ST-500 Inline Fluorometer Probe Instruction Manual

Version 1.4 June 2018

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1. Introduction

The Pyxis ST-500 inline fluorometer probe measures the concentration of fluorescence tracer PTSA (pyrenetetrasulfonic acid) in water. It can be simply inserted to the compression fitting port of a custom made tee. The companion tee has two ¾ inch female NPT ports and can be placed to an existing ¾ inch sample water line. The 4-20mA current output of the ST-500 probe can be connected to any controller that accepts an isolated or non-isolated 4-20mA input. The ST-500 probe is a smart device. In addition to measuring fluorescence, the ST-500 probe has extra photo-electric components that monitor the color and turbidity of the sample water. This extra feature allows automatic color and turbidity compensation to eliminate interferences common in real-world samples.

The Pyxis ST-500 probe has a short fluidic channel. It can be easily cleaned. The fluidic and optical arrangement of the ST-500 probe is designed to overcome shortcomings associated with other fluorometers that have a distal sensor surface or a long, narrow fluidic cell. These fluorometers are susceptible to color and turbidity interference and fouling, and difficult to be cleaned.

The Pyxis ST-500 probe uses a narrow wavelength band gallium phosphide photodiode and high temperature-tolerant and humidity-resistant optical filters. This combination greatly enhances the robustness of the 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-500 probe can be stable and consistent for a long period time.

Other features of the ST-500 probe include:

- Menu-driven calibration procedure via a computer USB port. Any standard containing PTSA in the range of 40 to 200 ppb can be used for the calibration. The standard could be the water sample itself if the PTSA concentration of the sample is measured by an offline fluorometer. This allows the ST-500 probe to be calibrated online without being removed from the system.

- Automatic compensation for turbidity up to 150 NTU and color created by up to 10 ppm iron or equivalent to 10 ppm humic acid.

- The probe can be configured to an ultra sensitive mode, allowing PTSA monitoring at the 0 to 10 ppb range.

- Diagnostic information (probe fouling, color or turbidity over range, failure modes) are available via Modbus RTU (ST-500B).

- 30 day history data are stored in the probe and can be downloaded as a csv file to a PC via a UBS connection (ST-500B).

- The ST-500 probe can be easily removed from the system without the need of any tools for being cleaned.

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

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)
- 100 ppb PTSA Calibration Standard Solutions (SKU: 21001)
- 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 (±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 300 ppb (3σ error: ±0.2 ppb)
- Regulatory: CE Marked

4. Installation

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

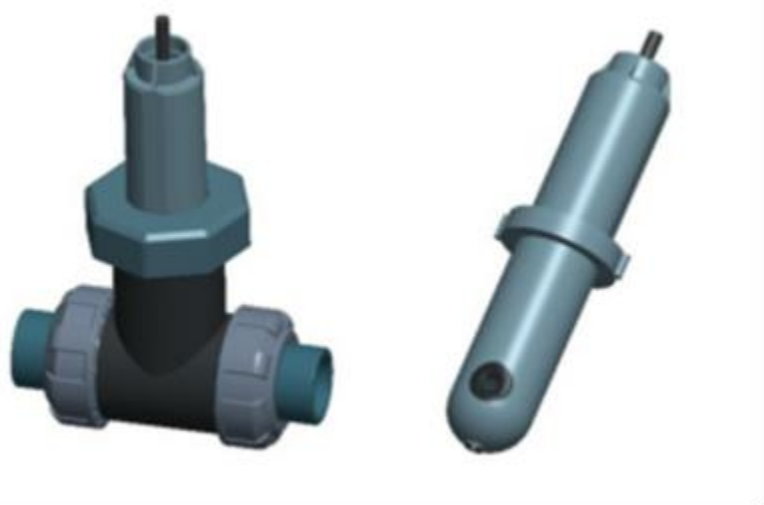


Figure 1. ST-500 with Tee Set

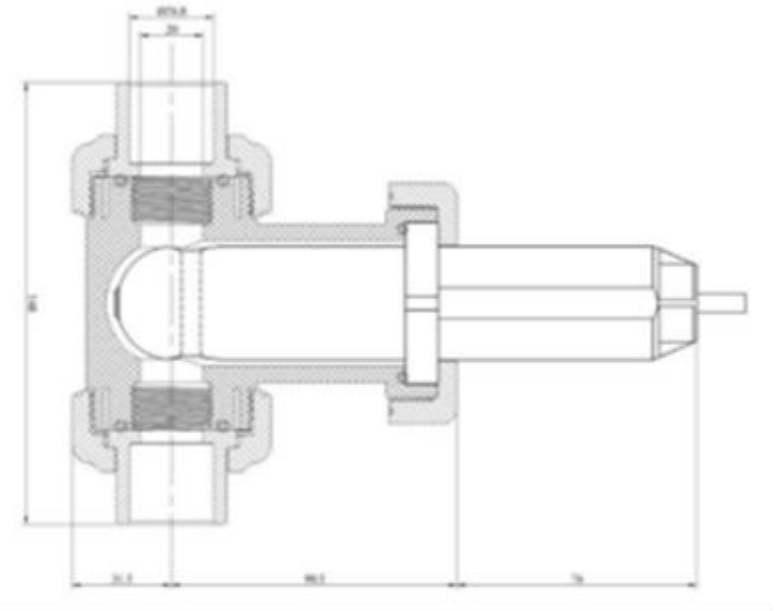


Figure 2. ST-500 Dimensions

4.1. Quick 4-20 mA Start

Note: The negative 24V power terminal and the negative 4-20 mA terminal on the ST-500 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-500 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 Bluetooth/WiFi

Figure 3 show the connection between a computer and the ST-500RO probe via Bluetooth/WiFi adapter (P/N: MA-W8). A smart phone app is provided to connect the ST-500RO probe to your smart phone via Bluetooth interface.

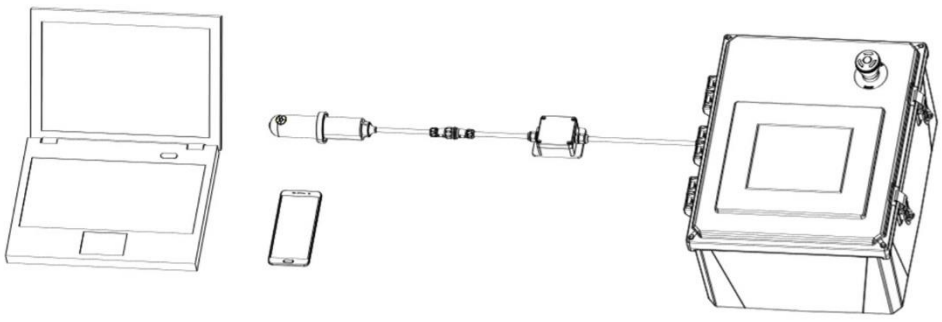


Figure 3. ST-500 connected to computer or smart phone via WiFi/Bluetooth adapter

4.3. Connecting via USB

Figure 4 shows the connection between a computer and the ST-500 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-500 probe communication hardware.

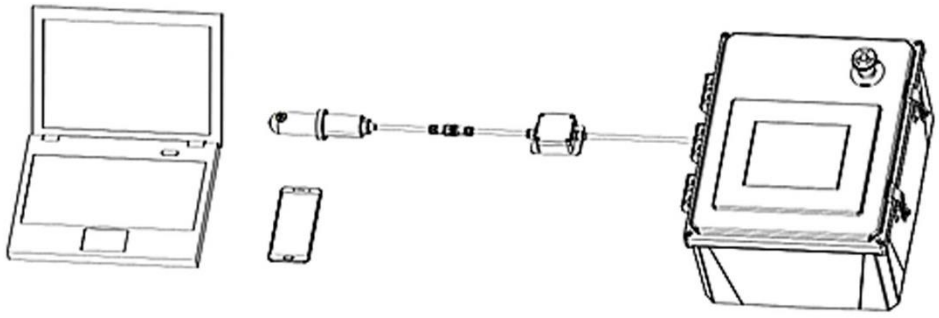
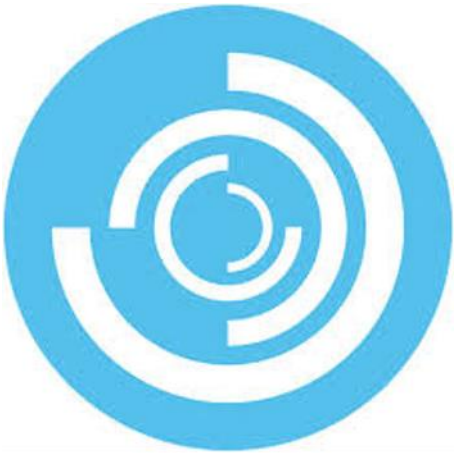


Figure 4. ST-500 connected to computer via USB-485 adapter

5. Probe Calibration with uPyxis Mobile App

5.1. Download uPyxis Mobile App

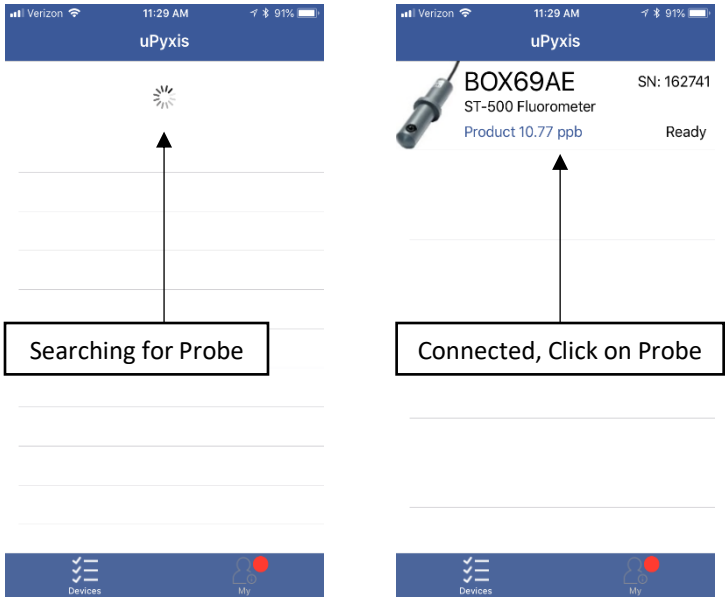
Download uPyxis Mobile App from **Apple App** Store or **Google Play**



uPyxis Mobile App

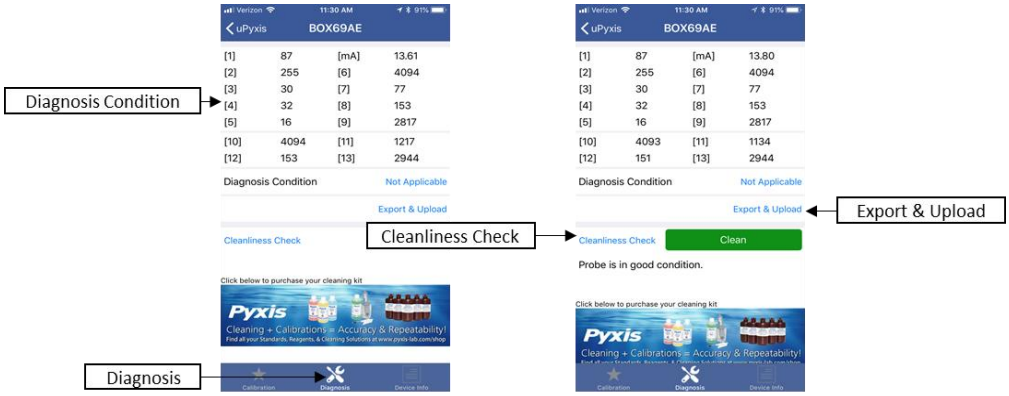
5.2. Connecting to uPyxis Mobile App

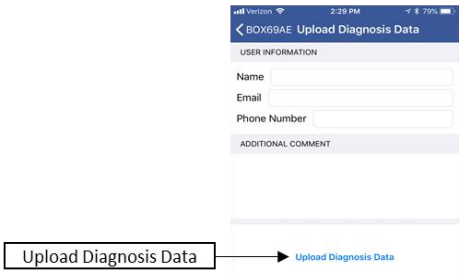
Turn on Bluetooth on your mobile phone (Do not pair the phone Bluetooth to the ST-500). Open uPyxis Mobile App. uPxis App connects to the Probe and click on the **ST-500 probe**.



5.3. Diagnosis Screen

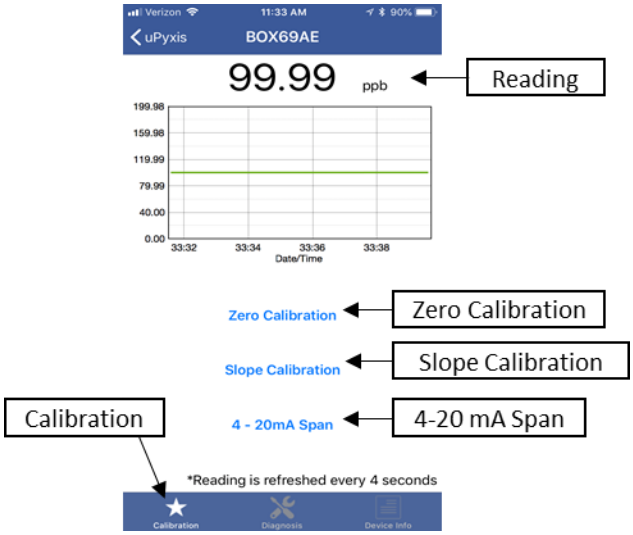
From the **Diagnosis** screen. You can check the diagnosis condition, **Cleanliness Check**, and **Export & Upload**.





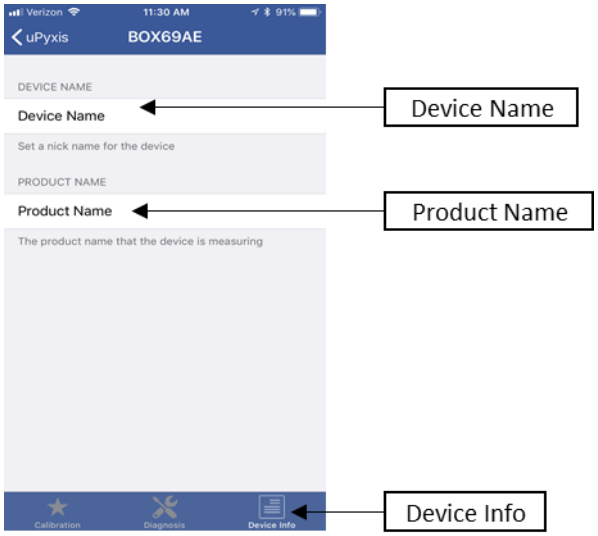
5.4. Calibration Screen and Reading

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**. Follow the screen instructions for each calibration step.



5.5. Device Info Screen

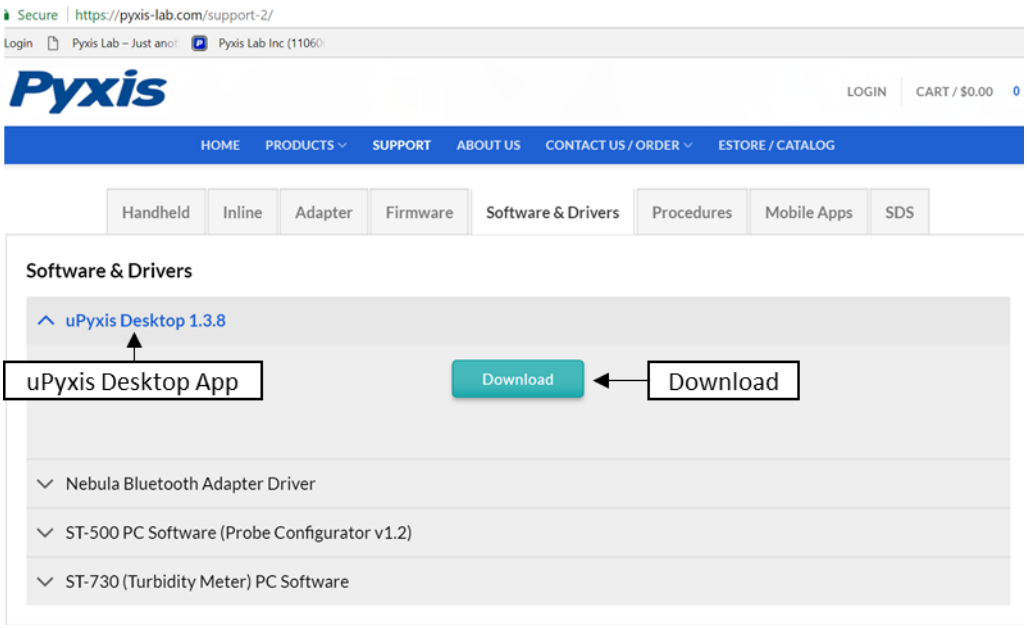
From the **Device Info** screen. You can name the Device or Product.

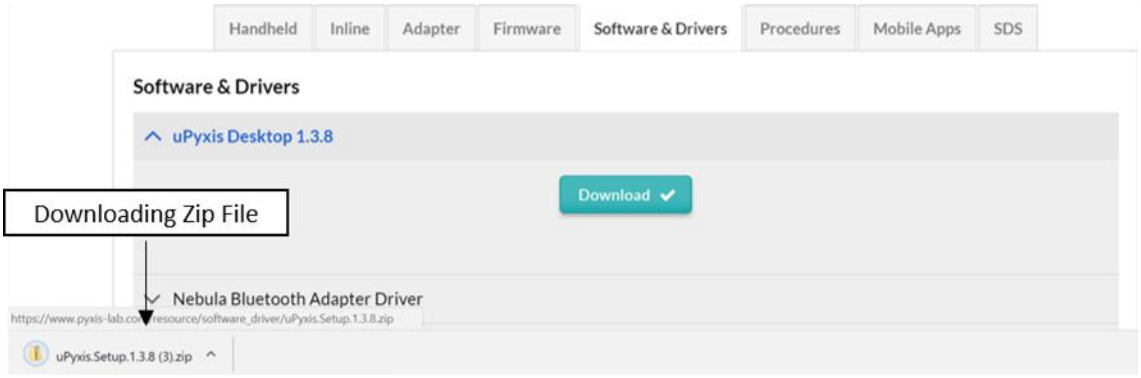


6. Probe Calibration with uPyxis Desktop App

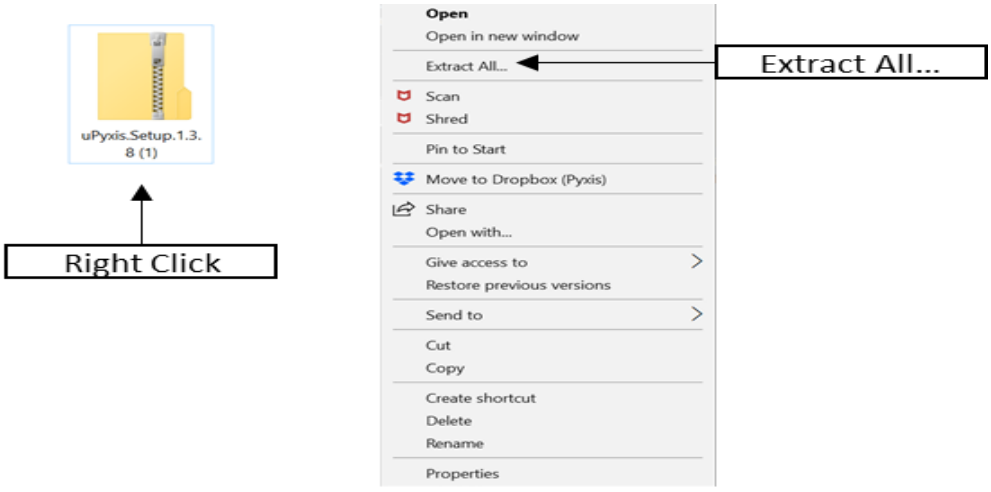
6.1 Download uPyxis Desktop App

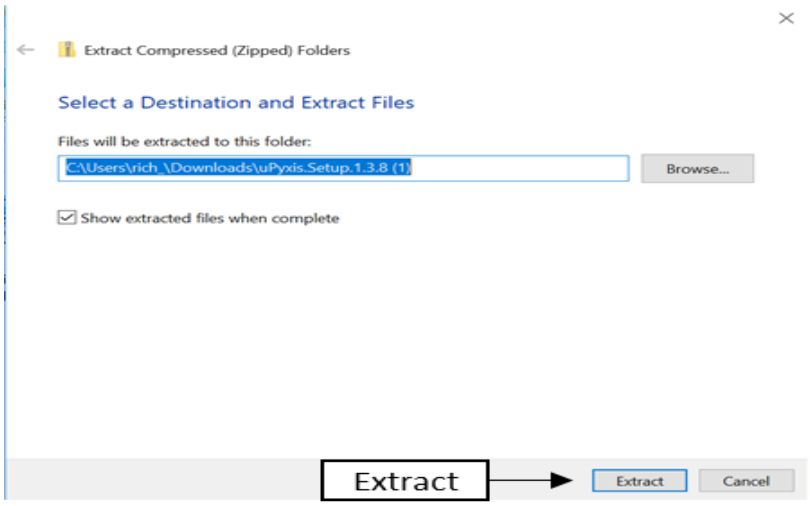
Download uPyxis Desktop App from https://pyxis-lab.com/support-2/





6.2. UnZip uPyxis Desktop App

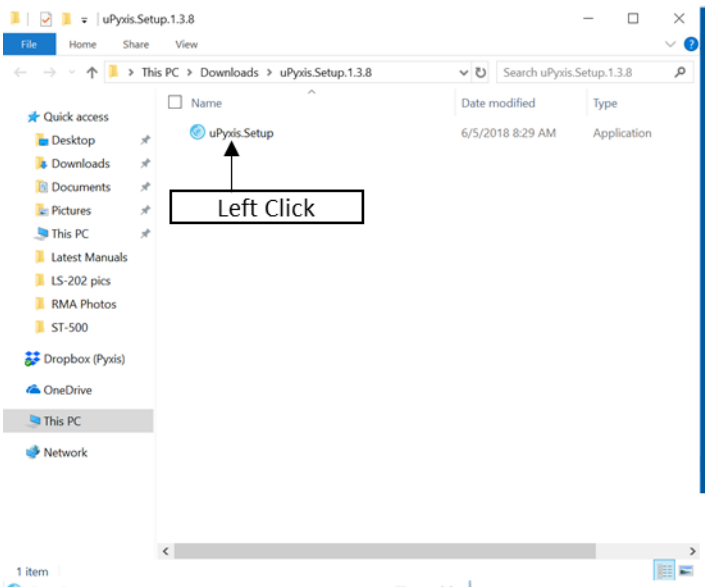


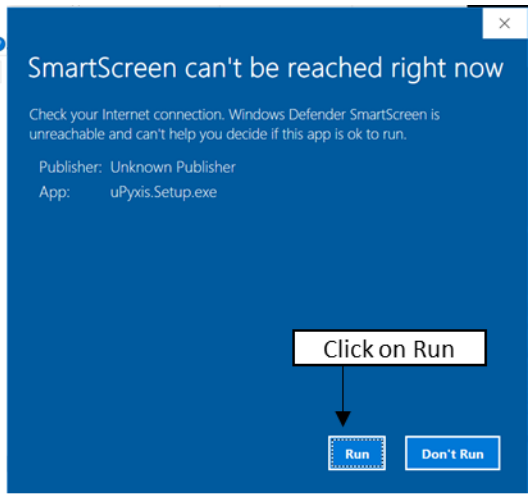


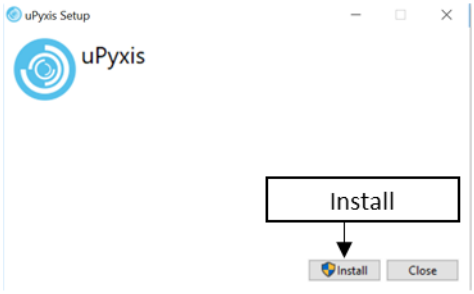
Find your downloaded uPyxis Setup 1.3.8 file, **Right Click on the file**, **Extract All**, and then **Extract**.

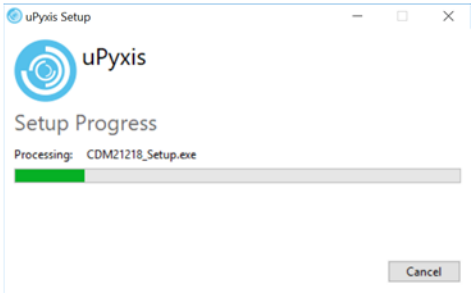
6.3. Installing uPyxis Desktop App

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 step during installation process.



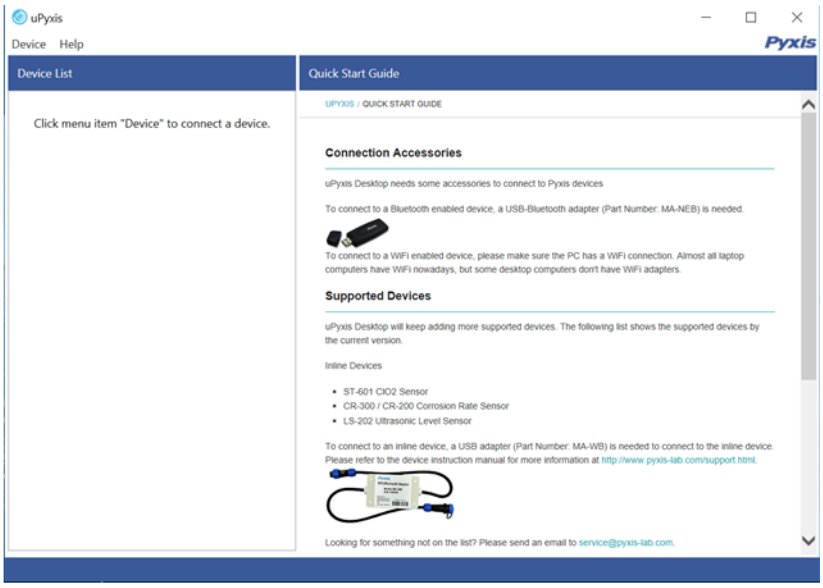


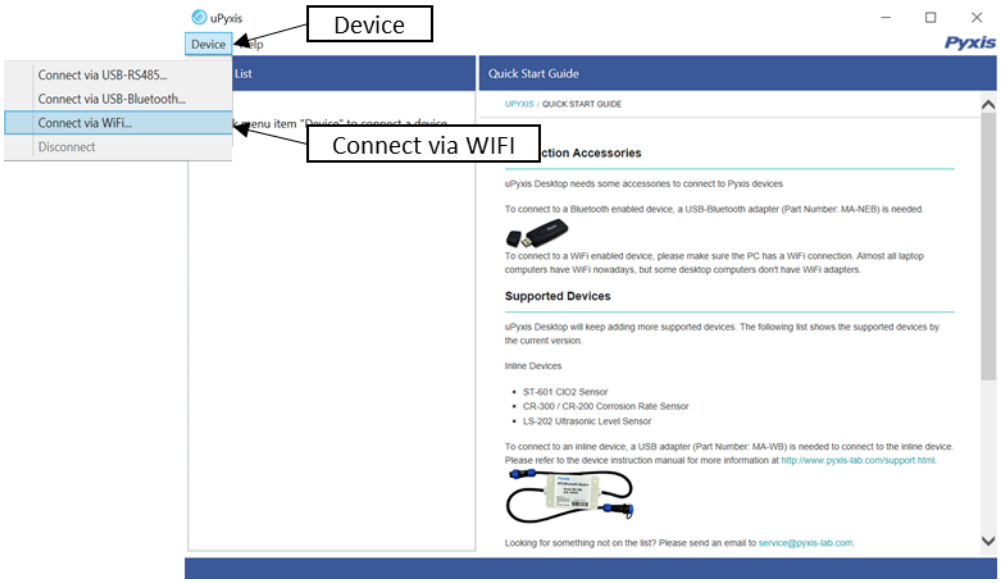




6.4. Connecting to uPyxis Desktop App

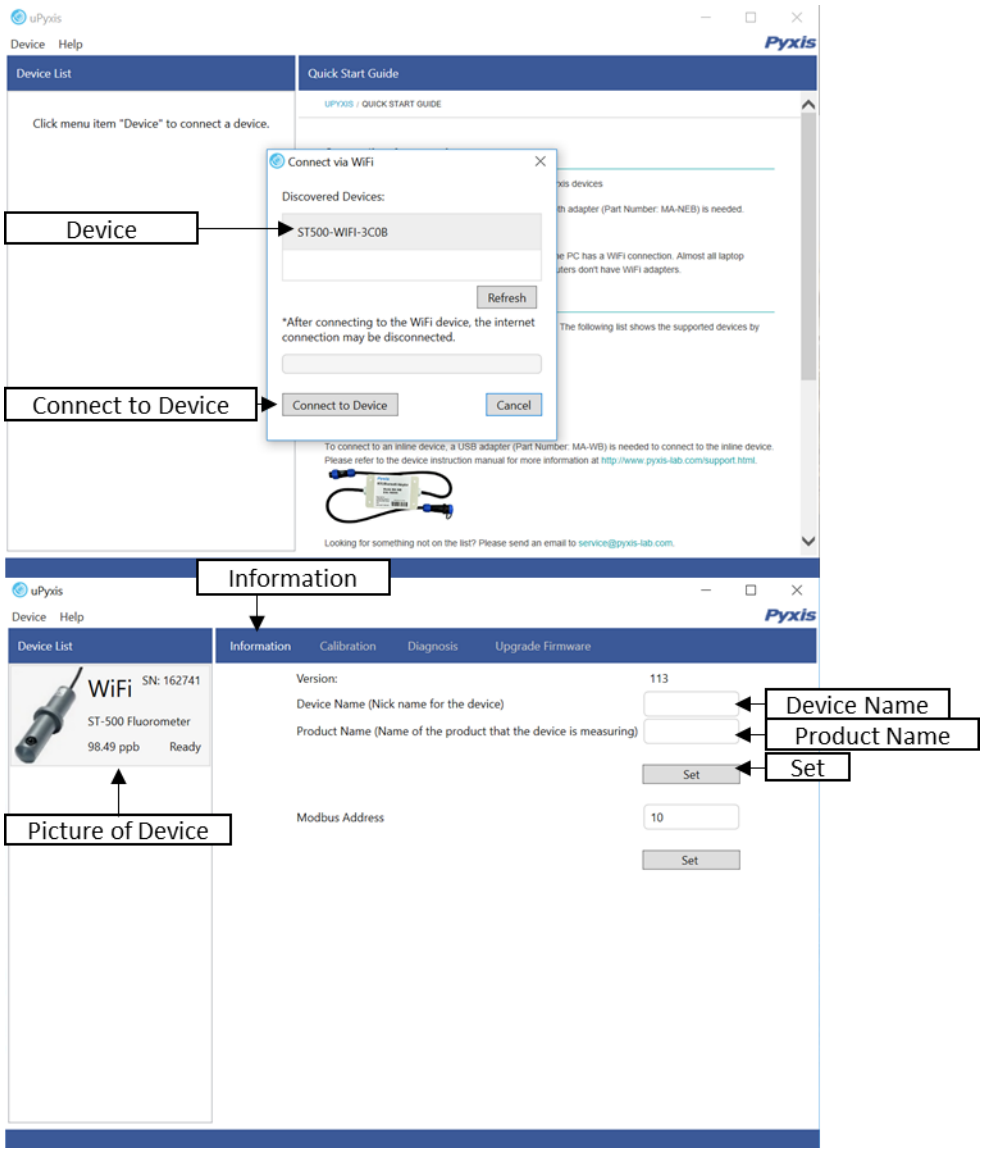
Open **uPyxis Desktop App** on your desktop. When the desktop app opens, to find your device, click on **Device**, then **Connect via WiFi**.





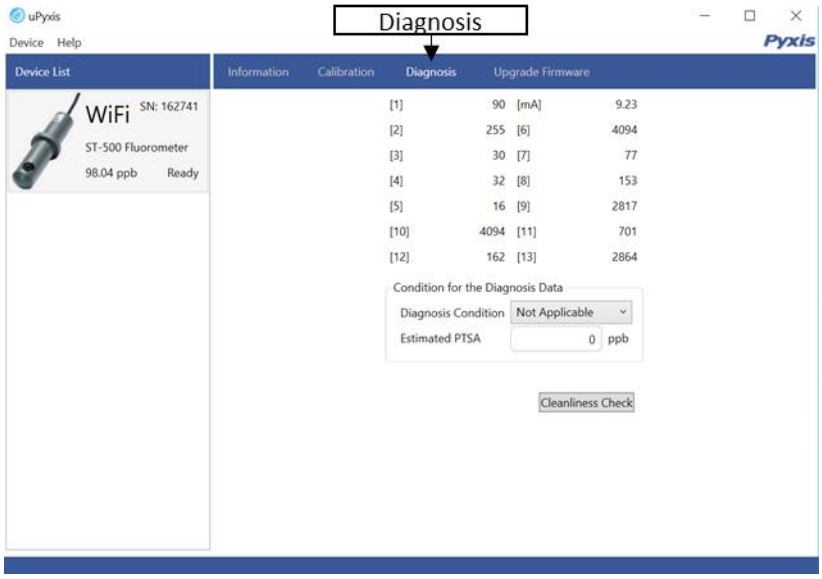
6.5. Connecting to Device

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.



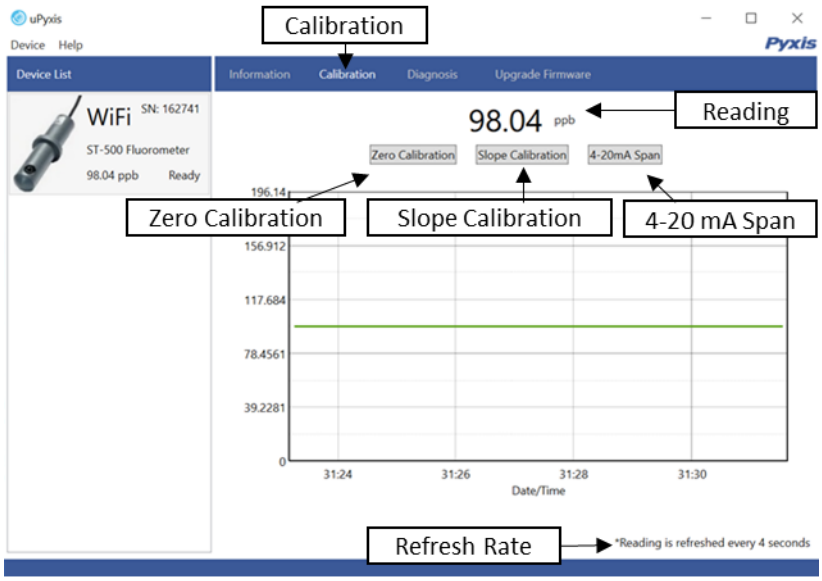
6.6. Diagnosis Screen

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.



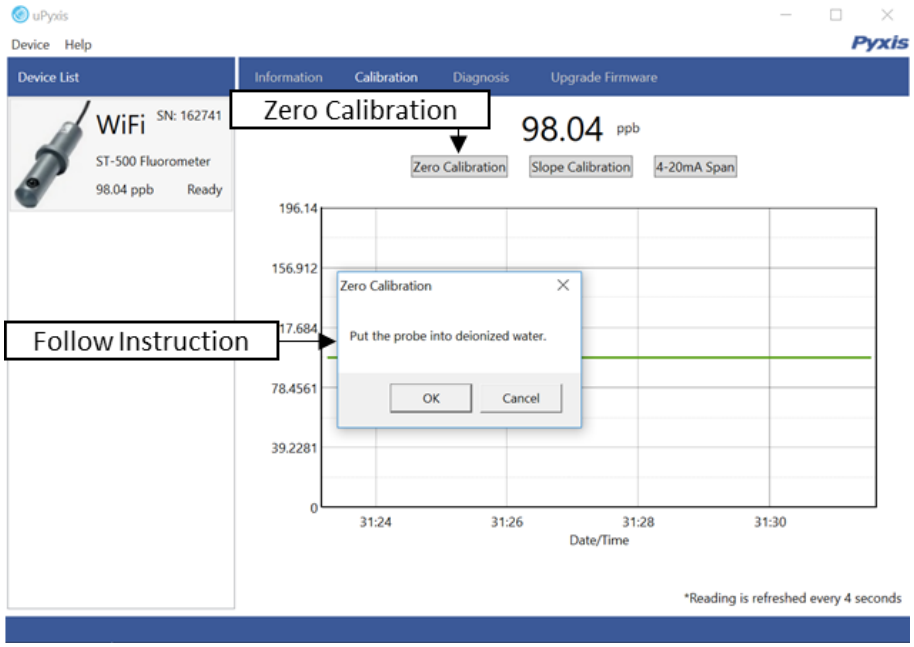
6.7. Calibrating Device

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.



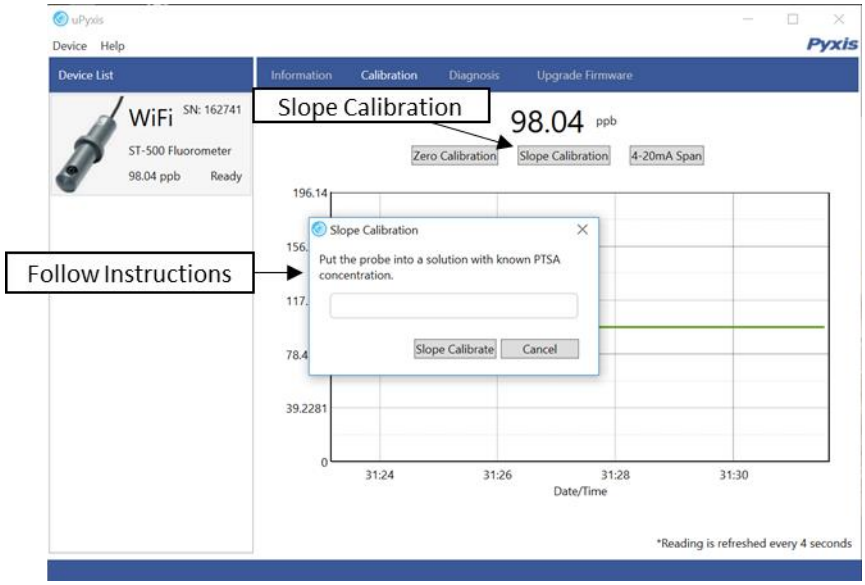
6.8. Zero Calibration

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



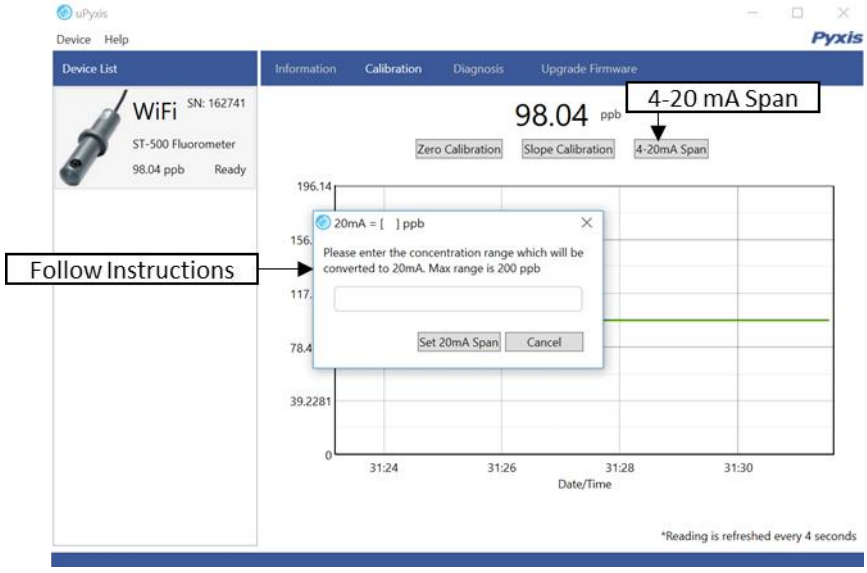
6.9. Slope Calibration

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



6.10. 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.



7. Communicating using Modbus RTU

The ST-500 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) for more information.

8. Probe Cleaning and Maintenance

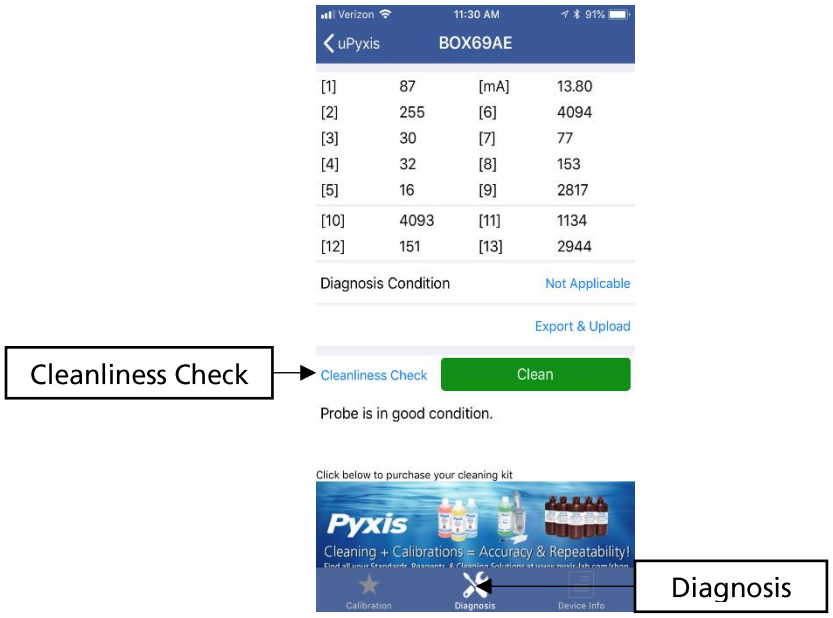
The ST-500 probe is designed to provide reliable and continuous PTSA readings even when installed in moderately contaminated industrial cooling waters. Although the optics are compensated for the effects of moderate fouling, heavy fouling will prevent the light from reaching the sensor, resulting in low readings and the potential for product overfeed if the ST-500 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-500 probe is designed to be easily removed, inspected, and cleaned if required. It is suggested that the ST-500 probe be checked for fouling and cleaning on a mothly basis. Heavily contaminated waters may require more frequent cleanings. Cleaner water sources with less contamination may not require cleaning for several months.

8.2. Methods to Cleaning ST-500 probe

Any equipment in contact with industrial cooling systems is subject to many potential foulants and contaminants. Our inline probe cleaning solutions below have 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-catergory/accessories/page/2/

Diagnostics Method: The diagnosis information can be obtained by connecting the ST-500 probe to uPyxis Mobile application or uPyxis Desktop application installed. Connect to the ST-500 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.



8.3. ST-500 Inline Probe Cleaning Solution

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

9. Other Common Troubleshooting Issues

If the ST-500 probe output signal is not stable and fluctuates significantly, make an additional solution ground connection – connect the clear solution ground wire to a conductor that contacts the sample water electrically such as a brass pipe adjacent to the ST-500 tee. Carry out routine calibration check against a PTSA standard. If necessary, carry out 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-500 probe from direct sunlight and precipitation.