



ST-730SS-T Series Inline Sensors

Turbidity Sensors for Critical AI Cooling



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**USER
MANUAL**

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Warranty Information

Confidentiality

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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 Material Authorization (RMA) 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://www.pyxis-lab.com/request-return-or-repair/>

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://www.pyxis-lab.com/request-return-or-repair/>

1 Introduction

Product Description

The Pyxis ST-730SS-T Series of sensors are a new 316L-stainless steel design allowing insertion and removal of the sensor into the new Pyxis ST-009 Series (Stainless Steel) inline tee and multi-sensor flow manifolds for high pressure applications up to 290psig. These sensors use temperature-tolerant and humidity-resistant optical filters that can be operated under a wide range of ambient conditions without the need of humidity and temperature regulation. With this design the performance of the ST-730SS-T series can remain stable and consistent for an extended period time. Additionally, it has a high tolerance to fouling, particulate matter and air bubbles, making it more reliable than alternative turbidity meters.

The ST-730SS -T series of sensor are available in two detection range formats: 0-10NTU (ST-731SS-T) and 0-100NTU (ST-730SS-T). Each device uses infrared light with a 90° surface scatter optical channel configuration.

The ST-730SS -T series sensors offer a combination of 4-20mA as well as RS-485 Modbus output signals and are Bluetooth® 5.0 Enabled for wireless cleaning and calibration when used with MA-WB or PowerPACK Bluetooth Adapters and the uPyxis® 2.0 APP for Mobile or Desktop devices. The ST-730SS-T series is ideally designed for use in Critical Cooling Water Distribution Units in the AI Server market where PG-25 (glycol based) fluids are utilized. With this in mind, both Pyxis Lab Formazin and Glycol based calibration standard solutions in the range of 2-100 NTU can be used for the calibration of these sensors based on the application of use. The calibration standard may also be the water or coolant fluid sample itself if the Turbidity concentration of the sample is measured and validated by a calibrated offline turbidimeter. This allows the ST-730SS-T sensors to be calibrated online without being removed from the system.



ST-730SS-T Series with ST-009 Stainless Steel Tee Assembly

2. Specifications

Item	ST-730SS-T	ST-731SS-T
P/N	56377	55995
Range	0 – 100 NTU	0 – 10 NTU
Resolution	0.1 NTU	0.05 NTU
Accuracy	± 2% of reading	
Method	Nephelometric Turbidity Units (NTU)	
Light Source	Infrared	
Light Format	LED	
Power Supply	22 – 26V DC, Power Consumption – 1.5W	
Outputs	Isolated 4 – 20 mA Analog Output, Isolated RS-485 Digital Output	
Dimension (L x W x H) [†]	Length (182 mm), body diameter (37mm)	
Weight	1.1lbs (500g)	
Installation	ST-009 Stainless Steel Tee – ¾-inch FNPT threaded ports (sold separately)	
Material	316SS Sensor & 316SS ST-009	
Operational Pressure	290 psi (20 Bar) when used with ST-009	
Operating Temperature	4 °C – 49 °C (40 – 120 °F)	
Storage Temperature	-20 °C – 60 °C (-4 – 140 °F)	
Cable Length	1.5m 7Pin Bulkhead w/adaptor + 1.5m 7Pin Flying Lead w/adaptor	
Calibration	Process calibration against sample water or Multi-point calibration against DI water and Formazin blended standard solutions	
Rating	IP67, Fully Dustproof & Waterproof	
Regulation	CE, RoHS, UKCA	
Compliance	ISO-7027	

* Specifications are subject to change without notice.

[†] See [Figure 3](#) for ST-730SS-T Series dimensions.

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

- One **ST-730SS-T** (P/N: 56377) or one **ST-731SS-T** (P/N: 55995) with 1.5m bulkhead cable with 7-pin Female Adapter
 - **NOTE** - ST-009 Stainless Steel Tee Assembly is Sold Separately
- One **MA-1100** - 7-Pin Flying Leads Cable with Male Adapter (5ft) (P/N: 50747)
- User Manual available online at <https://www.pyxis-lab.com/documents/>

3.2 Optional Accessories

The following optional accessories can be ordered from Pyxis Customer Service order@pyxis-lab.com or Pyxis E-Store at [Better Water Tools | Analytical Inline & Handheld Devices | Pyxis Lab, Inc.](#)

Accessory Name	P/N
ST-009 Stainless Steel Inline Tee Assembly ($\frac{3}{4}$ -inch FNPT Stainless Steel)	22624
ST-009-03 Three Sensor Flow Manifold ($\frac{3}{4}$ -inch FNPT 316 Stainless Flow Manifold)	24397
TURB-2 (Formazin Based Turbidity Calibration Standard 2NTU/ 500ml)	57010-6
TURB-10 (Formazin Based Turbidity Calibration Standard 10NTU/ 500ml)	57010-4
TURB-50 (Formazin Based Turbidity Calibration Standard 50NTU/ 500ml)	57009
TURB-2-PG25 (Formazin/PG-25 Based Turbidity Calibration Standard 2NTU/ 500ml)	36828
TURB-10-PG25 (Formazin/PG-25 Based Turbidity Calibration Standard 10NTU/ 500ml)	36777
TURB-50-PG25 (Formazin/PG-25 Based Turbidity Calibration Standard 50NTU/ 500ml)	34210
Pyxis Probe Cleaning Kit (Includes Sensor Cleaner 500mL + Accessories)	SER-01
MA-WB Bluetooth/USB Adapter (Pyxis Bluetooth/USB Adapter for 7Pin Pyxis Sensors)	MA-WB
PowerPACK Pro-5 (Five Chanel Auxiliary Power Supply w/Bluetooth for Pyxis Sensors)	MA-PS-5
MA-C10 (10' Extension Cable for 7Pin Pyxis Sensors)	50738
MA-C50 (50' Extension Cable for 7Pin Pyxis Sensors)	50705

4 Installation

4.1 ST-730SS-T installed in the ST-009 Stainless Series Steel Tee Assembly

The ST-730SS-T series sensors must be used with the ST-009 stainless steel inline tee assembly for use in high pressure applications exceeding 100psi. The maximum pressure of the sensor and tee assembly is 290psi. The ST-009 provides 3/4-inch FNPT threaded inlet and outlet for easy plumbing. The sensor should be installed horizontally with sample flow entering the bottom of the tee and exiting the top. ***NOTE*** The ST-009 is sold separately. Pyxis also offers 2, 3 and 4 sensor versions of the ST-009 for multiple sensor installations. Contact order@pyxis-lab.com for details.

To properly install the ST-730SS-T series sensors into the ST-009 Tee Assembly, follow the steps below:

1. The recommended installation of the sensor and tee is horizontal with sample flow entering the bottom of the tee and exiting the top. This ensures proper sensor optical channel flooding.
2. Insert the provided O-ring into the O-ring groove on the tee.
3. Insert the ST-730SS-T series sensor into the ST-009 tee.
4. Tighten the tee nut onto the tee to form a water-tight, compression seal.

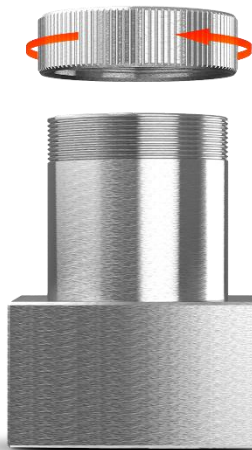


Figure 1. ST-009 Image

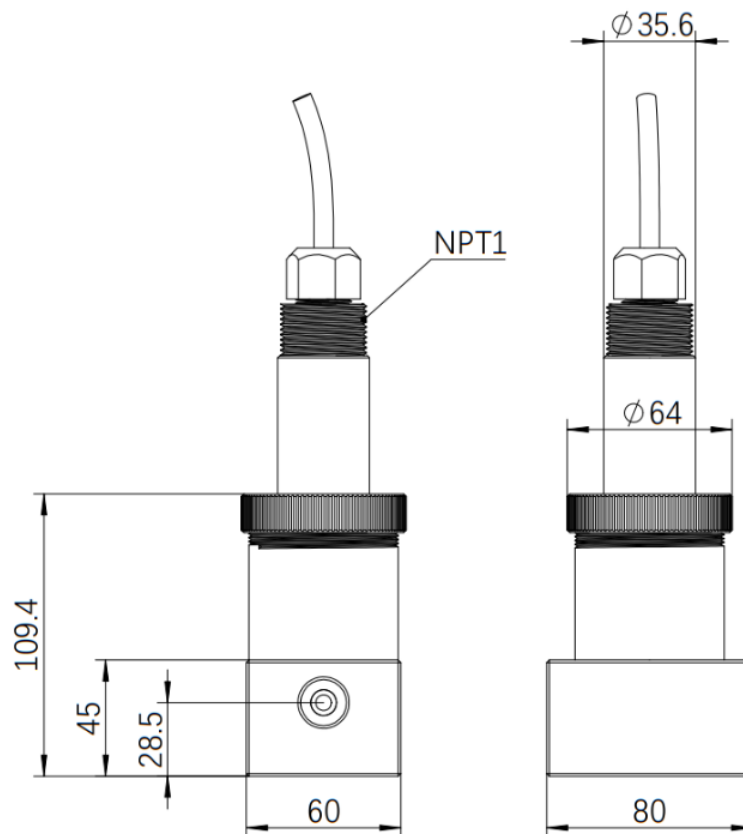


Figure 2. ST-009 Tee Assembly (mm)

4.2 ST-730SS-T Series Dimension

The ST-730SS-T Series dimensions can be found below.

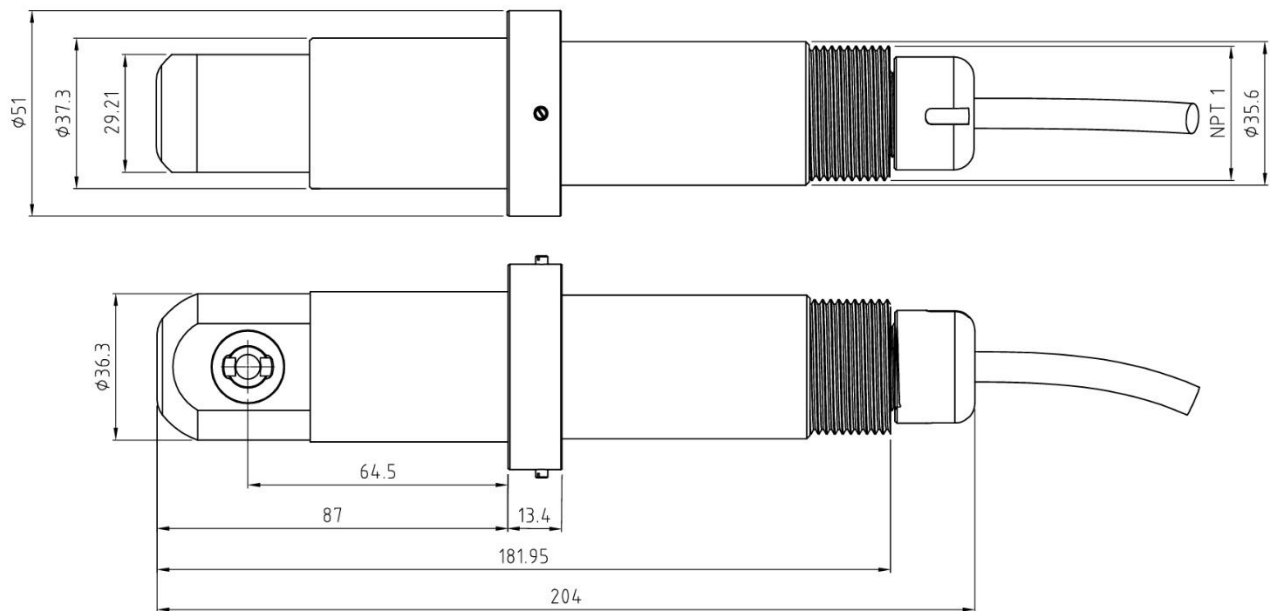


Figure 3. Dimension of the ST-730SS-T Series (mm)

4.3 Wiring

Follow the wiring tables below to connect the ST-730SS-T series sensors to a receiving controller.

***NOTE*:** *The 24V power ground (black) and the 4-20 mA- return (green) are internally connected. If an insufficient wattage is available from the connected controller (i.e. 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 @ 65mA. Detailed wiring diagrams for common controllers are available from www.pyxis-lab.com*

Table 2

Wire Color	Designation
Red	24 V +
Black	24 V- Power Ground
White	4-20 mA + for Turbidity
Green*	4-20mA -
Blue	RS-485 A
Yellow	RS-485 B
Clear	Shield, earth ground

* 4-20mA- and Power Ground are internally connected

Table 2A

4-20mA Scaling		
Sensor Name	4mA	20mA
ST-730SS-T	0 NTU	100 NTU
ST-731SS-T	0 NTU	10 NTU

4.4 Connecting via Bluetooth to a Mobile Device

An MA-WB Bluetooth/USB adapter (P/N: MA-WB) can be used to connect a ST-730SS-T sensor to a smart device with the **uPyxis®2.0** Mobile App. The power should be sourced from a 24 VDC power terminal of a connected controller. If a controller is not available, please purchase a Pyxis PowerPACK Pro-5 (P/N: MA-PS-5) auxiliary power supply with Bluetooth, or an alternative 24 V power supply that can directly connect to the ST-730SS-T sensor with proper cable connectors from Pyxis.

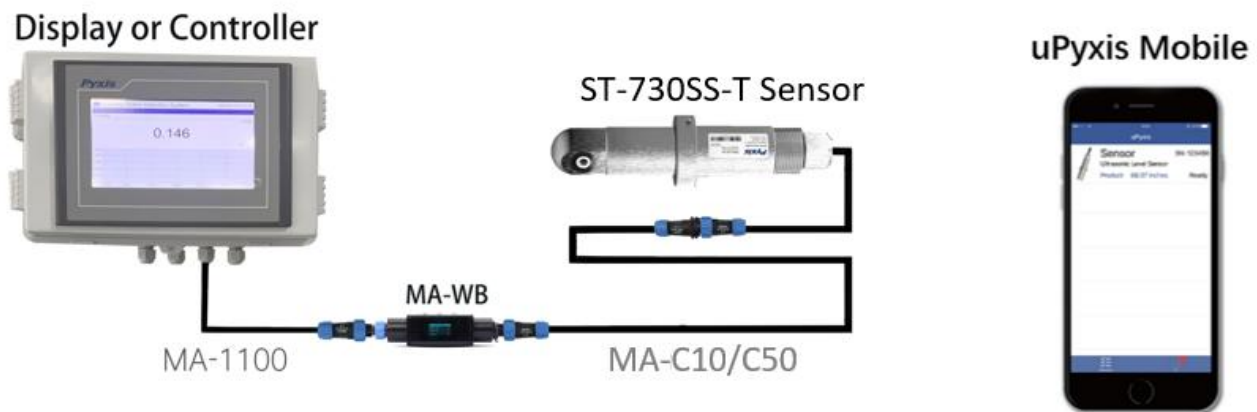


Figure 4. MA-WB Bluetooth connection to 7-Pin Pyxis sensor and uPyxis®2.0 Mobile App

5 Calibration and Diagnosis with the uPyxis®2.0 Mobile App

The ST-730SS series turbidity sensor is available with two-point calibration, process calibration and multi-point calibration. ***IMPORTANT NOTE*** *Because this sensor is commonly used in propylene glycol based critical cooling systems, each sensor is factory calibrated with Pyxis PG25 based turbidity calibration solutions. If the sensor is installed in a non PG25 system (i.e. water only) it is recommended that a two-point, process calibration or multi-point be performed depending on the coolant used. You can calibrate the sensor using the uPyxis®2.0 App or uPyxis®2.0 PC software.*

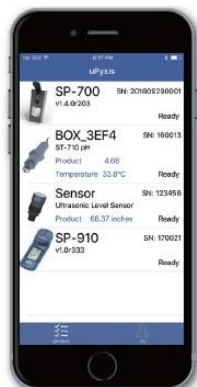
IMPORTANT NOTE *Direct sunlight or indoor light on the ST-730SS-Tseries sensor should be avoided although it is not necessary to completely shield the ST-730SS-T series sensor from the ambient light during both the zero point and slope calibrations.*

IMPORTANT NOTE *Prior to any calibration, the sensor should be checked for cleanliness using the uPyxis 2.0 Diagnostics Function. See Section 5.4 for details. 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 be sure to thoroughly clean the inner optical surfaces as outlined in Section 7.1 of this user manual.*

5.1 Download and Connect to the uPyxis® 2.0 Mobile App



Install the MA-WB Bluetooth adapter as outlined in Figure 4.



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 5. This may take up to one minute.

Tap the discovered ST-730SS-T 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 6, uPyxis will default to the **Trend Chart** page after connected to the sensor via the MA-WB Bluetooth adapter. The measurement value will be displayed as a line graph to show the real-time trend.

Tap **Configuration** 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 5.



Figure 6.

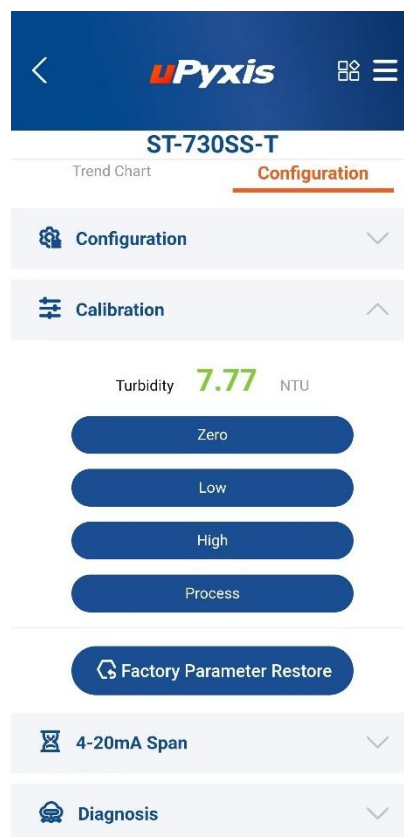


Figure 7.

5.2 Turbidity Calibration via uPyxis 2.0® Mobile App

5.2.1 Two-point calibration

We recommend a low-range or high-range calibration be conducted based on the application need. As an example, if the application is measuring low-range values, then a high-range calibration is unnecessary.

Low Range Calibration

It is recommended to use a standard turbidity solution to do a low range calibration if your typical turbidity measurement is within 0-2 NTU.

➤ Zero Calibration

Rinse the probe a few times with the ZERO calibration solution (A ZERO calibration solution means that the solution is clean and free of turbidity particles), then fill a beaker with zero calibration solution using a pipette to avoid air bubbles. Cover the beaker with a towel and wait for the turbidity reading to stabilize. Click Zero button in the uPyxis®2.0 App and wait for calibration completed. Once the calibration is successful, the turbidity reading will tighten to 0. *Please note it may take 1-2 minutes for the turbidity reading to come close to 0.*

➤ Low Point Calibration

Rinse the probe a few times with 2 NTU turbidity solution, then fill a beaker with 2 NTU turbidity solution using a pipette to avoid air bubbles. Cover the beaker with a towel and wait for the turbidity reading to stabilize. Click Low button and enter low calibration solution value (in this case, input value 2) in the uPyxis®2.0 App, then click Confirm button and wait for calibration completed. Once the calibration is successful, the turbidity reading will tighten to 2. *Please note, it may take 1-2 minutes for the turbidity reading to come close to 2 NTU.*

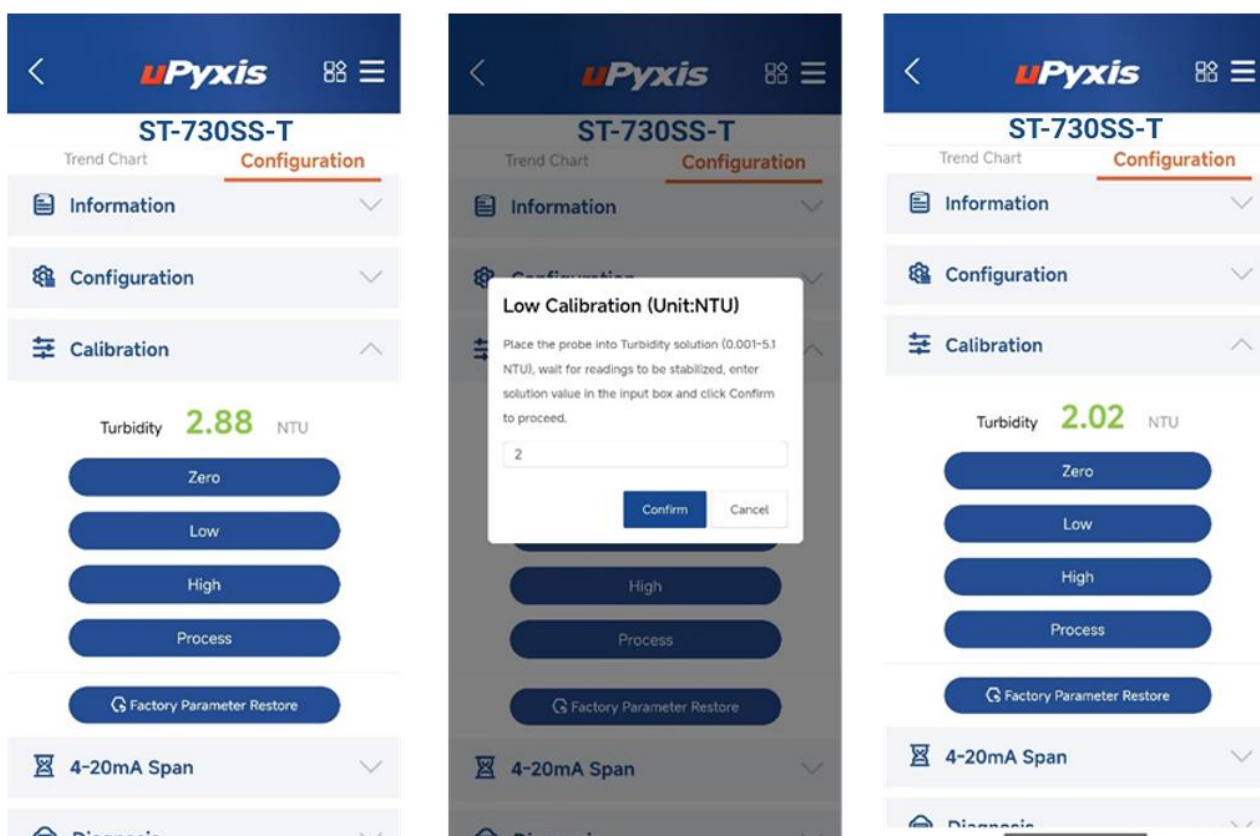


Figure 8

High Range Calibration

If the application turbidity measurement range is greater than 5NTU and less than 100NTU, it is recommended to use a standard solution or process water sample value for a high range calibration.

➤ Zero Calibration

Rinse the probe a few times with the ZERO calibration solution (A ZERO calibration solution means that the solution is clean and free of turbidity particles), then fill a beaker with zero calibration solution using a pipette to avoid air bubbles. Cover the beaker with a towel and wait for the turbidity reading to stabilize. Click Zero button in the **uPyxis®2.0** App and wait for calibration completed. Once the calibration is successful, the turbidity reading will tighten to 0. *Please note it may take 1-2 minutes for the turbidity reading to come close to 0.*

➤ High Point Calibration

Rinse the probe a few times with 50 NTU turbidity solution, then fill a beaker with 50 NTU turbidity solution using a pipette to avoid air bubbles. Cover the beaker with a towel and wait for the turbidity reading to stabilize. Click High button and input high calibration solution value (in this case, input value 50) in the **uPyxis®2.0** App, then click Confirm button and wait for calibration completed. Once the calibration is successful, the turbidity reading will tighten to 50. *Please note, it may take 1-2 minutes for the turbidity reading to come close to 50 NTU.*

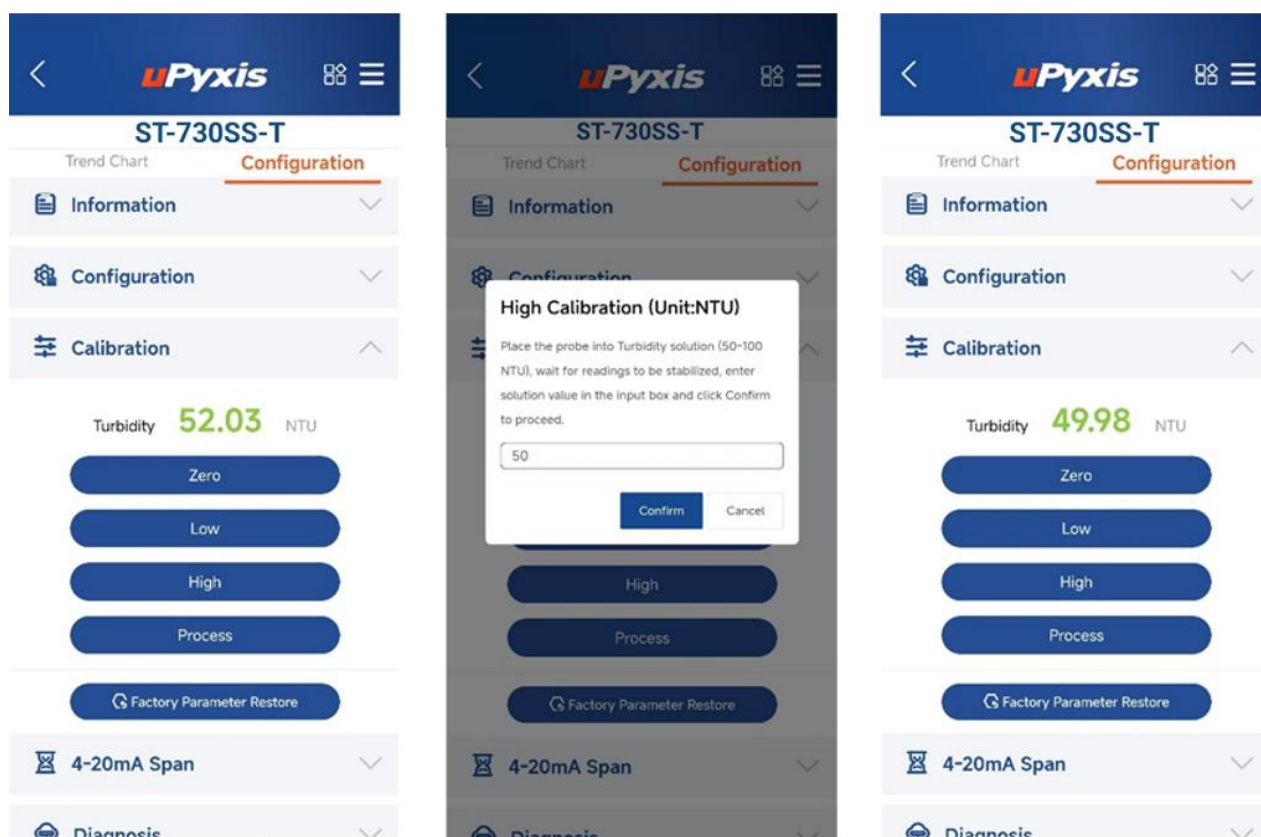


Figure 9

5.2.2 Process Calibration

Process calibration allows users to manually add an offset to the sensor measurement to match the actual turbidity value in the process water or fluid which is often obtained through a handheld turbidimeter. Click Process button, enter the actual handheld measured turbidity value in the **uPyxis®2.0** App and click the Confirm button and wait for the calibration to be completed. Once the calibration is successful, the sensor turbidity reading will tighten up to the actual turbidity value.

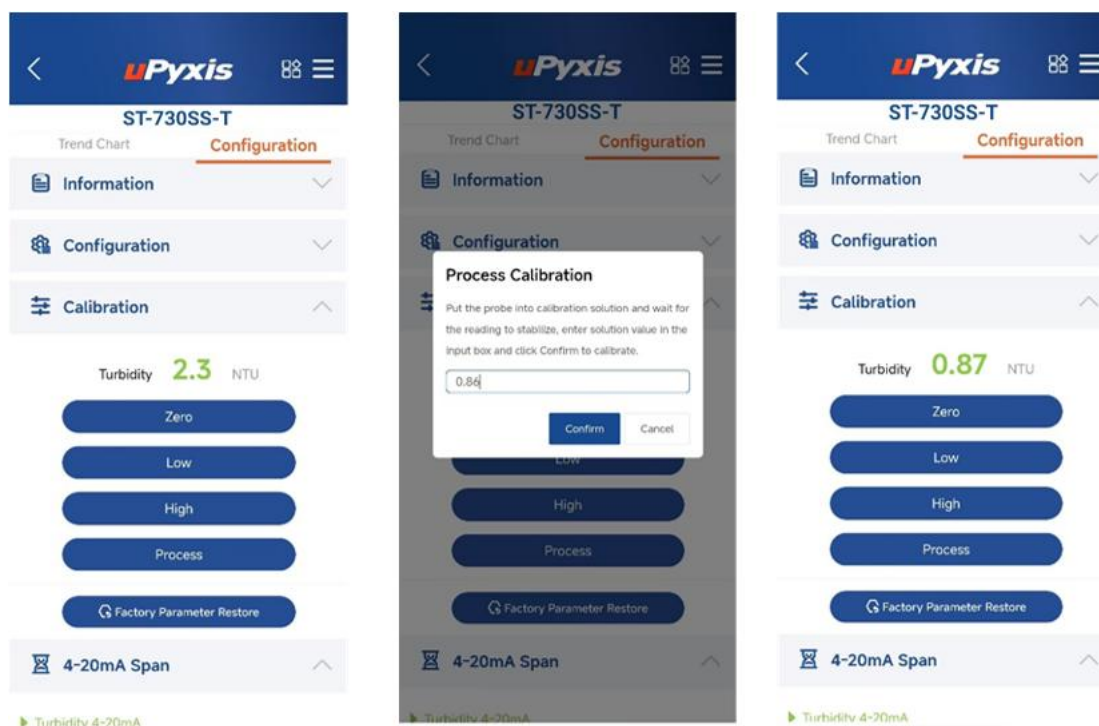


Figure 10

5.2.3 Multi-Point Calibration

A multi-point calibration is recommended if ST-730SS-T series turbidity sensor is installed in a non PG25 fluid system.

Zero Calibration

Rinse the probe a few times with the ZERO calibration solution (A ZERO calibration solution means that the solution is clean and free of turbidity particles), then fill a beaker with zero calibration solution using a pipette to avoid air bubbles. Cover the beaker with a towel and wait for the turbidity reading to stabilize. Click the Zero button in the **uPyxis®2.0** App and wait for calibration to complete. Once the calibration is successful, the turbidity reading will tighten to 0. **Please note, it may take 1-2 minutes for the turbidity reading to come close to 0.** After zero calibration, please do the low point and high range calibration.

Low Point Calibration

Rinse the probe a few times with 2 NTU turbidity solution, then fill a beaker with 2 NTU turbidity solution using a pipette to avoid air bubbles. Cover the beaker with a towel and wait for the turbidity reading to stabilize. Click the Low button and enter the low calibration solution value (in this case, enter value 2) in the **uPyxis®2.0** App, then click the Confirm button and wait for calibration to complete. Once the calibration is successful the turbidity reading will tighten to 2. *Please note, it may take 1-2 minutes for the turbidity reading to come close to 2 NTU.*

High Point Calibration

Rinse the probe a few times with 50 NTU turbidity solution, then fill a beaker with 50 NTU turbidity solution using another pipette to avoid air bubbles. Cover the beaker with a towel and wait for the turbidity reading to stabilize. Click the High button, enter the high calibration solution value (in this case, enter value 50) in the **uPyxis®2.0** App, then click the Confirm button and wait for calibration to complete. Once the calibration is successful, the turbidity reading will tighten to 50. *Please note, it may take 1-2 minutes for the turbidity reading to come close to 50 NTU.*

IMPORTANT CALIBRATION STANDARD NOTES

The ST-730SS-T series are ideally designed for use in the AI Server Critical Cooling markets and used in coolant fluid distribution networks that contain PG25 (propylene glycol) coolant fluid. As such, these sensors are factory calibrated with a unique formazin turbidity solution containing PG25 fluid (propylene glycol) prior to shipping. The sensor may also be used in water-based fluid systems to measure turbidity, and in these applications, users may find that the sensor's measurements in the target system are slightly higher than the actual turbidity value due to the difference in refractive index between water and propylene glycol.

In this case, Pyxis suggests using a handheld turbidimeter to measure the actual turbidity value in the target system to conduct a process calibration on the ST-730SS-T series turbidity sensor. To obtain more accurate reading values, it is recommended to perform multi-point calibration with turbidity solutions made for or from the target system.

Pyxis offers traceable 2 NTU and 50 NTU calibration solutions made for PG25 fluid-based systems. ***NOTE*** *For optimum accuracy, it is highly recommended to use Pyxis traceable PG25 based calibration solutions for field calibration if the ST-730SS-T Series turbidity sensor when installed in a critical cooling network containing PG25 fluid. See Optional Accessories Section 3.2 for details.*

SUGGESTED FORMAZIN CALIBRATION STANDARD RANGES		
Model	ST-730SS-T	ST-731SS-T
Near Zero	Zero solution	
Slope - Low	2 NTU	2 NTU
Slope - High	50 NTU	10NTU

5.2.4 Restoring Factory Calibration Settings

If the user accidentally makes an error during the turbidity calibration of the ST-730SS-T series turbidity sensor, they can restore the factory default calibration settings via the **uPyxis®2.0** application, which will ensure that you get the correct starting point for the next calibration. Click on the Factory Parameter Restore button and then click confirm to restore original factory calibration settings.

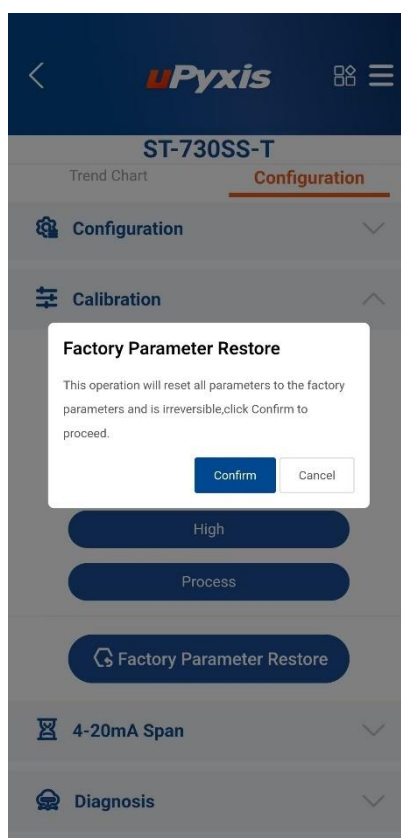


Figure 11 – Restore Calibration

5.3 Adjusting the 4-20mA Span via uPyxis2.0® Mobile App

From the Pyxis factory, the 4–20mA output of the ST-730SS-T series sensors are scaled as follows:

Sensor Name	4mA Value	20mA Value
ST-730SS-T	0 NTU	100 NTU
ST-731SS-T	0 NTU	10 NTU

Users may alter the output scale using **4-20mA Span** to change the Turbidity value corresponding to the 20mA output (*Figure 12*). ***NOTE*** The 20mA value span adjustment may only be equal to or lower than the upper range detection limit of the sensor.

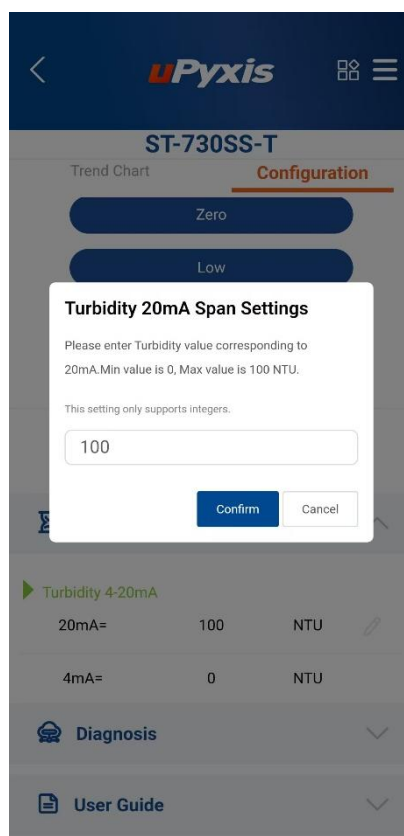


Figure 12 – Adjust 20mA Setting for Turbidity

5.4 Diagnosis Screen

Tap **Diagnosis** in the bottom of the **Configuration** page 13.

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-730SS-T sensor is currently measuring. For the best results, the ST-730SS-T sensor should be installed in a beaker of DI water and covered with a towel. 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-730SS-T section of this manual.

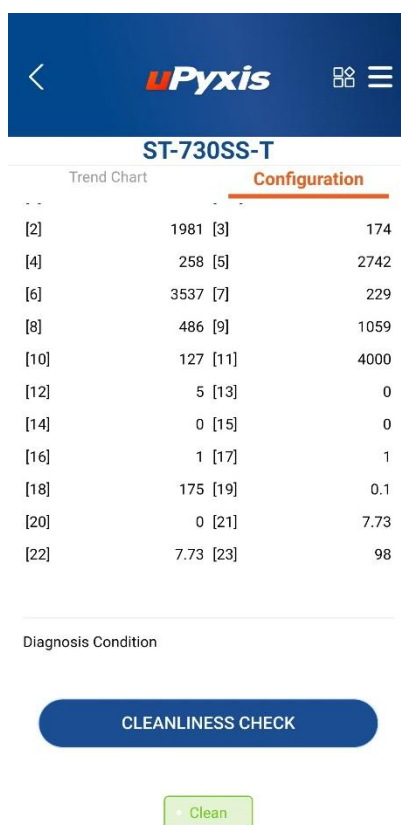


Figure 13.

6 Calibration and Diagnosis with the uPyxis®2.0 Desktop App

The uPyxis®2.0 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.

6.1 Communication using Modbus RTU

The ST-730SS-T Series sensors are configured as a Modbus slave device. In addition to the NTU Turbidity 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.

7 Sensor Maintenance and Precaution

The ST-730SS-T series sensors are designed to provide reliable and continuous turbidity readings even when installed in moderately contaminated industrial 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-730SS-T series sensors are 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 the desired maximum limit.

The ST-730SS-Tseries sensors are designed to be easily removed from the ST-009 inline tee assembly, inspected, and cleaned if required. It is suggested that the ST-730SS-T sensor be checked for fouling and cleaned/calibrated monthly. Heavily contaminated water may require more frequent cleaning. Cleaner water sources with less contamination may not require cleaning for several months.

7.1 Methods to Cleaning the ST-730SS-T Sensor

Any equipment in contact with industrial cooling or process systems is subject to potential foulants and contaminants. Our inline sensor cleaning solution below has been shown to remove the most common inorganic 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/st-series-probe-cleaning-kit/>



Figure 14. Inline Probe Cleaning Solution Kit (P/N SER-01)

To clean the ST-730SS-T sensor, soak the lower half of the sensor in 100 mL inline sensor cleaning solution for 10 minutes. Rinse the ST-730SS-T sensor with distilled water and then check for the flashing blue light inside the sensor's quartz tube (optical channel). If the surface is not entirely clean, continue to soak the ST-730SS-T sensor for an additional time. Use the small, soft bristle brush and Q-Tips cotton swabs as necessary to remove any remaining contaminants in the ST-730SS-T sensor quartz tube.

7.2 Storage

Avoid long term storage at temperatures over 140 °F. In an outdoor installation, properly shield the ST-730SS-T sensor from direct sunlight and precipitation.

8 Troubleshooting

If the ST-730SS-T 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-009 inline tee.

Carry out routine calibration verification against a qualified Turbidity standard. After properly cleaning the ST-730SS-T sensor, carry out the zero-point calibration with distilled water and slope calibration using the qualified Turbidity standard.

9 Contact Us

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