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Optical Dissolved Oxygen Sensor
WQ-FDO

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Congratulations on your purchase of the Global Water WQ-FDO Optical Dissolved Oxygen Sensor. This instrument has been quality tested and approved for providing accurate and reliable conductivity and temperature measurements. We are confident that you will find this product to be a valuable asset for your application. Should you require assistance, our technical staff will be happy to help.

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I. Overview

The WQ-FDO Optical DO Sensor is an instrument designed for measuring dissolved oxygen in water. The optical DO sensors were developed to meet the requirements ranging from surface water monitoring programs to harsh waste water applications. The WQ-FDO has been specifically designed to meet the demanding requirements of the environmental monitoring and scientific research sectors, providing long term, accurate and reliable dissolved oxygen measurement. The sensor has low power requirements and a 4-20 mA output making it ideal for incorporation into remote environmental monitoring installations.

The WQ-FDO Optical DO Sensor has many advantages over traditional DO sensors. Unlike conventional Galvanic and Polarographic DO sensors, optical sensors have no consumable cathodes or anodes that require replacement, minimizing maintenance requirements. The sensor does not consume oxygen either. Consequently, the measurement of DO by the sensor is unaffected by water flow. The WQ-FDO can even be deployed in stagnate groundwater bores. The sensors have extremely stable electronics – a service interval of 1 year is typical. The measuring and reference path of the optical components are identically designed inside the sensor. Natural aging processes of the sensor's optical components can therefore be compensated by the reference path and accordingly compensated in the measuring path. As a result, the sensor provides accurate DO measurements over long periods of time without the need for re-calibration. Service of the sensor usually consists of replacing the cap and membrane assembly. The cap has a memory chip installed which contains recalibration information that is read by the sensor, making recalibration unnecessary after this service.

The sensor's optical measuring technique provides accurate readings over a wide range of conditions. Because the concentration and saturation levels of dissolved oxygen vary with temperature, barometric pressure and conductivity (or salinity); the level of oxygen is reported by the sensor as partial pressure, allowing the conversion to concentration and saturation to be calculated externally using these other parameters. An in-line interface module converts the digital partial pressure and temperature data into two separate 4-20mA signals for monitoring with data loggers and PLC devices.

A free software tool is available for use with Global Water's family of data loggers that allows the WQ-FDO sensor's two 4-20mA outputs to be monitored, along with optional conductivity and barometric pressure sensors, to determine the oxygen concentration and saturation levels. If the optional sensors are not used, provision is made for the hand entry of barometric pressure (or altitude) and conductivity (or salinity) into the calculation. The partial pressure, concentration, saturation, temperature, conductivity, salinity, and barometric pressure can all be displayed in real time, or can be downloaded for use in a spreadsheet program.

The standard sensor comes with one meter of cable between the sensor and interface module, and 25 feet of marine grade cable for connecting to recording devices. Additional cable can extend the length up to 1000 feet. A protective armor shield is also available in either plastic or stainless steel.

II. Sensor Specifications

a. Specifications.

Output Type:		Two 4-20mA outputs
DO	Range:	0-400mbar @ 20ºC
	Resolution:	0.1mbar
	Accuracy:	+/- 0.5%
	Drift:	<1% per year
Temp. Range:		0ºC to +50ºC (+32ºF to +122ºF)
	Resolution:	0.01ºC (0.02ºF)
	Accuracy:	0.1ºC (0.2ºF)
Service Life of Cap:		1 Year minimum under normal use
Emersion Depth:		6cm Minimum (2.4 Inches)
Pressure Rating:		35psi maximum (25m/82ft H_2O)
Voltage Requirements:		10-30 VDC
Supply Current:		25ma plus sum of both 4-20mA outputs
Warm Up Time:		6 seconds minimum, 8 recommended
Response Time:		90% in <30 Seconds 95% in <45 Seconds 99% in <60 Seconds Low flow conditions reduce response time
Operating Temperature:		0°C to +50°C (32º to 122ºF)
Storage Temperature:		0°C to +50°C (32º to 122ºF)
Sensor Dimensions:		0.86” (22mm) diameter x 8” (202mm) long
Interface Dimensions:		0.82” (21mm) diameter x 7.2” (183mm)
Total Weight:		8oz plus cable

b. Connections:

Red:	10-36VDC
Black:	Ground
White:	4-20mA Oxygen Partial Pressure Output
Green:	4-20mA Water Temperature Output

Warning: Always turn off the power when connecting or disconnecting the sensor or it could be damaged.

III. Cleaning and Maintenance

Do not touch the sensor cap membrane with your fingers.

Avoid any mechanical stress such as shock or vibration.

Keep the outside of the sensor clean with tap water. Mild household detergent can also be used. Avoid cleaning in the area around the membrane. DO NOT use any cleaning products that contain alcohol. Use only a lint free microfiber cloth when cleaning the cap and membrane.

Should dirt or other contaminants get on or under the cap, or if moisture gets inside, the cap should be cleaned. Remove the sensor cap according to Appendix A. Do not touch the membrane with your fingers and do not allow the inside of the membrane to be exposed to any strong light source, especially sunlight. Strong light can damage the membrane, *remove the cap in light protected environments only*. Use only water and mild non-abrasive detergents, do not use any cleaners containing alcohol. Clean the inside and outside, pat dry all surfaces with a clean lint free microfiber cloth, then allow to air dry completely. Make sure the o-ring is in place when replacing the cap.

If the cap shows any visible damage it should be replaced.

This sensor is designed for measuring dissolved oxygen in water and other mild solutions only. Measuring acids, bases or organic solvents can considerably reduce the sensor's lifetime or cause permanent damage. Long term exposure to high temperatures may also damage it. These types of damage are not covered under warrantee.

IV. Sensor Calibration

The dissolved oxygen sensor should remain stable for the service life of the cap and membrane, which is greater than one year. This generally makes recalibration unnecessary. If the cap is replaced, recalibration should also not be necessary. The unique design of the FDO sensor allows a memory chip inside the cap to hold calibration information that is read by the sensor when a new cap is installed. The sensor then recalibrates itself for the new cap and adjusts its DO output accordingly. The temperature output should also not need recalibration.

Recalibrating the WQ-FDO sensor consists of measuring the output currents at two known oxygen levels. For greatest accuracy, one level should be at zero oxygen and one should be near full saturation.

There is no easy way to develop a calibration standard that has a known level of dissolved oxygen. Calibrating an oxygen sensor is generally done by comparing it to another instrument of known accuracy. The Winkler titration method can also be used. It provides the highest accuracy but involves the use of strong chemicals.

The oxygen level of water can be elevated by bubbling air through it with a conventional aquarium bubbler. Once saturated, the oxygen level can be measured and compared to the WQ-FDO sensor output. The zero oxygen level can be checked in one of two ways. The most accurate way is to expose the sensor to a nitrogen saturated atmosphere. Place the sensor in a sealable container and fill the container with nitrogen until all of the air has been displaced. Wait for the temperature to stabilize then measure the sensor DO output current. A zero oxygen sodium sulfite calibration standard can also be used.

To have the sensor's calibration checked, return it to Global Water. Contact the Technical Support department for more information.

V. Converting Partial Pressure Measurements

The calculation of dissolved oxygen concentration and saturation level is a complicated topic. Many variables affect the result including water and air temperature, conductivity or salinity, atmospheric pressure or altitude, and water vapor partial pressure. Some of these variables can't always be calculated accurately and it is common to rely on empirical data rather than calculations. Two common methods are used to make dissolved measurements. Electronic methods rely on measuring the oxygen partial pressure in the sample and mathematically converting partial pressure to concentration using the variables of salinity, pressure and temperature. Chemical methods are the most accurate and are generally used to check the calibration of electronic test instruments, the Winkler method being the most common.

The concentration of oxygen is the amount of oxygen in a given volume of water and is generally measured in mg/liter or ppm (these two units are equivalent, 1mg/L = 1 ppm). The saturation level is the percentage (%) of oxygen in the water as measured against the maximum amount (100%) the water can theoretically hold based on the amount of oxygen in the air above it.

There are different ways to convert oxygen partial pressure to concentration and percent saturation, a complete discussion will not be made here. Referencing lookup tables is common; as well as using equations, some of which are derived from empirical data.

As stated earlier in this manual, a free software tool is available for use with Global Water's family of data loggers that allows the WQ-FDO sensor's outputs to be monitored, along with optional conductivity and barometric pressure sensors, to determine the oxygen concentration and saturation levels. If the optional sensors are not used, provision is made for the hand entry of barometric pressure (or altitude) and conductivity (or salinity) into the calculation. The partial pressure, concentration, saturation, temperature, conductivity, salinity, and barometric pressure can all be displayed in real time, or can be downloaded for use in a spreadsheet program.

Oxygen Concentration:

First, calculate the oxygen concentration in mg/L (ppm) from the sensor's partial pressure and temperature readings assuming zero salinity (Conductivity < 1000uS).

$$C = PPO_2 * [(6.906334E\text{-}2) - (1.797779E\text{-}3 * t) + (3.108257E\text{-}5 * t\text{^}2) - (2.199777E\text{-}7 * t\text{^}3)]$$

Where:
C = Concentration of dissolved oxygen in mg/L
PPO_2 = Measured oxygen partial pressure in mbar
t = Measured water temperature in ºC

Next, if the conductivity of the sample is more than 1000uS, the calculated oxygen concentration should be corrected for salinity. Based on temperature and conductivity (or PSS, Practical Salinity Scale), find the correction value from Tables 7.1 to 7.4. Multiply the calculated oxygen concentration by the correction value to obtain the adjusted concentration level.

$$C = Cc * SCV$$

Where:
C = Oxygen concentration level in mg/L (or ppm) adjusted for salinity
Cc = Previously calculated concentration in mg/L based on zero salinity
SCV = Salinity correction value from Tables 7.1 to 7.4

Oxygen Solubility and Saturation:

To determine the percentage of saturation of oxygen in the water, the solubility of oxygen must be known. Solubility is the concentration required for the water to be 100% saturated; the point where equilibrium is reached between the partial pressure of oxygen in the water and in the air, as stated by Henry's Law. This saturation level is affected by temperature, atmospheric pressure, salinity, and water vapor pressure.

One common method of getting the oxygen solubility is to find it in a lookup table, based on the temperature and atmospheric pressure. Tables 6.1 through 6.4 list the solubility over a wide range of conditions. These tables were developed using

equations done by R.F. Weiss in 1970 and are generally considered to be a standard. These table entries will need to be corrected for salinity in the same way as the concentration above. Find the correction value from Tables 7.1 to 7.4. Multiply the oxygen solubility from tables 6.1 – 6.4 by the correction value to obtain the adjusted solubility.

An equation can also be used, which is based on the work done by Weiss. To find the solubility, use the following equation which has been corrected for altitude and salinity:

Solubility of Oxygen in Water (100% Saturation):

S_c = EXP(A + B*100/(T+273.15) + C*LN((T+273.15)/100) + D*(T+273.15)/100 + S*(E + F*(T+273.15)/100 + G*((T+273.15)/100)^2))*H*P_a

Where:
S_c = Solubility of O_2 in mg/L corrected for salinity, temperature and pressure
T = Temperature in ºC
S = Salinity in PSS
P_a = Atmospheric pressure in mbar

And:
A = -173.4292
B = 249.6339
C = 143.3483
D = -21.8492
E = -0.033096
F = 0.014259
G = -0.001700
H = 0.00140934

Percent Oxygen Saturation:

$S = (C / S_c) * 100$

Where:
S = Oxygen percent saturation (%) of water sample
C = Concentration adjusted for salinity as calculated above
Sc = Corrected solubility as calculated above, or from tables

Other Calculations:

Salinity:

Salinity is a unitless number but is generally referred to in PSS (Practical Salinity Scale or PSU (Practical Salinity Units). Salinity can be calculated from conductivity by the equation:

Salinity = A+(B*R^0.5)+(C*R)+(D*R^1.5)+(E*R^2)+(F*R^2.5)

Where:
A = 0.0120
B = -0.2174
C = 25.3283
D = 13.7714
E = -6.4788
F = 2.5842
R = Measured conductivity in uS / 53087uS

Altitude:

Calculating the barometric pressure based on altitude is not exact. It can vary with air temperature, temperature lapse rate, and other atmospheric conditions. The following is a good approximation.

Elevation Feet	Pressure mbar	Elevation Feet	Pressure mbar	Elevation Feet	Pressure mbar
0	1013	2000	944	4000	878
250	1004	2250	936	4250	870
500	994	2500	926	4500	862
750	985	2750	918	4750	854
1000	977	3000	910	5000	846
1250	969	3250	902	5250	838
1500	960	3500	894	5500	832
1750	952	3750	886	5750	824

P_a = 1013 - (3.54733E-2*A) + (4.6068714E-7 * A^2)

Where:
P_a = Atmospheric Pressure in mbar
A = Altitude in feet

VI. DO Solubility Lookup Tables

Table 6.1
Solubility of Oxygen vs. Temperature (ºC) and Atmospheric Pressure (mbar)

mbar	1059.6	1053.0	1046.3	1039.6	1033.0	1026.3	1019.6	1013.0	1006.3	999.6	993.0	986.3	979.6	973.0	966.3	959.7	953.0	946.3	939.7	933.0
ºC																				
0.0	15.3	15.2	15.1	15.0	14.9	14.8	14.7	14.6	14.5	14.4	14.3	14.2	14.1	14.0	13.9	13.8	13.7	13.6	13.5	13.4
0.5	15.1	15.0	14.9	14.8	14.7	14.6	14.5	14.4	14.3	14.2	14.1	14.0	13.9	13.8	13.7	13.6	13.5	13.4	13.3	13.2
1.0	14.8	14.7	14.6	14.5	14.4	14.4	14.3	14.2	14.1	14.0	13.9	13.8	13.7	13.6	13.5	13.5	13.4	13.3	13.2	13.1
1.5	14.6	14.5	14.4	14.3	14.2	14.2	14.1	14.0	13.9	13.8	13.7	13.6	13.5	13.4	13.3	13.3	13.2	13.1	13.0	12.9
2.0	14.4	14.3	14.2	14.1	14.0	14.0	13.9	13.8	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.1	13.0	12.9	12.8	12.7
2.5	14.2	14.1	14.0	13.9	13.8	13.8	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.9	12.8	12.7	12.6	12.5
3.0	14.1	14.0	13.9	13.8	13.7	13.7	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.8	12.7	12.6	12.5	12.4
3.5	13.9	13.8	13.7	13.6	13.5	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.6	12.5	12.4	12.3	12.2
4.0	13.7	13.6	13.5	13.4	13.3	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.4	12.3	12.2	12.1	12.0
4.5	13.5	13.4	13.3	13.2	13.2	13.1	13.0	12.9	12.8	12.7	12.7	12.6	12.5	12.4	12.3	12.2	12.2	12.1	12.0	11.9
5.0	13.3	13.2	13.1	13.0	13.0	12.9	12.8	12.7	12.6	12.5	12.5	12.4	12.3	12.2	12.1	12.0	12.0	11.9	11.8	11.7
5.5	13.2	13.1	13.0	12.9	12.9	12.8	12.7	12.6	12.5	12.4	12.4	12.3	12.2	12.1	12.0	11.9	11.9	11.8	11.7	11.6
6.0	13.0	12.9	12.8	12.7	12.7	12.6	12.5	12.4	12.3	12.2	12.2	12.1	12.0	11.9	11.8	11.7	11.7	11.6	11.5	11.4
6.5	12.8	12.7	12.6	12.6	12.5	12.4	12.3	12.2	12.2	12.1	12.0	11.9	11.9	11.8	11.7	11.6	11.5	11.5	11.4	11.3
7.0	12.7	12.6	12.5	12.4	12.4	12.3	12.2	12.1	12.0	11.9	11.9	11.8	11.7	11.6	11.5	11.4	11.4	11.3	11.2	11.1
7.5	12.5	12.4	12.3	12.3	12.2	12.1	12.0	11.9	11.9	11.8	11.7	11.6	11.6	11.5	11.4	11.3	11.2	11.2	11.1	11.0
8.0	12.4	12.3	12.2	12.2	12.1	12.0	11.9	11.8	11.8	11.7	11.6	11.5	11.5	11.4	11.3	11.2	11.1	11.1	11.0	10.9
8.5	12.2	12.1	12.0	12.0	11.9	11.8	11.7	11.6	11.6	11.5	11.4	11.3	11.3	11.2	11.1	11.0	10.9	10.9	10.8	10.7
9.0	12.1	12.0	11.9	11.9	11.8	11.7	11.6	11.5	11.5	11.4	11.3	11.2	11.2	11.1	11.0	10.9	10.8	10.8	10.7	10.6
9.5	11.9	11.8	11.8	11.7	11.6	11.5	11.5	11.4	11.3	11.2	11.2	11.1	11.0	10.9	10.9	10.8	10.7	10.6	10.6	10.5
10.0	11.8	11.7	11.7	11.6	11.5	11.4	11.4	11.3	11.2	11.1	11.1	11.0	10.9	10.8	10.8	10.7	10.6	10.5	10.5	10.4
10.5	11.7	11.6	11.5	11.5	11.4	11.3	11.2	11.1	11.1	11.0	10.9	10.8	10.8	10.7	10.6	10.5	10.4	10.4	10.3	10.2
11.0	11.5	11.4	11.4	11.3	11.2	11.1	11.1	11.0	10.9	10.8	10.8	10.7	10.6	10.5	10.5	10.4	10.3	10.2	10.2	10.1
11.5	11.4	11.3	11.3	11.2	11.1	11.0	11.0	10.9	10.8	10.7	10.7	10.6	10.5	10.4	10.4	10.3	10.2	10.1	10.1	10.0
12.0	11.3	11.2	11.2	11.1	11.0	10.9	10.9	10.8	10.7	10.6	10.6	10.5	10.4	10.3	10.3	10.2	10.1	10.0	10.0	9.9
12.5	11.1	11.0	11.0	10.9	10.8	10.8	10.7	10.6	10.6	10.5	10.4	10.3	10.3	10.2	10.1	10.1	10.0	9.9	9.9	9.8
13.0	11.0	10.9	10.9	10.8	10.7	10.7	10.6	10.5	10.5	10.4	10.3	10.2	10.2	10.1	10.0	10.0	9.9	9.8	9.8	9.7
13.5	10.9	10.8	10.8	10.7	10.6	10.6	10.5	10.4	10.4	10.3	10.2	10.1	10.1	10.0	9.9	9.9	9.8	9.7	9.7	9.6
14.0	10.8	10.7	10.7	10.6	10.5	10.5	10.4	10.3	10.3	10.2	10.1	10.0	10.0	9.9	9.8	9.8	9.7	9.6	9.6	9.5
14.5	10.6	10.5	10.5	10.4	10.3	10.3	10.2	10.2	10.1	10.0	10.0	9.9	9.8	9.8	9.7	9.7	9.6	9.5	9.5	9.4
15.0	10.5	10.4	10.4	10.3	10.2	10.2	10.1	10.1	10.0	9.9	9.9	9.8	9.7	9.7	9.6	9.6	9.5	9.4	9.4	9.3
15.5	10.4	10.3	10.3	10.2	10.1	10.1	10.0	10.0	9.9	9.8	9.8	9.7	9.6	9.6	9.5	9.5	9.4	9.3	9.3	9.2
16.0	10.3	10.2	10.2	10.1	10.0	10.0	9.9	9.9	9.8	9.7	9.7	9.6	9.5	9.5	9.4	9.4	9.3	9.2	9.2	9.1
16.5	10.2	10.1	10.1	10.0	9.9	9.9	9.8	9.8	9.7	9.6	9.6	9.5	9.4	9.4	9.3	9.3	9.2	9.1	9.1	9.0
17.0	10.1	10.0	10.0	9.9	9.8	9.8	9.7	9.7	9.6	9.5	9.5	9.4	9.3	9.3	9.2	9.2	9.1	9.0	9.0	8.9
17.5	10.0	9.9	9.9	9.8	9.7	9.7	9.6	9.6	9.5	9.4	9.4	9.3	9.2	9.2	9.1	9.1	9.0	8.9	8.9	8.8
18.0	9.9	9.8	9.8	9.7	9.6	9.6	9.5	9.5	9.4	9.3	9.3	9.2	9.1	9.1	9.0	9.0	8.9	8.8	8.8	8.7
18.5	9.8	9.7	9.7	9.6	9.5	9.5	9.4	9.4	9.3	9.2	9.2	9.1	9.0	9.0	8.9	8.9	8.8	8.7	8.7	8.6
19.0	9.7	9.6	9.6	9.5	9.4	9.4	9.3	9.3	9.2	9.1	9.1	9.0	8.9	8.9	8.8	8.8	8.7	8.6	8.6	8.5
19.5	9.6	9.5	9.5	9.4	9.3	9.3	9.2	9.2	9.1	9.0	9.0	8.9	8.8	8.8	8.7	8.7	8.6	8.5	8.5	8.4

Table 6.2
Solubility of Oxygen vs. Temperature (ºC) and Atmospheric Pressure (mbar)

mbar	1059.6	1053.0	1046.3	1039.6	1033.0	1026.3	1019.6	1013.0	1006.3	999.6	993.0	986.3	979.6	973.0	966.3	959.7	953.0	946.3	939.7	933.0
ºC																				
20.0	9.5	9.4	9.4	9.3	9.2	9.2	9.1	9.1	9.0	8.9	8.9	8.8	8.7	8.7	8.6	8.6	8.5	8.4	8.4	8.3
20.5	9.4	9.3	9.3	9.2	9.2	9.1	9.1	9.0	8.9	8.9	8.8	8.8	8.7	8.6	8.6	8.5	8.5	8.4	8.4	8.3
21.0	9.3	9.2	9.2	9.1	9.1	9.0	9.0	8.9	8.8	8.8	8.7	8.7	8.6	8.5	8.5	8.4	8.4	8.3	8.3	8.2
21.5	9.2	9.1	9.1	9.0	9.0	8.9	8.9	8.8	8.7	8.7	8.6	8.6	8.5	8.4	8.4	8.3	8.3	8.2	8.2	8.1
22.0	9.1	9.0	9.0	8.9	8.9	8.8	8.8	8.7	8.6	8.6	8.5	8.5	8.4	8.3	8.3	8.2	8.2	8.1	8.1	8.0
22.5	9.0	8.9	8.9	8.8	8.8	8.7	8.7	8.6	8.5	8.5	8.4	8.4	8.3	8.2	8.2	8.1	8.1	8.0	8.0	7.9
23.0	9.0	8.9	8.9	8.8	8.8	8.7	8.7	8.6	8.5	8.5	8.4	8.4	8.3	8.2	8.2	8.1	8.1	8.0	8.0	7.9
23.5	8.9	8.8	8.8	8.7	8.7	8.6	8.6	8.5	8.4	8.4	8.3	8.3	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.8
24.0	8.8	8.7	8.7	8.6	8.6	8.5	8.5	8.4	8.3	8.3	8.2	8.2	8.1	8.0	8.0	7.9	7.9	7.8	7.8	7.7
24.5	8.7	8.6	8.6	8.5	8.5	8.4	8.4	8.3	8.2	8.2	8.1	8.1	8.0	7.9	7.9	7.8	7.8	7.7	7.7	7.6
25.0	8.6	8.5	8.5	8.4	8.4	8.3	8.3	8.2	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.8	7.8	7.7	7.7	7.6
25.5	8.5	8.4	8.4	8.3	8.3	8.2	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5
26.0	8.5	8.4	8.4	8.3	8.3	8.2	8.2	8.1	8.0	8.0	7.9	7.9	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4
26.5	8.4	8.3	8.3	8.2	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4
27.0	8.3	8.2	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3
27.5	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2
28.0	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2
28.5	8.1	8.0	8.0	7.9	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1
29.0	8.0	7.9	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0
29.5	8.0	7.9	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0
30.0	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9
30.5	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9
31.0	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8
31.5	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7
32.0	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7
32.5	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6
33.0	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6
33.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5
34.0	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5
34.5	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4
35.0	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3
35.5	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3
36.0	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2
36.5	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2
37.0	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1
37.5	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1
38.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0
38.5	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0
39.0	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.5	6.4	6.4	6.3	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0
39.5	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9
40.0	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.4	6.3	6.3	6.2	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9

Table 6.3
Solubility of Oxygen vs. Temperature (ºC) and Atmospheric Pressure (mbar)

mbar	926.3	919.7	913.0	906.3	899.7	893.0	886.3	879.7	873.0	866.4	859.7	853.0	846.4	839.7	833.0	826.4	819.7	813.0	806.4	799.7
ºC																				
0.0	13.3	13.2	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.4	12.3	12.2	12.1	12.0	11.9	11.8	11.7	11.6	11.5
0.5	13.1	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.2	12.1	12.0	11.9	11.8	11.7	11.6	11.5	11.4	11.3
1.0	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.1	12.0	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.2
1.5	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.0
2.0	12.6	12.5	12.4	12.3	12.2	12.2	12.1	12.0	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.3	11.2	11.1	11.0	10.9
2.5	12.4	12.3	12.2	12.1	12.0	12.0	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.1	11.0	10.9	10.8	10.7
3.0	12.3	12.2	12.1	12.0	11.9	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.0	11.0	10.9	10.8	10.7	10.6
3.5	12.1	12.0	11.9	11.8	11.7	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.0	10.9	10.8	10.8	10.7	10.6	10.5	10.4
4.0	12.0	11.9	11.8	11.7	11.6	11.6	11.5	11.4	11.3	11.2	11.1	11.0	10.9	10.8	10.7	10.7	10.6	10.5	10.4	10.3
4.5	11.8	11.7	11.6	11.5	11.5	11.4	11.3	11.2	11.1	11.0	11.0	10.9	10.8	10.7	10.6	10.5	10.5	10.4	10.3	10.2
5.0	11.6	11.5	11.4	11.3	11.3	11.2	11.1	11.0	10.9	10.8	10.8	10.7	10.6	10.5	10.4	10.3	10.3	10.2	10.1	10.0
5.5	11.5	11.4	11.3	11.2	11.2	11.1	11.0	10.9	10.8	10.7	10.7	10.6	10.5	10.4	10.3	10.2	10.2	10.1	10.0	9.9
6.0	11.4	11.3	11.2	11.1	11.1	11.0	10.9	10.8	10.7	10.6	10.6	10.5	10.4	10.3	10.2	10.1	10.1	10.0	9.9	9.8
6.5	11.2	11.1	11.0	11.0	10.9	10.8	10.7	10.6	10.6	10.5	10.4	10.3	10.3	10.2	10.1	10.0	9.9	9.9	9.8	9.7
7.0	11.1	11.0	10.9	10.8	10.8	10.7	10.6	10.5	10.4	10.3	10.3	10.2	10.1	10.0	9.9	9.8	9.8	9.7	9.6	9.5
7.5	10.9	10.8	10.7	10.7	10.6	10.5	10.4	10.3	10.3	10.2	10.1	10.0	10.0	9.9	9.8	9.7	9.6	9.6	9.5	9.4
8.0	10.8	10.7	10.6	10.6	10.5	10.4	10.3	10.2	10.2	10.1	10.0	9.9	9.9	9.8	9.7	9.6	9.5	9.5	9.4	9.3
8.5	10.7	10.6	10.5	10.5	10.4	10.3	10.2	10.1	10.1	10.0	9.9	9.8	9.8	9.7	9.6	9.5	9.4	9.4	9.3	9.2
9.0	10.5	10.4	10.4	10.3	10.2	10.1	10.1	10.0	9.9	9.8	9.8	9.7	9.6	9.5	9.5	9.4	9.3	9.2	9.2	9.1
9.5	10.4	10.3	10.3	10.2	10.1	10.0	10.0	9.9	9.8	9.7	9.7	9.6	9.5	9.4	9.4	9.3	9.2	9.1	9.1	9.0
10.0	10.3	10.2	10.2	10.1	10.0	9.9	9.9	9.8	9.7	9.6	9.6	9.5	9.4	9.3	9.3	9.2	9.1	9.0	9.0	8.9
10.5	10.2	10.1	10.1	10.0	9.9	9.8	9.8	9.7	9.6	9.5	9.5	9.4	9.3	9.2	9.2	9.1	9.0	8.9	8.9	8.8
11.0	10.1	10.0	10.0	9.9	9.8	9.7	9.7	9.6	9.5	9.4	9.4	9.3	9.2	9.1	9.1	9.0	8.9	8.8	8.8	8.7
11.5	9.9	9.8	9.8	9.7	9.6	9.6	9.5	9.4	9.4	9.3	9.2	9.1	9.1	9.0	8.9	8.9	8.8	8.7	8.7	8.6
12.0	9.8	9.7	9.7	9.6	9.5	9.5	9.4	9.3	9.3	9.2	9.1	9.0	9.0	8.9	8.8	8.8	8.7	8.6	8.6	8.5
12.5	9.7	9.6	9.6	9.5	9.4	9.4	9.3	9.2	9.2	9.1	9.0	8.9	8.9	8.8	8.7	8.7	8.6	8.5	8.5	8.4
13.0	9.6	9.5	9.5	9.4	9.3	9.3	9.2	9.1	9.1	9.0	8.9	8.8	8.8	8.7	8.6	8.6	8.5	8.4	8.4	8.3
13.5	9.5	9.4	9.4	9.3	9.2	9.2	9.1	9.0	9.0	8.9	8.8	8.7	8.7	8.6	8.5	8.5	8.4	8.3	8.3	8.2
14.0	9.4	9.3	9.3	9.2	9.1	9.1	9.0	8.9	8.9	8.8	8.7	8.6	8.6	8.5	8.4	8.4	8.3	8.2	8.2	8.1
14.5	9.3	9.2	9.2	9.1	9.0	9.0	8.9	8.8	8.8	8.7	8.6	8.5	8.5	8.4	8.3	8.3	8.2	8.1	8.1	8.0
15.0	9.2	9.1	9.1	9.0	8.9	8.9	8.8	8.7	8.7	8.6	8.5	8.4	8.4	8.3	8.2	8.2	8.1	8.0	8.0	7.9
15.5	9.1	9.0	9.0	8.9	8.8	8.8	8.7	8.6	8.6	8.5	8.4	8.3	8.3	8.2	8.1	8.1	8.0	7.9	7.9	7.8
16.0	9.0	8.9	8.9	8.8	8.7	8.7	8.6	8.5	8.5	8.4	8.3	8.2	8.2	8.1	8.0	8.0	7.9	7.8	7.8	7.7
16.5	8.9	8.8	8.8	8.7	8.6	8.6	8.5	8.5	8.4	8.3	8.3	8.2	8.1	8.1	8.0	8.0	7.9	7.8	7.8	7.7
17.0	8.8	8.7	8.7	8.6	8.5	8.5	8.4	8.4	8.3	8.2	8.2	8.1	8.0	8.0	7.9	7.9	7.8	7.7	7.7	7.6
17.5	8.7	8.6	8.6	8.5	8.4	8.4	8.3	8.3	8.2	8.1	8.1	8.0	7.9	7.9	7.8	7.8	7.7	7.6	7.6	7.5
18.0	8.6	8.5	8.5	8.4	8.3	8.3	8.2	8.2	8.1	8.0	8.0	7.9	7.8	7.8	7.7	7.7	7.6	7.5	7.5	7.4
18.5	8.5	8.4	8.4	8.3	8.2	8.2	8.1	8.1	8.0	7.9	7.9	7.8	7.7	7.7	7.6	7.6	7.5	7.4	7.4	7.3
19.0	8.4	8.3	8.3	8.2	8.2	8.1	8.1	8.0	7.9	7.9	7.8	7.8	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3
19.5	8.4	8.3	8.3	8.2	8.1	8.1	8.0	8.0	7.9	7.8	7.8	7.7	7.6	7.6	7.5	7.5	7.4	7.3	7.3	7.2

Table 6.4
Solubility of Oxygen vs. Temperature (ºC) and Atmospheric Pressure (mbar)

mbar	926.3	919.7	913.0	906.3	899.7	893.0	886.3	879.7	873.0	866.4	859.7	853.0	846.4	839.7	833.0	826.4	819.7	813.0	806.4	799.7
ºC																				
20.0	8.3	8.2	8.2	8.1	8.0	8.0	7.9	7.9	7.8	7.7	7.7	7.6	7.5	7.5	7.4	7.4	7.3	7.2	7.2	7.1
20.5	8.2	8.1	8.1	8.0	7.9	7.9	7.8	7.8	7.7	7.6	7.6	7.5	7.4	7.4	7.3	7.3	7.2	7.1	7.1	7.0
21.0	8.1	8.0	8.0	7.9	7.9	7.8	7.8	7.7	7.6	7.6	7.5	7.5	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0
21.5	8.0	7.9	7.9	7.8	7.8	7.7	7.7	7.6	7.5	7.5	7.4	7.4	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9
22.0	8.0	7.9	7.9	7.8	7.7	7.7	7.6	7.6	7.5	7.4	7.4	7.3	7.2	7.2	7.1	7.1	7.0	6.9	6.9	6.8
22.5	7.9	7.8	7.8	7.7	7.7	7.6	7.6	7.5	7.4	7.4	7.3	7.3	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8
23.0	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4	7.3	7.3	7.2	7.2	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7
23.5	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.2	7.2	7.1	7.1	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6
24.0	7.7	7.6	7.6	7.5	7.5	7.4	7.4	7.3	7.2	7.2	7.1	7.1	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6
24.5	7.6	7.5	7.5	7.4	7.4	7.3	7.3	7.2	7.1	7.1	7.0	7.0	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5
25.0	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.1	7.0	7.0	6.9	6.9	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4
25.5	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4
26.0	7.4	7.3	7.3	7.2	7.2	7.1	7.1	7.0	6.9	6.9	6.8	6.8	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3
26.5	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3
27.0	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2
27.5	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2
28.0	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1
28.5	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0
29.0	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0
29.5	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9
30.0	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9
30.5	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8
31.0	6.7	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8
31.5	6.7	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7
32.0	6.6	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7
32.5	6.6	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6
33.0	6.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6
33.5	6.5	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5
34.0	6.4	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5
34.5	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4
35.0	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4	5.4
35.5	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.3	5.3
36.0	6.2	6.2	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.3	5.3
36.5	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.3	5.3	5.2	5.2
37.0	6.1	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.3	5.3	5.2	5.2
37.5	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.7	5.6	5.6	5.5	5.5	5.5	5.4	5.4	5.3	5.3	5.2	5.2
38.0	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.3	5.3	5.2	5.2	5.1	5.1
38.5	6.0	6.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.3	5.3	5.2	5.2	5.1	5.1
39.0	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.3	5.3	5.2	5.2	5.1	5.1	5.0	5.0
39.5	5.9	5.9	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.4	5.4	5.3	5.3	5.2	5.2	5.1	5.1	5.0	5.0
40.0	5.8	5.8	5.7	5.7	5.6	5.6	5.5	5.5	5.5	5.4	5.4	5.3	5.3	5.3	5.2	5.2	5.1	5.1	5.0	5.0

VII. Salinity Correction Lookup Tables

Table 7.1
Salinity Correction Factors for Dissolved Oxygen in Water vs. Temperature (ºC) and Conductivity (uS or PSS)

uS	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000	13000	14000	15000	16000
PSS	0.0	0.5	1.0	1.6	2.1	2.7	3.3	3.8	4.4	5.0	5.6	6.2	6.8	7.5	8.1	8.7	9.3
ºC																	
0	1.000	0.996	0.992	0.988	0.984	0.981	0.977	0.973	0.969	0.965	0.961	0.957	0.953	0.950	0.946	0.942	0.938
1	1.000	0.996	0.992	0.988	0.984	0.981	0.977	0.973	0.969	0.965	0.961	0.957	0.953	0.950	0.946	0.942	0.938
2	1.000	0.996	0.992	0.988	0.984	0.981	0.977	0.973	0.969	0.965	0.961	0.957	0.953	0.950	0.946	0.942	0.938
3	1.000	0.996	0.992	0.988	0.985	0.981	0.977	0.973	0.969	0.966	0.962	0.958	0.954	0.950	0.947	0.943	0.939
4	1.000	0.996	0.992	0.988	0.985	0.981	0.977	0.973	0.969	0.966	0.962	0.958	0.954	0.950	0.947	0.943	0.939
5	1.000	0.996	0.992	0.989	0.985	0.981	0.977	0.974	0.970	0.966	0.962	0.959	0.955	0.951	0.947	0.944	0.940
6	1.000	0.996	0.992	0.989	0.985	0.981	0.977	0.974	0.970	0.966	0.962	0.959	0.955	0.951	0.947	0.944	0.940
7	1.000	0.996	0.992	0.989	0.985	0.981	0.978	0.974	0.970	0.967	0.963	0.959	0.956	0.952	0.948	0.945	0.941
8	1.000	0.996	0.992	0.989	0.985	0.981	0.978	0.974	0.970	0.967	0.963	0.959	0.956	0.952	0.948	0.945	0.941
9	1.000	0.996	0.992	0.989	0.985	0.981	0.978	0.974	0.970	0.967	0.963	0.959	0.956	0.952	0.948	0.945	0.941
10	1.000	0.996	0.992	0.989	0.985	0.982	0.978	0.974	0.971	0.967	0.964	0.960	0.956	0.953	0.949	0.946	0.942
11	1.000	0.996	0.992	0.989	0.985	0.982	0.978	0.974	0.971	0.967	0.964	0.960	0.956	0.953	0.949	0.946	0.942
12	1.000	0.997	0.993	0.990	0.986	0.983	0.979	0.975	0.972	0.968	0.965	0.961	0.957	0.954	0.950	0.947	0.943
13	1.000	0.997	0.993	0.990	0.986	0.983	0.979	0.975	0.972	0.968	0.965	0.961	0.957	0.954	0.950	0.947	0.943
14	1.000	0.997	0.993	0.990	0.986	0.983	0.979	0.975	0.972	0.968	0.965	0.961	0.957	0.954	0.950	0.947	0.943
15	1.000	0.997	0.993	0.990	0.986	0.983	0.979	0.976	0.972	0.969	0.965	0.962	0.958	0.955	0.951	0.948	0.944
16	1.000	0.997	0.993	0.990	0.986	0.983	0.979	0.976	0.972	0.969	0.965	0.962	0.958	0.955	0.951	0.948	0.944
17	1.000	0.997	0.994	0.990	0.987	0.983	0.980	0.976	0.973	0.969	0.966	0.962	0.959	0.955	0.952	0.948	0.945
18	1.000	0.997	0.994	0.990	0.987	0.983	0.980	0.976	0.973	0.969	0.966	0.962	0.959	0.955	0.952	0.948	0.945
19	1.000	0.997	0.994	0.990	0.987	0.983	0.980	0.976	0.973	0.969	0.966	0.962	0.959	0.955	0.952	0.948	0.945
20	1.000	0.997	0.994	0.990	0.987	0.983	0.980	0.977	0.973	0.970	0.966	0.963	0.960	0.956	0.953	0.949	0.946
21	1.000	0.997	0.994	0.990	0.987	0.983	0.980	0.977	0.973	0.970	0.966	0.963	0.960	0.956	0.953	0.949	0.946
22	1.000	0.997	0.994	0.990	0.987	0.984	0.980	0.977	0.974	0.970	0.967	0.964	0.960	0.957	0.954	0.950	0.947
23	1.000	0.997	0.994	0.990	0.987	0.984	0.980	0.977	0.974	0.970	0.967	0.964	0.960	0.957	0.954	0.950	0.947
24	1.000	0.997	0.994	0.990	0.987	0.984	0.980	0.977	0.974	0.970	0.967	0.964	0.960	0.957	0.954	0.950	0.947
25	1.000	0.997	0.994	0.990	0.987	0.984	0.981	0.977	0.974	0.971	0.968	0.964	0.961	0.958	0.955	0.951	0.948
26	1.000	0.997	0.994	0.990	0.987	0.984	0.981	0.977	0.974	0.971	0.968	0.964	0.961	0.958	0.955	0.951	0.948
27	1.000	0.997	0.994	0.990	0.987	0.984	0.981	0.977	0.974	0.971	0.968	0.964	0.961	0.958	0.955	0.951	0.948
28	1.000	0.997	0.994	0.991	0.987	0.984	0.981	0.978	0.975	0.971	0.968	0.965	0.962	0.959	0.955	0.952	0.949
29	1.000	0.997	0.994	0.991	0.987	0.984	0.981	0.978	0.975	0.971	0.968	0.965	0.962	0.959	0.955	0.952	0.949
30	1.000	0.997	0.994	0.991	0.988	0.984	0.981	0.978	0.975	0.972	0.969	0.966	0.963	0.959	0.956	0.953	0.950
31	1.000	0.997	0.994	0.991	0.988	0.984	0.981	0.978	0.975	0.972	0.969	0.966	0.963	0.959	0.956	0.953	0.950
32	1.000	0.997	0.994	0.991	0.988	0.984	0.981	0.978	0.975	0.972	0.969	0.966	0.963	0.959	0.956	0.953	0.950
33	1.000	0.997	0.994	0.991	0.988	0.985	0.982	0.979	0.976	0.972	0.969	0.966	0.963	0.960	0.957	0.954	0.951
34	1.000	0.997	0.994	0.991	0.988	0.985	0.982	0.979	0.976	0.972	0.969	0.966	0.963	0.960	0.957	0.954	0.951
35	1.000	0.997	0.994	0.991	0.988	0.985	0.982	0.979	0.976	0.972	0.969	0.966	0.963	0.960	0.957	0.954	0.951
36	1.000	0.997	0.994	0.991	0.988	0.985	0.982	0.979	0.976	0.973	0.970	0.967	0.964	0.961	0.957	0.954	0.951
37	1.000	0.997	0.994	0.991	0.988	0.985	0.982	0.979	0.976	0.973	0.970	0.967	0.964	0.961	0.958	0.955	0.952
38	1.000	0.997	0.994	0.991	0.988	0.985	0.982	0.979	0.976	0.973	0.970	0.967	0.964	0.961	0.958	0.955	0.952
39	1.000	0.997	0.994	0.991	0.988	0.985	0.982	0.979	0.976	0.973	0.970	0.967	0.964	0.961	0.958	0.955	0.952
40	1.000	0.997	0.994	0.991	0.988	0.985	0.982	0.979	0.976	0.974	0.971	0.968	0.965	0.962	0.959	0.956	0.953

Table 7.2
Salinity Correction Factors for Dissolved Oxygen in Water vs. Temperature (ºC) and Conductivity (uS or PSS)

uS	17000	18000	19000	20000	21000	22000	23000	24000	25000	26000	27000	28000	29000	30000	31000	32000	33000
PSS	10.0	10.6	11.3	11.9	12.6	13.2	13.9	14.5	15.2	15.9	16.5	17.2	17.9	18.6	19.2	19.9	20.6
ºC																	
0	0.934	0.930	0.926	0.922	0.918	0.914	0.910	0.906	0.902	0.897	0.893	0.889	0.885	0.881	0.877	0.873	0.869
1	0.934	0.930	0.926	0.922	0.918	0.914	0.910	0.906	0.902	0.898	0.894	0.890	0.886	0.882	0.878	0.874	0.870
2	0.935	0.931	0.927	0.923	0.919	0.915	0.911	0.907	0.903	0.899	0.895	0.891	0.887	0.883	0.879	0.875	0.871
3	0.935	0.931	0.927	0.923	0.919	0.915	0.911	0.907	0.903	0.899	0.895	0.891	0.887	0.883	0.879	0.875	0.871
4	0.935	0.932	0.928	0.924	0.920	0.916	0.912	0.908	0.904	0.900	0.896	0.892	0.888	0.884	0.880	0.876	0.872
5	0.936	0.932	0.928	0.924	0.920	0.916	0.912	0.908	0.904	0.901	0.897	0.893	0.889	0.885	0.881	0.877	0.873
6	0.936	0.933	0.929	0.925	0.921	0.917	0.913	0.909	0.905	0.902	0.898	0.894	0.890	0.886	0.882	0.878	0.874
7	0.937	0.933	0.929	0.925	0.921	0.918	0.914	0.910	0.906	0.902	0.898	0.894	0.890	0.887	0.883	0.879	0.875
8	0.937	0.933	0.929	0.925	0.922	0.918	0.914	0.910	0.906	0.903	0.899	0.895	0.891	0.887	0.884	0.880	0.876
9	0.938	0.934	0.930	0.926	0.923	0.919	0.915	0.911	0.907	0.904	0.900	0.896	0.892	0.888	0.885	0.881	0.877
10	0.938	0.934	0.930	0.926	0.923	0.919	0.915	0.911	0.907	0.904	0.900	0.896	0.892	0.888	0.885	0.881	0.877
11	0.939	0.935	0.931	0.927	0.924	0.920	0.916	0.912	0.908	0.905	0.901	0.897	0.893	0.889	0.886	0.882	0.878
12	0.939	0.935	0.931	0.928	0.924	0.920	0.916	0.913	0.909	0.905	0.901	0.898	0.894	0.890	0.886	0.883	0.879
13	0.939	0.936	0.932	0.929	0.925	0.921	0.917	0.914	0.910	0.906	0.902	0.899	0.895	0.891	0.887	0.884	0.880
14	0.940	0.936	0.932	0.929	0.925	0.921	0.918	0.914	0.910	0.907	0.903	0.899	0.896	0.892	0.888	0.885	0.881
15	0.940	0.937	0.933	0.930	0.926	0.922	0.919	0.915	0.911	0.908	0.904	0.900	0.897	0.893	0.889	0.886	0.882
16	0.941	0.937	0.933	0.930	0.926	0.922	0.919	0.915	0.911	0.908	0.904	0.900	0.897	0.893	0.889	0.886	0.882
17	0.941	0.938	0.934	0.931	0.927	0.923	0.920	0.916	0.912	0.909	0.905	0.901	0.898	0.894	0.890	0.887	0.883
18	0.942	0.938	0.934	0.931	0.927	0.924	0.920	0.916	0.913	0.909	0.906	0.902	0.898	0.895	0.891	0.888	0.884
19	0.942	0.938	0.934	0.931	0.927	0.924	0.920	0.917	0.913	0.910	0.906	0.903	0.899	0.896	0.892	0.889	0.885
20	0.942	0.939	0.935	0.932	0.928	0.925	0.921	0.918	0.914	0.911	0.907	0.904	0.900	0.897	0.893	0.890	0.886
21	0.943	0.939	0.935	0.932	0.928	0.925	0.921	0.918	0.914	0.911	0.907	0.904	0.900	0.897	0.893	0.890	0.886
22	0.943	0.940	0.936	0.933	0.929	0.926	0.922	0.919	0.915	0.912	0.908	0.905	0.901	0.898	0.894	0.891	0.887
23	0.944	0.940	0.937	0.933	0.930	0.926	0.923	0.919	0.916	0.912	0.909	0.905	0.902	0.898	0.895	0.891	0.888
24	0.944	0.941	0.938	0.934	0.931	0.927	0.924	0.920	0.917	0.913	0.910	0.906	0.903	0.899	0.896	0.892	0.889
25	0.944	0.941	0.938	0.934	0.931	0.927	0.924	0.920	0.917	0.913	0.910	0.906	0.903	0.899	0.896	0.892	0.889
26	0.945	0.941	0.938	0.934	0.931	0.927	0.924	0.921	0.917	0.914	0.910	0.907	0.904	0.900	0.897	0.893	0.890
27	0.945	0.942	0.939	0.935	0.932	0.928	0.925	0.922	0.918	0.915	0.911	0.908	0.905	0.901	0.898	0.894	0.891
28	0.946	0.942	0.939	0.935	0.932	0.929	0.925	0.922	0.919	0.915	0.912	0.909	0.905	0.902	0.899	0.895	0.892
29	0.946	0.943	0.940	0.936	0.933	0.929	0.926	0.923	0.919	0.916	0.912	0.909	0.906	0.902	0.899	0.895	0.892
30	0.946	0.943	0.940	0.936	0.933	0.930	0.926	0.923	0.920	0.916	0.913	0.910	0.906	0.903	0.900	0.896	0.893
31	0.947	0.943	0.940	0.936	0.933	0.930	0.927	0.923	0.920	0.917	0.914	0.910	0.907	0.904	0.901	0.897	0.894
32	0.947	0.944	0.941	0.937	0.934	0.931	0.928	0.924	0.921	0.918	0.915	0.911	0.908	0.905	0.902	0.898	0.895
33	0.947	0.944	0.941	0.937	0.934	0.931	0.928	0.924	0.921	0.918	0.915	0.911	0.908	0.905	0.902	0.898	0.895
34	0.948	0.945	0.942	0.938	0.935	0.932	0.929	0.925	0.922	0.919	0.916	0.912	0.909	0.906	0.903	0.899	0.896
35	0.948	0.945	0.942	0.939	0.935	0.932	0.929	0.926	0.923	0.919	0.916	0.913	0.910	0.907	0.903	0.900	0.897
36	0.948	0.945	0.942	0.939	0.936	0.933	0.930	0.926	0.923	0.920	0.917	0.914	0.911	0.907	0.904	0.901	0.898
37	0.949	0.946	0.943	0.940	0.936	0.933	0.930	0.927	0.924	0.921	0.918	0.914	0.911	0.908	0.905	0.902	0.899
38	0.949	0.946	0.943	0.940	0.937	0.934	0.931	0.928	0.924	0.921	0.918	0.915	0.912	0.909	0.906	0.903	0.899
39	0.950	0.947	0.944	0.941	0.937	0.934	0.931	0.928	0.925	0.922	0.919	0.916	0.913	0.910	0.906	0.903	0.900
40	0.950	0.947	0.944	0.941	0.938	0.935	0.932	0.929	0.926	0.923	0.919	0.916	0.913	0.910	0.907	0.904	0.901

Table 7.3
Salinity Correction Factors for Dissolved Oxygen in Water vs. Temperature (ºC) and Conductivity (uS or PSS)

uS	34000	35000	36000	37000	38000	39000	40000	41000	42000	43000	44000	45000	46000	47000	48000	49000	50000
PSS	21.3	22.0	22.7	23.4	24.0	24.8	25.5	26.2	26.9	27.6	28.4	29.1	29.8	30.5	31.3	32.0	32.7
ºC																	
0	0.865	0.861	0.857	0.853	0.849	0.844	0.840	0.836	0.832	0.828	0.824	0.820	0.815	0.811	0.807	0.803	0.799
1	0.866	0.862	0.858	0.854	0.850	0.845	0.841	0.837	0.833	0.829	0.825	0.821	0.816	0.812	0.808	0.804	0.800
2	0.867	0.863	0.859	0.855	0.851	0.846	0.842	0.838	0.834	0.830	0.826	0.822	0.817	0.813	0.809	0.805	0.801
3	0.867	0.863	0.859	0.855	0.851	0.847	0.843	0.839	0.835	0.831	0.827	0.823	0.819	0.815	0.811	0.807	0.803
4	0.868	0.864	0.860	0.856	0.852	0.848	0.844	0.840	0.836	0.832	0.828	0.824	0.820	0.816	0.812	0.808	0.804
5	0.869	0.865	0.861	0.857	0.853	0.849	0.845	0.841	0.837	0.833	0.829	0.825	0.821	0.817	0.813	0.809	0.805
6	0.870	0.866	0.862	0.858	0.854	0.850	0.846	0.842	0.838	0.834	0.830	0.826	0.822	0.818	0.814	0.810	0.806
7	0.871	0.867	0.863	0.859	0.855	0.851	0.847	0.843	0.840	0.836	0.832	0.828	0.824	0.820	0.816	0.812	0.808
8	0.872	0.868	0.864	0.860	0.856	0.852	0.848	0.844	0.841	0.837	0.833	0.829	0.825	0.821	0.817	0.813	0.809
9	0.873	0.869	0.865	0.861	0.857	0.853	0.849	0.845	0.842	0.838	0.834	0.830	0.826	0.822	0.818	0.814	0.810
10	0.874	0.870	0.866	0.862	0.858	0.854	0.850	0.846	0.843	0.839	0.835	0.831	0.827	0.823	0.819	0.815	0.811
11	0.874	0.870	0.866	0.863	0.859	0.855	0.851	0.847	0.844	0.840	0.836	0.832	0.828	0.824	0.821	0.817	0.813
12	0.875	0.871	0.867	0.864	0.860	0.856	0.852	0.848	0.845	0.841	0.837	0.833	0.829	0.825	0.822	0.818	0.814
13	0.876	0.872	0.868	0.865	0.861	0.857	0.853	0.849	0.846	0.842	0.838	0.834	0.830	0.826	0.823	0.819	0.815
14	0.877	0.873	0.869	0.866	0.862	0.858	0.854	0.850	0.847	0.843	0.839	0.835	0.831	0.827	0.824	0.820	0.816
15	0.878	0.874	0.870	0.867	0.863	0.859	0.855	0.851	0.848	0.844	0.840	0.836	0.832	0.828	0.825	0.821	0.817
16	0.879	0.875	0.872	0.868	0.864	0.860	0.857	0.853	0.849	0.845	0.842	0.838	0.834	0.830	0.827	0.823	0.819
17	0.879	0.875	0.872	0.868	0.864	0.861	0.857	0.853	0.850	0.846	0.842	0.838	0.835	0.831	0.827	0.824	0.820
18	0.880	0.876	0.873	0.869	0.865	0.862	0.858	0.854	0.851	0.847	0.843	0.839	0.836	0.832	0.828	0.825	0.821
19	0.881	0.877	0.874	0.870	0.866	0.863	0.859	0.855	0.852	0.848	0.844	0.840	0.837	0.833	0.829	0.826	0.822
20	0.882	0.878	0.875	0.871	0.867	0.864	0.860	0.856	0.853	0.849	0.845	0.841	0.838	0.834	0.830	0.827	0.823
21	0.883	0.879	0.876	0.872	0.869	0.865	0.861	0.858	0.854	0.850	0.847	0.843	0.840	0.836	0.832	0.829	0.825
22	0.884	0.880	0.877	0.873	0.870	0.866	0.862	0.859	0.855	0.851	0.848	0.844	0.841	0.837	0.833	0.830	0.826
23	0.884	0.880	0.877	0.873	0.870	0.866	0.863	0.859	0.856	0.852	0.848	0.845	0.841	0.838	0.834	0.831	0.827
24	0.885	0.881	0.878	0.874	0.871	0.867	0.864	0.860	0.857	0.853	0.849	0.846	0.842	0.839	0.835	0.832	0.828
25	0.886	0.882	0.879	0.875	0.872	0.868	0.865	0.861	0.858	0.854	0.850	0.847	0.843	0.840	0.836	0.833	0.829
26	0.887	0.883	0.880	0.876	0.873	0.869	0.866	0.862	0.859	0.855	0.851	0.848	0.844	0.841	0.837	0.834	0.830
27	0.887	0.884	0.880	0.877	0.873	0.870	0.866	0.863	0.859	0.855	0.852	0.848	0.845	0.841	0.838	0.834	0.831
28	0.888	0.885	0.881	0.878	0.874	0.871	0.867	0.864	0.860	0.857	0.853	0.849	0.846	0.842	0.839	0.835	0.832
29	0.889	0.886	0.882	0.879	0.875	0.872	0.868	0.865	0.862	0.858	0.855	0.851	0.848	0.844	0.841	0.837	0.834
30	0.890	0.887	0.883	0.880	0.876	0.873	0.869	0.866	0.863	0.859	0.856	0.852	0.849	0.845	0.842	0.838	0.835
31	0.890	0.887	0.883	0.880	0.877	0.873	0.870	0.866	0.863	0.860	0.856	0.853	0.850	0.846	0.843	0.839	0.836
32	0.891	0.888	0.884	0.881	0.878	0.874	0.871	0.867	0.864	0.861	0.857	0.854	0.851	0.847	0.844	0.840	0.837
33	0.892	0.889	0.885	0.882	0.879	0.875	0.872	0.868	0.865	0.862	0.858	0.855	0.852	0.848	0.845	0.841	0.838
34	0.893	0.890	0.886	0.883	0.880	0.876	0.873	0.869	0.866	0.863	0.859	0.856	0.853	0.849	0.846	0.842	0.839
35	0.893	0.890	0.886	0.883	0.880	0.876	0.873	0.870	0.867	0.863	0.860	0.857	0.853	0.850	0.847	0.843	0.840
36	0.894	0.891	0.887	0.884	0.881	0.877	0.874	0.871	0.867	0.864	0.861	0.858	0.854	0.851	0.848	0.844	0.841
37	0.895	0.891	0.888	0.885	0.882	0.878	0.875	0.872	0.868	0.865	0.862	0.859	0.855	0.852	0.849	0.846	0.842
38	0.895	0.892	0.889	0.886	0.882	0.879	0.876	0.873	0.869	0.866	0.863	0.860	0.856	0.853	0.850	0.847	0.844
39	0.896	0.893	0.890	0.887	0.883	0.880	0.877	0.874	0.870	0.867	0.864	0.861	0.858	0.854	0.851	0.848	0.845
40	0.897	0.894	0.891	0.887	0.884	0.881	0.878	0.875	0.871	0.868	0.865	0.862	0.859	0.855	0.852	0.849	0.846

Table 7.4
Salinity Correction Factors for Dissolved Oxygen in Water vs. Temperature (ºC) and Conductivity (uS or PSS)

uS	51000	52000	53000	54000	55000	56000	57000	58000	59000	60000	61000	62000	63000	64000	65000	66000	67000
PSS	33.5	34.2	34.9	35.7	36.4	37.2	37.9	38.7	39.4	40.2	40.9	41.7	42.5	43.2	44	44.8	45.6
ºC																	
0	0.795	0.791	0.787	0.782	0.778	0.774	0.770	0.766	0.762	0.757	0.753	0.749	0.745	0.741	0.736	0.732	0.728
1	0.796	0.792	0.788	0.784	0.780	0.775	0.771	0.767	0.763	0.759	0.755	0.751	0.746	0.742	0.738	0.734	0.730
2	0.797	0.793	0.789	0.785	0.781	0.777	0.773	0.769	0.765	0.760	0.756	0.752	0.748	0.744	0.740	0.736	0.732
3	0.798	0.794	0.790	0.786	0.782	0.778	0.774	0.770	0.766	0.761	0.757	0.753	0.749	0.745	0.741	0.737	0.733
4	0.800	0.796	0.792	0.788	0.784	0.780	0.776	0.772	0.768	0.763	0.759	0.755	0.751	0.747	0.743	0.739	0.735
5	0.801	0.797	0.793	0.789	0.785	0.781	0.777	0.773	0.769	0.765	0.761	0.757	0.753	0.749	0.745	0.741	0.737
6	0.802	0.798	0.794	0.790	0.786	0.782	0.778	0.774	0.770	0.766	0.762	0.758	0.754	0.750	0.746	0.742	0.738
7	0.804	0.800	0.796	0.792	0.788	0.784	0.780	0.776	0.772	0.768	0.764	0.760	0.756	0.752	0.748	0.744	0.740
8	0.805	0.801	0.797	0.793	0.789	0.785	0.781	0.777	0.774	0.770	0.766	0.762	0.758	0.754	0.750	0.746	0.742
9	0.806	0.802	0.798	0.794	0.790	0.786	0.782	0.778	0.775	0.771	0.767	0.763	0.759	0.755	0.751	0.747	0.743
10	0.807	0.803	0.799	0.795	0.792	0.788	0.784	0.780	0.776	0.772	0.768	0.764	0.761	0.757	0.753	0.749	0.745
11	0.809	0.805	0.801	0.797	0.793	0.789	0.785	0.781	0.778	0.774	0.770	0.766	0.762	0.758	0.754	0.750	0.746
12	0.810	0.806	0.802	0.798	0.795	0.791	0.787	0.783	0.779	0.775	0.771	0.767	0.764	0.760	0.756	0.752	0.748
13	0.811	0.807	0.803	0.800	0.796	0.792	0.788	0.784	0.781	0.777	0.773	0.769	0.765	0.761	0.758	0.754	0.750
14	0.812	0.808	0.804	0.801	0.797	0.793	0.789	0.785	0.782	0.778	0.774	0.770	0.766	0.762	0.759	0.755	0.751
15	0.814	0.810	0.806	0.803	0.799	0.795	0.791	0.787	0.784	0.780	0.776	0.772	0.768	0.764	0.761	0.757	0.753
16	0.815	0.811	0.807	0.804	0.800	0.796	0.792	0.788	0.785	0.781	0.777	0.773	0.769	0.765	0.762	0.758	0.754
17	0.816	0.812	0.809	0.805	0.801	0.797	0.794	0.790	0.786	0.782	0.779	0.775	0.771	0.767	0.764	0.760	0.756
18	0.817	0.813	0.810	0.806	0.802	0.798	0.795	0.791	0.787	0.783	0.780	0.776	0.772	0.768	0.765	0.761	0.757
19	0.819	0.815	0.812	0.808	0.804	0.800	0.797	0.793	0.789	0.785	0.782	0.778	0.774	0.770	0.767	0.763	0.759
20	0.820	0.816	0.813	0.809	0.805	0.801	0.798	0.794	0.790	0.786	0.783	0.779	0.775	0.771	0.768	0.764	0.760
21	0.821	0.817	0.814	0.810	0.806	0.803	0.799	0.795	0.792	0.788	0.784	0.780	0.777	0.773	0.769	0.766	0.762
22	0.822	0.818	0.815	0.811	0.807	0.804	0.800	0.796	0.793	0.789	0.785	0.781	0.778	0.774	0.770	0.767	0.763
23	0.823	0.819	0.816	0.812	0.809	0.805	0.801	0.798	0.794	0.790	0.787	0.783	0.780	0.776	0.772	0.769	0.765
24	0.824	0.820	0.817	0.813	0.810	0.806	0.802	0.799	0.795	0.791	0.788	0.784	0.781	0.777	0.773	0.770	0.766
25	0.826	0.822	0.819	0.815	0.812	0.808	0.804	0.801	0.797	0.793	0.790	0.786	0.783	0.779	0.775	0.772	0.768
26	0.827	0.823	0.820	0.816	0.813	0.809	0.805	0.802	0.798	0.794	0.791	0.787	0.784	0.780	0.776	0.773	0.769
27	0.828	0.824	0.821	0.817	0.814	0.810	0.807	0.803	0.800	0.796	0.792	0.789	0.785	0.782	0.778	0.775	0.771
28	0.829	0.825	0.822	0.818	0.815	0.811	0.808	0.804	0.801	0.797	0.793	0.790	0.786	0.783	0.779	0.776	0.772
29	0.830	0.827	0.823	0.820	0.816	0.813	0.809	0.806	0.802	0.799	0.795	0.792	0.788	0.785	0.781	0.778	0.774
30	0.831	0.828	0.824	0.821	0.817	0.814	0.810	0.807	0.803	0.800	0.796	0.793	0.789	0.786	0.782	0.779	0.775
31	0.832	0.829	0.825	0.822	0.818	0.815	0.811	0.808	0.804	0.801	0.797	0.794	0.790	0.787	0.783	0.780	0.776
32	0.833	0.830	0.826	0.823	0.819	0.816	0.812	0.809	0.806	0.802	0.799	0.795	0.792	0.788	0.785	0.781	0.778
33	0.834	0.831	0.827	0.824	0.820	0.817	0.813	0.810	0.807	0.803	0.800	0.796	0.793	0.789	0.786	0.782	0.779
34	0.836	0.833	0.829	0.826	0.822	0.819	0.815	0.812	0.809	0.805	0.802	0.798	0.795	0.791	0.788	0.784	0.781
35	0.837	0.834	0.830	0.827	0.823	0.820	0.816	0.813	0.810	0.806	0.803	0.799	0.796	0.792	0.789	0.785	0.782
36	0.838	0.835	0.831	0.828	0.825	0.821	0.818	0.814	0.811	0.807	0.804	0.801	0.797	0.794	0.790	0.787	0.784
37	0.839	0.836	0.833	0.829	0.826	0.822	0.819	0.816	0.812	0.809	0.805	0.802	0.799	0.795	0.792	0.788	0.785
38	0.841	0.837	0.834	0.830	0.827	0.824	0.820	0.817	0.814	0.810	0.807	0.803	0.800	0.797	0.793	0.790	0.787
39	0.842	0.838	0.835	0.832	0.828	0.825	0.822	0.818	0.815	0.812	0.808	0.805	0.802	0.798	0.795	0.792	0.788
40	0.843	0.840	0.836	0.833	0.830	0.826	0.823	0.820	0.816	0.813	0.810	0.806	0.803	0.800	0.796	0.793	0.790

VIII. Trouble Shooting

There are no user serviceable parts inside the WQ-FDO sensor, only the cap and membrane assembly can is replaceable

a. Check all connections
b. Inspect the cable for damage
c. Check that the supply voltage is within specifications
d. Make sure the dissolved oxygen and temperature of the solution is within the measurement ranges of the sensor
e. Clean the sensor according to the guidelines described in the Cleaning and Maintenance section
f. Ensure that the minimum immersion depth is maintained.

Technical Support

a. Call us for technical support: 800-876-1172 or 916-638-3429
   Fax: 916-638-3270 or Email: globalw@globalw.com.
b. In the event that the equipment needs to be returned to the factory for any reason, please call to obtain a RMA # (Return Material Authorization). Do not return items without a RMA # displayed on the outside of the package.

   Before returning, clean and decontaminate the sensor if necessary.

   Include a written statement describing the problems.

   Send the package with shipping prepaid to Global Water's factory address. Insure the shipment, as the warranty does not cover damage incurred during transit.
c. When calling for tech support, please have as much of the following information as possible;
   1. Model #.
   2. Unit serial number.
   3. P.O.# the equipment was purchased on.
   4. Global Water's sales number or the invoice number.
   5. Repair instructions and/or specific problems relating to the product.

IX. Warranty

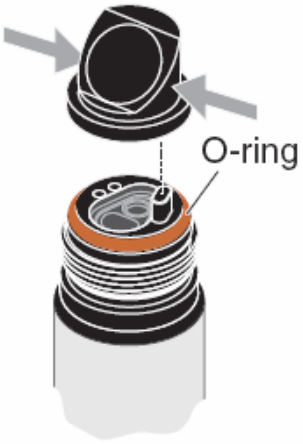
a. Global Water Instrumentation, Inc. warrants that its products are free from defects in material and workmanship under normal use and service for a period of one year from date of shipment from factory. Global Water's obligations under this warranty are limited to, at Global Water's option: (I) replacing or (II) repairing; any products determined to be defective. In no case shall Global Water's liability exceed the products original purchase price. This warranty does not apply to any equipment that has been repaired or altered, except by Global Water Instrumentation, Inc., or which has been subject to misuse, negligence or accident.

b. The warranty begins on the date of the product's invoice.

X. Appendix A – Sensor Cap

WQ SC-FDO

Handling of the sensor cap



- Dirt and moisture below the sensor cap can have negative influences on the function of the sensor and decrease lifetime of the sensor cap. Please pay attention to clean and dry working environment, when taking off the senor cap.
- Please do not touch the outer sensor membrane with your fingers. Touch the sensor cap principally only at the sides (arrows in the figure on the left).
- Avoid strong mechanical forces on the sensor membrane (pressure, scratches).
- The impact of light, particularly daylight, on the inner side of the sensor cap will have, over time, an impact on the measuring properties and can shorten the lifetime of the sensor cap. Therefore, the inner side of the sensor cap should not be exposed to direct sunlight. Please only store sensor caps in light protected environments.

Installation

Replace the O-ring each time when replacing the sensor cap. Refer to the sensor operating manual for detailed information.

XI. Appendix B – CE Certification

Declaration of CE Conformity

Global Water Instrumentation, Inc.

11390 Amalgam Way
Gold River, CA 95670 USA
FAX: 00 1 916 638 3270
Phone: 00 1 916 638 3429

declares that the Product:

Product Name: WQ-FDO Optical Dissolved Oxygen Sensor

Model Numbers: WQ-FDO

conforms to the following European Council directives:

Low Voltage Directives:	2006/95/EC; Requirements covering all health and safety risks of electrical equipment operating within certain voltage ranges. According to the following standards: EN61010-1: 2001
Electro-Magnetic Directives:	2004/108/EC; Requirements to prevent electrical and electronic equipment from generating or being affected by electromagnetic disturbances. According to the following standard: EN 61326-1: 2006

Global Water hereby certifies that the product stated above conforms to all directives and standards required for it to bear the CE mark.



Dale Daniel
Engineering Manager
Global Water Instrumentation, Inc.