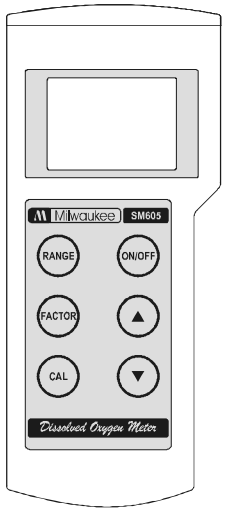
Milwaukee

USER MANUAL

PORTABLE DISSOLVED OXYGEN METER MODEL: SM605

Dissolved Oxygen Meter



WARRANTY:

This instrument is warranted against all defects in materials and manufacturing for a period of two years from the date of purchase. Probe is warranted for six months.

If during this period the repair or replacement of parts is required, and the damage is not because of negligence or erroneous operation by the user, please return the parts to either distributor or our office and the repair will be made free of charge.

Damage due to accident, misuse, tampering or lack of prescribed maintenance are not covered.

Note: We reserve the right to modify the design, construction and appearance of our products without advance notification.

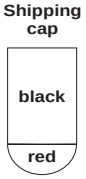
INITIAL OPERATIONS

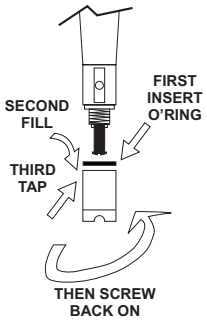
The meter is supplied with a 9V battery. Remove the battery compartment cover on the back of the meter and install the battery while paying attention to its polarity.

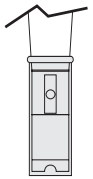
PROBE PREPARATION

D.O. probes are shipped 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 used for shipping purposes only and can be thrown away.
2. Wet the sensor by soaking the bottom 2.5 cm of the probe in electrolyte (**MA9071**) for 5 minutes.
3. Rinse the membrane (supplied with the meter) with electrolyte while shaking it gently. Refill with clean electrolyte.
4. Gently tap the sides of the membrane with the 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. Place rubber O-Ring properly inside the membrane cap.
6. With the sensor facing down, screw the cap clockwise. Some electrolyte will overflow.







When not in use and during polarization, place the protective cap supplied with the meter.

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 inside 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 indicated is both that of the test solution as well as that present in the electrolyte solution. This reading is obviously incorrect.

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 while ensuring that also the temperature sensor is immersed.

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

Anyway, wait the time necessary for thermal equilibrium to occur between the probe and the sample (a few minutes for temperature difference of several degrees).

The meter can display D.O. readings in mg/L (ppm) and in % O_2 (rate of Oxygen saturation with reference to 100% at sea level). Press the RANGE key to select the desired range.

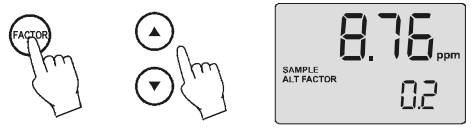
The temperature measurement is always displayed on the lower part of the LCD.

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

Set altitude and salinity compensations before performing calibration and taking measurements. The meter will automatically compensate for these factors.

ALTITUDE COMPENSATION

To enter altitude compensation, press the FACTOR key and the meter will display the "ALT FACTOR" message. Use UP and DOWN keys to set the altitude from 0 to 4.0 km, in steps of 0.1 km.

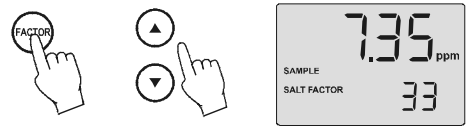


The meter will automatically compensate for altitude (see also the table below for verification).

°C	Altitude, Meters above Sea Level							°F
	0 m	300 m	600 m	900 m	1200 m	1500 m	1800 m	
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

To enter salinity compensation, press the FACTOR key twice and the "SALT FACTOR" message will be displayed. Use UP and DOWN keys to set the salinity between 0 and 80 g/L.



The meter will automatically compensate for salinity effects (see also following table for verification).

℃	Salinity (g/l) at Sea Level					℉
	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

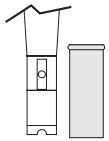
CALIBRATION PROCEDURE

Calibration is simple and is recommended every time the meter is switched on.

- 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 and properly polarized.
- Switch the meter on by pressing the ON/OFF key.

- The "COND" message will be displayed for about 45 seconds to inform the user that the probe is in auto-conditioning mode (automatic polarization) .

- Once “COND” disappears, the probe is polarized and the instrument can be calibrated.
- Remove the protective cap from the D.O. probe.



- Press CAL. "----" appears on the larger LCD together with "CAL" to indicate that the instrument is in calibration mode.

- The instrument will automatically standardize itself to the actual saturation value. After approx. 1 minute it will display "100%" to indicate that the calibration is complete.

Notes:

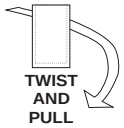
- It is recommended to re-calibrate the meter whenever probe, membrane or electrolyte is changed.
- To exit the calibration mode, press CAL.
- Switching from readings in % O_2 to readings in mg/L does not require recalibration.

PROBE & MEMBRANE MAINTENANCE

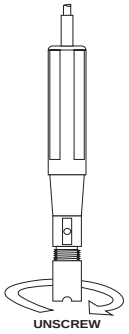
The D.O. probe body is made of reinforced plastic for maximum durability.

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.

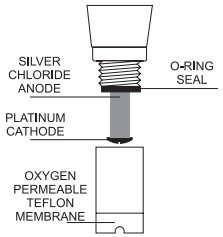
To replace the membrane or refill it with electrolyte, proceed as follows:



- Remove the protective cap by gently twisting and pulling it off the probe's body.
- Unscrew the membrane by turning it counterclockwise with the other hand.
- Wet the sensor by soaking the bottom 2.5 cm of the probe in electrolyte (**MA9071**) for 5 minutes.
- Rinse the new membrane supplied with the meter with electrolyte, while shaking it gently. Refill with clean electrolyte.
- Gently tap the sides of the membrane with the finger tip to ensure that no air bubbles remain trapped. Do no directly tap the bottom with the 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 clockwise. Some electrolyte will overflow.



If the Platinum cathode is tarnished or stained, which could be due to contact with certain gases or to an extended use with a loose or damaged membrane, it should be cleaned. Use a clean lint-free cardboard or cloth and rub the cathode very gently side to side 4-5 times. This will be enough to polish it 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: To obtain accurate and stable measurements, it is important that the surface of the membrane be 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 it carefully with distilled or deionized water. If any imperfections still exist, or any damage is evident (such as wrinkles or tears-holes), replace the membrane. Make sure that the O-Ring is properly seated in the membrane cap.

Note: If don’t take measurements for a few hours, protect the probe with the supplied cap.

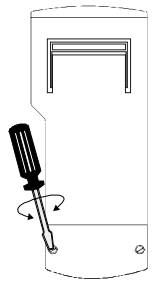
BATTERY REPLACEMENT

When the battery becomes weak, the meter will display the blinking battery symbol.

When the low battery indicator appears, only about 10 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, unscrew the two screws on the rear of the instrument, remove the cover and replace the 9V battery with a new one. Install the battery while paying attention to its polarity and reattach the cover.



ACCESSORIES:

MA840	D.O. probe
MA841	Spare membrane, 5 pcs
MA9071	Refilling Electrolyte solution, 230 ml

SPECIFICATIONS:

RANGE	0.0 to 45.00 mg/L (ppm) O_2 0.0 to 300 % O_2 0.0 to 50.0 °C
RESOLUTION	0.01 mg/L (ppm) O_2 0.1 %O_2 0.1 °C
ACCURACY (@25°C)	± 1.5% Full Scale mg/L (ppm) O_2 ± 1.5% Full Scale %O_2 ± 0.5 °C
TYPICAL EMC DEVIATION	± 0.3 mg/L (ppm) O_2 ± 3.5 %O_2 ± 0.5 °C
CALIBRATION	Automatic in saturated air
TEMPERATURE COMPENSATION	Automatic, from 0 to 50°C
ALTITUDE COMPENSATION	0 to 4000 m; 100 m resolution
SALINITY COMPENSATION	0 to 80 g/L; 1 g/L resolution
PROBE	**MA840** (included)
ENVIRONMENT	0 to 50°C; 100% RH max.
BATTERY TYPE	1 x 9V alkaline (included)
BATTERY LIFE	approx. 100 hours of use
AUTO-OFF	after 4 hours of non-use
DIMENSIONS	200 × 85 × 50 mm
WEIGHT	280 g (with battery)