LIGD DATA SHEET FUEL LEVEL SENSOR





Hightlight Feature:

SMS

Document

VERSION 2.2.7

*

99.5%

High accuracy up to 99.5%

Galvanic separation

Good operating temperature from -40 - 85 °C

Measures against dust and water IP67

Intelligent noise filtering algorithm

Designed by SOJI ELECTRONICS



TABLE OF CONTENTS

I.	GENERAL INTRODUCTION	3
II.	KEY FEATURES	3
III.	GENERAL APPLICATIONS	3
IV.	TECHNICAL SPECIFICATIONS	4
V.	OVERALL DIMENSIONS AND DETAILED DESCRIPTION	7
VI.	CONNECTOR	9
VII.	PRODUCT AND ACCESSORIES	18
VIII.	INSTALLATION	19
IX.	LIGO-SP ORDER CODE	20
Х.	CONTACT US	21
REV	ISION HISTORY	21

I. GENERAL INTRODUCTION

LIGO Fuel level sensor is produced and developed by SOJI Electronics Limited Company. The device is designed to measure the level of liquid fuel and other non-conductive liquids in vehicle's tanks and stationary fuel storage, applicable in different fields. The measured values will be transmitted to an external device as an output signal such as: Analog, Frequency, RS232, RS485... in order to connect to an external device.

Under particular conditions, the device can reach a high accuracy up to 99.5%. At present, on the market there are several lines of sensor used to measure fuel level, possessing different technologies such as: magnetically operated switches (reed switches), ultrasound wave (ultrasonic sensor), capacitive sensing (capacitive sensor). Among these ones, capacitive sensing technology is considered to have highest accuracy and best device lifespan.

II. KEY FEATURES

- 1. High accuracy up to 99.5%.
- 2. Wide operating voltage range (only applicable to LIGO-SP-PRO with the voltage from 7.5 to 75V).
- 3. Inside isolation voltage up to 2500V (only applicable to LIGO-SP-PRO).
- 4. Can be optionally cut off or prolonged up to 6000mm.
- 5. Automatic recognition for new length after being cut.
- 6. Wide operating temperature range from -40°C to +85°C.
- 7. A filter protecting the probe from dregs and water.
- 8. IP67 waterproof standard.
- 9. Interference filter and thermal error compensation system.
- 10. Installation and configuration software... on PC though a Connection Device.
- 11. Quick installation, security seal.

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-SP product

PARAMETER	AF	RS232	RS485
	700, 1000,	700, 1000,	700, 1000,
Standard length (L), mm	1500up to 6000	1500up to	1500up to
	mm	6000 mm	6000 mm
Measuring error, %	± 0.5 %	± 0.5 %	± 0.5 %
	Analog (09V),		
Output signal	Frequency	RS232	RS485
	(500- 2000Hz)		
		2400, 4800,	2400, 4800,
Baudrate bit/sec	9600	9600, 19200,	9600, 19200,
	7000	38400, 57600,	38400, 57600,
		115200.	115200.
Power supply (DC input voltage, V)	750	750	750
Maximum power consumption, mA	20	20	20
Waterproof standard (Ingress protection rating, IP)	IP67	IP67	IP67
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	Analog (08);		
measurement value	Frequency	0	0
	(5001500 Hz)		
Digital reading range corresponding to the maximum level	Analog (19V);		
magurement value	Frequency	4095	4095
	(10002000 Hz)		
Average sampling period, (s)	0255	0255	0255
Message interval, (s)	Continuous	160	160
Absolute error in temperature measurement within the entire	+2	+2	+2
temperature measuring range, °C	<u> </u>	<u> </u>	∸<
Average service life, years (minimum)	8	8	8



TECHNICAL CHARACTERISTICS



1. Voltage output signal depending on the probe length



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 DESCRIPTION



Figure 4. LIGO fuel level sensor's overall dimensions.

SP Series Smart fuel level sensor







Description:

No	Content		
1	Self-drilling M4.8x32mm x 4pcs, M5x20 Rivet nut x4pcs		
2	Sensor's head containing sensing circuit board		
3	Gasoline resistant rubber gasket		



VI. CONNECTOR





PIN	DESCRIPTION	
1	GND	
2	750 VDC	
3	NC (Not connected)	
4	Analog or Frequency	
5	TXD/A+	
6	RXD/ B-	



1. Connecting LIGO-SP and LIGO-SP PRO to an external device

+ RS232/ RS485



WIRE COLOUR		DESCRIPTION
	Black	GND (Ground) (V-)
	Yellow	RXD/B-
	Blue	TXD/A+
	Red	750VDC

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





+ AF (Analog & Frequency)



Black	GND (Ground) (V-)
Yellow	Out (Analog/Frequency)
Red	750VDC

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 overvoltage condition (up to 50V in LIGO-SP product and 100V in LIGO-SP-PRO product) and shortcircuit. 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.



Smart fuel level sensor



Figure 9. Connection diagram of sensor to PC via a configuration tool.

3. Configuration software interface

Setting up and managing the appropriate configurations for the sensor is indispensable to properly, stably and accurately operate the device sensor LiGO, as well as usually keep informed about the device's operating situation, failure (caused by the sensor itself or external factors), and lifespan.



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



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

level sensor

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 <u>www.sojielectronics.com</u> 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 SP-AF output voltage or frequency range according to the voltage or frequency range of the tracking device input
- 4. Level Max: Configure LIGO SP-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 SP-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.

- 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

11. Parameter selection: Select output value type for sensor data

level sensor

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

- Fuel level in standard (normalized) units (0...1000);
- Fuel level in millimeters (mm), 0.1 mm step;

SP Series

- 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 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



		Check	if	the	measuring	probe
250	Calibration error	actuals	size	value	is inserted c	orrectly
		and (or) re	-calib	rate the sens	sor

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 AutoClib 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

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

In some situations, there are oil tanks with particular dimensions, communicating oil tanks, too long or too large oil tanks... multiple oil tanks need to be managed on only 1 device or Dataloger cannot use only 1 sensor to measure the accurate fuel level inside oil tanks, and therefore requires the connection between 2 or multiple sensors together by the data processor DATA-SUM.



Figure 11. Oil tank with particular dimensions connecting multiple sensors together





Figure 12: Connecting 2 sensors by 01 processor SUM-DATA



Figure 13: Connecting multiple sensors together by multiple processors SUM-DATA

Smart fuel level sensor



VII. PRODUCT AND ACCESSORIES



Figure 14: Sensor and all the accessories

No.	Description		
1	LIGO 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	02	
9	7m PVC coated signal wire	01	
10	Quick installation manual	01	

Smart fuel level sensor



VIII. INSTALLATION

Quick installation through 5 steps:



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

BDSPSeries Smart fuel level sensor

IX. LIGO-SP ORDER CODE



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



X. CONTACT US

SP Series

fuel level sensor

The purpose of this datasheet is to provide comprehensive information on the structure, operation principle and operating rules for the LiGO SP - 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: <u>www.sojielectronics.com</u>

SOJI ELECTRONICS JOINT STOCK COMPANY

Ha Noi Head offfice: NO-04, LK-03 Ha Tri, Ha Cau, Ha Dong, Hanoi, Vietnam Ho Chi Minh office: No 154 Nguyen Van Thanh, Long Thanh My Ward, 9 District, Ho Chi Minh, Vietnam Tel/Fax: +84 24 62 932 369 Email: contact@sojielectronics.com Visit us at website: <u>www.sojielectronics.com</u>

REVISION HISTORY

Date	Version	Description
10.03.2022	2.4.7	2nd release