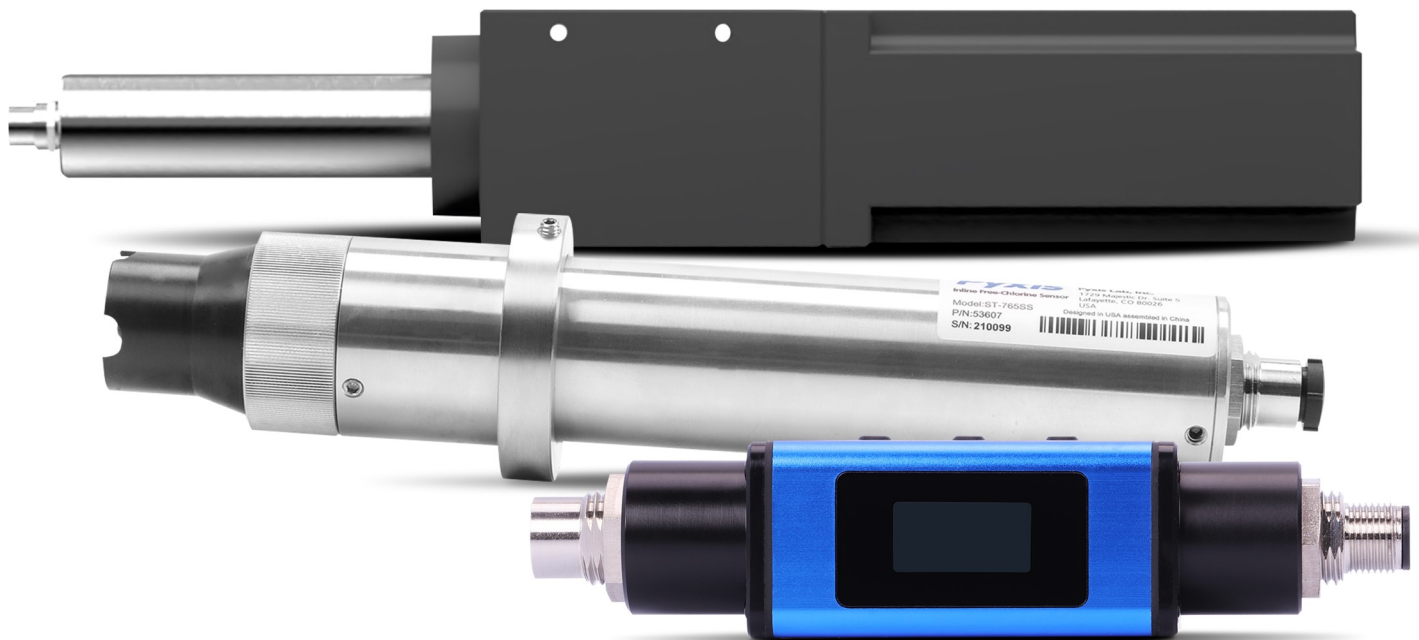# Pyxis®

ST-765SS-Br Bromine + pH
Multi-Parameter Sensor for Cooling & Process Water

Pyxis Lab® Inc.
1729 Majestic Dr. (Suite 5)
Lafayette, CO 80026
www.pyxis-lab.com

USER MANUAL

ST-765SS-Br

Bromine + pH
Multiparameter Sensor
User Manual

January 30, 2023
Rev. 1.5

Pyxis Lab, Inc.
1729 Majestic Dr. Suite 5
Lafayette, CO 80026 USA
www.pyxis-lab.com

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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 for the ST-765SS Series sensor body is thirteen (13) months from original shipment from Pyxis. The Pyxis warranty term for the EH-765 (electrode reference head) installed on the ST-765SS Series sensor body is six (6) months from original shipment from Pyxis. In no event shall the standard limited warranty coverage extend beyond this timeline 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 Request Return or Repair - Pyxis Lab, Inc. (pyxis-lab.com)

Pyxis Technical Support

Contact Pyxis Technical Support at +1 (866) 203-8397 ext. 2, service@pyxis-lab.com

1. Introducing the Pyxis ST-765SS-Br Sensor

Description

The Pyxis ST-765SS-Br is a stainless-steel multi-parameter membrane-less sensor based on unique electrochemical principles to determine Bromine plus pH and temperature of water. This sensor incorporates Pyxis' advanced technology in the field of bare-gold electrochemical detection. The ST-765SS-Br can simultaneously compensate for temperature and pH in the measurement of Bromine based on real-time conditions present in the application of use. This unique internal compensation results in a highly accurate oxidizer measurement consistent with DPD wet chemistry methodology as high as a pH of 9.0+ and is compliant with USEPA – 334.0 and ISO-7393 guidelines.

The ST-765SS-Br sensor offers a replaceable, front loading reference electrode assembly that has been independently developed by Pyxis Lab eliminating the shortcomings associated with membranes and gel replacement while offering reduced polarization time on startup with an electrode life span potential of up to 2-years. The flat front-end design of the ST-765SS-Br makes this platform less prone to contamination or fouling and is easy to clean. The ST-765S-Br sensor body is composed of 304 stainless steel and is well suited for aggressive environments.

The ST-765SS-Br sensor offers 2x 4-20mA and RS-485 Modbus outputs and is Bluetooth 5.0 enabled when used in conjunction with the MA-CR Bluetooth Adapter. This four-electrode composite sensor provides three measured parameters including Bromine, pH and temperature with one sensor equipped with fully integrated 2x 4-20mA and RS-485 Modbus outputs. ST-765SS-Br is uniquely designed for rapid and precise monitoring of cooling and process water applications utilizing Bromine. It should only be used in conjunction with the FR-300-PLUS self-brushing flow reservoir for challenging or dirty water applications.

ST-765SS-Br
Bromine + pH Sensor

Key Features

- Real-Time pH + Oxidizer (0-5ppm) Detection
- Dual 4-20mA Outputs (Oxidizer + pH) and RS-485
- Bluetooth Enabled when used with MA-CR Adapter Wireless uPyxis Calibration
- Integrated RTD & pH Compensation to pH 9.0+ of the Oxidizer Value
- Replaceable EH-765 Reference Electrode Assembly – Simple Maintenance

Common Applications

- Cooling Water
- Food & Beverage Process Water
- Industrial Process Water

EH-765
*Replacement Electrode
for all ST-765SS Series*

1.1 Specifications

Item	ST-765SS-Br
P/N	59643
Sensor Body Material	304SS
Oxidizer Range	0.00-5.00 ppm Bromine
Oxidizer Precision	± 0.01mg/L or 1% of the value w/pH compensation up to 9.0+
pH Range	0-14
pH Precision	$\pm$0.01 pH
Sample Inlet Pressure	7.25 – 30 psi (0.05 – 0.2MPa)
Installation	FR-300-PLUS Magnetic Coupling Brushing Flow Reservoir
FR-300-PLUS Suggested Flow Rate	200 – 800 mL/minute
FR-300-PLUS Sample Inlet /Outlet	3/8 - inch OD
FR-300-PLUS Operation	24VDC/2.5W Powered Constant ON Mode for Relay Control and RS-485
FR-300-PLUS Rotational Speed	200 RPM – Motorized Brush Preset for Constant Operation
Sensor Power Supply	22 – 26VDC, Power Consumption 2W
Storage Temperature	-7 °C – 60 °C (20 – 140 °F)
Outputs	Dual Isolated 4 – 20 mA Analog Outputs + Isolated RS-485 Digital Output
Dimension (L x D)	Length 8.3 inch (210.8 mm), body diameter 1.4 Inch (35.6 mm)
Weight	530 g (1.16lbs)
Maximum Sensor Pressure	100 psi (6.9 Bar) – Sensor Only
Operating Temperature	4 °C – 49 °C (40 – 120 °F)
Wet Material	UPVC
Rating	IP67, Fully Dustproof & Waterproof
Selectivity	Non-Selective / Cross Sensitive to other Oxidizing Species
Compliance	EPA 334.0 / ISO 7393
Regulation	CE Marked / RoHS
Cables Included	MA-4.9CR Cable (8Pin Adapters – 1.5m) MA-1.5CR Cable (8 Pin Adapter / Flying Leads – 1.5m)
Typical Electrode Service Life	2 Years
Electrode Warranty	6 Months
Sensor Body Warranty	13 Months

NOTE *Specifications are subject to change without notice.*

1.2 Unpacking the ST-765SS-Br

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 items listed on the packing slip are included. If any items are missing or damaged, please contact Pyxis Customer Service at service@pyxis-lab.com

1.3 Standard Accessories

- One **ST-765SS-Br** Series sensor (P/N: 59643)
- Includes One **MA.4.9CR** – (Standard Cable Male-Female 8-Pin Adapters – 1.5m)
- Includes One **MA-1.5CR** – (Flying Lead Cable Female/Flying Lead 8-Pin Adapter – 1.5m)
- The full instrument manual is available for download at Support Documents - Pyxis Lab, Inc. (pyxis-lab.com)

1.4 Optional Accessories

The following optional accessories can be purchased via order@pyxis-lab.com or your preferred Pyxis Lab distributor.

Accessory Name	Item number
EH-765 *(Replacement Reference Electrode Head for ST-765SS Series)*	53601
FR-300-PLUS (*Replacement FR-300+ Auto-Brushing Flow Assembly*)	50700-A44
FRP-300-1 (*Replacement Brush Head for FR-300-PLUS*)	50700-A49
MA-AC-7US *(110VAC Power Supply Adapter for FR-300-PLUS with USA Plug)*	26398
MA-AC-7EU *(230VAC Power Supply Adapter for FR-300-PLUS with EU/DIN Plug)*	28787
FLOWSWITCH-ROTAMETER *(Adjustable Contact Flow Switch Rotameter 6 - 60 Liter/Hour – Panel Mounted)*	21766
MA-CR *(Bluetooth Adapter For use with Pyxis 8-Pin Sensors)*	MA-CR
MA-NEB *(USB Bluetooth Adapter for use with Laptop or Desktop for uPyxis)*	MA-NEB
MA-50CR *(Extension Cable-50 feet)*	50743
UC-50 *(Display + Data Logging Terminal)*	43007
pH4-7-10 Combination Pack - Reference Standard Solutions *(500mL/each)*	57007
SP-200 OxiPocket *(Pocket All-Oxidizing Disinfectants Colorimeter & Fluorometer)*	50802
IK-765SS-Br-B *(ST-765SS-Br Sensor + FR-300-PLUS Flow Reservoir + UC-50 Display/Data Logger Panel Mounted)*	44074

2. Dimension

See dimension diagrams below for ST-765SS Series and FR-300-PLUS.
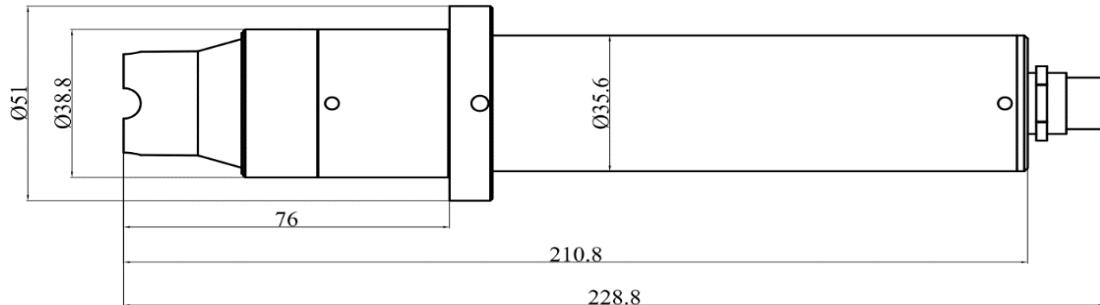
ST-765SS Series Dimensions (mm)

Figure 1. - Dimension of the ST-765SS Series (mm)
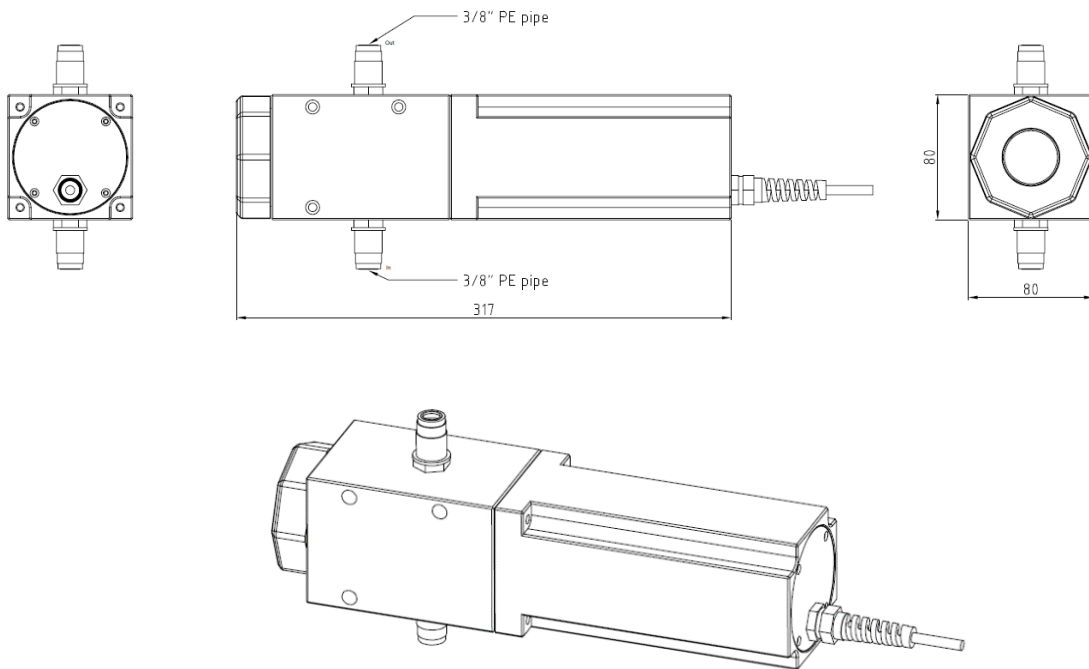
FR-300-PLUS Dimensions (mm)

Figure 2. — FR-300-PLUS (mm)
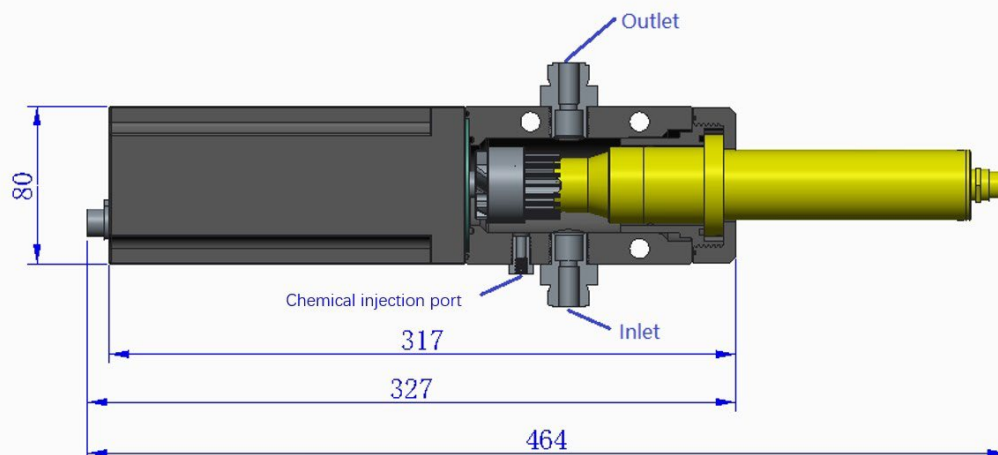
3. FR-300-PLUS Installation & Operation

The Pyxis FR-300-PLUS is a magnetic coupling motorized brush flow assembly that provides an inline mechanical cleaning of the ST-765SS Series bare gold electrode enabling sensor accuracy in challenging industrial cooling and process waters. This unique device enhances the convective mass transport of the oxidizer or reducing agent analyte to the sensor electrode surface eliminating the need for precision flow control commonly required for other amperometric sensors on the market. The FR-300-PLUS also provides supplemental deactivation protection of the bare gold electrode for long life, stability, and precision accuracy in extremely challenging waters. The FR-300-PLUS is also designed to be utilized with a wide variety of alternative Pyxis inline sensors for a broad range of measurement. These additional sensors are outline in this document.

The FR-300-PLUS contains a 'chemical injection port' in the assembly housing allowing for the optional injection of cleaning agents at the brush head for extremely challenged industrial waters containing fats, oils and grease. This port may also be used for the addition of Potassium Iodide for measurement of "True Total Chlorine". The FR-300-PLUS may be operated at a broad range of regulated sample flow from 200 and 800mL per minute with an inlet pressure of <30 psi. The FR-300-PLUS outlet flow line should be diverted to drain or returned to an atmospheric tank/sump within the process itself for reuse.
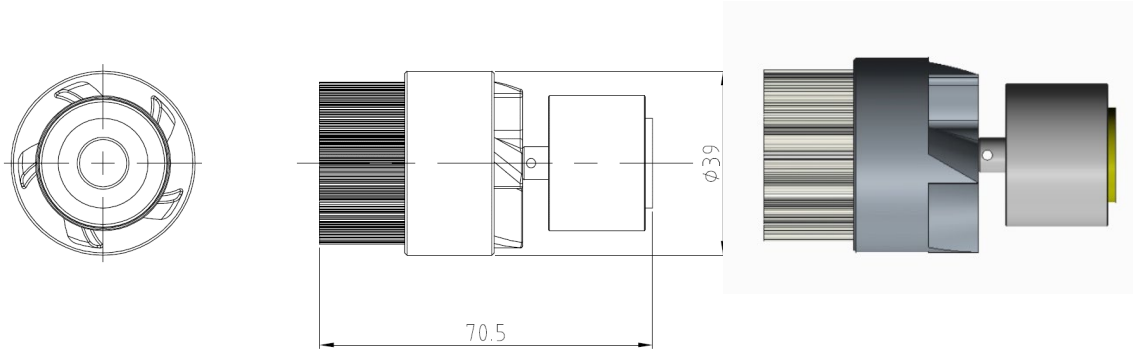
The FR-300-PLUS comes equipped with a magnetically coupled brush mounted in the liquid end of the flow reservoir. Operational life of the brush is typically 1+ year of service however this is application dependent based on water quality. The brush is held in place via magnetic coupling to the motor shaft for rapid tool-free removal and replacement. Brush replacement is outlined in the later sections of this document.

The FR-300-PLUS requires 24VDC power supply at approximately 2.5watts and can be directly connected to the OEM controller or may be powered by the optional Pyxis Lab outlet power supply adapter accessories available for both 110VAC and 230VAC outlet operation. (Purchased separately)
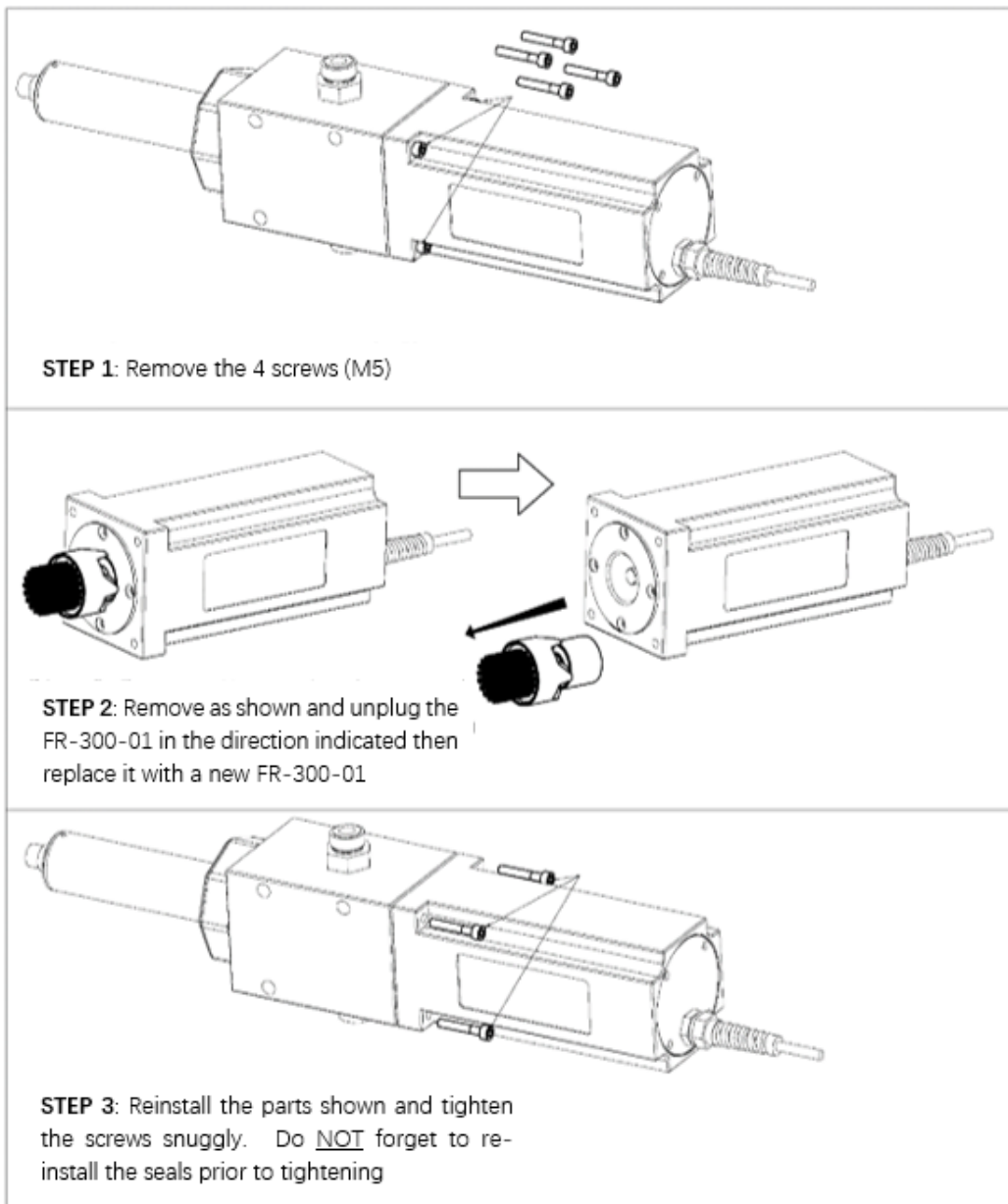
Pyxis Lab has developed a wide variety of pre-assembled analyzer panels incorporating the proprietary ST-765SS series sensor in combination with FR-300-PLUS self-brushing flow assembly and the UC-Series of Pyxis display and data logging terminals. Alternatively, the ST-765SS Series sensors and FR-300-PLUS self-brushing flow assembly may be utilized with OEM controllers, PLC's and DCS networks to providing a higher level of control for system chemistry applications while incorporating the unique Pyxis bare-gold sensor technology.

FR-300-01 Replacement Brushing Assembly Dimensions (mm) & Image

FR-300-01 Replacement Brushing Assembly Replacement Procedure

STEP 1: Remove the 4 screws (M5)

STEP 2: Remove as shown and unplug the FR-300-01 in the direction indicated then replace it with a new FR-300-01

STEP 3: Reinstall the parts shown and tighten the screws snuggly. Do NOT forget to re-install the seals prior to tightening

FR-300-PLUS Installation & Operation Guidelines

Mounting: The FR-300-PLUS must be securely mounted to a back panel through the three (3) pre-drilled screw mounting holes in the reservoir body, with the Pyxis sensor aligned in a horizontal format as seen in the figure below. *NOTE* *Sensor may be aligned to the left or right as desired.*
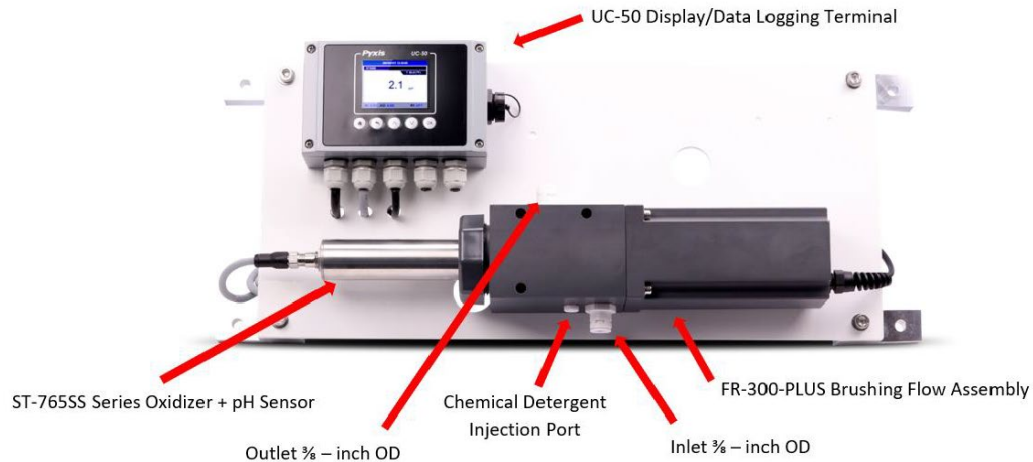
Controller/PLC Provided Power Supply & Operation Mode: The FR-300-PLUS is a stand-alone unit and requires 24VDC power supply to operate. Operating 100% of the time is the Pyxis suggested form of operation of the FR-300-PLUS, however some clients may desire to operate on a timed cycle or flow condition basis on desired cleanliness and system operation. This can be done via the connected controller as a powered relay activating the FR-300-PLUS on a timed sequence or system flow switch relay. See wiring section for FR-300-PLUS wiring.

Outlet Provided Power Supply & Operation Mode: For applications that require outlet provided power supply to the FR-300-PLUS, Pyxis offers **MA-AC-7US** (P/N 26398) and **MA-AC-7EU** (P/N 28787) power supply adapters in both 110VAC-USA (Type B) and 230VAC-EU (Type DIN) formats as optional accessories. These accessories allow the FR-300-PLUS to be outlet powered and operational 100% of the time. See order information section of this document for details.

RS-485 Communication: The FR-300-PLUS offers RS-485 connectivity which allows for rotational brush speed, operation and duration for those desiring precision control. Full time operation is suggested by Pyxis Lab for optimum sensor cleanliness.

Inlet/Outlet Flow: When mounted horizontally the inlet water flow to the FR-300-PLUS should enter the bottom of the unit via inlet port (3/8-inch OD) as seen in image above. The outlet water flow should exit the top of the unit via the outlet port (3/8-inch OD). The inlet water pressure should not exceed 30 psi. The outlet water should be returned to open sump at atmospheric pressure. The range of flow through the FR-300-PLUS should be consistently regulated between 200 and 800mL/minute. An inlet rotameter may be installed to verify and regulate inlet flow however, this is not absolutely necessary and a manual flow verification test is sufficient as long as flow remains consistently regulated. *NOTE* *The FR-300-PLUS should be installed in a way to ensure the ST-765 series sensor remains flooded and wet regardless of flow condition.*

Calibration: Once flow has been established and regulated, an in-situ slope calibration of the sensor can should be conducted using field analysis of the sample being measured. *(i.e. DPD Free Chlorine)* See ST-765SS Series Operation Manual for detailed calibration instructions.

OxiPanel IK-765SS-Br (Bromine + pH + Temperature Online Monitoring Panel)

For customers desiring a "Turn-Key" analyzer, the IK-765SS-Br is a pre-assembled Bromine + pH + Temperature monitoring panel. The IK-765SS series offers highly accurate, real-time measurement, display and data-logging of Bromine, pH and Temperature utilizing proprietary Pyxis Lab smart sensor technology, coupled with a Pyxis UC-50 micro display and data logging terminal. The IK-765-B also incorporates the uniquely designed FR-300-PLUS automated mechanical brush flow assembly which is directly controlled via the UC-50 display to maintain optimum sensor electrode cleanliness in the most challenging of system water.

The UC-50 is a microprocessor display/data-logging terminal that has been preconfigured to connect Pyxis inline sensors with fully integrated calibration, scaling and measurement protocol. The user may also configure and calibrate the output signal through the UC-50 controller's screen.

Item	P/N	Description
IK-765SS-Br-B	44074	ST-765SS-Br Sensor + FR-300 PLUS Flow Reservoir + UC-50 Display/Data Logger

Image and Dimensions of IK-765SS Series (mm)
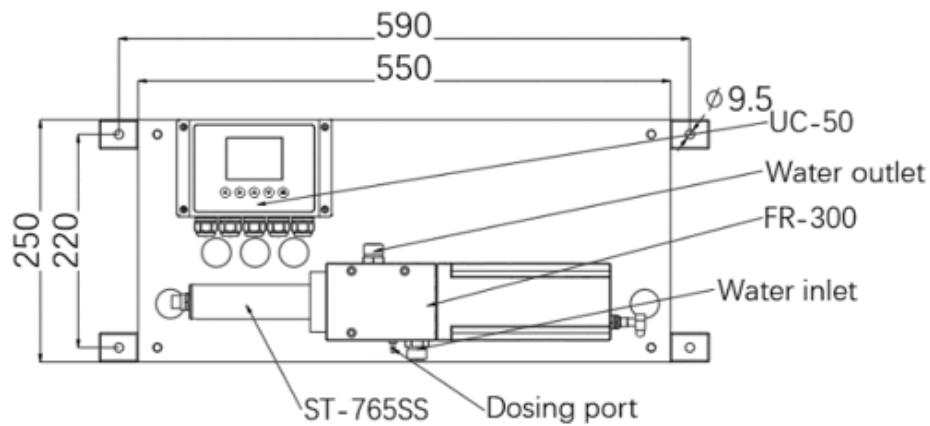
Figure 3 – IK-765SS-Br Series Panel

4. Wiring of ST-765SS-Br Sensor & FR-300-PLUS Flow Reservoir

ST-765SS-Br Wiring Instructions

Follow the wiring table below to connect the ST-765SS-Br sensor to a controller or PLC. *NOTE* All Pyxis sensors provide a passive 4-20mA output signal, they are UNDERLINE LOOP POWERED. 24VDC+ power supply and 4- 20mA+ signal are independent of each other in all Pyxis Lab sensors. If the 24V power ground and the 4-20 mA-return in the controller are internally connected (non- isolated 4-20mA input), it is unnecessary to connect the 4-20 mA- (Gray wire) to the 4-20 mA negative terminal in the controller.

Wire Color	Designation
Red	24 V +
Brown	Power Ground
Green	Shield, solution ground
Gray	4-20 mA -
White	4-20 mA + for Bromine
Pink	4-20 mA + for pH
Blue	RS-485 A
Yellow	RS-485 B
Black	Shield, solution ground

NOTE Pyxis recommends the 24VDC power supply to the ST-765 series sensor be turned OFF for systems that experience extended periods of stagnant water conditions exceeding one hour in duration. Upon sensor power-up, the ST-765 series will complete a 5-minute electrode initialization to remove any oxide layer from the gold electrode which accumulates during stagnation. The sensor will output 1mA for oxidizer/reducer during this initialization process and return to its normal reading with 4-20mA output once complete.

ST-765SS-Br Sensor 4-20mA Scaling		
Unit of Measure	4mA Value	20mA Value
pH	0.00 pH	14.00 pH
Bromine	0.00 ppm	5.00 ppm

FR-300-PLUS Wiring Instructions

Follow the wiring table below to connect the FR-300-PLUS to a controller or the Pyxis UC-50 via 24VDC and RS-485 Modbus. Alternatively, any OEM controllers capable of providing 24VDC power supply may also be used. The FR-300-PLUS may be operated 100% of the time with no issue, simply by providing the unit 24VDC power supply. Some users may also consider operating the FR-300-PLUS as desired in an ON/OFF relay format based on their application needs. *NOTE – The FR-300-PLUS may be operated via 110VAC or 230VAC outlet power supply by utilizing optional Pyxis power supply adapter cables with plug purchased separately. See the ORDER DETAILS section of this document for details.*

Pin #	Wire Color	Designation
1	Red	24V
2	Black	0V
3	Blue	485A
5	Yellow	485B
7	Silver	Ground
4	White	NA
6	Green	NA

5. Calibration and Diagnosis

The ST-765SS Series sensors are rigorously calibrated before leaving the factory. As such, users do not need to calibrate the sensor for a period of three months or up to one year <u>if the sensor is maintained in clean condition</u>. Users can however calibrate the sensor according to their application needs and as desired using the MA-CR Bluetooth adapter and uPyxis APP for mobile or desktop devices.

4.1 Calibration and Diagnosis by uPyxis Mobile App

Connect and power the ST-765SS sensor using the MA-CR Pyxis Bluetooth adapter (P/N: MA-CR) as shown in the following connection diagram. The power should be sourced from a 24 VDC power terminal of a controller. If a controller is not available, please purchase a 24VDC power supply.

MA-CR Bluetooth Adapter

Controller or Display   **uPyxis Mobile app**
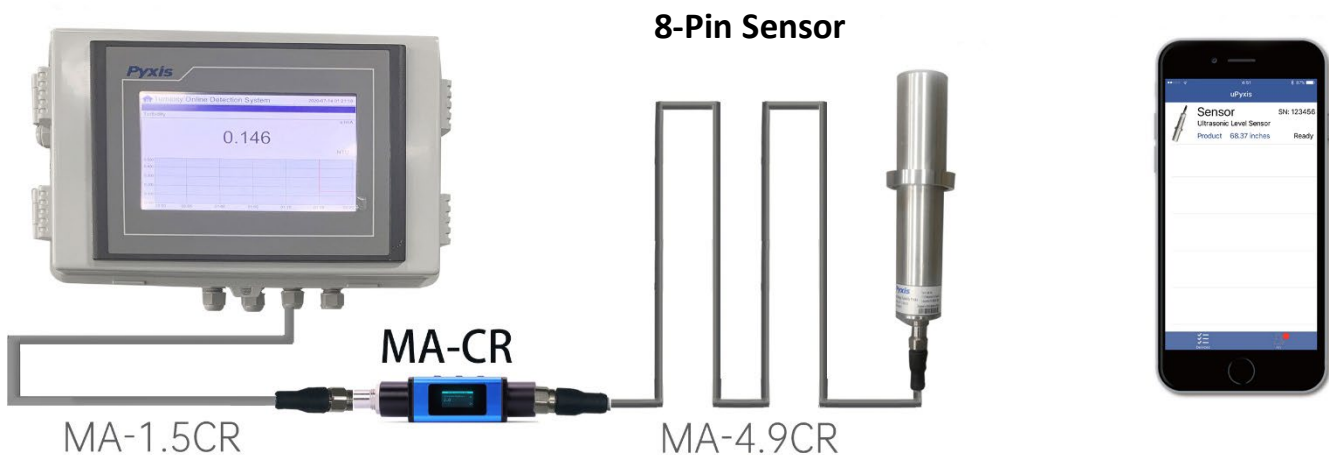
8-Pin Sensor

Figure 4. –

Power the ST-765SS via Display or Controller with the MA-CR Bluetooth Adapter inserted between Bulkhead & Flying Lead Cables

Download and install the uPyxis app from **Apple Store** or **Google Play**. Turn on the Bluetooth in the smart device (please do not pair your device Bluetooth to uPyxis, the app will do the pairing). Open the uPyxis app in the device. Swipe down with finger to refresh the screen to scan the available Pyxis Bluetooth devices.   The discovered devices will be listed as shown in *Figure 5*.

Tap the discovered ST-765SS sensor to connect to the sensor. The uPyxis app can identify the sensor type if multiple Pyxis sensors are discovered in the scan.

As shown in *Figure 6,* in the calibration page of uPyxis after connected to the sensor via the MA-CR Bluetooth adapter the current Bromine, pH and temperature values will be displayed. Six functional tabs of each are available in this page: Zero Calibration, Slope Calibration, pH Low Calibration, pH 7 Calibration, pH High calibration and 4-20mA Span.
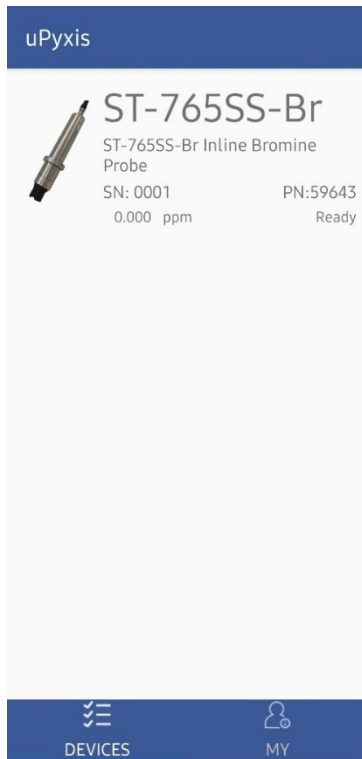

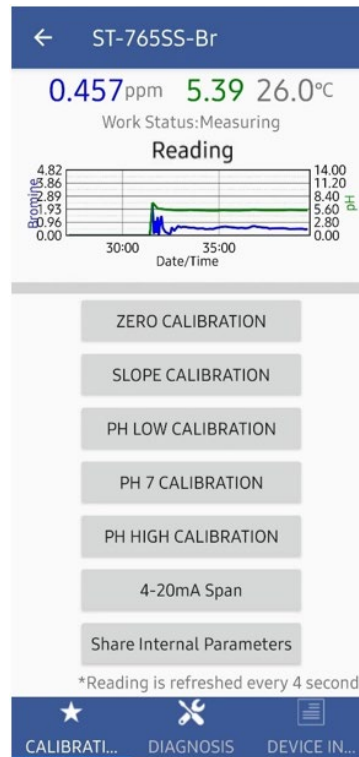*Figure 5 - ST-765SS Discovered via Bluetooth*

Figure 6 - Calibration Page

4.1.1 Bromine Calibration

The oxidizer measurement module of ST-765SS Series is rigorously calibrated before leaving the factory. If calibration is required, users can perform single-point or two-point calibration as required. Calibration for Zero and Slope Calibration using a known standard and actively flowing sample that has been tested and measured by DPD wet chemistry method is recommended.

4.1.1.1 Single Point Calibration Procedure

The ST-765SS Series must be slope calibrated in the FR-300-PLUS flow reservoir provided with the sensor and must have **CONSISTENT** flow within the specified range of 200 to 800mL per minute. Determine the Bromine concentration in ppm of the sample water taken from the FR-300-PLUS output sample by using the DPD method on a portable or laboratory colorimeter (i.e.. Pyxis SP-200 / SP-800 / SP-910 or similar). Launch the uPyxis app and connect to the ST-765SS Series sensor. Tap **SLOPE CALIBRATION**. Enter the Bromine concentration determined by the DPD method in the dialog window as shown in Figure 7. Please make sure that the sensor reading has been stable for at least 10 minutes before calibration. For best results, the concentration of the bromine sample flow standard should be in the range of 0.1 to 5.0 ppm.

4.1.1.2 Two-Point Calibration Procedure

Zero-point Calibration: Launch the uPyxis app and connect to the ST-765SS sensor. Remove the ST-765SS sensor from the FR-300 flow reservoir and place the sensor into a beaker containing Pyxis Zero-oxidizer Calibration Standard Solution (P/N 21022), then tap **ZERO CALIBRATION** in the uPyxis app. Please allow sufficient time (a few minutes) for the sensor to stabilize before performing the calibration. ***NOTE*** Users may also use up to 100 us/cm conductivity standard as a ZERO CALIBRATION solution.

Slope-point Calibration: Insert the ST-765SS Series sensor back into the FR-300-PLUS flow reservoir and reestablish sample flow. The ST-765SS Series must be slope calibrated in the FR-300-PLUS flow reservoir provided with the sensor and must have **CONSISTENT** flow within the specified range of 200 to 800mL per minute. Determine the Bromine concentration in ppm of the sample water taken from the FR-300-PLUS output sample by using the DPD method on a portable or laboratory colorimeter (i.e.. Pyxis SP-200 / SP-800 / SP-910 or similar). Launch the uPyxis app and connect to the ST-765SS Series sensor. Tap **SLOPE CALIBRATION**. Enter the bromine concentration determined by the DPD method in the dialog window as shown in Figure 7. Please make sure that the sensor reading has been stable for at least 10 minutes before calibration. For best results, the concentration of the bromine sample flow standard should be in the range of 0.1 to 5.0 ppm.
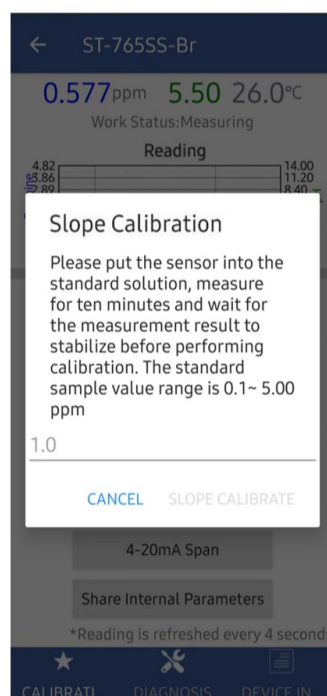

Figure 7 –   Enter Test Confirmed Bromine Concentration to begin Slope Calibration

4.1.2 pH Calibration

Remove and place the sensor in a low pH (i.e.. 4.0) calibration standard solution and tap **pH LOW CALIBRATION** in the uPyxis app. Measure for 1 minute and wait for the measurement result to stabilize before performing calibration, the low pH calibration standard value range acceptable for this step is 1.00-6.00 pH.

Place the sensor into the pH 7.0 calibration standard solution and tap **pH 7 CALIBRATION** in the uPyxis app. Measure for 1 minute and wait for the measurement result to stabilize before performing calibration.

Place the sensor in a high pH (i.e. 10.0) calibration standard solution and tap **pH HIGH CALIBRATION** in the uPyxis app. Measure for 1 minute and wait for the measurement result to stabilize before performing calibration, the high pH calibration standard value range acceptable for this step is 8.00-13.00 pH.
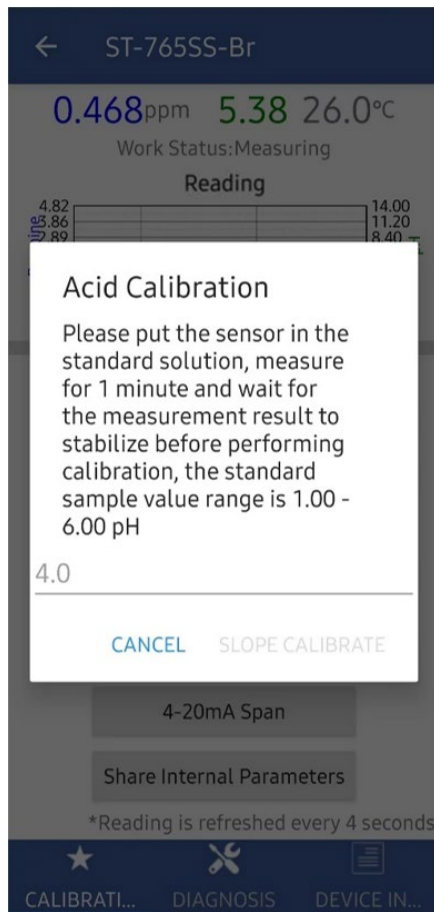

Figure 8
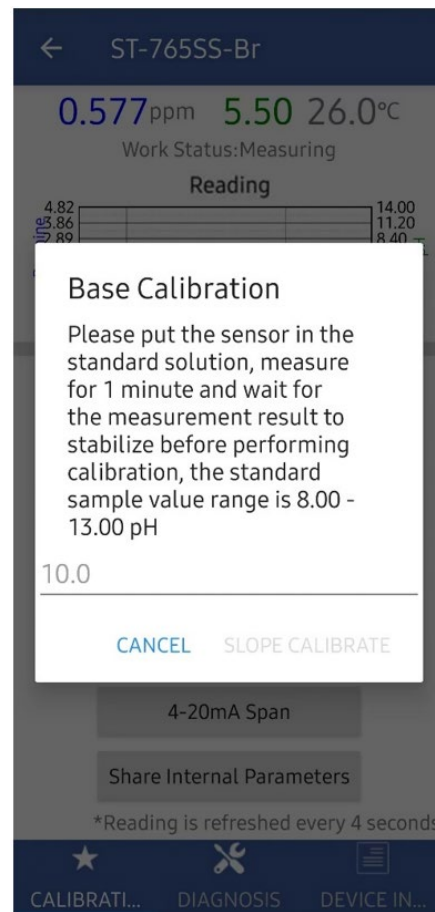*Enter Low-pH Concentration for Calibration*

Figure 9
Enter High-pH Concentration for Calibration

4.1.3 4-20mA Span

The 4–20mA output of the ST-765SS-Br sensor is scaled as:

- Bromine:
    - 4 mA = 0 ppm
    - 20 mA = 5 ppm

Tap **4-20mA SPAN** to change the bromine value corresponding to the 20mA output to a <u>lower value</u> as seen in *Figure 10*. ***NOTE*** The 4-20mA Span feature allows users to REDUCE the upper 20mA output scale only. <u>You cannot INCREASE the upper limit of the sensor beyond the range of the sensor.</u>
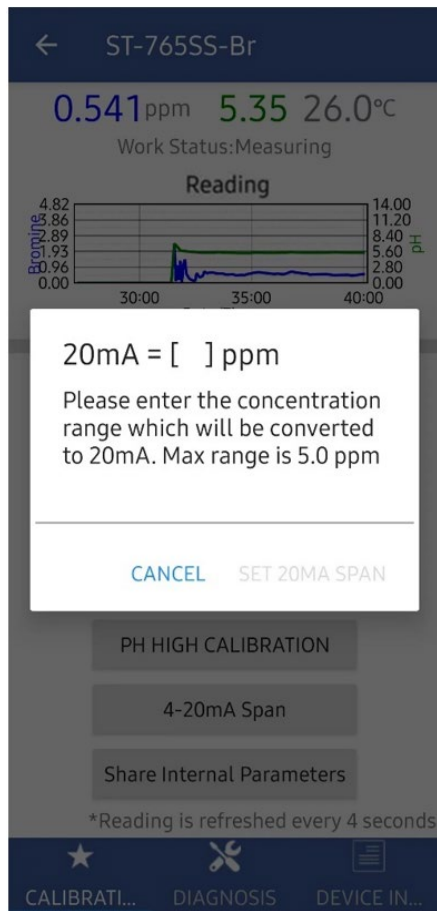
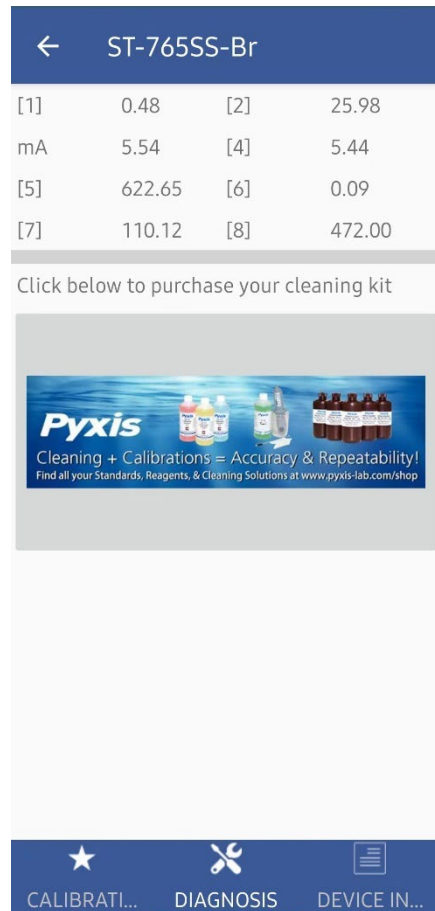*Figure 10 – Adjust 20mA Setting for Bromine (<5ppm)*   *Figure 11 - Diagnostic Interface*

4.1.4 Diagnosis

Tap **Diagnosis** in the bottom of the app page to launch the diagnosis page *Figure 11*.

In this page, the raw data measured by the sensor is displayed. To help troubleshooting possible issues with the sensor, please save images of these data when the sensor is respectively placed in a clean water (tap water or deionized water), in a pH standard solution, and in the sample that the sensor is intended for. This data may be exported from the uPyxis APP via email to <u>service@pyxis-lab.com</u> for technical support.

4.2   Calibration and Diagnosis by uPyxis Desktop App

1) Download and install uPyxis Desktop APP from

https://upyxis.pyxis-lab.com.cn/release/pc/uPyxis.Setup-latest.zip

2) Connect a USB Type-C cable to the port at the bottom of the MA-CR and to the USB port of the laptop or computer. This will provide power the MA-CR from the laptop/computer.   Connect the MA-CR to the ST-765SS-Br sensor. The MA-CR Bluetooth adapter will boost the 5V of the regular USB to 24V to power the sensor for use with uPyxis Desktop.

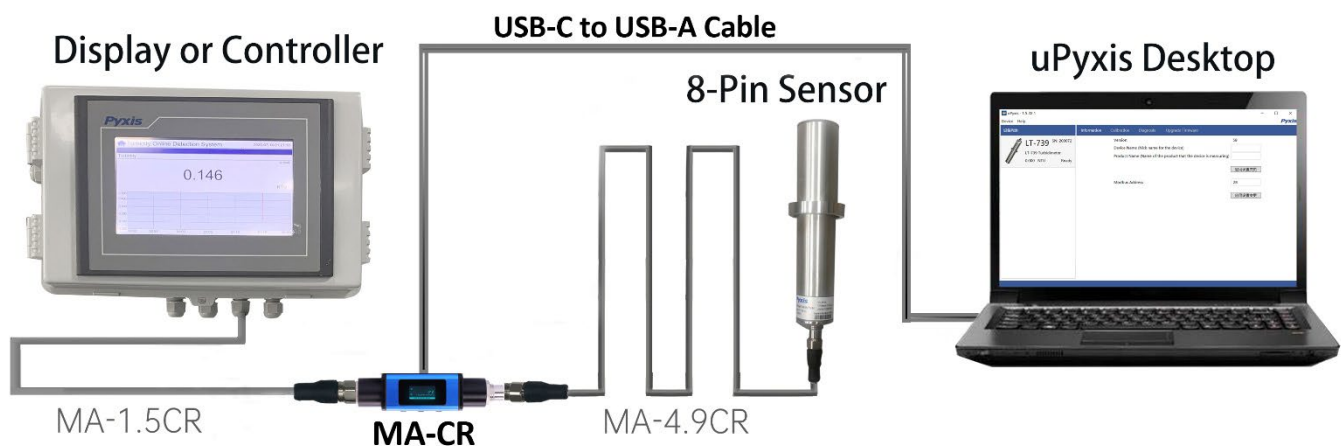*MA-CR Bluetooth Adapter – Bottom USB-C*

Figure 12 – MA-CR Connected to Sensor & Laptop

3) Set the MA-CR to operate in USB Mode by following the steps below.

   a. Once the MA-CR screen is powered Press ◀ or ▶   until you arrive at (USB to RS485) screen.
   b. Press the **OK** Button.
   c. Follow Prompts below to Enable USB feature. Once enabled, you may connect to uPyxis.

4) Open the desktop uPyxis APP.

5) Click Device to launch the connection option menu.

6) Select Connect via USB-RS485 (*Figure 1*3).

7) Select the Comm Port to make a connection. Normally only one Comm port is identified by uPyxis (*Figure 14).* If more than one Comm port listed in the selection dropdown, you may try to select each one to see if a connection can be made. Alternatively, you may use the Windows Device Manager to identify the Comm Port that the Pyxis USB adapter is using.

After the connection is established, the ST-765SS sensor series number and Bromine reading will be displayed on the left of the information page *Figure 15*. In this page, a nickname can be assigned to the sensor. The sensor Modbus address can also be changed if desired. Click Calibration to launch the calibration page *Figure 16*.
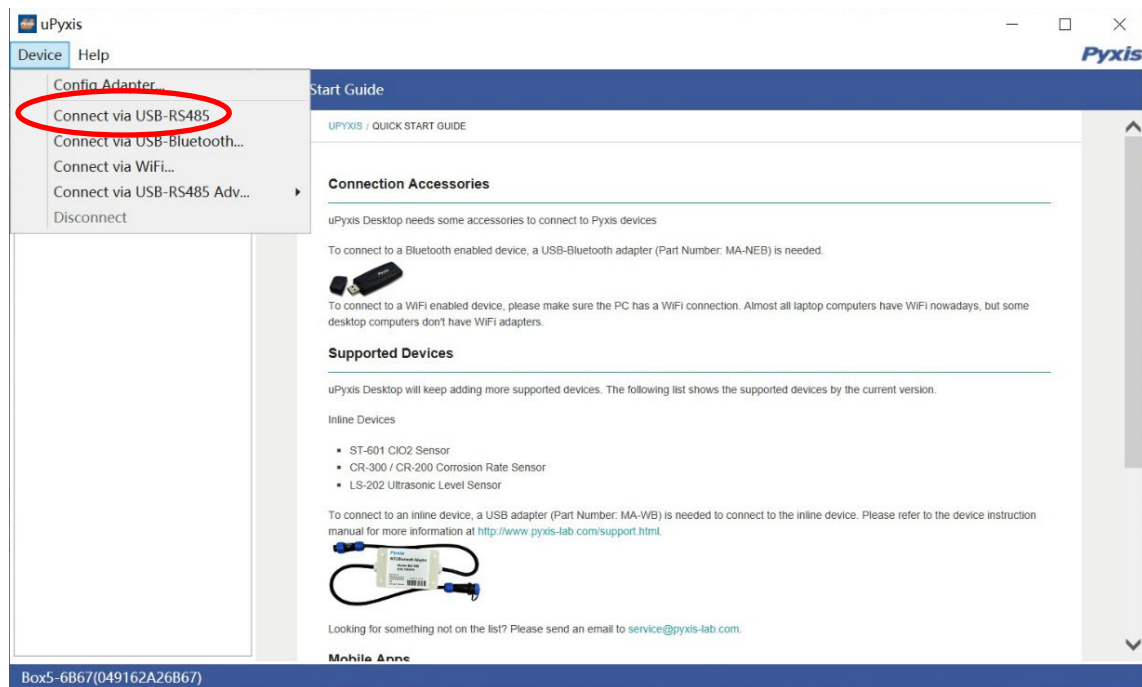

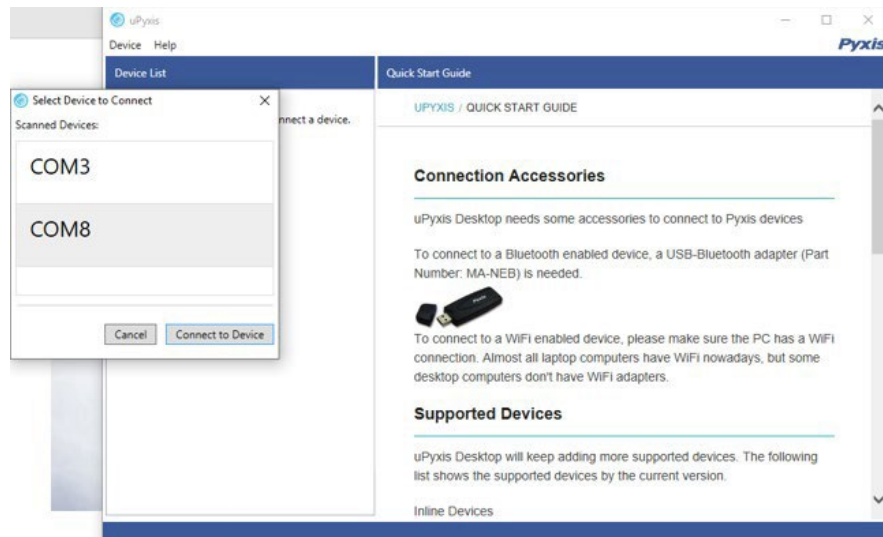
Figure 13 - Connection Options
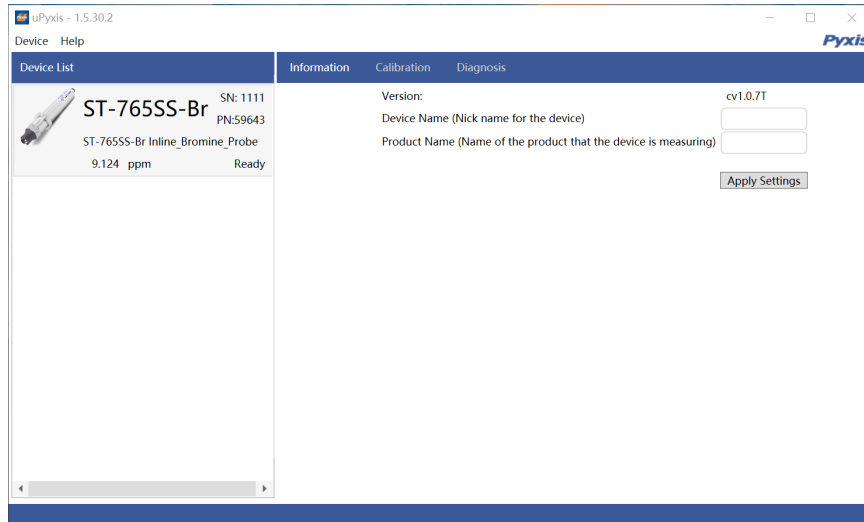
Figure 14 - Select a Comm port

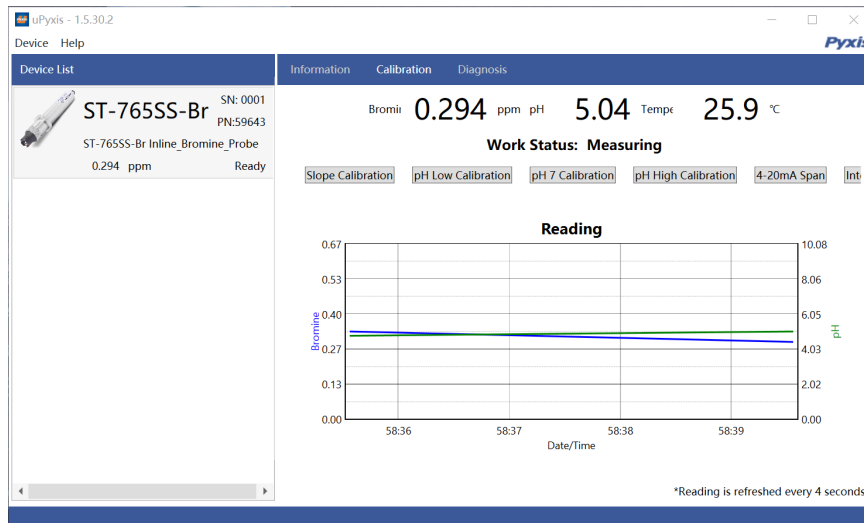*Figure 15 - Connected to ST-765SS-Br sensor and information page*

Figure 16 - Calibration Page

4.2.1 Bromine Calibration

The measurement module of the ST-765SS-Br sensor is thoroughly calibrated at the Pyxis Lab factory. To calibrate, the user can perform a single-point calibration according to the requirements of the application. Calibration for Zero and Slope Calibration using a known standard and actively flowing sample that has been tested and measured by DPD wet chemistry method is recommended.

4.2.1.1 Single Point Calibration

The ST-765SS Series must be slope calibrated in the FR-300-PLUS flow reservoir provided with the sensor and must have **CONSISTENT** flow within the specified range of 200 to 800mL per minute. Determine the Bromine concentration in ppm of the sample water taken from the FR-300-PLUS output sample by using the DPD method on a portable or laboratory colorimeter (i.e.. Pyxis SP-200 / SP-800 / SP-910 or similar). Launch the uPyxis app and connect to the ST-765SS Series sensor. Tap **SLOPE CALIBRATION**. Enter the Bromine concentration determined by the DPD method in the dialog window as shown in Figure 17. Please make sure that the sensor reading has been stable for at least 10 minutes before calibration. For best results, the concentration of the bromine sample flow standard should be in the range of 0.1 to 5.0 ppm.

4.2.1.2 Two-Point Calibration

Zero-point Calibration: Launch the uPyxis app and connect to the ST-765SS sensor. Remove the ST-765SS sensor from the FR-300 flow reservoir and place the sensor into a beaker containing Pyxis Zero-oxidizer Calibration Standard Solution (P/N 21022), then tap **ZERO CALIBRATION** in the uPyxis app. Please allow sufficient time (a few minutes) for the sensor to stabilize before performing the calibration. ***NOTE*** Users may also use up to 100 us/cm conductivity standard as a ZERO CALIBRATION solution.

Slope-point Calibration: Insert the ST-765SS Series sensor back into the FR-300-PLUS flow reservoir and reestablish sample flow. The ST-765SS Series must be slope calibrated in the FR-300-PLUS flow reservoir provided with the sensor and must have **CONSISTENT** flow within the specified range of 200 to 800mL per minute. Determine the Bromine concentration in ppm of the sample water taken from the FR-300-PLUS output sample by using the DPD method on a portable or laboratory colorimeter (i.e.. Pyxis SP-200 / SP-800 / SP-910 or similar). Launch the uPyxis app and connect to the ST-765SS Series sensor. Tap **SLOPE CALIBRATION**. Enter the bromine concentration determined by the DPD method in the dialog window as shown in Figure 17. Please make sure that the sensor reading has been stable for at least 10 minutes before calibration. For best results, the concentration of the bromine sample flow standard should be in the range of 0.1 to 5.0 ppm.
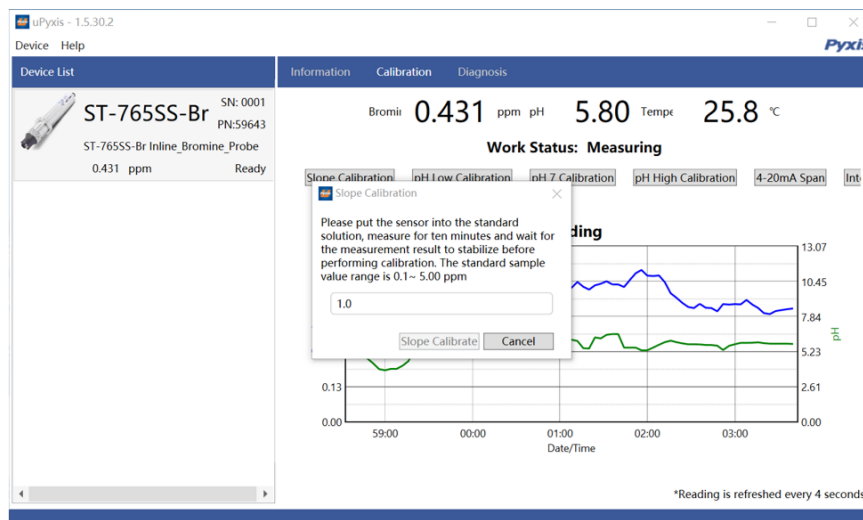

Figure 17 - Slope Calibration

4.2.2   pH Calibration

Remove and place the sensor in a low pH (i.e.. 4.0) calibration standard solution and tap **pH LOW CALIBRATION** in the uPyxis app. Measure for 1 minute and wait for the measurement result to stabilize before performing calibration, the low pH calibration standard value range acceptable for this step is 1.00-6.00 pH.

Place the sensor into the pH 7.0 calibration standard solution and tap **pH 7 CALIBRATION** in the uPyxis app. Measure for 1 minute and wait for the measurement result to stabilize before performing calibration.

Place the sensor in a high pH (i.e. 10.0) calibration standard solution and tap **pH HIGH CALIBRATION** in the uPyxis app. Measure for 1 minute and wait for the measurement result to stabilize before performing calibration, the high pH calibration standard value range acceptable for this step is 8.00-13.00 pH.
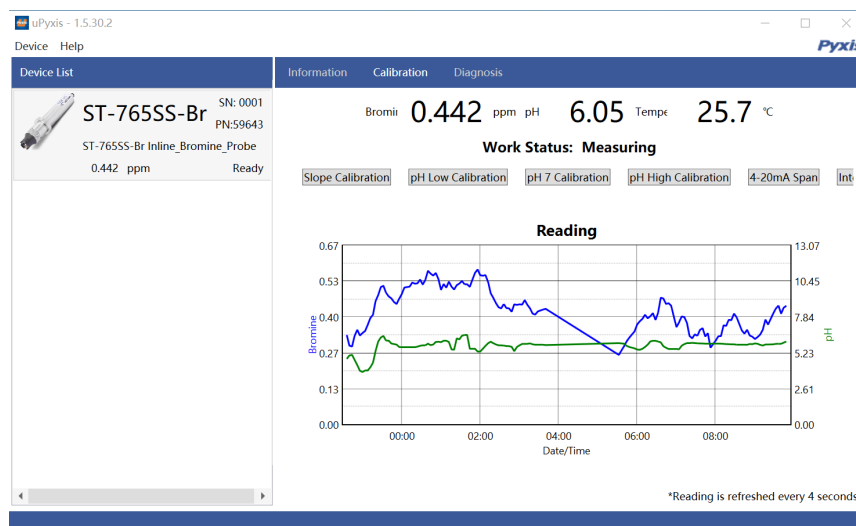

Figure 18 - pH Low Calibration
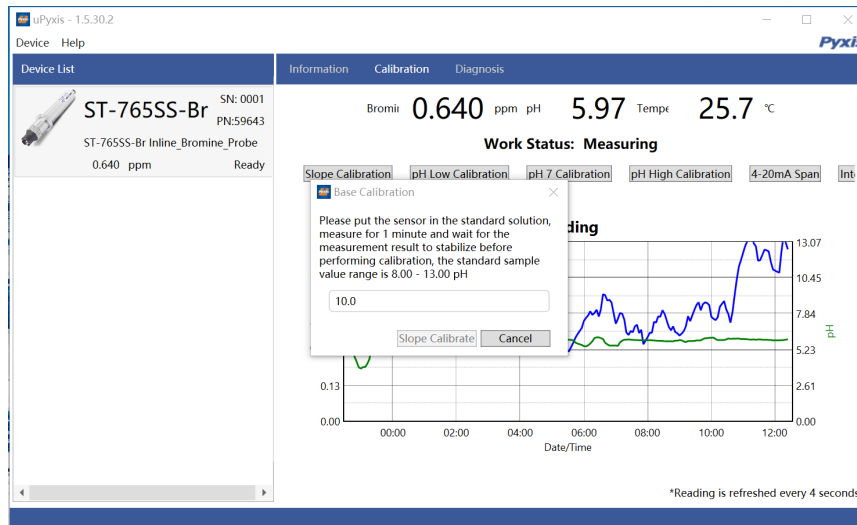

Figure 19 - pH 7 Calibration

Figure 20 - pH High Calibration

4.2.3 4-20mA Span

The 4–20mA output of the ST-765SS-Br sensor is scaled as:

- Bromine:
  - 4 mA = 0 ppm
  - 20 mA = 5 ppm

Tap **4-20mA SPAN** to change the bromine value corresponding to the 20mA output to a <u>lower value</u> as seen in *Figure 21*. ***NOTE*** The 4-20mA Span feature allows users to REDUCE the upper 20mA output scale only. <u>You cannot INCREASE the upper limit of the sensor beyond the range of the sensor.</u>

Figure 21   Set 4-20mA Span

4.2.4 Diagnosis

Tap **Diagnosis** in the bottom of the app page to launch the diagnosis page *Figure 22*. In this page, the raw data measured by the sensor is displayed. To help troubleshooting possible issues with the sensor, please save images of these data when the sensor is respectively placed in a clean water (tap water or deionized water), in a pH standard solution, and in the sample that the sensor is intended for. This data may be exported from the uPyxis APP via email to service@pyxis-lab.com for technical support.
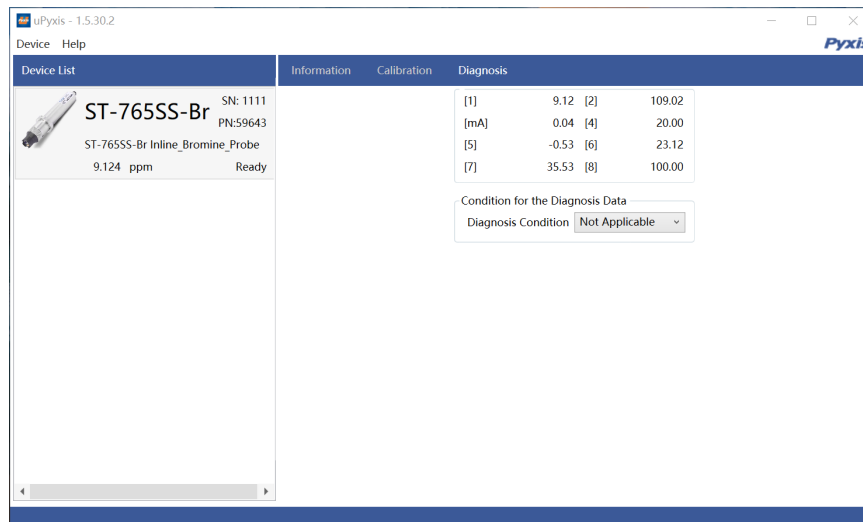

Figure 22 - Diagnostic Interface

4.3 Calibration on the Controller

It is recommended that the ST-765SS Series calibration be carried out using the uPyxis app as demonstrated in the sections above. Alternatively, a single point calibration can be carried on the controller by adjusting the mA-to-ppm ratio (Bromine). However, if calibration is to be performed via the controller, it must be cleaned then rinsed with deionized water prior to calibration, taking care to avoid direct hand contact with the electrodes. Please follow the controller manufacturer's procedures for 4-20mA calibration as with any sensor. With the default sensor settings, the controller should be set to convert 4 mA to 0 ppm and 20 mA to 5.00 ppm for ST-765SS-Br. Calibration of the ST-765SS-Br sensor for Bromine should be done with the sensor inline exposed to active flowing sample water. Use a portable or laboratory colorimeter (i.e.. Pyxis SP-200 / SP-800 / SP-910 or similar) to test the active (flowing) water sample in the flow tee assembly of the IK-765SS-Br panel.

5. Modbus RTU

The ST-765SS-Br Series sensors are configured as a Modbus slave device. In addition to the ppm bromine, 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.

6.   Sensor Cleaning and Maintenance

Soak the lower half of the sensor in 100 mL inline sensor cleaning solution for 10-15 minutes. Gently rub the sensor electrode head with the provided Q-tips. If the surface is not entirely clean, continue to soak the sensor for an additional time until clean. Rinse the sensor with distilled water. Pyxis Lab Inline Sensor Cleaning Solution can be purchased at our online Estore/Catalog at https://www.pyxis-lab.com/product/inline-sensor-cleaning-kit/


Figure 23 ST-Series Probe Cleaning Kit (P/N SER-01)

6.1 Other Common Troubleshooting Issues

If the ST-765SS sensor output signal is not stable and fluctuates significantly, make an additional solution ground connection–connect the black ground wire to a conductor that contacts the sample water electrically such as a brass pipe adjacent to the ST-765SS.

7. Replacing pH and Oxidizer Electrode Head

The pH/oxidizer electrode head of ST-765SS Series can be replaced when the original electrode head reaches its working life. The typical working life of the electrode can be as long as 2-years under normal operating conditions. Order a replacement electrode head EH-765 (P/N 53061) from Pyxis and follow instructions as below.

1) Turn off the sensor if it is powered on and make sure there is no water on the sensor.

2) Hold the ST-765SS main body with one hand and use the other hand to twist the stainless-steel locking ring counter-clockwise until the front end of the black electrode is completely unscrewed, as shown in *Figure 24-2*.

3) Pull out the electrode head as shown in *Figure 24-3*.

4) Loosen the electrode plug connector and remove the electrode head, as show in *Figure 24-4*.

5) To assemble the new electrode head, connect the plug, then insert the new electrode head into the main sensor housing and ensure that the two protrusions on the electrode head are aligned with the notches in the sensor main housing.

6) Then twist the stainless-steel lock ring of ST-765SS in a clockwise direction until the threads of the electrode head completely enter the ST-765SS housing as shown in *Figure 24-1*.

24-1

24-2

24-3

24-4

24-5
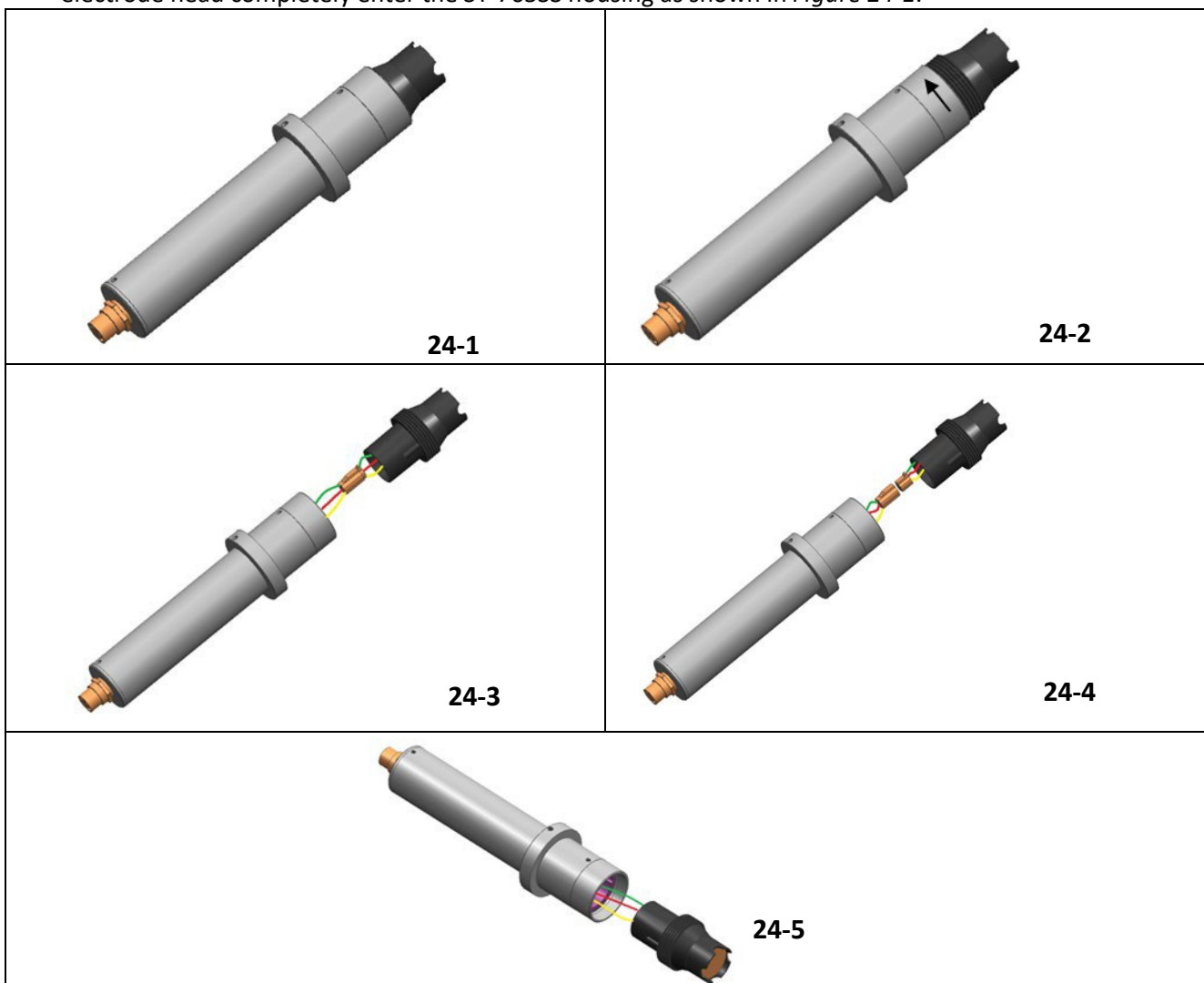
8.   Contact Us

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