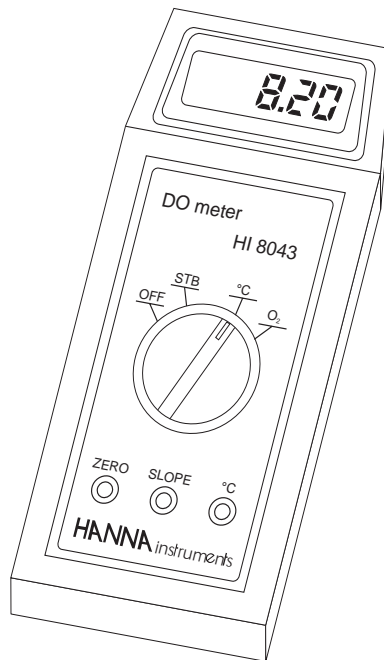


## Instruction Manual

---

# HI 8043

## Portable Dissolved Oxygen Meter



This Instrument is in Compliance with the CE Directives



Dear Customer,  
Thank you for choosing a Hanna Instruments Product.  
Please read this instruction manual carefully before using the instrument.  
This manual will provide you with all the necessary information for the correct use of the instrument, as well as a more precise idea of its versatility in a wide range of applications.  
This instrument is in compliance with the **CE**.

#### **TABLE OF CONTENTS**

Preliminary Examination .....	1
General Description .....	1
Functional Description Probe .....	2
Functional Description Meter .....	3
Specifications .....	4
Initial Probe Preparation .....	5
Dissolved Oxygen Calibration .....	7
Temperature Calibration .....	13
Taking Measurements .....	14
Probe & Membrane Maintenance .....	15
Battery Replacement .....	17
Accessories .....	18
Warranty .....	19
CE Declaration of Conformity .....	21



1

**PRELIMINARY EXAMINATION**

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

In addition to this manual you should find the following items:

- DO Meter
- DO Probe (HI 76401)
- Membrane cap (2 pcs)
- O-ring (2 pcs)
- Protective cap
- 30 mL electrolyte solution (HI 7041S)
- Screwdriver for calibration purposes
- 9V battery

**Note:** Save all packing material until you are sure that the instrument functions correctly. All defective items must be returned in the original packaging with the supplied accessories.

**GENERAL DESCRIPTION**

**HI 8043** is a portable meter for Dissolved Oxygen measurements.

It is housed in a lightweight case, with an easy-to-read LCD.

Dissolved oxygen and temperature measurements can be performed in the field (wastewater treatment, fish-farming, water analysis, etc.) as well as in the laboratory without compromising accuracy.

Dissolved oxygen is indicated in mg/l (ppm) and this value is compensated for the temperature effect (ATC).

The dissolved oxygen probe has a membrane covering the polarographic sensors and a built-in thermistor for temperature measurements and compensation. The thin permeable mem-

1

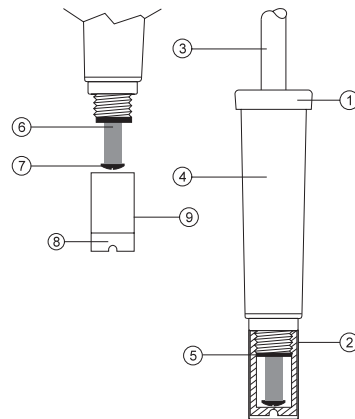
2

brane isolates the sensor elements from the sample tested, but allows oxygen to enter.

A voltage is applied across the sensor, and the oxygen that has passed through the membrane reacts causing the current to flow, hence determining a reading.

A convenient feature of the instrument is its standby mode which keeps the probe polarized and ready for instant measurements.

**FUNCTIONAL DESCRIPTION PROBE**

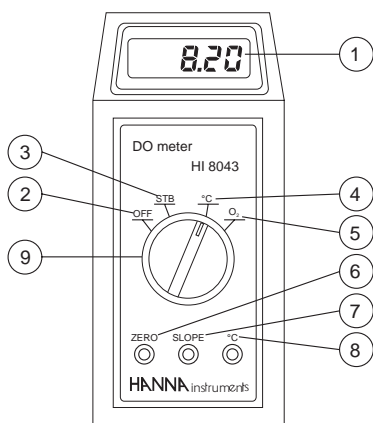


1. D.O. Probe
2. Protective Cap
3. Watertight Shielded Cable
4. Probe Body
5. O-Ring Seal
6. Silver Chloride Anode
7. Platinum Cathode (sensor)
8. Oxygen Permeable Teflon Membrane
9. Membrane Cap

2

3

**FUNCTIONAL DESCRIPTION**



1. Liquid Crystal Display
2. "OFF" (to switch the meter off)
3. "STB" (to switch the meter on and polarize the probe. Use this standby position without switching the meter off if you are going to take further measurements)
4. "°C" Measurement
5. "O<sub>2</sub>" Measurement
6. ZERO Calibration Trimmer
7. SLOPE Calibration Trimmer
8. °C Calibration Trimmer
9. Rotary Switch

3

4

**SPECIFICATIONS**

<b>Range</b>	<b>DO</b>	0.00 to 19.99 mg/l
	<b>°C</b>	0.0 to 50.0°C (32 to 122 °F)
<b>Resolution</b>	<b>DO</b>	0.01 mg/l
	<b>°C</b>	0.1°C
<b>Accuracy</b>	<b>DO</b>	±1.5% of full scale
	<b>°C</b>	±0.5°C
<b>Typical EMC</b>	<b>DO</b>	±1.5% of full scale
<b>Deviation</b>	<b>°C</b>	±1°C
<b>Calibration</b>	Manual on 2 points	
<b>Temperature Compensation</b>	Automatic from 0 to 30°C (32 to 86°F)	
<b>Probe</b>	HI 76401 polarographic with 3 m cable	
<b>Battery</b>	9V / 100 hours of continuous use	
<b>Environment</b>	0 to 50°C (32 to 122°F); 95% RH	
<b>Dimensions</b>	180 x 83 x 40 mm (7.1 x 3.3 x 1.6")	
<b>Weight</b>	650 g (23 oz.) with probe and soft carrying case	

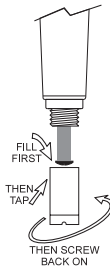
4

**INITIAL PROBE PREPARATION**

**PROBE PREPARATION**

All probes shipped from Hanna Instruments are dry. To hydrate the probe and prepare it for use, connect it to the meter and proceed as follows.

- 1 Remove the red and black plastic cap. This cap is for shipping purposes and can be thrown away.
- 2 Wet the sensor by soaking the bottom 2½ cm (1") of the probe in electrolyte (*HI 7041S*) for 5 minutes.
- 3 Rinse the membrane (*HI 76407A* supplied in the kit with the meter) with electrolyte while shaking it gently. Refill with clean electrolyte.
- 4 Gently tap the sides of the membrane with your finger tip to ensure that no air bubbles remain trapped. To avoid damaging the membrane, do not tap the membrane directly on the bottom.
- 5 Make sure that the rubber O-ring sits properly inside the membrane cap.
- 6 With the sensor facing down, screw the cap clockwise. Some electrolyte will overflow.



When not in use, place the protective cap supplied in the kit with the meter.



**PROBE POLARIZATION**

When the probe is under polarization it is continuously fed with a voltage of approximately 800 mV.

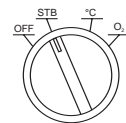
Probe polarization is essential for stable measurements to be taken with the same recurring degree of accuracy.

In the presence of the polarized probe, oxygen is continually "consumed" by passing through the sensitive diaphragm and dissolving in the electrolyte solution contained in the probe.

If this operation is interrupted, the electrolyte solution continues to be enriched with oxygen until it reaches an equilibrium with the surrounding solution.

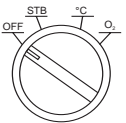
Whenever measurements are taken with a non-polarized probe, the oxygen level detected by the meter is both that of the tested sample as well as the oxygen present in the electrolyte solution itself.

By leaving the instrument in the "STB" mode, which signifies keeping the probe in a continual state of polarization, the oxygen which is present in the electrolyte solution is progressively "consumed", and the following measurements detect only the quantity of oxygen present in the sample to be tested.



Therefore, in order to keep the probe continuously polarized it is necessary to switch the meter to the "STB" mode and wait for at least 30 minutes. This should be done with the probe covered with the protective cap and filled with some electrolyte solution.

Polarization is not maintained when the instrument is switched to the "OFF" position.



**DISSOLVED OXYGEN CALIBRATION**

The calibration should be verified:

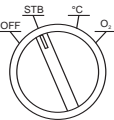
- After approximately 20 hours of use.
- Whenever the electrolyte or membrane is changed and after cleaning the electrode.
- After excessive use in aggressive solutions.

Accessories:

- 200 cc of HI 7040 solution
- 1 bottle of HI 7041 solution

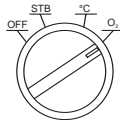
Procedure for calibration at sea level:

- If you are starting from the "OFF" position, switch to "STB" and wait 30 minutes for complete polarization of the probe before proceeding to the calibration procedure.

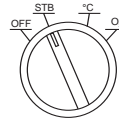


**ZERO CALIBRATION:**

- Switch from "STB" position to "O<sub>2</sub>" position.
- Remove the protective cap and immerse the probe in the HI 7040 zero oxygen solution and wait for approximately 5 minutes.
- The indications given by the instrument must fall to stabilization levels. If the probe has not been sufficiently polarized, the readout will continue to fluctuate.



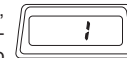
In this case, switch back to "STB" position, place the protective cap and wait for a few hours for complete polarization before proceeding.



- Using a small screwdriver, turn the Zero Calibration screw until the display reads zero.



- If the zero point is passed, "1" will appear on the display. If you cannot get zero reading the probe is probably defective, in which case you should check the membrane, electrode and electrolyte solution (see below).



Rinse the probe thoroughly with normal tap water after the zero calibration has been completed.

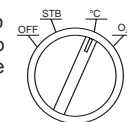
**SLOPE CALIBRATION:**

In order to perform a highly accurate calibration, take a B.O.D. bottle and then fill with water to a depth of 1 or 2 cm (1/2 or 3/4"), then seal the bottle with the probe inside.

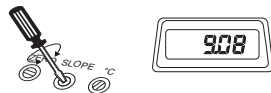
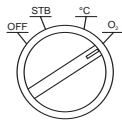


If this calibration is to be carried out with the bottle opened to air rather than according to the conditions described above, the margin of error is approximately 0.1 ppm.

- Switch the instrument to "°C", wait for readings to stabilize and then note the temperature of the water.



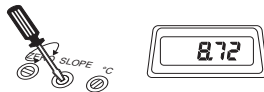
- Refer to Table 1 on page 10 for the corresponding dissolved oxygen reading at that temperature.
- Switch to "O<sub>2</sub>" position and adjust the "Slope" trimmer until the correct reading is displayed; e.g. at 20.5°C the trimmer should be adjusted until display reads 9.08.



**CORRECTION FOR ALTITUDE EFFECT**

If the calibration is not performed at sea level a correction should be made for the difference in altitude according to Table 2 on page 11; e.g. if calibrated at 20.5°C at an altitude of 300 m above sea level, the display should be adjusted to

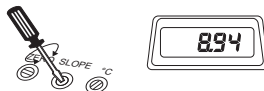
$$9.08 \times 0.96 = 8.72.$$



**CORRECTION FOR SALINITY EFFECT**

Another correction has to be performed if the sample presents significant salinity concentrations. In such case, the reading has to be adjusted according to Table 3 on page 12; e.g. if calibrated at 20.5°C and the sample has a salinity content of 3 g/l, the display should be set at

$$9.08 - (3 \times 0.0478) = 8.94.$$



**Table 1**  
Dissolved Oxygen (ppm) in Fresh Water  
as a function of Temperature (°C)

°C	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	14.62	14.58	14.54	14.50	14.46	14.43	14.39	14.35	14.31	14.27
1	14.23	14.19	14.15	14.11	14.07	14.03	14.00	13.96	13.92	13.88
2	13.84	13.80	13.77	13.73	13.70	13.66	13.62	13.59	13.55	13.52
3	13.48	13.45	13.41	13.38	13.34	13.31	13.27	13.24	13.20	13.17
4	13.13	13.10	13.06	13.03	13.00	12.97	12.93	12.90	12.87	12.83
5	12.80	12.77	12.74	12.70	12.67	12.64	12.61	12.58	12.54	12.51
6	12.48	12.45	12.42	12.39	12.36	12.33	12.29	12.26	12.23	12.20
7	12.17	12.14	12.11	12.08	12.05	12.02	11.99	11.96	11.93	11.90
8	11.87	11.84	11.81	11.79	11.76	11.73	11.70	11.67	11.65	11.62
9	11.59	11.56	11.54	11.51	11.49	11.46	11.43	11.41	11.38	11.36
10	11.33	11.31	11.28	11.26	11.23	11.21	11.18	11.16	11.13	11.11
11	11.08	11.06	11.03	11.01	10.98	10.96	10.93	10.91	10.89	10.85
12	10.83	10.81	10.78	10.76	10.74	10.72	10.69	10.67	10.65	10.62
13	10.60	10.58	10.55	10.53	10.51	10.49	10.46	10.44	10.42	10.39
14	10.37	10.35	10.33	10.30	10.28	10.26	10.24	10.22	10.19	10.17
15	10.15	10.13	10.11	10.09	10.07	10.05	10.03	10.01	9.99	9.97
16	9.95	9.93	9.91	9.89	9.87	9.84	9.82	9.80	9.78	9.76
17	9.74	9.72	9.70	9.68	9.66	9.64	9.62	9.60	9.58	9.56
18	9.54	9.52	9.50	9.48	9.46	9.44	9.43	9.41	9.39	9.37
19	9.35	9.33	9.31	9.30	9.28	9.26	9.24	9.22	9.21	9.19
20	9.17	9.15	9.13	9.12	9.10	9.08	9.06	9.04	9.03	9.01
21	8.99	8.97	8.96	8.94	8.93	8.91	8.89	8.88	8.86	8.85
22	8.83	8.82	8.80	8.79	8.77	8.76	8.74	8.73	8.71	8.70
23	8.68	8.67	8.65	8.64	8.62	8.61	8.59	8.53	8.56	8.55
24	8.53	8.52	8.50	8.49	8.47	8.46	8.44	8.53	8.41	8.40
25	8.38	8.36	8.35	8.33	8.32	8.30	8.28	8.27	8.25	8.24
26	8.22	8.21	8.19	8.18	8.16	8.15	8.13	8.12	8.10	8.09
27	8.07	8.06	8.04	8.03	8.01	8.00	7.98	7.97	7.95	7.94
28	7.92	7.91	7.89	7.88	7.86	7.85	7.83	7.82	7.80	7.79
29	7.77	7.76	7.74	7.73	7.71	7.70	7.69	7.67	7.66	7.64
30	7.63	7.62	7.60	7.59	7.58	7.57	7.55	7.54	7.53	7.51
31	7.50	7.49	7.48	7.47	7.46	7.45	7.44	7.43	7.42	7.41
32	7.40	7.39	7.38	7.37	7.36	7.35	7.34	7.33	7.32	7.31
33	7.30	7.29	7.28	7.27	7.26	7.25	7.24	7.23	7.22	7.21
34	7.20	7.19	7.18	7.17	7.16	7.15	7.14	7.13	7.12	7.11
35	7.10	7.09	7.08	7.07	7.06	7.05	7.04	7.03	7.02	7.01
36	7.00	6.99	6.98	6.97	6.96	6.95	6.94	6.93	6.92	6.91
37	6.90	6.89	6.88	6.87	6.86	6.85	6.84	6.83	6.82	6.81
38	6.80	6.79	6.78	6.77	6.76	6.75	6.74	6.73	6.72	6.71
39	6.70	6.69	6.68	6.67	6.66	6.65	6.64	6.63	6.62	6.61
40	6.60	6.59	6.58	6.57	6.56	6.55	6.54	6.53	6.52	6.51
41	6.50	6.49	6.48	6.47	6.46	6.45	6.44	6.43	6.42	6.41
42	6.40	6.39	6.38	6.37	6.36	6.35	6.34	6.33	6.32	6.31
43	6.30	6.29	6.28	6.27	6.26	6.25	6.24	6.23	6.22	6.21
44	6.20	6.19	6.18	6.17	6.16	6.15	6.14	6.13	6.12	6.11
45	6.10	6.09	6.08	6.07	6.06	6.05	6.04	6.03	6.02	6.01
46	6.00	5.99	5.98	5.97	5.96	5.95	5.94	5.93	5.92	5.91
47	5.90	5.89	5.88	5.87	5.86	5.85	5.84	5.83	5.82	5.81
48	5.80	5.79	5.78	5.77	5.76	5.75	5.74	5.73	5.72	5.71
49	5.70	5.69	5.68	5.67	5.66	5.65	5.64	5.63	5.62	5.61
50	5.60	5.59	5.58	5.57	5.56	5.55	5.54	5.53	5.52	5.51

**Table 2**  
Correction for measurements  
at different altitude

ALTITUDE (METERS)	ATMOSPHERIC PRESSURE KPa	CORRECTION FACTOR
Sea level	101.3	1.00
50	100.7	0.99
100	100.1	0.99
150	99.4	0.98
200	98.8	0.98
300	97.6	0.96
400	96.4	0.95
500	95.2	0.94
600	94.0	0.93
700	92.8	0.92
800	91.7	0.90
900	90.5	0.89
1000	89.4	0.88
1100	88.3	0.87
1200	87.2	0.86
1300	86.1	0.85
1400	85.0	0.84
1500	84.0	0.83
1600	82.9	0.82
1700	81.9	0.81
1800	80.9	0.80
1900	79.9	0.79

**Table 3**  
Correction for salinity effect

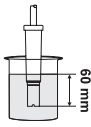
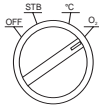



°C	Quantity to be subtracted per mg/l of NaCl	°C	Quantity to be subtracted per mg/l of NaCl
0	0.0892	26	0.0410
1	0.0861	27	0.0400
2	0.0830	28	0.0391
3	0.0802	29	0.0382
4	0.0779	30	0.0373
5	0.0749	31	0.0364
6	0.0724	32	0.0356
7	0.0701	33	0.0348
8	0.0678	34	0.0341
9	0.0657	35	0.0333
10	0.0637	36	0.0326
11	0.0618	37	0.0319
12	0.0599	38	0.0312
13	0.0582	39	0.0306
14	0.0565	40	0.0299
15	0.0549	41	0.0293
16	0.0533	42	0.0287
17	0.0519	43	0.0281
18	0.0505	44	0.0275
19	0.0491	45	0.0270
20	0.0478	46	0.0265
21	0.0466	47	0.0259
22	0.0454	48	0.0254
23	0.0442	49	0.0249
24	0.0431	50	0.0244
25	0.0421		



13

### TEMPERATURE CALIBRATION

The temperature should be calibrated at least every 3 months or whenever the readings are in doubt, using the following procedure:

- Immerse the bottom 60 mm (2.4") of the probe in a beaker of water. 
- Switch the instrument to °C. 
- Agitate the water for at least 10 minutes until thermal equilibrium between the probe and water is achieved. 
- Check the temperature of the water using ChecktempC or a thermometer with a resolution of 0.1°C (e.g. 20.0°C). 
- Adjust the °C trimmer until the display reads the thermometer temperature value. 

**Note:** It is important to ensure thermal equilibrium between probe and the water as 1 degree of temperature difference entails an error of  $\pm 3\%$  in dissolved oxygen measurement.

13

14

### TAKING MEASUREMENTS

Make sure the meter has been calibrated and the protective cap has been removed.

Immerse the tip of the probe in the sample to be tested.

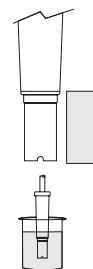
For accurate dissolved oxygen measurements a water movement of 0.3 m/sec is required at a minimum. This is to ensure that the oxygen-depleted membrane surface is constantly replenished. A moving stream will provide adequate circulation.

To quickly check if the water speed is sufficient, wait for the reading to be stable and then move the D.O. probe. If the reading is still stable, the measurement conditions are right, while if the reading increases the water movement is too low.

During field measurements, this condition may be met by manually agitating the probe. Accurate readings are not possible while the liquid is at rest.

During laboratory measurements, the use of a magnetic stirrer to ensure a certain velocity in the fluid is recommended. In this way, errors due to the diffusion of the oxygen present in the air in the solution are reduced to a minimum.

At all times, the time necessary for thermal equilibrium to occur between the probe and the sample must be allowed (a few minutes for temperature difference of several degrees).



14

### PROBE & MEMBRANE MAINTENANCE

The oxygen probe body is made of reinforced plastic for maximum durability.

A thermistor temperature sensor provides temperature measurements of the sample tested. It is always recommended that the protective cap be kept on the probe when the probe is not in use to provide protection against damage and dirt.

**To replace the membrane** or refill it with electrolyte, proceed as follows:

- Remove the protective cap by gently twisting and pulling it off the body of the probe (see fig. 1).
- Unscrew the membrane by turning it counter-clockwise with the other hand (see fig.2)
- Wet the sensor by soaking the bottom 2½ cm (1") of the probe in electrolyte (**HI 7041S**) for 5 minutes.
- Rinse the new membrane (**HI 76407A**) supplied with the meter with electrolyte while shaking it gently. Refill with clean electrolyte.
- Gently tap the sides of the membrane with your finger tip to ensure that no air bubbles remain trapped. Do not directly tap the bottom with your finger as this will damage the membrane.

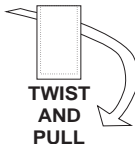


fig. 1

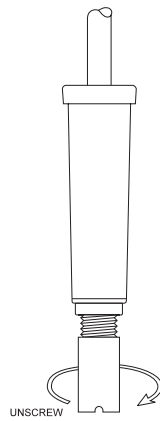


Fig. 2

- Make sure that the rubber O-ring is seated properly inside the membrane cap.
- With the sensor facing down, screw the membrane cap clockwise. Some electrolyte will overflow.

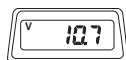
The Platinum cathode (#8 in the Functional Description at page 2) should always be bright and untarnished. If it is tarnished or stained, which could be due to contact with certain gases or extended use with a loose or damaged membrane, the cathode should be cleaned. You can use a clean lint-free cardboard or cloth. Rub the cathode very gently side to side 4-5 times. This will be enough to polish and remove any stains without damaging the platinum tip. Afterwards, rinse the probe with deionized or distilled water and install a new membrane cap using fresh electrolyte and follow the steps above. Recalibrate the instrument.

**Important:** in order to have accurate and stable measurements, it is important that the surface of the membrane is in perfect condition. This semipermeable membrane isolates the sensor elements from the environment but allows oxygen to enter. If any dirt is observed on the membrane, rinse carefully with distilled or deionized water. If any imperfections still exist, or any damage is evident (such as wrinkles or tears - holes), the membrane should be replaced. Make sure that the O-Ring is properly seated in the membrane cap.

17

### BATTERY REPLACEMENT

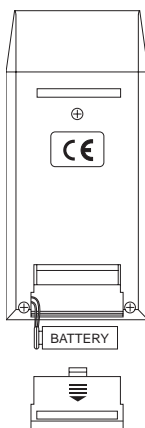
When the battery is rundown "V" is displayed on the Liquid Crystal Display to warn the user.



This is to inform the user that the display will be shut-off after about 4 hours of use to prevent erroneous measurements being taken due to low voltage.

Battery replacement must only take place in a non hazardous area using the battery types specified in this instruction manual (see page 17).

In order to replace rundown batteries, simply slide the cover off and replace the 9V battery with a new one.



17

18

### ACCESSORIES

<b>BATT9/P</b>	9V battery (10 pcs)
<b>HI 7040M</b>	Zero Oxygen calibration solution, 230 mL
<b>HI 7040L</b>	Zero Oxygen calibration solution, 460 mL
<b>HI 7041S</b>	Refilling Electrolyte solution, 30 mL
<b>HI 76401</b>	D.O. probe with 3 meters (10') cable
<b>HI 76407A/P</b>	5 spare membranes
<b>HI 76501/P</b>	Screwdrivers, length 90 mm for calibration purposes (20 pcs)
<b>MAN8043R1</b>	Instruction manual

18

### WARRANTY

All Hanna Instruments **meters are warranted for two years** against defects in workmanship and materials when used for their intended purpose and maintained according to the instructions. The **probes are warranted for a period of six months**.

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


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 failure. If the repair is not covered by the warranty, you will be notified of the charge for repair or replacement. If the instrument is to be returned to Hanna Instruments, obtain a Return Goods Authorization from the Customer Service Department first and then send it with shipment cost prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.

To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase.

*All rights are reserved. Reproduction in whole or in part is prohibited without the written consent of the copyright owner.*

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

# CE DECLARATION OF CONFORMITY



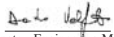
**CE**  
*DECLARATION OF CONFORMITY*

We  
Hanna Instruments Srl  
Via delle industrie 12  
35010 Ronchi di Villafranca (PD)  
ITALY

herewith certify that the dissolved oxygen meter  
**HI 8043**  
has been tested and found to be in compliance with the following regulations:

<b>IEC 801-2</b>	Electrostatic Discharge
<b>IEC 801-3</b>	RF Radiated
<b>EN 55022</b>	Radiated, Class B

Date of Issue: 04-04-1996

  
D. Volpato - Engineering Manager  
On behalf of  
Hanna Instruments S.r.l.

### 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 interferences to radio and TV equipments, requiring the operator to take all necessary steps to correct interferences.

Any variation introduced by the user to the supplied equipment may degrade the instrument's EMC performance.

To avoid damages or burns, do not perform any measurement in microwave ovens.

MAN8043R1  
07/96



*Stay in Touch with the Manufacturer!*