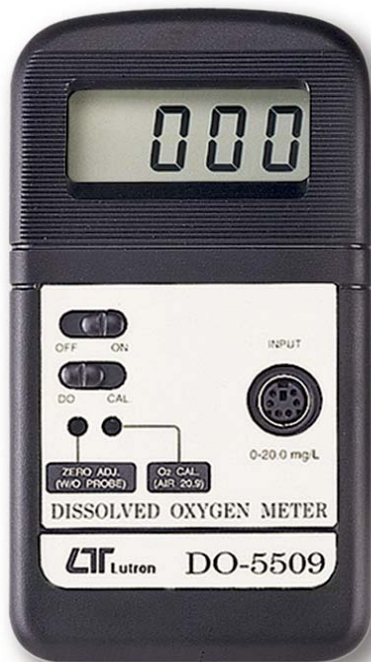


DISSOLVED OXYGEN METER

Model : DO-5509



Your purchase of this DISSOLVED OXYGEN METER marks a step forward for you into the field of precision measurement.

Although this DISSOLVED OXYGEN METER is a complex and delicate instrument, its durable structure developed. Please read the following instructions carefully and always keep this manual within easy reach.

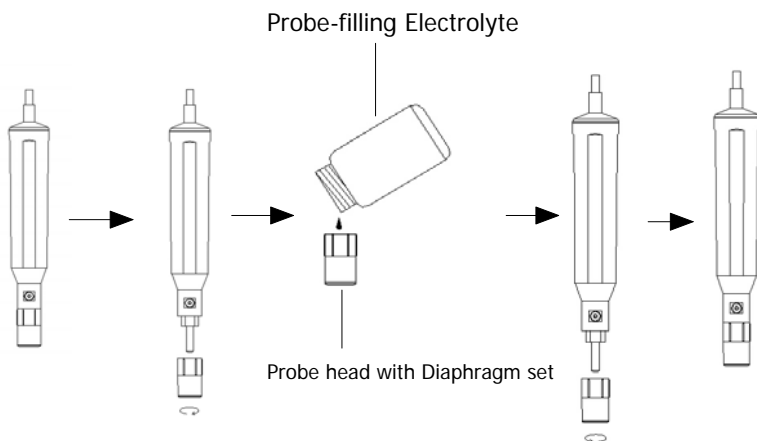
OPERATION MANUAL

ATTENTION :



Fill the Probe's Electrolyte at first.

Intend to keep the DO probe under the best condition, when user receive the **DIGITAL OXYGEN METER** along the **PROBE**, it should fill the **Probe's Electrolyte at first.**



The procedures that to fill the Probe's Electrolyte, refer the chapter 8 " PROBE MAINTENANCE ", page 9 .

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1. GENERAL DESCRIPTIONS

This Digital Dissolved Oxygen Meter is supplied with a polarographic type probe with an incorporated Temp. sensor which serves for precise Dissolved Oxygen (DO) and Temp. measurement.

Applications for Aquarium, Medical research, Agriculture, Fish hatcheries, Laboratory, Water conditioning, Mining industry, Schools & Colleges, Quality control...

2. SPECIFICATIONS

Display	13 mm (0.5") LCD, 3 1/2 digits.
Measurement Range	Dissolved Oxygen - 0 to 20.0 mg/L.
Resolution	0.1 mg/L..
Accuracy	± 0.4 mg/L. (after calibration within 23± 5 °C)
Sensor Temp. Compensation	Automatic from 0 to 40°C
Panel adj. knob	ZERO knob, CAL knob.
Battery	006P DC 9V battery (heavy duty).
Power Consumption	Approx. DC 3.5 mA.
Operating Temp.	0 °C to 50 °C (32 °F to 122 °F).
Operating Humidity	Less than 80% RH.
Dimension	<i>Main instrument :</i> 131 x 70 x 25 mm (5.2 x 2.8 x 1.0 inch). <i>Oxygen probe :</i> 190 mm x 28 mm Dia. (7.5" x 1.1" Dia.) <i>Probe cable length :</i> 4 meters
Weight	390 g (0.86 LB) - with probe & battery.

Accessories Included	Oxygen probe(OXPB-09N)..... 1 PC. Spare Probe head with Diaphragm set OXHD-04.....2 set Probe-filling Electrolyte OXEL-03.....1 set
Optional Accessories	* Oxygen probe..... OXPB-09N * Spare Probe head with Diaphragm set OXHD-04 * Probe-filling Electrolyte..... OXEL-03 * Hard carrying case..... CA-06

3. FRONT PANEL DESCRIPTION

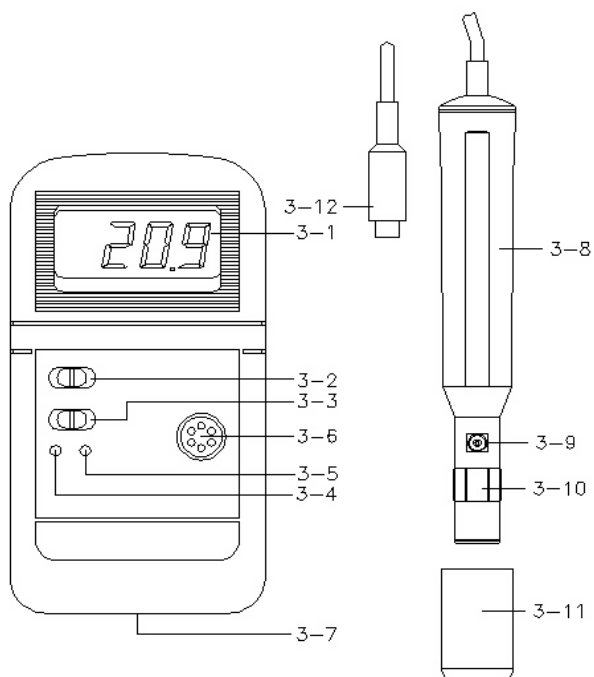


Fig. 1

- | | |
|-------------------------------|--------------------------------------|
| 3-1 Display | 3-8 Oxygen Probe handle |
| 3-2 Off/On Switch | 3-9 Temperature sensor |
| 3-3 Do/Cal Switch | 3-10 Probe head with diaphragm |
| 3-4 Zero Adj. VR | 3-11 Protection cover for probe head |
| 3-5 CAL VR | 3-12 Oxygen probe plug |
| 3-6 Input Socket | |
| 3-7 Battery compartment Cover | |

4 MEASURING PROCEDURE

4-1 Calibration

Before measurement, need to make following calibration procedures:

- 1) Disconnect the " OXYGEN PROBE plug " (3-12, Fig. 1) from the main instrument " Input socket " (3-6, Fig. 1).
- 2) Power on the instrument by select the " On/Off Switch " (3-2, Fig. 1) to the " On " position.
Slide the " DO / CAL Switch " (3-3, Fig. 1) to the " CAL " position. Adjust the " ZERO Adj. VR " (3-4, Fig. 1) until the display show zero value.
- 3) Power off, connect the " OXYGEN PROBE plug " (3-12, Fig. 1) to the main instrument " Input Socket " (3-6, Fig. 1), then power on. Wait 5 minutes at least until the display reading values become stable & no fluctuation. Adjust the " CAL Adj. VR " (3-5, Fig. 1) until the display reading show the values exact same as 20.9
(As the oxygen in air is 20.9 % typically, so use the environment air O2 value for quick & precise calibration)

Calibration consideration :

Please make calibration procedures under wide and ventilating environment for best effect.

4-2 Dissolved Oxygen (DO) measurement

- 1) After the meter be calibrated (above procedure 4-1), don't adjust the " CAL Adj. VR " & " ZERO Adj. VR " again until next calibration procedures be done.
- 2) Slide the " DO / CAL Switch " (3-3, Fig. 1) to the " DO " position.

- 3) a. Immersed the probe to a depth at least 10 cm of the measured liquid in order for the probe to be influenced by the temp. & automatic temperature compensation to take place
b. As for the thermal equilibrium to occur between the probe & the measurement sample must be allowed to pass, which usually amounts to a few minutes if the temp. difference between the two is only several C degrees.
- 4) a. In order to measure the dissolved oxygen content in any given liquid, it is sufficient to immerse the tip of the probe in the solution, making sure that velocity of the liquid coming into contact with the probe is at least 0.2 - 0.3 m/s or shake the probe.
b. During laboratory measurements, the use of a magnetic agitator 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 reduce to a minimum.
- 5) Rinsed the probe accurately with normal tap water after each series of measurement.

4-3 Measuring Consideration for different Atmospheric Pressure

Bear in mind that the above calibration concerning of the DO measurement is considered be taken at sea level; otherwise need to correct as the following formula:

$$DO' = DO \times P / 760$$

x : multiply / : divide

DO'---- The dissolved measurement values (mg/L) under the P mmHg atmospheric pressure.

DO ---- The dissolved measurement values (mg/L) under the 760 mmHg atmospheric pressure (sea level).

P ---- The atmospheric pressure(P mmHg) of the measured environment.

4-4 Measuring Consideration for different SALT Solution

The values that show in the display is intend to measure the dissolved oxygen into the liquid that not exist " salt ". However if the measured liquid contain the salt (Cl), the real dissolved oxygen values should be re-calculated according the following formula :

$$DO = DO' \times (1 - (A \text{ ppm} / 100000))$$

x : multiply / : divide

DO'----The dissolved oxygen value that show on the instrument.

DO ----The real dissolved values after be re-caculated.

A ppm -- The Cl values (unit : ppm) that exist in the measured liquid.

For example if the solution contain salt for 5000 ppm Cl and display values is 5.01 mg/L. Then the real DO values is equal :

$$5.01 \times (1 - (5000 / 100000)) = 4.76 \text{ mg/L.}$$

5. PROBE MAINTENANCE

User first time to use the meter :

Intend to let the DO probe keep the best condition. When user receive the **DIGITAL OXYGEN METER** along the **PROBE**, it should fill the Probe's Electrolyte at first.

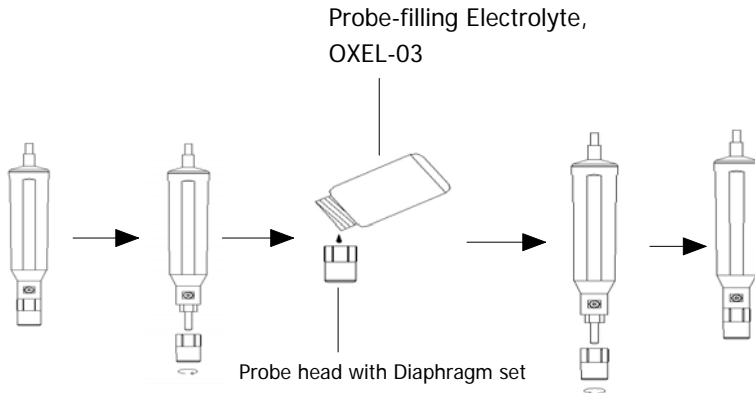
User already use the meter for a certain period :

Whenever user can not calibrate the meter properly or the meter's reading value is not stable, please check the oxygen probe to see if the electrolyte in the probe head container is run out or the diaphragm (probe head with diaphragm set) exist problem (dirty). If yes, please fill the electrolyte or change the " Probe head with diaphragm set " and make the new calibration.

The consideration of Diaphragm (probe head with diaphragm set) :

The oxygen probe component is the thin Teflon diaphragm housed in the tip of the probe. The diaphragm is permeable by the oxygen molecules but not by the considerably larger molecules contained in the electrolyte. Due to this characteristic, the oxygen may diffuse throughout the electrolyte solution contained in the probe, and its concentration may be quantified by the measurement circuit.

This sensitive diaphragm is rather delicate & is easily damaged if it comes into contact with solid objects or is subjected to blows. If the diaphragm is damaged or the electrolyte is run out, it must be replaced in the following way :



- 1) Unscrew the " Probe head " (5-3, Fig 2).
- 2) Pour out the old Electrolyte from the container of the " Probe head " .
- 3) Fill the new Electrolyte (OXEL-03) into the container of the " Probe head " .
- 4) Screw the " Probe head " (5-3, Fig 2) into the probe body.

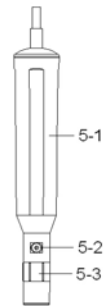


Fig. 2

5-1 Probe handle
 5-2 Temp. sensing metal
 5-3 Probe head

6. BATTERY REPLACEMENT

- 1) When the left corner of LCD display show " LBT ", it is necessary to replace the battery. However, in-spec measurement may still be made for several hours after low battery indicator appears.
- 2) Slide the " Battery Cover " (3-7, Fig. 1) away from the instrument and remove the battery.
- 3) Replace with 9V battery (heavy duty type) and reinstate the cover.
- 4) Make sure the battery cover is secured after changing the battery.