Pyxis®

www.pyxis-lab.com

LSP-X01 Submersible Level Sensor
User Manual

Pyxis Lab® Inc.
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LSP-X01 Series Submersible Level Sensors User Manual

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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 Authorization (RA) 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 LSP-X01 Series sensor is a pressure-based, submersible level sensor that provide continuous level measurement up to 393 inches (32.8 ft or 10 m) with a 4–20mA analog and Bluetooth digital output. The sensor is uniquely designed to be configured via the **uPyxis®** Mobile or Desktop App for mobile or PC based devices. The sensor is powered by 24 VDC external power supply commonly provided by the device it is connected to (ie. OEM controller or external power source). This submersible liquid level sensor platform is well suited for water, wastewater, oil, and other non-corrosive or corrosive liquids. LSP-X01 Series pressure transducer is available in 316LSS, PVC, and PVDF options; suited for a wide variety of liquid applications. Each sensor comes equipped with 32 feet PTFE cable and the base unit from which the output communication signal is terminated. See Selection Guide below on unit options with compatible materials of construction.

Pyxis **PYXIS LEVEL SENSOR PRODUCT LINE - SELECT*A*GUIDE** Pyxis

Functional Capability	LSP-101	LSP-201	LSP-301
Part #	54012	54013	54014
Pressure Based Level Sensor (0-32 Feet Capable)	X	X	X
Bluetooth Configuration via uPyxis APP	X	X	X
316L Stainless Steel Pressure Transducer	X		
PVC Pressure Transducer		X	
PVDF Pressure Transducer			X
**NOTE* - LSP-X01 Series are 24VDC Power Supply only* *LSP-X01 offers Bluetooth Connectivity for Configuration Only via uPyxis APP* *LSP Series offer 4-20mA Output Only*			

Figure 1. Pyxis Level Sensor Selection Guide

2 Specifications

Table 1. LSP-X01 Series Specifications

Specification*	LSP-101	LSP-201	LSP-301
P/N	54012	54013	54014
Range	0–393 inch H_2O (0–10 m H_2O)		
Resolution	0.02 inch (5 mm)		
Accuracy	±2% of the range		
Stability	±0.2% URL/year		
Measurement Interval	Continuous		
Output	Bluetooth 5.0, 32 ft (10 m) Line of Sight, 4–20mA Analog Output		
Installation	1” male NPT (Includes 2” NPT adapter w/ cable gland)		
Submersible Cable Length	32.8 ft (10 m)		
Power Supply	24 VDC, 1W		
Weight	3.1 lbs (1400 g)		
Enclosure Material	Polycarbonate (PC)		
Transducer Material	316L Stainless Steel	PVC	PVDF
Cable Material	PTFE		
Operational Temperature	14–140 °F (-10–60 °C)		
Storage Temperature	-4–158 °F (-20–70 °C)		
Enclosure Rating	IP66		
Transducer Rating	IP68		
Regulation	CE		

* 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

- LSP Series Flying Lead Adapter Cable (10 ft) P/N: 50774
- User Manual available online at https://pyxis-lab.com/support/

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/.

PYXIS LEVEL SENSOR ACCESSORIES

Accessory Name / Description	Part #	Photo
10' LS/LSP Series Waterproof Cable - 7Pin Adapter w/Flying Leads	50774	
MA-L25 25' Waterproof Extension Cable (4-20mA/RS485)	50775	
MA-L50 50' Waterproof Extension Cable (4-20mA/RS485)	50776	
MA-L100 100' Waterproof Extension Cable (4-20mA/RS485)	50777	
LSP-Series Wall Mounting Bracket	50770	

Figure 2. Pyxis Level Sensor Accessories

4 Installation

4.1 Tank Top and Mounting Bracket Installation

The LSP-X01 Series sensor consists of a pressure transducer module (Figure 3) and a processor module (Figure 4). The two modules are connected by a 32.8-ft PTFE cable. The cable provides electric connection between the two modules and serves as an air vent to the transducer.

∗**NOTE**∗ *Altering the cable can cause permanent damage to the LSP-X01 Series sensor.*

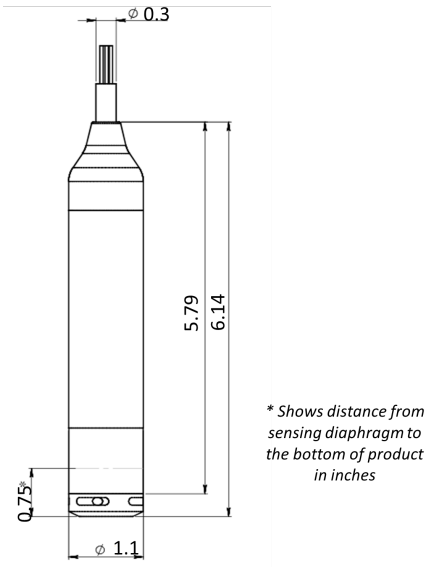

Figure 3. Pressure Transducer Module Dimension, inch.

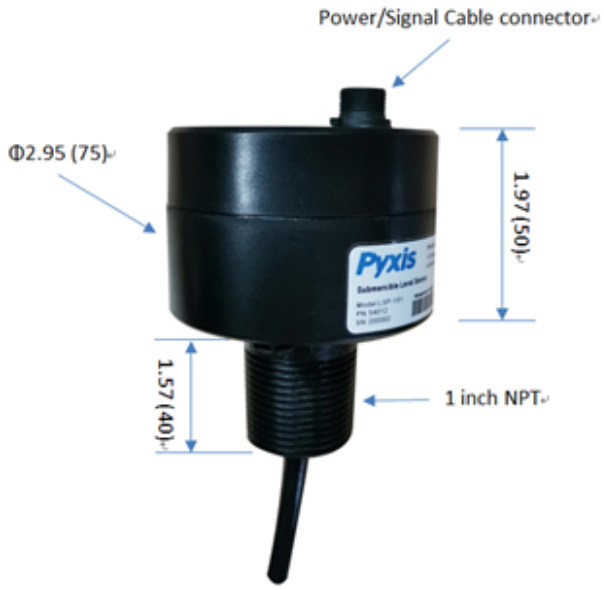

Figure 4. Processor Module Dimension, inch (mm)

The processor module of the LSP-X01 Series sensor can be installed to a 1" bulkhead fitting on the top of the tank. Alternatively, you may also use the LSP-X01 Series Mounting Bracket (P/N: 50770) for installations where top tank mount may be to too high for maintenance. In this format, the processor module is installed in a location away from the tank top to take the advantage of the 32.8-ft cable. Each LSP-X01 Series sensor is also shipped with a 2" male NPT bulkhead adapter with internal cable gland (pre-installed on transducer cable) for installations requiring a sealed bulkhead/cable fitting as shown in Figure 5.

Figure 5. LSP-X01 Series Mounting Bracket (P/N: 50770) w/ 2" male NPT bulkhead adapter

The following is a list of installation guidelines and precautions:

1. Leave a 1-inch space between the transducer module and the tank bottom surface.
2. Do not remove the protective cap and expose the diaphragm directly to the liquid. This may cause permanent sensor damage.
3. Ensure that installation is not near large vibration locations.

4.2 Wiring

If the power ground terminal and the negative 4–20mA terminal in the controller are internally connected (non-isolated 4–20mA input), it is unnecessary to connect the 4–20mA negative wire (green) to the 4–20mA negative terminal in the controller. 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.

> ∗**NOTE**∗ *The negative 24V power terminal (power ground) and the negative 4–20mA terminal on the LSP-X01 Series probe are internally connected.*

Follow the wiring table below to connect the LSP-X01 Series probe to a controller:

Table 2.

Wire Color	Designation
Red	24V+
Black	24V,Power Ground
White	4-20mA +
Green*	4-20mA -
Blue	No Connect
Yellow	No Connect
Clear	Shield, earth ground

**Internally connected to the power ground*

5 Instrument Overview

The indicators on the top of the sensor (Figure 6) are used to indicate power status and Bluetooth connection status.

Table 3.

LED Status	On	Off
Green LED	Power Supply is on	Power Supply is off
Blue LED	Bluetooth is connected	Bluetooth is disconnected

> ∗**NOTE**∗ *The Bluetooth connected LED will illuminate within 30 seconds of powerup of the device. This feature is designed to minimize controller power draw during startup.*

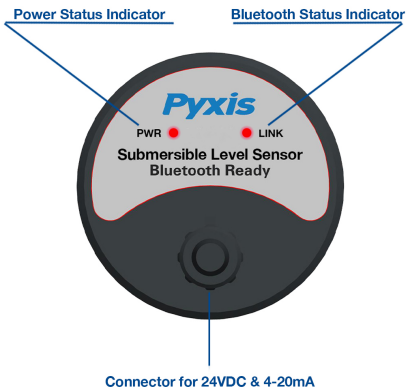

Figure 6. Sensor connection and indicators

6 Setup and Configuration with uPyxis® Mobile App

6.1 Download uPyxis® Mobile App

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

Figure 7. uPyxis® Mobile App installation

6.2 Connecting to uPyxis® Mobile App

Connect the LSP-X01 Series sensor to a mobile smart phone according to the following steps:

1. Open **uPyxis®** Mobile App.
2. On **uPyxis®** Mobile App, pull down to refresh the list of available Pyxis devices.
3. If the connection is successful, the LSP-X01 Series and its Serial Number (SN) will be displayed (Figure 8).
4. Press on the **LSP-X01 Series sensor image**.

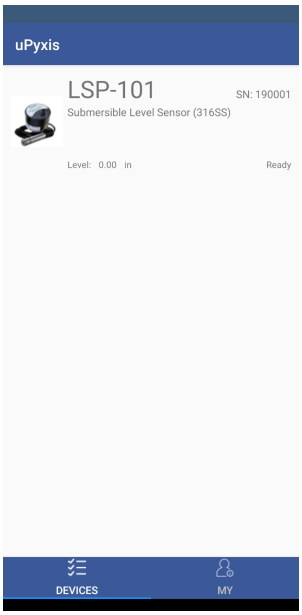

Figure 8.

6.3 Overview Screen

When connected, the **uPyxis®** Mobile App will default to the **Overview** screen. The **Overview** screen displays the current liquid level and volume of liquid remaining.

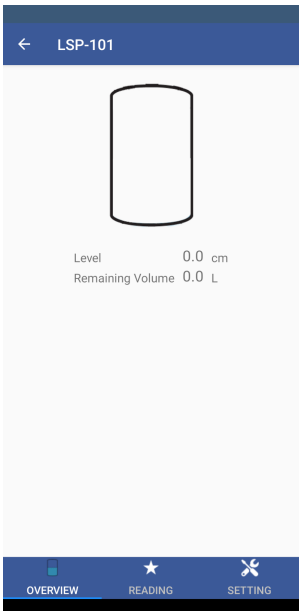

Figure 9.

6.4 Reading Screen

The **Reading** screen displays the current volume of liquid remaining and liquid level over time.

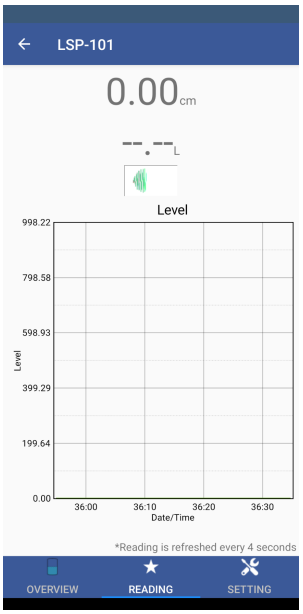

Figure 10.

6.5 Settings Screen

The LSP-X01 Series sensor measures the hydrostatic pressure created by the liquid level in the tank. Converting this measured pressure value to other parameters such as the tank level and the remaining liquid volume in gallons requires the tank volume capacity, the tank maximum liquid height measured from the bottom of the tank to the liquid surface when filled to the rated capacity, and the density of the liquid. Measurements assume the tank has a uniform horizontal cross-section. To convert the measured pressure to volumetric information, the LSP-X01 Series sensor requires the user to enter three parameters via the **uPyxis®** Mobile App's **Setting** screen:

- **Tank Volume** (rated volume capacity of the tank)
- **Max Level Height** (from the bottom of the tank to the liquid surface when filled to the rated capacity)
- **Density** (of liquid in lb/gal)

From the **Settings** screen, you can also set the **Device Name**, **Display Unit**, and **Log Period** (time, in seconds, between two measurements). To save your setting changes, press **Set Device**.

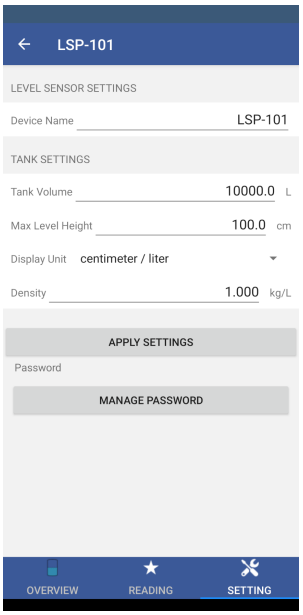

Figure 11.

7 Setup and Configuration with uPyxis® Desktop App

7.1 Install uPyxis® Desktop App

Download the latest version of **uPyxis®** Desktop software package from: https://pyxis-lab.com/upyxis/ 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-RS485 adapter (MA-485), and the main **uPyxis®** Desktop application. Double click the **uPyxis.Setup.exe** file to install.

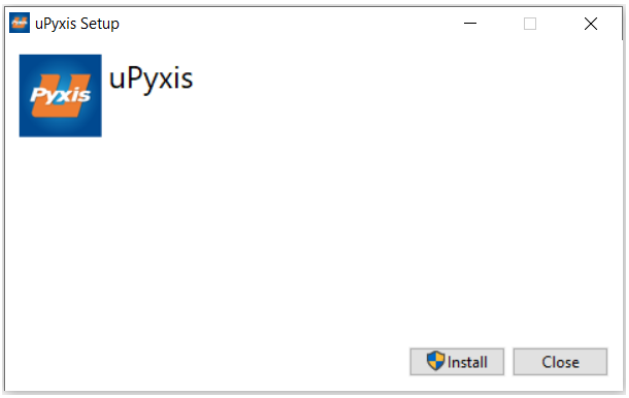

Figure 12. uPyxis® Desktop App installation

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

7.2 Connecting to uPyxis® Desktop App

Connect the LSP-X01 Series sensor to a Windows computer using a Bluetooth/USB adapter (P/N: MA-NEB) according to the following steps:

1. Plug the Bluetooth/USB adapter into a USB port in the computer.
2. Launch **uPyxis®** Desktop App.
3. On **uPyxis®** Desktop App, click Device → Connect via USB-Bluetooth as seen in Figure **??**
4. If the connection is successful, the LSP-X01 Seriesand its Serial Number (SN) will be displayed in the left pane of the **uPyxis®** window.

NOTE *After the sensor and WiFi/Bluetooth is powered up, it may take up to 10 seconds for the adapter to establish the wireless signal for communication.*

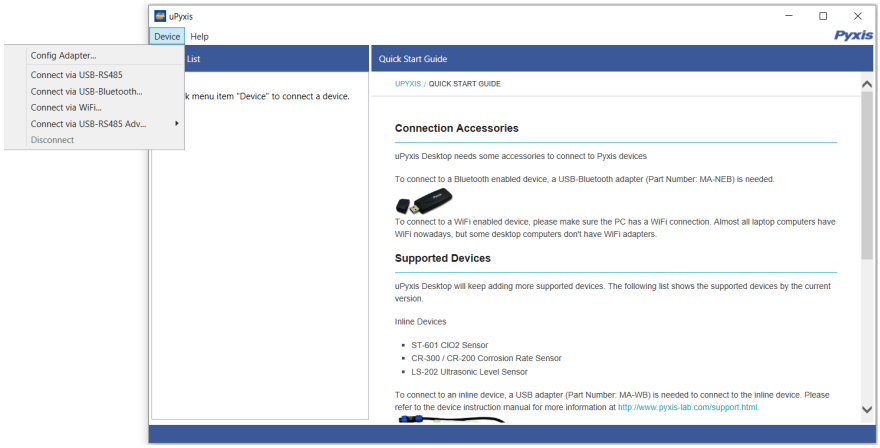

Figure 13.

7.3 Overview Screen

When connected, the **uPyxis®** Desktop App will default to the **Overview** screen. The **Overview** screen displays the current liquid level and volume of liquid remaining.

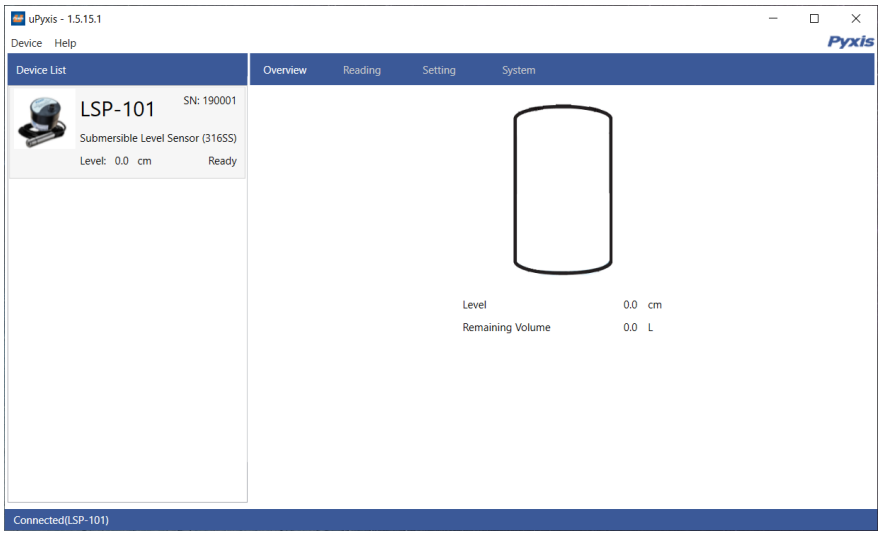

Figure 14.

7.4 Reading Screen

The **Reading** screen displays the current liquid level and the liquid level over time.

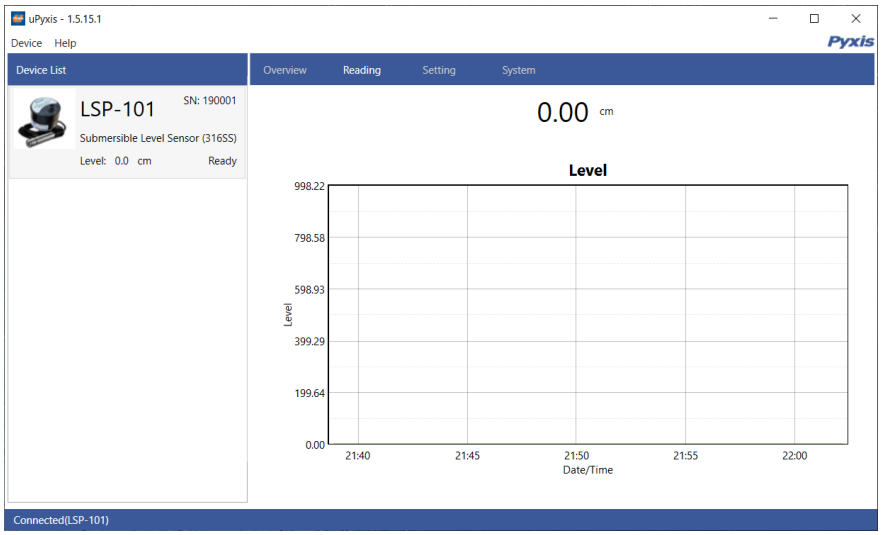

Figure 15.

7.5 Setting Screen

The LSP-X01 Series sensor measures the hydrostatic pressure created by the liquid level in the tank. Converting this measured pressure value to other parameters such as the tank level and the remaining liquid volume in gallons requires the tank volume capacity, the tank maximum liquid height measured from the bottom of the tank to the liquid surface when filled to the rated capacity, and the density of the liquid. Measurements assume the tank has a uniform horizontal cross-section. To convert the measured pressure to volumetric information, the LSP-X01 Series sensor requires the user to enter three parameters via the **uPyxis®** Desktop App's **Setting** screen:

- **Volume** (rated volume capacity of the tank)
- **Max Height** (from the bottom of the tank to the liquid surface when filled to the rated capacity)
- **Density** (of liquid in lb/gal)

From the **Settings** screen, you can also set the **Display Unit** and **Log Period** (time, in seconds, between two measurements). To save your setting changes, click **Set**.

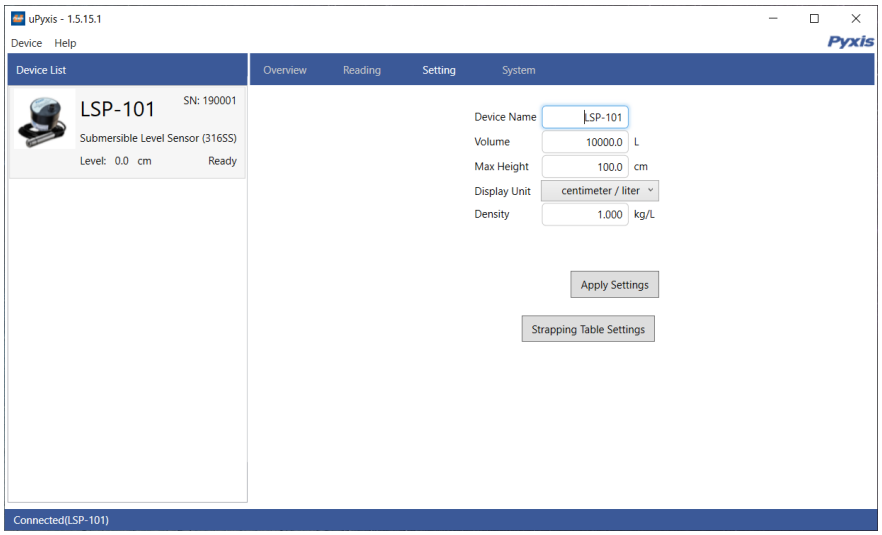

Figure 16.

8 Outputs

8.1 4-20mA Output Setup

The 4–20mA output of the sensor is scaled as:

- 4 mA = (Tank is Empty) = (Level is 0)
- 20 mA = (Tank is Full) = (Level is maximum height or volume)

The 4–20mA analog signal can be converted to one of three values (Level, Volume Remaining, or Volume Consumed) in the controller receiving the output according to the above scale. For example, a nominal 100-gallon vertical tank, the maximum height is 36 inches. The tank volume is 100 gallons when it is filled up to the maximum height 36 inches. The controller should be set up to convert 20 mA to 100 gallons, at which the tank is full and the tank level is 36 inches.

∗**NOTE**∗ *The nominal capacity provided by the tank manufacturer may be greater than the maximum safe (net or effective) capacity that can be practically filled. Please keep this in mind as you configure your LSP-X01 Series sensor for practical purposes.*

9 Sensor Maintenance and Precaution

9.1 Methods to Cleaning LSP-X01 Series Transducer

For best performance, following the steps below to clean the submersible pressure transducer if necessary:

1. Hold the body of the transducer with one hand and carefully remove the protective nose cap by simply unscrewing it from the transducer body. Do not touch the sensor diaphragm and do not dry the inside portion of the transducer, as you risk damaging the pressure sensor.
2. Place the transducer in a vertical position with the sensing end facing downward in a bowl containing Pyxis Probe Cleaning Solution for approximately 1 minute.
3. Place the protective nose cap in the same solution for approximately 1 minute.
4. Rinse the bowl with clean water and wipe dry the external casing of the transducer and the protective nose cap.
5. Screw the protective nose cap back into place on the transducer body.

The Pyxis Probe Cleaning Solution is from the **Inline Probe Cleaning Solution Kit** (P/N: SER-01) which can be purchased at our online E-Store https://pyxis-lab.com/product/st-series-probe-cleaning-kit/.

Figure 17. Inline Probe Cleaning Solution Kit

10 Regulatory Approval

United States

The LSP-X01 Series sensor has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in an installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Canada

This device complies with Industry Canada license exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device. Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible

11 Contact Us

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