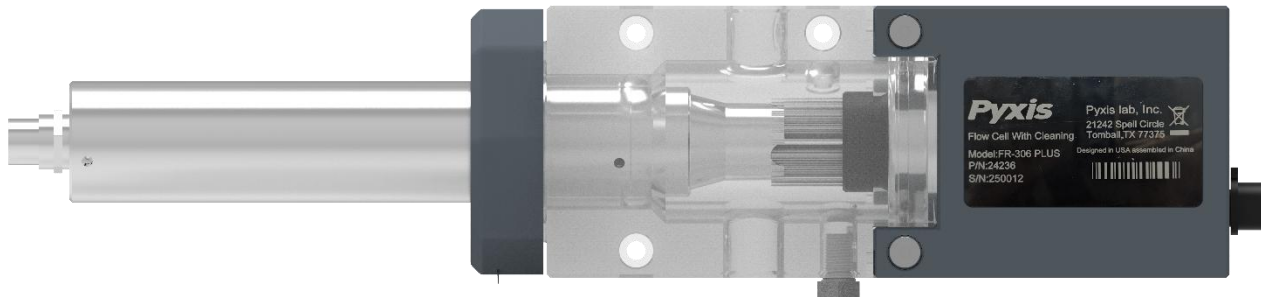


# FR-306-PLUS

## Self-Brushing Flow Reservoir for Pyxis Inline Sensors



### Product Description

The Pyxis FR-306-PLUS is a magnetic coupling motorized brush flow assembly that provides an inline mechanical cleaning of the ST-765 and ST-766 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-306-PLUS also provides supplemental deactivation protection of the bare gold electrode for long life, stability, and precision accuracy in extremely challenging waters. The FR-306-PLUS is also designed to be utilized with a wide variety of alternative Pyxis inline sensors for a broad range of measurements. These additional sensors are outlined in this document.

The FR-306-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-306-PLUS may be operated at a broad range of regulated sample flow from 200 and 800mL per minute with an inlet pressure of <60 psi. The FR-306-PLUS outlet flow line should be diverted to drain or returned to an atmospheric tank/sump or lower pressure line within the process itself for reuse.

The FR-306-PLUS comes equipped with a magnetically coupled brush mounted in the liquid end of the flow reservoir. The 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-306-PLUS requires a 24 VDC power supply and can be powered by any controller capable of providing a 24 VDC / 20 W or may be powered by the optional Pyxis Lab power supply adapter accessories available for both 110VAC and 230VAC outlet operation. *(Purchased separately)*

Pyxis Lab also offers a variety of pre-assembled analyzer panels, integrating the ST-765 and ST-766 series sensors, FR-306-PLUS cleaning assembly, and the UC-Series display & data logging terminals. Alternatively, these Pyxis sensors and FR-306-PLUS self-brushing flow assembly may be utilized with OEM controllers, PLC's and DCS networks to provide a higher level of control for system chemistry applications while incorporating the unique Pyxis bare-gold sensor technology.

## Specifications

Item	FR-306 PLUS
P/N	24236
Description	Self-Brushing Single Flow-Reservoir Assembly for Pyxis Sensors
Power Voltage*	24VDC
Power Consumption	Rated: 1 W (typical during normal operation) Max: 20 W (locked-rotor condition, sustained up to 5 seconds and trigger alarm)
Storage Temperature	-7 °C – 60 °C (20 – 140 °F)
Control Methodology	RS-485 or Powered Relay
Dimension (L x W x H)	Length 9.25-inch (235 mm), Body Square 3.15-inch (80 mm)
Body Material	UPVC & PC
Weight	1614 g (3.558 lbs.)
Operating Temperature	4 °C – 49 °C (40 – 120 °F)
Sample Inlet Pressure	7.25 – 60 psi (0.05 – 0.41MPa)
Minimum Speed	100 RPM
Maximum Speed	400 RPM
Sample Inlet/Outlet	½-inch NPT
Chemical injection port	¼-inch NPT
Suggested Maintained Flow Rate	200 - 800 mL/min <i>(Consistent Flow Rate Required)</i>
Wet Material	UPVC & PC & ABS & 316 Stainless Steel
Cable Interface	Explosion-Proof Male 7-Pin Adapter

**\*NOTE\* (1)** Specifications are subject to change without notice.

**(2)** Exercise caution when powering the FR-306 PLUS; the power supply must be selected according to the peak current under locked-rotor conditions.

## Package Contents

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](mailto:service@pyxis-lab.com)

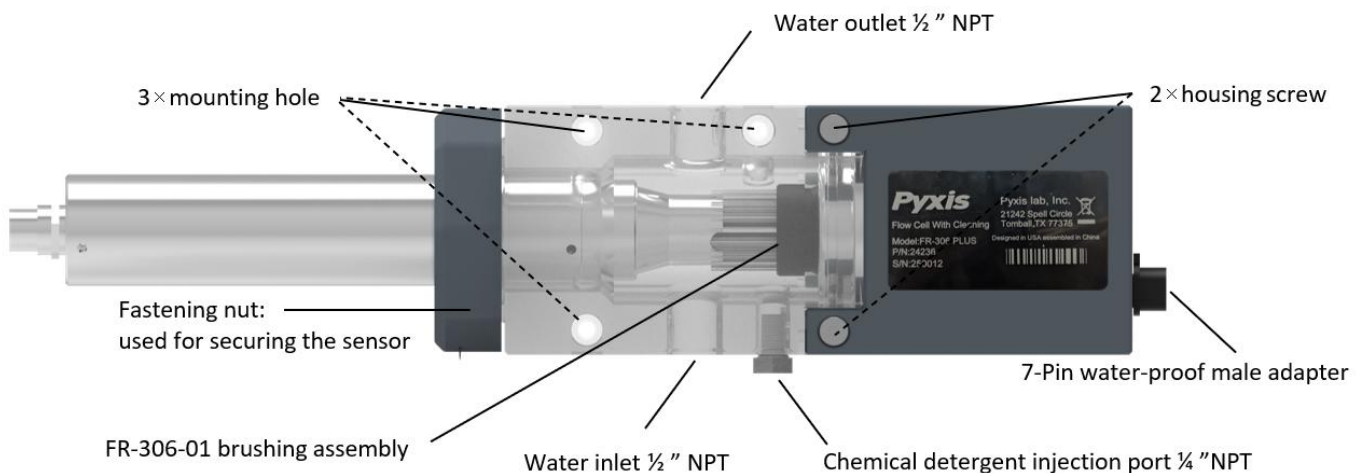
- One **FR-306 PLUS** flow reservoir (P/N: 24236)
- One **CE-FE-4.9** flying lead cable with explosion-proof female 7-Pin adapter – 1.5m/4.9 feet (P/N: 50762)
- One **CS-MS/FE-2.0** male 7-Pin to explosion-proof female 7-Pin adapter – 0.66m/2.0 feet (P/N: 15526)
- One **FR-300-03** Brush Extraction Tool (P/N: 23504)
- One FR-306 Plus Mounting Plate
- Two quick connect ⅜-inch OD tube to ½-inch NPT thread adapter
- Mounting materials
- The Startup guide is available for download at <https://www.pyxis-lab.com/documents/>

### Pyxis Sensors Compatible with FR-306-PLUS

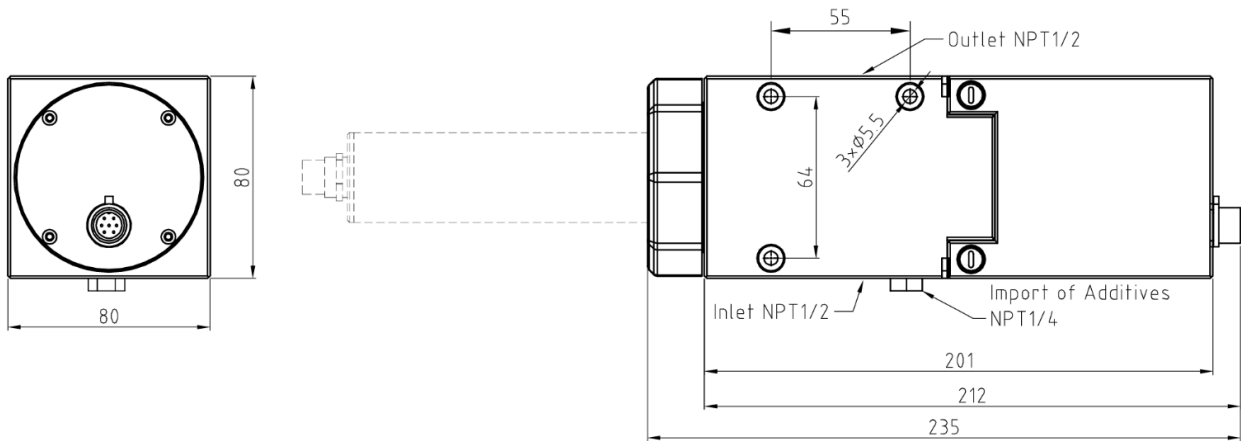
A wide variety of inline Pyxis sensors are specifically ideal for use with the FR-306-PLUS covering a broad range of measurement capability in dirty and challenged waters where previous sensor accuracy and maintenance was an issue. Please refer to current sensors below.

Sensor Name	Measurement	P/N
ST-765SS-FCL	Free Chlorine + pH + Temp	53607-NFR
ST-765SS-CLO	Chlorine Dioxide + pH + Temp	53608-NFR
ST-765SS-Br	Bromine + pH + Temp	59643
ST-765SS-O3	Ozone + pH + Temp	53614
ST-765SS-SO3	Sulfite + pH + Temp	53624
ST-765SS-DCL	Free Chlorine + Sulfite + pH + Temp	58444
ST-772T	Dissolved Oxygen (stainless)	53719
ST-772T-P	Dissolved Oxygen (CPVC)	53721
ST-765SS-PAA	PAA + pH + Temp	53610
ST-765SS-DBNPA	DBNPA + pH + Temp	54267
ST-710	pH (CPVC)	53001
ST-711	ORP (CPVC)	53002
ST-712	pH + ORP (CVPC)	53003
ST-710SS	pH (stainless)	53030
ST-711SS	ORP (stainless)	53031
ST-712SS	pH + ORP (stainless)	53032
ST-720	Conductivity/TDS	53101
ST-726	Conductivity/TDS	53114

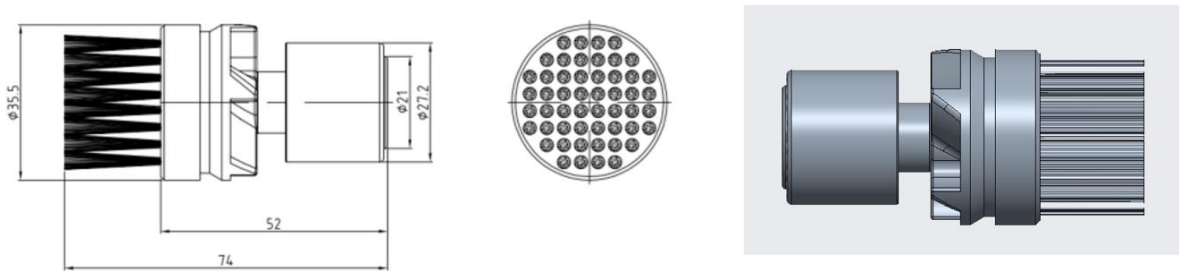
### FR-306-PLUS Component Schematic



FR-306-PLUS – Flow Reservoir Dimensions (mm)



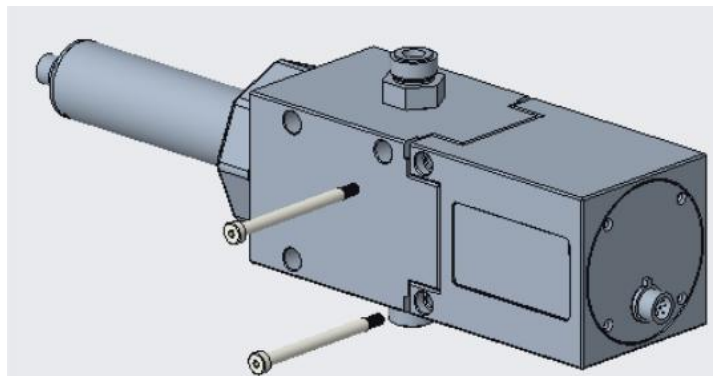
FRP-306-01 Replacement Brushing Assembly Dimensions (mm) & Image



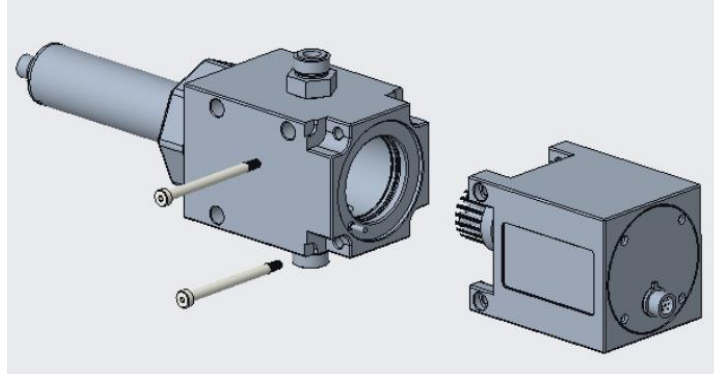
FR-306-01 Replacement Brushing Assembly Replacement Procedure

Replacement of brush assembly without special tools:

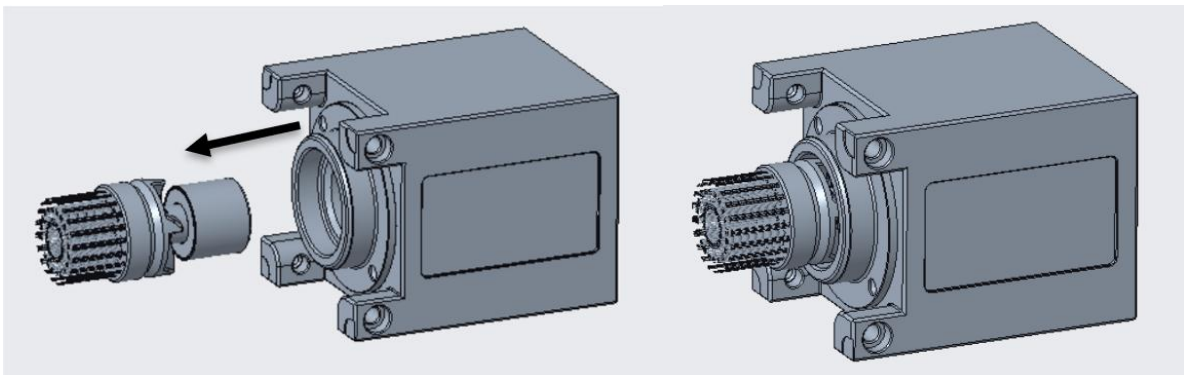
Step 1. Remove the 2 Housing Screws(M5).



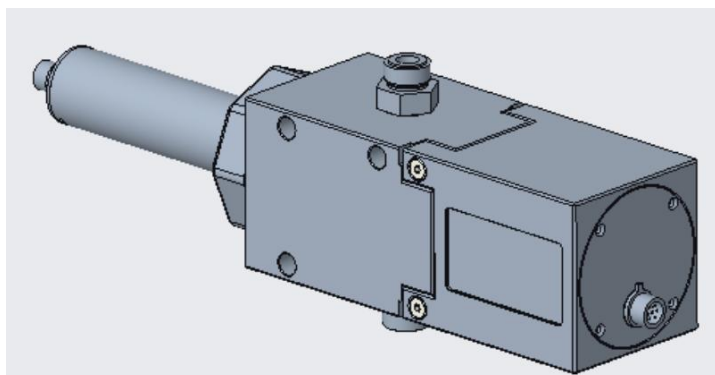
Step 2. Separate the flow cell section from the brush driver section.



Step 3. Unplug the old FRP-306-01 in the direction indicated then replace it with a new **FRP-306-01**.

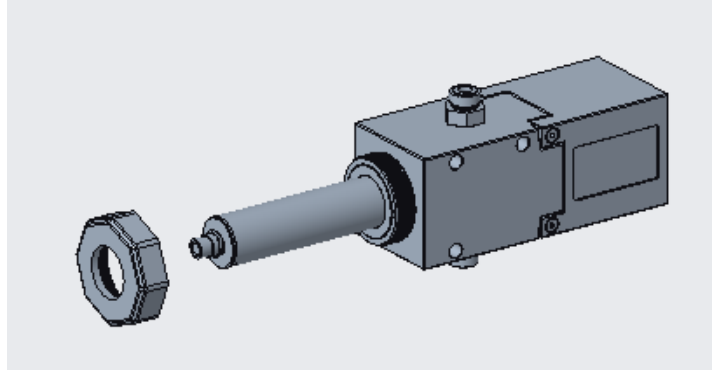


Step 4. Reinstall the parts shown and tighten the screws snugly.

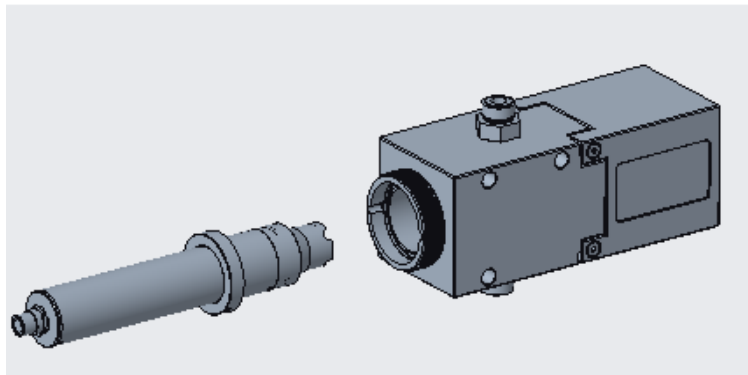


Replacement brush assembly with FR-300-03 extraction tool:

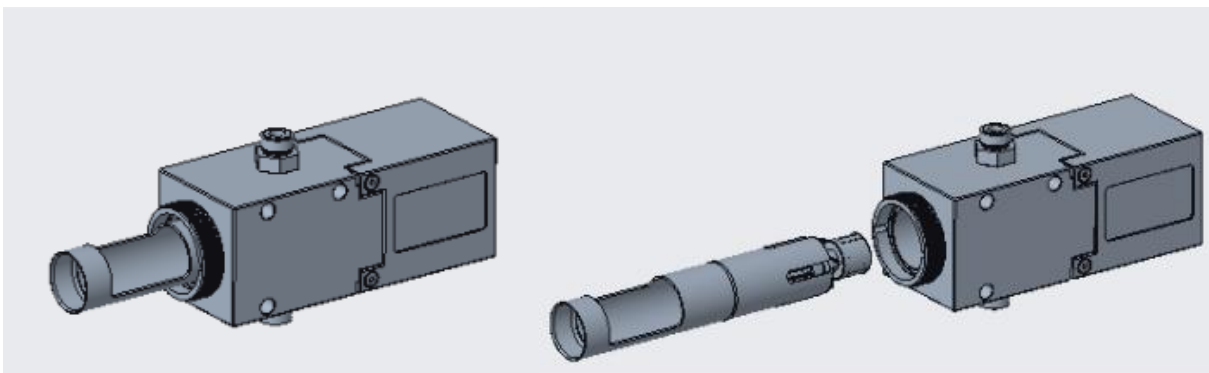
**Step 2.** Remove the sensor nut after isolating sample water flow.



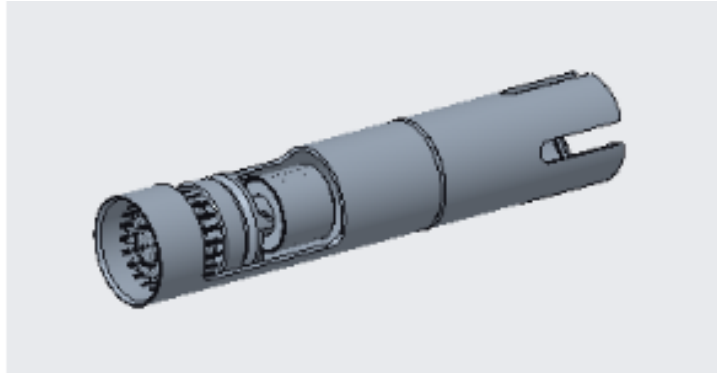
**Step 3.** Remove the sensor. Allow sample water to drain from the FR-306-PLUS.



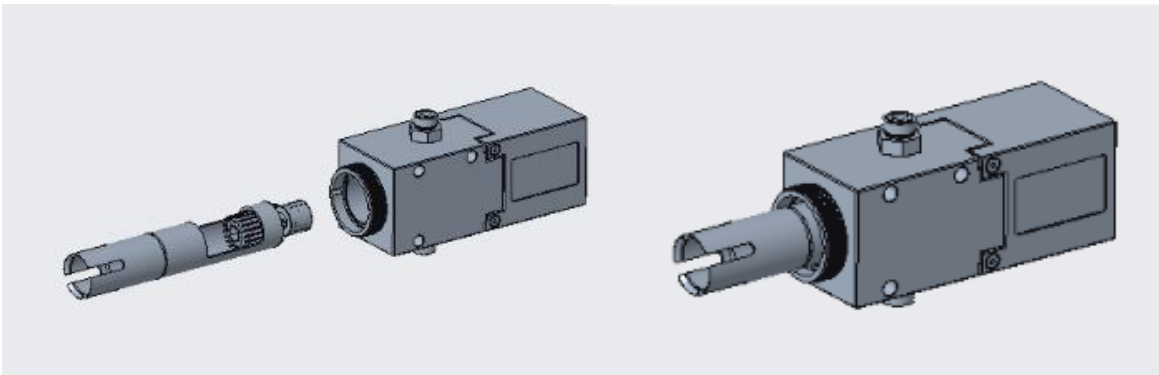
**Step 4.** Insert the tool and remove it when the head of the tool snaps into the groove of the brush



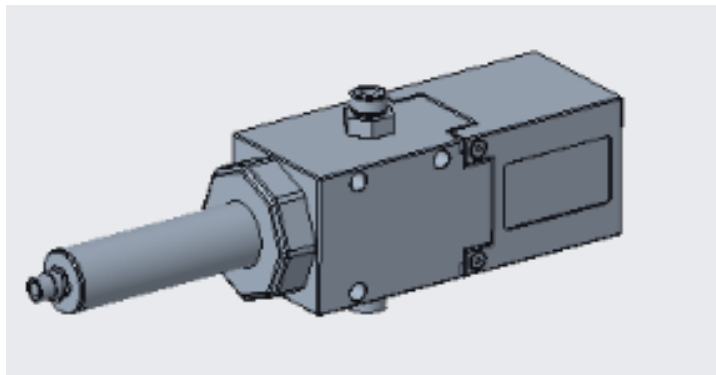
**Step 5.** Press the end of the brush and remove the brush when it reaches the tool groove.



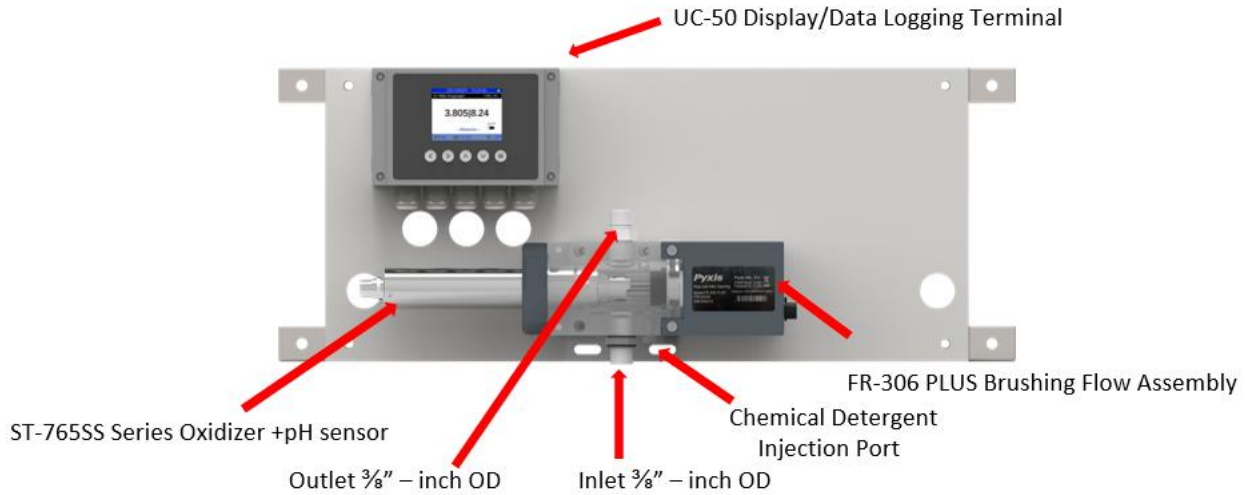
**Step 6.** Fit the new brush in the end position of the tool shown in the picture and insert it into the hole, then remove the tool.



**Step 7.** Install the sensor to the position shown and reinstall the sensor nut as shown in the image below.



## FR-306-PLUS Installation and Startup



**Mounting:** The FR-306-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-306-PLUS is a stand-alone unit and requires 24VDC, 20W power supply to operate. Operating 100% of the time or on a system operational flow basis is the Pyxis recommended mode of operation. This can be done via the connected controller as a powered relay activating the FR-306-PLUS on a system flow switch relay or with a constant 24VDC power supply. Each FR-306-PLUS will be shipped with both a flying lead cable (CE-FE-4.9) and PowerPACK connection cable (CE-ME-FE-2.0) as a standard. Users can choose which cable they desire to use based on need.

**Outlet Provided Power Supply & Operation Mode:** For applications that require outlet provided power supply to the FR-306-PLUS, Pyxis offers **MA-AC-7US** (P/N 26398), **MA-AC-7EU** (P/N 28787) and **MA-AC-7UK** (P/N 25802) power supply adapters in both 110VAC-USA (Type A), 230VAC-EU (Type DIN) and 230VAC-UK formats as optional accessories. These accessories allow the FR-306-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-306-PLUS offers RS-485 connectivity which allows for rotational brush speed, operation, and duration for those desiring precision control. Contact Pyxis for RS-485 details.

**Inlet/Outlet Flow:** The FR-306-PLUS is equipped with  $\frac{1}{2}$ -inch NPT threaded inlet and outlet ports. When mounted horizontally, the inlet water should enter the bottom port, and the outlet water should exit through the top port. For convenience, each FR-306-PLUS package includes two quick-connect adapters that convert  $\frac{1}{2}$ -inch NPT threads to  $\frac{3}{8}$ -inch OD tubing, as shown in the image above. The inlet water pressure should not exceed 60 psi. The outlet water should be returned to a lower pressure line, or an open sump at atmospheric pressure and prevent siphoning with valve if necessary. The range of flow through the FR-306-PLUS should be consistently regulated between 200 and 800mL/minute. An inlet rotameter or Pyxis Nano-Flow (P/N 21329) should be installed to verify and regulate inlet flow. **\*NOTE\*** The FR-306-PLUS should be installed in a way to ensure the ST-765 series sensor remains flooded and wet regardless of flow condition. Pyxis recommends the 24VDC power supply to the ST-765 and ST-766 series sensor be turned OFF for systems that experience extended periods of stagnant water conditions.

**Calibration:** Once flow has been established and stabilized, an in-situ slope calibration of the sensor should be conducted using field analysis of the sample being measured. (i.e. DPD Free Chlorine) See ST-765 or ST-766 Series Operation Manual for detailed calibration instructions.

### FR-306-PLUS Wiring Instruction

Follow the wiring table below to connect the FR-306-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-306-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-306-PLUS as desired in an ON/OFF relay format based on their application needs. Each FR-306-PLUS will be shipped with one flying lead cable (CE-FE-4.9) for direct wiring to terminal and one PowerPACK connection cable (CS-MS/FE-2.0) for direct adapter connection to Pyxis PowerPACK Series for power supply. **NOTE** – *The FR-306-PLUS may also 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.*

Wire Color	Designation
Red	24V power supply
Black	24V power ground
Blue	RS-485 A
Yellow	RS-485 B
Silver	PE
White	Not connected
Green	Not connected

### Communication Using Modbus RTU

#### Default Modbus Communication Parameters

Slave Address	200
Baud Rate	9600 bps
Data Bits	8-bit
Stop Bit	1-bit
Parity Check	Even
Bus Type	RS-485

#### Modbus RTU Protocol

Register Address Model	PLC Address Base 1
Byte Order	CDAB Little Endian Byte Swap

#### Supported Function Code

03	Read Holding Register
06	Write Single Register

## Register Map

Register Address	Function Code		Data Type	Description
	Read	Write		
42001	03	06	16-bit unsigned integer	Mailing address, Range: 1-250,default:200
42002	03	---	16-bit unsigned integer	Communication Data Bits
42003	03	06	16-bit unsigned integer	Communication parity, 0: no parity, 1: even parity, 2: odd parity
42004	03	---	32-bit unsigned integer	Communication Baud Rate
48001	03	06	16-bit unsigned integer	Start/stop, 1 is start, 0 is stop
48002	03	---	16-bit unsigned integer	Reserved for future use
48003	03	---	16-bit unsigned integer	Real-time speed, unit "RPM"
48004	03	06	16-bit unsigned integer	Target speed setpoint, unit "RPM" Range 100-400
48013 <sup>(1)</sup>	03	---	16-bit unsigned integer	Alarm flag, 0 means no alarm, 1 means motor speed below target setpoint 2 means motor locked-rotor
48014	03	06	16-bit unsigned integer	Alarm timeout, within this time, the real-time speed has not reached the target speed, then start the alarm. Unit "seconds", range 1-600

**\*Note\***(1) When Alarm flag  $\neq$  0, a partial or complete blockage is likely. Power off the FR-306 PLUS first, then remove and inspect the FR-306 PLUS, clean the internal brush, reinstall, and power on again.

## Order Information

## Order Information

## P/N

FR-306-PLUS <i>(Replacement FR-306-PLUS Auto-Brushing Flow Assembly Replacement)</i>	24236
CE-FE-4.9 <i>(Replacement 1.5meter Flying Lead w/7-Pin Waterproof Adapter Cable for FR-306-PLUS)</i>	50762
CS-MS/FE-2.0 <i>(Replacement 0.6meter Cable w/7-pin Dual Adapters for FR-306-PLUS to PowerPACK)</i>	15526
MA-AC-7US <i>(110VAC-24VDC Power Adapter for 7-Pin Pyxis Devices with USA Type A Plug)</i>	26398
MA-AC-7EU <i>(230VAC-24VDC Power Adapter for 7-Pin Pyxis Devices with EU Type DIN Plug)</i>	28787
MA-AC-7UK <i>(230VAC-24VDC Power Adapter for 7-Pin Pyxis Devices with UK Type Plug)</i>	25802
FRP-306-01 <i>(Replacement Brush assembly for FR-306-PLUS)</i>	20802
FR-300-03 <i>(Replacement Brush Extraction Tool for FR-306-PLUS)</i>	23504

## Contact Us

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