

OMNICOMM

Omnicom LLS 5 Fuel Level Sensor

User Manual

Omnicom Configurator 6

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General information

Omnicom LLS 5 Fuel Level Sensor

General information

This User Manual is designed for Omnicomm LLS 5 fuel level sensors.

Omnicom LLS 5 is a fuel level sensor with RS-232 and RS-485 interfaces.

While carrying out installation, observe the safety rules and regulatory requirements for this type of work.

Minimum allowable length of the measuring probe is 150 mm.

Technical Specifications

Technical Specifications

Parameters	Value
Measurement range, mm	0...700, 1000, 1500, 2000, 2500, 3000
REF-channel length, mm	- for sensors of 700, 1000 mm length - 200 - for sensors longer than 1500 mm - 700
Limit of the allowed basic level measurement error, %	$\pm 0,5$ (when working with fuel for which the calibration was carried out or after filling the tank to the full when changing the type of fuel)
Output interface for measured values	RS-232, RS-485
Programmable interface transmission rate, bit/s	1200, 2400, 4800, 7200, 9600, 14 400, 19 200, 38 400, 57 600, 115 200
Measured values output protocol (protocol auto-detection)	LLS, Modbus
Power supply voltage, V	7 – 75
Power consumption, W	0,4
Current consumption, mA	40
Electric strength of galvanic isolation, not less than, V	1500
Working temperature range, °C	From -40 to +80

Technical Specifications

Parameters	Value
Relative humidity at 25 °C (without moisture condensation), %	From 5 to 95
Atmospheric pressure, kPa	From 84 to 107
Maximum relative humidity at 25 °C (without moisture condensation), %	100
Ingress protection rating	IP69k
Operating mode	Continuous
Internal filter size	From 0 to 30
Measurement time period, s	1
Overall dimensions, mm	87.3 x 83.5 x (21 + length of the measuring probe)
Weight, kg	Not more than 2
Average service life, years	8
Digital reading range corresponding to the maximum value of the measured level	1...4095
Digital reading range corresponding to the minimum value of the measured level	0...1023
Temperature measuring range, °C	From -40 to +80

Preparation

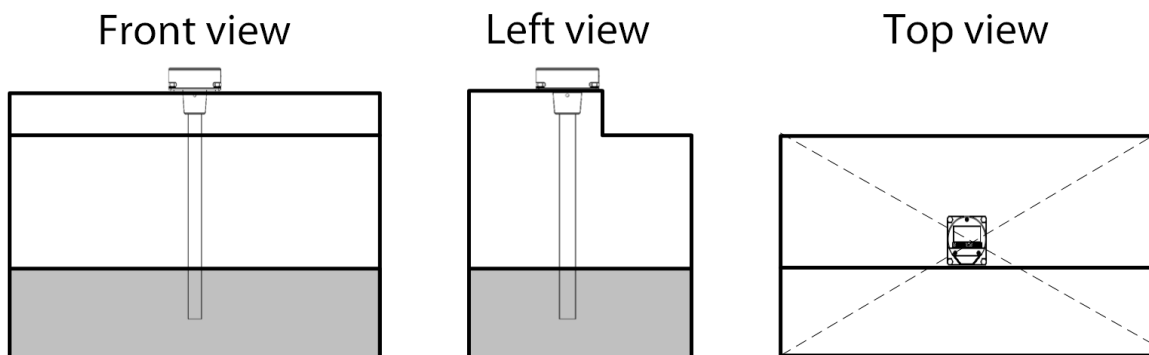
Parameters	Value
Absolute temperature measurement error throughout the whole range of working temperature, °C	± 5

Preparation

Fuel Tank Preparation

1. Select the location for Omnicomm LLS sensor installation, taking into account the following requirements:

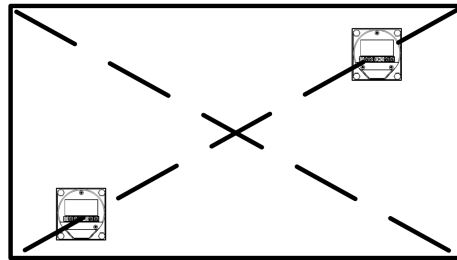
- The installation location should be as close to the geometric center as possible and be placed at the deepest level of the tank:



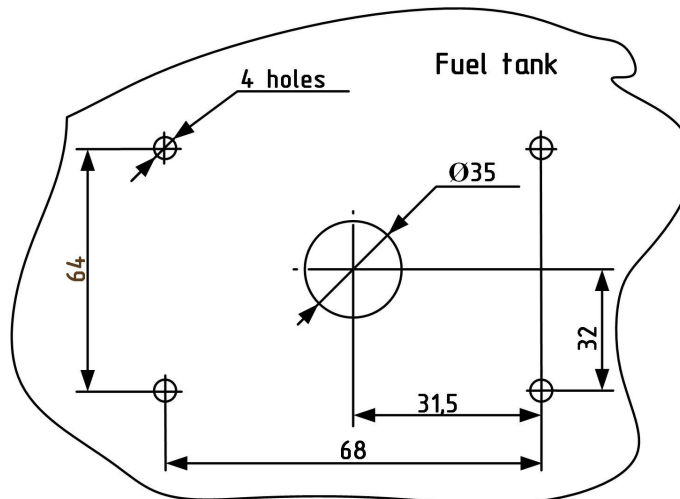
- When installed, the sensor should not be in contact with reinforcement ribs and existing equipment inside the tank
- Installing two sensors in one fuel tank allows to significantly reduce the influence of the vehicle inclination angle on the fuel level:

Preparation

Top view



2. Steam out the tank to comply with safety regulations
3. Drill out the central bore using a bimetal hole saw $\varnothing 35$ mm
4. Drill out four mounting holes according to the diagram:



The mounting hole diameter depends on the material of the tank:

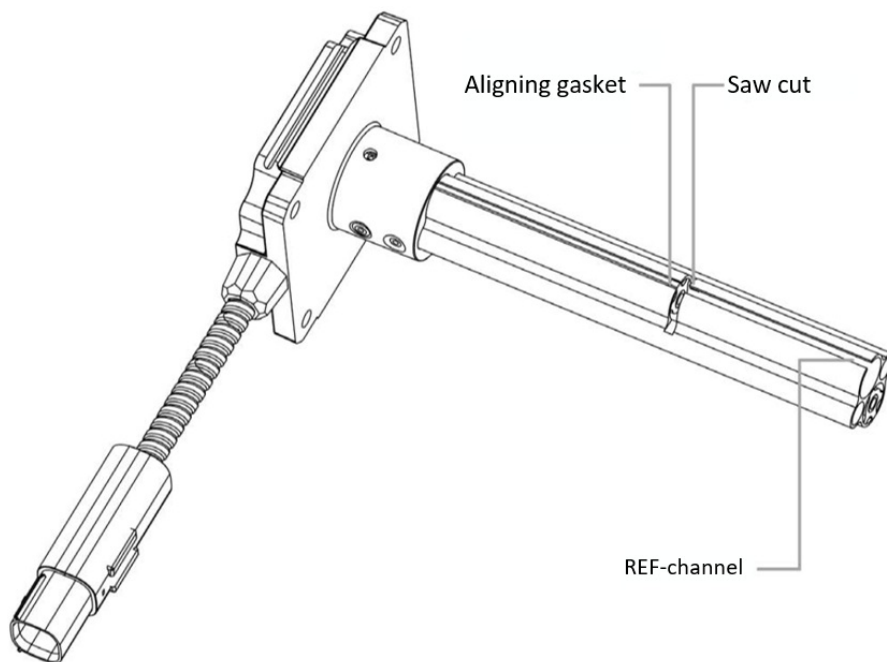
- $\varnothing 4$ mm – for metal tanks with wall thickness over 3 mm (cut M5 thread)
- $\varnothing 7$ mm – for plastic and metal tanks with wall thickness up to 3 mm (for rivets)
- $\varnothing 4$ mm – for plastic tanks with wall thickness over 3 mm

Preparation

Sensor Preparation

1. Cut the sensor measuring part according to the following recommendations:

- The length of the sensor measuring probe should be 20mm less than the depth of the tank.
- The REF channel must be at least 100 mm shorter than the measuring part of the sensor. If the difference is less than 100 mm, trim the REF channel according to the figure:



2. Install the central partition into the sensor measuring part at the depth of 1 cm.

Cut the REF channel (only if the length of the REF channel and the measuring part is less than 100 mm):

1. Install the central partition in the REF channel in close proximity to the cut point.
2. Cut with a cutting wheel (max. 125 mm in diameter)
3. Remove a section of the REF channel rod

The REF channel rod is shorter than the main measuring rod and is located on the right when looking at the sensor body on the connector side.

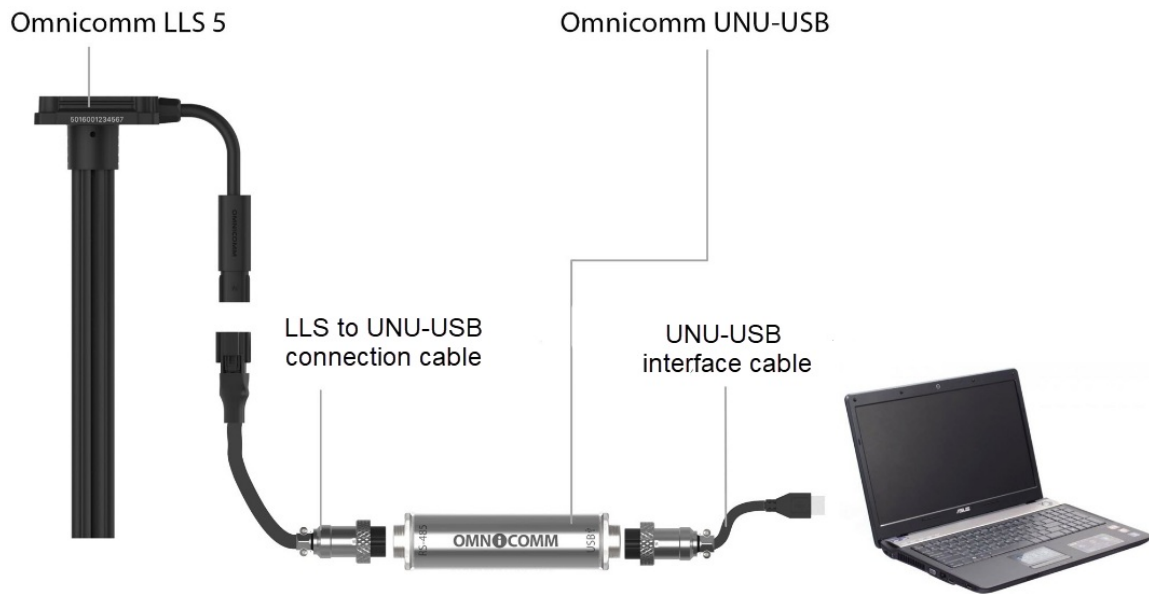
Setting

Setting

Firmware update is only done via RS-485 interface connection.

Connect the sensor to a PC.

Connect the Omnicomm LLS 5 sensors according to the diagram:



Run the Omnicomm Configurator program on your PC.

Setting

Omnicom Configurator (PC):

The screenshot displays the Omnicomm Configurator (PC) interface for an LLS 5 device (FW: 5.0.2.54). The interface is divided into several sections:

- Left Sidebar:** Contains icons for 'Sensor', 'Terminal', and 'Indicator'. A label 'Selection of equipment' points to this area.
- Main Configuration Area:** Includes fields for 'Network address' (1), 'Min level (0...4094)' (0), 'Max level (1...4095)' (4095), 'Filtering' (None), 'Baud rate' (19 200 bit/s), and 'Automatic data output' (None). There are also checkboxes for 'Compensate for thermal expansion of fuel' and 'Parameter initialization' (Yes), and a 'Compensation algorithm threshold' field.
- MODBUS RTU Section:** Includes fields for 'Modbus function', 'Level', and 'Temperature'.
- Right Panel:** Features a 'CALIBRATION' tab, a 'Service' menu, and a fuel level graph. The graph shows a fuel level of 1% N=39. Below the graph are 'FULL' and 'EMPTY' buttons. A 'Service' menu is open, showing options: 'Factory reset', 'Firmware upgrade', 'Modified settings cleaning', and 'Help'.
- Bottom:** A 'SAVE' button is visible.

Labels and annotations:

- 'Selection of equipment' points to the left sidebar.
- 'Settings of connection' points to the 'Modbus function', 'Level', and 'Temperature' fields.
- 'Selection of units: Gallons / liters' points to the unit selection icon at the bottom left.
- 'Factory reset', 'Firmware upgrade', 'Modified settings cleaning', and 'Help' are labels for the 'Service' menu options.

The fuel level value is displayed without filtering.

Setting

“Full/Empty” Calibration

During Full-Empty calibration and subsequent calibration of the fuel tank using one type of fuel, it is recommended to turn on “Auto-adjustment” (see [Sensor Settings](#)). Perform the automatic adjustment and save the settings in the fuel level sensor.

1. Fill the measuring container with fuel
2. Immerse the Omnicomm LLS sensor in the fuel to the full length of the measuring piece
3. Wait for the green indicator “Stabilized” to appear.
Press the button “Full” to record the value corresponding to a full tank
4. Remove the Omnicomm LLS sensor from the container and allow the fuel to drain from the measuring probe for 1 minute. Press the button “Empty” to record the value corresponding to an empty tank
5. Press the “Write to Device” button

Setting

Omnicom LLS 5 Sensor Setting

“Automatic adjustment” - turn on for automatic adjustment of measurements in case of a change in the permittivity of the fuel. Upon activation of auto-tuning, changes of level caused by thermal expansion of the fuel will be displayed, i.e. the level will be shown considering the current temperature. The setting is only available after sensor calibration.

To adjust automatically Omnicomm LLS 5 sensor calibration values, full fuelling of the tank is required when operating the vehicle.

When the tank is to be fully fueled, the max length of the measuring part that does not emerge into the fuel shall not exceed 10 cm from the sensor's flange.

When operating a vehicle with insufficient fuel level in the tank, auto-tuning cannot be performed.

“Network address” (1 to 254) – set the network address for the Omnicomm LLS fuel level sensor. When several sensors are connected to one external device, they should have unique network addresses.

“Min Level” (0 to 4095) – select the minimum reading for the LLS fuel level sensor. Default value – 0.

“Max Level” (1 to 4095) – select the maximum reading for the LLS fuel level sensor. Default value – 4095.

“Filtering” – set the output signal filtration parameters as follows:

- “None”– no filtering is applied, only isolated strong drifts are excluded.
- “Minimum”– the data interval for filtering is approximately 15 seconds. Used for city roads
- “Medium”– the data interval for filtering is approximately 30 seconds. Used for vehicles operating at regular road conditions
- “Maximum”– the data interval for filtering is approximately 5 minutes. Used when vehicles operate at severe road conditions and is not a recommended setting as it may cause delays in fuel readings after a refueling/draining operation

“Baud rate” – select the rate of data exchange with external devices. Default value – 19,200 bit/s.

“Automatic data output” – select:

Setting

- "Off" – no automatic data output (without request) is performed
- "On" – automatic binary data output
- "Data output interval" (1 to 255 seconds) – set the automatic data output interval

The automatic data output mode can be used only when not more than one Omnicomm LLS 5 sensor is connected to one interface and using exclusively the LLS protocol.

"Compensate for thermal expansion of fuel" - check the box to disable tracking fuel level changes due to temperature fluctuations (when the "Automatic adjustment" parameter is switched on).

- "Compensation algorithm threshold" - when this value of the difference in sensor readings is reached, the automatic adjustment function is triggered. Default value - 200.

"Modbus function" - select the Modbus protocol function. The default value - "0x03". Possible values:

- "0x03" - holding register reading
- "0x04" - input register reading

Fuel level sensor detects the protocol automatically - LLS or Modbus - and responds in the protocol of the request

"Level" - the address of the register with fuel level is specified, default value: 40001.

Possible values:

- 40001 to 49999 - for Modbus function "0x03"
- 30001 to 39999 - for Modbus function "0x04"

"Temperature" - the address of the register with sensor temperature is specified, default value: 40002. Possible values:

- 40001 to 49999 - for Modbus function "0x03"
- 30001 to 39999 - for Modbus function "0x04"

Installation and Connection

When installing the fuel level sensor onto the plastic fuel tank it is important to provide a secure electrical connection between the sensor's body and the frame of the vehicle. If this condition isn't met, it can lead to sensor malfunction caused by static electricity.

For installation onto cylindrical fuel tanks with the diameter 420...710 mm follow the instructions in the section [Fuel level sensor installation recommendations for cylindrical fuel tanks](#).

1. Put the mounting point gasket (included in the kit) on the measuring probe of the Omnicomm LLS sensor
2. Put the Omnicomm LLS sensor into the tank and secure it:
 - when securing with rivets, use a riveter
 - when securing with bolts, first put a seal (one on each bolt), a spacer and a spring washer
 - when securing onto a plastic tank with wall thickness of more than 3 mm, use the self-tapping screws and a seal (one on each self-tapping screw), included in the kit
3. Connect the Omnicomm LLS sensors to an external device as shown in the diagram:



Calibration

Functions of the mounting cable wires

Name of signal	Wire Color
RS-485 A	Orange-white
RS-485 B	White-blue
RS-232 Tx	Pink
RS-232 Rx	Gray
+V Power	Brown
Ground	White

4. Connect the fuse holder to the LLS sensor power cable (brown wire) in close vicinity to the vehicle power supply circuit

5. Install the fuse in the fuse holder

6. If necessary, seal the bolt (self-tapping screw) and the connection. Multiple Omnicomm LLS 5 sensors must be connected side-by-side via the RS-485 interface.

Calibration

Calibration of the fuel tank is necessary to verify the conformity of the digital code issued by the Omnicomm LLS 5 sensor to the fuel volume in a particular fuel tank.

Calibration of the fuel tank is performed by refueling up the tank – from empty to full, with a certain refueling interval, and recording the Omnicomm LLS 5 sensor readings in the cali-bration table.

A container may be calibrated by draining.

The calibration of a container with multiple Omnicomm LLS 5 sensors is performed similarly to the calibration with one sensor. Before the calibration process, add the necessary quantity of sensors and specify the network addresses.

Calibration

The calibration is performed for all sensors simultaneously. Connecting multiple sensors to a PC using a KTZ splitter.

Calibration of the tank with one Omnicomm LLS 5 sensor:

1. Empty the fuel tank
2. Connect the sensor to a PC according to the diagram in the Setting section
3. Run the Omnicomm Configurator program. Select "Calibration".

Omnicomm Configurator (PC):

Liters	Sensor No. 1 N = 2377 stable
150	3800
130	3650
110	3112
90	2822
70	2555
50	800
30	600
10	520

Service

By draining

Step 20

Tank volume 150

ADD A SENSOR [F7]

ADD ROW [Enter]

DELETE ROW [Del]

CONTINUE

Calibration table export

Calibration table import

Calibration table chart

Clear the table

Start / continue / finish calibration

If the sensor reading column is not displayed, press the "Add sensor" button. Select the type of sensor. Specify the network address set for the sensor during the setup.

Calibration

4. Set the flow interval in liters

If the tank has irregular shape, and/or there are wider or narrower parts, it is recommended to perform calibration on such tanks with higher amounts of calibration steps to improve accuracy.

5. Press the "Start/continue calibration" button

6. Fill with an amount of fuel equal to the flow interval

Refuel using a measuring container or under control of a fluid flowmeter with the preset interval. The container must have the metrological calibration test certificate.

7. Press "Add line"

The "Liters" column will display the refueling volume equal to the predefined flow interval.

The "Sensor" column will display the value equal to the refueling volume.

8. Press "Add line"

9. Repeat items 6, 7 and 8 according to the number of control points. Minimum recommended number of control points: 20. Use the "F2" key to export a calibration table with more than 65534 liters of fuel volume.

10. Press the "Finish calibration" button

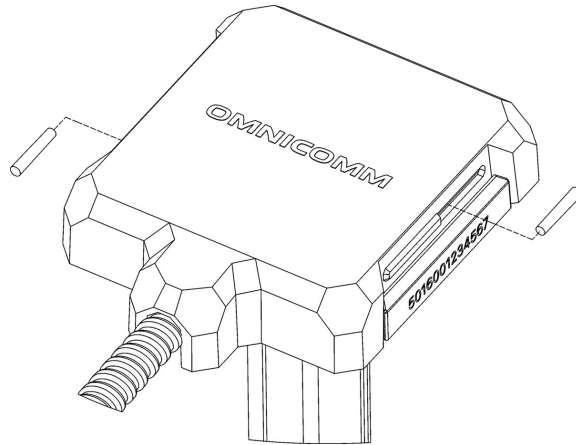
11. Save the calibration table in a calibration file (.ctb), Omnicomm Online (.xml) file, in the Terminal or in the Indicator, by pressing the "Export" button

When performing the calibration table export to the Omnicomm Online (.xml) file, the "Export" window will open. Specify the Omnicomm LLS sensor number to display in Omnicomm Online.

Sealing

Sealing

For Omnicomm LLS sensors, the sensor housing is sealed with a casing-seal and a connector:



1. Install the casing-seal on the sensor housing
2. Place the pins in the grooves of the casing-seals, making sure that they are positioned with the smaller diameter towards the jut of the casing, and push them all the way in

Once the pins are in place, the sensor cannot be removed without destroying the casing of the seal.

Install the seal-tie on Omnicomm LLS 5 connector:

Sealing



1. Join Omnicomm LLS 5 connector to the mounting cable until it clicks
2. Run the flexible part of the seal through the connectors
3. Run the flexible part of the seal through the hole in the seal body
4. Tighten up the connection
5. Cut off the protruding section of the flexible part of the seal

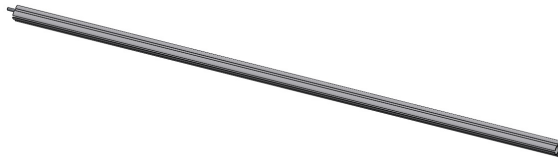
Additional casing-seals can be purchased separately.

Recommendations for the Assembly of the Fuel Sensors from 3 to 6 meters in length

Recommendations for the Assembly of the Fuel Sensors from 3 to 6 meters in length

1. Take the fuel level sensor and the extension of the measuring part from the package
2. Determine the appropriate length of the fuel and cut the excess of the measuring part

The measuring probe extension must be cut only from the threadless side.



3. Connect them by screwing completely the central rod of the fuel sensor and the extension of the measuring part



4. Move the profile (tube) of the extension of the measuring part until it is levels with the profile of the sensor

Remote Configuration and Firmware Update



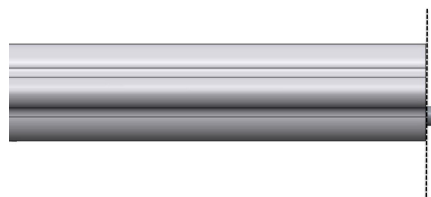
5. Cut the zip-ties which hold the coupling and locate the coupling symmetrical to the joints of the sensor and the extension of the measuring part



6. Screw in 8 screws to fixate the coupling in the following order: 4 screws on one side bottomed out, then tighten the 4 screws on the other side.

7. Check the electrical contact between the extension and the measuring part. Locate the probes of the multimeter in the gap of the reference channel on each side of the coupling. In the way that the probes will touch the inside of the tubing.

8. If necessary cut the excess of the rod until it is levels with the tube.



Remote Configuration and Firmware Update

When connecting the Omnicomm LLS 5 and LLS-Ex 5 fuel level gauges to the Omnicomm 3.0, 3.1 and 3.2 terminals with the firmware version of FW310 or higher, it is possible to update the firmware and sensor settings via the remote configuration server.

A detailed description of configuration and update of the Omnicomm LLS 5 and LLS-Ex 5 sensors firmware is contained in the terminal operating manual.

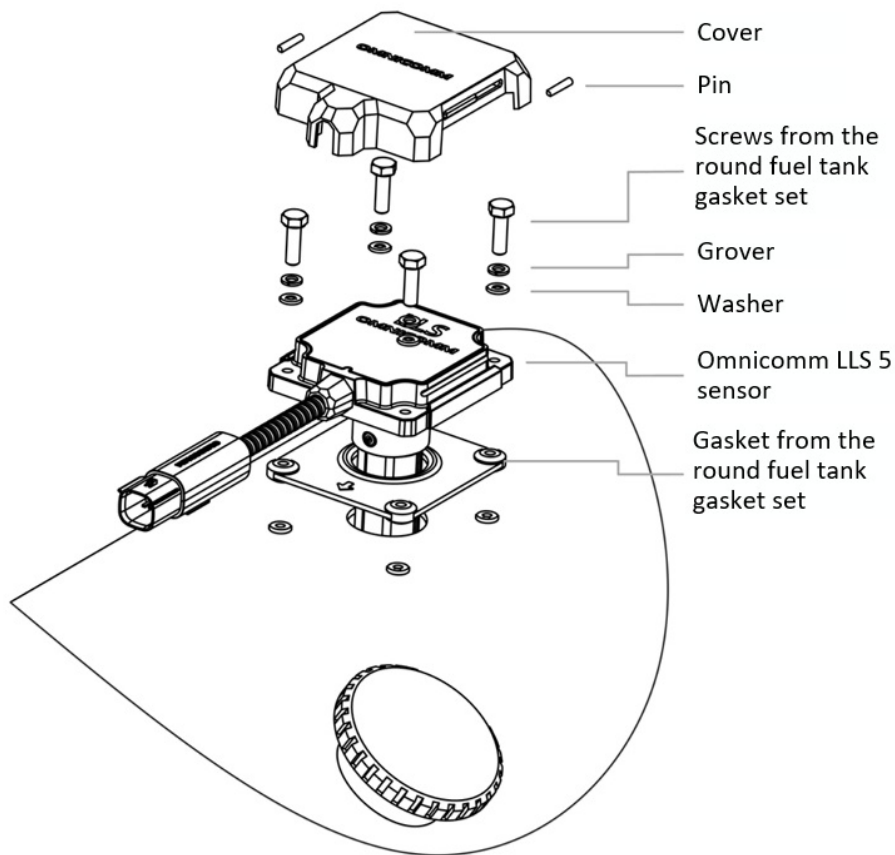
Fuel Level Sensor Installation Recommendations for Cylindrical Fuel Tanks

Fuel Level Sensor Installation Recommendations for Cylindrical Fuel Tanks

When installing the fuel sensor onto cylindrical fuel tanks with the diameter 420...710 mm it is necessary to purchase a set of gaskets for round fuel tanks.

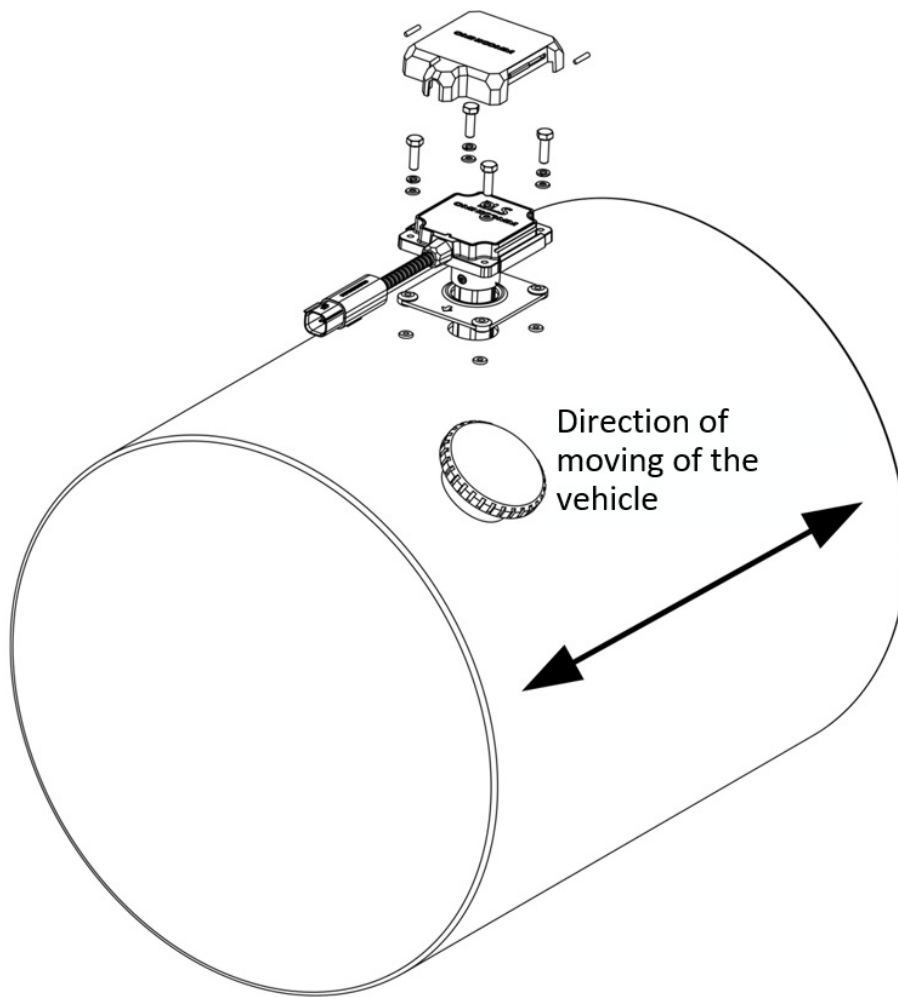
Replace the gaskets and the bolts provided with the LLS 5 with gaskets and screws for the round fuel tank.

The installation sequence of Omnicomm LLS 5 fuel level sensors:



The sensor's cable should align with the direction of the vehicle or shall be located on the long side of the fuel tank.

Fuel Level Sensor Installation Recommendations for Cylindrical Fuel Tanks



Appendix. List of equipment for Omnicomm LLS fuel level sensors installation

Appendix. List of equipment for Omnicomm LLS fuel level sensors installation

Nº	Name	Quantity
1	Bimetal core drill \varnothing 35 mm	1
2	Core drill shank	1
3	Metal drill \varnothing 7 mm or \varnothing 4 mm	1
4	Hacksaw	1
5	Spanner 8 mm	1
6	Tap M5 with holder	1
7	Snap-seal for bolt/self-tapping screw	1
8	Personal computer	1
9	Omnicomm Configurator program	1
10	Omnicomm UNU-USB (or UNU) setting device	1
11	DC power supply unit 10–15 V, 0.5 A (only when UNU is used)	1
12	Measuring container	1
13	Fuel	
14	Calibration container	1

Appendix. List of equipment for Omnicomm LLS fuel level sensors installation

№	Name	Quantity
15	Seal-tie	1

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