Pyxis®

ST-588W 'Direct Insert' Sensor for PTSA + Fluorescent Polymer for WALCHEM® & Turner Design® Tees

For Industrial Water Applications

Pyxis Lab® Inc.
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Tomball, TX 77375
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USER MANUAL

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Warranty Information

Confidentiality

The information contained in this manual may be confidential and proprietary and is the property of Pyxis Lab, Inc. Information disclosed herein shall not be used to manufacture, construct, or otherwise reproduce the goods described. Information disclosed herein shall not be disclosed to others or made public in any manner without the express written consent of Pyxis Lab, Inc.

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

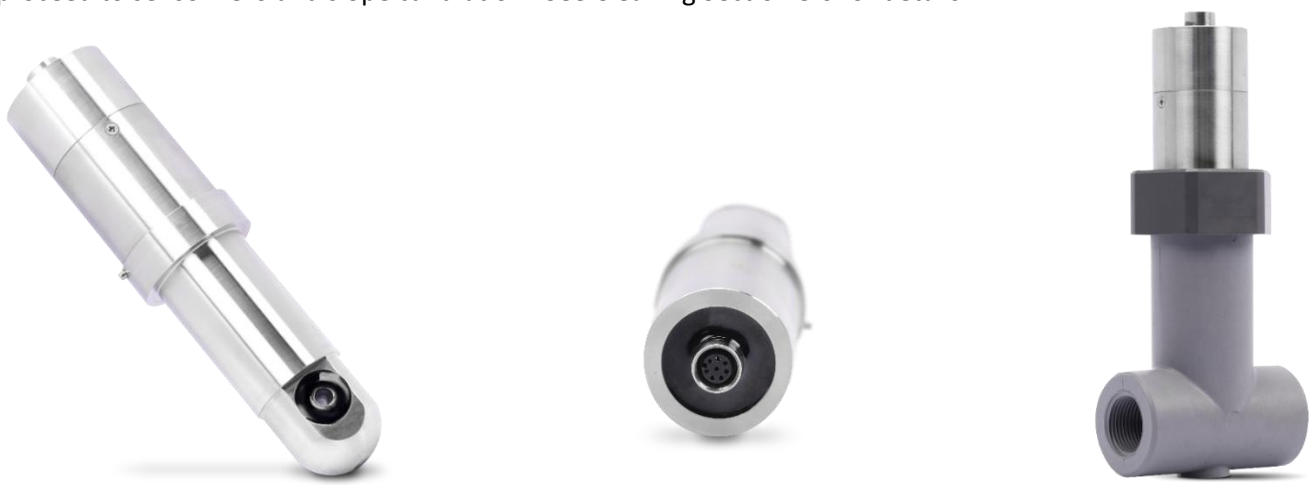
Contact Pyxis Technical Support at +1 (866) 203-8397, service@pyxis-lab.com, or by filling out a request for support at https://pyxis-lab.com/request-tech-support/.

1 Introduction

The ST-588W is a stainless steel inline PTSA / Fluorescent Polymer Pyxis smart sensor uniquely designed to be directly inserted into the Walchem® and alternative fluorometer tee assemblies. Since the alternative fluorometers commonly used in the water treatment industry have very similar dimensions as the Walchem tee design, the ST-588W design allows drop-in installation into both designs of inline tee assemblies without the need for plumbing modifications of equipment already in use.

The Pyxis ST-588W sensor is a smart device. In addition to measuring fluorescence, all ST-588 Series sensors have 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 interference commonly associated with real-world waters The ST-588W offers a combination of 4-20mA as well as RS-485 Modbus output signals in 8-Pin cable format and is Bluetooth Enabled for wireless cleanliness diagnostics and calibration when used with MA-CR or PowerPACK Series Bluetooth Adapters and the uPyxis APP for Mobile or Desktop devices. The ST-588W comes equipped with 1.5m (4.9ft) bulk-head cable with quick adapter as well as 1.5m (4.9ft) flying lead cable with quick adapter, enabling rapid wiring to any microprocessor controller, PLC or DCS system.

The ST-588W sensor is offered in a measurement range of 0-500ppb as PTSA and 0-20ppm as Fluorescent Polymer and is easy to calibrate using the uPyxis® 2.0 Mobile or Desktop App. Pyxis Lab calibration standard solutions containing PTSA in the range of 100 to 500 ppb and Fluorescent Polymer in the range of 10-20 ppm can be used for the calibration of the ST-588W. The calibration standard may also be the water sample itself if the PTSA and Fluorescent Polymer concentration of the sample is measured and validated by a calibrated offline fluorometer such as the Pyxis SP-380P. This allows the ST-588W sensor to be calibrated online without being removed from the system. The uPyxis® 2.0 App also provides diagnostic information about the ST-588W sensor such as sensor cleanliness factor which is instrumental in determining if the sensor should be cleaned prior to slope calibration. This diagnostic information can also be available via Modbus RTU. For proper calibration, the ST-588W sensor should be diagnosed for cleanliness via the uPyxis 2.0 APP, then cleaned using the Pyxis Probe Cleaning Kit (SER-01). Once cleaned, sensor cleanliness should be confirmed via the uPyxis 2.0 APP diagnostics function, then the user may proceed to sensor zero and slope calibration. See Cleaning Section 8.0 for details.



ST-588W Sensor

2 Specifications

Table 1. ST-588W Specifications

Item	ST-588W
P/N	55849
PTSA Output Range *Factory Set Range*	0–200 ppb
PTSA Maximum Range *Adjusted via uPyxis*	0 - 500ppb
Fluorescent Polymer Range	0–20 ppm
Precision	±0.1ppb PTSA / ±0.1ppm Polymer
PTSA Calibration	Single-Point or Two-Point calibration against PTSA standard solutions
Fluorescent Polymer Calibration	Single-Point or Two-Point calibration against TAG Polymer standard solutions
Excitation of PTSA / Polymer	365 nm / 410 nm
Emission of PTSA / Polymer	410 nm / 450 nm
Power Supply	22–26 VDC, ≈ 2W maximum at 20mA
Outputs	Isolated 4 – 20 mA Analog Outputs & RS-485 Modbus Output -8Pin
Installation	Walchem® Inline Tee *(pH & Conductivity)* Alternative Fluorometer Inline Tee
Miscellaneous Items Included	1-Universal Nut / 1-Oring for Walchem Tee / 1-Oring for Alternative Fluorometer Tee
Flow Range	0.25 – 8.0 GPM
Weight	500 g (1.1 lbs)
Operational Pressure	≤100 psi (6.9 Bar)
Operating Temperature	4 °C – 49 °C (40 – 120 °F)
Storage Temperature	-20 °C – 60 °C (-4 – 140 °F)
Material	304 Stainless Steel
Rating	IP67, Fully Dustproof & Waterproof
Regulation	CE Marked + RoHS
Dimension (L x W x H)	Length 6.8 inch (172.7 mm), body diameter 1.44 Inch (36.6 mm)
Cable Length	1.5 meter 8-pin Bulkhead w Adapter/ 1.5 meter 8-pin Flying Lead w/ Adapter

NOTE - *These specifications are subject to change without notice.*
Walchem® is a registered trademark of Iwaki America Inc. – Holliston, MA.

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 Included with ST-588W

Each ST-588W Package (P/N 55849) will include the following standard accessories.

- One ST-588W Inline PTSA & Fluorescent Polymer Sensor with 8-pin flying lead and bulkhead cable
- One Universal NUT (P/N 23133) for sensor install with Walchem -or- Alternative Fluorometer Tee Assemblies
- One O-ring for sensor use with the Walchem Tee (P/N 21501)
- One O-ring for sensor use with the Alternative Fluorometer Tee (P/N 26560)
- One Quick-Start Instruction Guide with QR Code to Operation Manual

User Manual also available online at www.pyxis-lab.com

Figure 1. – ST-588W Package As Opened

3.2 Optional Accessories

Optional Accessories Information	P/N
Universal Nut Replacement *(ST-500W Series Nut for use with Walchem or Alternative Tee Assembly)*	23133
O-ring Replacement *(for ST-500W Series use with Walchem Tee)*	21501
O-ring Replacement *(for ST-500W Series use with Alternative Fluorometer Tee)*	26560
PTSA-1010 *(PTSA 100ppb / Fluorescent Polymer 10ppm Combination Std – 500mL)*	21055
PTSA-100 *(PTSA Calibration Standard 100ppb / 500mL)*	21001
TAG-10 *(Fluorescent Polymer Calibration Standard – 10ppm/500mL)*	21054
Pyxis Probe Cleaning Kit *(500mL Cleaning Solution with Brushes)*	SER-01
MA-CR Bluetooth Adapter *(Pyxis Bluetooth Adapter for 8Pin Pyxis Sensors)*	MA-CR
MA-NEB Bluetooth/USB Adapter *(Enables Bluetooth for Desktop and uPyxis APP)*	MA-NEB
Power*PACK-1 (Single Chanel Auxiliary Power Supply w/Bluetooth For Pyxis Sensors)*	MA-BLE-1
Power*PACK-2 (Dual Chanel Auxiliary Power Supply w/Bluetooth For Pyxis Sensors)*	MA-BLE-2
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
MA-10CR *(10' Extension Cable for 8Pin Pyxis Sensors)*	50741
MA-50CR *(50' Extension Cable for 8Pin Pyxis Sensors)*	50743

4 Installation & Diagram

4.1 ST-588W Installation Instructions & Diagram

The ST-588W has been uniquely designed to be used in both the Walchem Tee Assembly or the Alternative Fluorometer Tee Assembly. This approach was taken to enable users to use advanced Pyxis sensor technology without the need for plumbing and/or equipment change of existing systems installed in the field.

Each ST-588W will come provided with the sensor.

- One MA-4.9CR 8-Pin bulkhead cable (P/N 50745)
- One MA-1.5CR 8-Pin flying lead cable (P/N 50746)
- One Universal NUT (CPVC) for use with both Walchem and Alternative Fluorometer Tee Assembly (P/N 23133)
- One O-ring for use with Walchem Tee Assembly (P/N 21501)
- One O-ring for use with Alternative Fluorometer Tee Assembly (P/N 26560)

The ST-588W can be installed in a vertical or horizontal flow path with the existing Walchem or Alternative Fluorometer Tee in place. When installed in a horizontal flow path, a downstream valve is always suggested to allow users to mitigate any potential for air bubble interference. The following steps should be taken for installation.

1. Determine if your existing inline Tee assembly is Walchem or Alternative Fluorometer. Typically, the Walchem tee is a light gray CPVC material while the Alternative Fluorometer tee is a dark grey or black CPVC material.
2. Once your tee is identified, insert the appropriately labeled O-ring provided with the ST-588W based on the manufacturer of your tee (ie. Walchem or Alternative Fluorometer). Insert the O-ring into the O-ring groove of the tee. You will note varying O-ring thickness is used for each tee design. Using the incorrect O-ring can lead to a non-water tight seal.
3. Insert the ST-588W sensor into the tee with the stainless-steel collar alignment screws properly aligned with the tee.
4. Tighten the Pyxis provided Universal Nut onto the tee to form a water-tight, compression seal.
5. ***NOTE*** *– This nut is universally designed to be used on <u>both</u> the Walchem and Alternative Fluorometer Designs tee assemblies and should aways be used with the correct O-ring provided by Pyxis Lab. Some tee threads may remain visible even if the nut is fully engaged onto the tee. This is <u>normal</u> and should not be for concern and the nut will function as specified for pressure and flow of the ST-588W sensor specifications. Replacement NUT and O-rings are available from Pyxis Lab Inc.*

Figure 2. ST-588W Installed into Walchem Tee

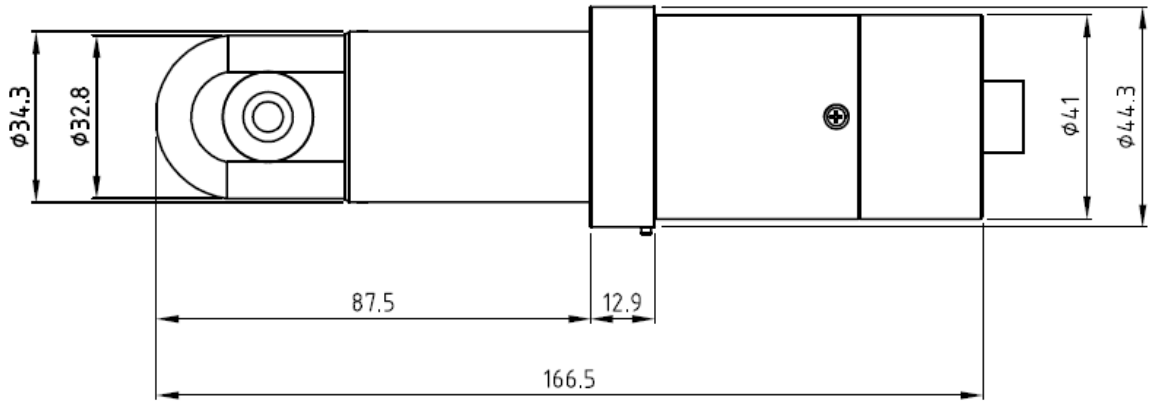


Figure 3. Dimension of the ST-588W Sensor

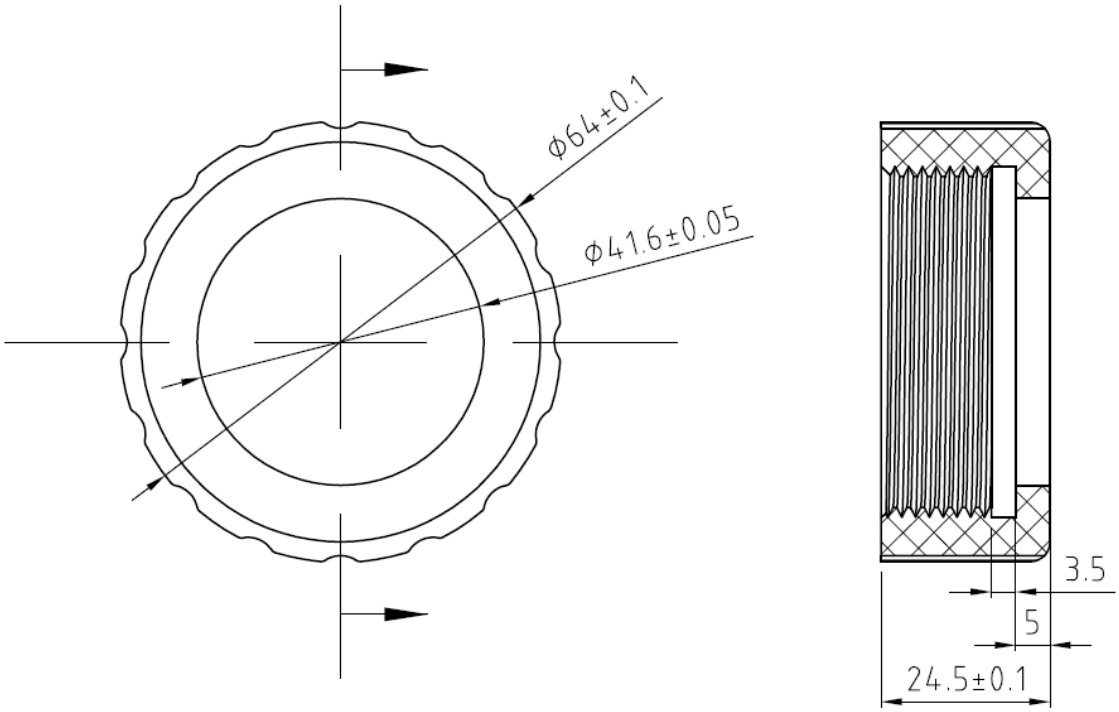


Figure 4 . Dimension of the ST-588W Universal NUT Tee Assembly (mm)

4.2 Wiring

Please refer to the table below for wiring of the ST-588W to a receiving controller or PLC.

NOTE: *The 24V power ground and the 4-20 mA- return are internally connected. If insufficient wattage is available from the connected controller (ie. 2W), Pyxis recommends the* ***PowerPACK Series*** *Auxiliary Power & Bluetooth Communication Adapters highlighted in the Optional Accessories section of this manual. 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 @2W. Detailed wiring diagrams for common controllers are available from www.pyxis-lab.com.*

Table 2.

Wire Color	Designation
Red	24V +
Brown	24V Power ground
White	4-20mA+ for Fluorescent Polymer
Pink	4-20mA+ for PTSA
Gray	4-20mA -
Green*	Earth Ground
Blue	RS-485 A
Yellow	RS-485 B
Black	Shield, Earth ground

Please refer to the table below for proper ST-588W input 4-20mA scaling in your receiving display, controller or PLC.

Table 3.

ST-588W Output Scaling (4-20mA)		
Unit of Measure	**4mA Value**	**20mA Value**
PTSA	0 ppb	200 ppb
Fluorescent	0 ppm	20 ppm

NOTE *the PTSA 20mA value is adjustable to a MAX of 500ppb via uPyxis. See Adjusting 4-20mA SPAN section in this manual for details.*

5. Calibration and Diagnosis with the uPyxis 2.0 Mobile App

The ST-588W sensor is rigorously calibrated before leaving the factory. If calibration is required, users can perform a single-point calibration after confirming the sensor cleanliness with uPyxis APP while the sensor remains inline (operational) based on a handheld test result of the sample being measured. Or users may perform a two-point calibration (Zero & Slope) for PTSA and Fluorescent Polymer after confirming the sensor cleanliness with the uPyxis APP in a light covered beaker using DI water and proper PTSA and Fluorescent Polymer Calibration Standard Solutions. See Section 5.5 for Cleanliness Diagnosis Check instructions.

5.1 Calibration and Diagnosis by uPyxis Mobile App

Install the MA-CR Pyxis Bluetooth adapter (P/N: MA-CR) between the ST-588W bulkhead cable and flying lead cable connected to the display or controller, using the 8-pin adapters as shown in the following connection diagram. The power should be sourced from a 24 VDC power terminal of the display or controller. If not available, please purchase a 24VDC power supply or use the Pyxis PowerPACK Series Bluetooth adapters (See Section 3.2 Optional Accessories).

MA-CR Bluetooth Adapter

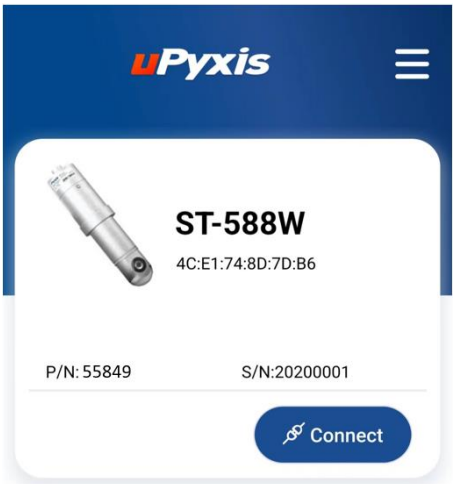
Figure 5. 8-Pin Pyxis Sensor with MA-CR and uPyxis Mobile APP

Download and install the **uPyxis2.0** app from **Apple Store** or **Google Play**. Turn ON the Bluetooth in the smart device being used. Please do not pair your devices Bluetooth to uPyxis, the app will do the pairing. Open the uPyxis app on the device. Click the **Scan Bluetooth** button to scan the available Pyxis Bluetooth devices. The discovered devices will be listed as shown in *Figure 6*. This may take up to one minute.

Tap the discovered ST-588W sensor to connect to the sensor. The uPyxis app will identify the sensor type if multiple Pyxis sensors are discovered in the scan.

As shown in *Figure 7,* uPyxis will default to the **Trend Chart** page after connected to the sensor via the MA-CR Bluetooth adapter. The measurement value will be displayed as a line graph to show the real-time trend.

Tap icon in the top of the app page to launch the configuration page. Five functional tabs of each are available on this page: Information, Configuration, Calibration, 4-20mA Span and Diagnosis.



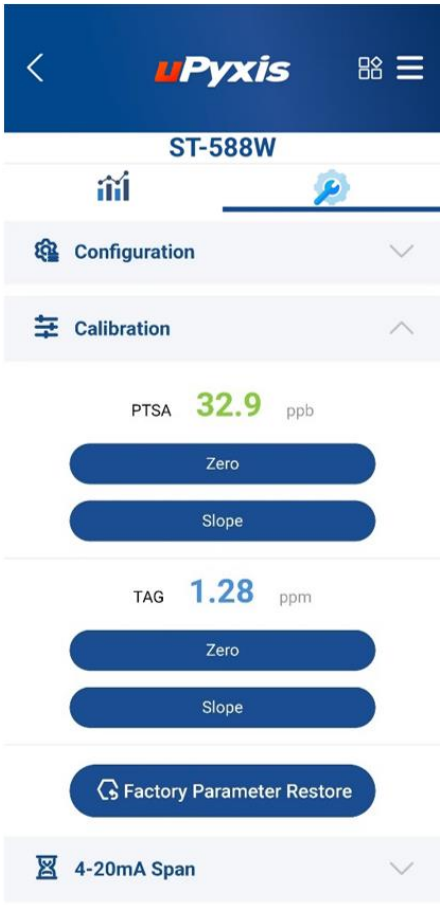


Figure 6 - ST-588W Discovered via Bluetooth *Figure 7 – Trend Chart Page* *Figure 8 – Configuration Page*

5.2 PTSA Calibration

Single Point (In-Situ) PTSA Calibration

If you have confirmed the ST-588W sensor is clean by using the Cleanliness Check Function of the Diagnostic tab within uPyxis 2.0 (see section 5.5), users may conduct an in-situ slope calibration of PTSA while the sensor is in operation. Users can tap **Slope CALIBRATION** and enter the handheld measured PTSA value, then hit confirm. ***NOTE*** *If the sensor is dirty, it must be removed for proper optical channel cleaning with the Pyxis Probe Cleaning Solution (P/N SER-01) prior to conducting sensor calibration. Confirmation of sensor cleanliness with the uPyxis 2.0 APP Cleanliness Check Function is required before proceeding to sensor calibration. See video here* https://www.youtube.com/watch?v=hFmk2znyvjs&pp=ygUIcHl4aXMgbWE%3D

Two-Point (Beaker) PTSA Calibration

Two-point PTSA calibration for the ST-588W requires deionized (DI) water and Pyxis PTSA-100-ppb or Pyxis PTAG-1010 Combined Calibration Standard (100ppb PTSA + 10ppm Tag Polymer). (see the Optional Accessories Section 3.2). ***NOTE*:** *For best results, the ST-588W sensor should be calibrated in a completely light-proof environment by covering the beaker with a towel.*

After confirming sensor cleanliness as outlined above, place the sensor into a beaker containing deionized (DI) water, then tap **ZERO CALIBRATION** in the uPyxis app. Please allow sufficient time (a few minutes) for the sensor to stabilize before performing the calibration.

After completing the zero calibration, place the sensor into Pyxis PTSA-100 or Pyxis PTAG-1010 calibration standard solution and tap **Slope CALIBRATION** in the uPyxis app. Enter the PTSA concentration 100 in the dialog window as in *Figure 10*.

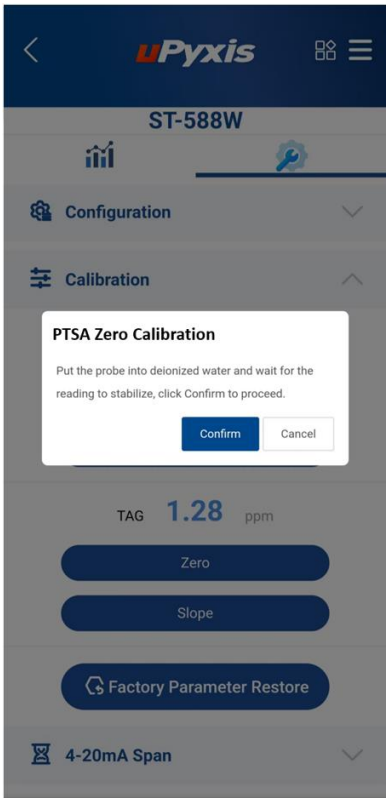


Figure 9 – PTSA Zero Calibration

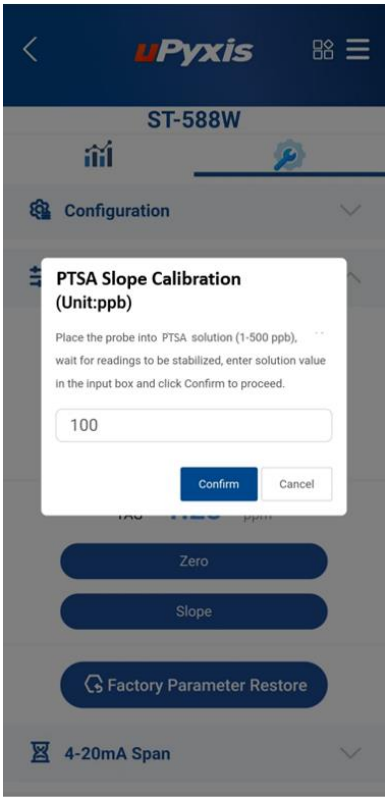


Figure 10 – PTSA Slope Calibration

5.3 Fluorescent Polymer Calibration

Single Point (In-Situ) Fluorescent Polymer Calibration

If you have confirmed the ST-588W sensor is clean by using the Cleanliness Check Function of the Diagnostic tab within uPyxis 2.0 (see section 5.5), users may conduct an in-situ slope calibration while the sensor is in operation. Users can tap **Slope CALIBRATION** and enter the handheld measured Fluorescent Polymer value, then hit confirm. ***NOTE*** *If the sensor is dirty, it must be removed for proper optical channel cleaning with the Pyxis Probe Cleaning Solution (P/N SER-01) prior to conducting sensor calibration. Confirmation of sensor cleanliness with the uPyxis 2.0 APP Cleanliness Check Function is required before proceeding to sensor calibration.*

Two-Point (Beaker) Turbidity Calibration

Two-point Turbidity calibration for the ST-588W requires deionized (DI) water and Pyxis PTAG-1010 or Pyxis TAG-10 calibration standard solution. (see the Optional Accessories Section 3.2). ***NOTE*:** *The ST-588W sensor should be calibrated in a completely light-proof environment by covering the beaker with a towel.*

After confirming sensor cleanliness as outlined above, place the sensor into a beaker containing deionized (DI) water, then tap **ZERO CALIBRATION** in the uPyxis app. Please allow sufficient time (a few minutes) for the sensor to stabilize before performing the calibration.

After completing the zero calibration, place the sensor into Pyxis PTAG-1010 or TAG-10 calibration standard solution and tap **Slope CALIBRATION** in the uPyxis app. Enter the ppm concentration of 10 in the dialog window as in *Figure 12*.

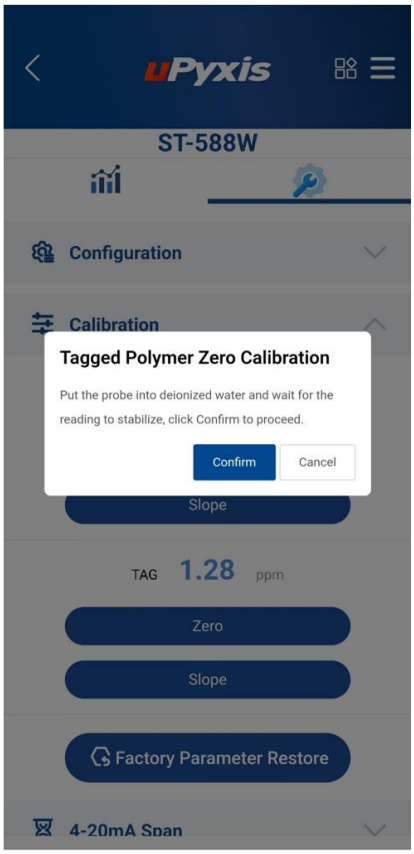


Figure 11 – Fluorescent Polymer Zero Calibration

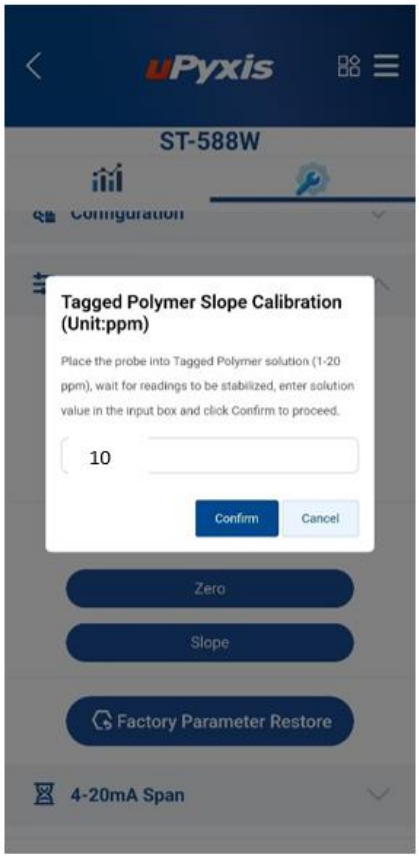


Figure 12 - Fluorescent Polymer Slope Calibration

5.4 Adjusting 4–20mA Span

From the Pyxis factory, the 4–20mA output of the ST-588W sensor is scaled as follows:

ST-588W Sensor 4-20mA Scaling		
Unit of Measure	**4mA Value**	**20mA Value**
PTSA	0 ppb	200 ppb
Fluorescent Polymer	0 ppm	20 ppm

NOTE *The 20mA* PTSA *value is adjustable to a MAX of 500ppb via uPyxis.*

Users may alter the output scale using **4-20mA Span** to change the PTSA and Fluorescent Polymer value corresponding to the 20mA output (*Figure 13 & Figure 14*).

NOTE *The 20mA value span adjustment may only be equal to or lower than the upper range detection limit of the sensor.*

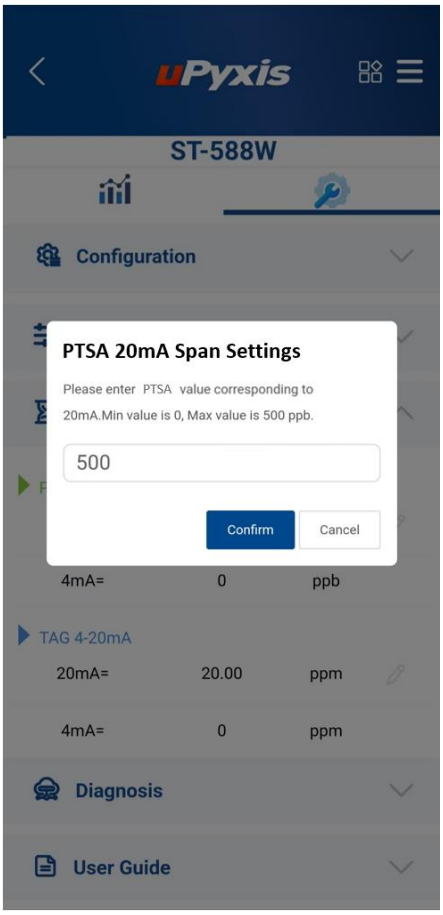


Figure 13 – Adjust 20mA Setting for PTSA

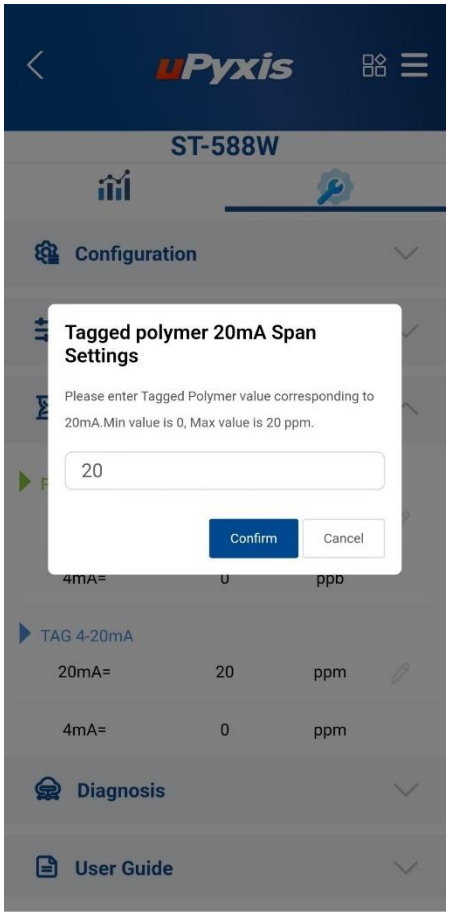


Figure 14 – Adjust 20mA Setting for Polymer

5.5 Diagnosis Screen

Tap **Diagnosis** in the bottom of the **Configuration** page, as shown in figure 15.

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.

To perform a sensor Cleanliness Check, first select the Diagnosis Condition which defines the fluid type that the ST-588W sensor is currently measuring, then click **Cleanliness Check**. If the sensor is clean, a **Clean** message will be shown. If the sensor is fouled, a Becoming Dirty or **Dirty** message will be shown. In this case, follow the procedure in the Methods to Cleaning the ST-588W section of this manual.

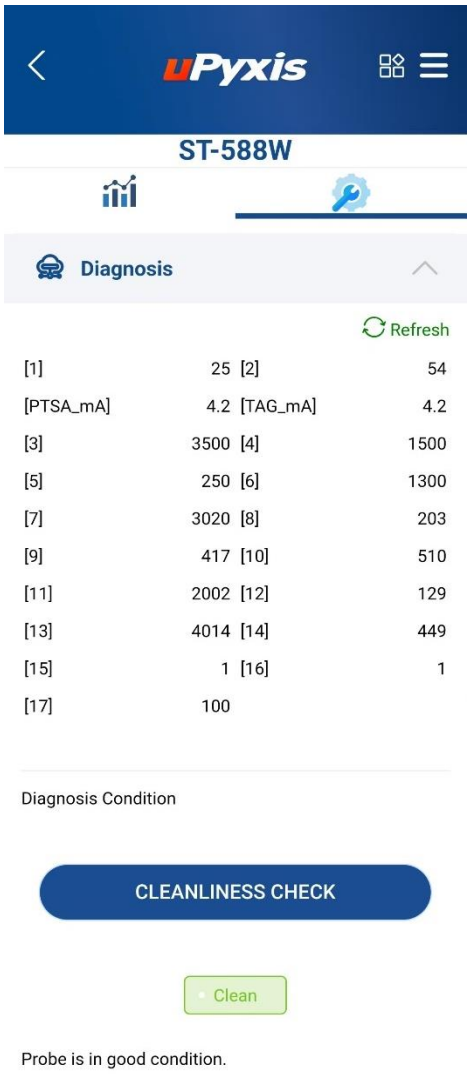


Figure 15.

6. Calibration and Diagnosis with uPyxis® Desktop App

The use of ST-588W with the uPyxis Desktop App is still under active development. Once complete, this section will be updated with use instructions. Please contact service@pyxis-lab.com for updates.

7 Communication using Modbus RTU

The ST-588W sensor is configured as a Modbus slave device. In addition to the Fluorescent Polymer (ppm) and PTSA (ppb) value, many operational parameters, including cleanliness condition, 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-588W sensor is designed to provide reliable and continuous PTSA and Fluorescent Polymer readings even when installed in moderately contaminated samples as high as 150NTU, while offering the user an in-situ cleanliness diagnostic check to predict need for cleaning PRIOR to and upset issue. Although the optics are compensated for the effects of moderate fouling, heavy fouling will prevent the light from reaching the sensor, resulting in false readings and the potential for product overfeed if the ST-588W 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 Pyxis Probe Cleaning Solution Kit (P/N: SER-01) is a uniquely designed cleaning solution designed to effectively remove the most common inorganic foulants and contaminants from the quartz optical channel of the ST-588W sensor. The kit is provided with 500mL bottle of cleaning solution (sufficient for up to 5-10 cleanings) as well as glass jar, soft bristle brush and Q-Tips. The **Inline Probe Cleaning Solution Kit** (P/N: SER-01) can be purchased at our online E- Store Inline Sensor Cleaning Kit | Pyxis Lab® (pyxis-lab.com).

The need to clean the ST-588W sensor can be determined by the **Cleanliness Check** using either the **uPyxis®** Mobile App (see the **Mobile Diagnosis Screen** section) or the **uPyxis®** Desktop App (see the **Desktop Diagnosis Screen** section).

See Instructional Video on proper cleaning & calibration techniques of the ST-588W sensor below.

YouTube

How to Clean & Calibrate a Pyxis Lab® ST-Series Inline Sensor | Pyxis Lab® | 2022 Tutorial - YouTube

8.1 Methods to Cleaning the ST-588W 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://www.pyxis-lab.com/product/inline-sensor-cleaning-kit/

Figure 16. Pyxis Inline Probe Cleaning Solution Kit (P/N SER-01)

To clean the ST-588W sensor, soak the lower half of the sensor in 100 mL inline sensor cleaning solution for 30 minutes. Rinse the ST-588W sensor with distilled water and then check for the flashing blue light inside the ST-588W sensor quartz tube. If the surface is not entirely clean, continue to soak the ST-588W sensor for an additional 30 minutes. Use the small, soft bristle brush and Q-Tips cotton swabs as necessary to remove any remaining contaminants in the ST-588W sensor quartz tube.

8.2 Storage

Avoid long term storage at temperature over 140 °F. In an outdoor installation, properly shield the ST-588W sensor from direct sunlight and precipitation.

9 Troubleshooting

If the ST-588W sensor output signal is not stable and fluctuates significantly, make an additional ground connection — connect the black (shield, earth ground) wire to a conductor that contacts the sample water electrically such as a metal pipe adjacent to the ST-588W installation tee.

10.Contact Us

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