

### **BATTERY REPLACEMENT:**

When the battery becomes weak the meter will display "V".

When the low battery indicator appears, only a few hours of battery life remain. A low battery will result in unreliable measurements. It is recommended to replace the battery immediately.

Battery replacement must only take place in a non-hazardous area using an alkaline 9V battery.

Turn the meter off, slide off the battery compartment cover at the rear of the meter and replace the 9V battery with a new one. Make sure the battery contacts are tight and secure, seat the battery in its compartment and insert the cover again.



### **OPTIONAL ACCESSORIES:**

<b>MA 9070</b>	Zero Oxygen calibration solution, 220 ml
<b>MA 9071</b>	Refilling Electrolyte solution, 220 ml
<b>MA 841</b>	Spare membrane, 5 pcs
<b>MA 840</b>	D.O. probe

### **PROBE POLARIZATION:**

The probe is under polarization with a fixed voltage of approximately 800 mV.

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

With the probe properly polarized, 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 revealed is both that of the tested solution as well as that present in the electrolyte solution. This reading is incorrect.

### **CALIBRATION PROCEDURE:**

The calibration is very simple and fast.

- Make sure the probe is ready for measurements (see Probe Preparation), i.e. the membrane is filled with electrolyte and the probe is connected to the meter.
- Switch the meter on by pressing the ON/OFF key.
- For an accurate calibration, it is recommended to wait at least 15 minutes to ensure conditioning of the probe.
- Remove the protective cap from the D.O. probe.



### Zero Calibration:

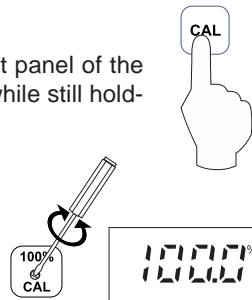
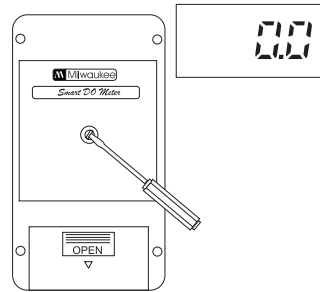
- Dip the probe into **MA9070** zero oxygen solution and stir gently for 2-3 minutes.
- Allow the LCD readout to stabilize.
- Adjust the zero D.O. calibration trimmer (located on the back of the meter) until the display reads "0.0".



### Slope Calibration:

It is suggested to perform the slope calibration in saturated air.

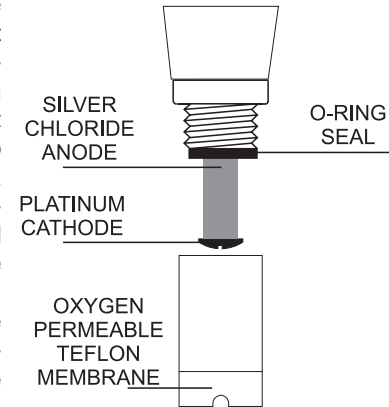
- Rinse the probe with a large amount of clean water to remove any residual zero oxygen solution.
- Dry the probe tip and allow a few minutes for the LCD readout to stabilize.
- Press and hold the CAL key.
- Adjust the slope trimmer on the front panel of the meter to read "100%" on the LCD (while still holding the CAL button).
- Release the CAL key and the LCD will display the value in ppm of oxygen.



The **zero calibration** of the **SM600** is very stable, therefore this procedure needs only to be performed **whenever the probe is replaced**.

However, because the **slope calibration** is more critical, **it is recommended to perform this procedure every week**.

The Platinum cathode should always be bright and untarnished. If it is tarnished or stained, which could be due to contact with certain gases or to an 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.

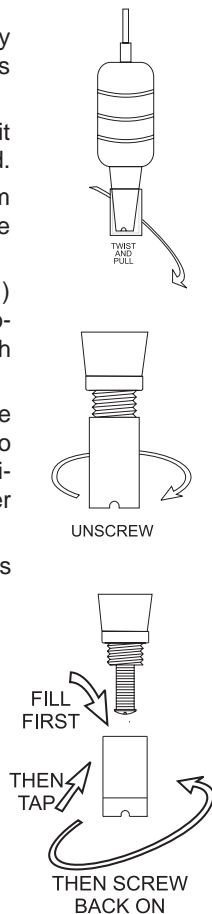


Afterwards, rinse the probe with deionized or distilled water and install a new membrane cap using fresh electrolyte and follow the steps above. Recalibrate the instrument.

**Note:** in order to obtain accurate and stable measurements, it is important that the surface of the membrane be in perfect condition. This semi-permeable membrane isolates the sensor elements from the environment, but allows oxygen to enter. If any dirt is observed on the membrane, rinse it 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.

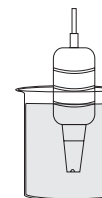
**To replace the membrane** or refill it with electrolyte, proceed as follow:

- Remove the protective cap by gently twisting and pulling it off the probe's body.
- Unscrew the membrane by turning it counter-clock-wise with the other hand.
- Wet the sensor by soaking the bottom 2½ cm of the probe in electrolyte (**MA9071**) for 5 minutes.
- Rinse the new membrane (**MA841**) 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.
- Make sure that the rubber O-ring is seated properly inside the membrane cap.
- With the sensor facing down, screw the membrane cap clock-wise. Some electrolyte will overflow.



**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 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 stabilize 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 not adequate.

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, 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).

**ALTITUDE & SALINITY COMPENSATION:**

If the sample contains salts or if you are performing the measurements at altitude different from sea level, the readout values must be corrected, taking into account the lower degree of oxygen solubility.

**ALTITUDE COMPENSATION:**

All the readouts are referred to sea level, thus the displayed measurements are higher than the actual values. In fact, altitude affects D.O. concentration by decreasing its value. The following table reports the oxygen solubility at various temperatures and altitudes, based on sea level barometric pressure of 760 mmHg.

This gives an idea of the error that can be introduced at different altitudes and allows to calculate the quantity to be subtracted to correct the reading.

°C	Altitude, Meters above Sea Level							°F
	0 m	300 m	600 m	900 m	1200 m	1500m	1800m	
0	14.6	14.1	13.6	13.2	12.7	12.3	11.8	32.0
2	13.8	13.3	12.9	12.4	12.0	11.6	11.2	35.6
4	13.1	12.7	12.2	11.9	11.4	11.0	10.6	39.2
6	12.4	12.0	11.6	11.2	10.8	10.4	10.1	42.8
8	11.8	11.4	11.0	10.6	10.3	9.9	9.6	46.4
10	11.3	10.9	10.5	10.2	9.8	9.5	9.2	50.0
12	10.8	10.4	10.1	9.7	9.4	9.1	8.8	53.6
14	10.3	9.9	9.6	9.3	9.0	8.7	8.3	57.2
16	9.9	9.7	9.2	8.9	8.6	8.3	8.0	60.8
18	9.5	9.2	8.7	8.6	8.3	8.0	7.7	64.4
20	9.1	8.8	8.5	8.2	7.9	7.7	7.4	68.0
22	8.7	8.4	8.1	7.8	7.7	7.3	7.1	71.6
24	8.4	8.1	7.8	7.5	7.3	7.1	6.8	75.2
26	8.1	7.8	7.5	7.3	7.0	6.8	6.6	78.8
28	7.8	7.5	7.3	7.0	6.8	6.6	6.3	82.4
30	7.5	7.2	7.0	6.8	6.5	6.3	6.1	86.0
32	7.3	7.1	6.8	6.6	6.4	6.1	5.9	89.6
34	7.1	6.9	6.6	6.4	6.2	6.0	5.8	93.2
36	6.8	6.6	6.3	6.1	5.9	5.7	5.5	96.8
38	6.6	6.4	6.2	5.9	5.7	5.6	5.4	100.4
40	6.4	6.2	6.0	5.8	5.6	5.4	5.2	104.4

**SALINITY COMPENSATION:**

The table below shows the influence of salt concentration in the measurement of oxygen.

In **SM 600** all the readouts are referred to 0 g/l of salinity value. In fact, salinity affects D.O. concentration by decreasing its value.

The table below reports the oxygen solubility at various temperatures and salinity. From the table it is possible to calculate the quantity to be subtracted to correct the reading.

°C	Salinity (g/l) at Sea Level					°F
	0 g/l	10 g/l	20 g/l	30 g/l	35 g/l	
10	11.3	10.6	9.9	9.3	9.0	50.0
12	10.8	10.1	9.5	8.9	8.6	53.6
14	10.3	9.7	9.1	8.6	8.3	57.2
16	9.9	9.3	8.7	8.2	8.0	60.8
18	9.5	8.9	8.4	7.9	7.6	64.4
20	9.1	8.5	8.0	7.6	7.4	68.0
22	8.7	8.2	7.8	7.3	7.1	71.6
24	8.4	7.9	7.5	7.1	6.9	75.2
26	8.1	7.6	7.2	6.8	6.6	78.8
28	7.8	7.4	7.0	6.6	6.4	82.4

**PROBE & MEMBRANE MAINTENANCE:**

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

A thermistor temperature sensor provides temperature measurements of the tested sample. It is always recommended to keep the protective cap on the probe when not in use, to protect it against damage and dirt.