

# **Water Quality Meter**

**850081**

# **Water Quality Meter Kit**

**850086**

## **Instruction Manual**



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**Water Quality Meter - 850081**

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## INTRODUCTION

This Sper Scientific Water Quality Meter (Model 850081) uses optional, interchangeable probes to read pH, millivolt (mV)/ oxygen reduction potential (ORP), conductivity, total dissolved solids (TDS), salinity, dissolved oxygen (DO) and temperature with optional probes. Order only the probes required for your current parameters and add additional probes in the future.

***All probes are optional and not included with the meter.***

The meter automatically recognizes pH buffers 4, 7 and 10 for simple calibration. Other features include readings in °C or °F, automatic temperature compensation (ATC) and salinity and altitude compensation for DO measurements.

An RS232 port enables communication with a computer. Additional features include automatic shutoff, minimum and maximum values, a fold-out easel back and a tripod mounting screw.

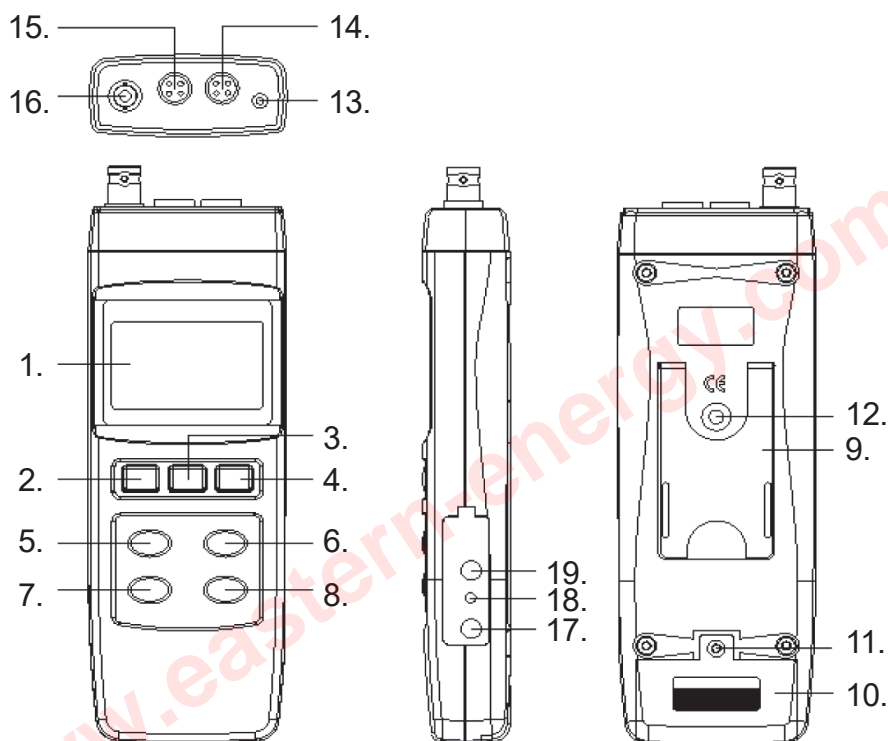
## **FEATURES**

- Reads pH, mV/ORP, conductivity, TDS, salinity, DO and temperature with optional probes
- Automatic temperature compensation
- Automatic calibration recognition of pH buffers
- Salinity and altitude compensation for DO measurements
- Maximum and minimum values
- Hold function
- Temperature units in °C or °F
- RS232 PC serial interface
- Battery or optional DC 9V power adapter
- Tripod mounting screw
- Automatic shutoff
- Backlight

## **MATERIALS SUPPLIED**

- Water Quality Meter
- Instruction Manual
- DC 9V Battery
- Hard Carrying Case

## FRONT PANEL DESCRIPTION



1. LCD Display
2. Power/Backlight Button
3. Hold/Escape Button
4. Record Button
5. ▲/Range Button
6. ▼/Function Button
7. Set Button
8. Enter Button
9. Easel Stand
10. Battery Compartment Cover

11. Battery Compartment Cover Screw
12. Tripod Mounting Screw
13. Temperature Probe Socket
14. Dissolved Oxygen Probe Socket
15. Conductivity Probe Socket
16. pH Probe/BNC Socket
17. DC 9V Power Adapter Socket
18. Reset Button
19. RS232 Output Terminal

## SETUP

### Meter On and Off

1. Press **POWER** to turn the meter **on**.
2. Press and hold **POWER** for 3 seconds and release to turn the meter **off**.

### Backlight

The backlight will illuminate automatically when the meter is turned **on**.

1. Press the backlight button to turn the backlight **off**.
2. Press the backlight button again to turn the backlight **on**.

### Entering Setup Mode

1. Press **POWER** to turn the meter **on**.
2. Press **SET** for two seconds to enter Setup Mode.
3. Press **SET** to cycle through the options until the desired parameter is displayed.
4. Press **ESC** at any time to exit Setup Mode.

### Automatic Shutoff

1. In Setup Mode, press **SET** until “PoFF” is displayed.
2. Press **▲** or **▼** to toggle between “Yes” (automatic shutoff is **on**) or “No” (disable automatic shutoff).
3. Press **ENTER** to save the selection.
4. Press **SET** to continue to the next setup parameter, or press **ESC** to exit Setup Mode.

## Beeper

1. In Setup Mode, press **SET** until “bEEP” is displayed.
2. Press **▲** or **▼** to toggle between “Yes” (beeper is **on**) or “No” (disable beeper).
3. Press **ENTER** to save the selection.
4. Press **SET** to continue to the next setup parameter, or press **ESC** to exit Setup Mode.

## Select Temperature Units

1. In Setup Mode, press **SET** until “t-CF” is displayed.
2. Press **▲** or **▼** to toggle between °C or °F.
3. Press **ENTER** to save the selection.
4. Press **SET** to continue to the next setup parameter, or press **ESC** to exit Setup Mode.

## Select DO Salinity Compensation

This feature is active in DO Mode only.

1. In Setup Mode, press **SET** until “SALt” is displayed.
2. The default value is 0%. Press **▲** or **▼** to adjust the upper salinity compensation value.
3. Press **ENTER** to save the selection.
4. Press **SET** to continue to the next setup parameter, or press **ESC** to exit Setup Mode.

## Select DO Altitude Compensation in Meters

This feature is active in DO Mode only.

1. In Setup Mode, press **SET** until “HIGh” is displayed.
2. The default value is 0 meters. Press ▲ or ▼ to adjust the upper altitude compensation value in increments of 100 meters.
3. Press **ENTER** to save the selection.
4. Press **SET** to continue to the next setup parameter, or press **ESC** to exit Setup Mode.

## Select DO Altitude Compensation in Feet

This feature is active in DO Mode only.

1. In Setup Mode, press **SET** until “HIGhF” is displayed.
2. The default value is 0 feet. Press ▲ or ▼ to adjust the upper altitude compensation value in increments of 100 feet.
3. Press **ENTER** to save the selection.
4. Press **SET** to continue to the next setup parameter, or press **ESC** to exit Setup Mode.

## Select Conductivity Temperature Compensation Value

This feature is active in Conductivity Mode only.

1. In Setup Mode, press **SET** until “PEr C” is displayed.
2. The default value is 2% per ° C. Press ▲ or ▼ to adjust the upper temperature compensation value.
3. Press **ENTER** to save the selection.
4. Press **ESC** to exit Setup Mode.

## Select pH Manual Temperature Compensation Value

This feature is active in pH Mode only.

1. In Setup Mode, press **SET** until “t-SEt” is displayed.
2. The default value is 25° C / 77° F. Press ▲ or ▼ to adjust temperature compensation value.
3. Press **ENTER** to save the selection.
4. Press **ESC** to exit Setup Mode.

## System Reset

If the meter appears unresponsive or pressing the keys produces no result, reset the system:

1. With the meter **on**, open the cover on the side of the meter.
2. Use a pin or the end of a paperclip to press **RESET**.

## MEASUREMENT FUNCTIONS

### Select Function (Mode)

1. Press **POWER** to turn the meter **on**.
2. Press **FUNCTION** to cycle through the available modes until the desired function is displayed:
  - PH
  - OrP – oxidation-reduction potential
  - do – dissolved oxygen
  - O2 - oxygen
  - Cd - conductivity
  - tdS – total dissolved solids
  - SALt – salinity
3. Follow the specific measurement procedures for the parameter in use.

Parameter	Page
pH	12
mV (ORP)	15
DO	15
O2	17
Conductivity	17
TDS	19
Salinity	20

### Data Hold Function

1. During measurement, press **HOLD** to freeze the reading on the display. “Hold” appears on the LCD.
2. Press **HOLD** to return to Normal Mode.

## Minimum and Maximum Values

1. During measurement, press **REC** to begin recording the readings. "REC" displays on the LCD.
2. Press **REC** to display the maximum value. "REC MAX" will display.
3. Press **REC** to display the minimum value. "REC MIN" will display.
4. Press **REC** for 2 seconds to clear MIN/MAX and return to Normal Mode.

## pH MEASUREMENT

### Calibration

The pH probe should be calibrated before first use.  
Recalibrate regularly to ensure highly accurate measurement.

### Note...

Calibration should begin with pH 7.00 and then be followed by either pH 4.00 or pH 10.00. Be sure to rinse the electrode in distilled water between calibration points.

The entire two-point calibration procedure should be repeated at least twice.

### pH Probe Calibration with Automatic Temperature Compensation

1. Plug and secure the pH probe into the pH socket on top of the meter.
2. Plug the temperature probe into the **TEMP** socket on top of the meter.
3. Press **POWER** to turn the meter **on**.
4. Press **FUNCTION** to cycle through the available functions until "pH" is displayed.

5. Immerse the pH probe and the temperature probe into the standard buffer solution.
6. Gently shake the pH electrode.
7. The pH value and the temperature of the solution are displayed.
8. Press and hold ▲ and ▼ until “pH” and “CAL” are displayed.
9. Press ▲ or ▼ to select 4.00, 7.00, or 10.00 calibration to correspond with the buffer solution.
10. Press **ENTER** to save the calibration data and return to Normal Mode.
11. To clear the existing calibration data, select “CLr” from the calibration options.
12. Press **ENTER** to confirm the selection and return to Normal Mode.

### **pH Probe Calibration with Manual Temperature Compensation**

1. Plug and secure the pH probe into the pH socket on top of the meter.
2. Press **POWER** to turn the meter **on**.
3. Press **FUNCTION** to cycle through the available functions until “pH” is displayed.
4. Immerse the pH probe into the standard buffer solution.
5. Gently shake the pH electrode.
6. The pH value and the manual temperature setting are displayed.
7. Press and hold ▲ and ▼ until “pH” and “CAL” are displayed.
8. Press ▲ or ▼ to select 4.00, 7.00, or 10.00 calibration to correspond with the buffer solution.
9. Press **ENTER** to save the calibration data and return to Normal Mode.
10. To clear the existing calibration data, select “CLr” from the calibration options.

11. Press **ENTER** to confirm the selection and return to Normal Mode.

## **pH Measurement with Automatic Temperature Compensation**

1. Plug and secure the pH probe into the pH socket on top of the meter.
2. Plug the temperature probe into the **TEMP** socket on top of the meter.
3. Press **POWER** to turn the meter **on**.
4. Press **FUNCTION** to cycle through the available functions until “pH” is displayed.
5. Immerse the temperature probe into the solution to be measured.
6. Hold the pH electrode handle and immerse the sensing head completely into the solution.
7. Gently shake the electrode.
8. The pH value and the temperature of the solution are displayed.

## **pH Measurement with Manual Temperature Compensation**

1. Plug and secure the pH probe into the pH socket on top of the meter.
2. Press **POWER** to turn the meter **on**.
3. Press **FUNCTION** to cycle through the available functions until “pH” is displayed.
4. Hold the electrode handle and immerse the sensing head completely into the solution to be measured.
5. Gently shake the electrode.
6. The pH value and the manual temperature setting are displayed.

## mV (ORP) Measurement

1. Plug and secure the pH/ORP probe into the pH socket on top of the meter.
2. Press **POWER** to turn the meter **on**.
3. Press **FUNCTION** to cycle through the available functions until “OrP” is displayed.
4. Hold the electrode handle and immerse the sensing head completely into the solution to be measured.
5. Gently shake the electrode.
6. The mV value is displayed.

### Note...

During pH measurement, simply press **FUNCTION** to switch to ORP measurement.

## DO MEASUREMENT

### DO Probe Calibration

The DO probe should be calibrated before first use. For the highest level of accuracy, recalibrate before each use.

Air calibration (20.9%) is recommended for simple and precise calibration. Calibration should be performed in a well-ventilated environment.

1. Plug the DO probe into the DO socket on top of the meter.
2. Press **POWER** to turn the meter **on**.
3. Press **FUNCTION** to cycle through the available functions until “O2” is displayed.
4. Wait 5 minutes until the readings stabilize.
5. Press and hold ▲ and ▼ until “CAL” and “20.9” are displayed.

6. Press **ENTER**. The display will count down from 30 to 0 as calibration occurs.
7. The meter returns to Normal Mode.

## Do Measurement

1. Plug the DO probe into the DO socket on top of the meter.
2. Press **POWER** to turn the meter **on**.
3. Press **FUNCTION** to cycle through the available functions until “do” is displayed.
4. Hold the electrode handle and immerse the sensing head at least 10 cm into the solution to be measured.
5. Wait several minutes for the probe and solution to reach thermal equilibrium.
6. With the probe tip immersed in the solution, shake the probe or make sure that the liquid has a velocity of at least 0.2 – 0.3 m/s. (A magnetic agitator is recommended to reduce errors due to the diffusion of the oxygen present in the air into the solution.)
7. The DO values in mg/L and the temperature of the solution are displayed.
8. Rinse the probe with tap water after each series of measurements.

## Oxygen in the Air

1. Plug the DO probe into the DO socket on top of the meter.
2. Press **POWER** to turn the meter **on**.
3. Press **FUNCTION** to cycle through the available functions until “O2” is displayed.
4. The percentage of oxygen in the air is displayed.

## CONDUCTIVITY MEASUREMENT

### Conductivity Probe Calibration

The conductivity probe should be calibrated before first use. Recalibrate the probe periodically to ensure accuracy.

#### Note...

One-point calibration should be executed at 1.413 mS. For multi-point calibration, execute 1.413 first and then proceed to other ranges.

1. Plug the conductivity probe into the CD socket on top of the meter.
2. Press **POWER** to turn the meter **on**.
3. Press **FUNCTION** to cycle through the available functions until “Cd” is displayed.
4. Hold the electrode handle and immerse the sensing head completely into the standard buffer solution.
5. Gently shake the electrode.
6. The conductivity value and the temperature of the solution are displayed.
7. Press and hold ▲ and ▼ until “Cd” and “CAL” are displayed.
8. Press **ENTER** to display the values.

9. Press **▲** or **▼** to adjust the conductivity value to correspond with the standard buffer.
10. Press **ENTER** to save the calibration data and return to Normal Mode.

## Conductivity Measurement

1. Plug the conductivity probe into the CD socket on top of the meter.
2. Press **POWER** to turn the meter **on**.
3. Press **FUNCTION** to cycle through the available functions until “Cd” is displayed.
4. Hold the electrode handle and immerse the sensing head completely into the solution to be measured.
5. Gently shake the electrode.
6. The conductivity value and the temperature of the solution are displayed.

## Manual Range Selection

The meter defaults to automatic range setting. To manually set the range, press **RANGE** to cycle through the selections until the desired range is displayed:

- 200.0  $\mu$ S
- 2.000 mS
- 20.00 mS
- 200.0 mS
- Auto

## Zero Adjustment

“0” should appear on the display when the range is 200  $\mu\text{S}$  and the probe is not immersed in a solution. If the display shows a value of  $< 2.0 \mu\text{S}$ , adjust the value to zero by pressing **RANGE** for 10 seconds until zero is displayed.

## TDS Measurement

1. Plug the conductivity probe into the CD socket on top of the meter.
2. Press **POWER** to turn the meter **on**.
3. Press **FUNCTION** to cycle through the available functions until “tdS” is displayed.
4. Hold the electrode handle and immerse the sensing head completely into the solution to be measured.
5. Gently shake the electrode.
6. The TDS value and the temperature of the solution are displayed.

### Note...

During conductivity measurement, simply press **FUNCTION** to switch to TDS measurement.

## Salinity Measurement

1. Plug the conductivity probe into the CD socket on top of the meter.
2. Press **POWER** to turn the meter **on**.
3. Press **FUNCTION** to cycle through the available functions until “SALt” is displayed.
4. Hold the electrode handle and immerse the sensing head completely into the solution to be measured.
5. Gently shake the electrode.
6. The salinity value as a percentage of weight is displayed.

**Note...**During TDS measurement, simply press **FUNCTION** to switch to salinity measurement.

## SOFTWARE DOWNLOAD

### Note...

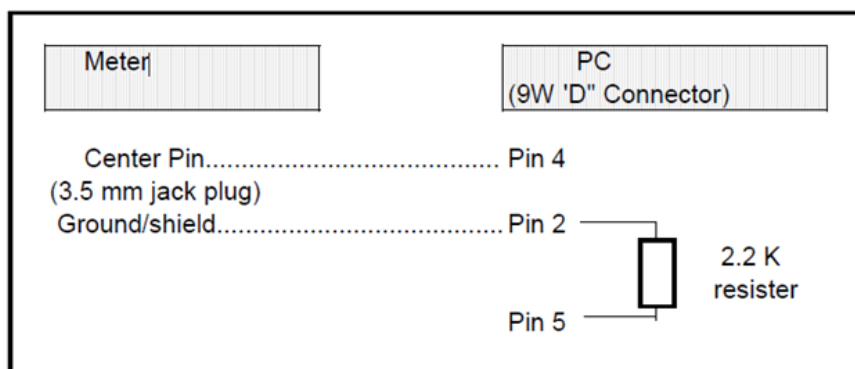
Different computer systems may require slightly different installation steps than those below.

1. The first most important step in software installation is to verify that the target system meets the general hardware requirements of the application. Beginning the installation in a computer which does not possess the minimum requirements can lead to either an unsuccessful installation or failure of the program to run after installing it.
2. Since programs in general are written to be Operating System dependent, make sure that the version of the application you are installing corresponds to the Operating System platform running on your machine.
3. Aside from the general hardware requirements, some computer programs also have software requirements prior to installation. Double check if you need to update or upgrade your Operating System or if there is a need to download other tools or utilities.
4. Once all the initial requirements have been met, make sure that there are no unnecessary programs running before beginning the installation procedure. In some instances, applications may require that the antivirus programs be disabled. Make sure that you are installing a legitimate application before disabling your protection software.
5. Software installation can be done either from the Internet (skip to step 8) or from an installation disc provided by the software manufacturer. To install from the disc, simply open the CD or DVD drive and insert the installer.
6. A setup wizard window should be launched. In case there is none, open the Explorer and navigate to the optical drive. Double click on either the Autorun or Setup file.

7. Once the wizard is running, simply follow the prompts until the installation process is completed. For novice users, accept the default values to minimize potential problems during the procedure. Jump to step 10.
8. For installation from the Web, launch your browser application, Go to: [www.sperdirect.com/software.htm](http://www.sperdirect.com/software.htm), find your meter, and download the setup file to your hard drive.
9. After completion of the downloading process, run the setup program to execute the setup wizard that will handle the automatic installation of the software. Do step 7.
10. After the installation procedure has been completed and the setup wizard has terminated, reboot your machine before launching the newly installed software.

## RS232 PC Serial Interface

The meter provides data output through an RS 232 / USB PC computer interface located on the side of the instrument. Use an optional cable with the following connection to link the meter to a PC serial port:



The RS232 format is 9600, N, 8, 1:

<b>Baud Rate</b>	9600
<b>Parity</b>	No parity
<b>Data Bits</b>	8 data bits
<b>Stop Bit</b>	1 stop bit

Data output is a 16-digit stream formatted as:

D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0

<b>Digit Status</b>			
<b>D15</b>	Start word		
<b>D14</b>	4		
<b>D13</b>	Status = 1 when sending the upper display data		
	Status = 2 when sending the lower display data		
<b>D12, D11</b>	Annunciator for Display		
	uS = 13	mS = 14	ppm = 19
	pH = 05	mV = 18	% = 03
	mg/L = 07	% 02 = 06	°C = 01 / °F = 02
<b>D10</b>	0 = positive polarity 1 = negative polarity		
<b>D9</b>	Decimal point (DP) position from right to left: 0 = no DP, 1 = 1 DP, 2 = 2 DP, 3 = 3 DP		
<b>D8 - D1</b>	Display reading. D1 = LSD, D8 = MSD.  For example, if the display reading is 1234, D8 to D1 would be 00001234.		
<b>D0</b>	End word		

## POWER SUPPLY

### Battery Power

This meter uses one DC 9 V (006 P) heavy-duty alkaline battery. To install the battery before first use:

1. Unscrew and remove the screw on the back battery cover.
2. Slide off the battery cover in the direction of the arrows.
3. Insert a new 9 V battery by snapping the terminals into the connectors.
4. Replace the battery cover and reinstall the screw.

Replace the battery when the low-battery icon shows on the LCD. However, accurate measurements may still be made for several hours after the low-battery icon appears.

#### **Note...**

Before replacing the batteries, turn the meter **off** and disconnect the probe. This is necessary for most meters, but I did not see this instruction in the manufacturer info. Please remove if it is not necessary.

### DC Adapter

#### **Note...**

When the optional DC power adapter is connected, the meter will supply power from the adapter rather than the batteries. The meter will remain on while the adapter is connected and the power button will be disabled.

To connect the DC adapter, open the cover on the side of the meter and insert the adapter plug into the DC 9V adapter socket.

## SPECIFICATIONS

### General Specifications

<b>Circuit</b>	Custom one-chip microprocessor LSI circuit
<b>Display</b>	52 x 38 mm LCD
<b>Sample Rate</b>	~ 1 second
<b>Data Output</b>	RS 232 / USB PC computer interface
<b>Operating RH%</b>	< 85% RH
<b>Operating Temperature</b>	0 - 50 °C 32 - 122 °F
<b>Power Consumption</b>	~ DC 14 mA with backlight <b>off</b> ~ DC 26 mA with backlight <b>on</b>
<b>Power Supply</b>	One DC 9V (006 P) heavy-duty alkaline battery Optional: DC 9V adapter input
<b>Dimensions</b>	7.0" x 2.7" x 1.9" 177 x 68 x 45 mm
<b>Weight</b>	489 g / 1.08 lb

### Electrical Specifications (23 ± 5 °C)

pH / mV				
Measurement		Range	Resolution	Accuracy (for calibrated meter)
	<b>pH</b>	0 to 14 pH	0.01 pH	± (0.02 + 2 d)
	<b>mV</b>	-1999 to 1999 mV	1 mV	± (0.5% + 2 d)
<b>Input Impedance</b>		10 <sup>12</sup> ohm		
<b>pH Temperature Compensation</b>		Manual: 0 – 100 °C		
		Automatic (ATC): 0 – 65 °C with optional temperature probe		
<b>pH Calibration</b>		pH 4, pH 7, pH 10 (3-point calibration)		

<b>General Conductivity</b>	
<b>Temperature Compensation</b>	Automatic (ATC) from 0 to 60 °C (32 to 140 °F) with temperature compensation factor variable between 0 to 5.0% per °C.
<b>Probe Operating Temperature</b>	0 to 60 °C

<b>Conductivity</b>			
<b>Measurement</b>	<b>Range</b>	<b>Res</b>	<b>Accuracy</b>
<b>0 - 200.00 uS</b>	200 uS	0.1 uS	± (2% full scale + 1 d) for measurement values ≤ 100 mS
<b>0.20 - 2.00 mS</b>	2 mS	0.001 mS	
<b>2.00 - 20.00 mS</b>	20 mS	0.01 mS	
<b>20.00 - 200.00 mS</b>	200 mS	0.1 mS	

<b>Total Dissolved Solids</b>			
<b>Measurement</b>	<b>Range</b>	<b>Res</b>	<b>Accuracy</b>
<b>0 - 132 ppm</b>	200 ppm	0.1 ppm	± (2% full scale + 1 d) for measurement values ≤ 66,000 ppm
<b>132 - 1,320 ppm</b>	2,000 ppm	1 ppm	
<b>1,320 - 13,200 ppm</b>	20,000 ppm	10 ppm	
<b>13,200 - 132,000 ppm</b>	200,000 ppm	100 ppm	

Temperature			
Measurement Units	Range	Resolution	Accuracy
°C	0 - 60 °C	0.1 °C	± 0.8 °C
°F	32 - 140 °F	0.1 °F	± 1.5 °F

Salinity		
Range	Resolution	Accuracy
0 -12% salt by weight	0.01% salt	0.5% salt value full scale

Dissolved Oxygen			
Temperature Compensation	Automatic (ATC) from 0 - 50 °C		
Salinity Compensation	0 - 50% salt		
Altitude Compensation (M.T.)	0 - 8900 meters		
Measurement	Range	Res	Accuracy
Dissolved Oxygen	0 - 20.0 mg/L	0.1 mg/L	± 0.4 mg/L
Oxygen in Air	0 - 100.0%	0.1% O2	± 0.7% O2
Temperature	0 - 50 °C	0.1 °C	± 0.8% °C / 1.5 °F

### Note...

The above dissolved oxygen specifications apply only to environments with RF Field Strength of less than 3 V/M and frequencies of less than 30 MHz.

## WARRANTY

Sper Scientific warrants this product against defects in materials and workmanship for a period of **one (1) years** from the date of purchase, and agrees to repair or replace any defective unit without charge. If your model has since been discontinued, an equivalent Sper Scientific product will be substituted if available. This warranty does not cover probes, batteries, battery leakage, or damage resulting from accident, tampering, misuse, or abuse of the product. Opening the meter to expose its electronics will break the waterproof seal and void the warranty.

To obtain warranty service, ship the unit postage prepaid to:

**SPER SCIENTIFIC LTD.**  
8281 East Evans Road, Suite #103  
Scottsdale, AZ 85260

The defective unit must be accompanied by a description of the problem and your return address. Register your product online at [www.sperwarranty.com](http://www.sperwarranty.com) within 10 days of purchase.



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