Pyxis®

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ST-565/T HST or TTA Inline Sensor

User Manual

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ST-565 Series
Inline Azole Sensors
User Manual

April 7, 2022
Rev. 1.44

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Warranty Information

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Standard Limited Warranty

Pyxis Lab warrants its products for defects in materials and workmanship. Pyxis Lab will, at its option, repair or replace instrument components that prove to be defective with new or remanufactured components (i.e., equivalent to new). The warranty set forth is exclusive and no other warranty, whether written or oral, is expressed or implied.

Warranty Term

The Pyxis warranty term is thirteen (13) months ex-works. In no event shall the standard limited warranty coverage extend beyond thirteen (13) months from original shipment date.

Warranty Service

Damaged or dysfunctional instruments may be returned to Pyxis for repair or replacement. In some instances, replacement instruments may be available for short duration loan or lease.

Pyxis warrants that any labor services provided shall conform to the reasonable standards of technical competency and performance effective at the time of delivery. All service interventions are to be reviewed and authorized as correct and complete at the completion of the service by a customer representative, or designate. Pyxis warrants these services for 30 days after the authorization and will correct any qualifying deficiency in labor provided that the labor service deficiency is exactly related to the originating event. No other remedy, other than the provision of labor services, may be applicable.

Repair components (parts and materials), but not consumables, provided during a repair, or purchased individually, are warranted for 90 days ex-works for materials and workmanship. In no event will the incorporation of a warranted repair component into an instrument extend the whole instrument's warranty beyond its original term.

Warranty Shipping

A Repair Authorization (RA) Number must be obtained from Pyxis Technical Support before any product can be returned to the factory. Pyxis will pay freight charges to ship replacement or repaired products to the customer. The customer shall pay freight charges for returning products to Pyxis. Any product returned to the factory without an RA number will be returned to the customer. To receive an RMA you can generate a request on our website at https://pyxis-lab.com/request-tech-support/.

Pyxis Technical Support

Contact Pyxis Technical Support at +1 (866) 203-8397, service@pyxis-lab.com, or by filling out a request for support at https://pyxis-lab.com/request-tech-support/.

1 Introduction

The ST-565 Series inline fluorometers are patented to Pyxis Lab Inc. These devices utilized UV light fluorescence to detect Halogenated Tolytriazole (HST with ST-565) and Tolytriazole (TTA with ST-565T) content in water. The results are instantaneous and, with proper application understanding, results are highly reliable. It is important to note that this technology is not wet chemistry testing for azole content and variations may be observed depending on the quality of the water sample. In certain waters the background of other organic matter may cause a false positive reading of azole due to UV fluorescence or absorbance. Inconsistent makeup water quality with little organic loading (ie. city water makeup) and systems with no known organic contamination (ie. hydrocarbon) this technology is very accurate in comparison to wet chemistry methods. The ST-565 Series sensor does not differentiate between azole species or reacted versus unreacted azole. The device measures the total UV fluorescence signature of the azole and offers the final value as ppm Halogenated Tolytriazole (HST with ST-565) and Tolytriazole (TTA with ST-565T). It is incumbent for the user to identify the correlation to exact wet chemistry values and potential background interference should be accounted for by identifying untreated makeup for UV fluorescent signal and removing that from the final value measured.

The ST-565 Series sensor will not work in waters containing Nitrite treatment as Nitrite absorbs UV light and will result in a false high value. With these application limitations clearly understood, the ST-565 Series sensor is commonly used for rapid azole validation, dramatically reducing service time enabling water treaters to adjust their programs accordingly. It is important to note however, that there are some applications (surface makeup water systems or high organic loading/contaminated systems) where this technology is not ideal due to a high degree of interference. The user needs to understand the dynamics of their system and evaluate its use accordingly.

1.1 Main Features

The ST-565 Series measures Halogenated Tolytriazole (HST with ST-565)/Tolytriazole (TTA with ST-565T) in a water sample and includes the following features:

- Easy calibration with using **uPyxis®** Mobile or Desktop App.
- Automatic compensation for turbidity and color.
- Water sample does not need to be acidified. Sample pH between 6.4 to 10.0 and the sample PTSA concentration (<300 ppb) do not affect the azole measurement.
- Diagnostic information (sensor fouling, color or turbidity over range, failure modes) are available in **uPyxis®** App or via Modbus RTU.
- Easy to remove from the system for cleaning and calibration without the need for any tools.

2 Specifications

Table 1. ST-565 Series Specifications

Specification*	ST-565	ST-565T
Part Number (P/N)	50664	50671
Azole Species	Halogenated Tolytriazole (HST)	Tolytriazole (TTA)
Azole Range (4-20mA)	0–7.5 ppm	0–10.0 ppm
Azole Accuracy	±0.2 ppm	
Calibration	Two-point calibration against standard solution	
Outputs	4–20mA Analog Output, RS-485 Digital Output with Modbus protocol	
Installation	Custom tee assembly (P/N: ST-001) with 3/4” FNPT socket & threaded ports	
Cable Length	1.5 meter with IP67 connectors & 1.5 meter flying lead with IP67 adapter	
Power Supply	22–26 VDC, 1 W	
Dimension (L × Dia)	6.8 × 1.44 inch (172.7 × 36.6 mm)	
Weight	0.37 lbs (170 g)	
Material	UPVC	
Operational Temperature	32–120 °F (0–49 °C)	
Storage Temperature	-4–140 °F (-20–60 °C)	
Pressure	Up to 100 psi (0.7 MPa)	
Flowrate	0–8 gpm (505 cm^3/s)	
Enclosure Rating	IP67	
Regulation	CE / RoHS	

* With Pyxis’s continuous improvement policy, these specifications are subject to change without notice.

3 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.

3.1 Standard Accessories

- Tee Assembly 3/4” NPT (1x Tee, O-ring, and Nut) P/N: ST-001
- 7-Pin Female Adapter/Flying Leads Cable (1.5 meter) P/N: MA-1100
- User Manual available online at https://pyxis-lab.com/support/

3.2 Optional Accessories

The following optional accessories can be ordered from Pyxis Customer Service (order@pyxis-lab.com) or Pyxis E-Store at https://pyxis-lab.com/shop/.

Optional Accessories Information	P/N
ST-001 Inline Tee Assembly Spare *(3/4 – inch FNPT Inline Tee For ST Probes)*	50704
HST-01 *(HST Calibration Standard 1ppm for ST-565T / 500mL)*	20131
HST-02 *(HST Calibration Standard 2ppm for ST-565T / 500mL)*	20132
TTA-01 *(TTA Calibration Standard 1ppm for ST-565T / 500mL)*	57015
TTA-02 *(TTA Calibration Standard 2ppm for ST-565T / 500mL)*	57016
Probe Cleaning Kit *(Contains Probe Cleaner Solution 100mL + Qtips + Pipe Cleaners)*	SER-01
MA-WB Bluetooth Adapter *(Pyxis Bluetooth Adapter for 7Pin Pyxis Sensors)*	MA-WB
Power*PACK-1* *(Single Chanel Auxiliary Power Supply w/Bluetooth For Pyxis Sensors)*	MA-BLE-1
Power*PACK-4* *(Four Chanel Auxiliary Power Supply w/Bluetooth For Pyxis Sensors)*	MA-BLE-4
MA-NEB Bluetooth/USB Adapter *(Enables Bluetooth for Desktop and uPyxis APP)*	MA-NEB
SP-395 Handheld HST Fluorometer *(HST 0-7.5ppm)*	50209
SP-395T Handheld HST Fluorometer *(TTA - 10.0ppm)*	50221
MA-C10 *(10' Extension Cable for 7Pin Pyxis Sensors)*	50738
MA-C50 *(50' Extension Cable for 7Pin Pyxis Sensors)*	50705

Figure 1.

4 Installation

4.1 Piping

The ST-565 Series sensor can be installed in an inline flow application using the included Pyxis ST-001 Inline Tee Assembly. The ST-001 offers 3/4" FNPT thread or socket weld adapters with unions for easy installation and sensor maintenance. To properly install the ST-565 Series sensor into the ST-001 Tee Assembly, follow the steps below:

1. Insert the provided O-ring into the O-ring groove on the tee.
2. Insert the ST-565 Series sensor into the tee.
3. Tighten the tee nut onto the tee to form a water-tight, compression seal.

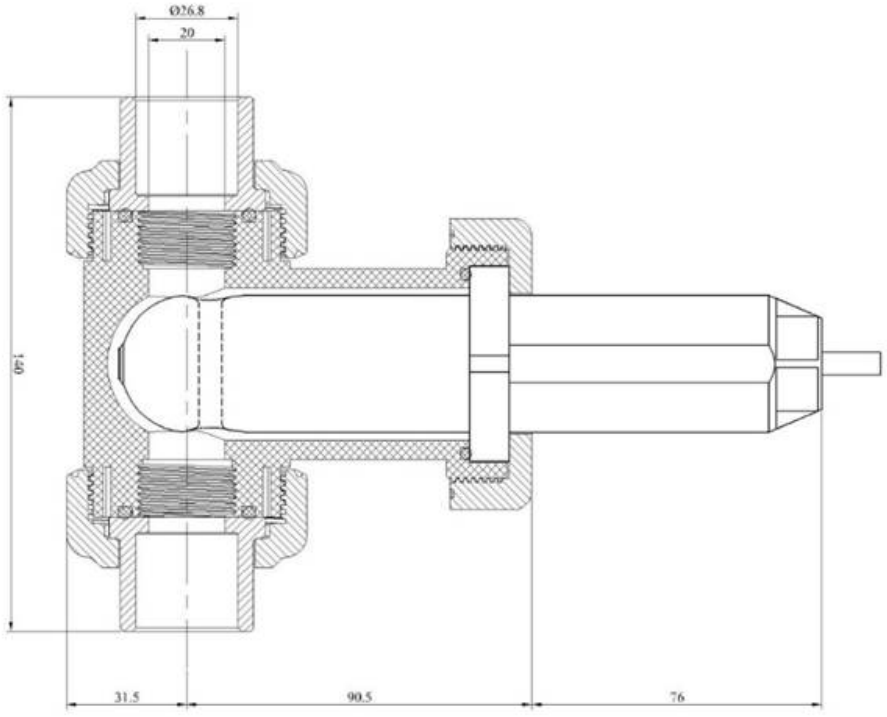

Figure 2. Dimension of the ST-565 Series sensor and the ST-001 Tee Assembly (mm)

4.2 Wiring

The power ground wire (black) and the negative 4–20mA are internally connected. There is connection of a 4-20mA- wire for ST565 series. If a separate DC power supply other than that from the controller is used, make sure that the output from the power supply is rated for 22–26 VDC @ 65 mA.

NOTE The negative 24V power terminal (power ground) and the negative 4–20mA terminal on the ST-565 Series sensor are internally connected.

Follow the wiring table below to connect the ST-565 Series sensor to a controller:

Table 2.

ST-565 Wiring Table (HST)	
Color	**Designation**
Red	24V+
Black	24V-
White	4-20mA + *HST (0-7.5ppm)*
Green	No Connect
Blue	RS-485 A
Yellow	RS-485 B
Clear	Earth Ground

ST-565T Wiring Table (TTA)	
Color	**Designation**
Red	24V+
Black	24V-
White	4-20mA + *TTA (0-10.0ppm)*
Green	No Connect
Blue	RS-485 A
Yellow	RS-485 B
Clear	Earth Ground

4.3 Connecting via Bluetooth

A Bluetooth adapter (P/N: MA-WB) can be used to connect a ST-565 Series sensor to a smart phone with the **uPyxis®** Mobile App or a computer with the **uPyxis®** Desktop App.

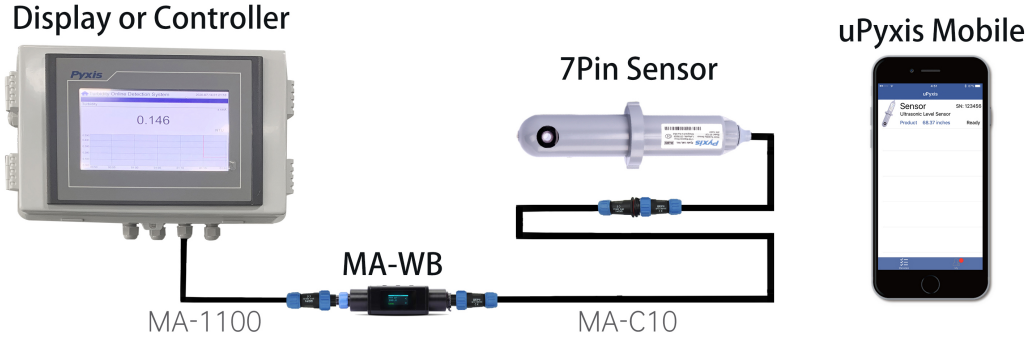

Figure 3. Bluetooth connection to ST-565 Series sensor with MA-WB and uPyxis Mobile App.

4.4 Connecting via USB

A USB-RS485 adapter (P/N: MA-485) can be used to connect a ST-565 Series sensor to a computer with the **uPyxis®** Desktop App.

∗**NOTE**∗ *Using non-Pyxis USB-RS485 adapters may result in permanent damage of the ST-565 Series sensor communication hardware.*

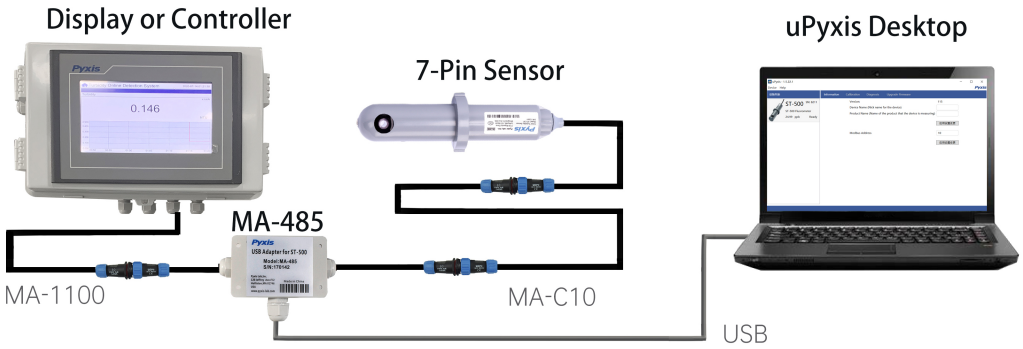

Figure 4. USB connection to ST-565 Series sensor with MA-485 and uPyxis Destop App.

5 Setup and Calibration with uPyxis® Mobile App

5.1 Download uPyxis® Mobile App

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

Figure 5. uPyxis® Mobile App installation

5.2 Connecting to uPyxis® Mobile App

Connect the ST-565 Series sensor to a mobile smart phone according to the following steps:

1. Open **uPyxis®** Mobile App.
2. On **uPyxis®** Mobile App, pull down to refresh the list of available Pyxis devices.
3. If the connection is successful, the ST-565 Series and its Serial Number (SN) will be displayed (Figure 6).
4. Press on the **ST-565 Series sensor image**.

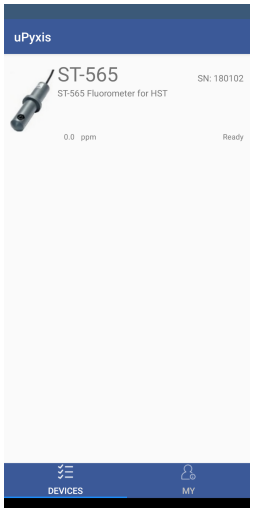

Figure 6.

5.3 Calibration Screen and Reading

When connected, the uPyxis® Mobile App will default to the Calibration screen. From the Calibration screen, you can perform calibrations by pressing on Zero Calibration, Slope Calibration, and 4–20mA Span. Follow the screen instructions for each calibration step.

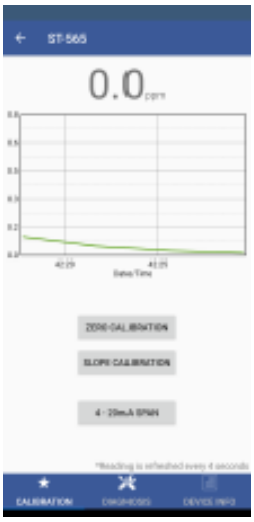

Figure 7.

5.4 Diagnosis Screen

From the **Diagnosis** screen, you can check the diagnosis condition as well as **Send to Pyxis**. This feature may be used for technical support when communicating with service@pyxis-lab.com.

To preform a sensor Cleanliness Check, first select the **Diagnosis Condition** which defines the fluid type that the ST-565 Series sensor in currently measuring, then press **Cleanliness Check**. If the sensor is clean, a green **Clean** message will be shown. If the sensor is partially fouled, a yellow **Becoming Dirty** message will be shown. If the sensor is severely fouled, a red **Dirty** message will be shown. In this case, follow the procedure in the **Methods to Cleaning the ST-565 Series Sensor** section of this manual.

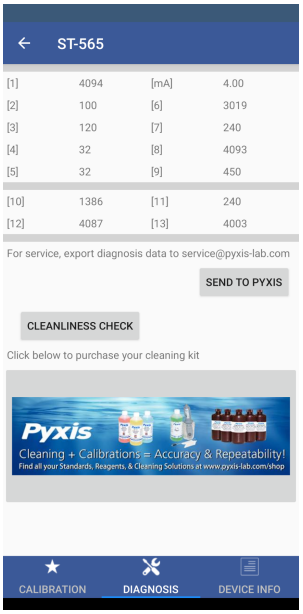

Figure 8.

5.4 Diagnosis Screen

From the **Diagnosis** screen, you can check the diagnosis condition as well as **Send to Pyxis**. This feature may be used for technical support when communicating with service@pyxis-lab.com.

To preform a sensor Cleanliness Check, first select the **Diagnosis Condition** which defines the fluid type that the ST-565 Series sensor in currently measuring, then press **Cleanliness Check**. If the sensor is clean, a green **Clean** message will be shown. If the sensor is partially fouled, a yellow **Becoming Dirty** message will be shown. If the sensor is severely fouled, a red **Dirty** message will be shown. In this case, follow the procedure in the **Methods to Cleaning the ST-565 Series Sensor** section of this manual.

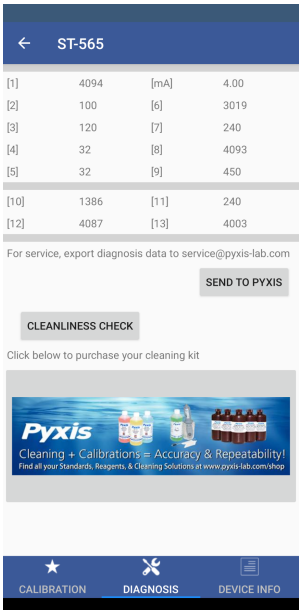

Figure 8.

5.5 Device Info Screen

From the **Device Info** screen. You can name the Device or Product as well as set the Modbus address.

Figure 9.

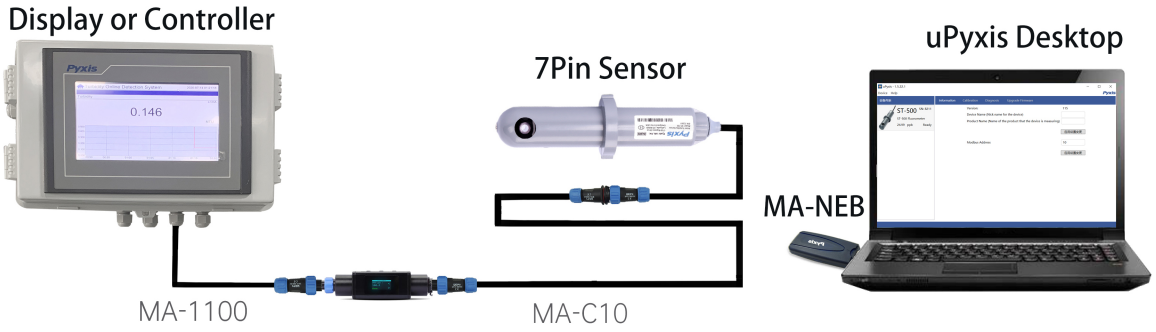

Figure 10. USB Connection to ST-565 sensor with MA-WB and MA-NEB and uPyxis Desktop App.

6 Setup and Calibration with uPyxis® Desktop App

6.1 Install uPyxis® Desktop App

Download the latest version of **uPyxis®** Desktop software package from: https://pyxis-lab.com/upyxis/ this setup package will download and install the Microsoft.Net Framework 4.5 (if not previously installed on the PC), the USB driver for the USB-Bluetooth adapter (MA-NEB), the USB-RS485 adapter (MA-485), and the main **uPyxis®** Desktop application. Double click the **uPyxis.Setup.exe** file to install.

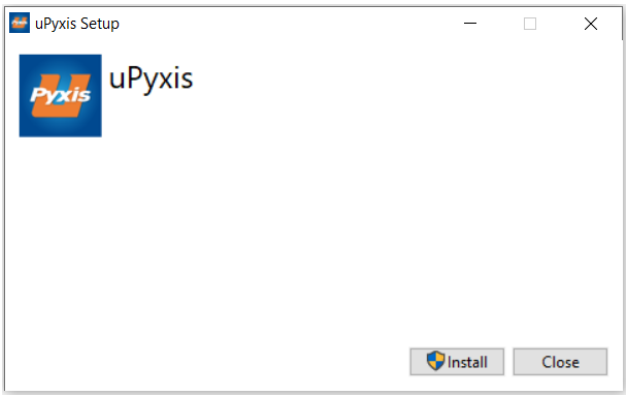

Figure 11. uPyxis® Desktop App installation

Click **Install** to start the installation process. Follow the screen instructions to complete the USB driver and **uPyxis®** installation.

6.2 Connecting to uPyxis® Desktop App

Connect the ST-565 Series sensor to a Windows computer using either a Bluetooth/USB adapter (P/N: MA-NEB) or a USB-RS485 adapter (P/N: MA-485) according to the following steps:

1. Plug the Bluetooth/USB adapter or USB-RS485 adapter into a USB port in the computer.
2. Launch **uPyxis®** Desktop App.
3. On **uPyxis®** Desktop App, click Device→ **Connect via USB-Bluetooth** or **Connect via USB-RS485** (Figure 12).
4. If the connection is successful, the ST-565 Series and its Serial Number (SN) will be displayed in the left pane of the **uPyxis®** window.

NOTE *After the sensor and Bluetooth is powered up, it may take up to 10 seconds for the adapter to establish the wireless signal for communication.*

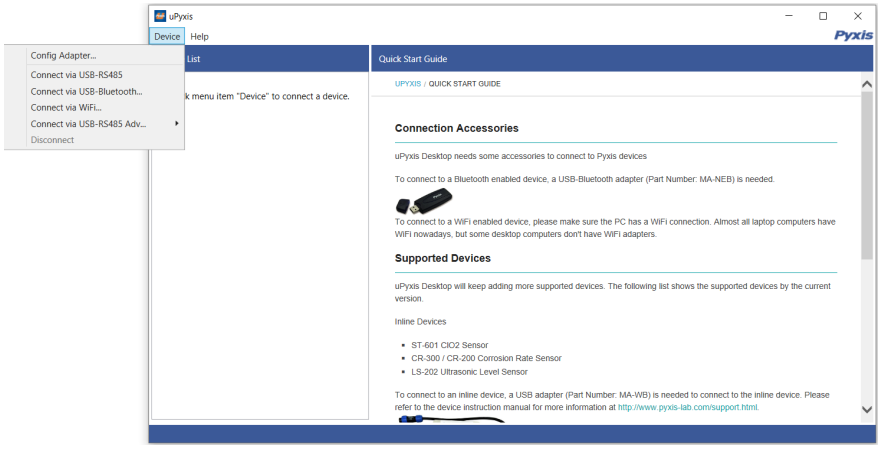

Figure 12.

6.3 Information Screen

Once connected to the device, a picture of the device will appear on the top left corner of the window and the **uPyxis®** Desktop App will default to the **Information** screen. On the **Information** screen you can set the information description for **Device Name**, **Product Name**, and **Modbus Address**, then click **Apply Settings** to save.

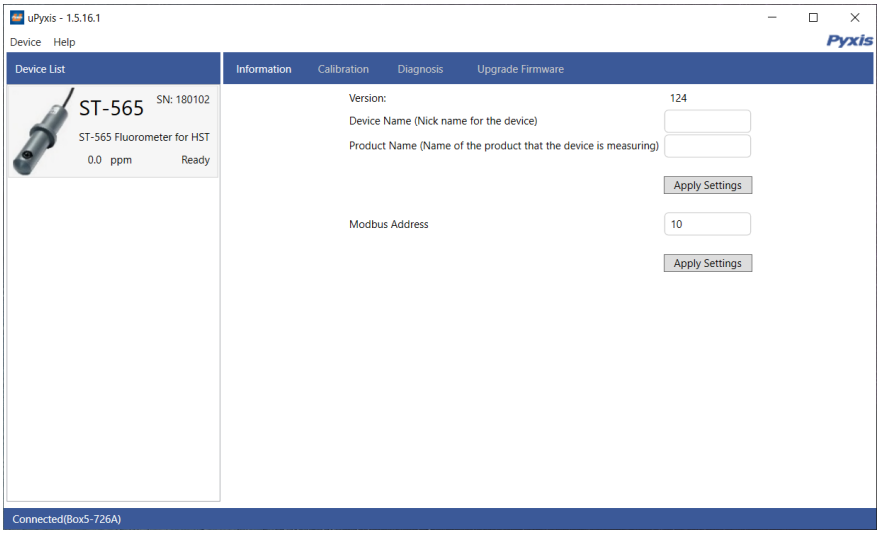

Figure 13.

6.4 Calibration Screen

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

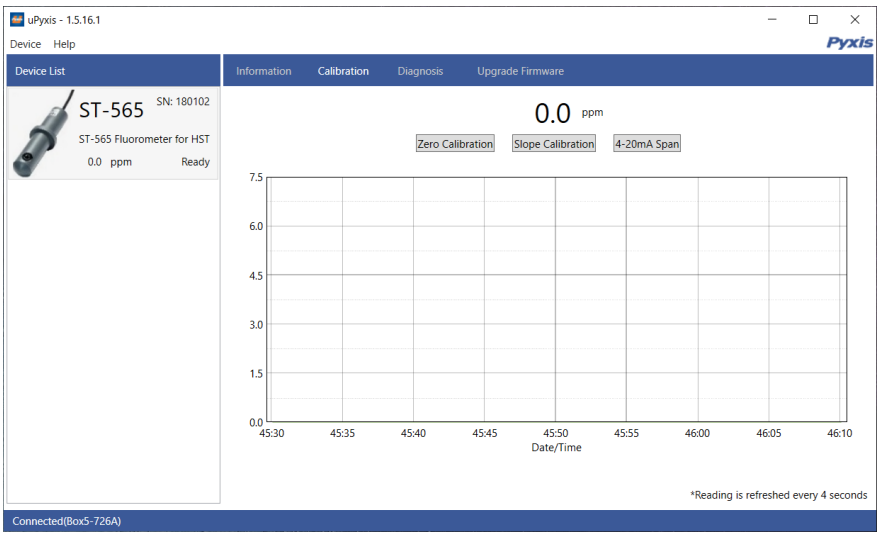

Figure 14.

6.5 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. This feature may be used for technical support when communicating with service@pyxis-lab.com.

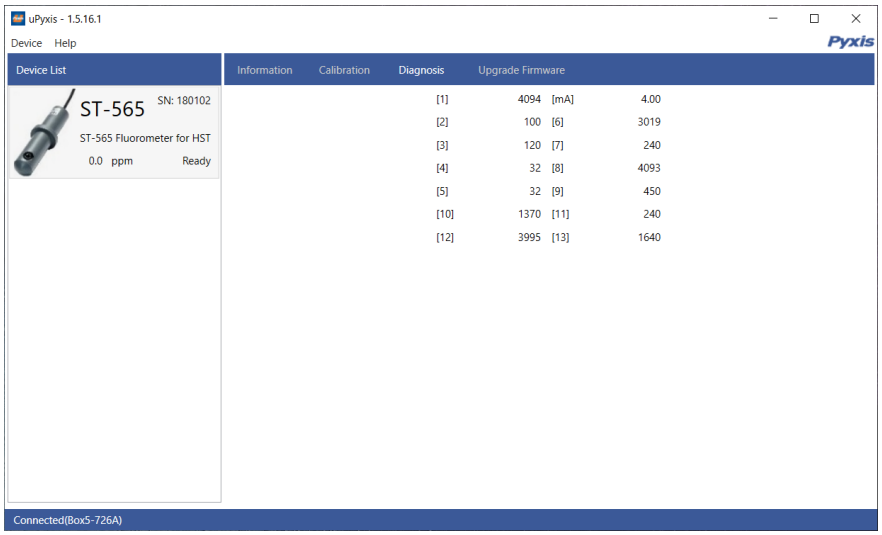

Figure 15.

7 Outputs

7.1 4–20mA Output Setup

The 4–20mA output of the ST-565 sensor is scaled as:

- Halogenated Tolytriazole (HST):
  - 4 mA = 0 ppm
  - 20 mA = 7.5 ppm

The 4–20mA output of the ST-565T sensor is scaled as:

- Tolytriazole (TTA):
  - 4 mA = 0 ppm
  - 20 mA = 10.0 ppm

7.2 Adjusting 4–20mA Span

Users may adjust the output scale using 4–20mA Span to change the HST or TTA ppm value corresponding to the 20 mA output via **uPyxis®**. For the **uPyxis®** Mobile App, press **4-20mA Span** found on the **Calibration and Reading Screen**, shown in Figure 16. For the **uPyxis®** Desktop App, click **4-20mA Span** found on the **Calibration Screen**, shown in Figure 17.

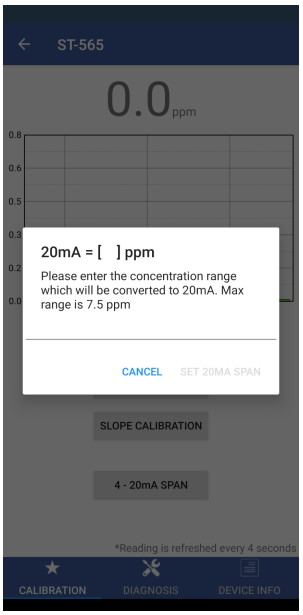

Figure 16.

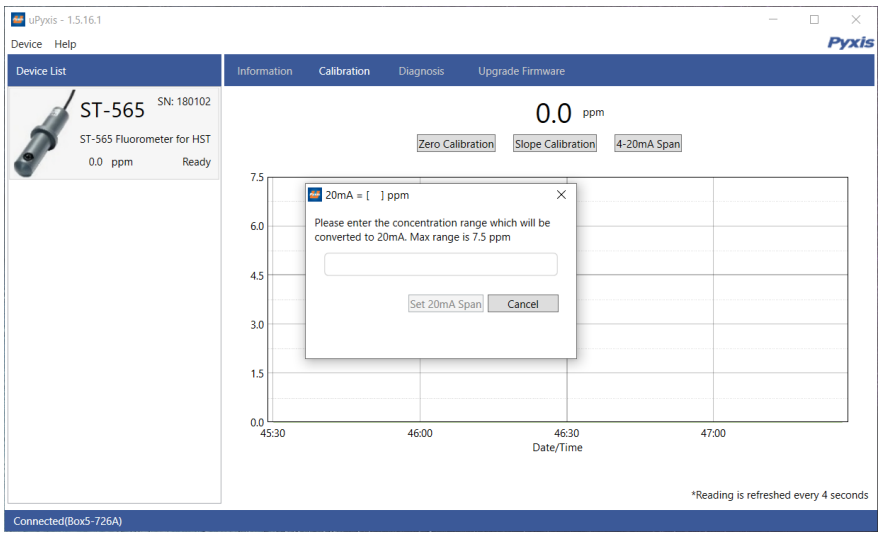

Figure 17.

7.3 Communication using Modbus RTU

The ST-565 Series sensor is configured as a Modbus slave d evice. In addition to the HST or TTA ppm values, 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 Sensor Maintenance and Precaution

The ST-565 Series sensor is designed to provide reliable and continuous HST or TTA 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-565 Series sensor 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 overfeed, for example by limiting pump size or duration, or by alarming if the pumping rate exceeds a desired maximum limit.

The ST-565 Series sensor is designed to be easily removed, inspected, and cleaned if required. It is suggested that the ST-565 Series sensor be checked for fouling and cleaned/calibrated 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. The need to clean the ST-565 Series sensor can be determined by the **Cleanliness Check** using the **uPyxis®** Mobile App (see the **Mobile Diagnosis Screen** section).

8.1 Methods to Cleaning the ST-565 Series Sensor

Any equipment in contact with industrial cooling systems is subject to many potential foulants and contaminants. Our inline sensor 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 sensor housing and the quartz optical sensor channel. These components and more come with a Pyxis Lab **Inline Probe Cleaning Solution Kit** (P/N: SER-01) which can be purchased at our online E-Store https://pyxis-lab.com/product/probe-cleaning-kit/

Figure 18. Inline Probe Cleaning Solution Kit

To clean the ST-565 Series sensor, soak the lower half of the sensor in 100 mL inline sensor cleaning solution for 10 minutes. Rinse the ST-565 Series sensor with distilled water and then check for the flashing blue light inside the ST-565 Series sensor quartz tube. If the surface is not entirely clean, continue to soak the ST-565 Series sensor for an additional 10 minutes. Use the small, soft bristle brush and Q-Tips cotton swabs as necessary to remove any remaining contaminants in the ST-565 Series sensor quartz tube.

8.2 Storage

Avoid long term storage at temperature over 100 °F. In an outdoor installation, properly shield the ST-565 Series sensor from direct sunlight and precipitation.

9 Troubleshooting

If the ST-565 Series sensor output signal is not stable and fluctuates significantly, make an additional ground connection — connect the clear (shield, earth ground) wire to a conductor that contacts the sample water electrically such as a metal pipe adjacent to the ST-565 Series tee.

Carry out routine calibration verification against a qualified Halogenated Tolytriazole (HST with ST-565) or Tolytriazole (TTA with ST-565T) standard. After properly cleaning the ST-565 Series sensor, carry out the zero point calibration with distilled water and slope calibration using the qualified standard. Pyxis Lab **HST Calibration Standard** can be purchased at our online Estore/Catalog https://pyxis-lab.com/product/halogen-stable-triazole-calibration-standards/. Pyxis Lab **TTA Calibration Standard** can be purchased at our online Estore/Catalog https://pyxis-lab.com/product/tta-standards/.

10 Contact Us

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