Inline Turbidity Probe Series Operational Manual

Model # ST-730, ST-730B, ST-730SS, ST-731, and ST-735

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1. Introduction

The Pyxis ST-730 series of inline probes measure turbidity in water using a white LED as the excitation light source and by measuring the scattered light at a 90-degree angle with respect to the excitation beam. The fluidic and optical arrangement of the ST-730 series probes is designed to overcome many shortcomings associated with other inline turbidimeters. It can be easily inserted into the custom-made tee with a compression fitting port designed to ensure correct positioning of the ST-730 series probe in the fluid stream. The ST-730 series probes custom mounting tee has two ¾ inch female NPT ports for plumbing into an existing ¾ inch sample water line. The ST-730 series probes can be also submersed into a vessel with using the Pyxis MA-102S submersion adapter. The ST-730 series probes can be connected to any device that accepts an isolated or non-isolated 4-20mA input. The ST-730 series probes have a short fluidic channel that can be easily cleaned. Other features of the Pyxis ST-730 series probes include:

- Menu-driven calibration procedure using uPyxis APP for smartphone via Bluetooth or by USB to uPyxis APP for Desktop. Any of the formazin turbidity standards in the range of solutions offered by Pyxis Lab (10 to 1,000 NTU) can be used for the calibration. Select the standard that fits the range scale of your probe for proper calibration. The standard can be the water sample itself when the turbidity value of the sample has been measured by another turbidimeter that has been calibrated. This allows the ST-730 series probes to be calibrated without being removed from the system.
- Diagnostic information (probe fouling, color or turbidity over range, failure modes) can be communicated to digital displays via Modbus RTU.
- The ST-730 series probes can be easily removed from the custom tee for cleaning without the need or any tools.

The ST-730 series of probes measure light scattering for the 0 – 100 NTU range using a white LED as the incident light source, the 100 – 1000 NTU range using a 950 nm LED light source, and the 950 nm absorbance for the 1000 – 10,000 NTU range. The ST-730 series turbidity probes automatically select the measurement method needed for the sample according to the sample turbidity range detected when inserted inline.

The Pyxis ST-730 series probes all use long life LEDs as their light source and will not require replacement unlike conventional turbidity probes. It can be operated under a wide range of ambient conditions without the need for humidity and temperature regulation. The performance of the ST-730 series of probes can be stable and consistent for a very long period time.

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 serice@pyxis-lab.com.

2.1. Standard Accessories

- ¾" NPT Inline Pyxis Tee Set (Tee, O-ring, and Nut) (SKU: 50704)
- Probe Bulkhead Cable w/ Male Adapter
- Flying Lead Cable w/ Female Adapter & Open Leads – (SKU: MA-1100) *(Wired to Controller)*

2.2. Optional Accessories

- **WiFi/Bluetooth Adaptor** (Item Number: MA-WB) – *For Wireless Calibration via uPyxis APP for Smartphone*
- **Turbidity Standard 10 NTU** (SKU: 57010-4) – *For ST731 uPyxis Calibration*
- **Turbidity Standard 50 NTU** (SKU: 57009) – *For ST730 uPyxis Calibration*
- **Turbidity Standard 100 NTU** (SKU: 57010) – *For ST730 uPyxis Calibration*
- **Turbidity Standard 200 NTU** (SKU: 57010-1) – *For ST730B uPyxis Calibration*
- **Turbidity Standard 500 NTU** (SKU: 57010-2) – *For ST730B uPyxis Calibration*
- **Turbidity Standard 1000 NTU** (SKU: 57010-3) – *For ST730B or ST735 uPyxis Calibration*
- **ST Series Inline Probe Cleaning Solution** (SKU: SER-01) – *For Proper Probe Cleaning*
- **1.5 inch OD O-ring** (SKU: MA-150)
- **Extension Cable** – 50 feet (SKU: 50705)
- **Extension cable** – 100 feet (SKU:5070)
- **Submersion Adapter** (SKU: MA-102S) - *For Submersed Installation into a Tank or Vessel*

3. Specifications

	ST-730	ST-730B	ST-730SS	ST-731	ST-735
P/N	53201	53202	ST730SS	53505	53204
Range	0 – 100 NTU	0 – 1,000 NTU	0 – 100 NTU	0 – 10 NTU	0 – 10,000 NTU
Resolution	0.1 NTU	1 NTU	0.1 NTU	0.05 NTU	10 NTU
Accuracy	± 2% of reading or 1 NTU whichever is grater				
Method	Nephelometric, with light sources of White LED and IR LED (860nm)				
Power Supply	22 – 26V DC, Power Consumption – 1W				
Outputs	Isolated 4 – 20 mA Analog Output, Isolated RS-485 Digital Output, Supporting MODBUS protocol				
Dimension	Length 6.8 inch, body diameter 1.44 inch				
Weight	0.37 pounds (2.5 lbs ST-730SS)				
Installation	Custom Tee with ¾ NPT Glue & Thread				
Material	CPVC (304 Stainless Steel for ST-730SS)				
Pressure	Up to 100 psi (ST-730SS - Up to 2.0 MPa (290 PSI) at 65°C (149 °F)				
Temperature	Operation 40 – 120 °F, Storage 20 – 140 °F (ST-700SS - 0° C ~ 40 °C (32~104 °F)				
Cable Length	5 feet, terminated with IP6 connectors. 30 feet, 60 feet extension cables available				
Calibration	Two point calibration against standard solution				
Rating	IP66				
Regulation	CE marked				

4. Installation

It is recommended to install the ST-730 series probe tee in the pipe system in a vertical flow pattern. Place the O-ring on the ST-730 series probe. Insert the ST-730 series probe into the tee. Make sure the fluidic channel in the ST-730 series probe is aligned with the sample flow direction.

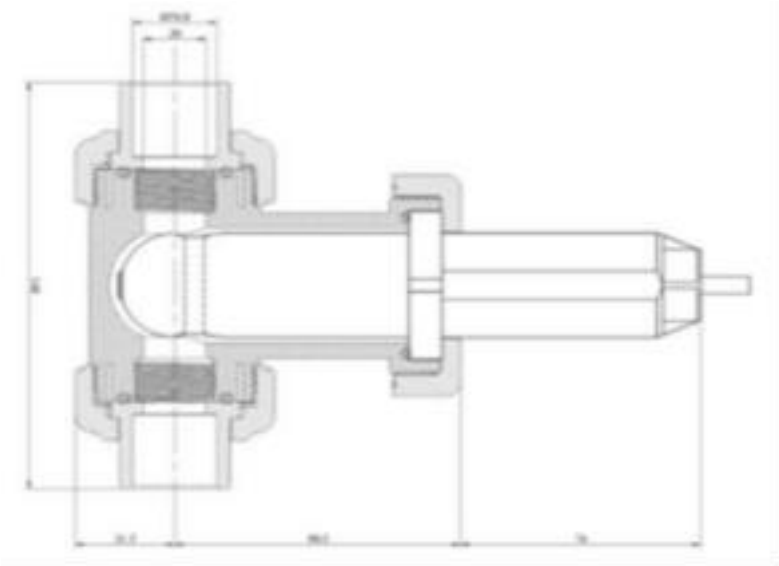
4.1. Quick 4 -20 mA Start

Note: The negative 24V power terminal (power ground) and the negative 4-20 mA terminal on the ST-730 series probe are internally connected.

If the power ground 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.

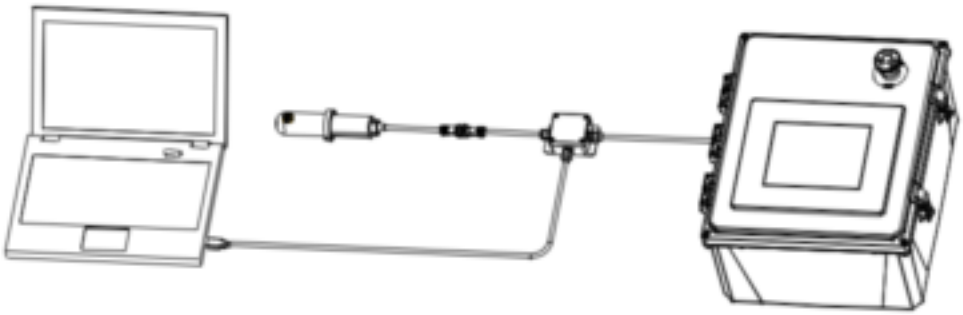
Follow the wiring table below to connect the ST-730 series probe to a controller.

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. Connecting via WiFi/Bluetooth

The connection between a computer and the ST-730 series probe via WiFi/Bluetooth adapter (P/N: MA-WB) and use the **uPyxis APP** for smart phone app to diagnose and calibrate



WiFi/Bluetooth interface.

4.3. Connecting via USB

The connection between a computer and the ST-730 series probe via USB-RS485 adapter. Use the USB-RS485 adapter provided by Pyxis Lab Inc. (Item Number: MA-485). Using other USB-485 adapters may result in permanent damage of the ST-730 series probe communication hardware.

5. Probe Calibration with uPyxis Mobile App

5.1. Download uPyxis Mobile App

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

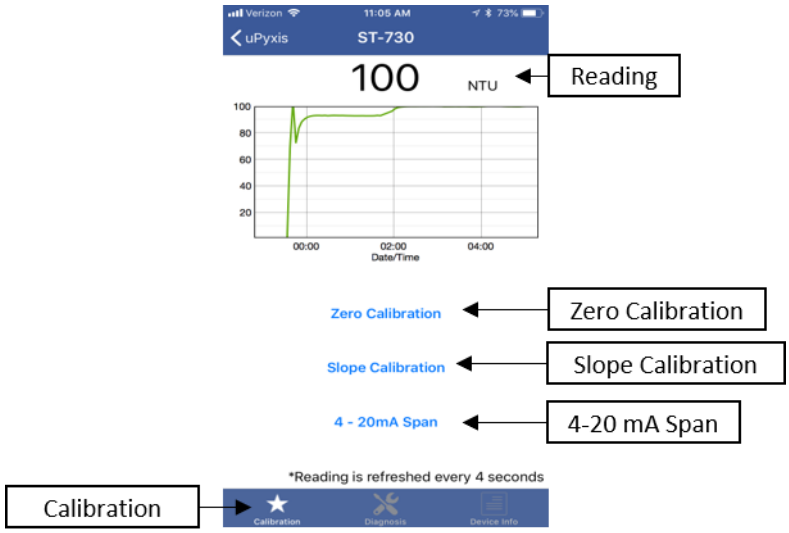
Calibration Standards Available Online At

https://pyxis-lab.com/product-category/calibration-standards-reagents/

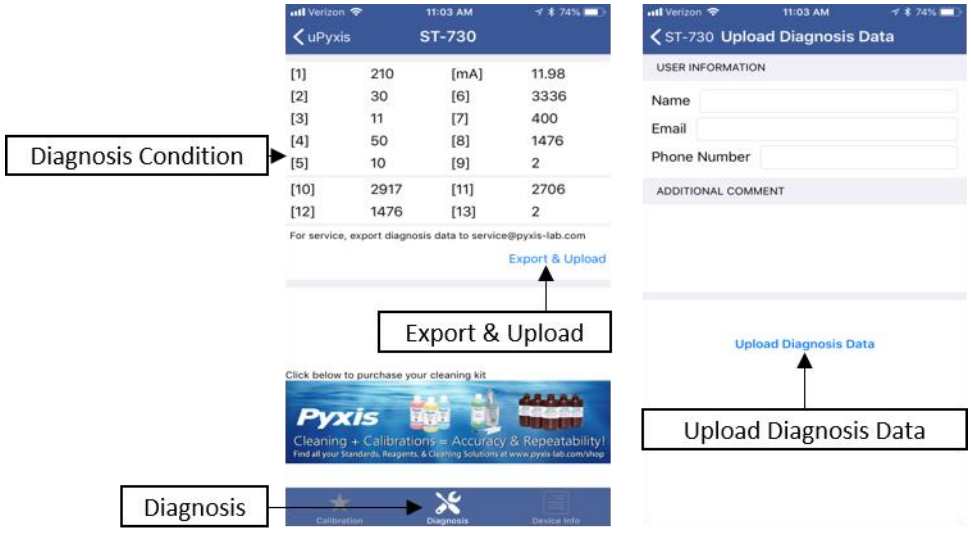
5.2. Connecting ST-730 to uPyxis Mobile App

Turn on Bluetooth on your mobile phone (Do not pair the phone Bluetooth to the probe). Open uPyxis Mobile, uPyxis App searches for probe then connects to probe, click on **ST-730 probe**.

When connected, uPyxis Mobile App will default to the **Calibration** screen. From the Calibration screen you can see the readings and calibrate the ST-730 probe. To perform Zero Calibration, click on **Zero Calibration** and follow the uPyxis app prompts. To perform Slope Calibration, click on **Slope Calibration** and follow the uPyxis app prompts. To perform 4-20 mA Span, click on **4-20 mA Span** and follow the uPyxis app prompts.



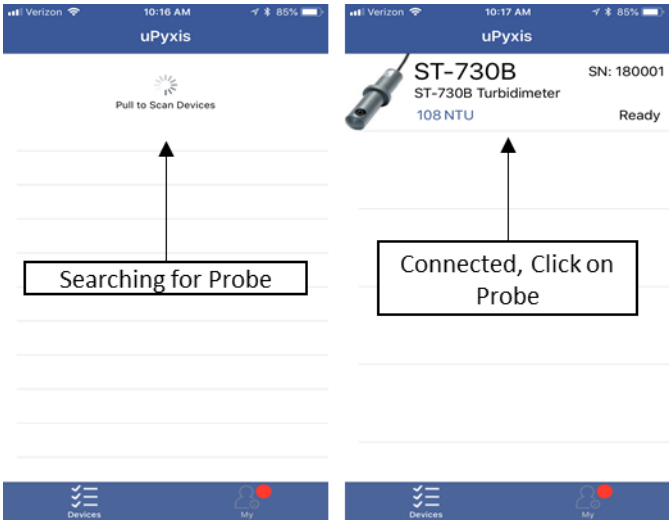
Diagnosis condition can be checked by, click on **Diagnosis** to enter the diagnosis screen. In the Diagnosis screen you can check the condition of the meter, export, and upload diagnosis data. To export and upload diagnosis data, click on **Export & Upload**. Fill in the user information then click on **Upload Diagnosis Data**.



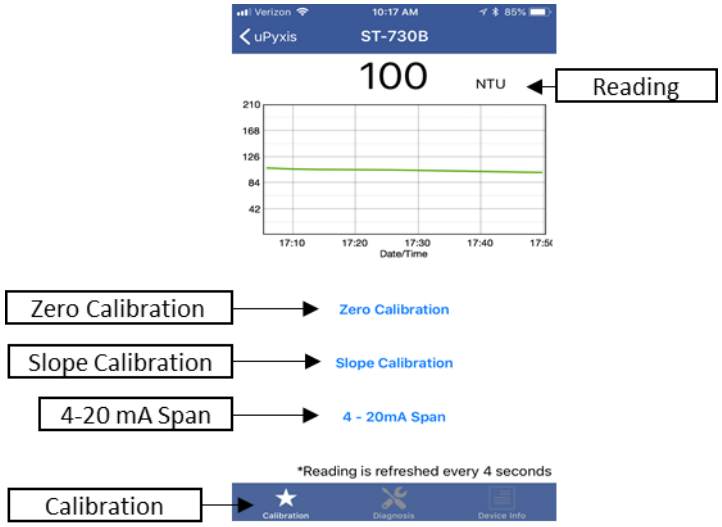
To set the Device Information, click on **Device Info** to enter the Device Info screen. In the Device Info screen, you can name the device and product.

5.3. Connecting ST-730B to uPyxis Mobile App

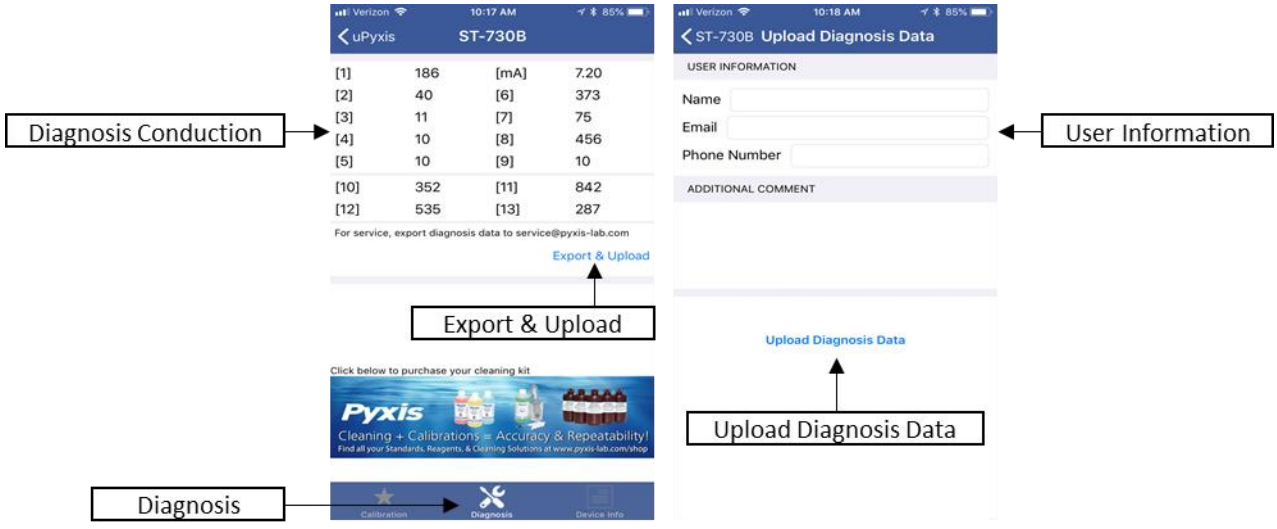
Turn on Bluetooth on your mobile phone (Do not pair the phone Bluetooth to the probe). Open uPyxis Mobile, uPyxis App searches for probe then connects to ST-730B probe, click on **ST-730B probe**.



When connected, uPyxis Mobile App will default to the **Calibration** screen. From the Calibration screen you can see the readings and calibrate the ST-730B probe. To perform Zero Calibration, click on **Zero Calibration** and follow the uPyxis app prompts. To perform Slope Calibration, click on **Slope Calibration** and follow the uPyxis app prompts. To perform 4-20 mA Span, click on **4-20 mA Span** and follow the uPyxis app prompts.



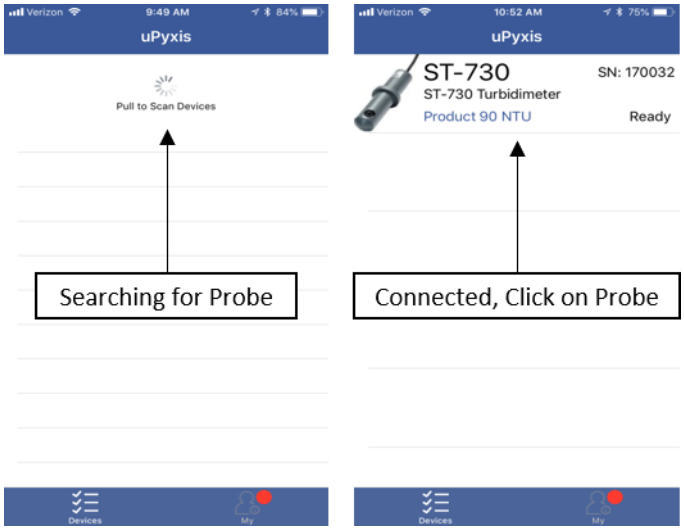
Diagnosis condition can be checked by, click on **Diagnosis** to enter the diagnosis screen. In the Diagnosis screen you can check the condition of the meter, export, and upload diagnosis data. To export and upload diagnosis data, click on **Export & Upload**. Fill in the user information then click on **Upload Diagnosis Data**.



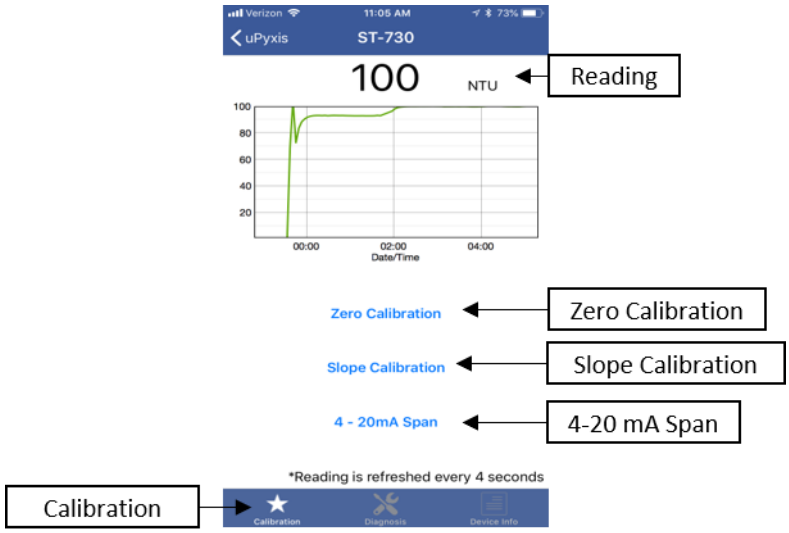
To set the Device Information, click on **Device Info** to enter the Device Info screen. In the Device Info screen, you can name the device and product.

5.4. Connecting ST-730SS to uPyxis Mobile App

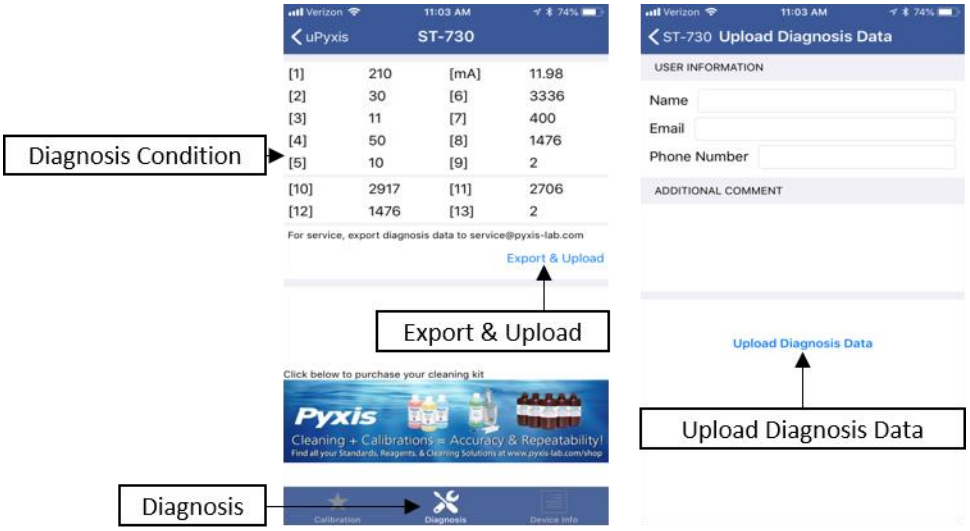
Turn on Bluetooth on your mobile phone (Do not pair the phone Bluetooth to the probe). Open uPyxis Mobile, uPyxis App searches for probe then connects to probe, click on **ST-730SS probe**.



When connected, the uPyxis Mobile App will default to the **Calibration** screen. From the Calibration screen you can see the readings and calibrate the ST-730SS probe. To perform Zero Calibration, click on **Zero Calibration** and follow the uPyxis app prompts. To perform Slope Calibration, click on **Slope Calibration** and follow the uPyxis app prompts. To perform 4-20 mA Span, click on **4-20 mA Span** and follow the uPyxis app prompts.



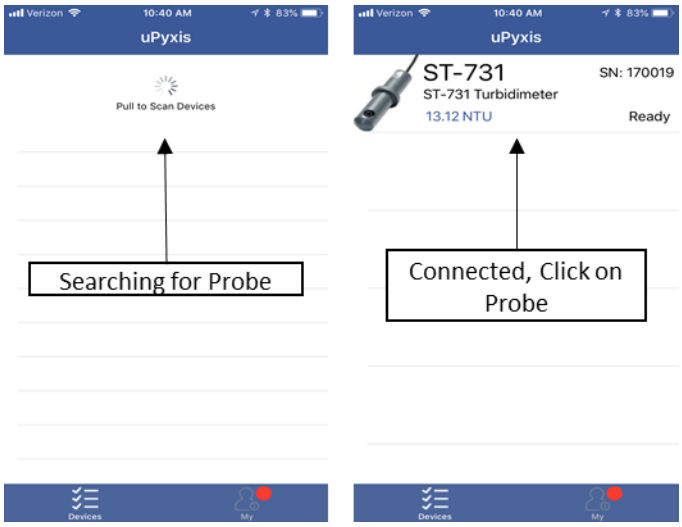
Diagnosis condition can be checked by, click on **Diagnosis** to enter the diagnosis screen. In the Diagnosis screen you can check the condition of the meter, export, and upload diagnosis data. To export and upload diagnosis data, click on **Export & Upload**. Fill in the user information then click on **Upload Diagnosis Data**.



To set the Device Information, click on **Device Info** to enter the Device Info screen. In the Device Info screen, you can name the device and product.

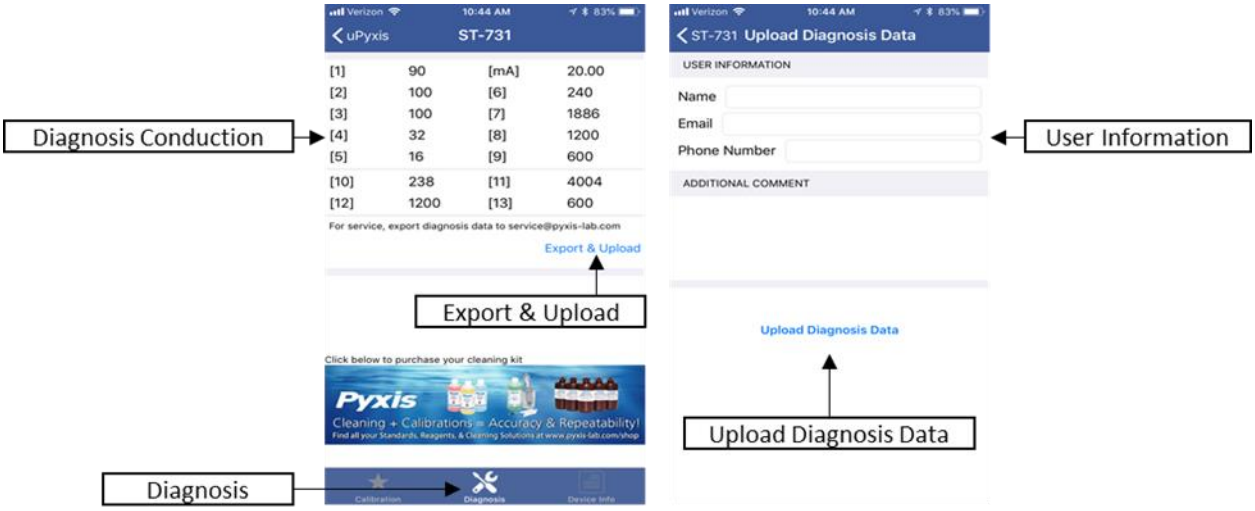
5.5. Connecting ST-731 to uPyxis Mobile App

Turn on Bluetooth on your mobile phone (Do not pair the phone Bluetooth to the probe). Open uPyxis Mobile, uPyxis App searches for probe then connects to ST-731 probe, click on **ST-731 probe**.



When connected, the uPyxis Mobile App will default to the **Calibration** screen. From the Calibration screen you can see the readings and calibrate the ST-731 probe. To perform Zero Calibration, click on **Zero Calibration** and follow the uPyxis app prompts. To perform Slope Calibration, click on **Slope Calibration** and follow the uPyxis app prompts. To perform 4-20 mA Span, click on **4-20 mA Span** and follow the uPyxis app prompts.

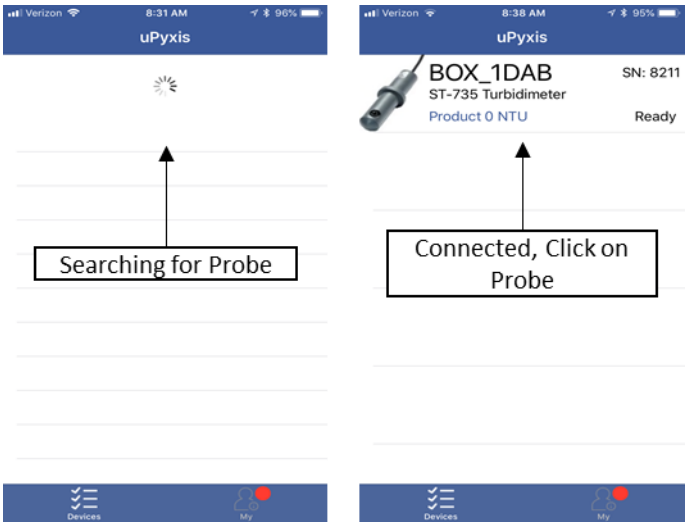
Diagnosis condition can be checked by, click on **Diagnosis** to enter the diagnosis screen. In the Diagnosis screen you can check the condition of the meter, export, and upload diagnosis data. To export and upload diagnosis data, click on **Export & Upload**. Fill in the user information then click on **Upload Diagnosis Data**.



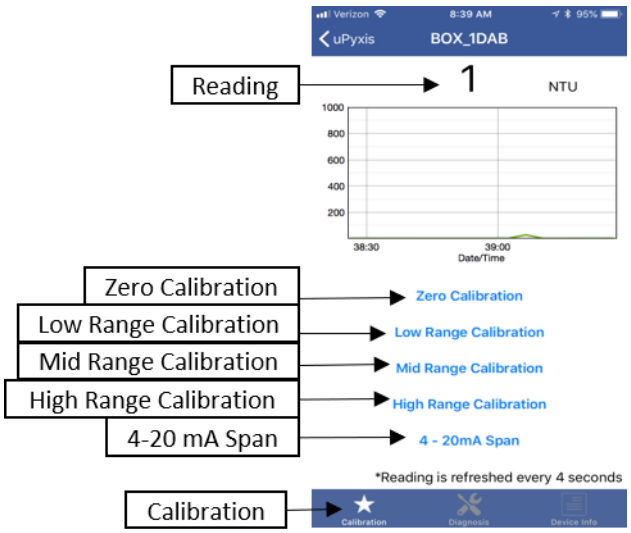
To set the Device Information, click on **Device Info** to enter the Device Info screen. In the Device Info screen, you can name the device and product.

5.6. Connecting ST-735 to uPyxis Mobile App

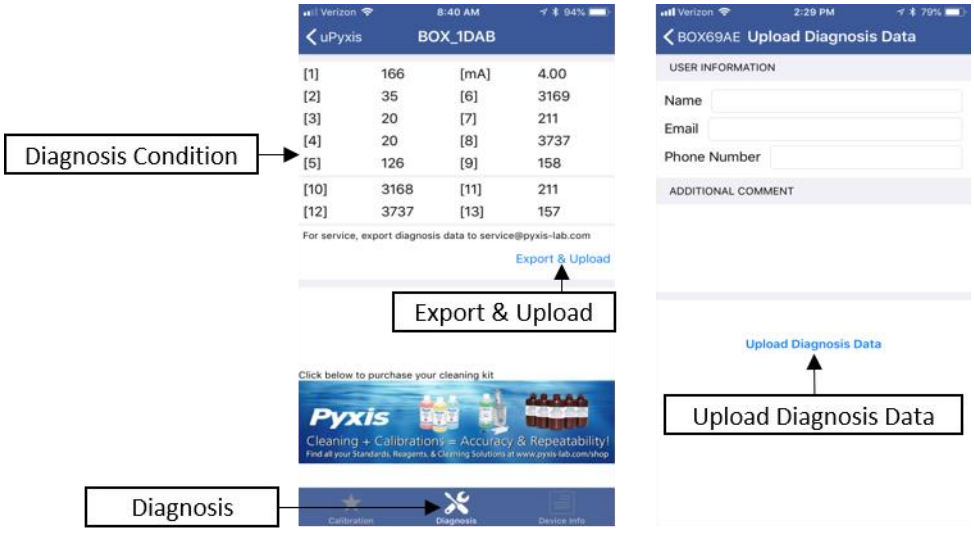
Turn on Bluetooth on your mobile phone (Do not pair the phone Bluetooth to the probe). Open uPyxis Mobile, uPyxis App searches for probe then connects to ST-735 probe, click on **ST-735 probe**.



When connected, the uPyxis Mobile App will default to the **Calibration** screen. From the Calibration screen you can see the readings and calibrate the ST-735 probe. To perform Zero Calibration, click on **Zero Calibration** and follow the uPyxis app prompts. To perform Low Range Calibration, click on **Low Range Calibration** and follow the uPyxis app prompts. To perform Mid Range Calibration, click on **Mid Range Calibration** and follow the uPyxis app prompts. To perform High Range Calibration, click on **High Range Calibration** and follow the uPyxis app prompts. To perform 4-20 mA Span, click on **4-20 mA Span** and follow the uPyxis app prompts.



Diagnosis condition can be checked by, click on **Diagnosis** to enter the diagnosis screen. In the Diagnosis screen you can check the condition of the meter, export, and upload diagnosis data. To export and upload diagnosis data, click on **Export & Upload**. Fill in the user information then click on **Upload Diagnosis Data**.

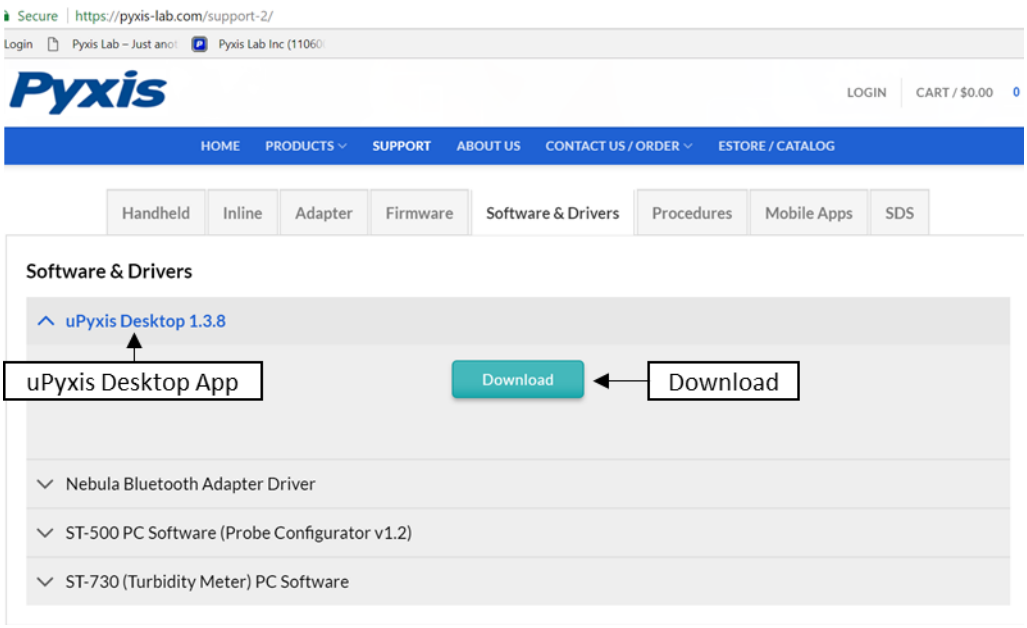


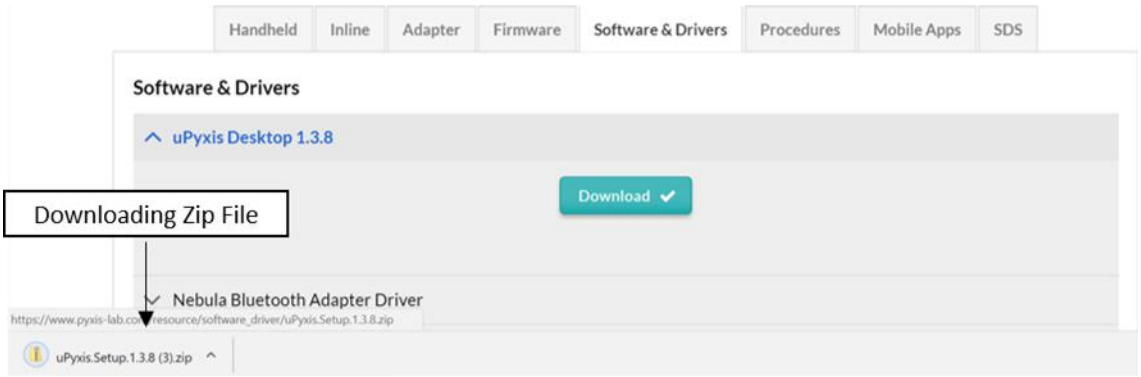
To set the Device Information, click on **Device Info** to enter the Device Info screen. In the Device Info screen, you can name the device and product.

6. Probe Calibration with uPyxis Desktop App

6.1. Download uPyxis Desktop App

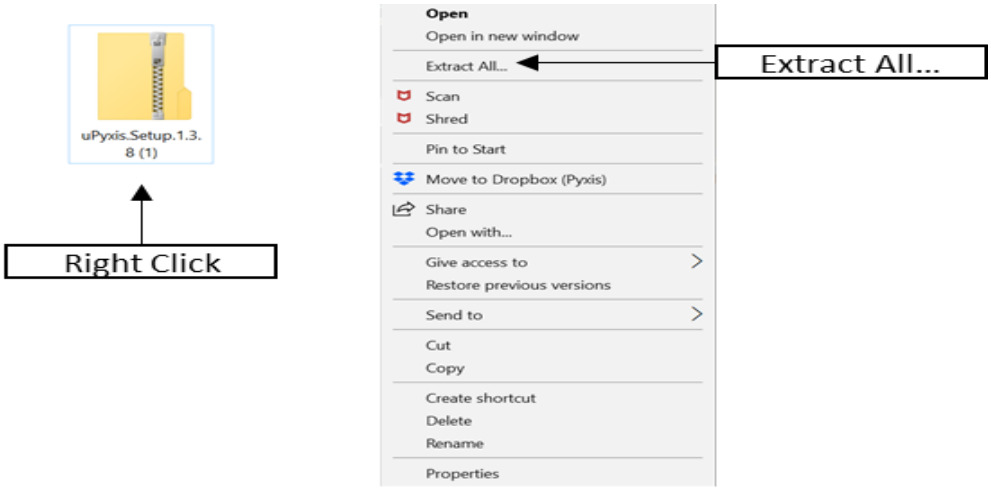
Download uPyxis Desktop App from https://pyxis-lab.com/support-2/.

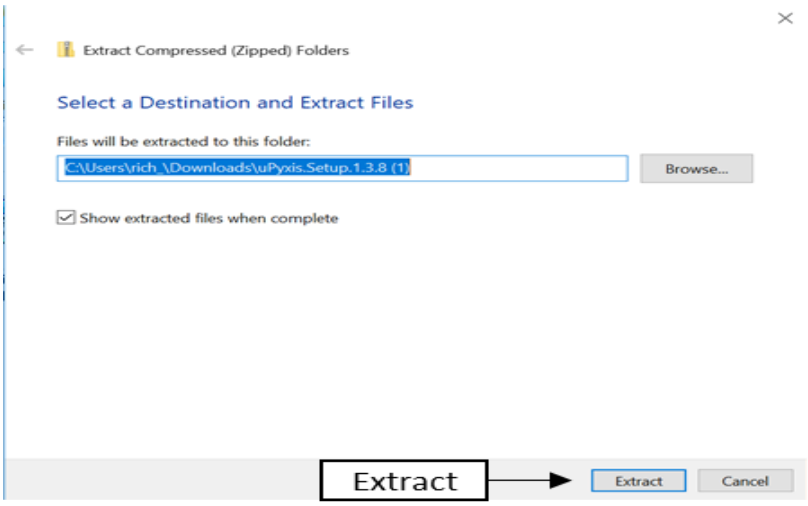




6.2. UnZip uPyxis Desktop App

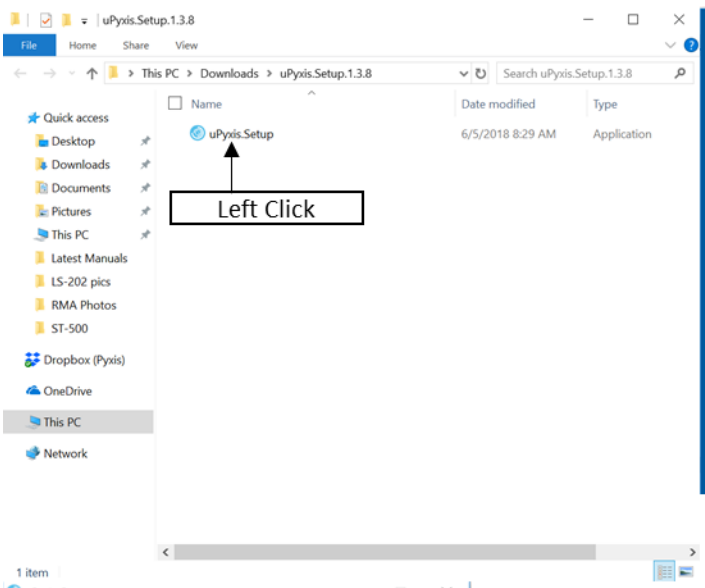
Find your downloaded uPyxis Setup 1.3.8 file, **Right Click on the file**, **Extract All**, and then **Extract**.

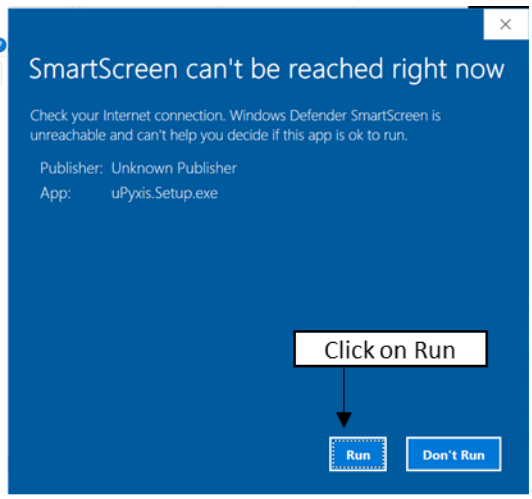


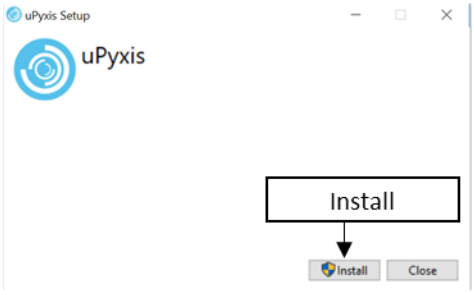


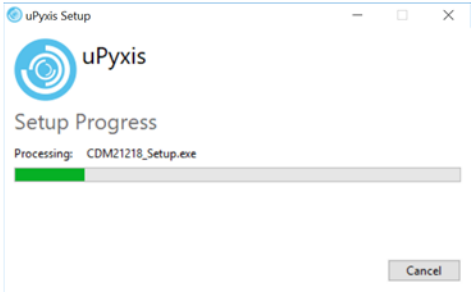
6.3. Installing uPyxis Desktop App

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.



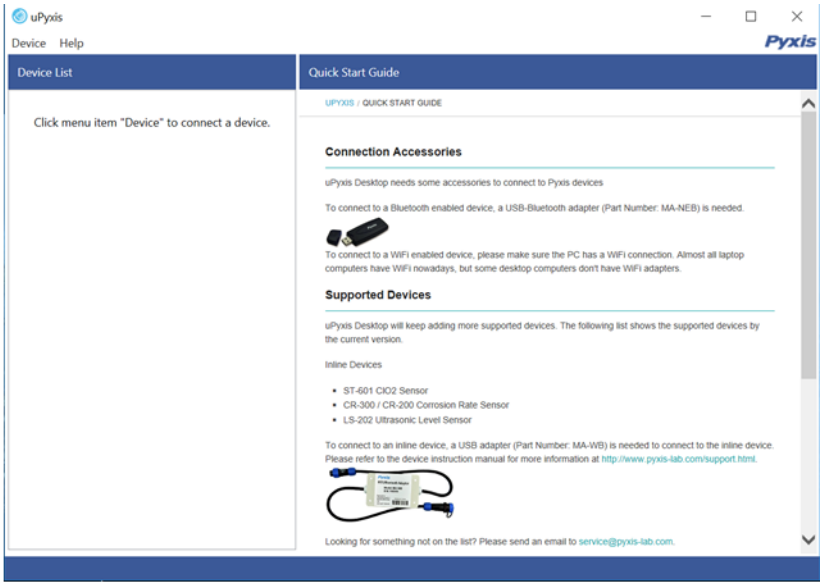


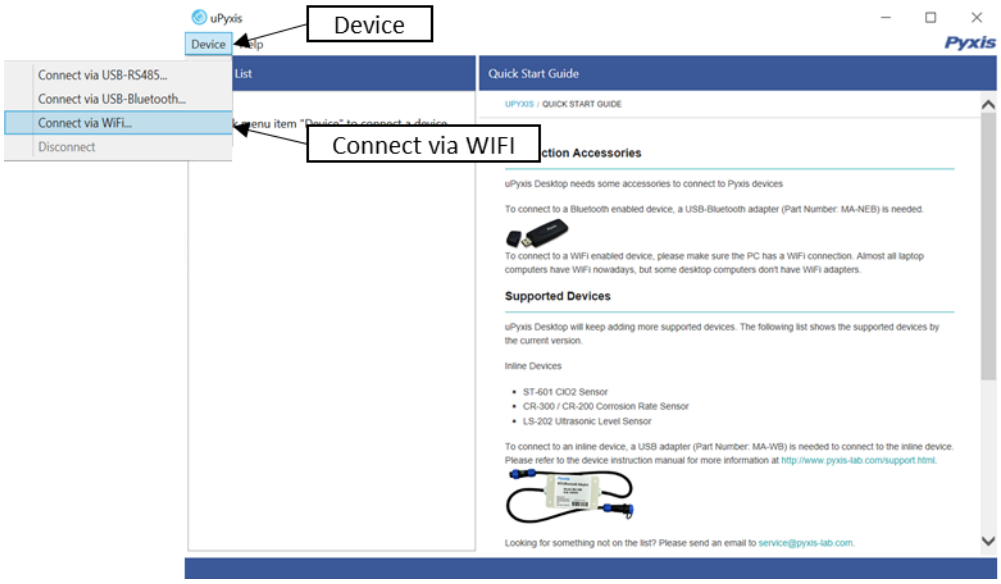




6.4. Connecting to uPyxis Desktop App

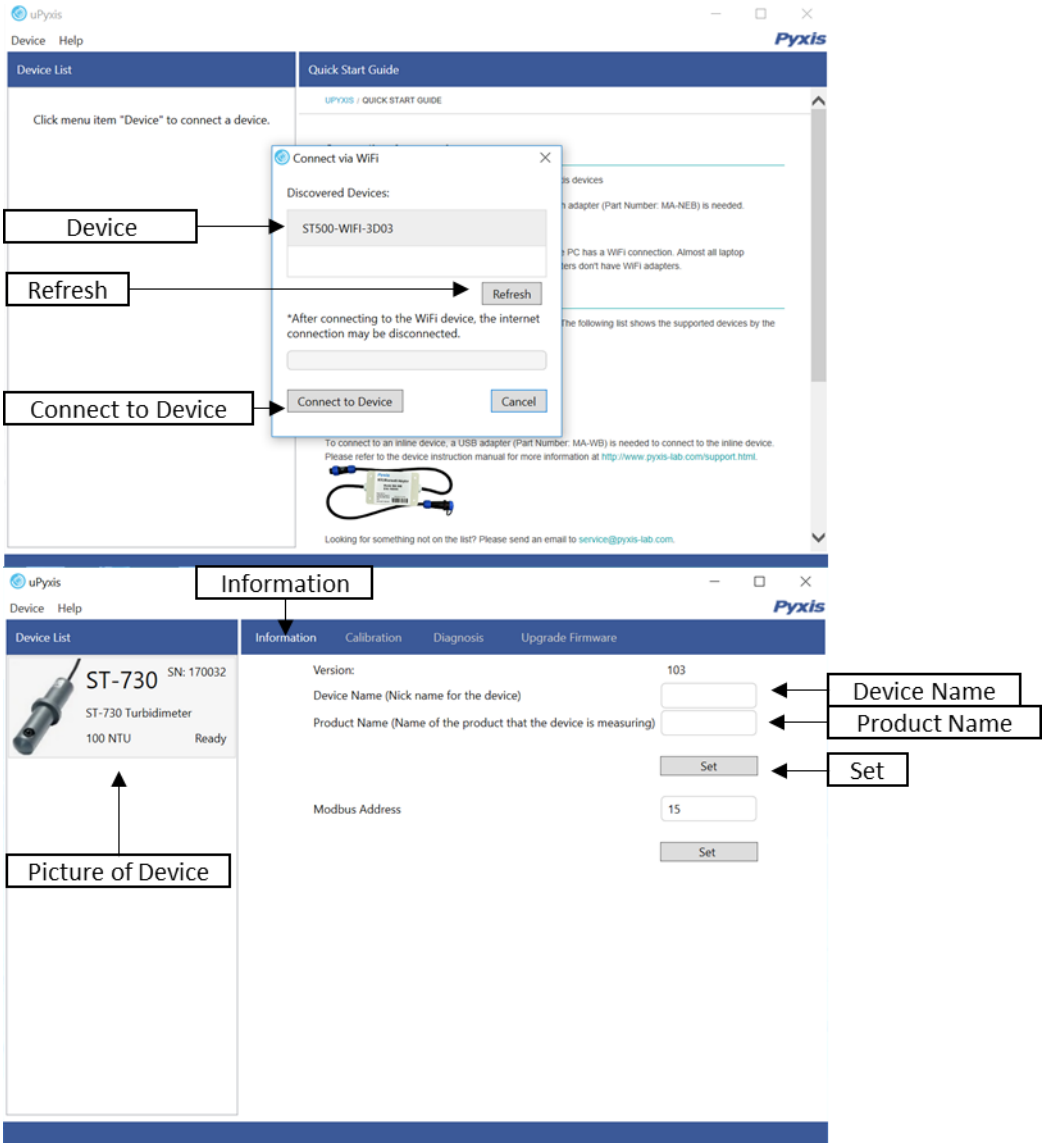
Open **uPyxis Desktop App** on your desktop. When the desktop app opens, to find your device, click on **Device**, then **Connect via WiFi**.



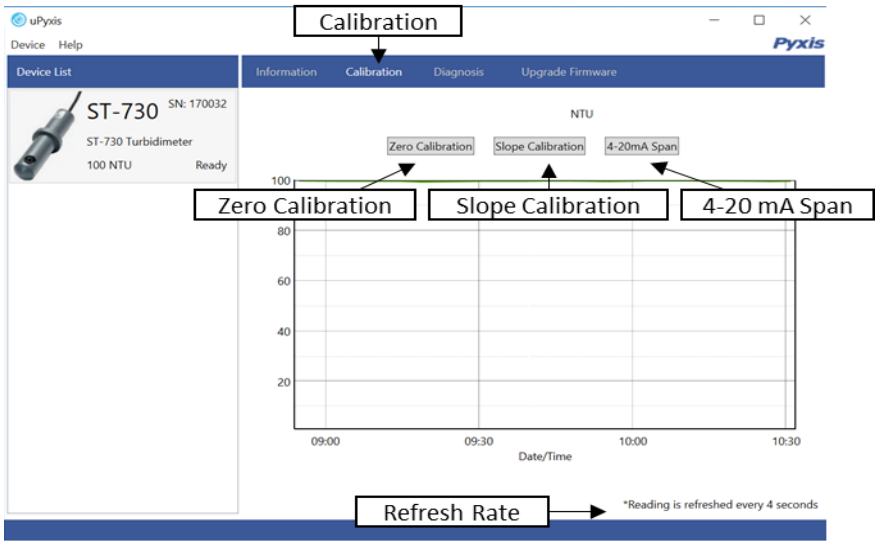


6.5. Connecting to ST-730 via uPyxis Desktop App

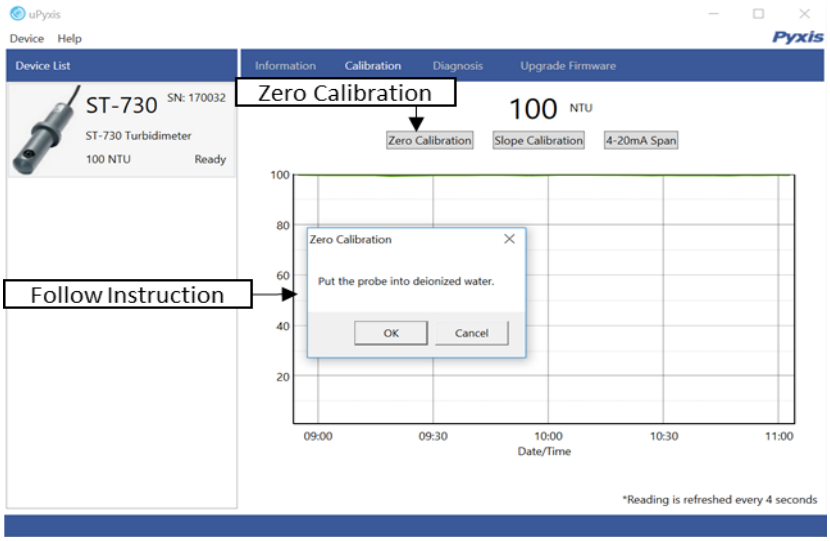
When connected via WiFi, in the Discovered Devices box there will be the device product name (If no device product name in the Discovered Devices box, click **Refresh**). If device product name shows in the box, then click on **Connect to Device**. Once connected to the device on the main screen a picture 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.



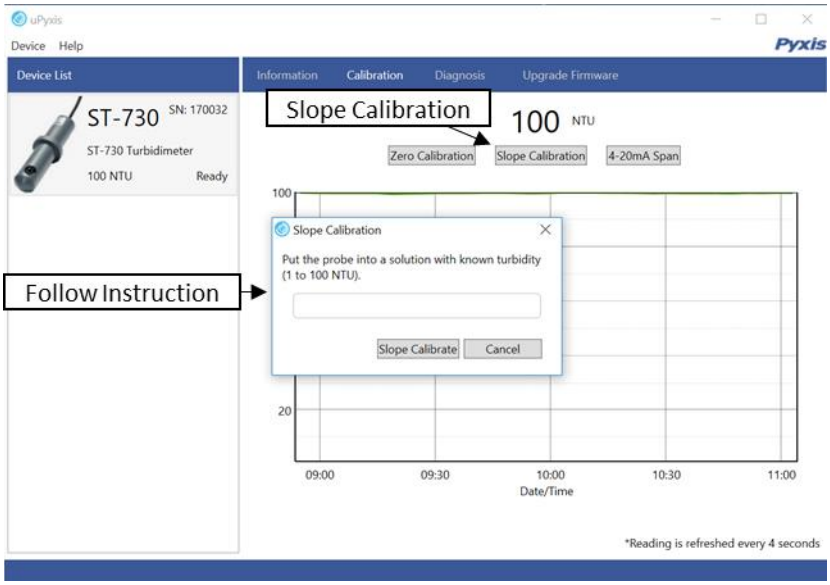
To calibrate the device, click on **Calibration**. On the Calibration screen there are three calibration tabs, **Zero Calibration**, **Slope Calibration**, and **4-20 mA Span**. The screen does also display the reading of the device. The reading refreshed rate is every 4 seconds.



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

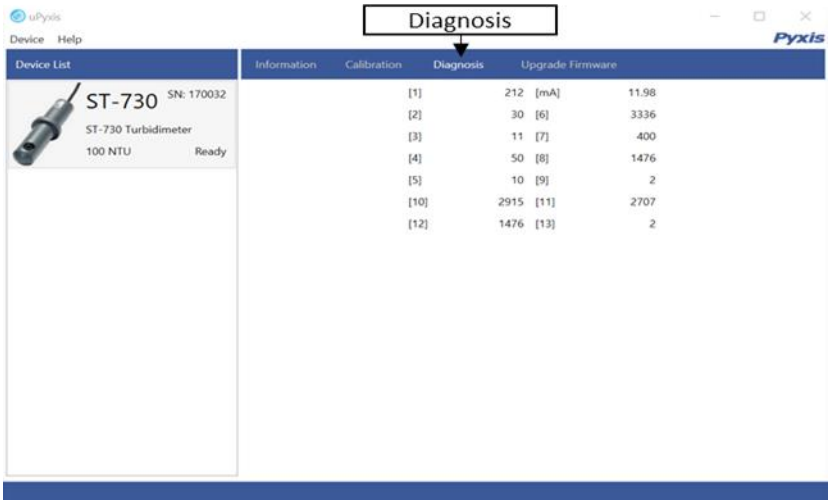


To perform Slope Calibration, click on **Slope Calibration**. Then follow the instruction on how to calibrate, then click **Slope Calibration.**



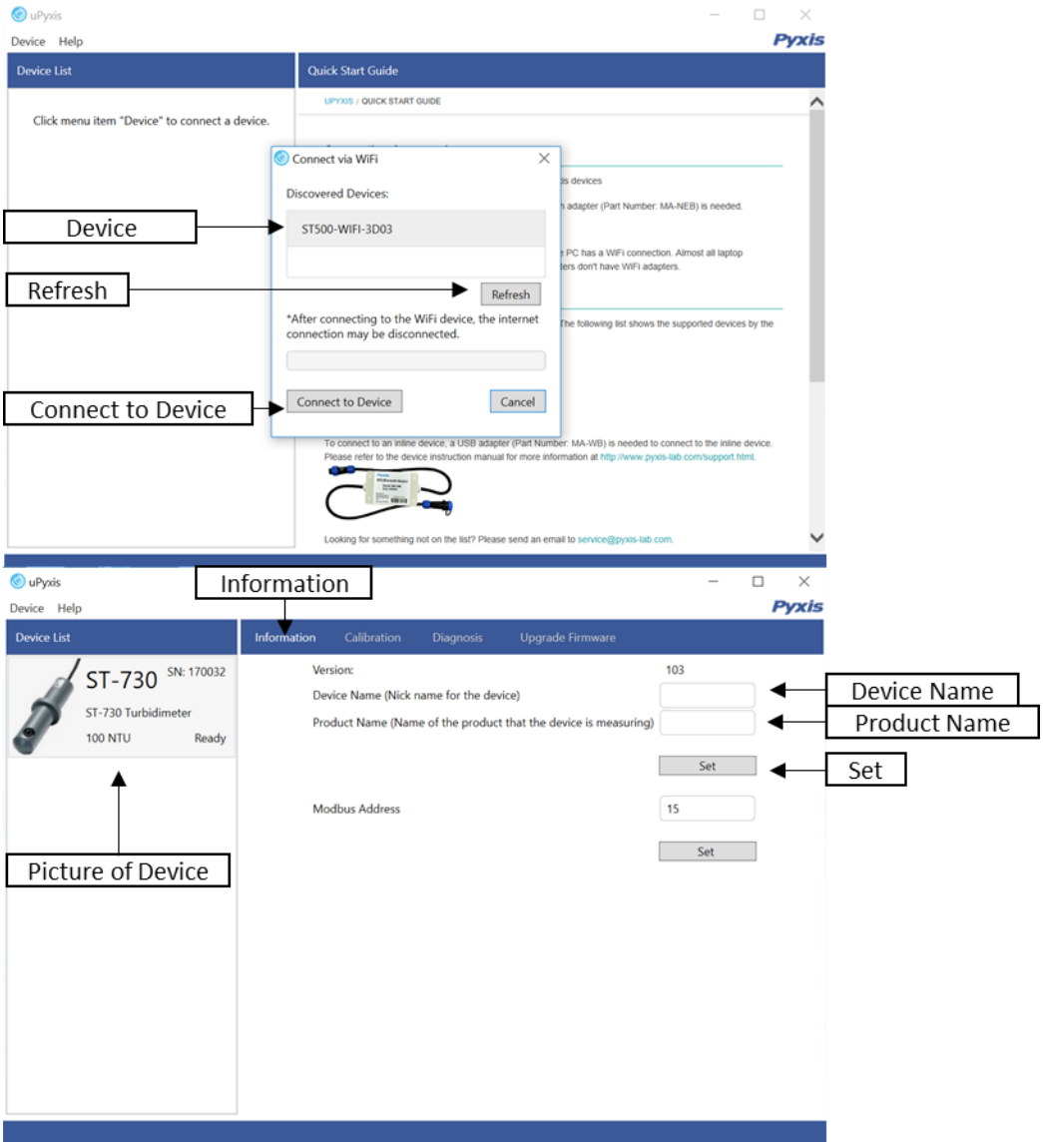
To perform 4-20 mA Span, click on **4-20 mA Span**. Then follow the instruction on how to calibrate, then click 4-20 mA Span.

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.

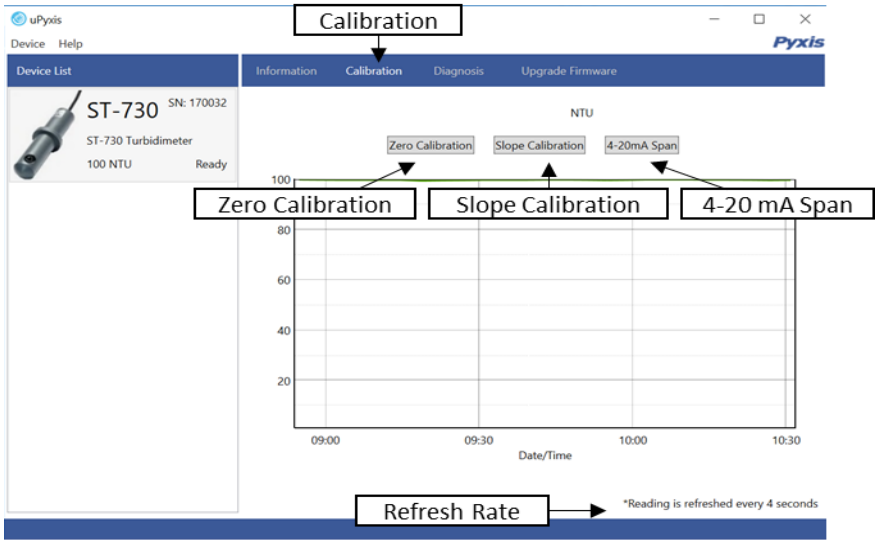


6.6. Connecting to ST-730B via uPyxis Desktop App

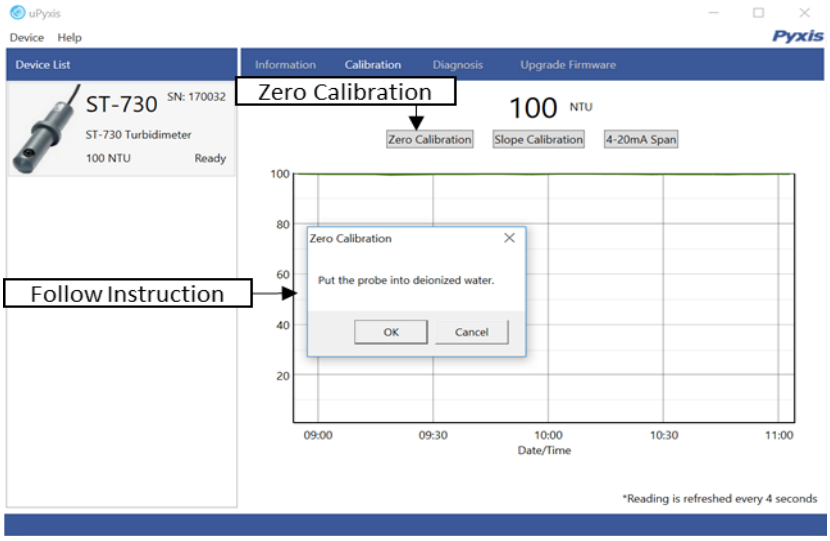
When connected via WiFi, in the Discovered Devices box there will be the device product name (If no device product name in the Discovered Devices box, click **Refresh**). If device product name shows in the box, then click on **Connect to Device**. Once connected to the device on the main screen a picture 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.



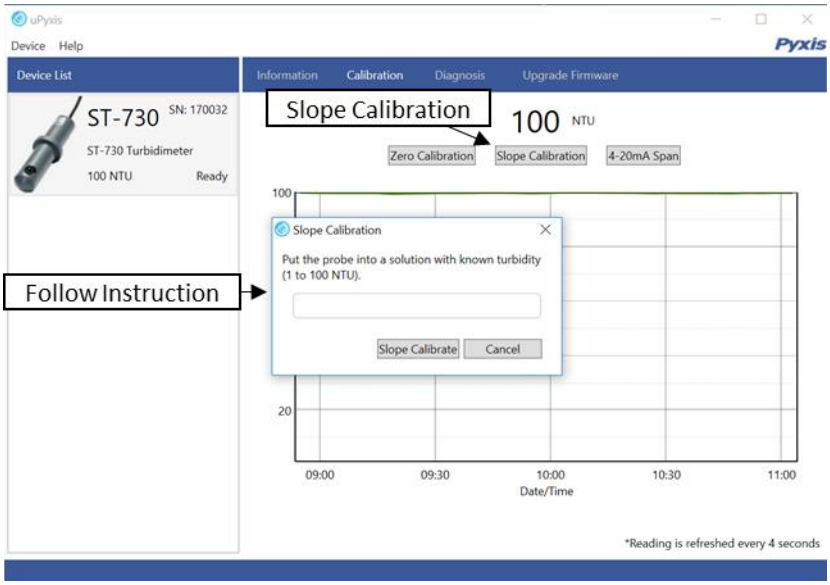
To calibrate the device, click on **Calibration**. On the Calibration screen there are three calibration tabs, **Zero Calibration**, **Slope Calibration**, and **4-20 mA Span**. The screen does also display the reading of the device. The reading refreshed rate is every 4 seconds.



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

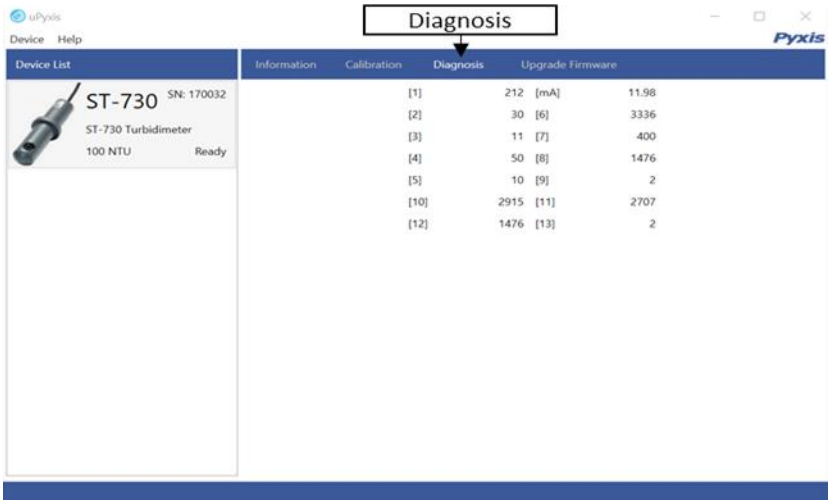


To perform Slope Calibration, click on **Slope Calibration**. Then follow the instruction on how to calibrate, then click **Slope Calibration.**



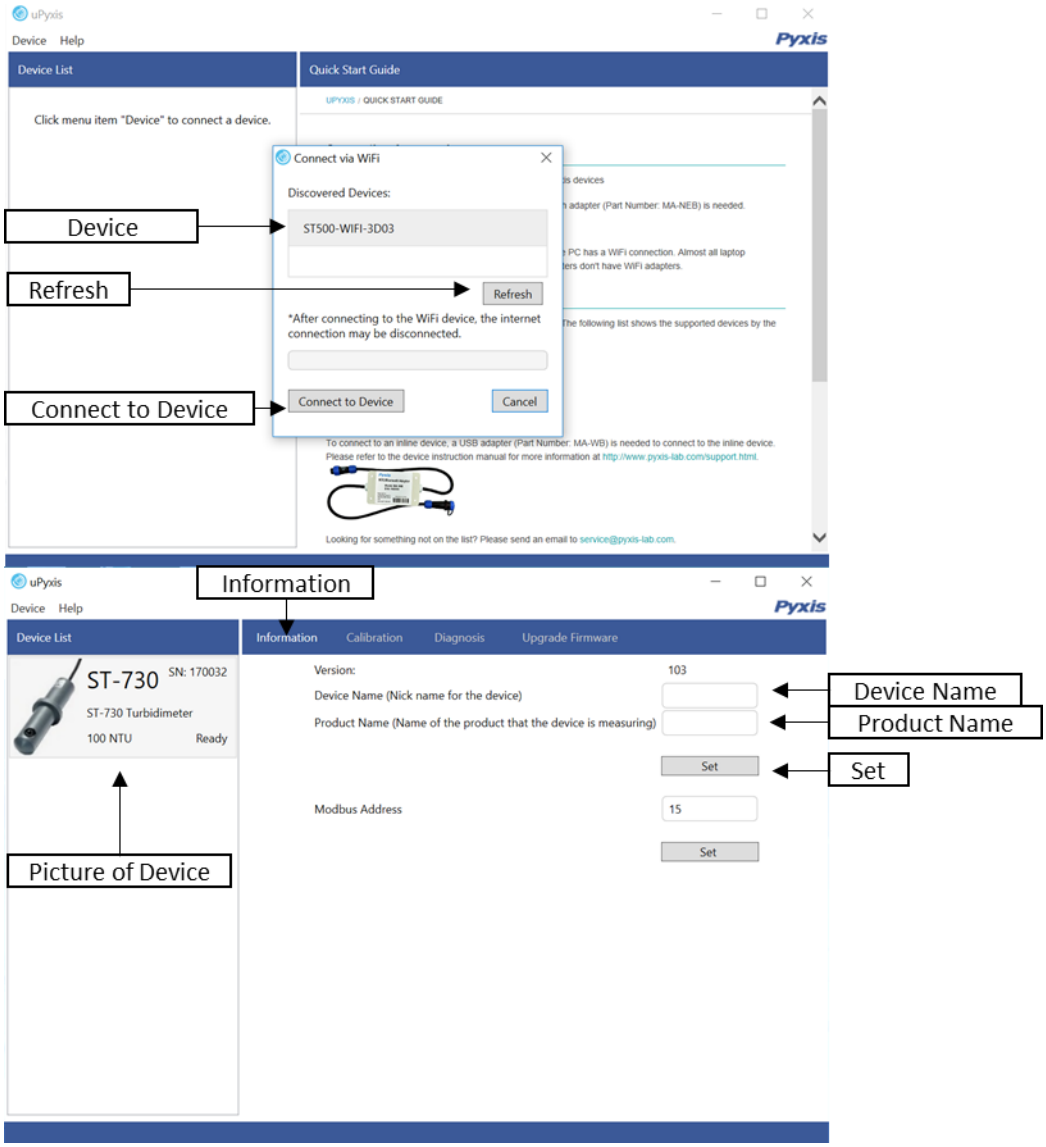
To perform 4-20 mA Span, click on **4-20 mA Span**. Then follow the instruction on how to calibrate, then click 4-20 mA Span.

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.

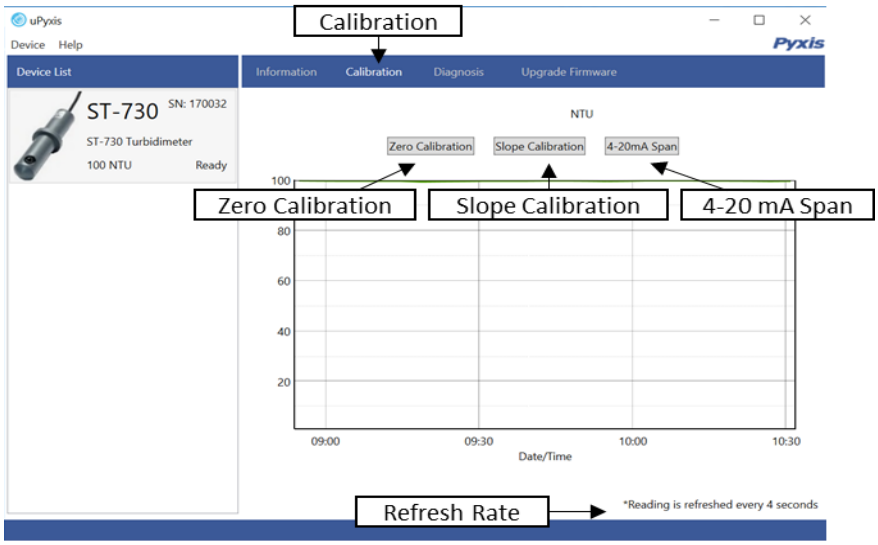


6.7. Connecting to ST-730SS via uPyxis Desktop App

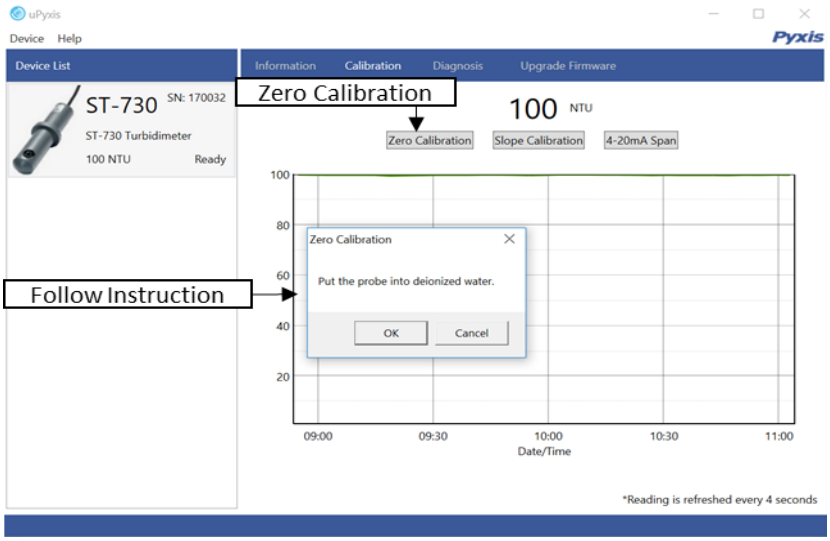
When connected via WiFi, in the Discovered Devices box there will be the device product name (If no device product name in the Discovered Devices box, click **Refresh**). If device product name shows in the box, then click on **Connect to Device**. Once connected to the device on the main screen a picture 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.



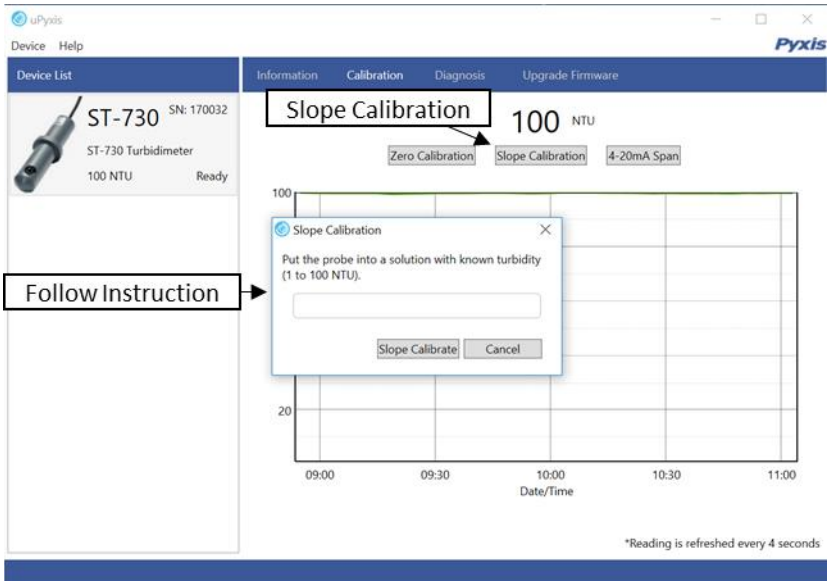
To calibrate the device, click on **Calibration**. On the Calibration screen there are three calibration tabs, **Zero Calibration**, **Slope Calibration**, and **4-20 mA Span**. The screen does also display the reading of the device. The reading refreshed rate is every 4 seconds.



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

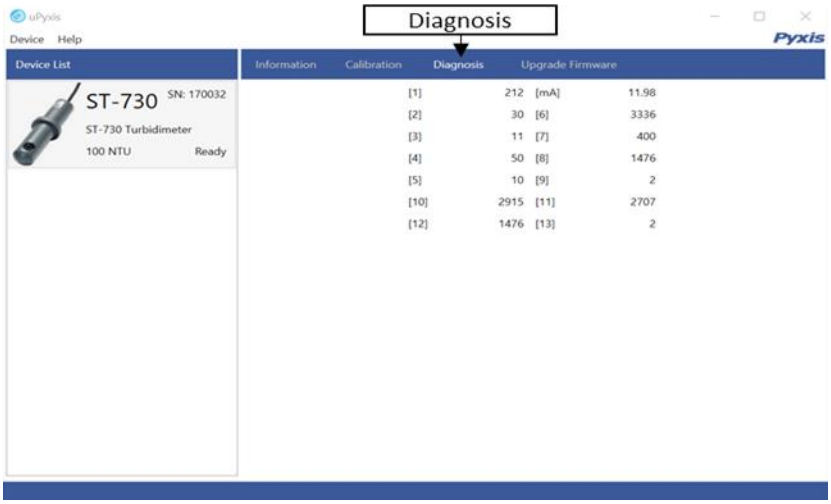


To perform Slope Calibration, click on **Slope Calibration**. Then follow the instruction on how to calibrate, then click **Slope Calibration.**



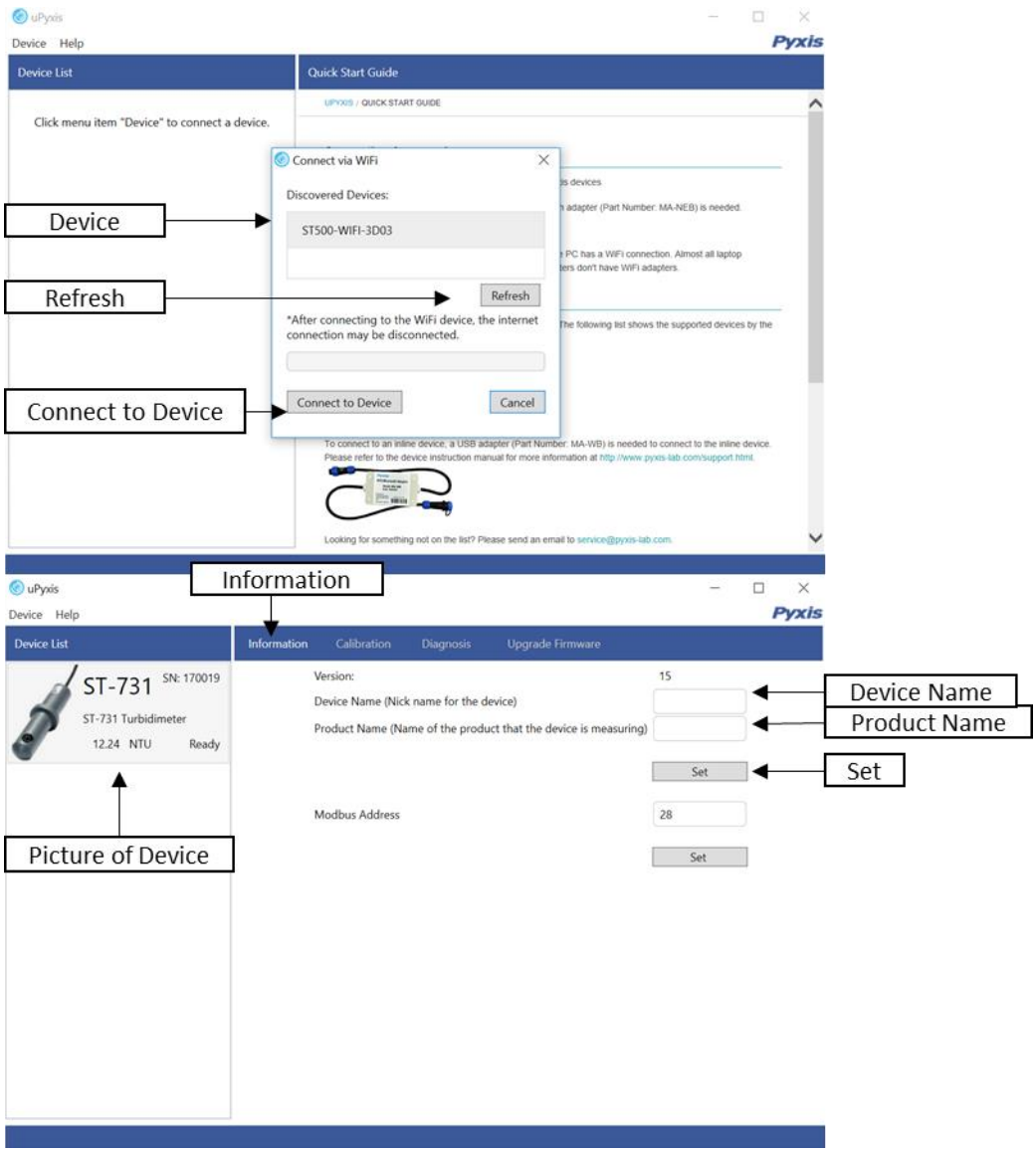
To perform 4-20 mA Span, click on **4-20 mA Span**. Then follow the instruction on how to calibrate, then click 4-20 mA Span.

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.

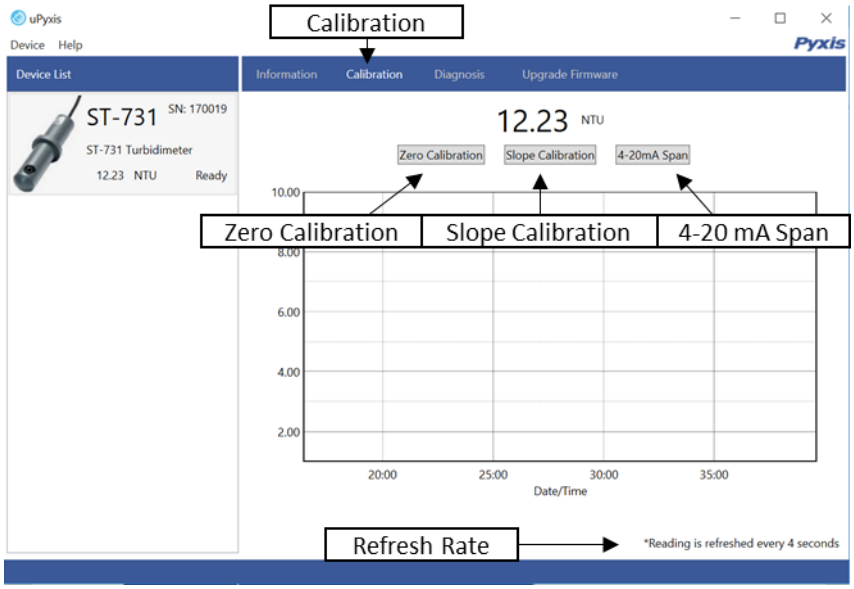


6.8. Connecting to ST-731 via uPyxis Desktop App

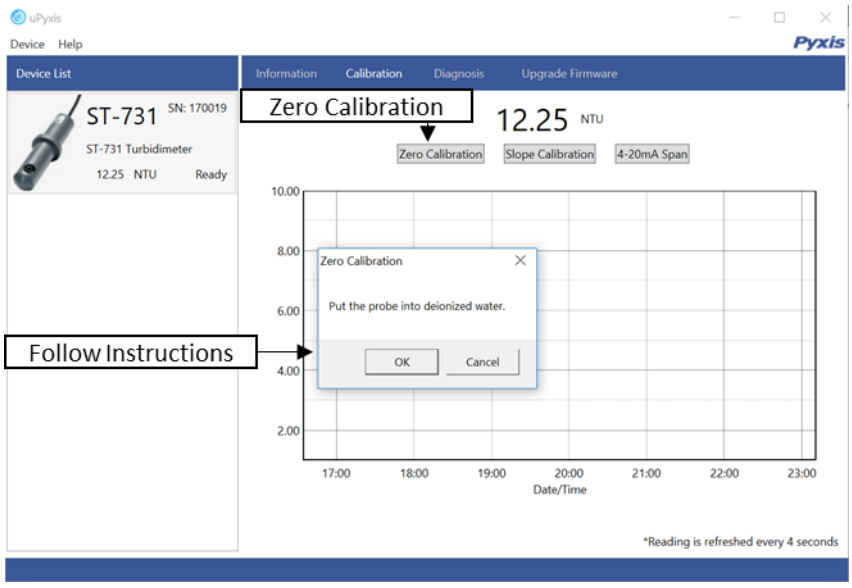
When connected via WiFi, in the Discovered Devices box there will be the device product name (If no device product name in the Discovered Devices box, click **Refresh**). If device product name shows in the box, then click on **Connect to Device**. Once connected to the device on the main screen a picture 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.



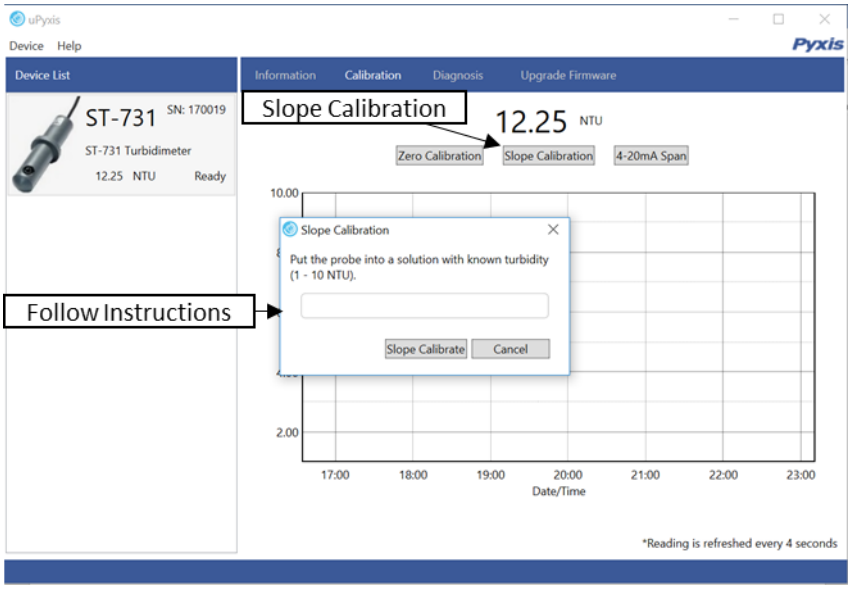
To calibrate the device, click on **Calibration**. On the Calibration screen there are three calibration tabs, **Zero Calibration**, **Slope Calibration**, and **4-20 mA Span**. The screen does also display the reading of the device. The reading refreshed rate is every 4 seconds.



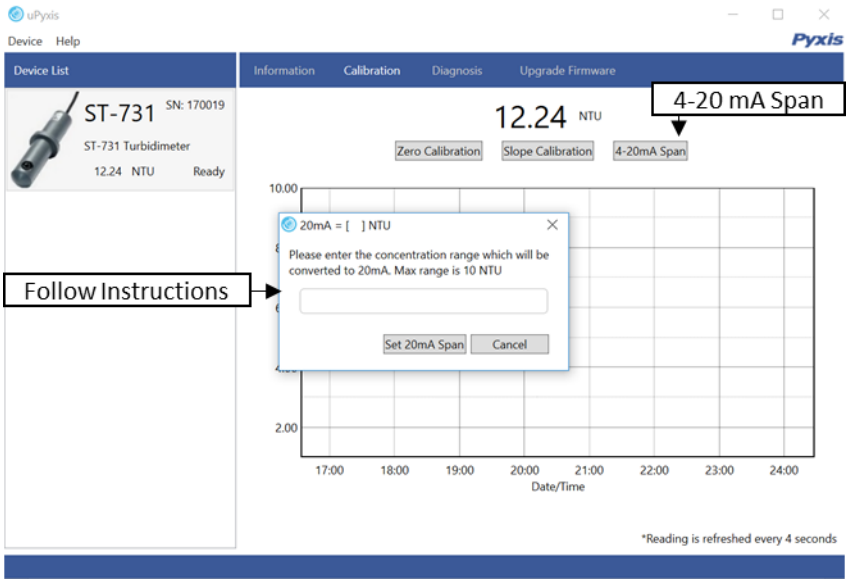
To perform Zero Calibration, click on **Zero Calibration**. Then follow the instruction on how to calibrate, then click **Ok**.



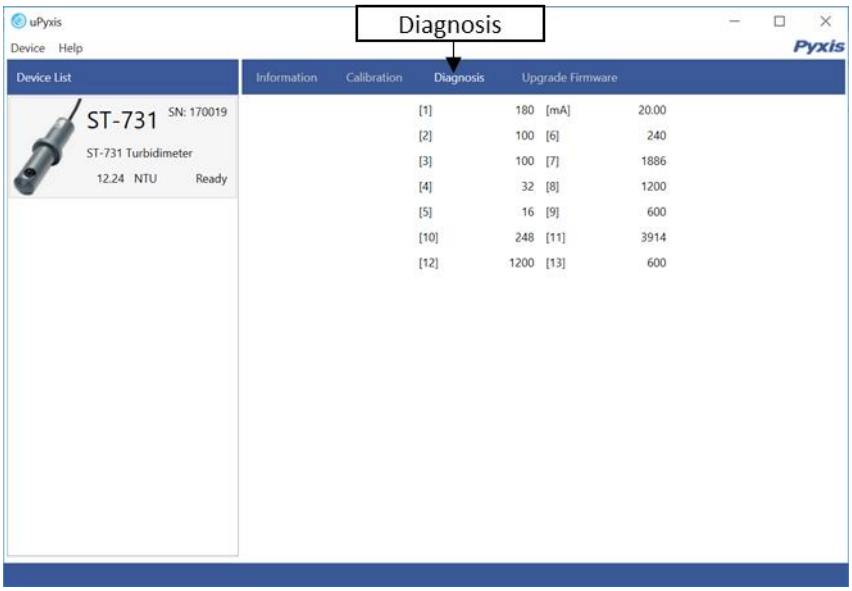
To perform Slope Calibration, click on **Slope Calibration**. Then follow the instruction on how to calibrate, then click **Slope Calibration.**



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.

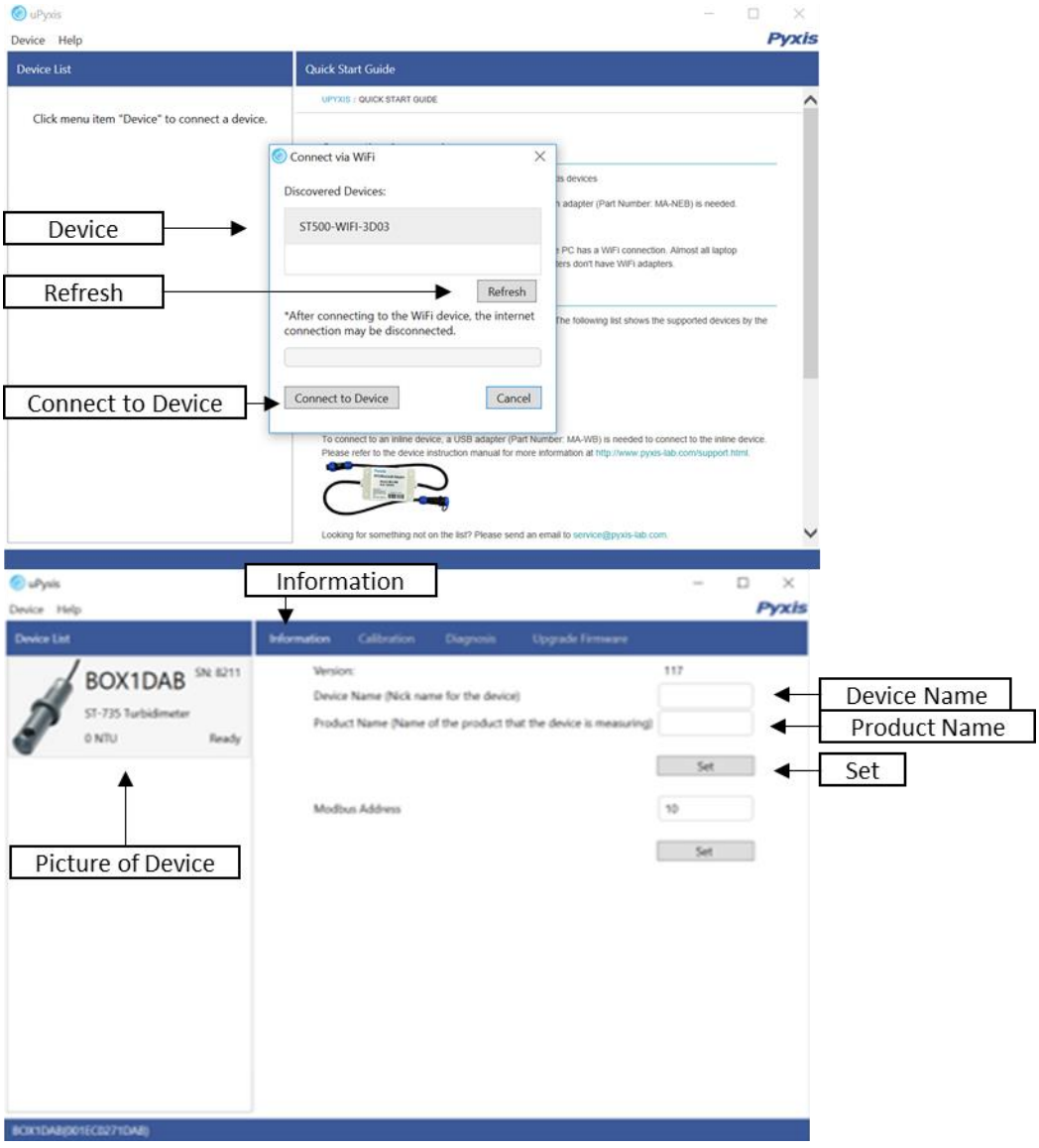


After the device has been calibrated and installation has been completed. To check diagnosis, click on **Diagnosis**. When in the Diagnosis screen you can view the Diagnosis Condition of the device.

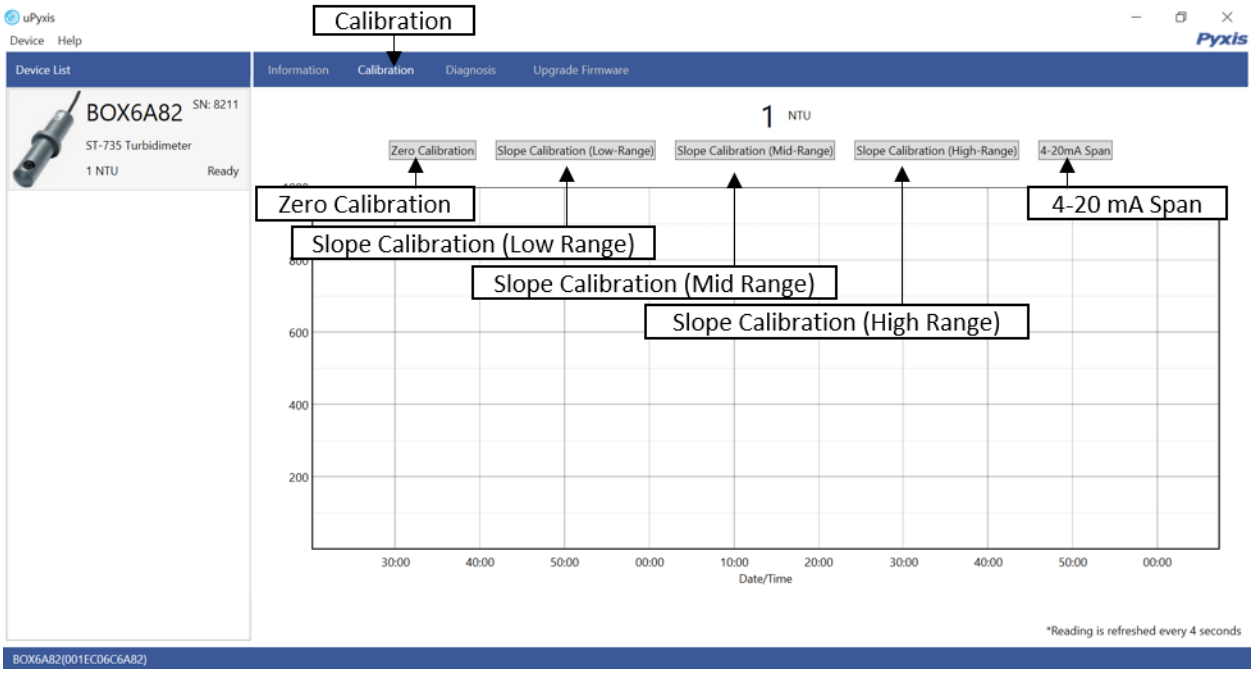


6.9. Connecting to ST-735 via uPyxis Desktop App

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.

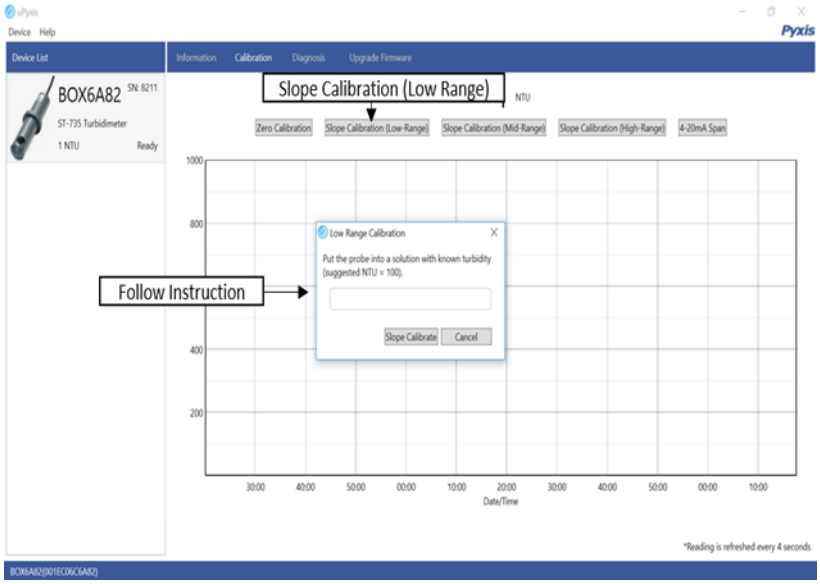


To calibrate the device, click on **Calibration**. On the Calibration screen there are three calibration tabs, **Zero Calibration**, **Slope Calibration (Low Range)**, **Slope Calibration (Mid Range), Slope Calibration (High Range)**, and **4-20 mA Span**. The screen does also display the reading of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

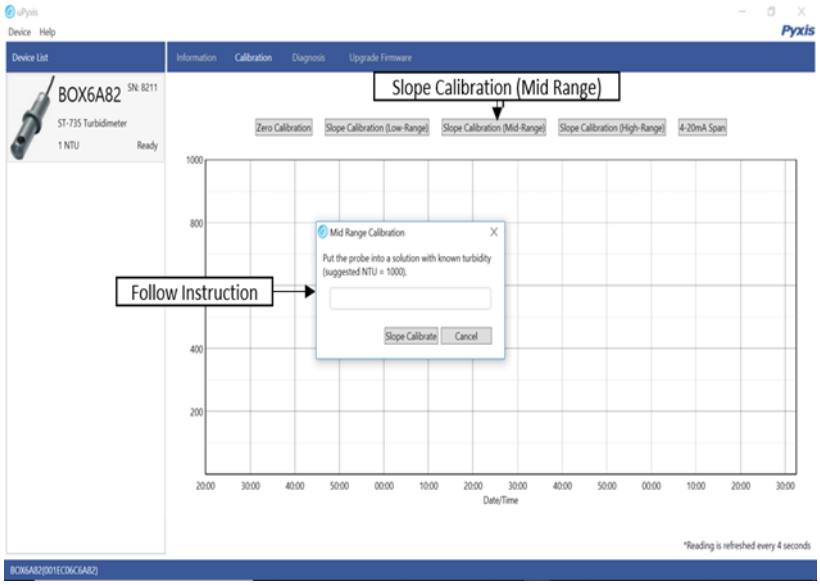


To perform Zero Calibration, click on **Zero Calibration**. Then follow the instruction on how to calibrate, then click **Ok**.

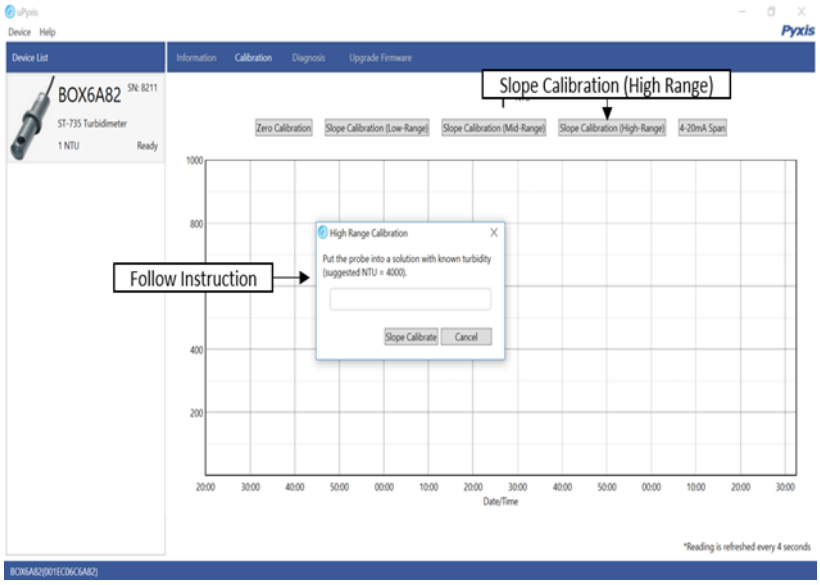
To perform Slope Calibration (Low Slope), click on **Slope Calibration (Low Range)**. Then follow the instruction on how to calibrate, then click **Slope Calibration.**



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

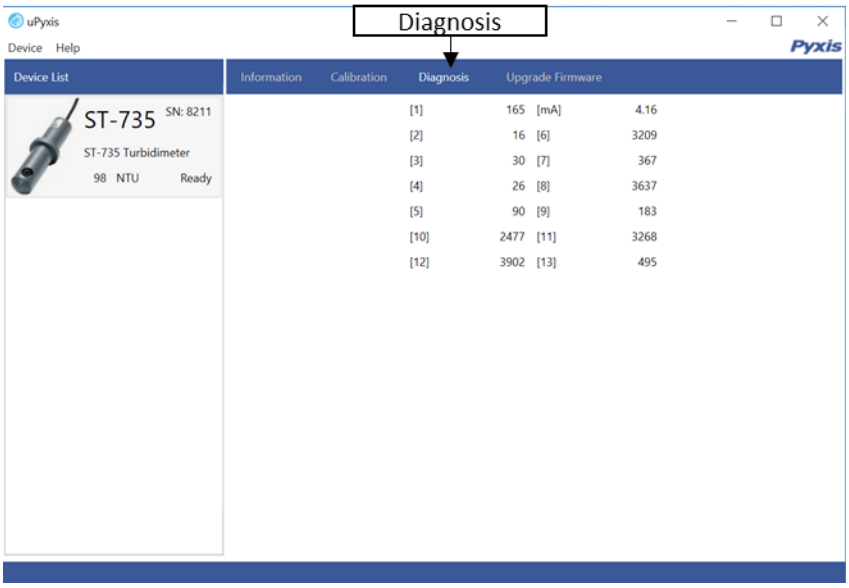


To perform Slope Calibration (High Slope), click on **Slope Calibration (High Range)**. Then follow the instruction on how to calibrate, then click **Slope Calibration.**



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.

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-730 series probe is configured as a Modbus slave device. In addition to the NTU 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

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-730 series probe is designed to be easily removed, inspected, and cleaned if required. It is suggested that the ST-730 series probe be checked for fouling and cleaned 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-730 Series 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/st-500-probe-cleaning-kit/.

8.2. ST-730 Series Inline Probe Cleaning Solution

Soak the lower half of the ST-730 series probe in 100 ml inline probe cleaning solution for 15 minutes. Rinse the ST-730 series probe with distilled water and then check for the flashing blue light inside the ST-730 series probe quartz tube. If the surface is not entirely clean, continue to soak the ST-730 series probe for an additional 15 minutes. Pyxis Lab Inline Probe Cleaning Solution can be purchased at our online Estore/Catalog https://pyxis-lab.com/product/st-500-probe-cleaning-kit/.

9. Other Common Troubleshooting Issues

If the ST-730 series 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-730 series tee.

Carry out routine calibration check against a turbidity 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-730 series probe from direct sunlight and precipitation.