

Pyxis[®]

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LSP-X00 Submersible Level Sensor *User Manual*



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LSP-X00 Series Submersible Level Sensors User Manual

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Warranty Information

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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.

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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 Series sensor is a pressure-based, submersible, level sensor. It provides continuous level measurement up to 393 inch (32.8 ft or 10 m) with a 4-20mA analog and Bluetooth digital output. It can be configured via the Pyxis’s **uPyxis®** Mobile App or **uPyxis®** Desktop App. The sensor can be powered by 4 AA Li/SOCl₂ batteries or a 24 VDC external power supply. This battery-powered and Bluetooth-enabled level sensor is ideally suited for applications where signal/power wiring may be difficult or unavailable to install. A 1.3-inch OLED display and four push-buttons are also included in the sensor for display and setup. The base product of the series, the LSP-100, is well suited for water, waste water, oil, and other non-corrosive liquid. Other sensors in the LSP Series are available and suited for more corrosive liquids. See Figure 1 below on alternative units with compatible materials of construction.







Pyxis		PYXIS LS SERIES PRODUCT LINE - SELECT*A*GUIDE						Pyxis	
Functional Capability	LS-200	LS-202	LS-202EX	LSP-100	LSP-200	LSP-300			
Part #	54011	54002	54008	54005	54009	54010			
Ultrasonic Level Sensor (0-86" Capable)	X								
Ultrasonic Level Sensor w/Local Display (0-78" Capable)		X	X						
Pressure Based Level Sensor w/Local Display (0-32 Feet Capable)				X	X	X			
Bluetooth Configuration via uPyxis APP	X	X	X	X	X	X			
Bluetooth 6-Months Data Download via uPyxis APP		X	X	X	X	X			
4-AA Battery Powered Capable		X	X	X	X	X			
4-20mA/RS485 24V Powered Capable	X	X	X	X	X	X			
Class I & II Div 2 Certified / Class III Div 1 & 2 - Hazardous Environment			X						
316L Stainless Steel Pressure Transducer				X					
PVC Pressure Transducer					X				
PVDF Pressure Transducer						X			
<p>*NOTE* - LS-200 is 24VDC Power Supply only LS-202 / LSP Series Can Use AA Battery or 24VDC Power Supply LS-202 & LSP Series Sensors offer Bluetooth Connectivity for Configuration & Data Download via uPyxis APP LS-200 offers Bluetooth Connectivity for Configuration Only via uPyxis APP All LS / LSP Series Sensors offer 4-20mA & RS-485 Modbus Output</p>									

Figure 1.

2 Specifications

Table 1.

Specification*	LSP-100	LSP-200	LSP-300
P/N	54005	54009	54010
Range	0-393 inch H ₂ O (0-10 m H ₂ O)		
Resolution	0.02 inch (5 mm)		
Accuracy	±2% of the range		
Stability	±0.2% URL/year		
Measurement Interval	Continuous, 10 sec, 30 sec, 3 min, 30 min, 60 min, custom, or stopped		
Data Storage	6 months at 60 min measurement interval		
Output	Bluetooth 4.1, 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	4 AA Li/SOCl ₂ batteries or 24 VDC, 2W		
Weight	3.1 lbs (1400 g)		
Enclosure Material	Polycarbonate (PC)		
Transducer Material	316L Stainless Steel	PVC	PVDF
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 www.pyxis-lab.com/support.html

3.2 Optional Accessories





<div style="display: flex; justify-content: space-between; align-items: center;"> Pyxis PYXIS LEVEL SENSOR ACCESSORIES Pyxis </div>		
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	
LS-202 - Ultimate Lithium AA Battery (4 each)	57000	
LSP-Series Li/SOCl2 Battery Kit (4 each)	50731	
LSP-Series Wall Mounting Bracket	50770	

Figure 2.

4 Installation

4.1 Battery Installation

The LSP Series sensor can be powered by four (4) AA Li/SOCl₂ batteries if a 24 VDC supply is not available. These batteries are unique and available through Pyxis Lab (P/N: 50731). Typical battery life after replacing a new battery set is about 6 months with a 60 minute measurement interval. The LSP Series battery compartment is shown in Figure 2.

NOTE Do NOT use rechargeable nickel cadmium (NiCad) or rechargeable lithium batteries.



Figure 3. Battery Installation

Follow the steps below to install or replace batteries:

1. Separate the upper portion of the sensor by loosening the four hex bolts with the screw driver included in the package. Reach the battery holder by hand and pull it out carefully. Pay careful attention to the connection wire between the cover and main sensor body when separating them.
2. Follow the positive and negative signs and insert batteries firmly into the battery holder. Please note that four batteries need to be replaced, two on each side of the battery holder. Replace the four batteries together rather than partially.
3. Place the battery holder back to the main sensor body and secure it firmly.
4. Place the upper portion of the sensor back to the sensor main body. Make sure that the sealing O-ring is lying flat in the groove of the main sensor body. Failure to do so may result in water/moisture damage to the sensor.
5. Firmly tighten the hex bolts to prevent the LSP Series sensor from accidentally being turned on or off due to vibration.

4.2 Tank Top and Mounting Bracket Installation

The LSP Series sensor consists of a pressure transducer module (Figure 3) and a display/processor module (Figure 4). The two modules are connected by a 32.8-ft PVDF 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 Series sensor.*

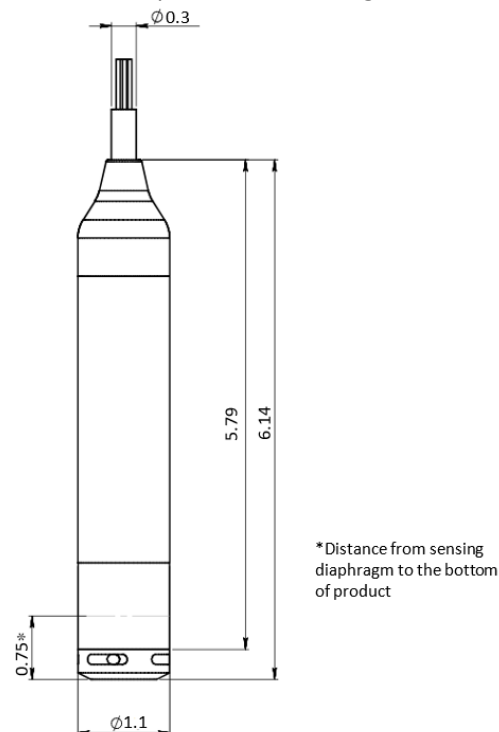


Figure 4. Pressure Transducer Module Dimension, inch.

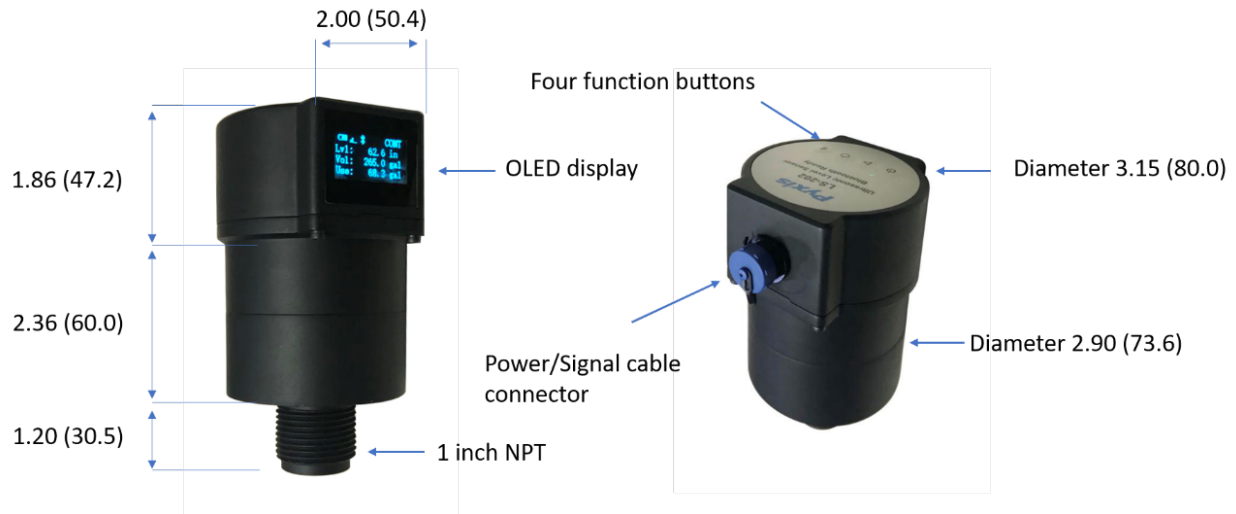


Figure 5. Display/Processor Module Dimension, inch (mm)

The display/processor module of the LSP Series sensor can be installed to a 1-inch bulkhead fitting on the top of the tank. Alternatively, you may also use the LSP Series Mounting Bracket (P/N: 50770) for installations where top tank mount may be too high for visual display verification. In this format, the display/processor module is installed in a location away from the tank top to take the advantage of the 32.8-foot cable and have visibility to the display. Each LSP 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 6. LSP 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.

4.3 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 Series probe are internally connected.*

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

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

NOTE *When the LSP Series sensor is powered through the above 24 VDC wiring configuration, the batteries should be removed from the compartment.*

5 Instrument Overview

5.1 Function Buttons

The buttons on top of the LSP Series sensor (Figure 6) are used to select one of four display modes, one of three Bluetooth modes, and one of four measurement modes.

NOTE *The function buttons are not used to configure the sensor. For LSP Series sensor configuration, see either the **Setup and Configuration with uPyxis® Mobile App** section or the **Setup and Configuration with uPyxis® Desktop App** section of this manual.*




Figure 7.

Power Button  :


- Power On: Hold the power button for 1 second
- Power Off: Hold the power button until OLED display is turned off

- Display Wakeup: Hold the power button for 1 to relight OLED display (Only the power button has this function)


Working Mode Button  : This button cycles through the different measurement intervals pre-programmed into the LSP Series sensor. The current measurement interval is displayed on the top-right corner of the OLED screen:

- CONT: Continuous measuring
- 10s: Measurement every 10 seconds
- 30s: Measurement every 30 seconds
- 3m: Measurement every 3 minutes
- 30m: Measurement every 30 minutes
- 1h: Measurement every 60 minutes
- STOP: Stop measuring


Other measurement intervals can also be configured on the **uPyxis®** App.

Display Mode Button  : This button cycles through four display modes and two system information modes. For more details, see the **OLED Display** section of this manual.

Bluetooth Mode Button  : This button cycles through three Bluetooth modes:

- B: Beacon mode, allows multiple Bluetooth-enabled devices to read the LSP Series sensor's broadcasting results at the same time.
- P: Peripheral mode, used for sensor configuration and data download only. The LSP Series sensor can only pair with a single Bluetooth-enabled device while in this mode.
- Absence of  : Shutdown mode, disables Bluetooth communication with the LSP Series sensor.

5.2 OLED Display

The OLED display supports four display modes and two system information modes as shown in the following figures. Press the display mode button  to switch modes.

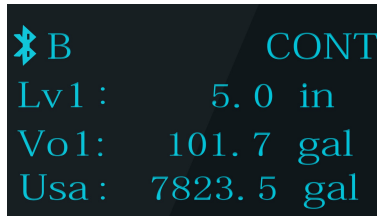


Figure 8. Display Mode 1: Status and Measurement Summary



Figure 9. Display Mode 2: Level



Figure 10. Display Mode 3: Remaining Volume



Figure 11. Display Mode 4: Used Volume



Figure 12. System Info Mode 1: ID's and Error Code (EC)



Figure 13. System Info Mode 2: Date/Time and Software Version (SV)

NOTE The date/time will reset to 2000-01-01 00:00:00 on every power-on operation. When the LSP Series sensor is connected to a phone or PC via the **uPyxis®** App, the date/time will be automatically set according to the phone or PC’s clock. The wrong system date/time **does not** affect the sensor measurement function, but the time stamp in the data log will be incorrect.

5.3 Display Symbol Glossary

Table 3.

Symbol	Definition
⌘P	Bluetooth Peripheral mode
⌘P ↔	Bluetooth is paired
⌘B	Bluetooth Beacon mode
⌘ⓧ	Switching Bluetooth mode
CONT	Continuous measuring
_s	Measurement every _ seconds
_m	Measurement every _ minutes
_h	Measurement every _ hours
STOP	Stop measuring
Lvl	Liquid level
in	Inches
m	Meters
cm	Centimeters
Vol	Liquid volume remaining
gal	Gallons
L	Liters
Usa	Liquid usage or used volume
FULL	Liquid level is at the highest setting value
EMPTY	Liquid level is at the lowest setting value
FCC ID	Federal Communications Commision Identification
Mac	Mac Address
EC	Error Code
SV	Software Version

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 14.

6.2 Connecting to uPyxis® Mobile App

Turn on Bluetooth on your mobile phone (**Do not pair the phone Bluetooth to the LSP Series sensor**). Open uPyxis® Mobile App. Once the app is open the app will start to search for the sensor. When the uPyxis® Mobile App connects to the sensor then press on the [LSP Series sensor](#).



Figure 15.

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.

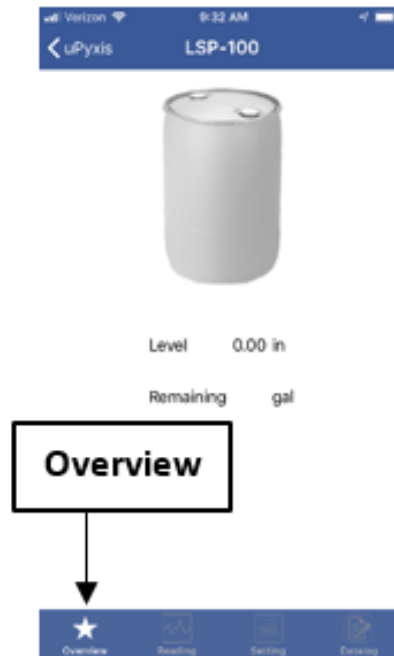


Figure 16.

6.4 Reading Screen

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

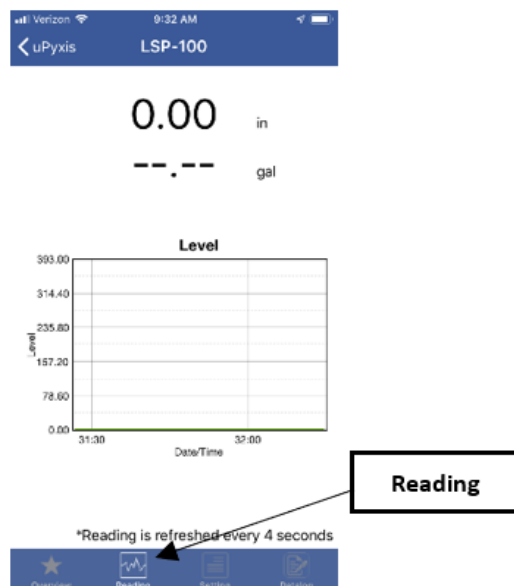


Figure 17.

6.5 Settings Screen

The LSP 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 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**.

NOTE The LSP Series sensor must be in Peripheral mode (P) to change settings.



Figure 18.

6.6 Datalog Screen

From the **Datalog** screen, you can view and download the data records of the LSP Series sensor. To view the records, press **Read Records**, then press either **Read Overview**, **Read Last 100**, or **Read All**. To download the records, press **Export/Share**. To delete all records, press **Clear Datalog**.

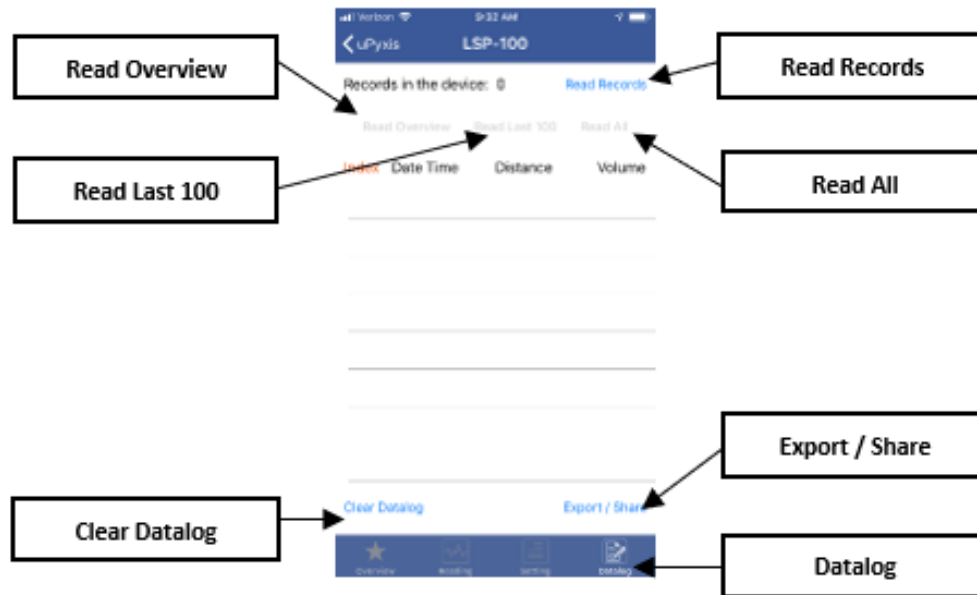


Figure 19.

7 Setup and Configuration with uPyxis® Desktop App

7.1 Install uPyxis® Desktop App

Download the latest version of **uPyxis®** Desktop software package from: <http://www.pyxis-lab.com/support.html> 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.

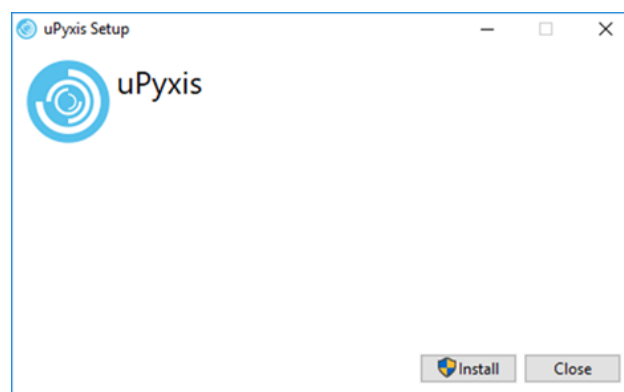




Figure 20.

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 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. Hold the  key on LSP Series sensor until the Bluetooth mode changes to Peripheral mode ( P).
3. Launch uPyxis® Desktop App.
4. On uPyxis® Desktop App, click Device → Connect via USB-Bluetooth as seen in Figure ??
5. If the connection is successful, the LSP Series and 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.

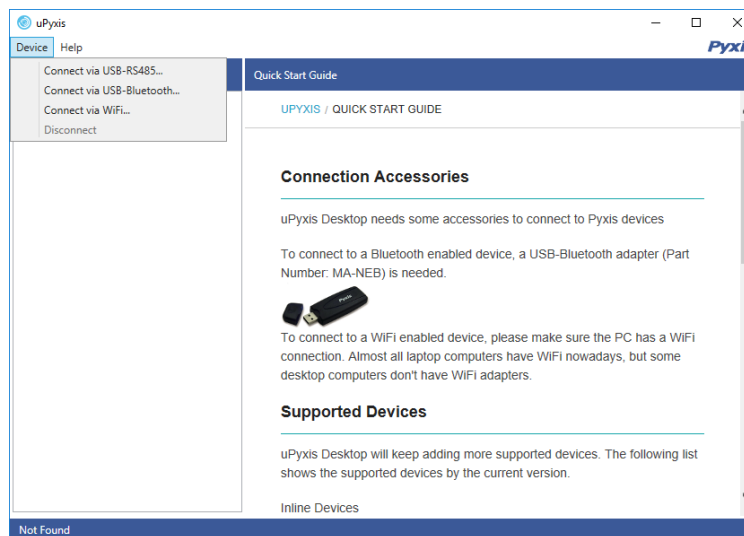


Figure 21.

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.

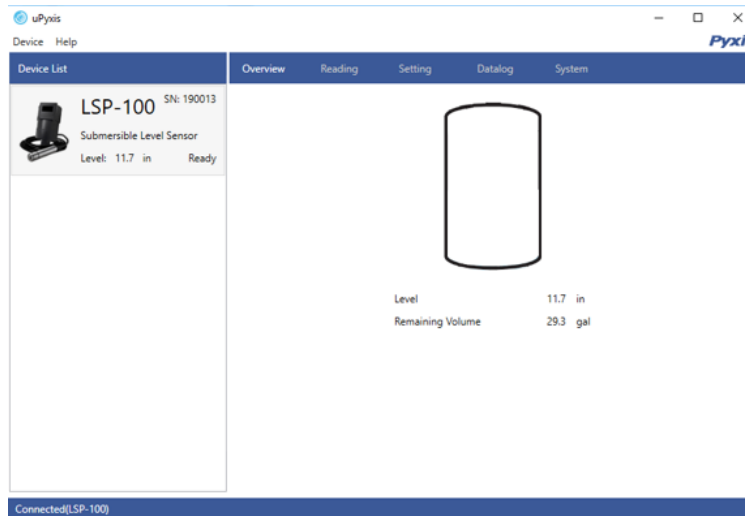


Figure 22.

7.4 Reading Screen

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

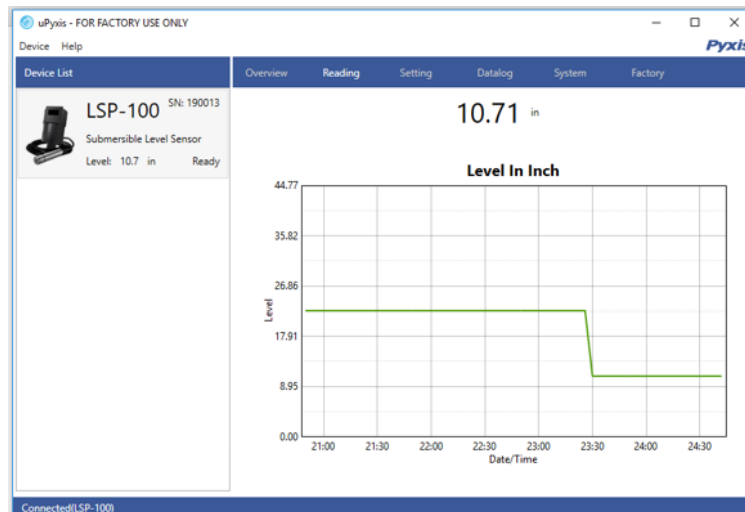


Figure 23.

7.5 Setting Screen

The LSP 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 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**.

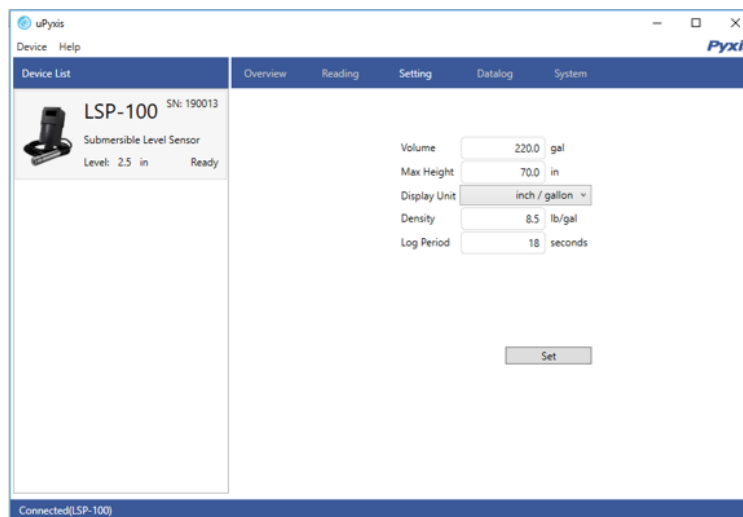


Figure 24.

7.6 Datalog Screen

From the **Datalog** screen, you can view and download the datalogs of the LSP Series sensor. To view the datalogs, click **Read Datalog Info**, then click either **Read Overview Value**, **Read Recent 100 Datalogs**, or **Read All Datalogs**. To download the datalogs, click **Export**. To delete all datalogs, click **Clear All Datalogs**.

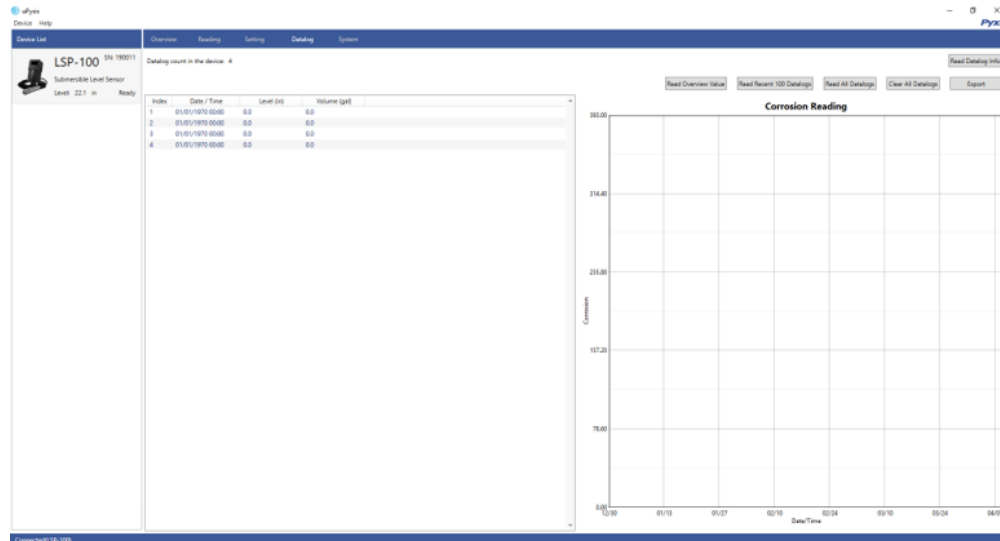


Figure 25.

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 Series sensor for practical purposes.*

9 Sensor Maintenance and Precaution

9.1 Methods to Cleaning LSP 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 ST Series Sensor Cleaner (P/N: SER-01) 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.

10 Regulatory Approval

United States

The LSP 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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