Pyxis®

HW-201 Stainless Steel Sensor

Inline Sugar Sensor

Pyxis Lab® Inc.
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USER MANUAL

V1.1

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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 HW-201 probe is thirteen (13) months from original shipment from Pyxis. 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 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 HW-201 Sensor

Description

The Pyxis HW-201 is an inline fluorometer sensor designed to directly measure Sugar (Thin Juice) contamination in condensate carried over from the multiple effect evaporators in a sugar plant production process. The sensor utilizes near UV light to directly measure fluorescence representative units displayed as ppm Sugar. Pure glucose sugar does not fluoresce at any significant amount, however the raw sugar, also referred to as "Thin Juice" processed in the multiple effect evaporators fluoresces blue/green light when excited by a near UV light source. The fluorometer in HW-201 is designed to detect the raw sugar fluorescence to monitor possible sugar thin-juice carryover into boiler condensate.

Because all sugar processing facilities may differ in fluorescent signal ratio to Thin-Juice content, the HW-201 is factory calibrated by Pyxis Lab using Synthetic Sugar (Thin-Juice) Calibration Standard Solutions (Sugar200 & Sugar400) and is capable of measuring this value in a range of 5 to 500ppm in this scale of detection. The unit may be field calibrated using Pyxis Synthetic Calibration Standards as outlined in this operation manual and the device readings may be correlated to onsite test validated samples to determine site specific values of residual Thin-Juice.

The HW-201 offers a combination of fully integrated 4-20mA as well as RS-485 Modbus output signals and is Bluetooth® 5.0 Enabled for wireless cleaning and calibration when used with MA-WB or PowerPACK Series Bluetooth Adapters and the uPyxis APP for Desktop devices. The HW-201 is provided in 304 Stainless Steel and have ¾-inch NPT on the sensor itself, 1.5-meter bulk-head cable with quick adapter and 1.5-meter flying lead cable with quick adapter, enabling rapid wiring to any microprocessor controller, PLC or DCS system.

Key Features

- No Reagents – Direct Reading
- Low operating costs except for routine maintenance and calibration
- Used to monitor boiler condensate in a sugar processing facility with high sensitivity for early detection
- Reading as Sugar ppm (Fluorescent Representative Units)
- Simple Maintenance and Calibration using Pyxis Synthetic Sugar (Thin-Juice) Calibration Standard Solutions
- HW-201 offers both 4-20mA and RS-485 outputs via 7-pin cable with adapters.
- Bluetooth Enabled when used with MA-WB Adapter Wireless uPyxis Calibration
- The probe can be diagnosed via the uPyxis Desktop APP

1.1 Specifications

Item	HW-201	HW-201-T
P/N	52217	57769
Target	Raw Sugar-Multiple Forms	
Range	5-500 ppm	
Lower Detect Limit	5 ppm	
Repeatability	≤1.5% or 10 ppm	
Accuracy	±3% of reading	
Methodology	Ultraviolet fluorescence	
Material	304 Stainless Steel	
Installation	3/4-inch NPT Thread	Requires ST-007 Stainless Steel Tee 1/4/inch OD *(Sold Separately)*
Pressure	Up to 100 psi (6.9 Bar)	
Recommended Flow Rate	0-3 m/s	
Enclosure Rating	IP66	
Operating Temperature	32.8–104 °F (1–40 °C)	
Storage Temperature	19.4–140 °F (-7–60 °C)	
Power Supply	22 – 26V DC, Power Consumption – 1W	
Outputs	Isolated 4-20mA Analog Output Isolated RS-485 Digital Output, Supporting MODBUS protocol	
Cable Length	1.5m – 7Pin Bulkhead Cable w/ IP67 Adapter 1.5m – 7Pin Flying Lead Cable w/IP67 Adapter *3m or 15m Optional Extension Cables Available*	
Dimension (L×W×H)	210.8* 57.15*44.45 mm	
Weight	1450 g (3.19lbs)	
Regulation	CE / RoHS / UKCA	
Calibration	Calibrated by using Pyxis Synthetic Standard (Sugar200 & Sugar400)	

(1)

Specifications are subject to change without notice.

(2) *The measurement value depends on the composition of organic matter and the water sample. Site specific correlation to the device value and actual ppm of Raw Sugar (Thin-Juice) is required.*

1.2 Unpacking the HW-201

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 HW-201 (P/N 52217) sensor or the HW-201-T (P/N 57769)
- Bulkhead Cable (1.5m / 7Pin Cable w/Adapters)
- Flying Lead Cable (1.5m / 7Pin Cable w/Adapters)
- 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	P/N
Pyxis Probe Cleaning Kit *(Includes Sensor Cleaner 500mL + Accessories)*	SER-01
MA-WB Bluetooth/USB Adapter (*Pyxis Bluetooth/USB Adapter for 7Pin Pyxis Sensors*)	MA-WB
Power*PACK-1* *(Single Chanel Auxiliary Power Supply w/Bluetooth For Pyxis Sensors)*	MA-BLE-1
Power*PACK-4* *(Four Chanel Auxiliary Power Supply w/Bluetooth For Pyxis Sensors)*	MA-BLE-4
MA-C10 *(10' Extension Cable for 7Pin Pyxis Sensors)*	50738
MA-C50 *(50' Extension Cable for 7Pin Pyxis Sensors)*	50705
SUGAR-400 *(Synthetic Sugar Thin Juice Calibration Standard Solution - 200ppm -500mL Bottle)*	21037
SUGAR-400 *(Synthetic Sugar Thin Juice Calibration Standard Solution - 400ppm -500mL Bottle)*	36054
ST-007 *(Stainless Steel Tee Assembly ¼-inch OD – Required for use with HW-201T)*	50700-A51

2. Installation

HW-201 Piping

The HW-201 sensor has 3/4” female NPT threaded ports on the sensor itself and therefore does not require a custom tee assembly. It is recommended that two 3/4” NPT to 1/4” tubing adapters are used to connect the sensor to the sampling system. Sample water entering the sensor must be cooled down to below 120 °F (49 °C). The sensor can be held by a 1.75-inch pipe clamp or mounted to a panel with four 1/4-28 bolts. See Figure 1 for HW-201 dimensions.

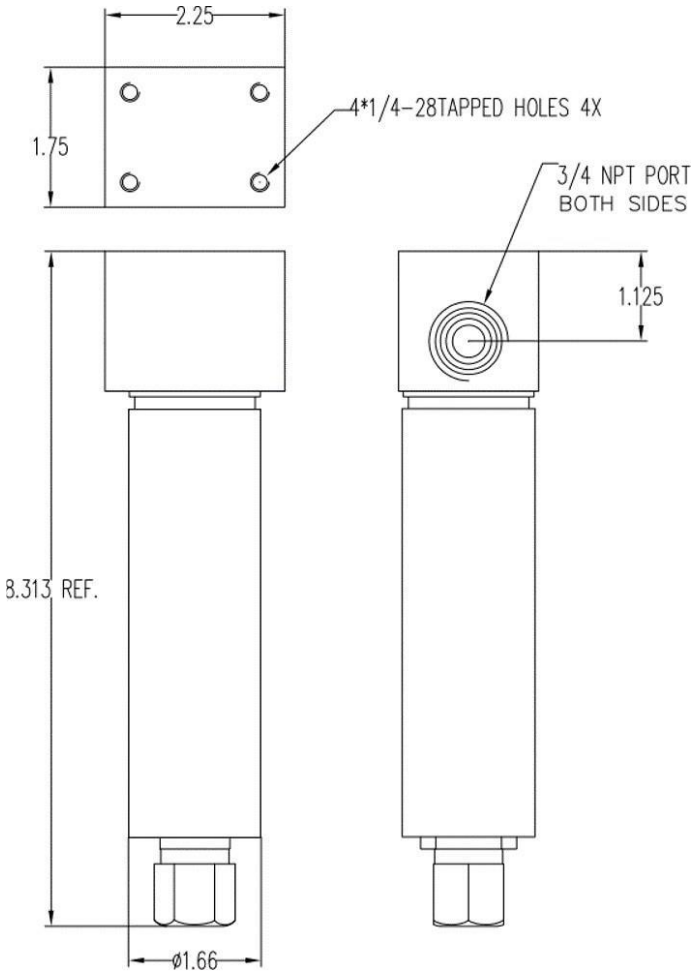

Figure 1 – Dimension of the HW-201 (inch)

HW-201-T Compression (1/4-inch OD)

The HW-201T sensor series must be used with the ST-007 stainless steel inline tee assembly for use in a precooled sample. The maximum pressure of the sensor and tee assembly is 290psi. ST-007 provides 1/4-inch OD compression (Swagelok) fittings. The sensor should be installed horizontally with sample flow entering the bottom of the tee and exiting the top.

NOTE *ST-007 is sold separately.*

To properly install the HW-201T sensor into the ST-00 Tee Assembly, follow the steps below:

1. The recommended installation of the sensor and tee is horizontal with sample flow entering the bottom of the tee and exiting the top. This ensures proper sensor optical channel flooding.
2. Insert the provided O-ring into the O-ring groove on the tee.
3. Insert the HW-201T series sensor into the ST-007.
4. Tighten the tee nut onto the tee to form a water-tight, compression seal.

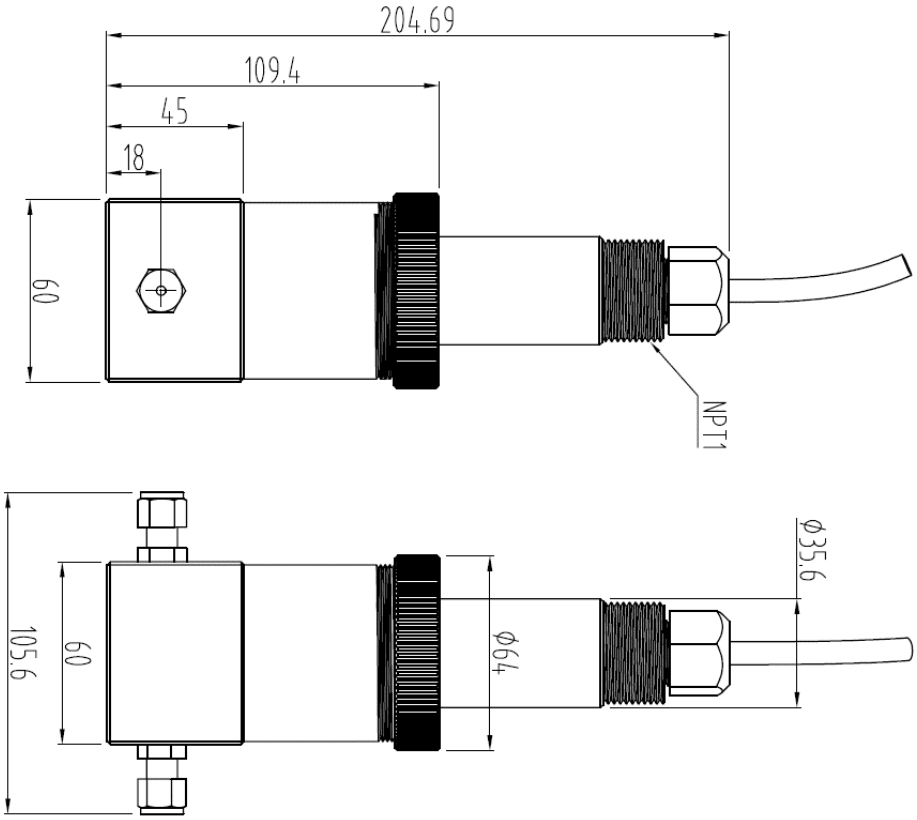

Figure 1A – Dimension of the HW-201-T installed in ST-007 (mm)

3. Quick 4-20mA Start

Follow the wiring table below to connect the HW-201 sensor to a receiving controller.

Wire Color	Designation
Red	24 V +
Black	Power Ground
White	4-20 mA + for Sugar
Green	Not Used
Blue	RS-485 A
Yellow	RS-485 B
Clear	Shield, Solution ground

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

HW-201 Sensor 4-20mA Scaling		
Unit of Measure	**4mA Value**	**20mA Value**
Sugar	5 ppm	500 ppm

__NOTE__: The 24V power ground and the 4-20 mA- return are internally connected. If insufficient wattage is available from the connected controller (i.e., 1.5-1.6W), Pyxis recommends the **PowerPACK Series** Auxiliary Power & Bluetooth Communication Adapters highlighted in the Optional Accessories section of this manual. If a separate DC power supply other than that from the controller is used, make sure that the output from the power supply is rated for 22-26 VDC @ 65mA. Detailed wiring diagrams for common controllers are available from www.pyxis-lab.com.

4. Calibration and Diagnosis

The HW-201 probe can be calibrated in a two-point (zero + slope) procedure using a deionized water sample and a standard solution containing a known Sugar standard solution. **For HW-201, Pyxis recommends** Pyxis Synthetic Sugar (Thin-Juice) Calibration Standard Solutions**. Pyxis item Sugar200 and Sugar400**. **HW-201 sensor should be calibrated in a completely light-proof environment.**

4.1 Calibration and Diagnosis by uPyxis Mobile App

Connect and power the HW-201 sensor using the MA-WB Pyxis Bluetooth adapter (P/N: MA-WB) 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-WB Bluetooth Adapter

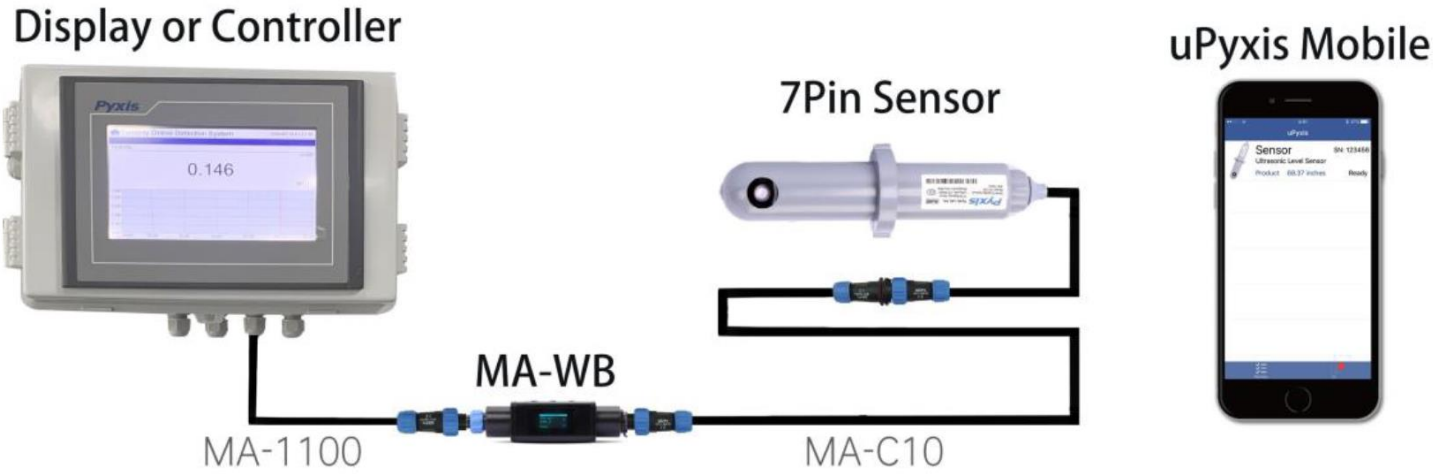

Figure 2. –

Power the HW-201 via Display or Controller with the MA-WB Bluetooth Adapter inserted between Bulkhead & Flying Lead Cables

Download and install the **uPyxis2.0** 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. Click Scan Bluetooth button to scan the available Pyxis Bluetooth devices. The discovered devices will be listed as shown in *Figure 3*.

Tap the discovered HW-201 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 4,* uPyxis will default to **Trend Chart** page after connected to the sensor via the MA-WB Bluetooth adapter. The measurement value will be displayed as a line graph to show the real-time trend.

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

Figure 3 - HW-201 Discovered via Bluetooth

Figure 4 – Trend Chart Page

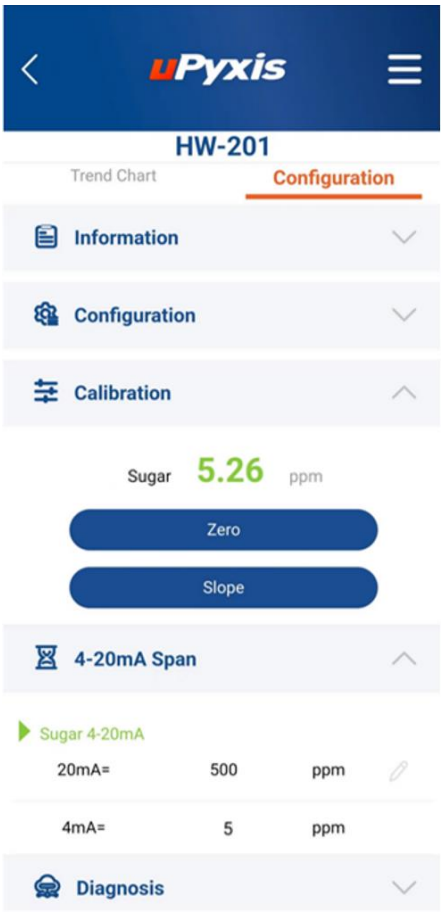

Figure 5 – Configuration Page

4.1.1 Sugar Calibration

Sugar calibration for the HW-201 requires deionized (DI) water and a standard solution. SUGAR calibration uses 200 ppm SUGAR standard solution (see the **Optional Accessories** section). ***Note*: HW-201 sensor should be calibrated in a completely light-proof environment.**

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

Place the sensor into Pyxis Sugar 200 calibration standard solution and tap **Slope CALIBRATION** in the uPyxis app. Enter the Sugar concentration 200 in the dialog window as in Figure 7.

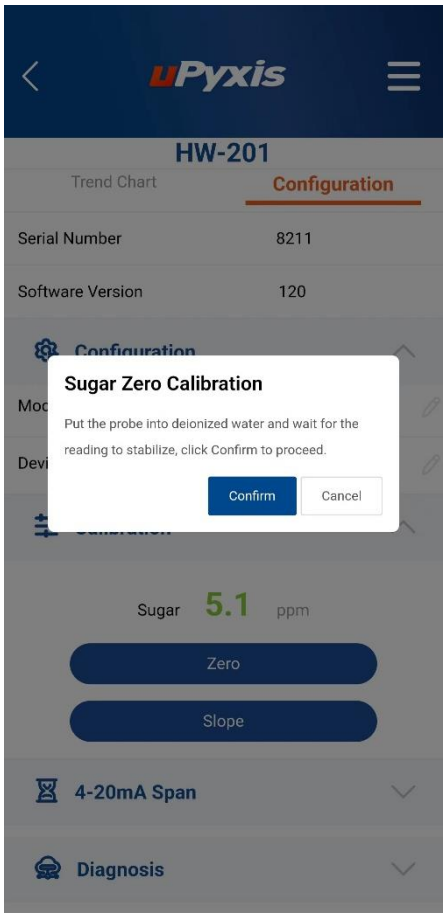

Figure 6 – Zero Calibration

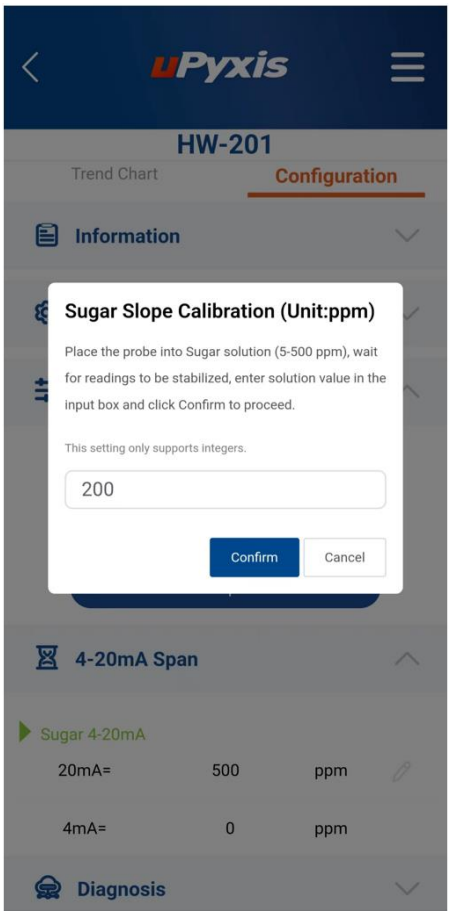

Figure 7 – Slope Calibration

4.1.2 4-20mA Span

The default 4-20mA span is 20 mA = 500 ppm and 4 mA = 5 ppm. Users may alter the output scale using **4-20mA Span** to change the sugar value corresponding to the 20mA output (Figure 8). ***NOTE* the 20mA value span adjustment may only be equal to or lower than the upper range detection limit of the sensor.**

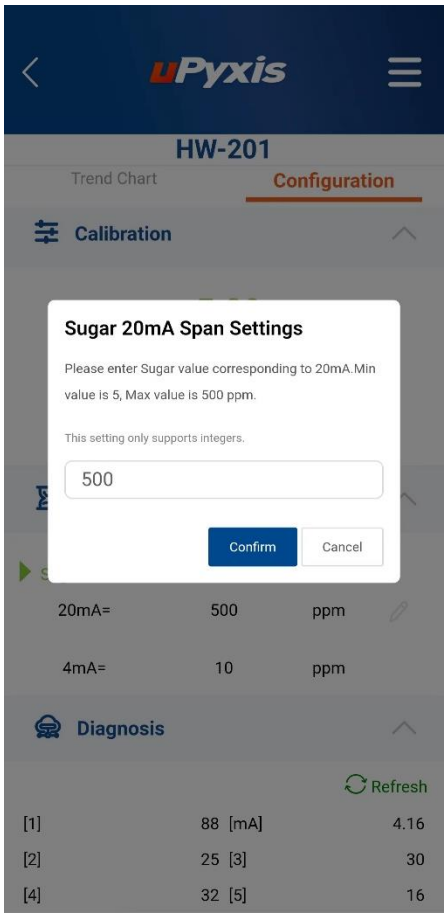

Figure 8 – Adjust 20mA Setting for Sugar

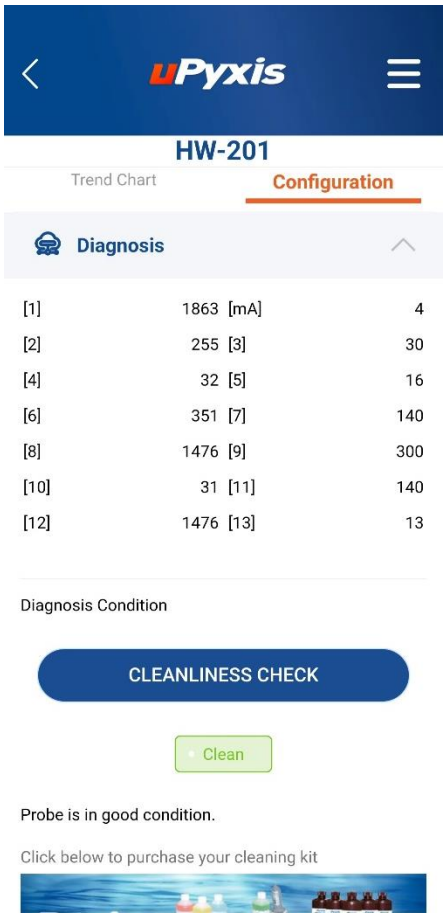

Figure 9 - Diagnostic Section

4.1.3 Diagnosis and Cleanliness Check

Tap **Diagnosis** in the bottom of the **Configuration** page *Figure 9*.
In this section, the raw data measured by the sensor is displayed. To help troubleshoot possible issues with the probe, please save an image of this page when the probe is placed in a clean water (tap water or deionized water), in a standard, and in the sample that the probe is intended. This data may be exported from the uPyxis APP via email to service@pyxis- lab.com for technical support.

To perform a Cleanliness Check, press Cleanliness Check. If the sensor is clean, a Clean message will be shown. If the sensor is severely fouled, a Dirty message will be shown. In this case, follow the procedure in the Methods to Cleaning the HW-201 Sensor section of this manual.

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-WB and to the USB port of the laptop or computer. This will provide power the MA-WB from the laptop/computer. Connect the MA-WB to the HW-201 sensor. The MA-WB Bluetooth adapter will boost the 5V of the regular USB to 24V to power the sensor for use with uPyxis Desktop.

MA-WB Bluetooth Adapter – Bottom USB-C

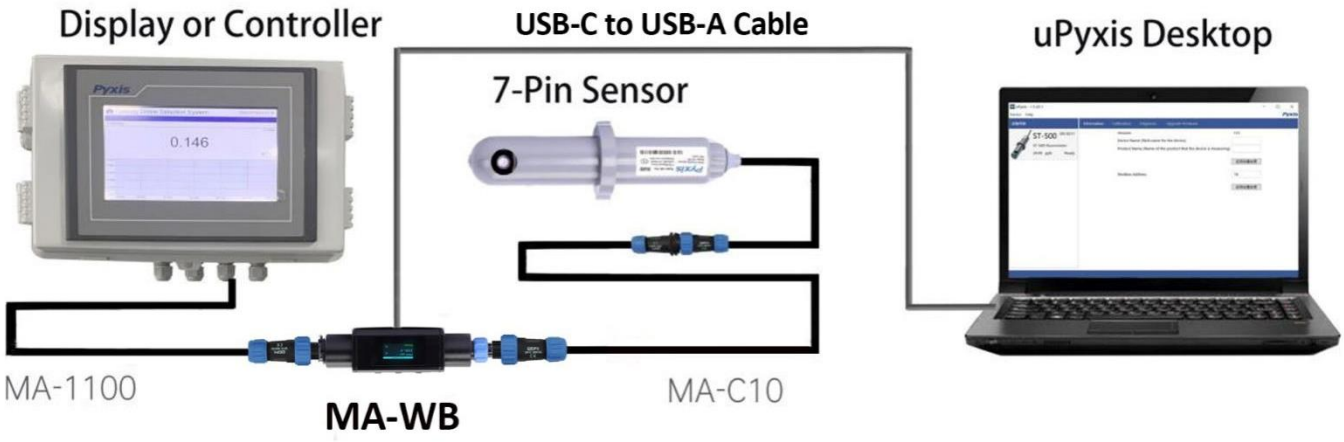

Figure 10 – HW-201 Probe / MA-WB / USB-C Cable connected to uPyxis Desktop

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

   a. Once the MA-WB 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 11*).
7) Select the Comm Port to make a connection. Normally only one Comm port is identified by uPyxis (*Figure 12).* 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.

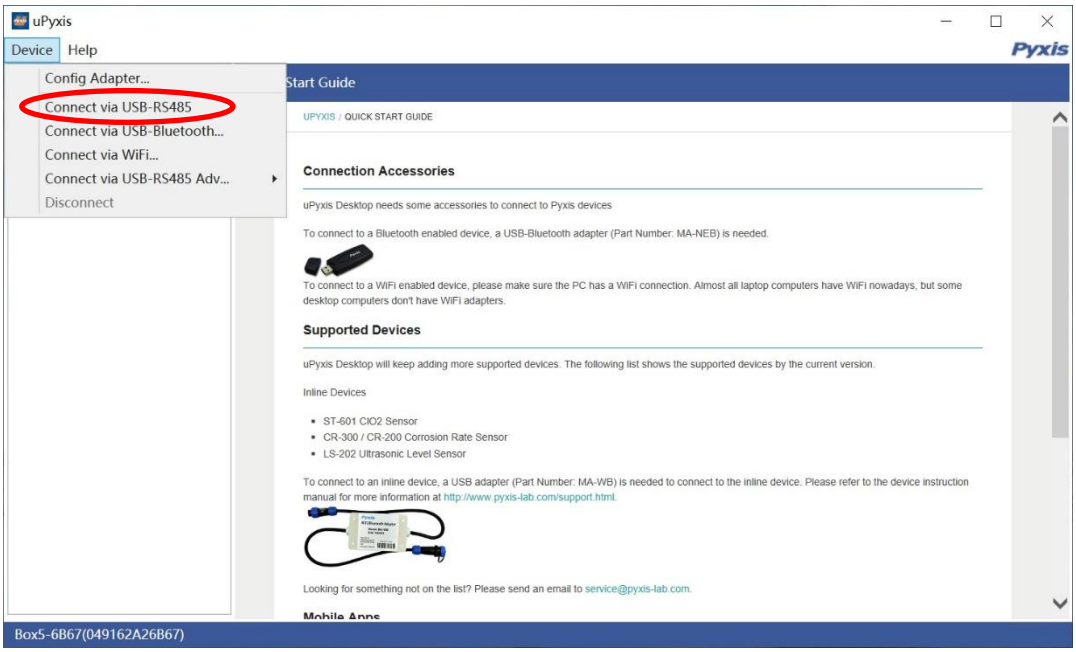

Figure 11 - Connection Options

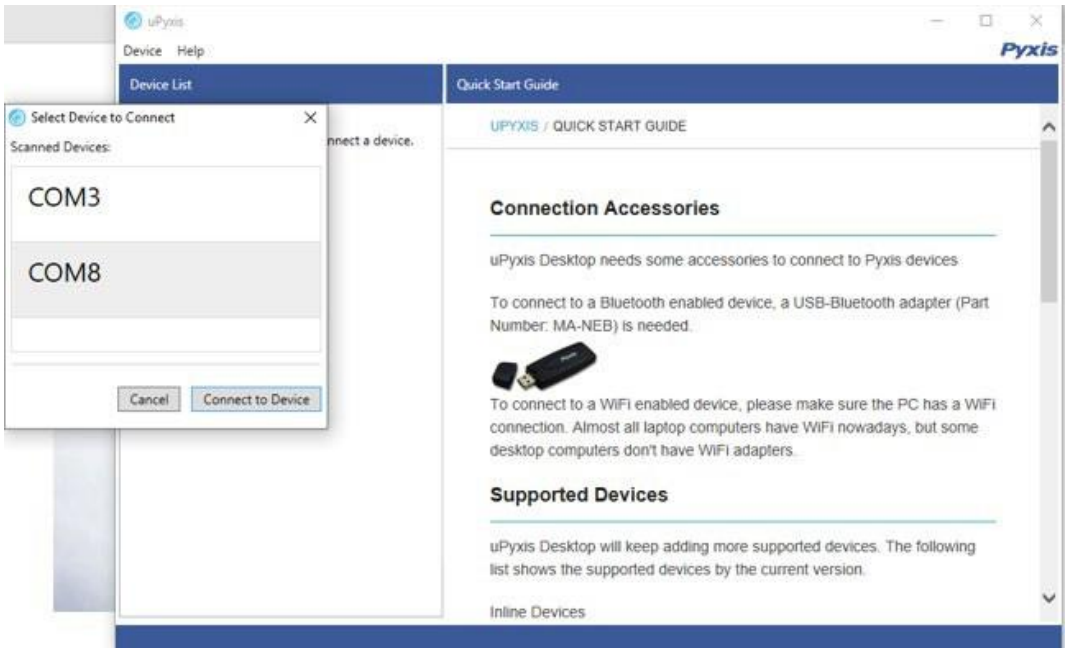

Figure 12 - Select a Comm port

After the connection is established, the HW-201 probe series number and current Sugar reading are displayed on the left of the information page (Figure 13). In this page, a nickname can be assigned to the probe. The sensor Modbus address can also be changed if desired.

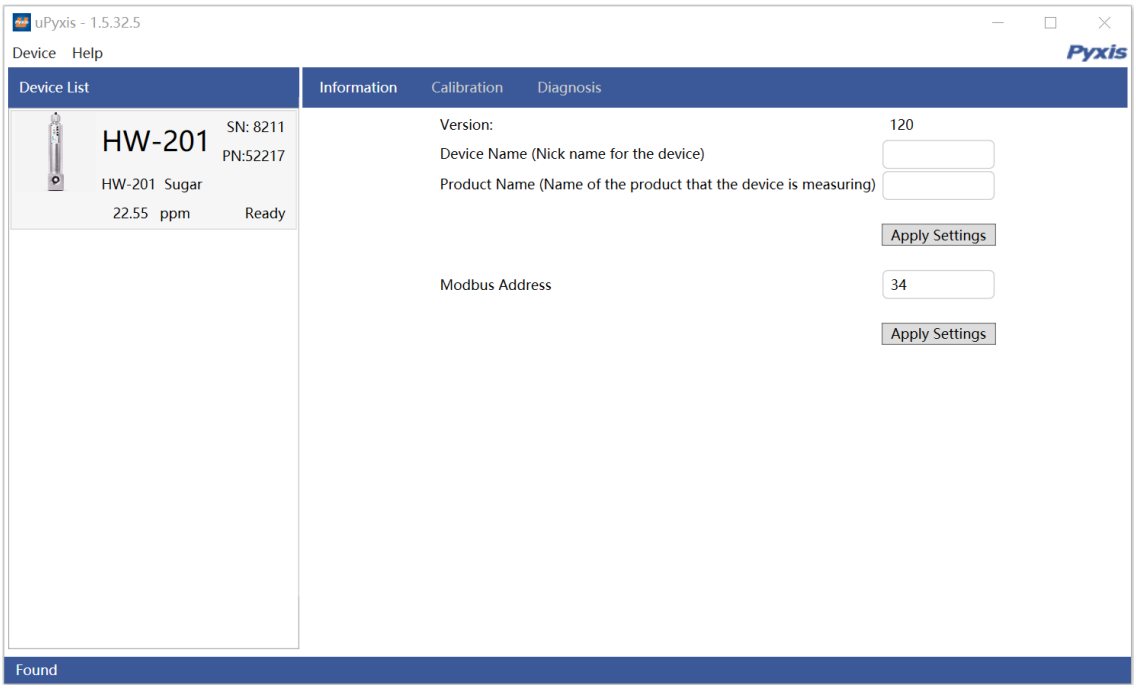

Figure 13 - Connected to a HW-201 probe and information page

Click Calibration to launch the calibration page *Figure 14*.On the Calibration screen there are four clickable buttons: Zero Calibration, Slope Calibration, 4-20mA Span and Adjust LED Current. The screen also displays the sugar(thin juice) concentration and s365 signal (see section 4.2.3 for more details).

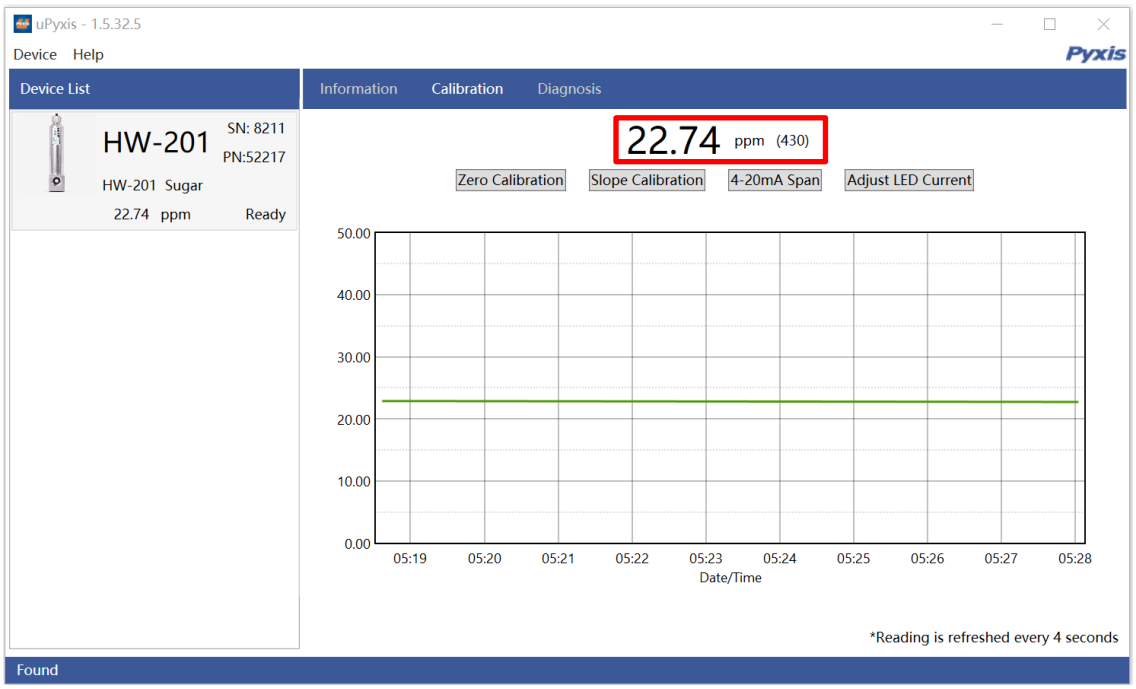

Figure 14 - Calibration Page

4.2.1 Sugar Calibration

Sugar calibration for the HW-201 requires deionized (DI) water and a standard solution. SUGAR calibration uses 200 ppm SUGAR standard solution (see the **Optional Accessories** section). ***Note*: HW-201 sensor should be calibrated in a completely light-proof environment.**

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

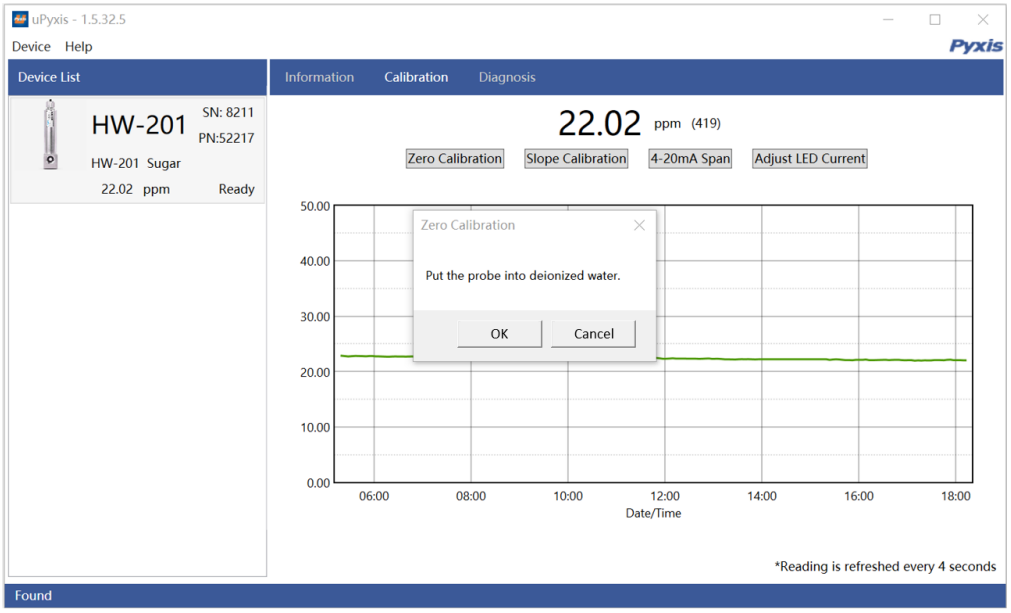

Figure 15 -Zero Calibration

Place the sensor into Pyxis Sugar 200 calibration standard solution and tap **Slope CALIBRATION** in the uPyxis app. Enter the Sugar concentration 200 in the dialog window as in Figure 16.

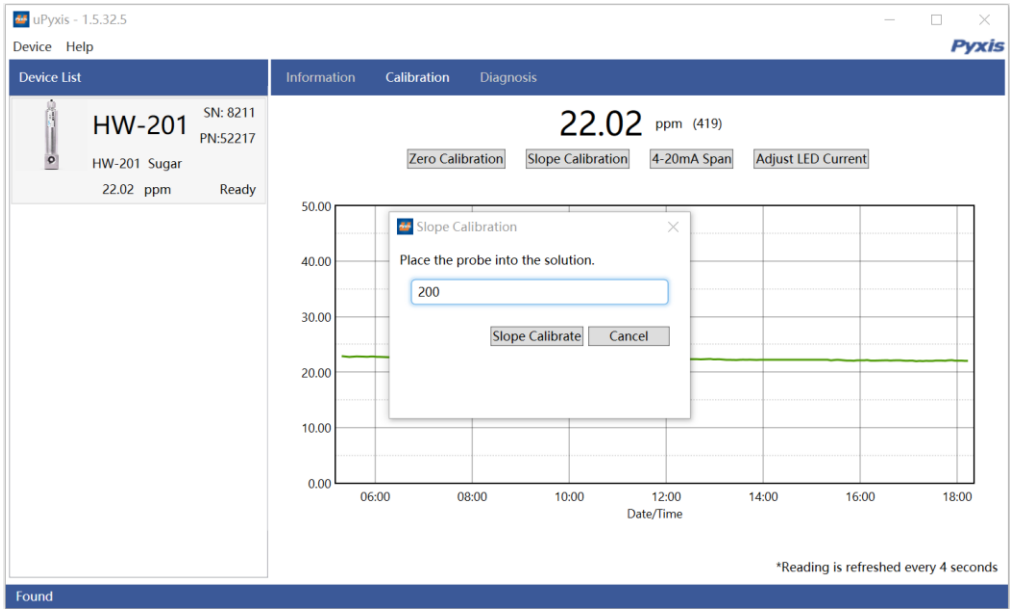

Figure 16 - Slope Calibration

4.2.2 4-20mA Span

The default 4-20mA span is 20 mA = 500 ppm and 4 mA = 5 ppm. Users may alter the output scale using **4-20mA Span** to change the sugar value corresponding to the 20mA output (Figure 17). ***NOTE* the 20mA value span adjustment may only be equal to or lower than the upper range detection limit of the sensor.**

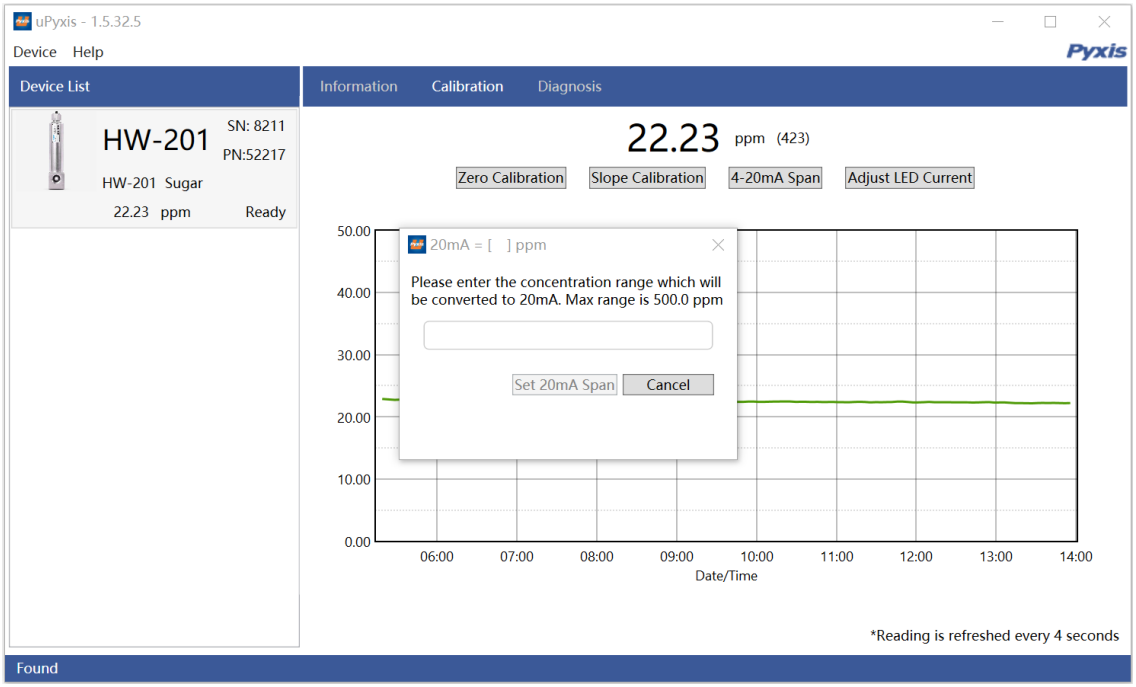

Figure 17 Set 4-20mA Span

4.2.3 Adjust LED Current

The HW-201 sensor utilizes UV LED to directly measure fluorescence representative units displayed as ppm Sugar and represented the intensity of florescence as s365 signal displayed in parentheses. User can adjust the UV LED current based on conditions present in the application of use (Figure 18). The higher the LED current, the more sensitive the sensor is, but this will saturate the s365 signal (this value must be ≤3500).

***Note* Please do zero and slope calibration after performing adjust LED current function.**

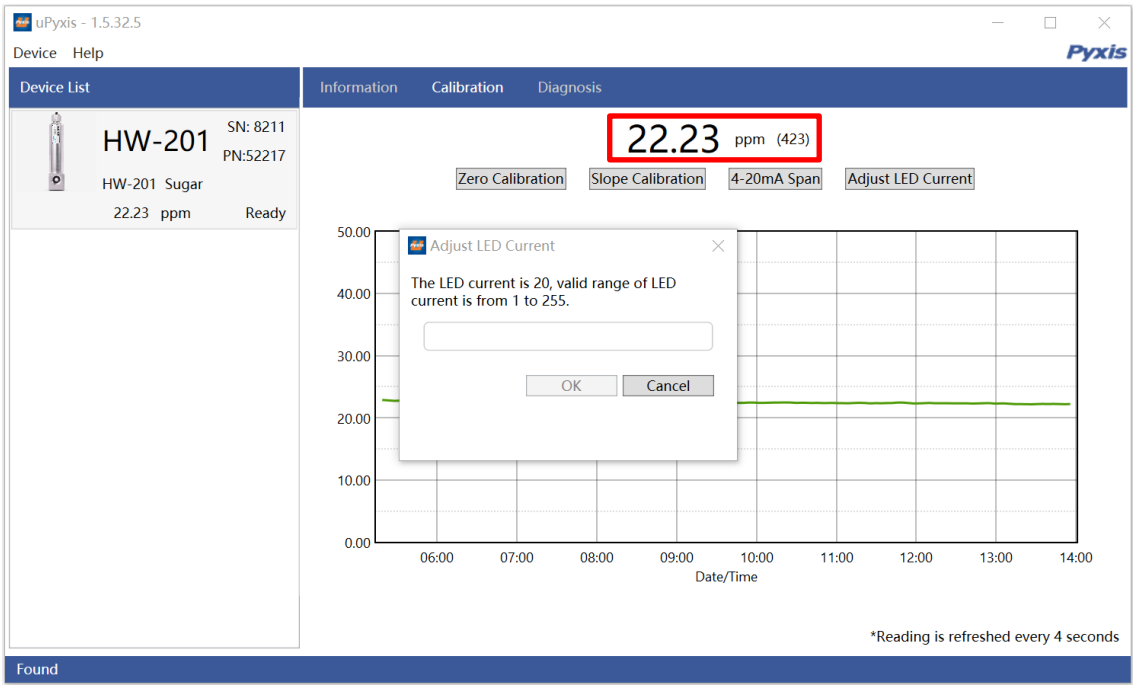

Figure 18 Adjust LED current

4.2.4 Diagnosis and Cleanliness Check

Click **Diagnosis** to display the diagnosis page (Figures 19). 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.

To perform a Cleanliness Check, press Cleanliness Check. If the sensor is clean, a Clean message will be shown. If the sensor is severely fouled, a Dirty message will be shown. In this case, follow the procedure in the Methods to Cleaning the HW-201 Sensor section of this manual.

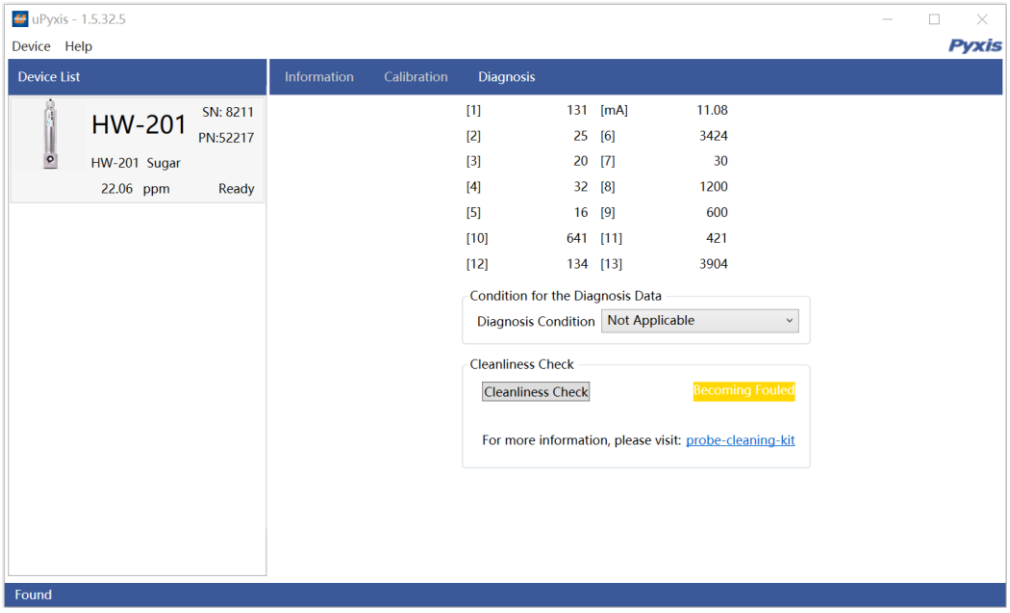

Figure 19 - Diagnostic Interface

4.3 Calibration on the Controller

It is recommended that HW-201 calibration is carried out using the uPyxis app as demonstrated in the sections above. Alternatively, a single point calibration can be carried on the receiving controller by adjusting the mA-to-ppm Sugar ratio. A two-point calibration could also be carried out on the controller by adjusting both the mA-to- ppm Sugar ratio and the zero-point 4-20mA current value. Please follow the controller manufacturer's procedure to carry the 4-20mA calibration. With the default probe settings, the controller should be set up to convert 4 mA = 0 ppm and 20 mA = 500 ppm for HW-201. It is critical that the sensor optical channel be properly cleaned prior to sensor calibration. Please refer to Section 6 for proper cleaning procedures.

5. Modbus RTU

The HW-201 Series sensors are configured as a Modbus slave device. In addition to the ppm Sugar, 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

The HW-201 probes are designed to provide reliable and continuous sugar concentration readings even when installed in moderately contaminated samples. Although the optics are compensated for the effects of moderate fouling, heavy fouling will prevent the light from reaching the sensor, resulting in false readings.

The HW-201 probes are designed to be easily removed, inspected and cleaned if required. It is suggested that the HW-201 probes be checked for fouling and cleaned/calibrated on a monthly basis. Heavily contaminated samples may require more frequent cleanings.

6.1 Cleaning Procedure

A light deposit inside the probe quartz tube can be cleaned by a Q-tip. Aged heavy deposition, especially carbonate and iron oxide deposits, can be removed using a cleaning solution that is capable of removing these inorganics, such as the Pyxis Probe Cleaning Solution Kit (P/N SER-01) available from Pyxis online EStore Inline Sensor Cleaning Kit | Pyxis Lab® (pyxis-lab.com).

Soak the lower half of the HW-201 probe in 100 mL probe cleaning solution for 10 minutes. Scrub the internal surfaces of the quartz optical channel aggressively with the pipe-cleaner brush and Q-tip provided with the kit. Allow the sensor to soak in the cleaning solution for an additional 5-10 minutes. Remove and rinse the HW-201 probe with distilled water or clean tap water and then check for the flashing blue light inside the HW-201 probe quartz tube. If the surface is not entirely clean, continue to soak the HW-201 probe for an additional 10 minutes or until clean. Repeat as needed.

Figure 20 – Pyxis Probe Cleaning Kit (P/N – SER-01)

6.2 Other Common Troubleshooting Issues

If the HW-201 probe output signal is not stable and fluctuates significantly, make an additional solution ground connection - connect the clear solution ground wire to a conductor that contacts the sample water electrically such as a brass pipe near the HW-201 probe.

7. Contact Us

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