RT-110 SERIES

Inline Refractometers for Food & Process Applications

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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 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://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 Pyxis Prism RT-110 series are online digital refractometers that measure the refractive index of a liquid sample. These sensors provide highly accurate concentration values for a wide variety of water and process related applications. They are stand-alone devices capable of self-sustained operation, live data logging and communication output. The Prism RT-110 series also offer fully integrated 4-20mA and RS-485 Modbus output signals for connectivity to any microprocessor-based controller, display, PLC, or DCS network. The Prism RT-110 series have built-in temperature-dependent equations to convert the measured sample temperature and refractive index to the percentage concentration of Mono Ethylene Glycol (MEG), Mono Propylene Glycol (MPG) and Sugar Content (Brix). Two installation design versions of the RT-110 series are available, including RT-110 for bypass flow installation and RT-110L for tank wall installation.

NOTE *The Prism RT-110 is a very robust sensor and capable of operating in contaminated fluid samples. It is important, however, to note that users should take all precautions to prevent and filter suspended solids from the sample stream prior to the sensor to avoid tenacious deposit build-up on the sensor eye. In highly fouled applications, Pyxis recommends users conduct sensor eye cleaning on a regular basis. Pyxis Lab offers the Ultra-Sonic RT-Series Cleaning Module Kit (P/N 56208) for installation into the Tri-Clamp Flow Cell Assembly as an optional accessory allowing for automated online cleaning of the RT-110 refractive index sensor. Contact www.order@pyxis-lab.com for technical and pricing details of this online cleaning accessory.*

1.1 Main Features

- 4-20 mA output of sample temperature and the unit selected via the uPyxis
- User customizable 4-20mA concentration output ranges with uPyxis APP
- RS-485 Modbus RTU output of temperature, refractive index and other diagnostics
- Built-in temperature dependent equations % BRIX, %MPG, %MEG
- Future Addition of Product Concentration Curves by Pyxis as Market Requests
- Built-In Historical Data Log up to 56 Days of Storage at 1 Reading Per Minute via uPyxis APP
- Bluetooth Enabled when used with MA-CR Bluetooth Adapter
- Sturdy 316L stainless-steel construction and suitable for harsh application environments
- Convenient Stainless-Steel Tri-Clamp Flow Cell Assembly w ¾-inch NPT Flange
- Optional RT-Series Ultra-Sonic Cleaning Module sold separately
- RT-110L is specifically designed for direct installation on the tank.
- RT-110L is also easy to integrate into data center coolant monitoring systems.

2 Specifications

Table 1. Prism RT-110 Specifications

ITEM	RT-110	RT-110L
P/N	59207	57682
RANGE OF MEASUREMENT *(% IS BY MASS)*	Refractive Index: 1.31700 – 1.5100 Brix: 0.00 – 85.00% Mono Ethylene Glycol: 0.00 – 100.00% Mono Propylene Glycol: 0.00 – 100.00% Temperature: -20°C – 80°C	
RESOLUTION	Refractive Index: 0.00001 Brix and Glycol: 0.01%	
ACCURACY	Refractive Index: ±0.0001 Brix and Glycol: ±0.1%	
SAMPLE TEMPERATURE	-4 – 158 °F (-20 – 70 °C)	-4 – 149 °F (-20 – 65 °C)
MAX SAMPLE PRESSURE / FLOW	≤142 psi (0.98 MPa) / <13.5 GPM (9.8 ft/s)	
ENVIRONMENTAL TEMPERATURE	14 – 104 °F (-10 – 40 °C)	
WEIGHT	1kg	
DIMENSION	φ2.52 x 5.24 inch (φ64 x 133mm)	
PROTECTION	IP-67	
LIGHT SOURCE	LED	
WET MATERIALS	Sapphire, 316L Stainless Steel, Viton	
SIGNAL OUTPUT	4-20 mA and RS-485 Modbus	
POWER	24 VDC (1.5W)	
REGULATION	CE / RoHS Marked	

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

3 Unpacking Instrument

Remove the instrument and accessories from the shipping container and inspect each item for any damage that may have occurred during shipping. Verify that all accessory items are included. If any item is missing or damaged, please contact Pyxis Lab Customer Service at service@pyxis-lab.com.

3.1 Standard Accessories

RT-110 Prism Package (P/N 59207)

- One RT-110 Prism Refractive Index Sensor w/8Pin Female Adapter
- One 316L Stainless Steel Tri-Clamp Flow Cell Assembly (P/N 56206)
- One MA-1.5CR Cable (1.5 Meter/ 4.9 ft 8Pin Male Adapter/Flying Lead) (P/N 50746)
- One MA-4.9CR (Standard Cable Male-Female 8-Pin Adapters-4.9ft/1.5m) (P/N 50745)

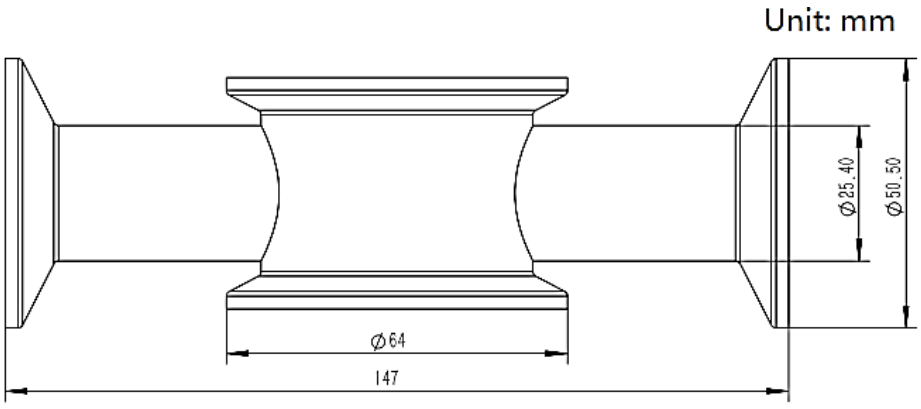
Figure 1. RT-110 Prism / Tri-Clamp Flow Cell Assembly / MA-1.5 Flying Lead Cable/ MA-4.9 Male-Female Cable

RT-110L Prism Package (P/N 57682)

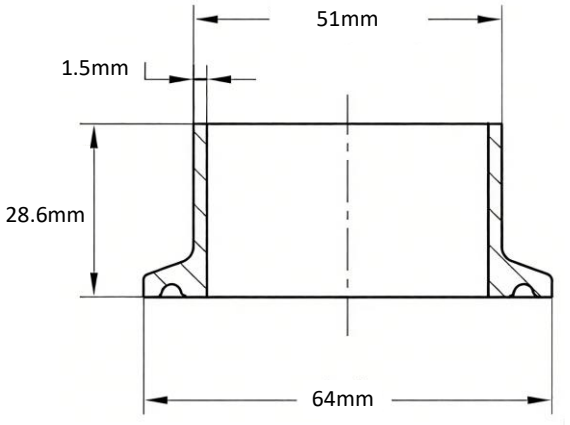
- One RT-110L Prism Refractive Index Sensor w/8Pin Female Adapter
- One 316L Stainless Steel Sanitary Clamp Coupling (P/N 24641)
- One MA-1.5CR Cable (1.5 Meter/ 4.9 ft 8Pin Male Adapter/Flying Lead) (P/N 50746)

Figure 2. RT-110L Prism / Stainless Steel Clamp Coupling / MA-1.5 Flying Lead Cable/ MA-4.9 Male-Female Cable

Tri-Clamp Flow Assembly Side Diagram – Provided with RT-110



Stainless Steel Clamp Coupling Diagram (mm) – Provided with RT-110L



3.2 Optional Accessories

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

Table 2. Optional Accessories

Optional / Replacement Accessories	P/N
MA-CR *(Bluetooth Adapter for 8-Pin Pyxis Sensors for use with uPyxis Mobile & Desktop)*	MA-CR
MA-NEB *(USB Bluetooth Adapter for PC to use uPyxis Desktop)*	MA-NEB
Stainless Steel Sanitary Clamp Coupling with Gasket (64mm / 2.5-inch) *For Use with RT-110L Only*	24641
Tri-Clamp Flow Cell Assembly Complete Replacement *For use with RT-110 Only*	56206
Tri-Clamp Flow Cell Assembly Replacement Gasket Kit	56209
RT-110L Stainless Coupler with Gasket Replacement Kit	24641
Y-MS-1.0 *Y-type 8-Pin Adapter (8-Pin to 8-Pin & 3-Pin) for Ultrasonic Cleaning Module Use*	12045
RT-Series Ultra-Sonic Cleaning Module Kit *For use with RT-110 Only*	56208
MA-1.5CR *(4.9-Foot Flying Lead Cable)*	50746
MA-4.9-CR *(4.9-Foot Extension Cable w/8Pin Adapters)*	50745
MA-10CR *(10-Foot Extension Cable w/ 8-Pin Adapters)*	50741
MA-50CR *(50-Foot Extension Cable w/ 8-Pin Adapters)*	50743
Pyxis Probe Cleaning Kit	SER-01

Figure 3. Y-MS-1.0 (Y-type 8-Pin Adapter for use with Ultrasonic Cleaning Module)

4 Installation

4.1 Main Assembly

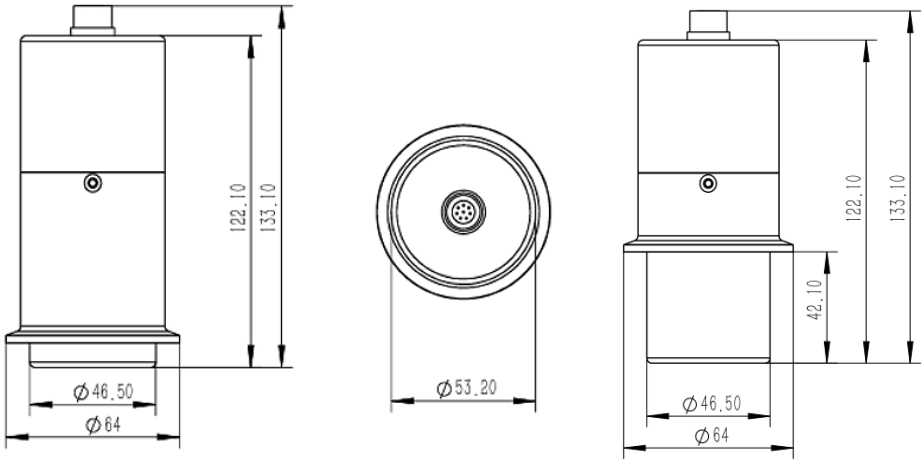


Figure 4. Prism RT-110 and RT-110L Sensor Dimensions (mm)

RT-110 By-Pass Flow Line Installation

Each Prism RT-110 is provided with a 316L stainless steel Tri-Clamp Inline Flow Assembly with 3/4-inch FNPT inlet/outlet flanges. A flange and plug are also inserted into a portal opposite of the sensor eye for use with the RT-Series Ultrasonic Cleaning Module Kit (P/N 56208) in applications requiring automated inline cleaning.

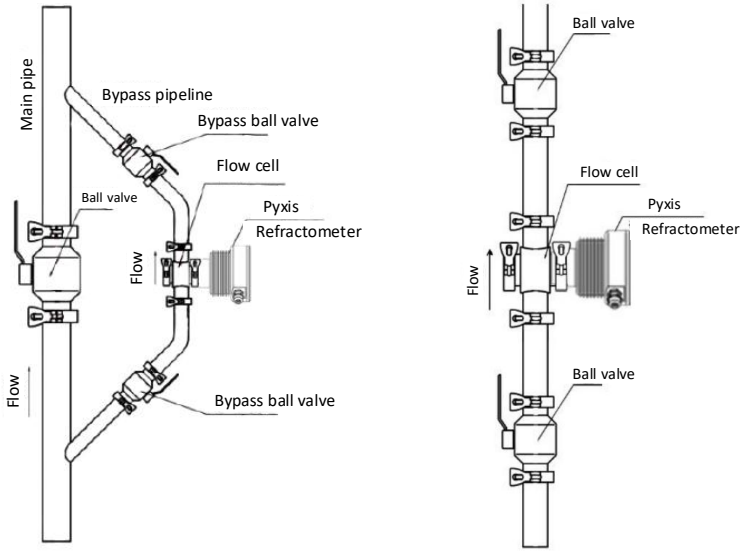


*Figure 5. Prism **RT-110** pipeline installations*

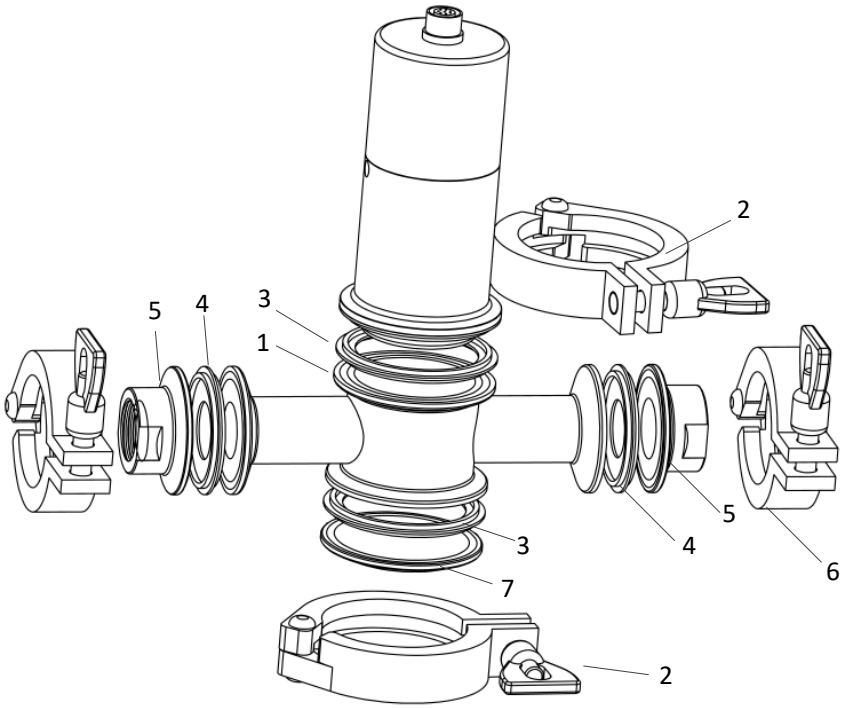


Figure 6. Tri-Clamp Flow Cell Assembly (P/N: 56206)

Table 3. Tri-Clamp Flow Cell Assembly Components

ID #	Description
1	Flow cell with 2.5-inch Port for Prism RT-110 Sensor Head
2	Sensor Tri-Clamp 2.5-inch
3, 4	Tri-Clamp Flow Cell Gasket Kit (P/N: 56209)
5	3/4-inch NPT Flange
6	Flange Tri-Clamp 2-inch
7	Plug Capφ64mm, Reserved Ultrasonic Transducer

RT-110L – Tank Side Wall Installation

The Prism RT-110L is specifically designed for real-time mixing of large tanks. It is equipped with a stainless-steel clamp coupling, which is welded to the tank body. Its protruding design ensures full contact between the measuring surface and the liquid, reducing measurement delay.

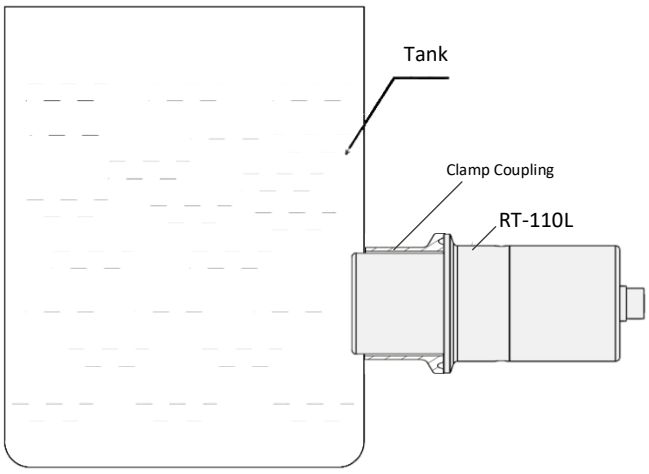


Figure 7. RT-110L Tank Wall Installation

4.2 Piping Installation – For RT-110

The Prism RT-110 with Tri-Clamp Flow Cell Assembly should be installed per the diagram provided in Figure 6. Be sure to avoid installations being illustrated in Figure 7.

Figure 8. Correct Installations

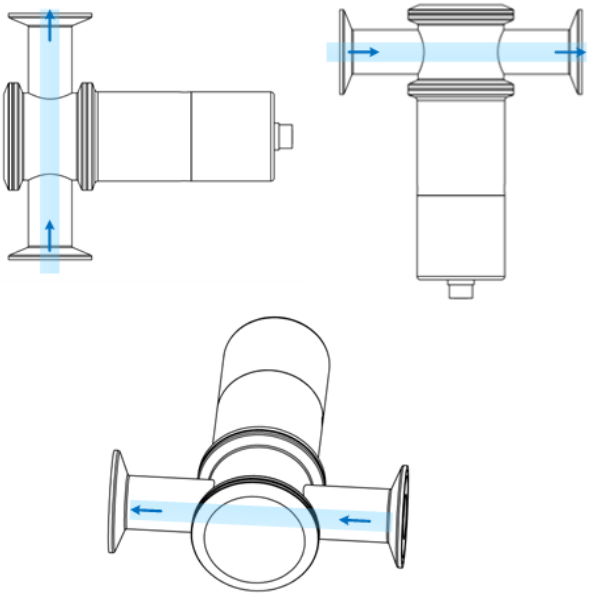
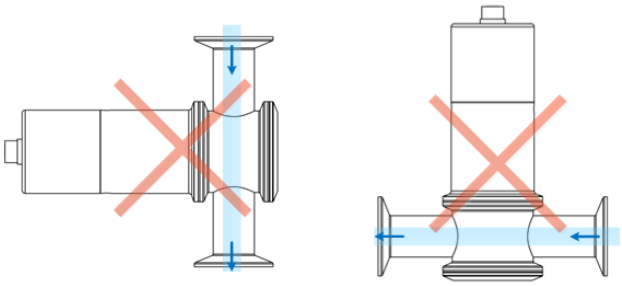


Figure 9. Incorrect Installations



4.3 Wiring

Powered by a Direct 24VDC Power Source via 8-Pin Cable Provided with Prism RT-110

For applications where the Prism RT-110 is connected to and directly powered by 24VDC source (Controller, PLC, DCS etc.), the device should be connected via the 8-Pin Cable and MA-1.5CR Flying Lead Cable. These cables provide power as well as 4-20mA and RS-485 output communication to the connected device. Please refer to Table 4 for wire designations of the 8-pin cables.

NOTE *This cable may continue to be used to pass 4-20mA and RS-485 output signals to receiving device while using the MA-CR Bluetooth adapter for* ***uPyxis®*** *App access.*

Table 4. Wire Designations

Wire Color	Designation
Red	24V +
Brown	24V Power ground
Gray*	4–20mA -
White	nD/Brix/Others %, 4–20mA +
Pink	Trigger Out - Ultrasonic Cleaning Cycle
Blue	RS-485 A
Yellow	RS-485 B
Green	RS-485 Ground

NOTE ***Gray Wire*** *Internally connected to the power ground. 4-20mA is not loop powered.*

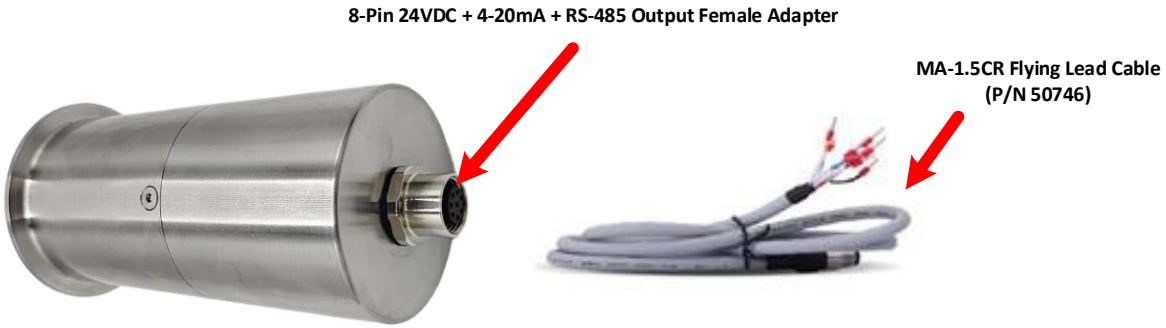


Figure 10. Prism RT-110 and MA-1.5CR Flying Lead Cable (P/N: 50746)

4.4 RT-110 Connection to RT-Series Ultrasonic Cleaning Module Kit

For dirty applications users may desire to implement auto-cleaning of the RT-110, with the Pyxis RT-Series Ultrasonic Cleaning Module Kit. In these scenarios, the RT-110 must use the Y-type adapter cable Y-MS-1.0 (P/N:12045) to expand a 3-pin interface for connecting to the RT-Series ultrasonic cleaning device (P/N: 56208) as shown in the figure below. This conversion cable is sold separately as an optional accessory. For use of this cleaning accessory, please refer to RT-Series Ultrasonic Cleaning Module User Manual found at [Ultrasonic Cleaning Module Kit | RT-100 PRISM | Pyxis Lab®]

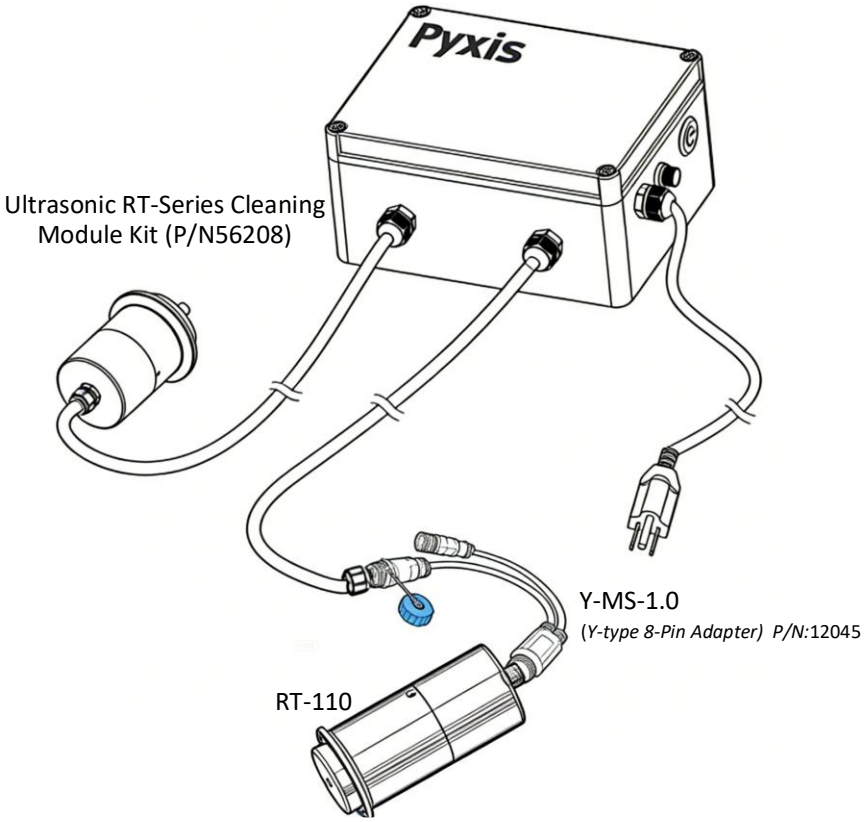
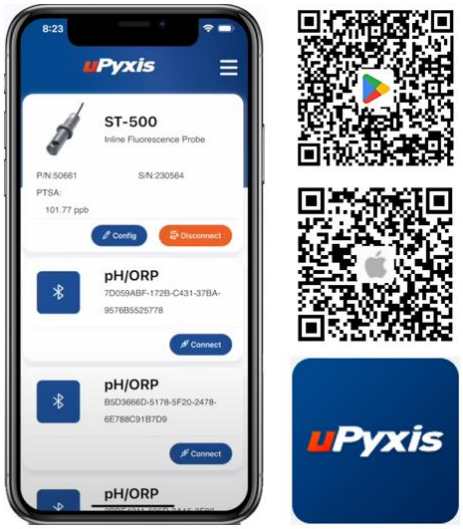


Figure 11. Prism RT-110 Ultrasonic Connection Diagram

5 Setup and Configuration with uPyxis® Mobile App

5.1 Download uPyxis® Mobile App



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

Figure 12. uPyxis® Mobile App installation

5.2 Connecting to uPyxis® Mobile App via Bluetooth

Connect the Prism RT-110 to the Pyxis MA-CR Bluetooth adapter (P/N MA-CR) and a controller or PLC with a 24 VDC power source according to the figures below. Figure 25 shows that the Prism RT-110 is powered by a controller through the 8-Pin cable provided with the Prism RT-110.

NOTE* **uPyxis® 2.0 Mobile is for mobile devices (ie. smart phones, smart pads) and communicates directly with RT-110 via Bluetooth 5.0 connectivity. This wireless connectivity may also be used with **uPyxis® 2.0** Desktop (i.e. Laptops) and requires the MA-NEB (USB Bluetooth adapter) to be installed in the PC for wireless access to RT-110. For PC's operating on WINDOWS 10 and newer, do NOT need to use the MA-NEB.*

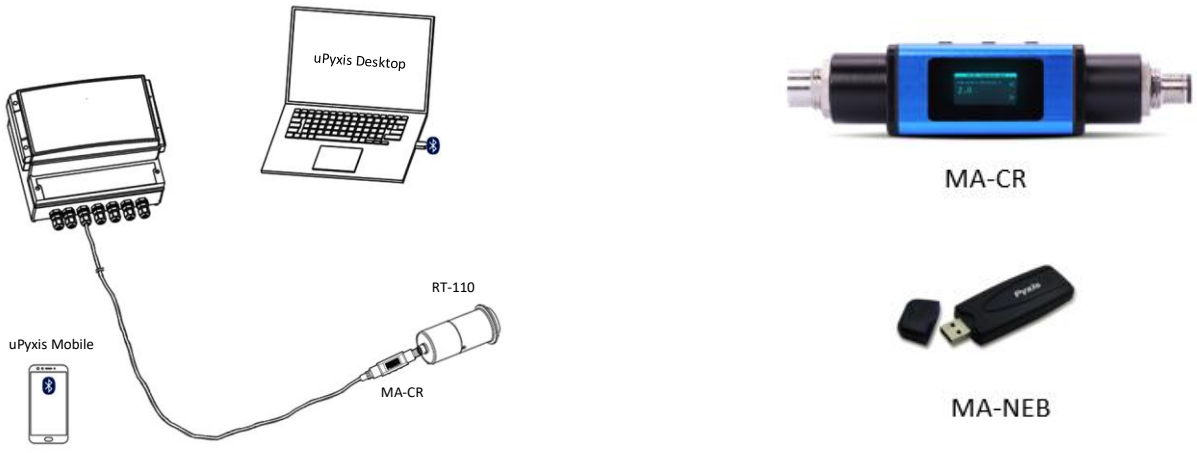


Figure 13. 24VDC Powered via Controller through 8-Pin Cable and MA-CR Bluetooth Adapter

1. Install the MA-CR Bluetooth Adapter on the 8Pin output cable from the RT-110 as outlined above.
2. Open the **uPyxis®** Mobile App.
3. In the **uPyxis®** Mobile App, press scan with finger on the main screen to refresh the list of available Pyxis devices. **NOTE* this may take a few minutes for Bluetooth to connect to the device.*
4. If the connection is successful, the Prism RT-110 and its Serial Number (S/N) will be displayed (Figure 26).
5. Press on the Prism RT-110 sensor image.

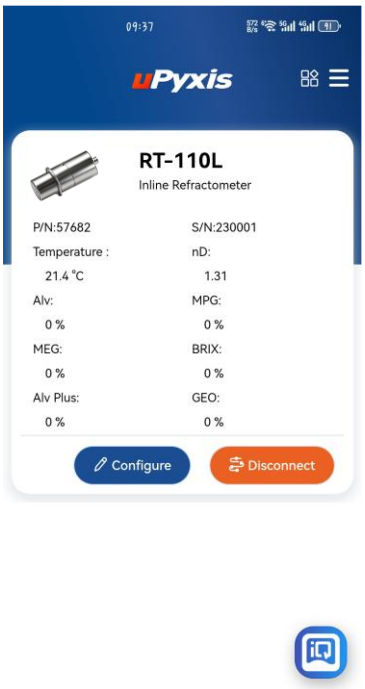


Figure 14. – Discovered RT-110 on uPyxis Mobile APP

5.3 Trend Chart

When connected, the **uPyxis® 2.0** Mobile App will default to the **Trend Chart** screen. From the **Trend Chart** screen, the user can select substances for curve display.

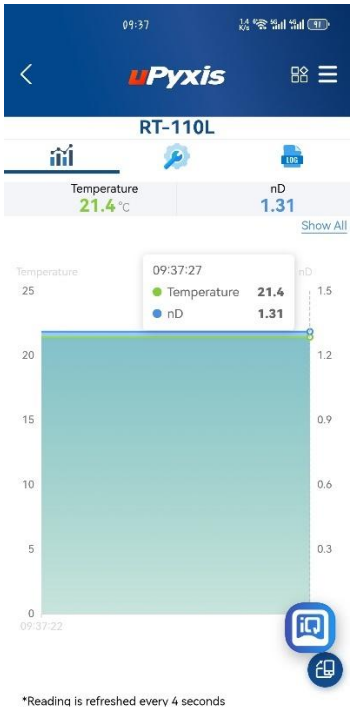


Figure 15. – Trend Chart uPyxis 2.0 Mobile APP.

5.4 Device Setting

From the **Information** screen. You can view the product's P/N, S/N, software version number, etc.

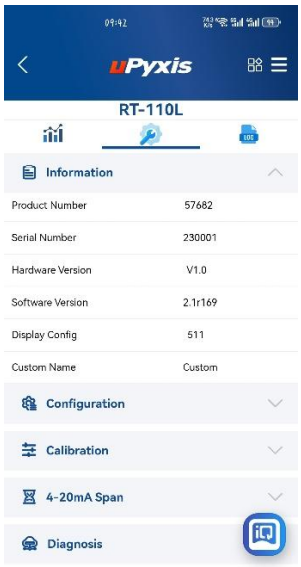


Figure 16. – Device Info Screen Interface

The **Configuration** Screen performs the Device or Product as well as set the Modbus address.

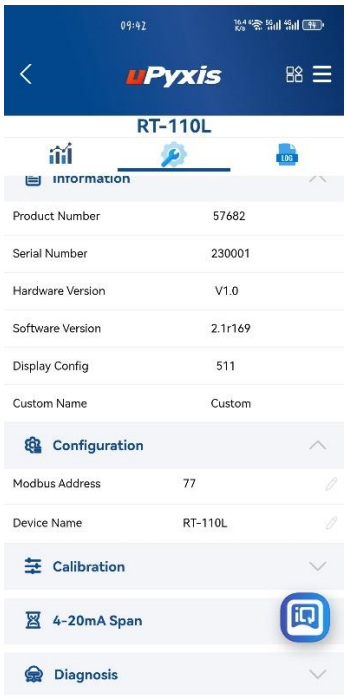


Figure 17. – Device Configuration Screen Interface

5.5 Air Calibration of Refractive Index

Calibration for refractive index is **not** required for the RT-110 Series use. The Prism RT-110 can however be calibrated in air to correct possible misalignment and aging of the optic components. This calibration optimizes output stability and indirectly calibrates Brix and other liquid concentrations.

1. Clean the Prism RT-110 sapphire lens with soft tissue.
2. If any tenacious deposits are present on the sensor lens, you may pre-soak the sensor lens in Pyxis Probe Cleaning Solution (P/N: SER-01) for 10–15 minutes, then rinse with clean water and wipe with soft tissue prior to proceeding to air calibration of refractive index.

   NOTE *Please refer to the Section 8.1* ***Methods to Cleaning the Prism RT-110*** *for details.*
3. After properly cleaning the sensor lens, remove any residual liquid from the sapphire lens.
4. Shield the lens from the ambient light. Typically, place the RT-110 flat on a table and cover the entire device with a towel to ensure no light shines on the window.
5. Press the **Air Calibration** button, then click Confirm again, wait for a few seconds to complete the air calibration.

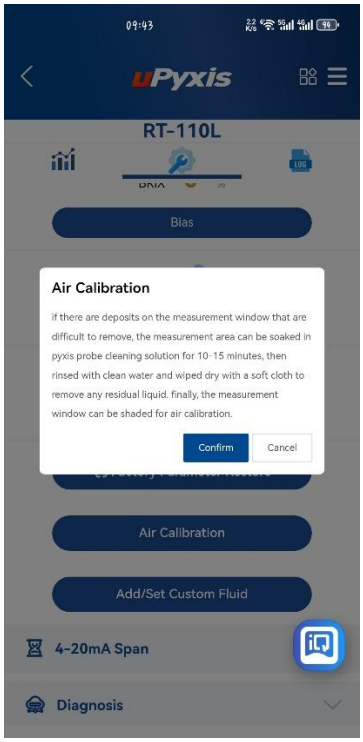


Figure 18. *Air Calibration*

5.6 Brix and Other Liquid Concentration Offset Calibration

The refractive index value does not require calibration as stated in Section 5.5. The refractive index and temperature values are internally converted to the desired liquid concentration unit selected through the uPyxis APP. This liquid concentration unit value may be calibrated (adjusted) to a known solution if desired as an enhancement to the internal conversion calculations within the RT-110 firmware. To do this:

1. Place the Prism RT-110 in the calibration liquid of a known concentration making sure the sensor is covered from ambient light. (ie. Sample liquid and RT-110 in a beaker covered with dark towel)

2. Select the corresponding substance, click **Bias**, and enter a value (if you think the RT-110's reading is too low, enter a positive number; if you think it's too high, enter a negative number).

5.7 Factory Parameter Restore

The user may also perform a factory reset of all calibration values saved in the device by pressing Factory Parameter Restore.

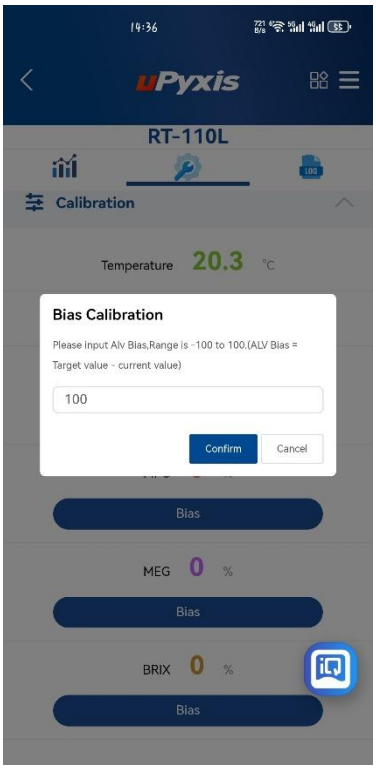


Figure 19. – Bias Calibration Screen Interface uPyxis Mobile APP.

5.8 Cleaning Cycle Setup

RT-110 supports an extended ultrasonic cleaning function using the Ultra-Sonic RT-Series Cleaning Module Kit (P/N 56208). The RT-110 default programmed cleaning time is every 15-minutes. For pricing, technical data and programming of the Ultra-Sonic Cleaning Module Kit, please contact order@pyxis-lab.com.

Since the RT-110 is not equipped with a display, the cleaning cycle can only be set via Upyxis. In most cases, the default 15-minute interval is sufficient for use. The working cleaning cycle is set by RT-110 in increments of every 5, 15 or 30 minutes for a cleaning duration of 5-seconds per cycle.

5.9 Selection and Setting 4-20mA

4-20mA Output Selection. The RT-110 series supports the measurement of substances such as BRIX, EG, and PG. To set the 4-20mA output, you need to use the uPyxis software, which will determine the substance's 4-20mA signal through the white cable output. **The default output of the 4-20mA white cable is BRIX**. Alternatively, you can use an RS485-to-USB adapter to connect to a PC and configure it with dedicated uPyxis Desktop software. See Section 6.5 for details.

Setting 4-20mA Range. The 4-20mA output range for any concentration scale may be modified by the user, if the default range is not suitable for you. This feature enables the user to adjust the 4-20mA output values of the RT-110 for the concentration curve as desired.

NOTE *20mA value adjustment must be LESS than the highest default 20mA output value of the concentration selected. (i.e. for BRIX concentration, the 20mA value may be set to 100% or lower). Please refer to Section 7.1 for default 4-20mA output scales of the RT-110.*

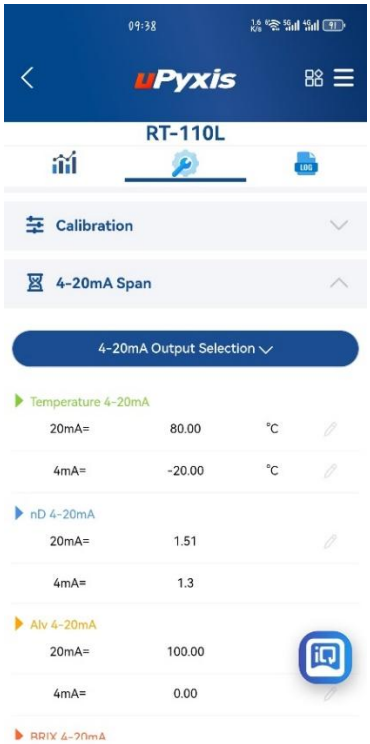


Figure 20. – Setting 4-20mA Range

5.10 Add/Set Custom Fluid

To adapt to more application scenarios, users can create and add new customized fluids through the uPyxis APP. This method will establish a formula between the new fluid and Brix%, and the accuracy can reach ±0.2%. Modification of the Custom Fluid Name and Coefficient are also supported via uPyxis.

STEP 1 - Name the Custom (New) Fluid

The name should not exceed 7 characters in length. ***NOTE*** *Only alphanumeric and "_" may be used.*

STEP 2 - Entering at Least 5-sets of Custom Product Concentration Data

The user should then enter at least 5-sets of the Custom (New) Fluid Concentration (%) and to the corresponding Brix (%) concentration already populated in the table. The uPyxis APP will calculate and establish the coefficient formula between the Custom (New) Fluid Concentration (%) and Brix (%). ***NOTE*** *If your data correlation coefficient R^2 is less than 0.8, the uPyxis APP will **NOT** permit you to proceed to the next step and users must check their concentration data for accuracy.*

STEP 3 - Confirm

Apply this custom fluid and display it on the OLED screen.

STEP 4 - Set Custom (New) Fluid 4-20mA Range & Sensor Output Scale

According to the concentration range of the Custom (New) Fluid refer to Section 7.4 setting 4-20mA range. Enter the appropriate concentration (%) of 4mA, and concentration (%) of 20mA to program the 4-20mA output scale from the sensor. ***NOTE*** *It is important to remember this output scale for programming the signal receiving device accurately (ie. Controller, PLC or Network)*

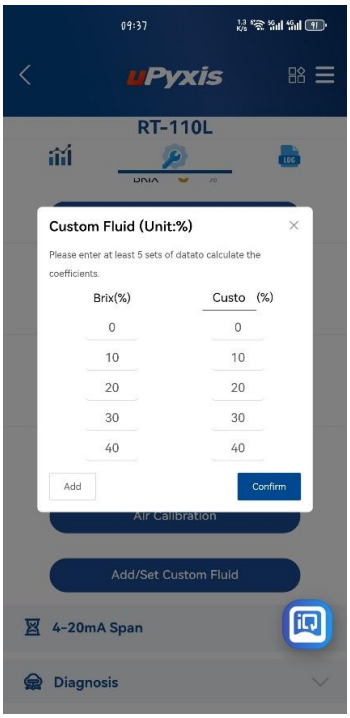


Figure 21.

5.11 Diagnosis Screen

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

Get spectrum data, if necessary, spectral data can also be obtained to assist in diagnosing sensor issues.

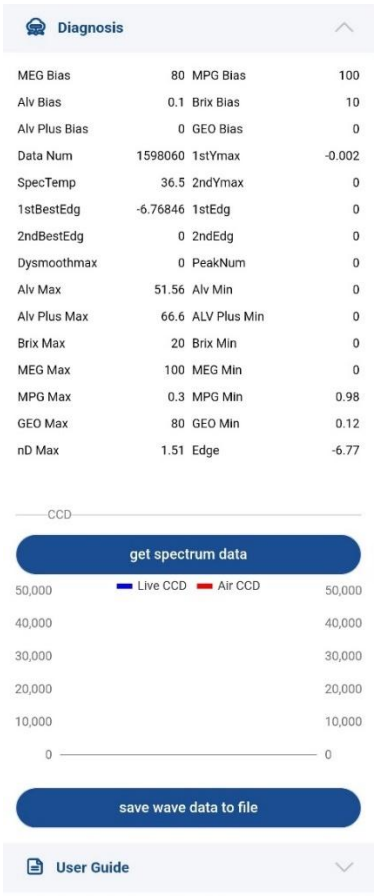


Figure 22. – Diagnosis Screen Interface

5.12 Data Log Screen

The user can choose the time period of data export, including hour, day, week, month, and all data stored. After selecting, wait for the progress bar to load.

NOTE *The Prism RT-110 is programmed to store data at a frequency of once per minute with a maximum of 56 days storage capacity.*

The Data Log screen's functions are described in table below:

Table 6. – Data Log Screen Functions

Function	Description
Remove all Data records	The removal of unnecessary historical data is a relatively slow process. Do not power off during the process.
Export hour/day/week/month/all History Data records	The historical data is exported and saved in CSV format. The storage contents include refractive index nD, temperature °C, Brix, MEG, PEG and others.

Figure 23. – Data Log

6 Setup and Calibration with uPyxis® Desktop App

6.1 Install uPyxis® Desktop App

Download the latest version of **uPyxis®** Desktop software package from: [uPyxis® App | Mobile Monitoring, Calibration & Configuration | Pyxis Lab®]

This setup package will download and install the Microsoft.Net Framework 4.5 (if not previously installed on the PC), the USB driver for the USB-Bluetooth Adapter (MA-NEB), the USB-485 Adapter (MA-485), and the main **uPyxis®** Desktop application. Double click the **uPyxis.Setup.exe** file to install.

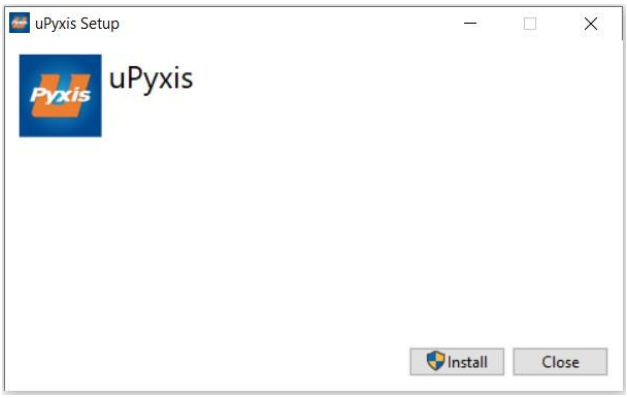


*Figure 24. **uPyxis®** Desktop App installation*

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

6.2 Connecting to uPyxis® Desktop App via USB-C Cable

For those desiring not to use wireless connection to uPyxis, the MA-CR Bluetooth adapter (P/N: MA-CR) can be used to connect an RT-110 sensor to a laptop or a desktop computer with a USB-C cable and the **uPyxis®** Desktop App. In this format, the power should be sourced from the laptop via the USB-C cable connected to the MA-CR and Laptop USB-C port.

1) Download and install uPyxis Desktop APP from https://www.pyxis-lab.com/upyxis-app/
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 RT-110 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 App.

MA-CR Bluetooth Adapter – Bottom USB-C

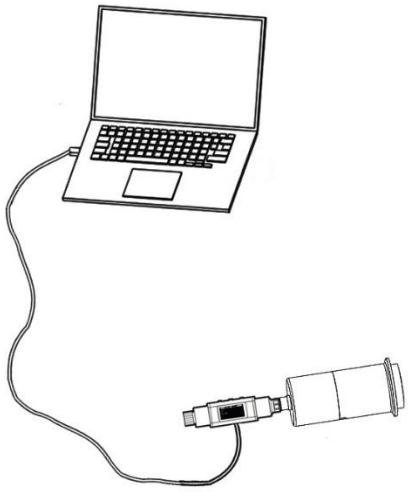


Figure 25. MA-CR Adapter Connected via USB-C to Laptop for uPyxis Desktop Use

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 23)*.
7) Select the Comm Port to make a connection. Normally only one Comm port is identified by uPyxis. If there is 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.

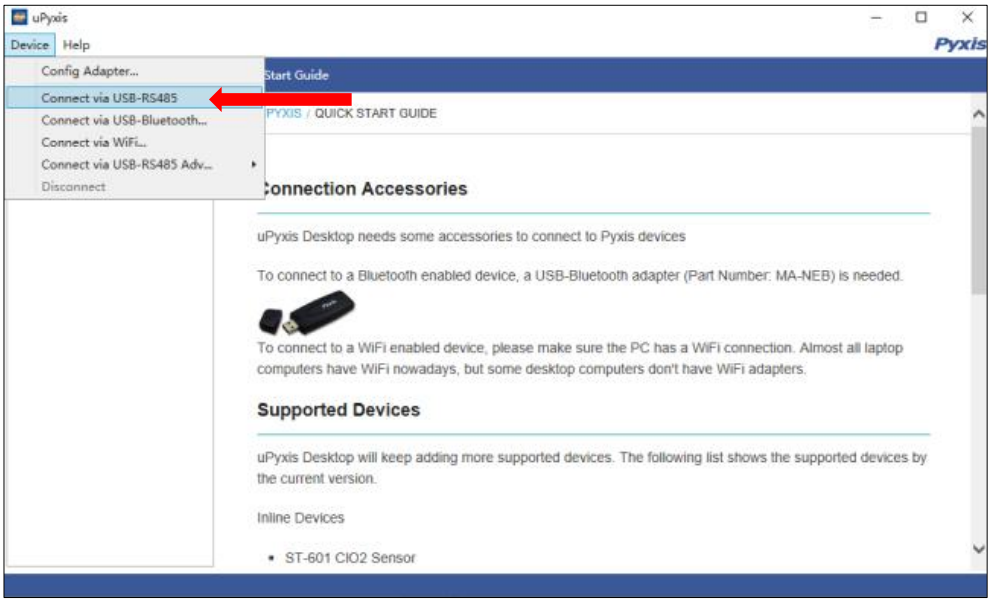


Figure 26. Connect to RT-110 via USB-RS485 option

6.3 Information Screen

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

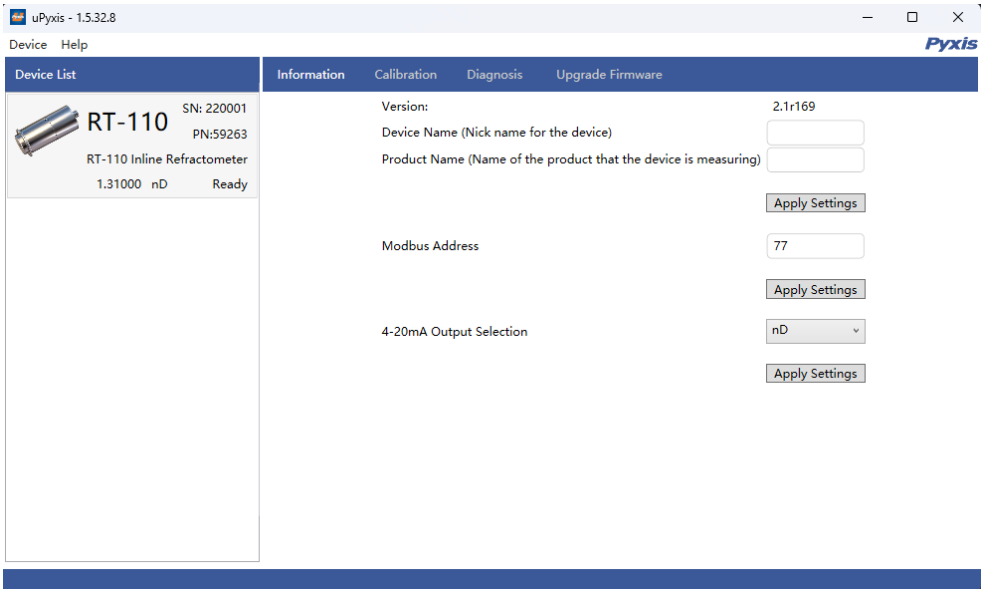


Figure 27. Information Screen uPyxis Desktop

6.4 Calibration Screen

To calibrate the device, click on Calibration. From the **Calibration** screen, the user can perform the various forms of calibrations as discussed in this manual (see Sections 5.5 and 5.6) by pressing on Air Calibration and Bias Calibration (Offset Calibration). The calibration objective is determined by the drop-down box selected. On the **Calibration** screen there are seven calibration options based on the including AIR CALIBRATION, BRIX, MEG, MPG. Follow the screen instructions for each calibration step.

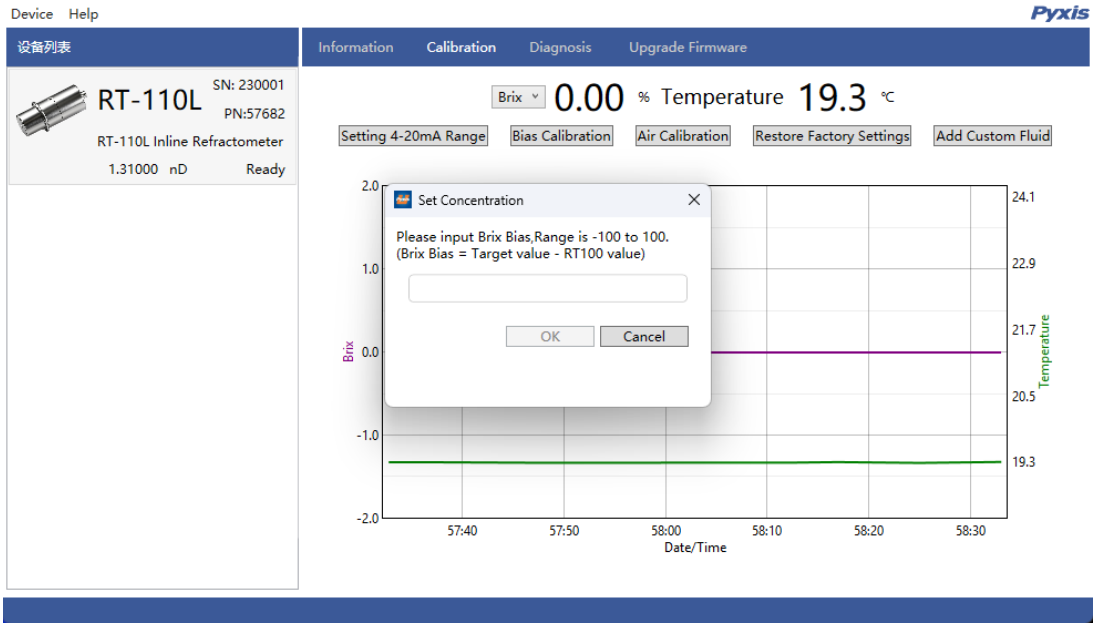


Figure 28. Bias Calibration

The user may also perform a factory reset of all calibration values saved in the device by pressing Restore Factory and entering '**upyxis**' into the prompt.

6.5 Selection and Setting 4-20mA

Setting 4-20mA Range The 4-20mA output range for any concentration scale may be modified by the user, if the default range is not suitable for you. This feature enables the user to adjust the 4-20mA output values of the RT-110 for the concentration curve as desired.

NOTE *20mA value adjustment must be LESS than the highest default 20mA output value of the concentration selected. (ie. for BRIX concentration, the 20mA value may be set to 100% or lower). Please refer to Section 7.1 for default 4-20mA output scales of the RT-110.*

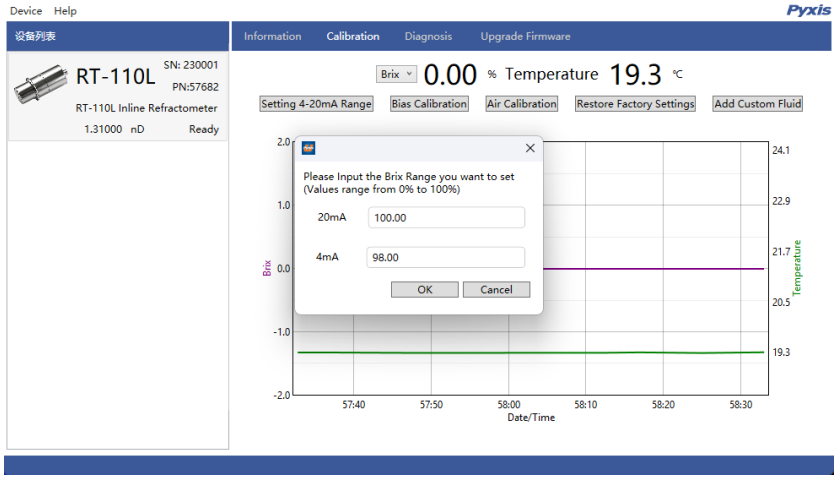


Figure 29.

4-20mA Output Selection. The RT-110 series supports the measurement of substances such as BRIX, EG, and PG. To set the 4-20mA output, which will determine the substance's 4-20mA signal through the white cable output. **The default output of the 4-20mA white cable is BRIX**. Alternatively, you can use an RS485-to-USB adapter to connect to a PC and configure it with dedicated uPyxis Desktop software.

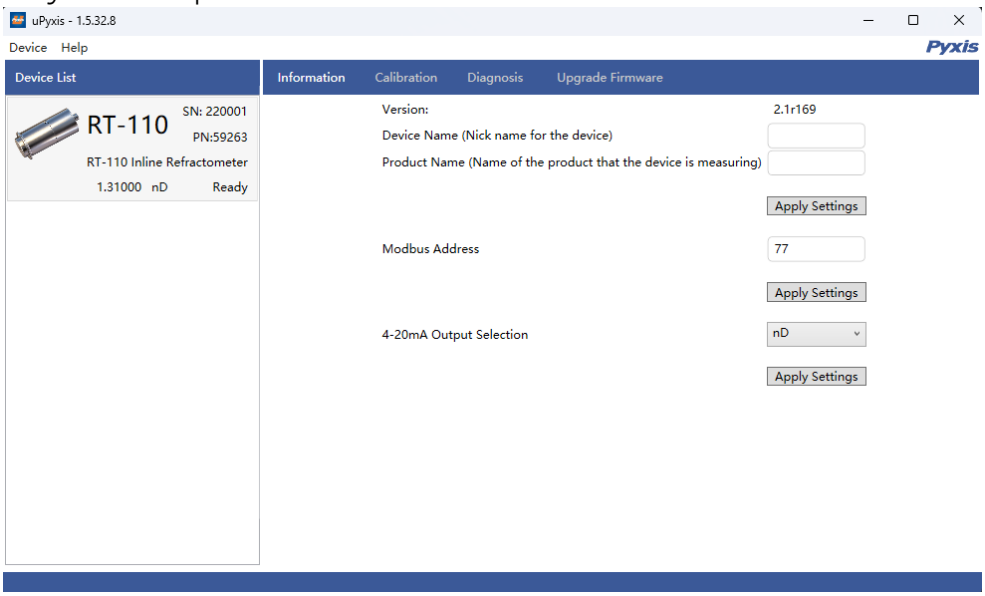


Figure 30.

6.6 Add/Modify Custom Fluid

To adapt to more application scenarios, users can add new fluids through uPyxis and display them on the OLED screen. This method will establish a formula between the new fluid and Brix%, and the accuracy can reach ±0.2%. Modification of the Custom Fluid Name and Coefficient are also supported via uPyxis.

STEP 1 - Name the Custom (New) Fluid

The name should not exceed 7 characters in length. ***NOTE*** *Only alphanumeric and "_" may be used.*

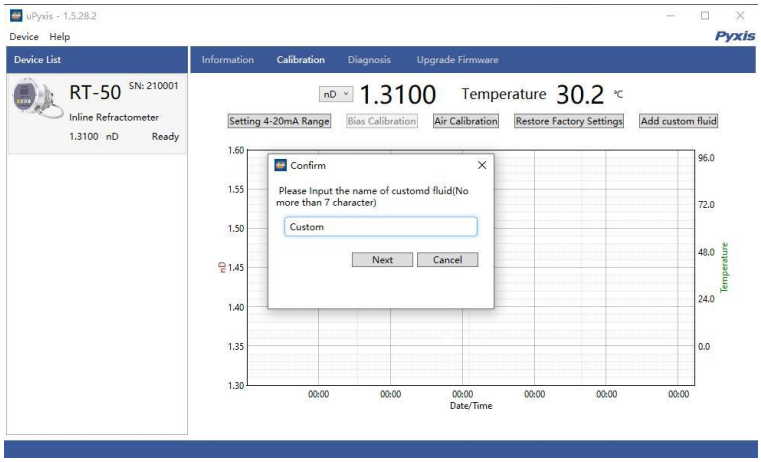


Figure 31.

STEP 2 - Entering at Least 5-sets of Custom Product Concentration Data

The user should then enter at least 5-sets of the Custom (New) Fluid Concentration (%) and to the corresponding Brix (%) concentration already populated in the table. The uPyxis App will calculate and establish the coefficient formula between the Custom (New) Fluid Concentration (%) and Brix (%).

NOTE *If your data correlation coefficient R^2 is less than 0.8, the uPyxis APP will **NOT** permit you to proceed to the next step and users must check their concentration data for accuracy.*

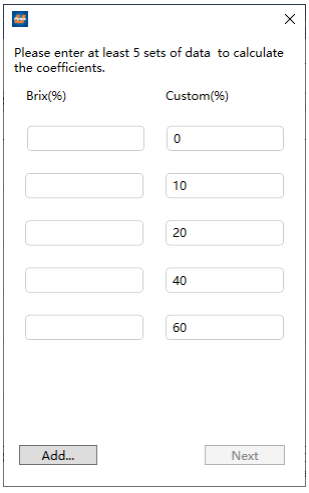


Figure 32.

STEP 3 - Set Custom (New) Fluid 4-20mA Range & Sensor Output Scale

According to the concentration range of the Custom (New) Fluid, enter the appropriate concentration (%) of 4mA, and concentration (%) of 20mA to program the 4-20mA output scale from the sensor.

NOTE *It is important to remember this output scale for programming the signal receiving device accurately (ie. Controller, PLC or Network)*

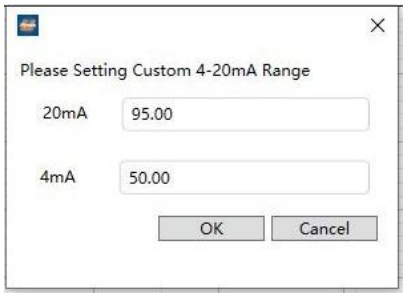


Figure 33.

STEP 4 - Apply the Custom (New) Fluid Settings and Display

Please confirm whether to apply this custom fluid and display it on the OLED screen. Once OK is pressed, the uPyxis APP will apply this customized firmware to the RT-110 process control board and the unit is now set to display your custom fluid.

Figure 34.

6.7 Diagnosis Screen

From the Diagnosis screen, the user can check the diagnosis condition. This feature may be used for technical support when communicating with service@pyxis-lab.com.

The user can choose the time period of data export, including: hour, day, week, half month, and all data stored. After selecting the time, press Export History Data and wait for the progress bar to load.

NOTE *The Prism RT-110 is programmed to store data at a frequency of once per minute with a maximum of 56 days storage capacity.*

The **Diagnosis** screen's functions are described in table below:

Table 7.

Function	Description
Wipe History Data	It is convenient to clear unnecessary historical data. This process is relatively slow. Do not power off during the process.
Export Spectrum	Derive the original spectrum.
Export History Data	The historical data is exported and saved in CSV format. The storage contents include refractive index nD, temperature °C, Brix, EG, and other.
Save & Share	Save the data and send it to other software.
Hour (Dropdown)	Select the length of time to export data. The latest hour is exported by default. Users may select Day, Week, and Half-Month. Data can be exported for up to 56 days.

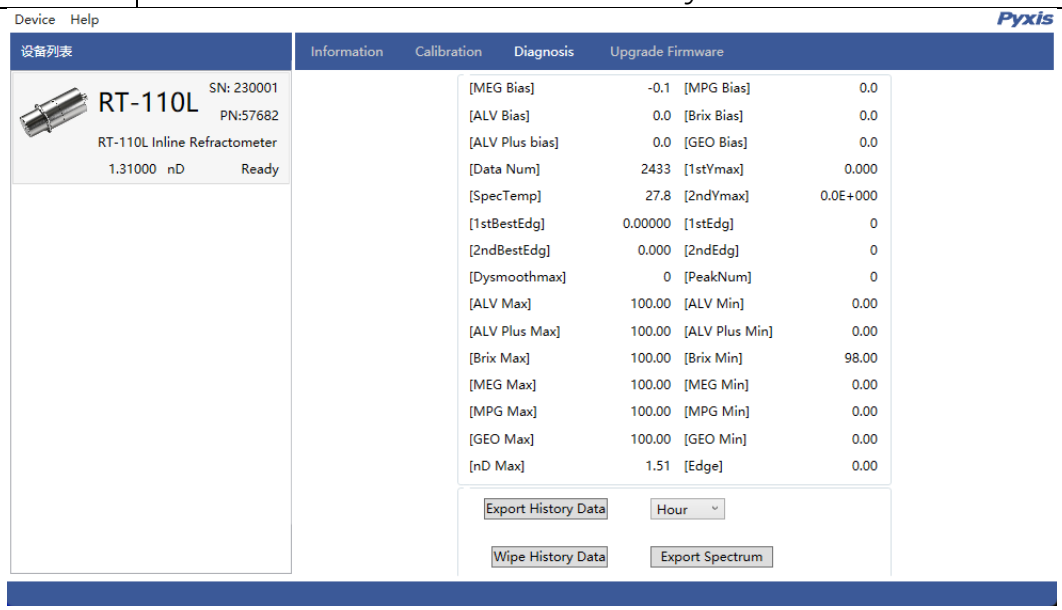


Figure 35.

6.8 Upgrade Firmware

NOTE* RT-110 must be used in USB connection mode.* Select the **"*.bin"** file for firmware update, if you need to fix some issues with the firmware of your device.

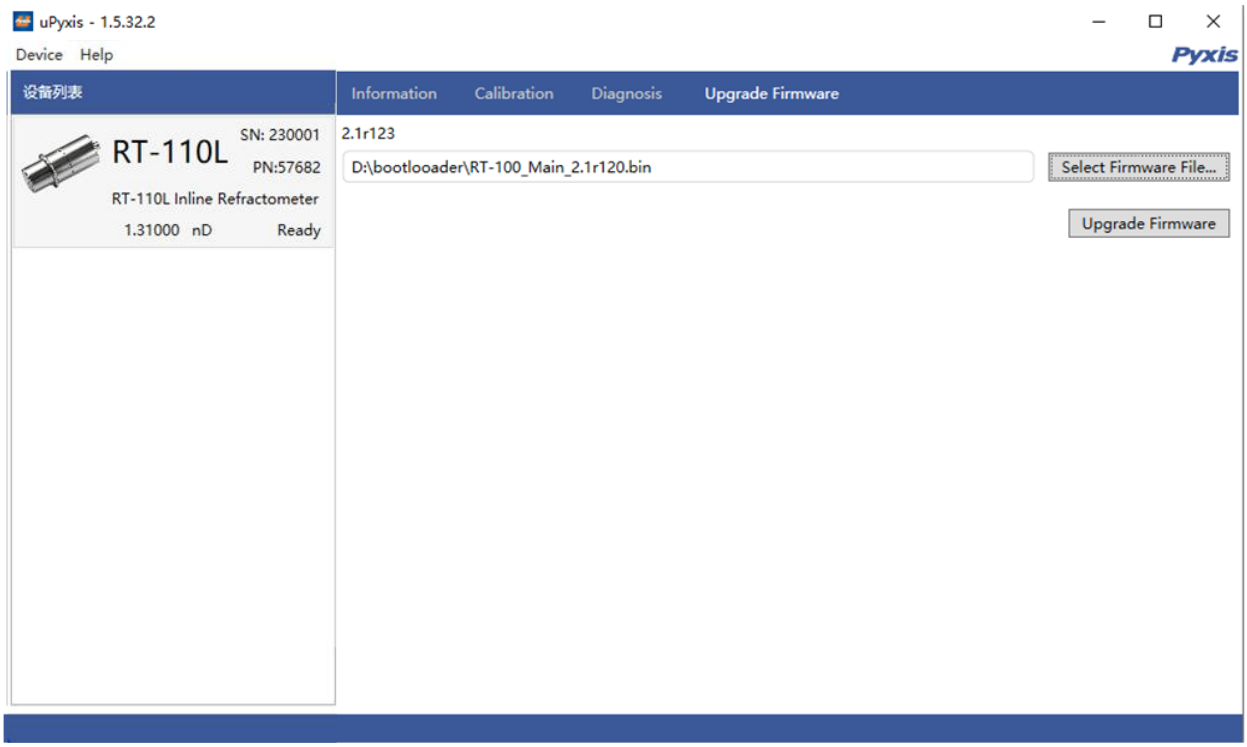


Figure 36.

7 Outputs

7.1 4–20mA Output Setup

The 4 ~ 20mA range can be modified by uPyxis, if the default range is not suitable. The 4–20mA default output of the Prism RT-110 sensor is scaled as outlined below. The default output of the **white cable** is a 4-20mA signal corresponding to **Brix** values.

Table 8.

Measurement Mode	4 mA Output Value	20 mA Output Value
Refractive Index (nD)	1.3000	1.5100
Brix (% or Bx)	0%	100%
Mono Ethylene Glycol (%MEG)	0%	100%
Mono Propylene Glycol (%MPG)	0%	100%
Temperature	-20 °C	80 °C

7.2 Communication using Modbus RTU

The Prism RT-110 sensor is configured as a Modbus slave device. In addition to the nD, %Bx, %MEG, %MPG, and temperature values, many operational parameters, including warning and error messages, are available via a Modbus RTU connection. Contact Pyxis Lab Customer Service (service@pyxis-lab.com) for more information.

General Communication Settings

* Baudrate: 9600 bps
* Databit: 8-bit
* Stopbit: 1 bit
* Parity Check: Even
* Bus Type: RS485

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
* 16 – Write Multiple Registers

RT-110 & RT-110L Modbus Slave Address: 77

Air Calibration Procedure

1) Place the measurement window in air with stable temperature
   NOTE *- Please avoid direct light*
2) Write value 13 to operation command register (43001), then wait 20 seconds
3) Read calibration status register (41003)
   0 - Calibration is busy
   1 - Calibration succeeds
   2 - Calibration failed

Change Communication Settings Procedure

1) Write communication settings value to corresponding register, e.g., write parity check value to Parity Check register (42003)
2) Wait for 1 second
3) Write value 7 to operation command register (43001), then wait 2 seconds

Restore Factory Parameters

1) Write value 4 to operation command register (43001)
2) Read command result register (41002)
   0 - Restore is busy
   1 - Restore succeed
   2 - Restore failed

Register Name	Register Address	Data Length	Data Type
Product number	41005	32bit	UINT32
Modbus Address	42001	16bit	UINT16
Parity Check	42003	16bit	UINT16
Baudrate	42004	32bit	UINT32
Command Result	41002	16bit	UINT16
Calibration Status	41003	16bit	UINT16
Operation Command	43001	16bit	UINT16
Customized measure enable	43030	32bit	UINT32
Customized measure name	43032	8 bytes	Char[8]
Temperature 4mA Value	43045	32bit	Float
Temperature 20mA Value	43047	32bit	Float
Temperature (℃)	46003	32bit	Float
Refractive Index	46005	32bit	Float
PG Concentration	46007	32bit	Float
EG concentration	46009	32bit	Float
ALV concentration	46011	32bit	Float
Brix concentration	46013	32bit	Float
ALV Plus concentration	46035	32bit	Float
GEO concentration	46038	32bit	Float
Customized measure concentration	46058	32bit	Float
Brix 4mA Value	52001	32bit	Float
Brix 20mA Value	52003	32bit	Float
EG 4mA Value	52005	32bit	Float
EG 20mA Value	52007	32bit	Float
PG 4mA Value	52009	32bit	Float
PG 20mA Value	52011	32bit	Float
Customized measure 4mA Value	52025	32bit	Float
Customized measure 20mA Value	52027	32bit	Float

8 Sensor Maintenance and Precaution

8.1 Methods to Cleaning the Prism RT-110

For most RT-110 sensor cleanings, the sapphire lens should be rinsed with clean or DI water than wiped clean with a soft tissue. If tenacious inorganic deposits are present on the sapphire lens, soak the lower half of the Prism RT-110 sensor in 100 mL of Pyxis inline sensor cleaning solution (SER-01) for 15-minutes. If the surface is not entirely clean, continue to soak the sensor for an additional time until clean. Lightly wipe the sensor lens with a soft tissue. Rinse sensor eye with clean or DI water. Pyxis Lab Inline Sensor Cleaning Solution can be purchased at our online E-Store/Catalog at https://www.pyxis-lab.com/product/inline-sensor-cleaning-kit/

Figure 37. Inline Probe Cleaning Solution Kit (P/N: SER-01)

9 Contact Us

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