



# ST-500RO Inline Fluorometer Probe Instruction Manual

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## 1. Introduction

The Pyxis ST-500RO inline fluorometer probe measures the concentration of fluorescent tracer PTSA in water. It is a higher sensitive version of the ST-500RO probe and ideal for monitoring PTSA traced RO treatment products in RO feedwater containing 5 to 35 ppb PTSA.

The fluidic and optical arrangement of the ST-500RO probe is designed to overcome many shortcomings associated with other fluorometers. It can be easily inserted into the custom-made tee with a compression fitting port designed to ensure correct positioning of the ST-500RO probe in the fluid stream. The ST-500RO probe custom mounting tee has two  $\frac{3}{4}$  inch female NPT ports for plumbing into an existing  $\frac{3}{4}$  inch sample water line. The ST-500RO probe can be connected to any device that accepts an isolated or non-isolated 4-20mA input. In addition to measuring fluorescence, the ST-500RO probe has extra photo-electric components that monitor the color and turbidity of the sample water. This extra feature allows the ST-500RO probe to automatically compensate for color and turbidity to eliminate interferences common in real-world samples. The ST-500RO probe has a short fluidic channel that can be easily cleaned.

The ST-500RO probe uses a narrow wavelength band gallium phosphide photodiode, integrated with a high-temperature tolerant and high humidity resistant optical filter. This combination greatly enhances the robustness of the ST-500RO probe. It can be operated under a wide range of ambient conditions without the need of humidity and temperature regulation. The performance of the ST-500RO probe is designed to be stable and consistent for a long period time.

Other features of the Pyxis ST-500RO probe include:

- Menu-driven calibration procedure using our uPyxis mobile app or our uPyxis desktop app with your computer connected via USB or WiFi connection. Any standard containing PTSA in the range of 5 to 35 ppb can be used for the calibration. The standard can be the water sample itself when the PTSA concentration of the sample has been measured by another fluorometer that has been calibrated. This allows the ST-500RO probe to be calibrated without being removed from the system.
- Automatic compensation for turbidity changes up to 30 NTU and color changes equivalent to 10 ppm humic acid or 10 ppm iron.
- Diagnostic information (probe fouling, color or turbidity over range, failure modes) can be communicated to digital displays via Modbus RTU.
- The ST-500RO probe can be easily removed from the custom tee for cleaning without the need for any tools.

## 2. Unpacking Instrument

Remove the instrument and accessories from the shipping container and inspect each item for any damage that may have occurred during shipping. Verify that all accessory items are included. If any item is missing or damaged, please contact Pyxis Lab Customer Service at [service@pyxis-lab.com](mailto:service@pyxis-lab.com)

### 2.1. Standard Accessories

- Tee Set (tee, O-ring, and nut)
- Bulkhead Cable
- The Instrument Manual is available from <http://www.pyxis-lab.com/support>.

### 2.2. Optional Accessories

- USB-RS485 Adapter (P/N: MA-485)
- Bluetooth Adapter (P/N: MA-WB)
- 30 ppb PTSA Calibration Standard Solutions (P/N: PTSA-30)
- 1.5 inch OD O-ring (P/N: MA-150)
- Extension cable – 50 feet (P/N:50705)
- Extension cable – 100 feet (P/N:5070)

## 3. Specification

- Power Supply Required: 24 ( $\pm 2$ ) VDC @ 65 mA
- Signal Output: 4-20 mA and RS-485 Modbus RTU
- Temperature, Sample Water: 40 – 104 °F (4 – 40 °C)
- Temperature, Ambient during operation: 40 – 120 °F (4 – 49 °C)
- Temperature, Ambient during storage: 20 – 140 °F (-7 – 60 °C)
- Sample Pressure: 100 PSI
- Cable Length: 5 feet, terminated with IP67 connectors
- Water proof connector
- Dimension: Length 6.8 inch (172.7 mm), body diameter 1.44 inch (36.6 mm)
- Weight: 0.37 pounds (170 grams)
- PTSA Measuring Range: 0 to 40 ppb ( $3\sigma$  error:  $\pm 0.2$  ppb)
- Regulatory: CE Marked

4. Installation

Place the O-ring into the O-ring groove in the tee. Insert the ST-500RO probe into the tee. Make sure that the fluidic channel in the ST-500RO probe is aligned with the sample flow direction.



Figure 1. ST-500RO with Tee Set

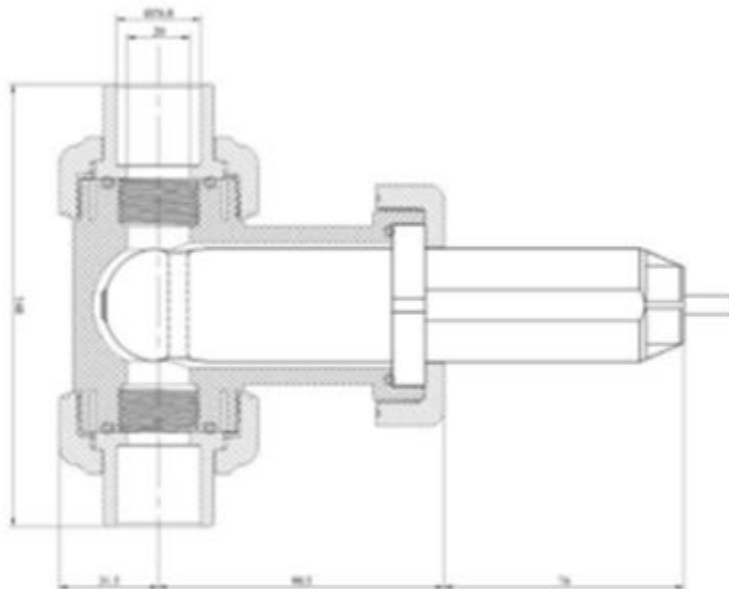


Figure 2. ST-500RO Dimensions

#### 4.1. Quick 4-20 mA Start

Note: The negative 24V power terminal and the negative 4-20 mA terminal on the ST-500RO probe are internally connected.

If the negative 24V power terminal and the negative 4-20 mA terminal in the controller are internally connected (non-isolated 4-20mA input), it is unnecessary to connect the 4-20 mA negative wire (blue) to the 4-20 mA negative terminal in the controller. If a separate DC power supplier other than that from the controller is used, make sure that the output from the power supply is rated for 22-26 VDC @ 65mA.

Follow the wiring table below to connect the ST-500RO probe to a controller.

Wire Color	Designation
Red	24 V
Black	Power ground
White	4-20 mA +
Green	4-20 mA - Internally connected to the power ground
Blue	RS-485 A
Yellow	RS-485 B
Clear	Shield, solution ground

#### 4.2. Connect via USB

Figure 3 shows the connection between a computer and the ST-500RO probe via USB-RS485 adapter. Use the USB-RS485 adapter provided by Pyxis Lab Inc. (P/N: MA-485). Using other USB-485 adapters may result in permanent damage of the ST-500RO probe communication hardware.

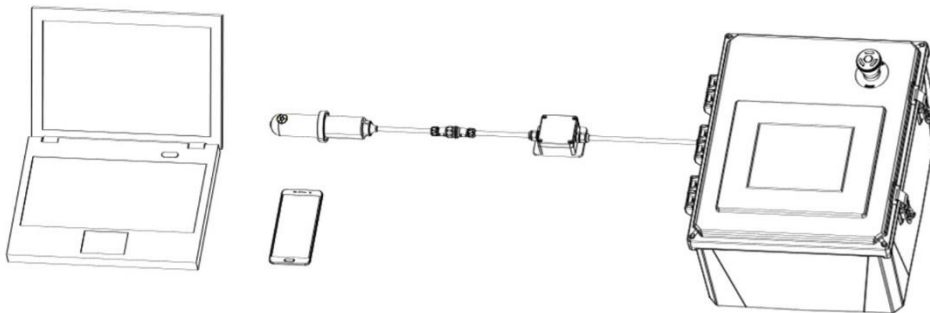


Figure 3. ST-500RO connected to computer via USB-485 adapter (MA-485)

### 4.3. Connecting via Wifi/Bluetooth

Figure 4 show the connection between a computer and the ST-500RO probe via WiFi/Bluetooth adapter (P/N: MA-WB). A smart phone app is provided to connect the ST-500RO probe to your smart phone via Bluetooth interface.

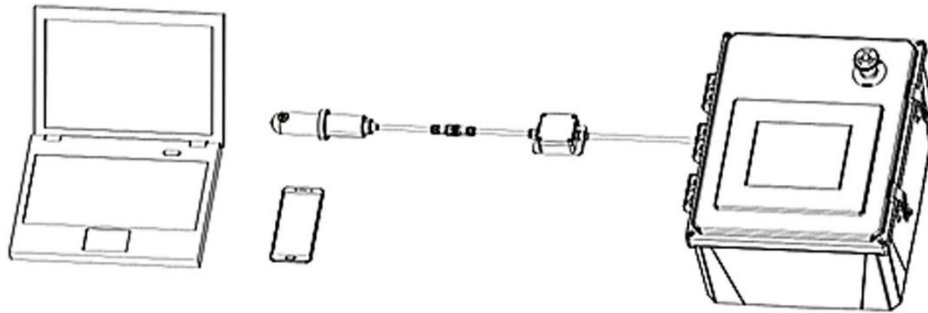


Figure 4. ST-500RO connected to computer or smart phone via WiFi/Bluetooth adapter (MA-WB)

## 5. Probe Calibration with uPyxis Mobile App

### 5.1. Download uPyxis Mobile App

Download uPyxis Mobile App from [Apple App Store](#) or [Google Play](#)



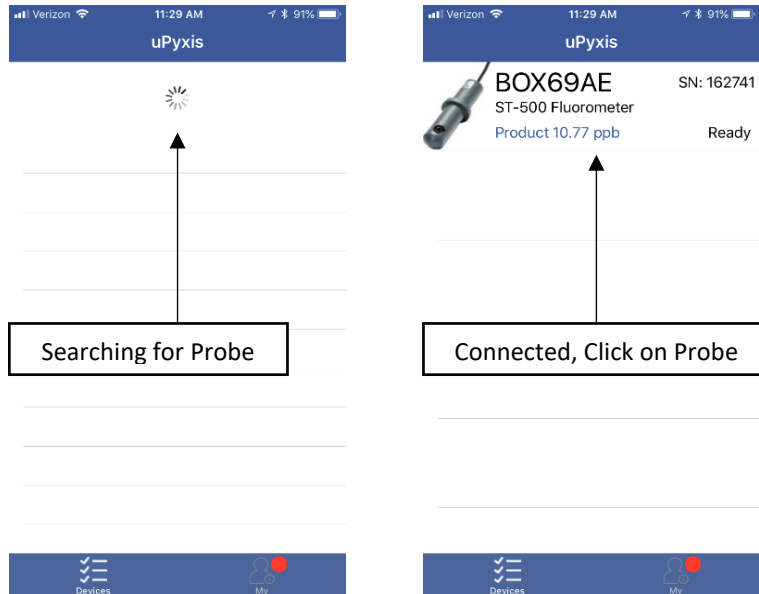
uPyxis Mobile App



## 5.2. Connecting to uPyxis Mobile App

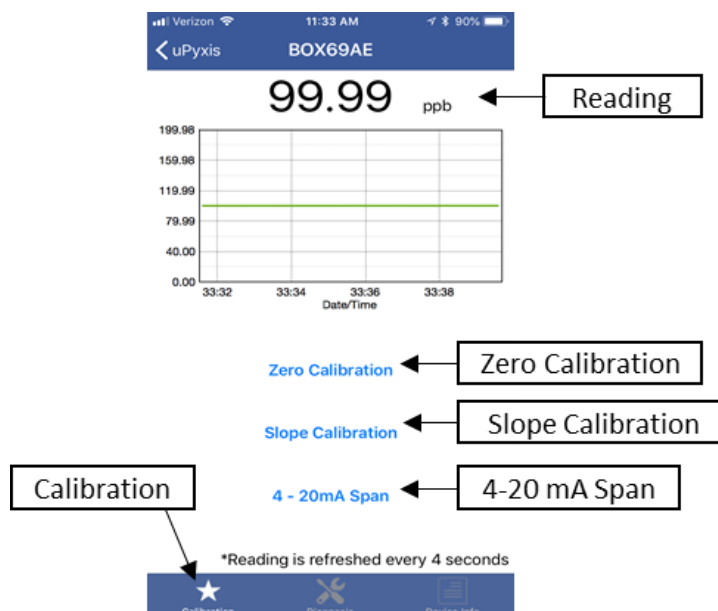
Turn on Bluetooth on your mobile phone (Do not pair the phone Bluetooth to the ST-500RO). Open uPyxis Mobile App. uPyxis App connects to the Probe and click on the **ST-500RO probe**.

*\*Note\* - Picture below references ST-500 probe as example name however uPyxis will identify as ST-500RO.*



## 5.3. Calibration Screen and Reading

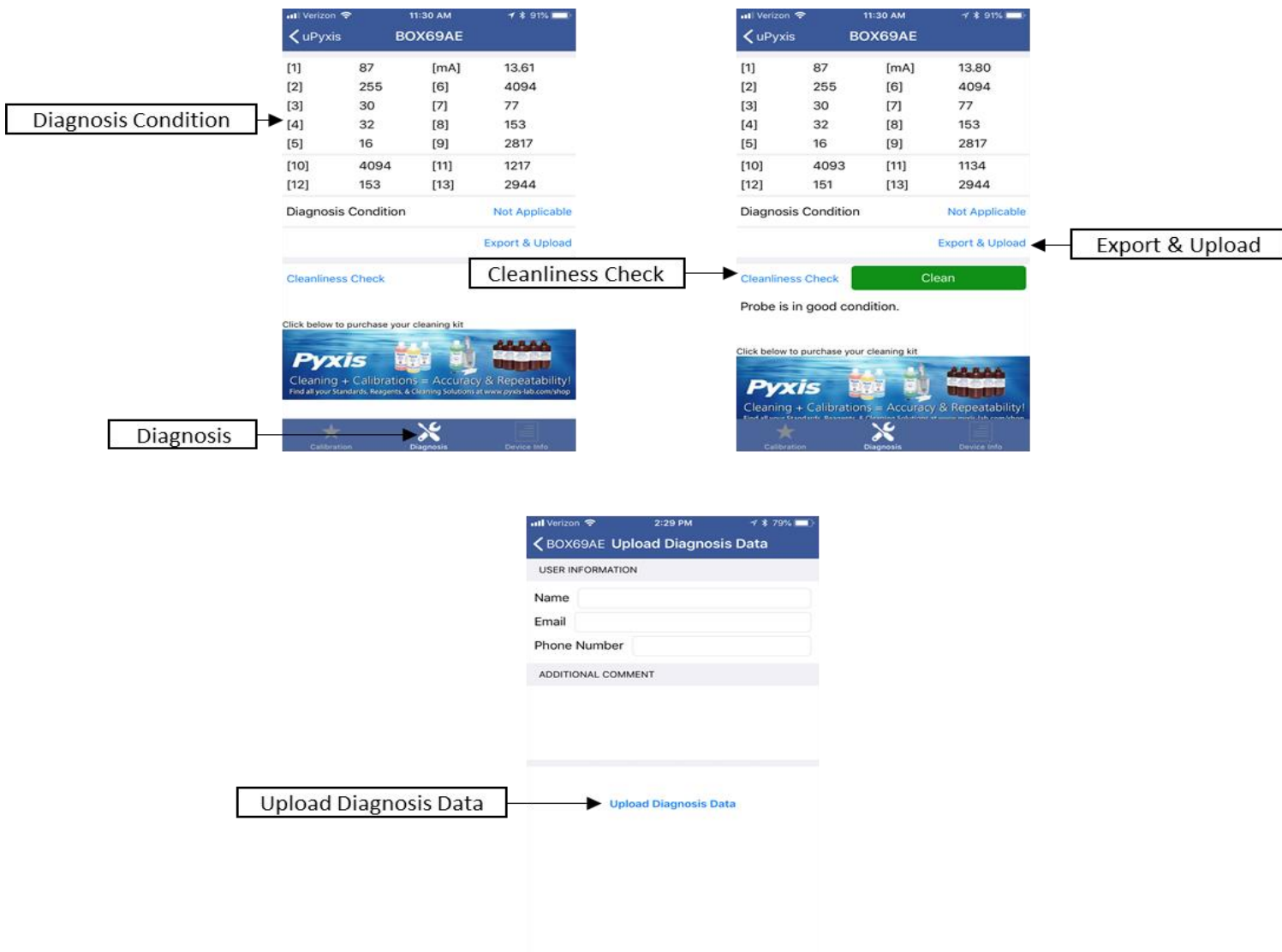
When connected, Mobile App will default to the **Calibration** screen. From the Calibration screen you can perform calibrations by pressing on **Zero Calibration**, **Slope Calibration** and **4-20 mA Span**.





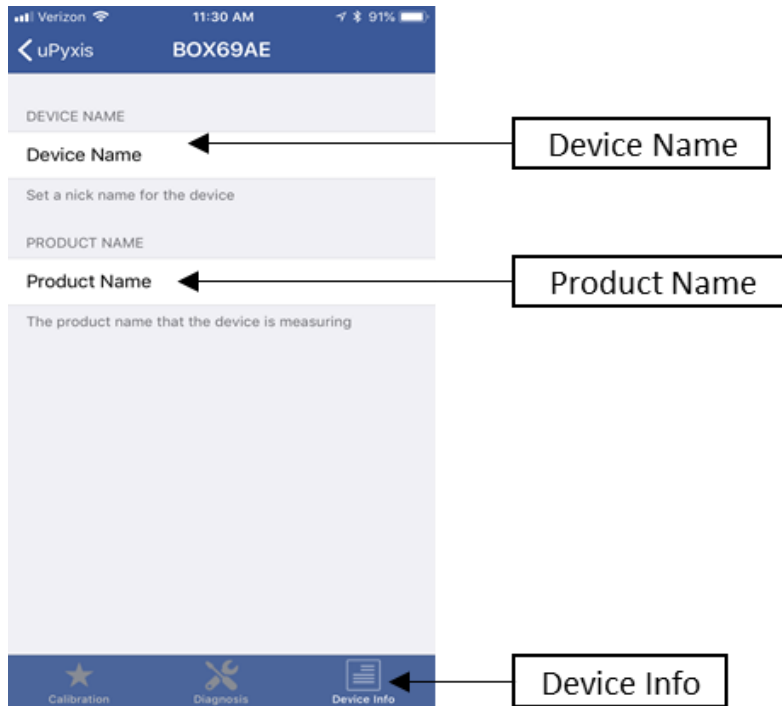
## 5.4. Diagnosis Screen

From the **Diagnosis** screen. You can check the diagnosis condition, **Cleanliness Check**, and **Export & Upload**.



## 5.5. Device Info Screen

From the **Device Info** screen. You can rename the Device or Product.



**Pyxis**

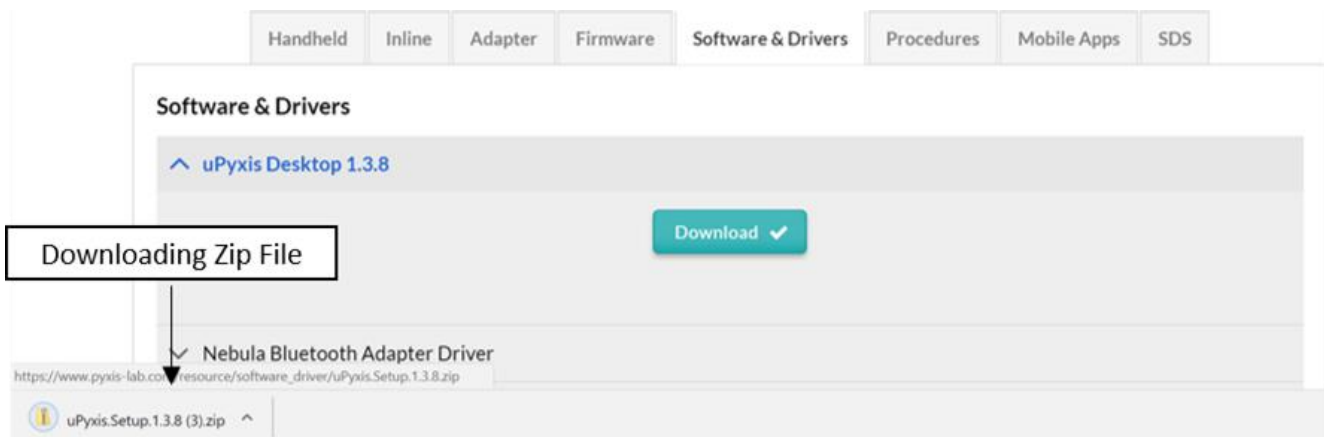
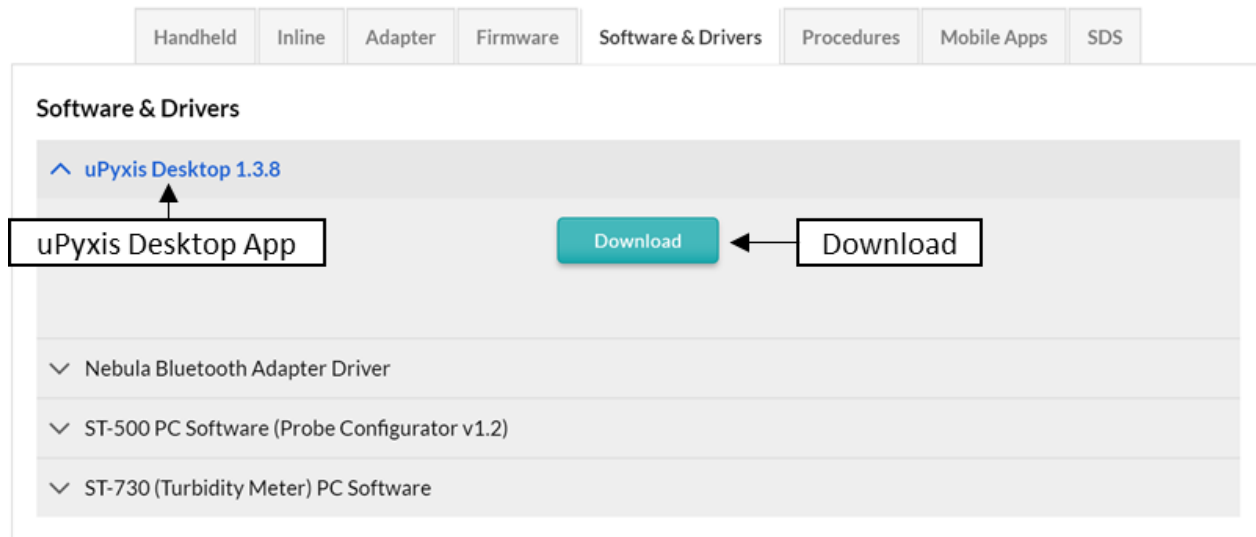
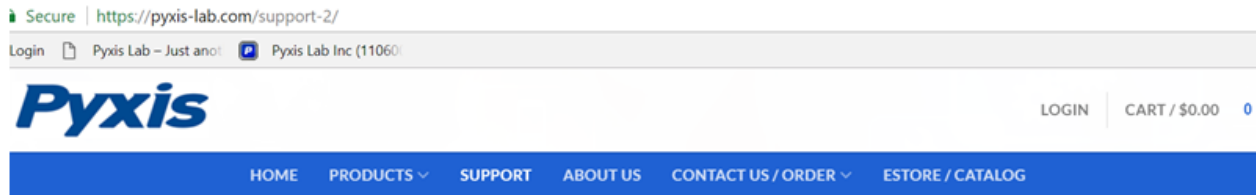
Cleaning + Calibrations = Accuracy & Repeatability!

Find all your Standards, Reagents, & Cleaning Solutions at [www.pyxis-lab.com/shop](http://www.pyxis-lab.com/shop)

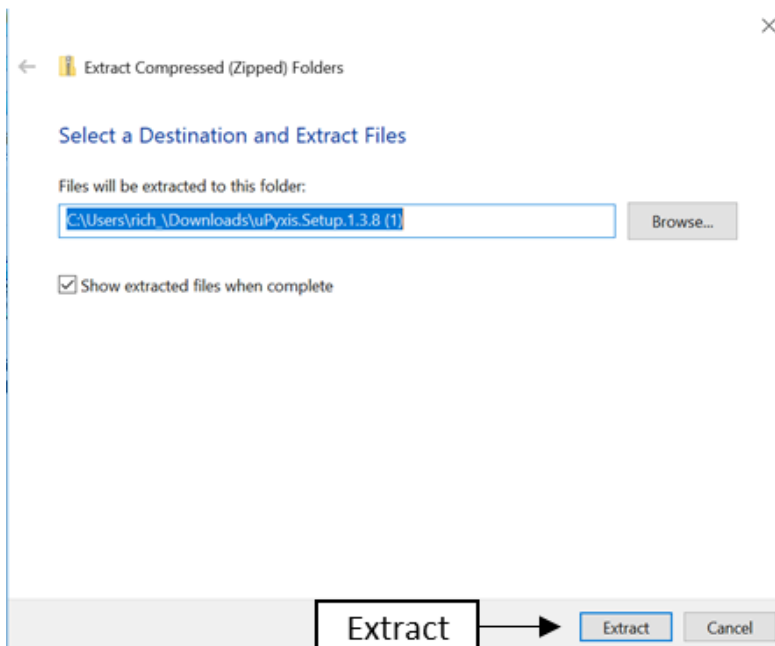
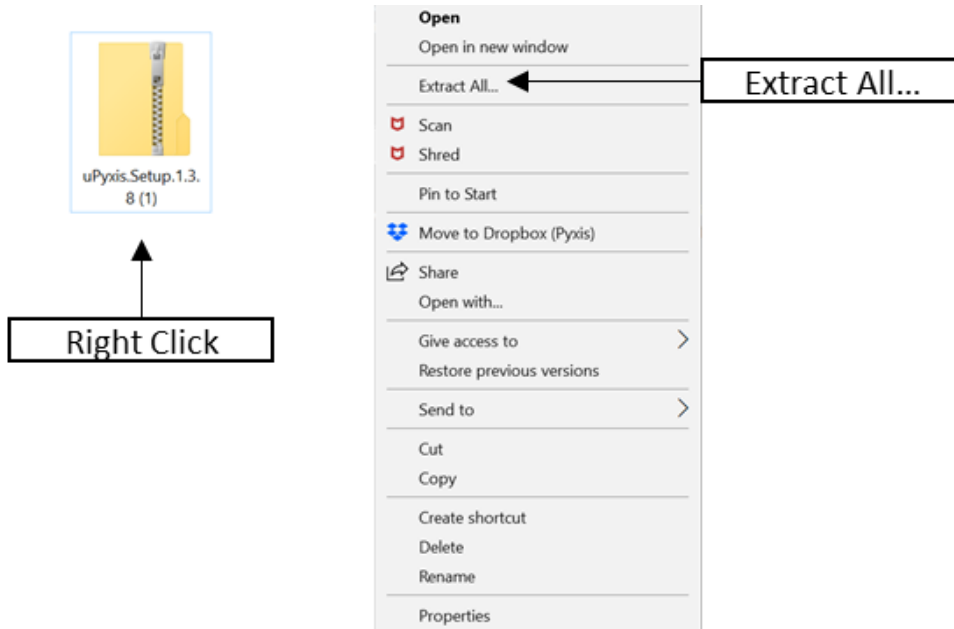
## 6. Probe Calibration with uPyxis Desktop App

### 6.1. Download uPyxis Desktop App

Download uPyxis Desktop App from <https://pyxis-lab.com/support-2/>



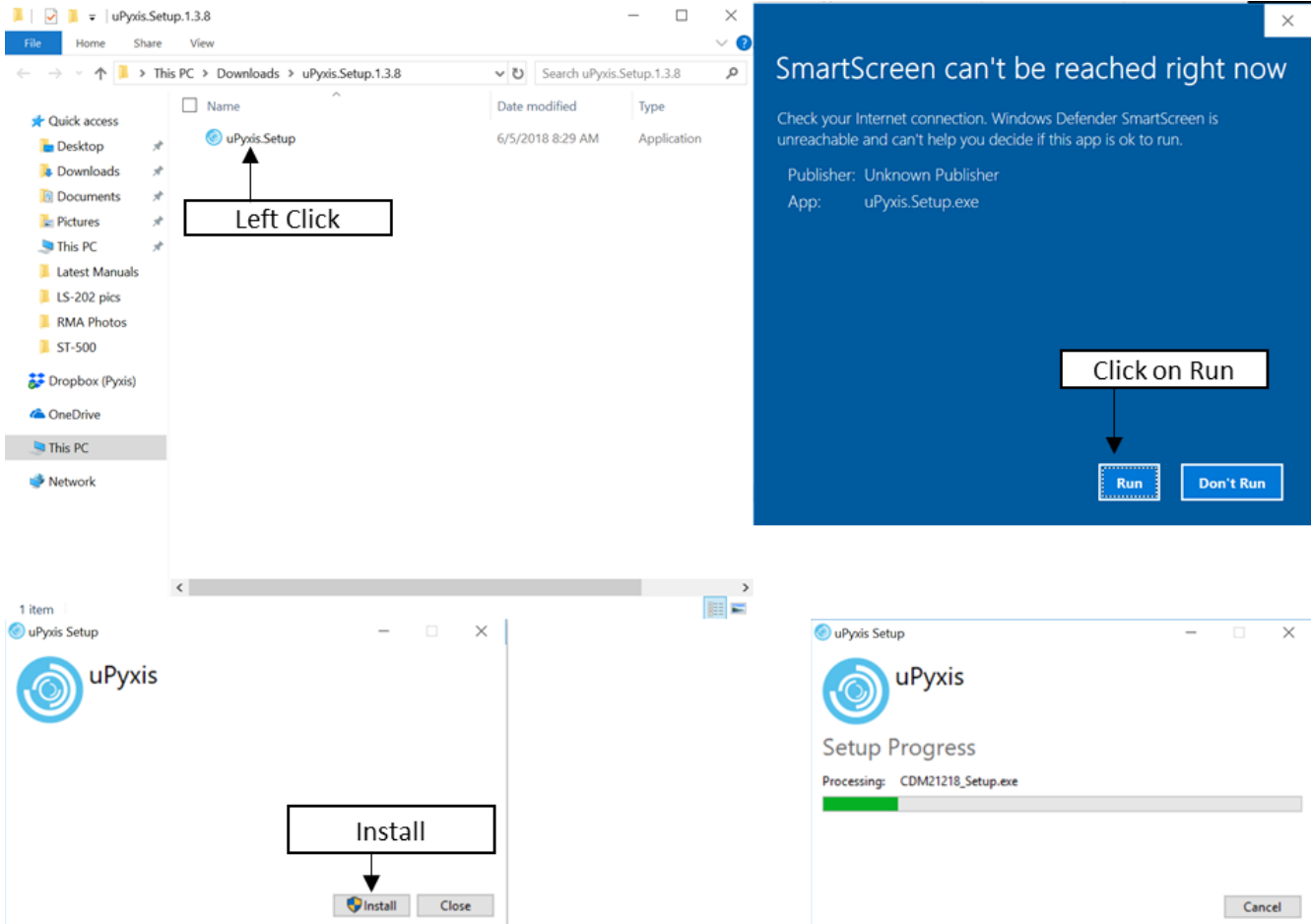
## 6.2. UnZip uPyxis Desktop App



Find your downloaded uPyxis Setup 1.3.8 file, **Right Click on the file**, **Extract All**, and then **Extract**.

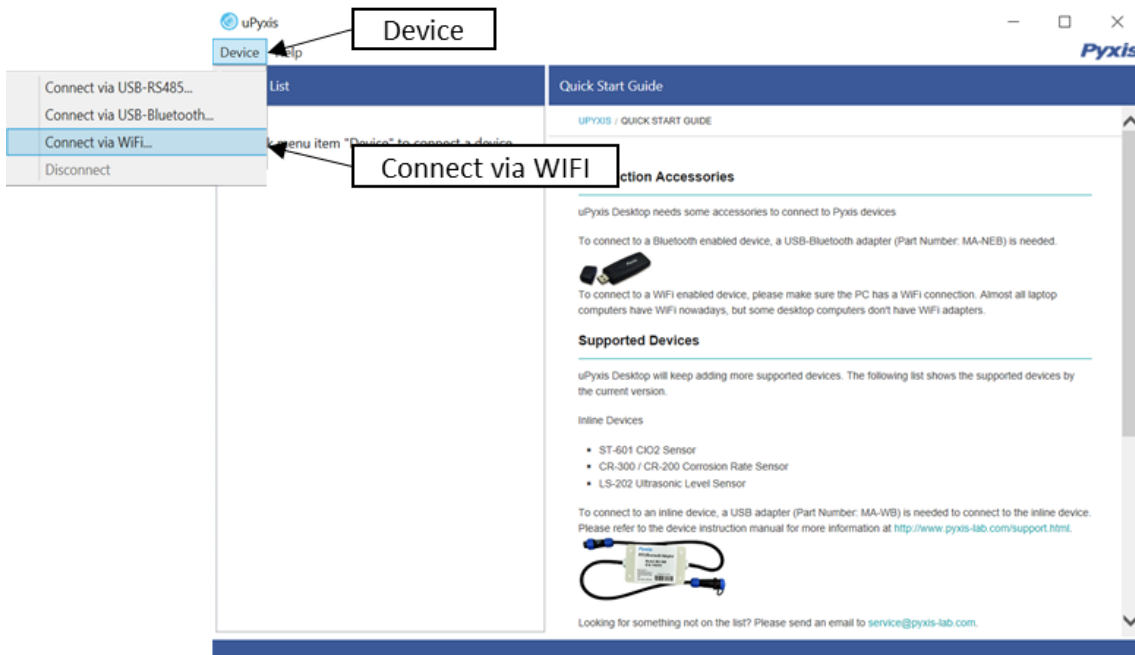
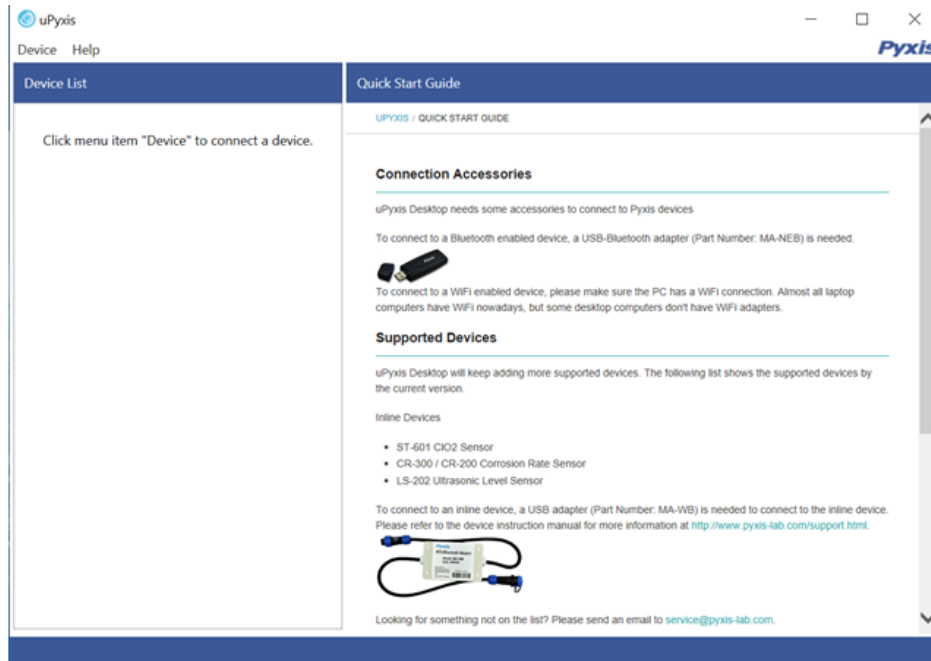
## 6.3. Installing uPyxis Desktop App

Once the uPyxis Desktop App has been extracted. Find the extracted **uPyxis Setup** file and left click, click on **Run**, and then click **Install**. After install has been clicked the Setup Progress will continue. Follow the steps during installation process.



## 6.4. Connecting to uPyxis Desktop App

Open **uPyxis Desktop App** on your desktop. When the desktop app opens, to find your device, click on **Device**, then **Connect via WiFi**.



## 6.5. Connecting to Device

When connected via WiFi, in the Discovered Devices box there will be the device product name (If no device product name in the Discovered Devices box, click **Refresh**). If device product name shows in the box, then click on **Connect to Device**. Once connected to the device on the main screen a picture of the device will appear on the top left corner. On the main screen you can set the information description for Device Name and Product Name then click **Set** to save.

The screenshot illustrates the uPyxis software interface during the device connection process. It is divided into two main sections: the top section for connecting via WiFi and the bottom section for configuring device information.

**Top Section: Connecting via WiFi**

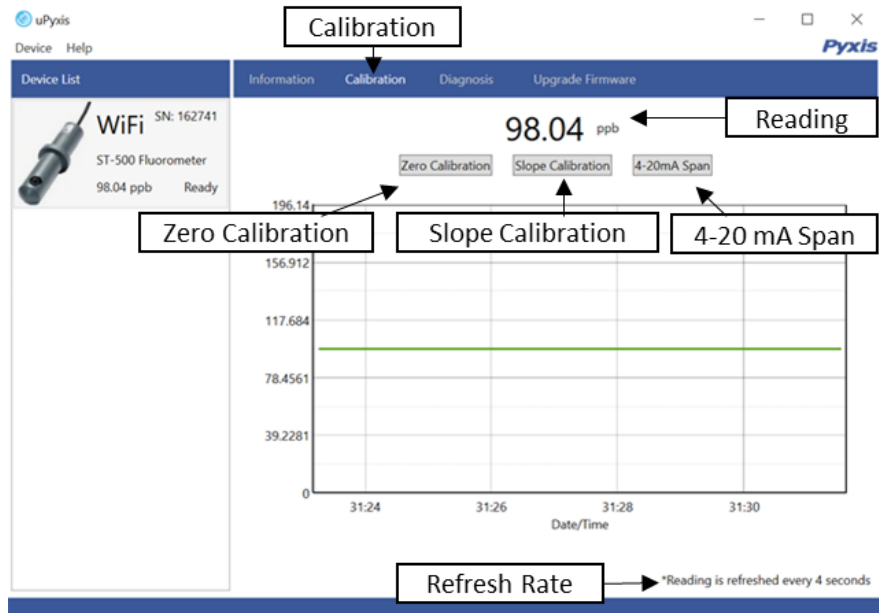
- The **Device List** tab is active, displaying a message: "Click menu item 'Device' to connect a device."
- A **Connect via WiFi** dialog box is open, showing a **Discovered Devices** list with the entry **ST500-WIFI-3C0B**. A **Refresh** button is located below the list.
- A note in the dialog states: "\*After connecting to the WiFi device, the internet connection may be disconnected."
- Buttons for **Connect to Device** and **Cancel** are at the bottom of the dialog.
- Annotations: A box labeled **Device** points to the device name in the list, and a box labeled **Connect to Device** points to the corresponding button.

**Bottom Section: Device Information**

- The **Information** tab is selected in the top navigation bar.
- The **Device List** on the left shows a device card for **WiFi** with SN: 162741, **ST-500 Fluorometer**, 98.49 ppb, and **Ready** status. A **Picture of Device** box points to the device image.
- The main area displays configuration fields:
  - Version:** 113
  - Device Name (Nick name for the device):** [Text Input Field] with a **Device Name** annotation box pointing to it.
  - Product Name (Name of the product that the device is measuring):** [Text Input Field] with a **Product Name** annotation box pointing to it.
  - Modbus Address:** 10
- Set** buttons are located below the Device Name, Product Name, and Modbus Address fields, with a **Set** annotation box pointing to the first one.

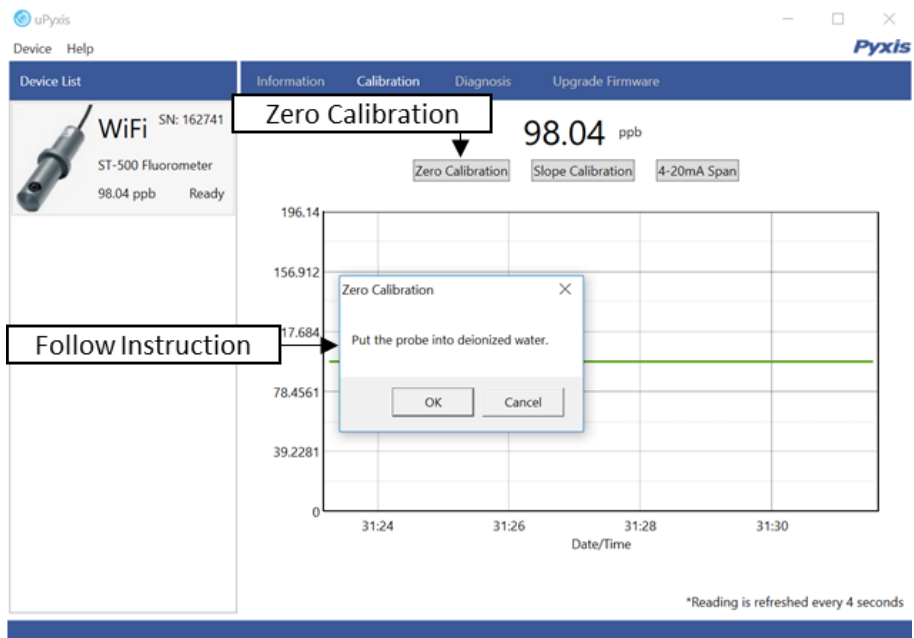
## 6.6. Calibrating Device

To calibrate the device, click on **Calibration**. On the Calibration screen there are three calibration tabs, **Zero Calibration**, **Slope Calibration**, and **4-20 mA Span**. The screen does also display the reading of the device. The reading refreshed rate is every 4 seconds.



## 6.7. Zero Calibration

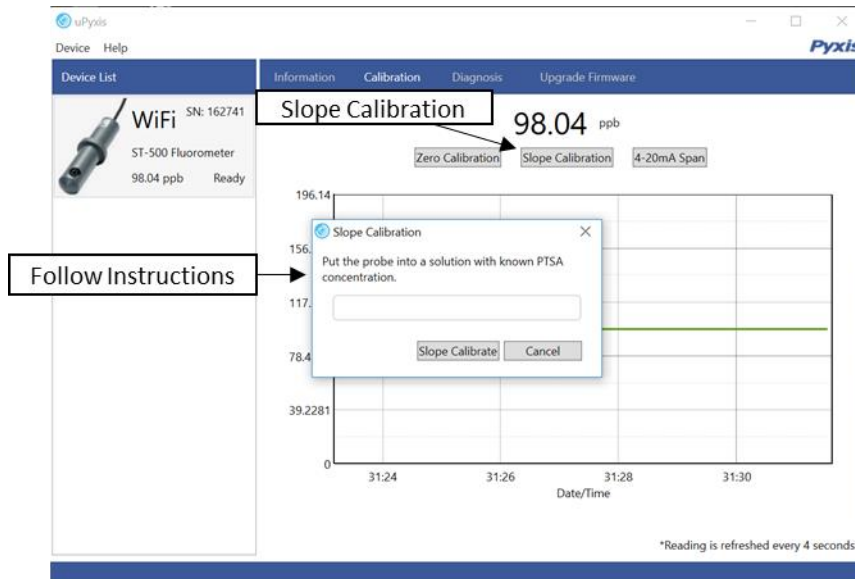
To perform Zero Calibration, click on **Zero Calibration**. Then follow the instruction on how to calibrate, then click **OK**.





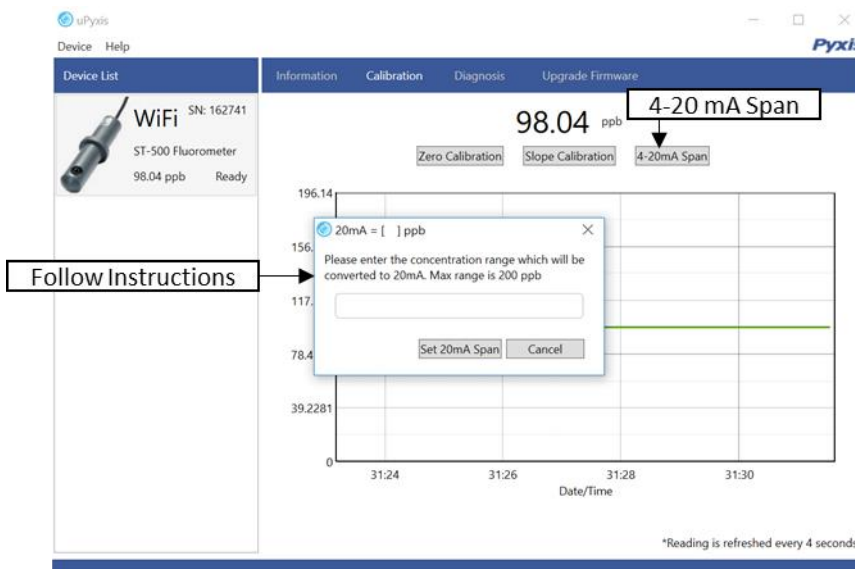
## 6.8. Slope Calibration

To perform Slope Calibration, click on **Slope Calibration**. Then follow the instruction on how to calibrate, then click **Slope Calibration**.



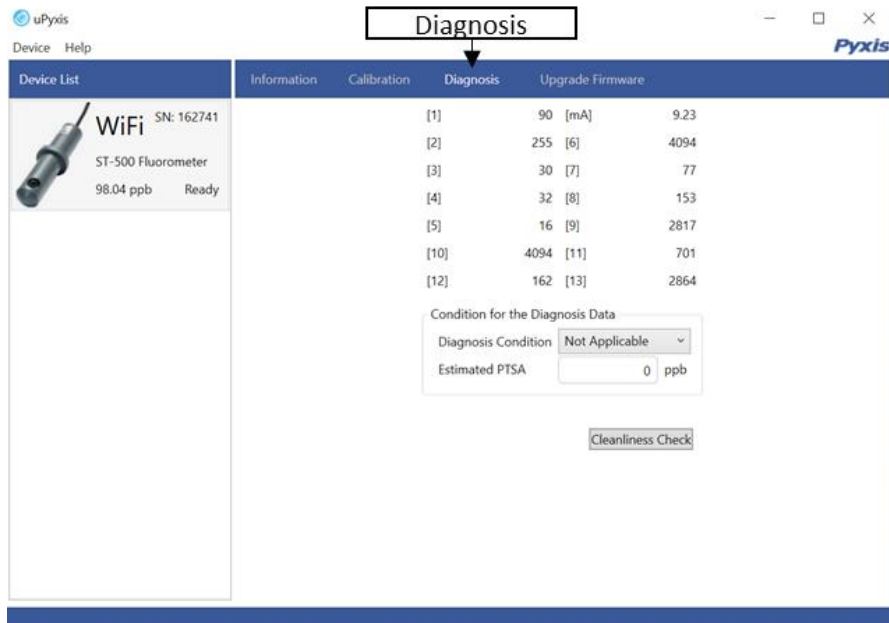
## 6.9. 4-20 mA Span

To perform 4-20 mA Span, click on **4-20 mA Span**. Then follow the instruction on how to calibrate, then click 4-20 mA Span.



## 6.10. Diagnosis Screen

After the device has been calibrated and installation has been completed. To check diagnosis, click on **Diagnosis**. When in the Diagnosis screen you can view the Diagnosis Condition of the device.



## 7. Communicating using Modbus RTU

The ST-500RO probe is configured as a Modbus slave device. In addition to the ppb PTSA value, many operational parameters, including warning and error messages, are available via a Modbus RTU connection.

Contact Pyxis Lab Customer Service ([service@pyxis-lab.com](mailto:service@pyxis-lab.com)) or 1-866-203-8397 for more information.

## 8. Probe Cleaning and Maintenance

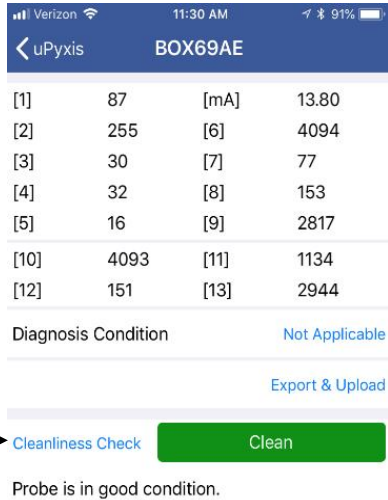
The ST-500RO probe is designed to provide reliable and continuous PTSA readings even when installed in moderately contaminated industrial cooling waters. Although the optics are compensated for the effects of moderate fouling, heavy fouling will prevent the light from reaching the sensor, resulting in low readings and the potential for product overfeed if the ST-500RO is used as part of an automated control system. When used to control product dosing, it is suggested that the automation system be configured to provide backup to limit potential product overfeeds, for example by limiting pump size or duration, or by alarming if the pumping rate exceeds a desired maximum limit.

The ST-500RO probe is designed to be easily removed, inspected, and cleaned if required. It is suggested that the ST-500RO probe be checked for fouling and cleaning on a monthly basis. Heavily contaminated waters may require more frequent cleanings. Cleaner water sources with less contamination may not require cleaning for several months.

### 8.1. Methods to Cleaning ST-500RO probe

Any equipment in contact with industrial cooling systems is subject to many potential foulants and contaminants. Our inline probe cleaning solution below has been shown to remove most common foulants and contaminants. A small soft bristle brush, Q-Tips cotton swab, or soft cloth may be used to safely clean the probe housing and the quartz optical sensor channel. Pyxis Lab Inline Probe Cleaning Solution Kit can be purchased at our online Estore/Catalog <https://pyxis-lab.com/product-category/accessories/page/2/>

**Diagnostics Method:** The diagnosis information can be obtained by connecting the ST-500RO probe to uPyxis Mobile application or uPyxis Desktop application installed. Connect to the ST-500RO probe, then click the **Diagnosis tab**. When in diagnosis screen click the **Cleanliness Check** and the application will let you know if the probe is fouled or in good condition.



The screenshot shows the uPyxis mobile application interface. At the top, it displays the Verizon carrier, signal strength, Wi-Fi, time (11:30 AM), and battery level (91%). Below the header, there is a table of 13 data points:

[1]	87	[mA]	13.80
[2]	255	[6]	4094
[3]	30	[7]	77
[4]	32	[8]	153
[5]	16	[9]	2817
[10]	4093	[11]	1134
[12]	151	[13]	2944

Below the table, the 'Diagnosis Condition' is listed as 'Not Applicable'. There are buttons for 'Export & Upload', 'Cleanliness Check', and 'Clean'. A box labeled 'Cleanliness Check' has an arrow pointing to the 'Cleanliness Check' button. Below the buttons, the text reads 'Probe is in good condition.' At the bottom, there is a promotional banner for the cleaning kit with the text 'Click below to purchase your cleaning kit' and 'Pyxis Cleaning + Calibrations = Accuracy & Repeatability!'. A box labeled 'Diagnosis' has an arrow pointing to the 'Diagnosis' button in the bottom navigation bar.

## 8.2. ST-500RO Inline Probe Cleaning Solution

Soak the lower half of the ST-500RO probe in 100 ml inline probe cleaning solution for 30 minutes. Rinse the ST-500RO probe with distilled water and then check for the flashing blue light inside the ST-500RO probe quartz tube. If the surface is not entirely clean continue to soak the ST-500RO probe for an additional 30 minutes. Pyxis Lab Inline Probe Cleaning Solution (SER-01) can be purchased online at <https://pyxis-lab.com/product-category/accessories/page/2/>.



## 9. Other Common Troubleshooting Issues

If the ST-500RO probe output signal is not stable and fluctuates significantly, make an additional solution ground connection by connecting the clear solution ground wire to a conductor that contacts the sample water electrically such as a brass pipe adjacent to the ST-500RO tee. Carry out routine calibration check against a Pyxis PTSA standard ONLY. If necessary, conduct the zero point and slope calibration.

## 10. Storage

Avoid long term storage at temperature over 100 °F. In an outdoor installation, properly shield the ST-500RO probe from direct sunlight and precipitation.