

*Operator's Manual*



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## Technical Support

If you have questions or experience problems with your equipment, contact our skilled technical support team in your area by chat, email, or phone by going to [www.in-situ.com/support](http://www.in-situ.com/support).

Be sure to have the following information available:

- Product model
- Serial number
- Description of the problem, including how the product was used and the conditions noted at the time of the malfunction

### Unpacking and Inspecting

Your equipment was carefully inspected before shipping. Check the equipment for any physical damage sustained during shipment. Notify In-Situ and file a claim with the carrier if there is any such damage; do not attempt to deploy or operate the equipment.



Save packing materials for future storage and shipping of your equipment.

## Document Conventions

Throughout this document, you will see the following symbols:



A checkmark highlights a tip or feature.



The exclamation point calls your attention to a requirement, safety issue, or important action that should not be overlooked.

## Disposal

Recycle the instrument according to local regulations. Dispose of calibration solutions as described in the Safety Data Sheet accompanied with the calibration solution.

In the UK and EU, In-Situ can provide recycling of your old equipment and can sometimes recycle other manufacturers' equipment when replaced with In-Situ equipment. Trade-in options may be available for new equipment. Contact In-Situ for more information.

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# Introduction

## Serial Numbers

The probe serial number is engraved on the side of the unit. The RDO cap serial number is programmed on the memory chip inside the cap.

## About the RDOX Optical Dissolved Oxygen Probe

The RDOX Optical Dissolved Oxygen Probe is a rugged, reliable instrument designed to deliver accurate dissolved oxygen (DO) data across a wide measurement range and to reduce maintenance costs. The probe features the latest optical technology for DO measurement.

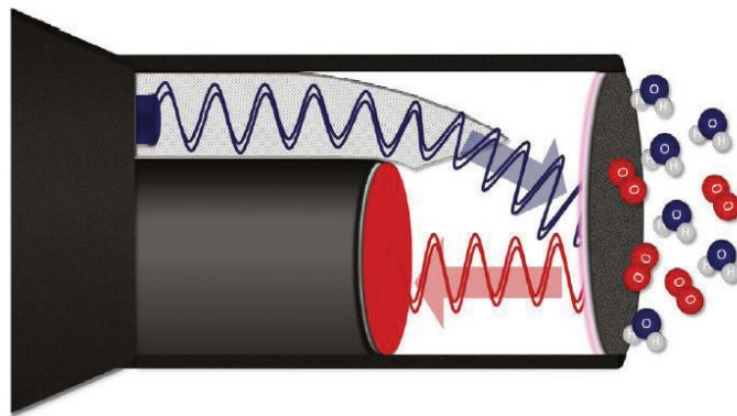
This kind of optical technology requires very few consumables:

- No membrane replacement
- No electrolyte

The RDO cap contains the optically sensitive material. Replace the RDO cap according to your site's needs or approximately once every 2 years.

The sensor operates with optical luminescence measurement technology described in Standard Method 4500-O and In-Situ Methods 1002-8-2009, 1003-8-2009, 1004-8-2009 (EPA approved).

When the probe initiates a reading, an LED emits blue light, which excites lumiphore molecules in the sensing element. Excited lumiphore molecules emit red light, which is detected by a photodiode. Oxygen molecules quench the excited lumiphore molecules and prevent the emission of red light—a process called dynamic luminescence quenching. Determination of DO concentration by luminescence quenching has a linear response over a range of concentrations.



*Lumiphore molecules are excited by blue light and then emit red light, which is detected by a photodiode. Optical electronics report DO concentration in mg/L.*

# Instrument Details

The RDOX is designed to deliver accurate dissolved oxygen (DO) data across a wide measurement range and to reduce maintenance costs. The probe features the latest optical technology for DO measurement.



1	Cable end with flying leads
2	Titanium casing with built-in thermistor



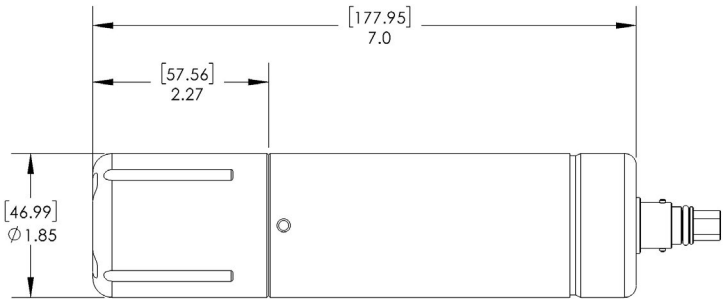
3	Cable end with Twist-Lock connector for Rugged Cable system
4	RDO cap (installed on RDO sensor)
5	Dust cap
6	Nose cone



7	Storage canister
8	RDO cap (replacement)

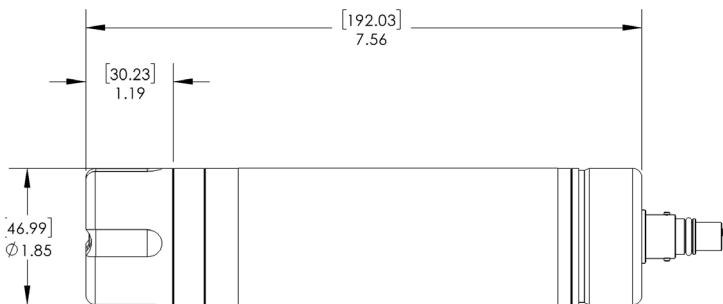
# Instrument Specifications

## RDOX



Instrument length	7.0 in (177.95 mm)
Nose cone	2.27 in (57.56 mm)
Instrument diameter	1.85 in (46.99 mm)

## RDOX Stainless Steel



Instrument length	7.56 in (192.03 mm)
Nose cone	1.19 in (30.23 mm)
Instrument diameter	1.85 in (46.99 mm)

## Unpack the Probe

1. Remove the probe and other packaging materials from the box.
2. Unscrew the nose cone from the probe and remove the red protective dust cap from the sensor. Save the dust cap for later use.
3. Remove the RDO cap from the storage sleeve within the storage canister.

## Technical Specifications

Environmental Class	IP68 (with sensor cap installed)
Materials	Viton, Acrylonitrile Butadiene Styrene (ABS), Polycarbonate/ Polymethylmethacrylate (PC/PMMA) blend, Acrylonitrile Butadiene Rubber (NBR), FKM Fluoroelastomer, Polychloroprene, Thermoplastic Polyurethane (TPU), Titanium, Stainless Steel, CPVC
Weight	1.03 kg (2.27 lbs)
Operating Temperature	0° to 50° C (32° to 122° F)
Storage Temperature	Probe: -5° to 60° C (23° to 140° F) Cap: 1° to 60° C (33° to 140° F)
Mounting Location	Indoor/Outdoor
Cable Type	Rugged Cable system with Twist-Lock connector
Pressure Rating (Depth)	210 m (289 ft)
Supply	12 VDC from Monitor
Sensor Communication	Modbus/RS 485
Range	0-60 mg/L
Accuracy	±0.1% mg/L on range 0-20 mg/L ±0.2% mg/L on range 20.01 - 60 mg/L
Resolution	0.01 mg/L
Response Time	90% of value in less than 45 seconds @ 25° C (77° F) 95% of value in less than 60 seconds @ 25° C (77° F)
Measurement Principle	Optical measurement of luminescence
Light Source	Blue LED
Temperature Measurement	Thermistor
Flow Rate	No flow necessary
Compliance	EMC 2014/30/EU IEC 61000-6-2:2005 EN 55011:2009





## Box Contents

- RDOX instrument (stainless steel or plastic)
- RDO cap

## Tools, Supplies, & Accessories (Not Included)

- Flathead & Phillips head screwdrivers
- Wire cutters
- 7300 monitor or other monitor

## Getting Started

### 1 Install RDO cap.



Remove the RDO cap from the storage canister.



Remove red dust cap. Unscrew and remove nose cone from the instrument.



Align RDO cap's flat edge with instrument's flat edge. Slide on cap.



Replace the nose cone.

### 2 Wire RDOX instrument to monitor.



Isolate the monitor from power before moving forward. There is a risk of electrical shock if you do not isolate the monitor before installing wires.



Connect RDOX to Twist-Lock cable. Twist cable until it clicks into place.



Ensure monitor is isolated. Remove cover. Unscrew cable gland cap.



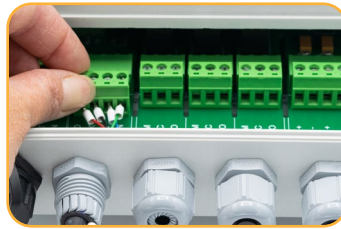
Insert flying leads cable through cable gland cap.



Identify brown and white cables. Cut these unused wires close to their base.



Thread wires through cable gland opening. Remove terminal plug from terminal block.



Insert red, black, blue, green wires into plug. Screw in. Insert terminal plug into terminal block.



Tighten cap securely onto cable gland locknut.



Screw on monitor cover. Connect power to monitor.

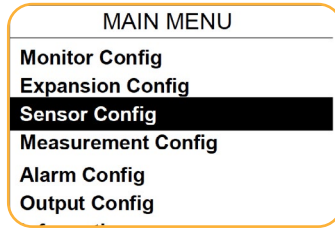


Connect the blue cable where the terminal is labeled "white" when wiring cable into plug.

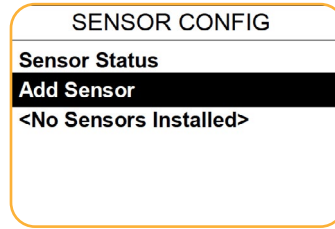
### 3 Add RDOX readings to 7300 monitor.



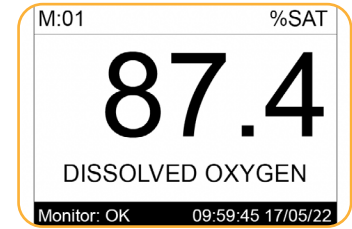
Connect power to monitor. Press **Menu**.



Use arrow keys to select **Sensor Config**. Press **OK**.



Use arrow keys to select **Add Sensor**. Press **OK**.



When RDOX appears, select it. Press **Menu** twice to access data.



Repeat above to install more sensors. An expansion box is required for more than 2 sensors.

### 4 Calibrate RDOX instrument.



Clean sensor with a soft cloth.



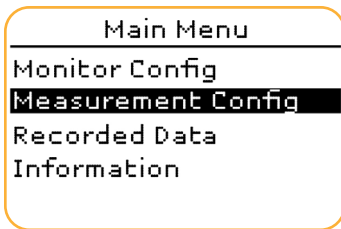
Moisten a sponge and place it in a dark cup.



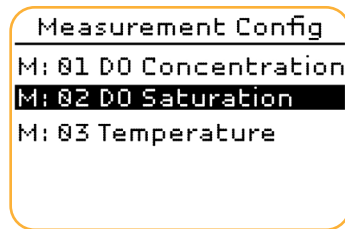
Put instrument in cup. Allow it to humidify for up to 5 minutes.



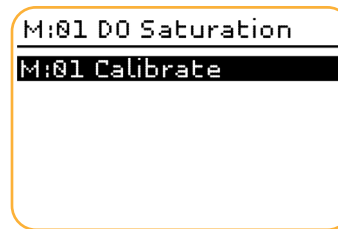
Press **Menu**.



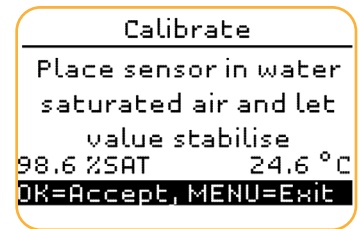
Use the arrow keys to select **Measurement Config** and press **OK**.



Select **DO saturation** and press **OK**.



Select **Calibrate** and press **OK**.



Press **OK** to begin calibration. Press **OK** when the value stabilizes.

## Safety



Read the safety information on this page before using the RDOX. If you have questions, contact In-Situ technical support for assistance.

- Only suitably qualified personnel or competent persons may install, operate, or repair this equipment.
- Check that the sensor has been terminated correctly. Incorrect termination may cause damage to the instrument or monitor.
- Sensors need to be correctly addressed to the monitor before use.



To clean the instrument, use a soft cloth and mild detergent. Keep the nose cone and RDO cap on. Do not use organic solvents because they may damage the RDO cap.

### Intended Use

The RDOX is designed to be safe in these conditions:

- Operable temperatures of 0° to 50° C (32° to 122° F).



If the equipment is used in a manner not specified by the manufacturer, the protection provided for the equipment may be impaired.

### Learn More

View additional specifications, compliance information, and detailed instructions at [www.in-situ.com](http://www.in-situ.com).

# 7300 Monitor Options

## Sensor Connections to 7300 Monitor

You can directly connect two sensors to the standard 7300 monitor. You can add more sensors by using the optional expansion boxes, which are available separately.

Remove the 4-way connector from the 7300 monitor by pulling downwards to disconnect for easy access to the connections. Connect the sensor wires as follows. (Terminals are listed from left to right on the 4-way connector.)

- Terminal 1 (Left) - RED (+12 V)
- Terminal 2 - Black (0 V)
- Terminal 3 - Blue (Data A) *not white as identified on the label*
- Terminal 4 (Right) - Green (Data B)

Always connect the screen drain wire with Black (Terminal 2).

Always use bootlace ferrules when terminating the sensors to ensure a good connection to the terminals.

## Set Salinity

You may apply a salinity factor to the reading by setting the salinity. Under normal conditions where the salt content of the water is low, this setting can be left at its default, 0 PSU (Practical Salinity Units).

The Practical Salinity Scale defines salinity in terms of the conductivity ratio of a sample to that of a solution of 32.4356 g of KCl at 15° C in a 1 kg solution. A sample of seawater at 15° C with a conductivity equal to this KCl solution has a salinity of exactly 35 PSUs.

For standard applications of the RDOX, it is safe to assume that 1 PSU = 1 ppt. The maximum selectable value is 42 PSU, and the minimum is 0 PSU.

## Set Pressure

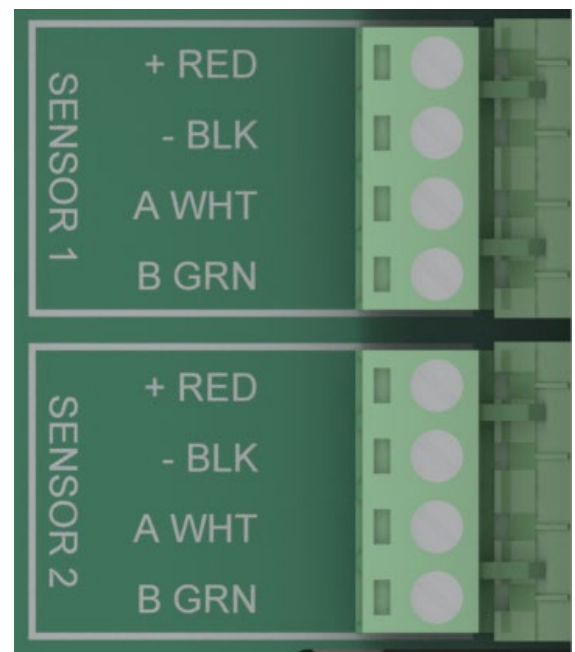
You may set an atmospheric pressure when the instrument is installed at an elevation above sea level:

- The default value is 1013.2 mbar.
- The maximum value is 1114.6 mbar.
- The minimum is 506.6 mbar.

These values should cover installations in all standard applications.

## Add Measurement

You may add two extra measurements to this list for the RDOX: dissolved oxygen in PPM, and O<sub>2</sub> partial pressure.



# Calibration

## Calibrating the Sensor

The RDOX sensor is an optical sensor. The required calibration frequency depends on the application and deployment conditions. When deploying the instrument for the first time, do the following:

1. Calibrate the sensor during initial deployment.
2. If desired, repeat the calibration after one week of operation and again after 3 months.
3. After this time, calibrate the sensor according to site needs and check measurement validity yearly.

The RDOX sensor can be calibrated at 100% saturation only, or at both 0% and 100% saturation. Calibration at 100% saturation is sufficient for most applications.

## 100% Saturation Calibration



Clean the sensor with mild detergent and a soft cloth.



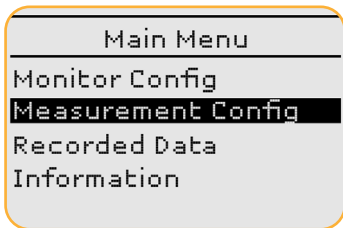
Moisten the calibration sponge and place it in the calibration cup.



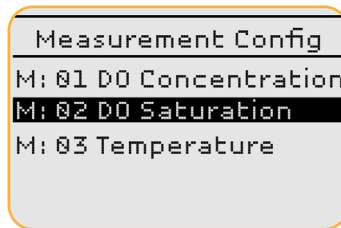
Put instrument in calibration cup. Allow chamber to humidify.



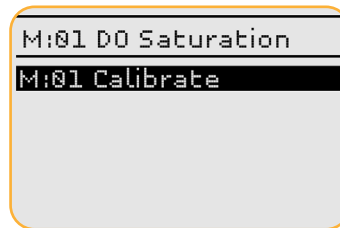
Press **Menu** to show the main menu.



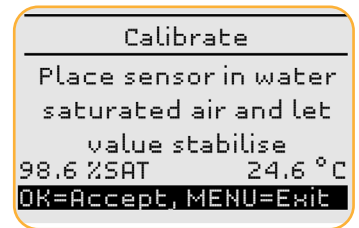
Use the arrow keys to select **Measurement Config** and press **OK**.



Select **DO saturation** and press **OK**.



Select **Calibrate** and press **OK**.



Press **OK** to begin calibration. Press **OK** when the value stabilizes.

## 0% Saturation Calibration

0% saturation calibration can be accessed from service mode on the monitor. Contact In-Situ technical support for guidance before attempting to calibrate at 0% saturation.

# Storage and Maintenance

## Storing the Sensor

Prior to installing the cap, store the cap above freezing in the container in which it was shipped. Store the instrument in a clean, dry area between -5° and 60°C (23° and 140°F).

After installing the cap, store the instrument in a clean, dry area that is above freezing.

## Maintenance



Clean and inspect your instrument regularly for accurate readings and best performance.

When installing the instrument for the first time, inspect the instrument weekly to determine the best cleaning frequency for your deployment site.

If the sensor measurements begin to drift from expected values, clean the sensor and calibrate. If calibration cannot be performed or if you are receiving invalid measurements or errors, replace the RDO cap.

## How to Clean the Instrument



Use a soft cloth to wipe the cap gently.



Use mild detergent on a soft cloth to remove build-up on the probe.



Do not use organic solvents to clean cap. Never wet the lens area under the cap. Use only the supplied lens cloth to clean lens.

## How to Replace the RDO Cap



Remove nose cone from RDOX. Slide off RDO cap.



Remove new RDO cap from storage canister.



Install new cap. Align cap's flat edge with instrument's flat edge. Slide on cap.



Replace nose cone and calibrate the instrument.

## Mechanical Installation



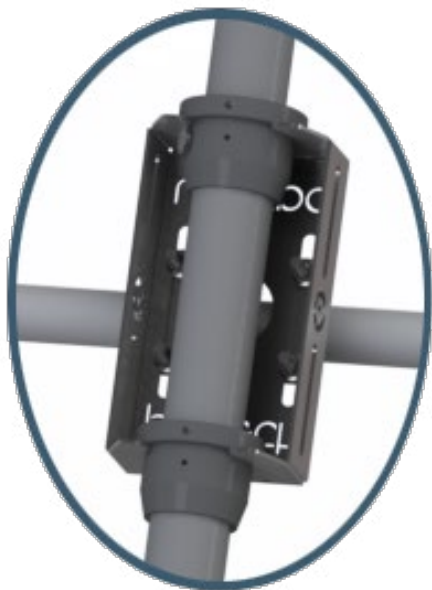
Follow the installation guidelines below for reliable, accurate measurement. Contact In-Situ technical support or your local distributor if you need assistance with installation.

Before installing the sensor or if an installed sensor gives unreliable measurements, do the following:

- Ensure that the sensor is immersed deeply enough into the sample.
- Mount the sensor in such a way as to allow easy access for calibration and maintenance. It should be possible to remove the sensor from the process without the need to shut the process down.
- The sensor must be monitoring a sample of the process that is representative of the whole process.
- To allow a single technician to calibrate and maintain the system, place the sensor within sight of the 7300 monitor. Although cable runs of up to 100 m (328 ft) are possible, it may cause practical operational problems.
- Where possible, angle the sensor so that it is pointing downstream; this will allow any “ragging” to be removed by the flow past the sensor.
- Do not install the sensor where there is a likelihood of freezing.

### Mounting Options

Mount the sensor in a location that is stable, accessible for calibration and maintenance, and that allows the sensor to be fully submerged in all expected flow conditions.



## Mounting Shaft

An optional mounting shaft fitting can be used to allow the RDOX to be fitted to a number of mounting accessories. Mounting shafts are available in standard lengths of 0.5, 1.0, 1.5, 2.0, 2.5, and 3.0 m. Contact In-Situ for custom lengths. Keep shaft lengths to a minimum, because sensors with long mounting shafts are difficult to move safely and can present problems with calibration and maintenance.

## Handrail and Wall Brackets

Attach the mounting shaft to the tank or flow channel that requires measurement. Position the mounting shaft inside the mounting bracket and secure it using locking collars. To remove the mounting shaft, remove the locking thumb screw and lift the shaft from the bracket. Ensure that the sensor can be reached from a walkway to allow removal for calibration and maintenance.



## Customer Supplied Brackets



Follow the guidelines below when designing or selecting brackets to mount the RDOX.

- Choose strong brackets that can support the sensor with minimum movement when installed into the sample.
- Fit the instrument by clamping around the instrument body or suspending it from the cable.
- Select brackets that will allow you to easily replace or remove the sensor for inspection, calibration, and service.



# Declarations of Similarity



# In-Situ

Innovations in Water Monitoring

## UKCA Declaration of Similarity

Manufacturer: In-Situ, Inc.  
221 East Lincoln Avenue, Fort Collins, CO 80524, USA

We declare that the performance of each of the following products is equivalent to the Aqua TROLL RDO Pro-X Sensor:

Product name: **ChemScan RDOX Stainless Steel Sensor**

Model: **ChemScan RDOX Stainless Steel Connector**

Part Number: 200038

Product Description: The ChemScan RDOX Stainless Steel Sensor is a dissolved oxygen sensor with a rugged exterior design that can be used in both environmental water applications (rivers, lakes, oceans, wells) and in process applications.

These products are in compliance with the following Regulations:

- EMC Regulation 2016
- Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) Regulation (S.I. 2012:3032)

and meet or exceed the following British requirements and compliance standards:

- **EMC Standard:** BS 61326:2021
- **RoHS:** BS 63000:2018

The UKCA mark is affixed accordingly.

David A. Bossie  
Regulatory Compliance Manager  
In-Situ, Inc.  
November 30, 2022





## CE Declaration of Similarity

Manufacturer: In-Situ, Inc.  
221 East Lincoln Avenue, Fort Collins, CO 80524, USA

**Declares that performance of each of the following products is equivalent to the RDO Pro-X with Twist Lock Connector:**

Product name: **ChemScan RDOX Stainless Steel Sensor**

Model: **ChemScan RDOX Stainless Steel Connector**

Part Number: 200038

Product Description: The ChemScan RDOX Stainless Steel Sensor is a dissolved oxygen sensor with a rugged exterior design that can be used in both environmental water applications (rivers, lakes, oceans, wells) and in process applications.

This is in compliance with the following Directives:

- 2014/30/EU EMC Directive
- Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) Directive, 2011/65/EU and Commission Delegated Directive, (EU) 2015/863

and meets or exceeds the following international requirements and compliance standards:

**EMC Standard:**

EN 61326-1:2021

**RoHS Standard:**

EN 63000:2018

The CE mark is affixed accordingly.

David A. Bossie  
Regulatory Compliance Manager  
In-Situ, Inc.  
November 30, 2022





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Manufacturer: In-Situ, Inc.  
221 East Lincoln Avenue, Fort Collins, CO 80524, USA

We declare that the performance of each of the following products is equivalent to the Aqua TROLL RDO Pro-X Sensor:

Product name: **ChemScan RDOX Delrin Sensor**

Model: **ChemScan RDOX Delrin Connector**

Part Number: 200021

Product Description: The ChemScan RDOX Delrin Sensor is a dissolved oxygen sensor with a rugged exterior design that can be used in both environmental water applications (rivers, lakes, oceans, wells) and in process applications.

These products are in compliance with the following Regulations:

- EMC Regulation 2016
- Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) Regulation (S.I. 2012:3032)

and meet or exceed the following British requirements and compliance standards:

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- **RoHS:** BS 63000:2018

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221 East Lincoln Avenue, Fort Collins, CO 80524, USA

**Declares that performance of each of the following products is equivalent to the RDO Pro-X with Twist Lock Connector:**

Product name: **ChemScan RDOX Delrin Sensor**

Model: **ChemScan RDOX Delrin Connector**

Part Number: 200021

Product Description: The ChemScan RDOX Delrin Sensor is a dissolved oxygen sensor with a rugged exterior design that can be used in both environmental water applications (rivers, lakes, oceans, wells) and in process applications.

This is in compliance with the following Directives:

- 2014/30/EU EMC Directive
- Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) Directive, 2011/65/EU and Commission Delegated Directive, (EU) 2015/863

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