

LiGO-PRO

Ingress protection rating

IP69K

Wide operating
temperature range
from -40°C to 85°C



High accuracy
up to 99.5%

99.5%

Intelligent noise
filtering algorithm



Galvanic isolation

2500V



DATA SHEET

FUEL LEVEL SENSOR

Version: 2.2.6

www.sojielectronics.com

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I. GENERAL INTRODUCTION

The LIGO PRO fuel level sensor represents a significant advancement as a third-generation product, having undergone extensive mechanical refinements to enhance both performance and durability. These improvements enable the sensor to better cope with issues such as water resistance and electrical insulation, especially compared to its predecessors. Notably, this product adheres to the highest standards of water and chemical resistance, including its ability to withstand water ingress according to the IP69K standard.

Another key feature is the sensor's base, constructed from synthetic plastic, which has been cleverly designed to flex and conform seamlessly to the curved surfaces of fuel tanks without the need for multiple rubber gaskets to prevent oil spillage.

Furthermore, the product is manufactured with high-quality materials, ensuring reliability in extreme temperature environments. It effectively withstands the impacts of chemicals, gasoline, and UV radiation without succumbing to any form of degradation or corrosion. This makes the sensor an ideal choice for applications in harsh temperature conditions and those requiring exceptional durability.

II. KEY FEATURES

1. High accuracy up to 99.5%.
2. Operating input voltage range from 7V-50V
3. Internal isolation voltage up to 2500V.
4. Possibility of cutting down or extending up to 6000mm (optional)
5. Wide operating temperature range from -40°C to +85°C.
6. A filter protecting the probe from dregs and water.
7. Ingress protection rating IP69K
8. Noise filter and temperature compensation system.
9. Installation and configuration software on multiple application devices: phone, laptop, etc.
10. Anti-vibration spring when moving.
11. Quick installation, safety guaranty.

III. GENERAL APPLICATIONS

- Trucks, container cars, excavators, trains...
- Boats, barges.
- Electric generators.
- Industrial oil storage tanks and stationary storage tanks.
- Factories, industrial zones.
- Fuel storage tanks in agricultural machines and maritime transportation...



IV. TECHNICAL SPECIFICATIONS

Technical specifications of the LIGO PRO product

PARAMETER	AF	RS232	RS485
Standard length (L), mm	700, 1000, 1500...up to 6000 mm	700, 1000, 1500...up to 6000 mm	700, 1000, 1500...up to 6000 mm
Measuring error, %	± 0.5 %	± 0.5 %	± 0.5 %
Output signal	Analog (0...9V), Frequency (500- 2000Hz)	RS232	RS485
Baud rate, bit/sec	9600	2400, 4800, 9600, 19200, 38400, 57600, 115200.	2400, 4800, 9600, 19200, 38400, 57600, 115200.
Power supply (DC input voltage, V)	7...50	7...50	7...50
Maximum power consumption, mA	20	20	20
Dielectric strength of galvanic isolation, min (V)	2500	2500	2500
Ingress protection rating	IP69K	IP69K	IP69K
Operating temperature, °C	-40...+85	-40...+85	-40...+85
Maximum allowed humidity level, %	100	100	100
Resolution, bit	12	12	12
Digital reading range corresponding to the minimum level measurement value	Analog (0...8); Frequency (500...1500 Hz)	0	0
Digital reading range corresponding to the maximum level measurement value	Analog (1...9V); Frequency (1000...2000 Hz)	4095	4095
Average sampling period, (s)	0...255	0...255	0...255
Message interval, (s)	Continuous	1...60	1...60
Absolute error in temperature measurement within the entire temperature measuring range, °C	±2	±2	±2
Average service life, years (minimum)	10	10	10

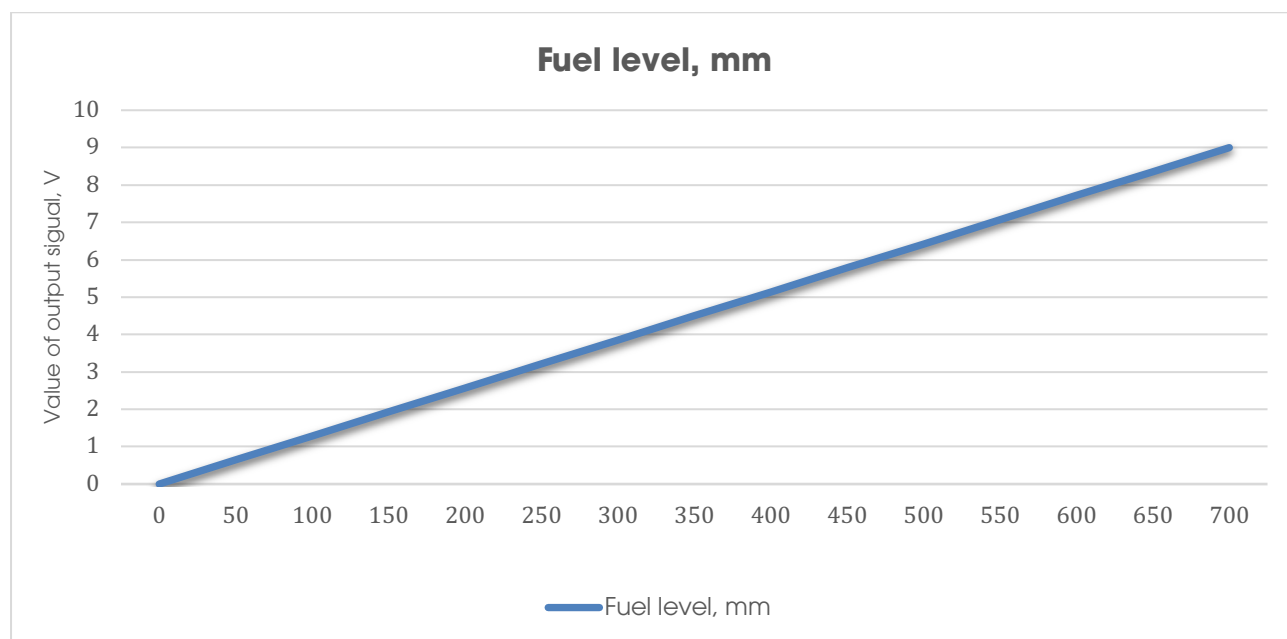
TECHNICAL CHARACTERISTICS**1. Voltage output signal depending on the probe length**

Figure 1. Dependence of the voltage output signal on the fuel level.

Operating voltage range from (0...9V).

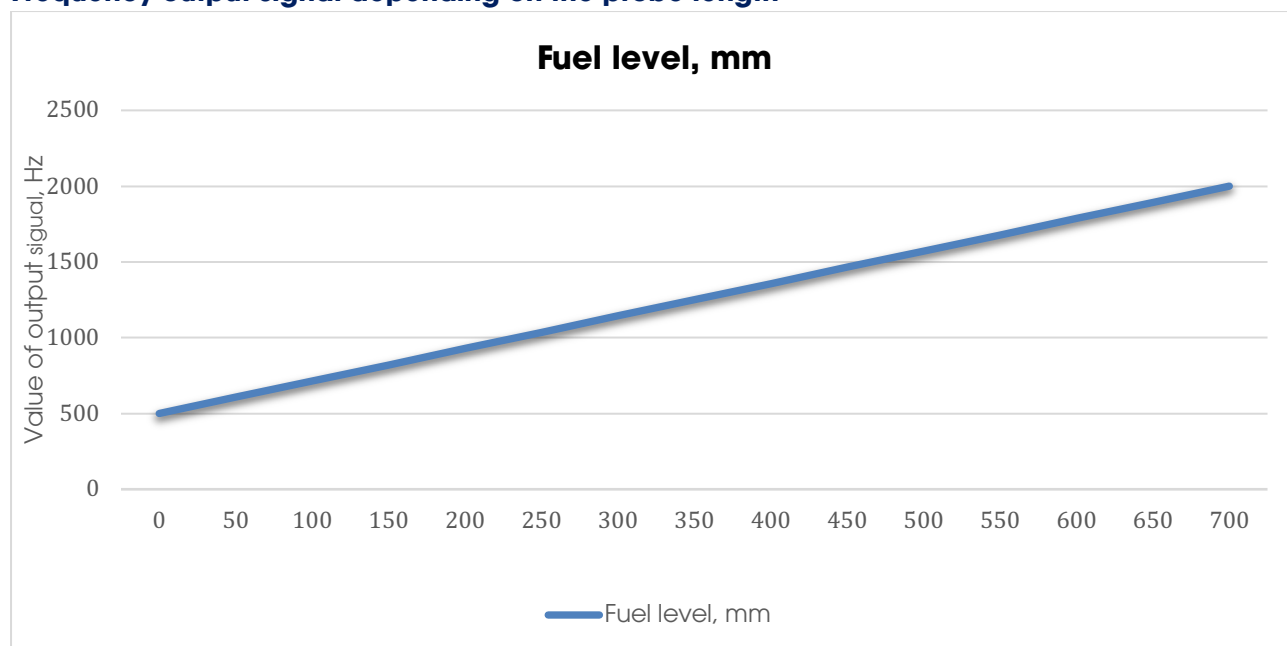
2. Frequency output signal depending on the probe length

Figure 2. Dependence of the frequency output signal on the probe length.

Operating frequency range from (500-2000Hz).

3. RS232/RS485 output signal depending on the probe length

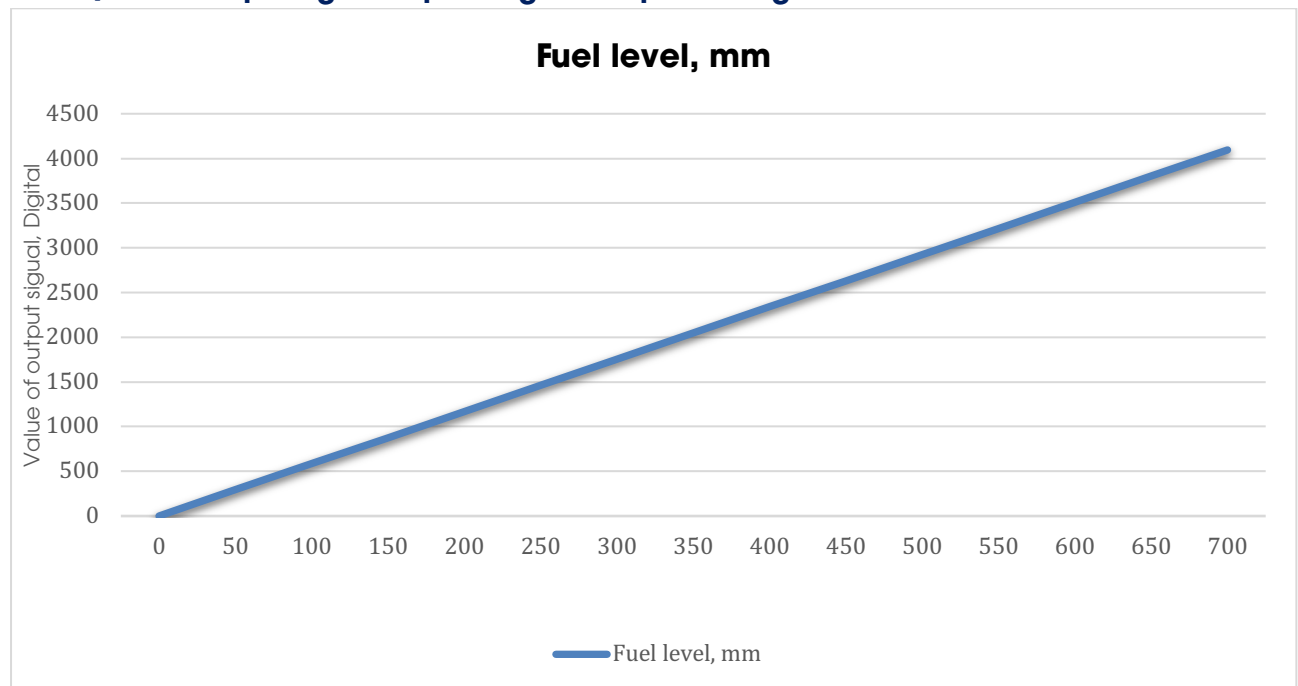


Figure 3. Dependence of the RS232/RS485 output signal on the probe length.

Measurement range from (0-4095)

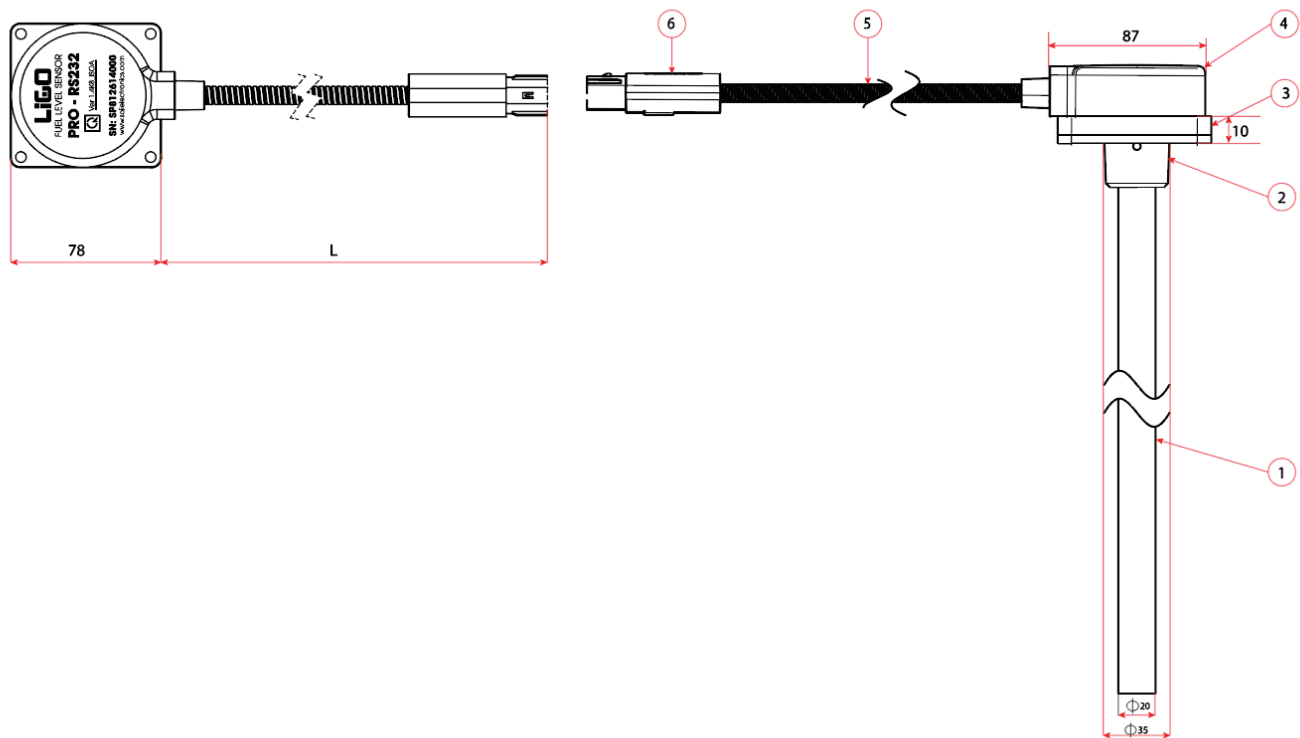
V. OVERALL DIMENSIONS AND DETAILED DESCRIPTIONS

Figure 4. Overall dimensions of LIGO PRO fuel level sensor.

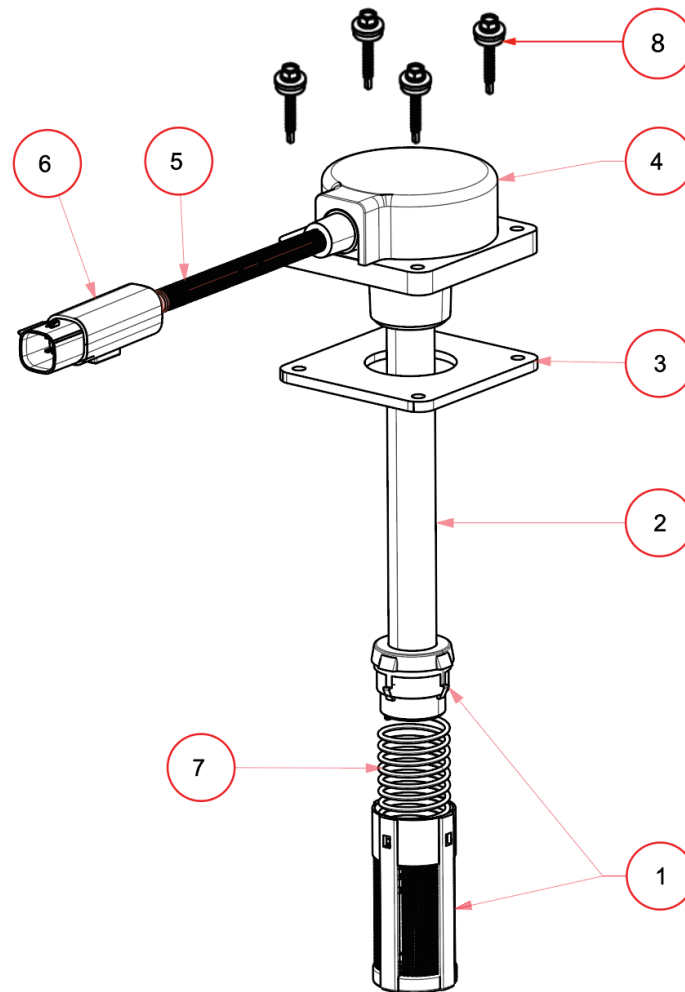


Figure 5: Description of sensor's parts

Description:

No	Content
1	Oil filter
2	Sensing probe
3	Gasoline resistant rubber gasket
4	Sensor's head containing sensing circuit board
5	Twisted steel stainless steel plastic conduit
6	Connector IP67
7	Anti-vibration spring
8	Self-drilling M4.8x32mm x 4pcs or M5x20 Rivet nut x4pcs

VI. CONNECTOR

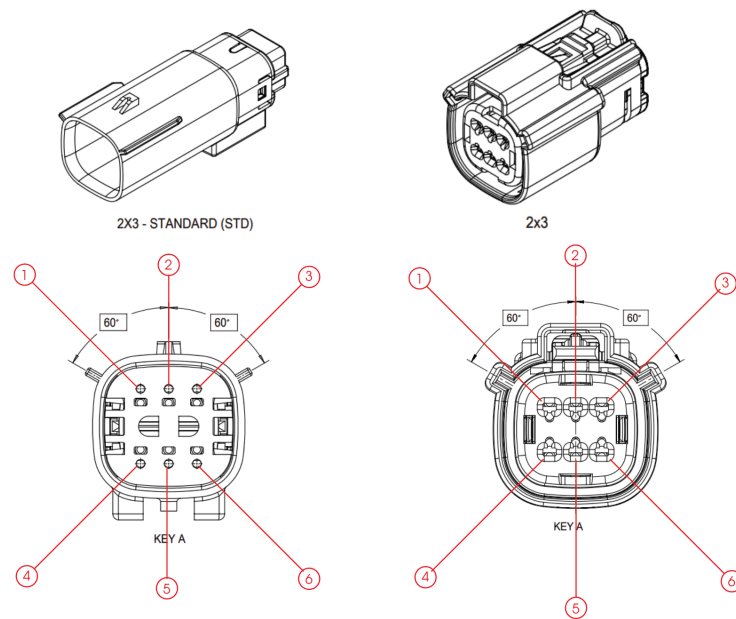
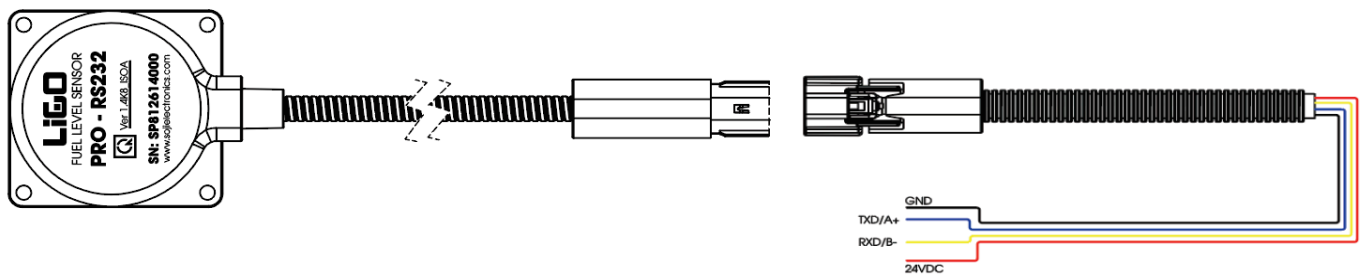


Figure 6. The detail of connector Pins

PIN	DESCRIPTION
1	GND
2	NC (Not connected)
3	7...50 VDC
4	TXD/A+
5	Analog or Frequency
6	RXD/ B-

1. Connecting LIGO PRO to an external device

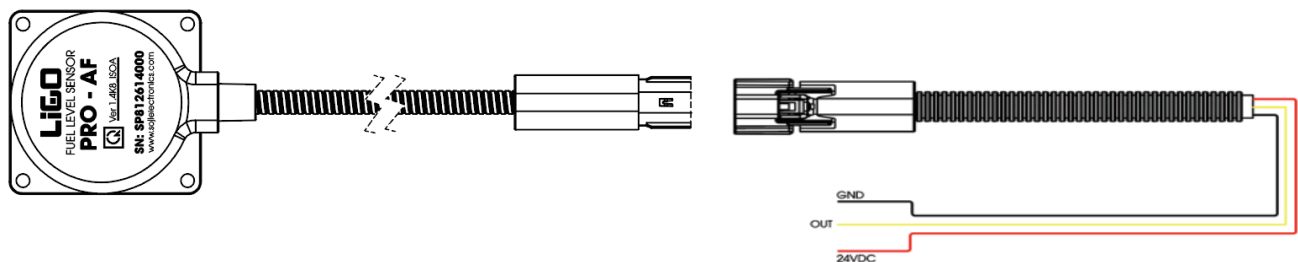
+ RS232/ RS485



WIRE COLOUR		DESCRIPTION
	Black	GND (Ground) (V-)
	Yellow	RXD/B-
	Blue	TXD/A+
	Red	7...50VDC

Figure 7. Wiring diagram of RS232 and RS485 output signals.

+ AF (Analog & Frequency)



WIRE COLOUR		DESCRIPTION
	Black	GND (Ground) (V-)
	Yellow	Out (Analog/Frequency)
	Red	7...50VDC

Figure 8. Wiring diagram of Analog and Frequency output signals.



LIGO fuel sensor is protected against reverse-polarity and overvoltage. This feature helps to protect circuit boards against incorrect connections and it can withstand a continuous over-voltage condition (up to 50V in LIGO-SP product and 100V in LIGO-SP-PRO product) and short-circuit. Please avoid connecting sensor to a power supply which is unstable, usually fluctuates, or has a voltage higher than the recommended voltage range above.

Using a fuse coupled with one pole (-) or (+) is recommended for over-voltage protection purpose in case the car equipment is too old or the power cannot be guaranteed. It is advisable to use fuses which have the rated current less than 2A.

2. Configuration software interface

A. On mobile platform

Connecting the sensor to LIGO mobile configurator

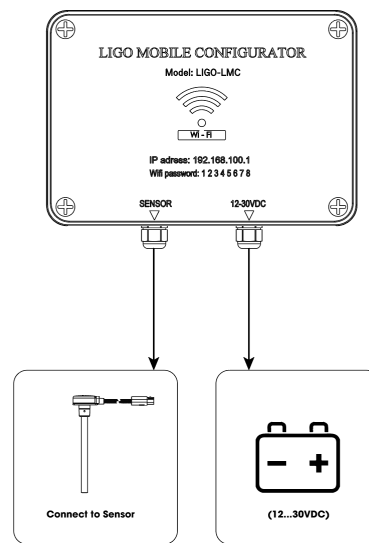


Figure 9. Connecting the sensor to the LIGO mobile configurator

Configuring and managing the appropriate settings for the LIGO device sensor is essential to ensure its proper, stable, and accurate operation. It also allows for continuous monitoring of the device's operational status, potential failures (whether caused by the sensor itself or external factors), and overall lifespan.



Figure 10. Device's management, setting up and configuration software interface

B. On PC device

Connecting the sensor to LIGO configurator on the PC.

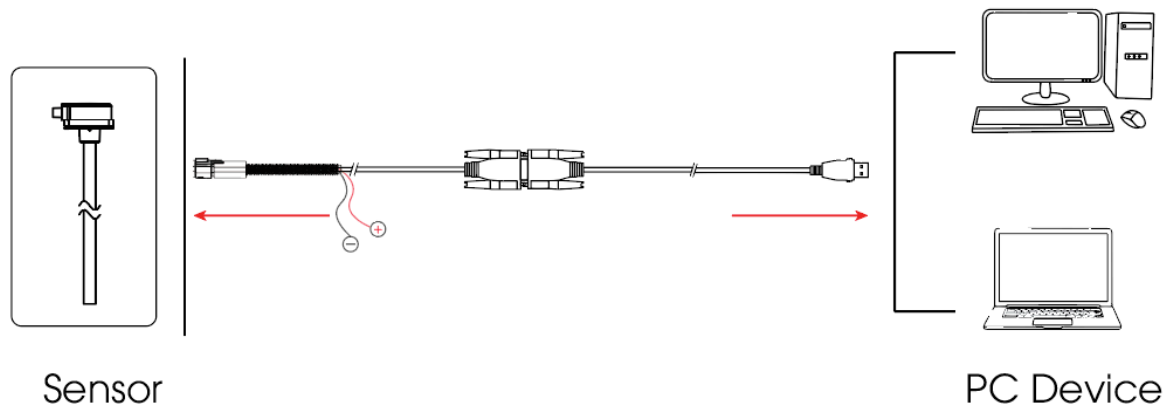


Figure 11. Connection diagram of sensor to PC via a configuration tool.

In addition to the configuration options on mobile platforms, we also provide the capability to configure the sensor on personal computers (PCs), enabling remote support and more in-depth setup and configuration of the sensor.



Figure 12. Device's management, setting up and configuration software interface on PC

Main parameters:

1. Sensor:

Restore password: Restore user password, user will receive an encrypted string which will be sent to SOJI for password decryption

Change password: Change user password

Load config: Load configurations from sensor to PC. Note: user must load configurations from sensor before changing configurations on PC

Save config: Save configurations from PC to sensor

Update firmware: Upgrade new firmware for sensor (visit www.sojielectronics.com for the latest firmware version)

Set full: Set Full for maximum fuel level calibration

Set Empty: Set Empty for minimum fuel level calibration

Exit: Quit configuration interface

2. **Language:** Choose English or Vietnamese interface
3. **Level Min:** Configure LIGO PRO-AF output voltage or frequency range according to the voltage or frequency range of the tracking device input
4. **Level Max:** Configure LIGO PRO-AF output voltage or frequency range according to the voltage or frequency range of the tracking device input
5. **Output type:** Select analog or frequency output (used only for LIGO PRO-AF)
6. **Filter time:** set output signal processing time. Default time 60 seconds.
7. **Automatic transmission mode:** Automatic transmission mode applied only to RS232/RS485 defines sensor output message type:
 - Off – no automatic message transmission, sensor is waiting for tracking device request;
 - HEX - automatic message transmission in binary format (used by default);
 - ASCII - automatic message transmission in text format;
 - ASCII EXT – automatic message transmission in extended text format. Additional Prefix and Postfix configurable parameters are available for this mode to insert required header or ending of the message.
8. **Message interval:** Time period that the sensor automatically sends output message to the tracking device. Parameter value range is from 1...60 seconds with 1 second step. Default value is 1 second.
9. **Actual length:** The actual length of sensor probe
10. **Address (0-254):** Set the network address for the sensor. When several sensors are connected to one external device, they should have a unique network address.
11. **Parameter selection:** Select output value type for sensor data

One of the following output value types available for LIGO PRO-RS232 and LIGO PRO-RS485

 - Fuel level in standard (normalized) units (0...1000);
 - Fuel level in millimeters (mm), 0.1 mm step;
 - Fuel volume in liters (L), 0.1 L step;
 - Fuel volume in percentage (%), 0.4% step.
12. **COM Port:** COM port number will be displayed on PC as well as baud rate for RS232 and RS485.
13. **Baud rate:** Select the rate for data exchange with external device. Default value – 9600 bit/s.
14. **Output:**
 - OSC frequency:** Initial measuring generator frequency (Hz)
 - Data output:** Data output (0-4095)
 - Sensor message:** Sensor working message

Sensor message	Transcript of the malfunction code	Possible solution
255 or 254	Calibration error	Check if the measuring probe actual size value is inserted correctly and (or) re-calibrate the sensor
253	Short circuit in measuring probe tubes	Wash the measuring probe tubes with clean fuel, clean fuel tank of mud and water.
252	Calibration error	Check if the measuring probe actual size value is inserted correctly and (or) re-calibrate the sensor
251	Hardware failure	Contact supplier
250	Calibration error	Check if the measuring probe actual size value is inserted correctly and (or) re-calibrate the sensor

Sensor temperature: temperature inside sensor circuit board

Sensor type: Sensor models RS232, RS485, AF

15. **Calibration Table:** Calibration table

16. **History:** Configuration history

17. **Enable AutoCalib feature:** Automatically calibrate after cutting. User does not need to reconfigure after cutting.

18. **Infor device:**

Firmware version: Sensor's firmware version

Device ID: Sensing chip's ID

HW version: Sensor's hardware version

Boot version: Sensor's bootloader version

3. Connecting multiple sensors together (Only applicable to RS232 and RS485)

In some situations, there are oil tanks with specific dimensions, interconnected oil tanks, or oil tanks that are either too long or too large. Using just one sensor to measure the accurate fuel level inside these oil tanks may not be feasible. Hence, there is a need to connect two or more sensors together through a data processor called SUM-DATA.

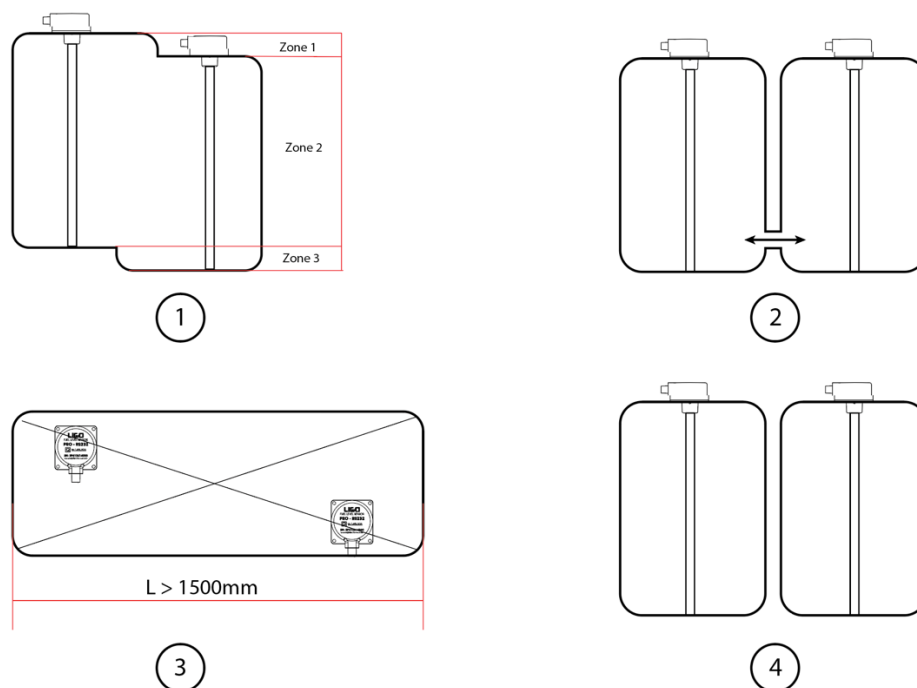


Figure 13. Oil tank with particular dimensions connecting multiple sensors together

Connection diagram of the processor SUM-DATA for multiple sensors:

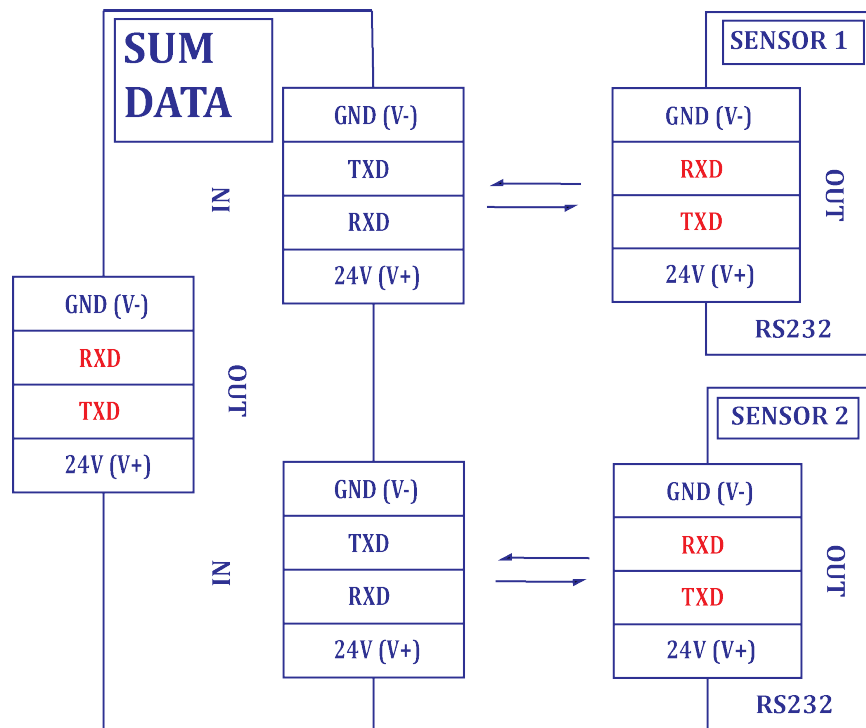


Figure 14: Connecting two sensors by 01 processor SUM-DATA

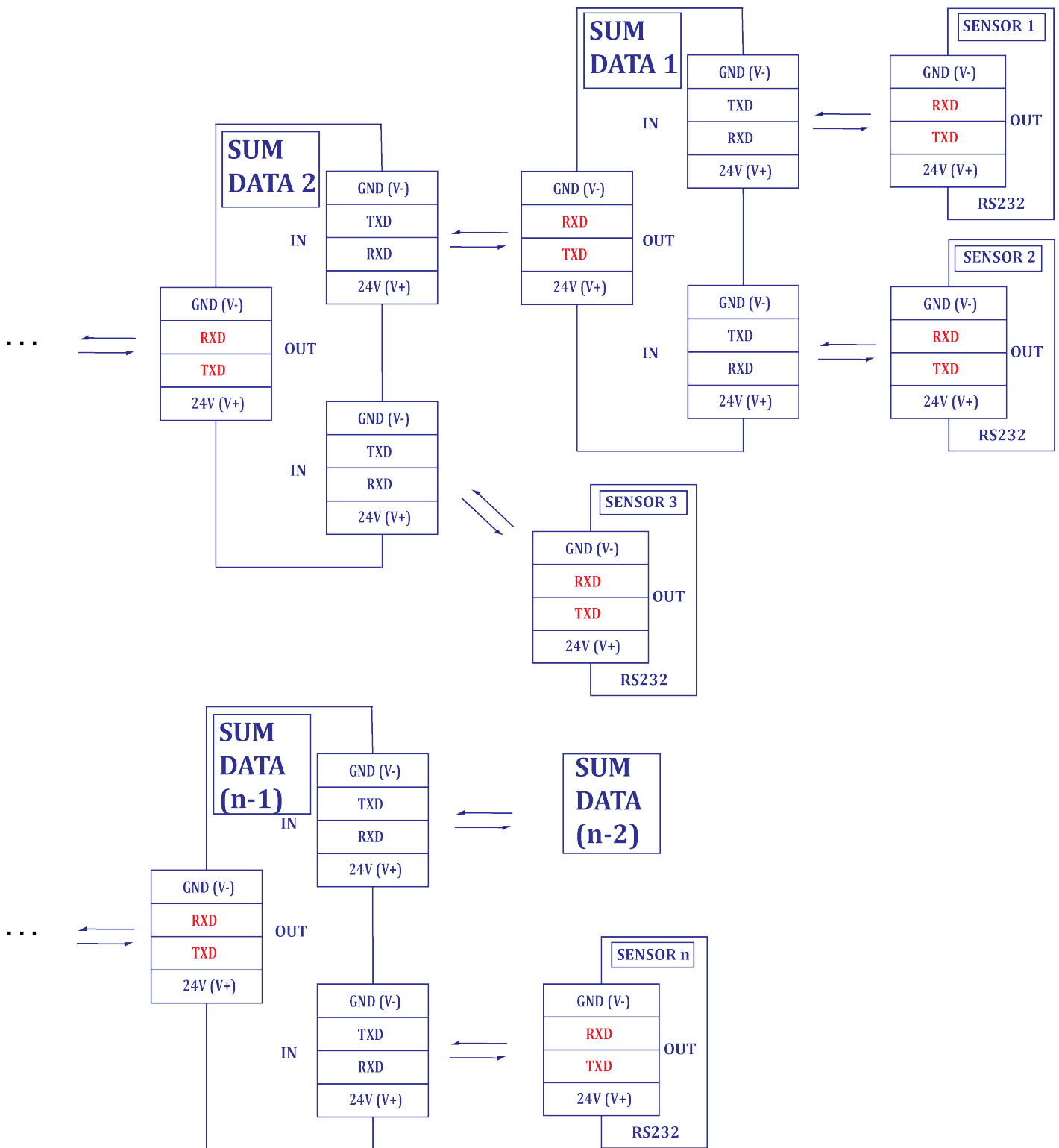


Figure 15: Connecting multiple sensors together by multiple processors SUM-DATA

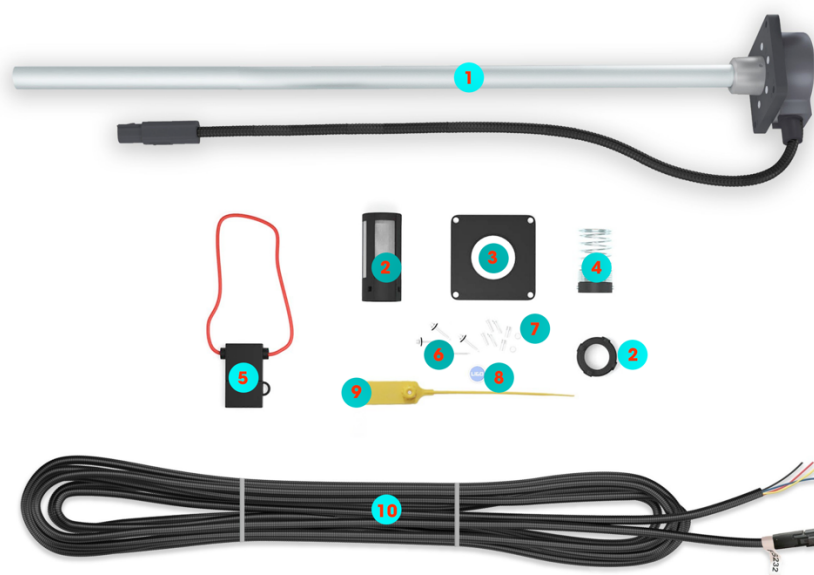
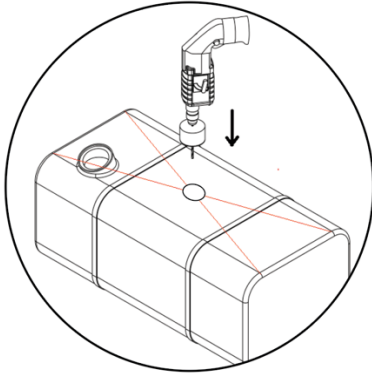
VII. PRODUCT AND ACCESSORIES

Figure 16: Sensor and all the accessories

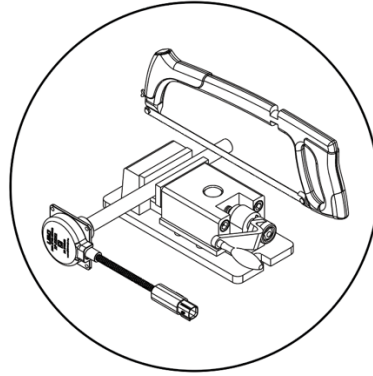
No.	Description	Qty (pcs)
1	LIGO PRO Fuel Level Sensor. Standard lengths: 700, 1000, 1500mm (for other customized lengths, please contact the manufacturer)	01
2	Oil filter	01
3	Gasoline resistant rubber gasket	01
4	Anti-vibration spring when moving	01
5	2A Fuse protection	01
6	Self-drilling screw M4.8x32mm	04
7	Rivet and screw M5x20mm	04
8	Sealing cord	01
9	Plastic wire sealing connector	01
10	7m PVC coated signal wire	01
11	Quick installation manual	01

VIII. INSTALLATION

Quick installation through 5 steps:



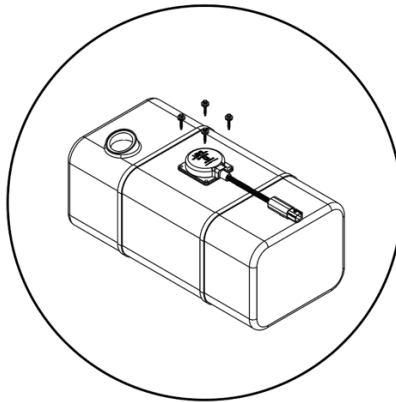
Step 1: Pierce oil tank



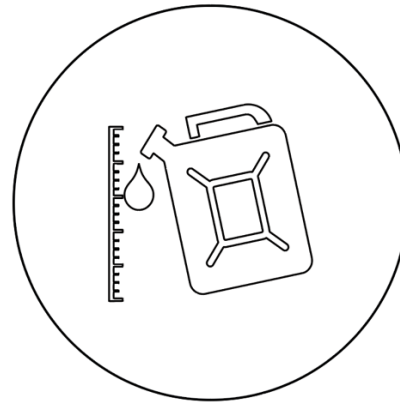
Step 2: Based on oil tank's height, cut a suitable level



Step 3: Configure new length



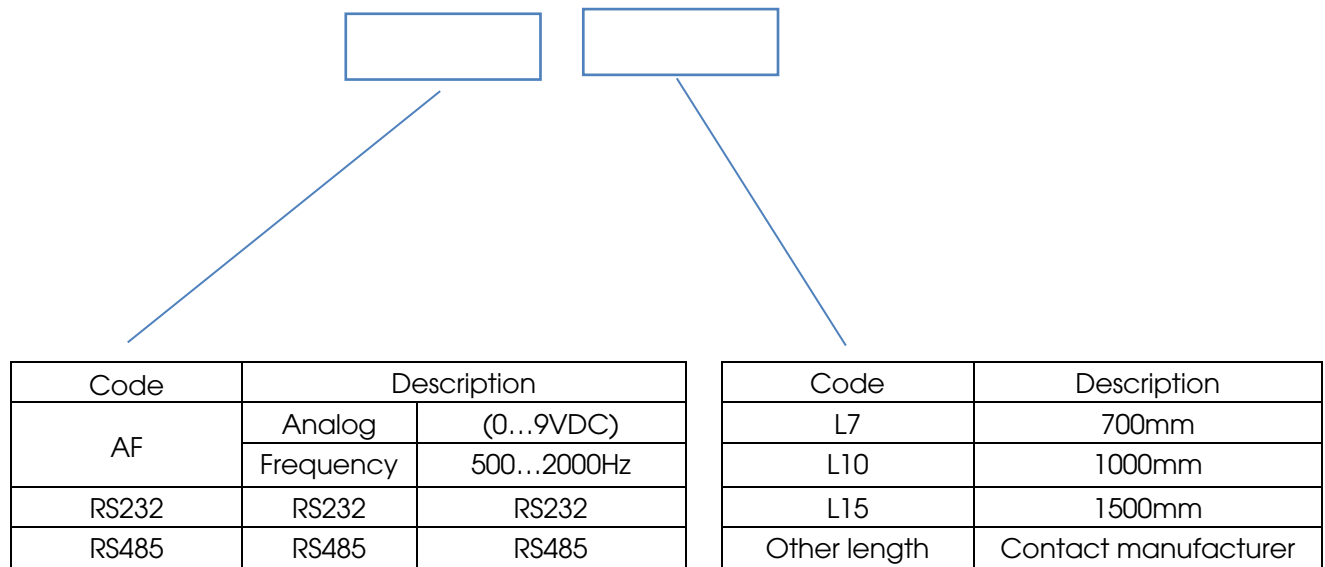
Step 4: Install the level indicator in the oil tank



Step 5: Re-adjust the sensor according to the volume of the oil

Figure 17. 5-step sensor installation.

For further information about the sensor's installation procedure and configurator software, please visit our website www.sojielectronics.com or contact us for more details.

IX. LIGO PRO ORDER CODE

For Example: **700mm length, output signal AF** sensor has the order code: LIGO PRO - AFL7

X. CONTACT US

The purpose of this datasheet is to provide comprehensive information on the structure, operation principle and operating rules for the LiGO PRO - series fuel level sensor. Please feel free to send your comments regarding any errors or omissions you might find, or any suggestions you might have for the general improvement of this document. Data specifications can be changed without any notification. For the latest information and updates, please visit us at: www.sojielectronics.com

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REVISION HISTORY

Date	Version	Description
11.09.2023	2.5.1	2nd release

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