

# Dissolved Oxygen Meter W/ Optical D.O. Probe

## INSTRUCTION MANUAL 860067



SPER  
SCIENTIFIC

# QUICK GUIDE

This optical dissolved oxygen (ODO) probe is factory calibrated and does not require calibration before use. Please also don't try to disassemble the sensing tip since it is not replaceable.

**Step 1:** (Only required for the first time use or after long term storage)  
Refill distilled water to re-hydrate the sensing surface for 12 hours. Then, refer to page 14 to check the accuracy before use.



**Step 2:**  
Blot the whole probe dry with a lint-free tissue. Then, using anti-collision cap to protect sensing surface.



**Step 3:**  
Connect probe to meter. Immersing probe into the medium. Eliminate bubbles trapped under the membrane. Wait for 5 minutes till the probe's temperature to stabilize in order to get best result.  
Now, press power key to turn on the meter.  
Wait for about 1 minute to get result.

**Step 4:**  
Clean up probe by distilled water. Between measure and overnight, keep the probe in the storage tube, making sure to wet the sponge with distilled water.

**Step 5:**  
Keep the probe away from direct sunlight and extreme temperature during storage.

**Step 6:**  
Do periodically accuracy check once a month. Refer to page 14

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# INTRODUCTION

The optical dissolved oxygen meter (luminescent dissolved oxygen or fluorometric dissolved oxygen) is based on luminescent optical technology. The measuring principle offers the following advantages:

- ◆ Low operating costs due to reduced maintenance work (no electrolyte changes)
- ◆ Greater calibration intervals due to low drift behavior
- ◆ No polarization voltage required
- ◆ No oxygen consumption
- ◆ No minimum inflow

It is simple to use and requires low maintenance . To achieve the best measuring result, please read the instructions in detail and keep manual properly for future reference.

## FEATURES

This portable optical dissolved oxygen meter is compatible with a wide range of applications including water and wastewater analysis. It features automatic temperature and manual pressure/salinity compensation.

This meter provides below:

### **DO Concentration**

Measuring the dissolved oxygen concentration in a water sample. This is an absolute measurement of dissolved oxygen concentration expressed as milligrams of oxygen gas dissolved per liter of water. Unit is milligrams per liter (mg/L) or the same as parts per million (ppm). The readings are automatically temperature (water temperature) and manual pressure (atmospheric)/salinity compensated.

## **DO Saturation**

Measuring the percent saturation of dissolved oxygen in a water sample. Percent saturation is a relative measurement in which the dissolved oxygen concentration is expressed as a percentage of the maximum amount of oxygen that water can hold at a given temperature and pressure.

## **Temperature**

Measuring water temperature of the sample. Units can be changed from °C to °F . It is always in use internally to temperature compensate the dissolved oxygen readings.

## **Pressure**

Manually input the atmospheric pressure in unit of kPa. It is in use internally to pressure compensate the dissolved oxygen readings if user manually input this value.

## **DO Salinity**

This parameter shall be considered when measuring dissolved oxygen in highly saline environments (> 1 ppt). In these cases, a correction must be made manually to account for the effect of salinity on dissolved oxygen concentration. Salinity is not measured by the D.O. probe, but it can be manually entered in setup up mode. Salinity unit is parts per thousand (ppt).

Further more, this portable meter has below operation function to make your daily work easier:

- \*IP 67 waterproof for hygienic cleaning purpose.
- \*Multiple points calibration.
- \*99 points memories w/recall function.
- \*Low battery indication.
- \*Auto power off time selectable
- \*Hold function
- \*Counting maximum and minimum from the moment you need.

# MATERIAL SUPPLIED

This optical dissolved oxygen meter comes with all required accessories, you don't need to purchase extra accessories or chemicals. The full package contains:

- 1.IP67 waterproof meter, 1pc
- 2.Waterproof optical D.O probe w/3M long cable and anti-collision cap, 1pc
- 3.AAA alkaline batteries, 6pcs
- 4.Manual, 1pc
- 5.Hard carry case, 1pc



## HOW TO TAKE CARE OF ODO PROBE

**Do not twist the sensing tip.** The fluorometric dissolved oxygen sensing tip is not replaceable.

**Avoid touching the black color sensing tip surface,** because it can become scratched or dirty. If this happens, the functionality of the probe can no longer be guaranteed.

**Re-hydration prior to use.** The probe is delivered wet but it may dry out after long term storage. The sensing tip must be re-hydrated to ensure measurement accuracy. 12 hours (one night) in clean distilled water is enough.

**Often calibration is not required.** This probe is factory calibrated and does not require calibration by the user. Only do calibration while the probe is not reading accurately or after chemical cleaning.

Must always **keep clean**, particularly in the area around the optical sensing surface. The presence of a biofilm on the sensing surface can lead to measuring errors.

**Be rinsed prior to being stored,** and the storage tube should be fitted with a moist absorbent surface, such as sponge.

# INTERFERING SUBSTANCES

Alcohols greater than 5%, hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) greater than 3%, sodium hypochlorite ( $\text{NaClO}$ , commercial bleach) greater than 3%, gaseous sulfur dioxide ( $\text{SO}_2$ ) and gaseous chlorine ( $\text{Cl}_2$ ) may interfere with the dissolved oxygen measurements.

Highly cross-sensitivity to Organic solvents, such as acetone, toluene, chloroform or methylene chloride, Chlorine gas. So, do not use the ODO probe in solutions that contain organic solvents, such as acetone, chloroform or methylene chloride.

If the measurements are unstable and other troubleshooting procedures do not correct the problem, there may be interfering substances present in the solution.

**No cross-sensitivity with :**  $\text{CO}_2$ ,  $\text{H}_2\text{S}$ ,  $\text{SO}_2$ . Carbon dioxide ( $\text{CO}_2$ ), ammonia ( $\text{NH}_3$ ), pH, any ionic species like sulfide ( $\text{S}_2^-$ ), sulfate ( $\text{SO}_4^{2-}$ ), chloride ( $\text{Cl}^-$ ) and hydrogen sulfide ( $\text{HS}^-$ ) do not interfere with the dissolved oxygen measurements.

## SUBSTANCES THAT DAMAGE THE ODO PROBE

This probe should be used in aqueous solutions only. Do not place the probe in viscous, organic liquids, such as heavy oils, glycerin (glycerol), ethylene glycol, or alcohols.

Do not place the probe in acetone or non-polar solvents, such as pentane or hexane.

## HOW TO CONNECT PROBE TO METER BODY

This device is **not designed to be used under water**.

The IP67 meter body and connector provide you convenience to do cleaning after usage without worry of damaging device.

There is an alignment guide inside probe plug, please lineup with the socket of meter, push plug into position and rotate lock cap to tight..



## HOW TO INSTALL BATTERIES

Besides first time use, it is also needed to install new batteries when the battery low icon appears or while you could not turn the meter on.

6pcs AAA alkaline batteries can provide 10 hours operation time. Using screw driver to open the battery compartment in the rear side of meter, installing 6pcs new and same brand batteries properly, put back the battery cover and screw on. No need to screw over-tight.



The O-ring in this compartment is used for resisting water, don't remove it and keep it flat, smooth and clean.




# KEYPAD OPERATION

This 6 keys meter provides you multiple functions. Some functions are only activated by pressing key longer time.

  
**SET**

- Short press to switch power on or off, count down for 6 seconds and then enter the normal mode.
- Long press in normal mode to enter setup mode.

  
**RECMX**

- In normal and recall mode, short press to switch the display to different D.O. Unit
- Long press to start recording the maximum and minimum values. To switch displaying of max. and min. values, short press this key again.

**CAL**  
**ESC**

- Press and hold the button in normal mode to enter calibration.
- Press to escape while in REC MAX&MIN, calibration, recall and setup mode.

**HOLD**

- In normal mode, short press to freeze the screen. Short press again to unlock.
- In setting, recall and calibration mode, short press to adjust.

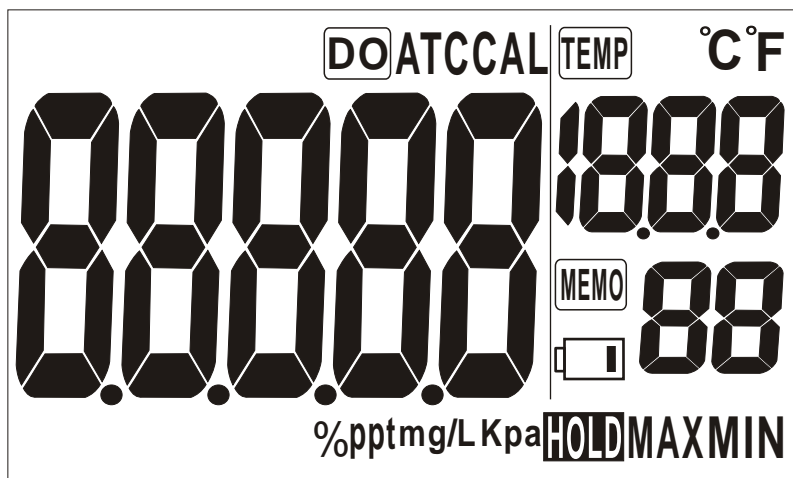
**MEM**

- Short press to save the measured value into memory file, up to 99 records.
- In setting, recall and calibration mode, short press to adjust.

  
**RECALL**

- In the setup and calibration mode, short press to confirm the calibration or parameter setting.
- Long press to enter the Recall mode, read back the saved measured value.

# LCD DISPLAY



This big display provides clear information even under the sun.

**DO** mg/L %

To indicate the measured value is D.O. and unit is mg/L or %

**ppt**

To indicate the manual input salinity value is ppt (part per thousand)

**ATC**: D.O value is auto temperature compensated

**TEMP** °C°F : To indicate the displayed value is degree C or F.

 : To indicate battery power is too low for correct measure

**HOLD** : To indicate the display is currently locked

**MEMO** : Flash to indicate the display is currently in recall mode.  
Display how many records are stored in meter

**MIN MAX** : To indicate the min/max value since pressing this key

**CAL** : To indicate the meter is now in calibration mode

**Kpa** : To indicate the measured value is pressure and unit is Kpa

# OPERATION

## Start to Measure

### Step 1.

Re-hydration prior to use: (Only required for the first time use or after long term storage)

Refill distilled water to re-hydrate the sensing surface for 12 hours. .

Then, refer to page 14 to check the accuracy before use.



### Step 2:

If any salt or mineral deposits are observed on the ODO probe, immediately rinse them off with distilled or deionized water. Always keep sensing surface clean and no scratch.



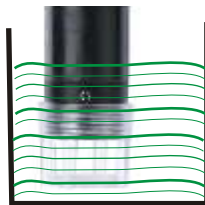
### Step 3:

Blot the whole probe dry with a lint-free tissue. Then, using anti-collision cap to protect sensing surface.



### Step 4:.

During the introduction of the probe to a new environment, wait for 5 minutes to make probe's temperature reach stabilization.



### Step 5:

While in the same environment, 60 seconds waiting time is essential for having accurate result. The probe shall be covered by at least a 2 inch of the solution to ensure the temperature sensor is immersed in solution.


5 mins for Temp. equilibrium & 2 inch deep


## Step 6:

Once completing testing, remove the ODO probe from the sample, rinse it with distilled water, blot it dry with a lint-free tissue, insert the probe into the next sample or refer to below ODO probe cleaning and storage section for the storage procedures.

### Power on /off meter

Before power on, plug the probe into meter.

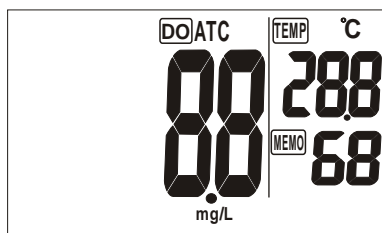
Short press “  ” to turn on the meter and a 6 seconds count down starts.

Short press “  ” again to turn off the meter. If the meter is programmed with sleeping mode, it will be auto off accords to the time you choose.

The displayed value shown as right picture and the resolution changes accords to measured range.

0.1% for 0.0~200.0%



0.1mg/L for 0.1 ~20.0mg/L



### Change mode of D.O.

In normal and recall mode, short press “ %↔mg/L ” to convert D.O. value between DO Concentration (mg/L) and DO Saturation value (%)

### Freeze Reading

In normal mode, short press “ **HOLD** ” to freeze the screen and “  ” icon appears. Short press “ **HOLD** ” again to unlock and “  ” disappears.

## Manual 99 recording

In normal or hold mode, short press “ **MEM** ” to save the current value into memory file, up to 99 records. If memory is full, it will start to overwrite the earlier records.

You will see measured value flashing to indicate it is taken into memory and also the memory number of right lower corner “ **MEMO** ” column increase.

## Calculating Max./Min.

In normal mode, press “ **RECMX** ” longer time to start the max. value counting from the moment you execute this feature.

Press “ **RECMX** ” again to get minimum value. “ **MAX** ” or “ **MIN** ” appears to indicate the status.

Please note the D.O.unit cannot be changed in this mode.

Besides, the displayed max. or min. D.O and temperature are not a pair and can be from different time stamp.

To quit this mode, short press “ **ESC** ” and this ends this maximum and minimum cycle. While you enter this mode again next time, it will re-counting.

## Check Memorized Data (Recall)

In normal mode, press “ **RECALL** ” key longer time to review the logged data. “ **MEMO** ” flash to indicate the status.

Press “ **▲** ” or “ **▼** ” to scroll.

D.O. unit change mode is active in recall mode. You can press “ **%↔mg/L** ” to switch between mg/L and % .

To quit this mode, short press “ **ESC** ”.

## ODO Probe Cleaning

Avoid touching the center part of the membrane, because it can become scratched or dirty. If this happens, the functionality of the device can no longer be guaranteed.

Rinse the sensor with distilled water from a squirt bottle or spray bottle and blot dry with a lint-free soft cloth.

Inspect the ODO sensing surface for scratches or discoloration and replace the probe if any flaws are observed. For more details about probe cleaning tricks, please see page 13

## ODO Probe Storage

Between measurements and overnight, keep the ODO in the storage tube, making sure to wet the sponge with distilled water, or in a beaker with distilled water.

Keep the ODO probe away from direct sunlight during storage and not to expose to temperature extremes.



## Setup (Preference setting)

This meter is designed for many applications, you can custom made the basic setting to make it suitable for your unique application. For example, salinity shall be considered when measuring D.O. in high saline, > 1 ppt, environments.

Pressing “ **SET** ” to enter the setup mode. It returns to normal model if operation idle for 20 seconds.

Using “ ▲ ” “or” ▼ “ to choose program and press “ ← ” to enter program.

Using” ▲ “or” ▼ “ to adjust and press “ ← ” “ to confirm setting or press “ **ESC** ” to quit without saving.

The adjustable programs number, description, default value and adjustable range are all listed below.

After setting, press “ **ESC** ” to quit until you return to normal mode.

Programs number	Description	Default value	Adjustable range
P2 .0	Memory all clear	No	Yes or No
P3 .0	D.O. Compensation		
P3 .1	Salinity compensation	ON	OFF or ON
P3 .3	Salinity value	No	0.0~55.0 ppt
P3 .4	Pressure value	No	50.0~115.0 kPa
P5 .0	Auto sleep time	No	No, Sleep in 15, 30, 45, 60 minutes
P6 .0	Temperature unit	°C	°C or °F
P7 .0	Reset to factory setting	No	Reset instrument to default and this clear memory as well.

# CLEAN UP PROBE THOROUGHLY

## Cleaning the sensing tip

1. Avoid touching the center part of the sensing tip, because it can become scratched or dirty. If this happens, the functionality of the device can no longer be guaranteed.



2. Rinse the probe with distilled water from a squirt bottle or spray bottle and blot dry with a lint-free soft cloth.

3. Inspect the ODO sensing tip for scratches or discoloration and replace the probe if any flaws are observed.

Above are common procedures to clean the probe after usage. Please note **calibration is not required after each cleaning**.

However, a water saturated air calibration is recommended after performing below more strict cleaning procedures:

4. If algal growth is present on the sensing tip, gently clean it with a soft brush. Or refer to step 2 in below “Cleaning the ODO probe body” section to clean up.

5. Do not use solvents or soaps to clean the sensing tip and do not rub the tip with abrasive material. Use of these materials will damage the surface and void the warranty.

6. The presence of a biofilm on the sensing tip can lead to measuring errors. A dirty optical sensing tip should be cleaned with warm, soapy water. A soft sponge should be used for cleaning (not an abrasive scouring sponge)

7. Do not let salt or mineral deposits form on the probe. To remove salt or mineral deposits from the cap, refer to step 2 in below “Cleaning the ODO probe body” section.



## Cleaning the ODO probe body

1. Gently cleaning the probe body with a wet soft clothes.

2. Calcareous fouling can normally be dissolved with **household vinegar**. Immerse the probe in vinegar overnight. If the marine growth remains, use clean cotton swabs to gently wipe the growth off after it has been softened by soaking in vinegar.

3. After cleaning the ODO probe, thoroughly rinse the probe in distilled water and blot it dry with a lint-free tissue before using or storing it.

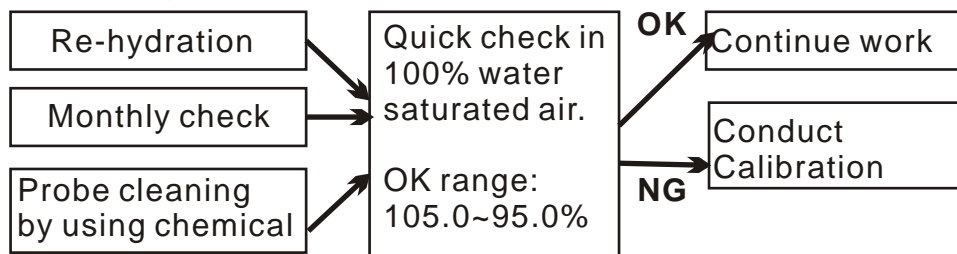
After cleaning the ODO probe body as described in above step 2, a water saturated air calibration is recommended after performing above more strict cleaning procedures.



## CALIBRATION

Periodically check the accuracy of D.O probe and conduct calibration while required. D.O calibration feature is available in this meter. This probe is factory calibrated and does not require calibration by the user often or before each use. Only do calibration while the probe is not reading accurately or after chemical cleaning.

If doing ....



# 100% D.O. CHECK or CAL

There are two methods to proceed 100% check or calibration:

1. By positioning the probe in **water vapor-saturated air**

For example, directly over a water surface.

**NOTE:** probe must be kept dry during the calibration process. Drops of water adhering to the probe membrane could distort the measurement.

2. By positioning the probe in **air-saturated water**

Air is directed through water until the water is saturated with it.

**NOTE:** The air pressure and temperature must remain constant during the calibration

In practice, check and calibration can be done quickly and conveniently by performing the first method:

100% water vapor-saturated air.

100% Water vapor -saturated air

The probe must be kept dry during this process. Drops of water adhering to the probe membrane could distort the measurement. The air pressure and temperature must remain constant during the calibration.

1. Completely saturate the sponge with distilled water and squeeze the excess water out of the sponge.

2. The probe must be kept dry. Put back the storage tube

3. Wait at least 30 minutes so create a 100% Water vapor -saturated air condition in the space between sponge and sensing surface.

4. Check the D.O. reading. Qualified range shall be 95.0~105.0 %









5. Follow the keypad instructions in below to perform a 100% water-saturated air calibration if checked reading is out of qualified range.

6. After doing the calibration, the displayed measurement shall be within the qualified range as 102.0~98.0% range.

Keypad operation of doing calibration

In normal mode, pressing “ **CAL** ” long time to enter the calibration. It returns to normal model if operation idle for 20 seconds.

Using “  “ or “  “ to choose program and press “  “ to enter program.

Using”  “ or “  “ to adjust and press “  “ to confirm executing calibration or press “ **ESC** ” to quit without doing calibration.

The programs number, description, default value are all listed below.

After calibration, press “ **ESC** ” to quit until you return to normal mode.

Programs number	Description	Default value	Adjustable range
P8 .0	100% D.O CAL.	No	Yes or No
P9 .0	0% D.O CAL.	No	Yes or No

# 0% D.O. CHECK OR CAL

## Zero Oxygen Solution for Zero Point Calibration

The probe can be damaged by chemicals. A damaged sensing surface can lead to incorrect measurement results. The probe must not be in contact with the Zero Oxygen Solution (sulphite solution) for longer than one hour.

If you need a very good testing performance for below 1ppm D.O., Checking or even calibrate at zero oxygen condition is required. Otherwise, you don't need to do this as part of your routine task.

1.Prepare a sodium sulfite solution by dissolving about 15.0 g of  $\text{Na}_2\text{SO}_3$  in about 250 mL of distilled water. Transfer the solution to a BOD bottle or flask.

Note: A small amount of cobalt salt can be added to the sodium sulfite solution. The cobalt salt will act as an indicator and change color when the sodium sulfite solution no longer has a zero oxygen content.

2.Always perform a 100% water-saturated air calibration first and then zero oxygen calibration.

3.Immerse the probe in a water-sulphite solution in order to determine the zero point (0% saturation). Stir the probe with solution to quickly decrease oxygen saturation, stirring can make the oxygen fixed to the membrane cap consumed.

4. Add a stir bar to the bottle or flask. Immerse the ODO probe into the bottle or flask and use parafilm to **seal the open area** between the bottle or flask and the probe.

5.Place the bottle or flask on a magnetic stir plate and gently stir the solution.

6.Wait at least five minutes for the ODO probe to equilibrate.

7.If the measured value is larger than 5.0%, follow the keypad instructions in page 16 to perform a zero point calibration.

8.Thoroughly rinse the ODO probe under running water and blot it dry with a lint-free tissue.

9.If the ODO probe is sluggish or inaccurate after a zero point calibration, means not all of the sodium sulfite was removed from the probe. A very thorough soaking and rinsing of the ODO probe in distilled water is required to remove all of the sodium sulfite solution and restore the probe performance. Soak the ODO probe in distilled water for 30 minutes, blot it dry with a lint-free tissue.

## **TROUBLE SHOOTING**

The most important principle in troubleshooting is to isolate the components of the system and check each in turn.

The components of the system include water resistance, the meter, ODO probe, testing sample and technique.

### **1. Water Resistance**

This device is not designed to be used under water. The IP67 meter body and connector provide you the convenience to do cleaning after usage without worry of damaging device. The ODO probe can be submerged in an aquatic environment for some minute, not designed for long-term immersion application.

### **2.Meter**

The meter is the easiest component to eliminate as a possible cause of error.

### **3.ODO Probe**

First, rinse the ODO probe thoroughly with distilled water, blot it dry with a lint-free tissue and inspect the sensing surface for scratches or discoloration.

Then, if readings continue to be erratic and unstable, the probe may need to be replaced.

#### 4. Testing sample

If the ODO probe works properly in standards (100% and 0%) but not in the sample, look for possible interferences or substances in the sample that could alter the probe response or physically damage the probe. If possible, determine the composition of the sample and check for issues. The common see chemicals which will damage probe are listed in page 4.

#### 5. Technique

Check if the method of this optical D.O. analysis is compatible with your sample.

## **Common asked error & solution**

### **Unable to calibrate the ODO probe:**

1. Verify the calibration setup and procedure are followed.
2. Make sure that no water droplets are on the surface of the ODO probe surface while doing 100% water vapor saturated air check.
3. Perform ODO probe cleaning section.

### **Dissolved oxygen measurements are unstable:**

1. Give the probe a few minutes to equilibrate in the sample, especially if the water is not at room temperature or unstable.
2. Perform ODO probe cleaning up procedure.
3. Interfering substance may be present.

### **Dissolved oxygen measurement is too low**

1. Salt may be present in the sample. Set the salinity factor in the meter.
2. Perform ODO probe cleaning up procedure.
3. If the ODO probe is sluggish or inaccurate after a zero point calibration, means not all of the sodium sulfite was removed from the probe. A very thorough soaking and rinsing of the ODO probe in distilled water is required to remove all of the sodium sulfite solution and restore the probe performance.

### **Wrong temperature displayed:**

1. Verify that the ODO probe is immersed in the solution at least 2 inch deep.

### **Bad zero point calibration:**

1. The ODO probe must be in an oxygen free solution for at least five minutes.
2. Make sure that the open area between the probe and bottle is covered with parafilm.

### **Bad reading after zero point calibration:**

1. Soak the ODO probe in distilled water for 30 minutes, use a wash bottle to thoroughly rinse the probe with distilled water and then soak the probe for another 30 minutes in fresh distilled water.

### **More error codes:**

Whatever the error code you see, first, check if battery is well installed or change new batteries to see if the issue solved.

#### **E01:Probe isn't detected**

Power off first. Check whether the probe is connected normally, turn it on after confirming the probe connection is normal, if it still occurs, contact the shop you purchase product from for after sales service.

**E02 in temp.:**Measured temp. is below 0 °C

**E03 in temp.:**Measured temp. is higher than 40 °C

Put probe in room temp. for 30mins,if it still occurs, contact the shop you purchase product from for after sales service.

**E02 in D.O.:**Measured D.O. is below range

**E03 in D.O.:**Measured D.O. Is too high

**E04 in D.O.:**Measured temp. is in error

Put probe in room temp. for 30mins,if it still occurs, contact the shop you purchase product from for after sales service.

# SPECIFICATION

IP67 Dissolved Oxygen Meter,w/ optical D.O. Probe	
DO range (in mg/L)	0.0~20.0 mg/L (ppm)
DO accuracy	±0.3ppm(<5ppm), ±0.4ppm(5~20ppm)
DO resolution	0.1mg/L(ppm)
DO range (in %)	0.0%~200.0%
DO accuracy	±3% of F.S
DO resolution	0.1 %
Temp. range	0~40.0°C/32~104°F
Temp. accuracy	+/-0.5°C/0.9°F
Temp. resolution	0.1°C
Auto Temp. Compensation	0.0~40.0°C/32~104°F
Manual Compensation	INCLUDED
Salinity range	0.0~55.0 ppt
Salinity res.	0.1 ppt
Barometric pressure	50.0 ~ 115.0 kPa
Pressure res.	0.1 kPa
D.O. Calibration points	0.0% ,and 100.0%
LCD size	32.5(H)x54(W)
Operating temp.	0~50°C
Operating RH%	Humidity<85%
Storage temp.	0~50°C
Storage RH%	Humidity < 80%
Sensor life time	>1 year (with good maintenance)
Dimension	169(L)x78.3(W)x43.4(H)
Weight	400g
Probe cable length	3 meters
Battery	6pcs AAA
Power consumption	10 hours operation
Standard Package	Meter /D.O. Probe/6pcs AAA batteries/ hard carry case/manual