidents, misuse, tampering or lack of prescribed maintenance is not covered.

If service is required, contact the dealer from whom you purchased the instrument. If under warranty, report the model number, date of purchase, serial number and the nature of the problem.

If the repair is not covered by the warranty, you will be notified of the charges incurred.

If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization Number from the Technical Service department and then send it with shipping costs prepaid. When shipping any instrument, make sure it is properly packed for complete protection.

Hanna Instruments reserves the right to modify the design, construction or appearance of its products without advance notice.

Dear Customer,

Thank you for choosing a Hanna product.

Please read carefully this instruction manual before using the meter. If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com or view our worldwide contact list at www.hannainst.com.

PRELIMINARY EXAMINATION

Remove the instrument from the packing material and examine it carefully to make sure that no damage has occurred during shipment. If there is any damage, notify your Dealer.

The meter is supplied complete with

- D.O. probe, fixed:
 - HI 76409/4 with 4 m cable for HI 9147-04
 - HI 76409/10 with 10 m cable for HI 9147-10
- Spare membranes (HI 76409A/P) with O-rings, 5 pcs.
- HI 7042S electrolyte solution (30 ml bottle)
- Batteries (3 x 1.5V AAA)
- Screwdriver and instructions.

Note: Conserve all packing material until the instrument has been observed to function correctly. Any defective item must be returned in its original packing.

GENERAL DESCRIPTION

HI 9147 is a water-resistant Dissolved Oxygen meter with manual calibration, automatic temperature compensation (ATC), salinity compensation and direct probe.

Dissolved Oxygen is indicated in mg/L or in % of saturation.

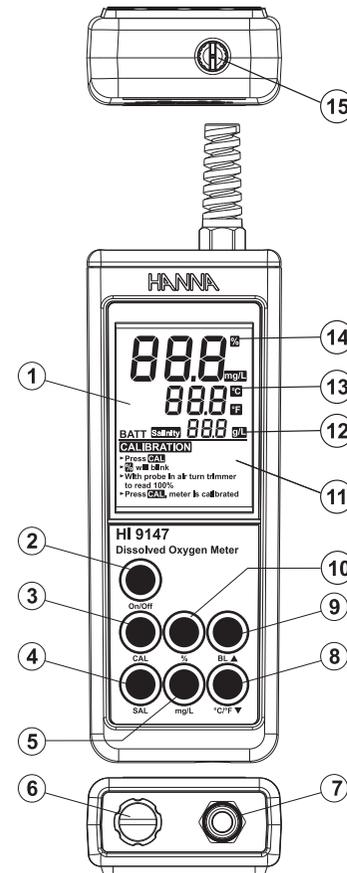
The temperature can be measured in the range from -5 to 50°C. The Dissolved Oxygen readings are automatically compensated for the temperature effects on the oxygen solubility and membrane permeability. Moreover, the salinity compensation feature allows determination of Dissolved Oxygen even in salty waters.

The meter is housed in a rugged water-resistant case for maximum protection in the field as well as in the laboratory.

The D.O. probe is provided with a membrane covering the galvanic sensors and a built-in thermistor for temperature measurement and compensation. The thin permeable membrane isolates the sensor elements from the testing solution, but allows oxygen to enter. Oxygen that passes through the membrane causes a current flow, from which the oxygen concentration is determined.

Two models are available:

- HI 9147-04 with HI 76409/4 probe (4 m cable)
- HI 9147-10 with HI 76409/10 probe (10 m cable)



FUNCTIONAL DESCRIPTION

- 1) Liquid Crystal Display
- 2) On/Off key, turn the instrument ON/OFF
- 3) CAL key, to enter %DO calibration
- 4) SAL key, display setting menu of salinity factor. Use ARROW keys to set salinity factor. Press SAL to exit
- 5) mg/L key, display O₂ measurement in mg/L
- 6) Battery holder cap
- 7) HI 76409/4 or HI 76409/10 galvanic D.O. probe (fixed)
- 8) °C/°F or ▼ key, to select temperature unit or to decrease salinity, during salinity setup
- 9) BL or ▲ key, turn the backlight ON or OFF. Increase salinity coefficient during salinity setup.
- 10) % key, display O₂ measurement in % of saturation
- 11) DO Calibration Help screen
- 12) Salinity display LCD line
- 13) Temperature display LCD line
- 14) DO display LCD line
- 15) % trimmer, for calibration adjustment

SPECIFICATIONS

Range	0.0 to 50.0 mg/L O ₂ 0 to 600 % O ₂ -5.0 to 50.0°C (23 to 122°F)
Resolution	0.1 mg/L or 1% (O ₂) / 0.1°C (1°F)
Accuracy	±1% of reading (O ₂) / ±0.2°C (1°F) (excluding probe error)
Calibration	Manual, in saturated air
Temperature Compensation	Automatic, from 0 to 50°C (32 to 122°F)
Salinity Compensation	0 to 51 g/L (resolution 1 g/L)
Probe (fixed)	HI 76409/4 with 4 m cable or HI 76409/10 with 10 m cable
Battery Type	3 x 1.5V AAA
Battery Life	1000 hours of use (BL off)
Auto-off	After approx. 8 minutes
Environment	0 to 50°C (32 to 122°F); max 95% RH non-condensing
Dimensions	185 x 72 x 36 mm (7.3 x 2.8 x 1.4")
Weight	450 g (15.9 oz.) (with HI 76409/4 probe)

ACCESSORIES

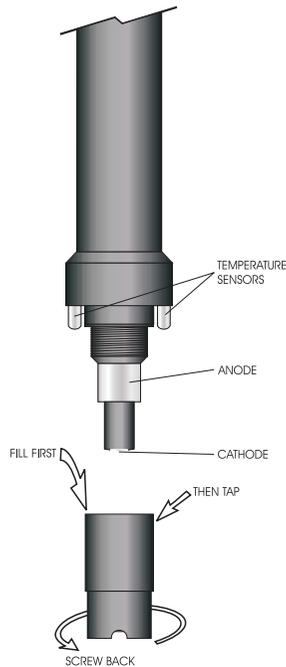
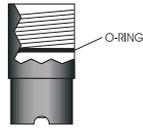
- HI 76409/4* Galvanic D.O. probe with built-in temperature sensor and 4 m cable
- HI 76409/10* Galvanic D.O. probe with built-in temperature sensor and 10 m cable
- HI 76409-0 Protective sleeve for HI 76409 probes series
- HI 76409A/P Membrane for HI 76409 probes series, 5 pcs.
- HI 7040L Zero Oxygen Solution, 500 ml bottle
- HI 7042S Electrolyte solution, 30 ml bottle
- HI 731326 Calibration screwdriver (20 pcs.)

* To be substituted by authorized technical personnel only

PROBE PREPARATION

All Hanna D.O. probes are shipped dry. To hydrate the probe and prepare it for use proceed as follows:

1. Remove the black & red plastic cap. This cap is used for shipping purposes only and can be thrown away.
2. Insert the supplied O-ring in the membrane (see figure).
3. Rinse the supplied membrane (HI 76409A) with electrolyte while shaking it gently. Refill with clean electrolyte. Gently tap the membrane over a surface to ensure that no air bubbles remain trapped. To avoid damaging the membrane, do not touch it with your fingers.



4. Whilt the sensor facing down screw the cap clockwise to the end of the threads. Some electrolyte will overflow.

CALIBRATION

Calibration is a very simple 1-point procedure, performed in air. Ensure the probe is ready for measurements, i.e. the membrane is filled with electrolyte (see "Probe Preparation" section for details). Switch the meter on, select the % mode and turn the % trimmer to display 100%.

If the environmental relative humidity is lower than 30%, pour some deionized water (approx. 3 mm) in the white cap supplied with the membrane. Insert the probe in the cap and calibrate.



Keep the probe in vertical position to avoid any contact of the membrane with the water.

Note: For best accuracy, calibration should be performed on the measurement site, and the probe should be at the same temperature as the air.

Note: After replacing the membrane or the electrolyte solution, wait a few minutes for the reading to stabilize.

TAKING MEASUREMENTS

Ensure the meter has been calibrated. Ensure the temperature sensors are immersed in the sample to be tested.

The D.O. reading can be displayed in % air saturation or in mg/L; press the corresponding key to enter the desired mode. The instrument also measures the temperature. Press the °C/°F button to display the temperature value in the desired unit. The salinity coefficient is also displayed on the LCD. Press SAL key to enter/exit salinity setup menu. Use ARROW keys to modify salinity coefficient.

For accurate dissolved oxygen measurements a water movement of at least 5-7 cm/sec is required. In this way a constant replenishment of the oxygen-depleted membrane surface is ensured.

During field measurements, this condition may be achieved by manually agitating the probe into the solution being measured. Accurate readings are not possible in still water.

During laboratory operations, the use of a magnetic stirrer is recommended.

Note: For some particular applications, such as fish farming, the membrane can be sterilized with stabilized iodine (20 to 50 ppm), typically used for this purpose.

Note: For use in harsh environments, it is recommended to protect the membrane with the optional HI 76409-0 sleeve. The response time will slightly slow down.

SALINITY COMPENSATION

Oxygen measurements can be compensated for salinity factor and the correction value can be set by the user.

Press SAL to enter/exit salinity coefficient menu, with the help of the ARROW keys adjust to the desired coefficient value (within the 0 to 51 g/L range).

ALTITUDE COMPENSATION

When salinity compensation is not required (i.e. not salty water), the SAL indicator can be used to set the altitude correction value. Press the SAL button. Use ARROW keys to set desired altitude. See below table for reference:

ALTITUDE	g/L	ALTITUDE	g/L
250 m	6	1250 m	26
500 m	11	1500 m	31
750 m	17	1750 m	36
1000 m	22	2000 m	40

Press SAL key to exit.

PROBE & MEMBRANE MAINTENANCE

For a top performance probe, it is recommended to replace the membrane every 2 months and the electrolyte once a month.

Proceed as follows:

- Unscrew the membrane by turning it counterclockwise.
- Rinse the supplied spare membrane (HI 76409A) with some electrolyte solution while shaking it gently. Refill with clean electrolyte.
- Gently tap the membrane over a surface to ensure that no air bubbles remain trapped.
- Whilt the sensor facing down screw the cap clockwise to the end of the threads. Some electrolyte will overflow.

If any deposit scales the sensors, gently brush the sensor surface with the supplied scouring pad, while paying attention to not damage the plastic body.

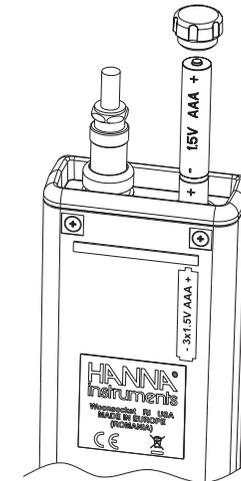
BATTERY REPLACEMENT

When the battery level is low, "BATT" tag is displayed blinking on the LCD to advise the user that approx. 1 hour of working time is left.

It is recommended to change the batteries as soon as the battery indicator blinks.

To replace the batteries, follow the next steps:

- Turn OFF the instrument.
- Open the battery compartment cap (located on the top of the instrument).
- Remove old batteries.
- Insert three new 1.5V AAA batteries in the battery compartment, following the instructions on the rear of the instrument.
- Reattach the battery compartment cap.



The instrument is provided with the BEPS (Battery Error Prevention System) feature, which automatically turns the instrument off when the battery level is too low to ensure reliable readings. At start up the display will show "0 % BATT" message for a few seconds, then the instrument automatically turns off.

Recommendations for Users

Before using this product, make sure that it is entirely suitable for the environment in which it is used. Operation of this instrument in residential area could cause unacceptable interference to radio and TV equipment, requiring the operator to take all necessary steps to correct interference. Any variation introduced by the user to the supplied equipment may degrade the instruments' EMC performance. To avoid electrical shock, do not use this instrument when voltages at the measurement surface exceed 24 Vac or 60 Vdc. To avoid damage or burns, do not perform any measurement in microwave ovens.