

OMNICOMM

Omnicomm LLS 20230 Fuel Tankers Installation Guide

IG LLS 20230: Installation, Launch, Setup, and Control Guide
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General

Omnicom LLS 20230 Fuel Tankers Installation Guide

General

This manual outlines the rules and procedures for installation, start-up, setting and connection of fuel level sensor LLS 20230 (hereinafter - product), as well as calibration procedure for a fuel tank with an installed sensor.

The Omnicomm LLS 20230 fuel level sensor is installed on special types of equipment or on stationary fuel tanks and storages, which require equipment explosion protection and have the "0ExiallBT6X" explosion protection label. The LLS 20230 fuel level sensor shall operate only with the Omnicomm BIS 20240 spark protection unit, produced by Omnicomm

Recommendations for assembling LLS 20230 fuel level sensors with the length from 3 to 6m, are given in the Appendix L.

Installation Works List

- 1) Checking completeness (Paragraph 3.1)
- 2) Selection of location to install the product (Paragraph 3.2)
- 3) Choosing the BIS 20240 installation place (Paragraph 3.3)
- 4) Preparation of the fuel tank for installation (Paragraph 3.4)
- 5) Product cutting to match the specific fuel tank
- 6) Configuring the Product with Omnicomm Configurator (Paragraph 3.6)
- 7) Product installation (Paragraph 4.1)
- 8) Installation of BIS 20240 (for LLS 20230) (Paragraph 4.2)
- 9) Product setting depending on the interface connecting it with an external device (Paragraphs 5.1 and 5.2)
- 10) Preparation and laying of cable to connect the product with an external device (Paragraphs 5.3 and 5.4)
- 11) Fuse installation (Paragraph 5.5)
- 12) Fuel tank calibration (Paragraph 5.6)
- 13) Sealing (Paragraph 7.1)

A list of required equipment and tools is provided in Appendix B (Table 1)

Abbreviations and Symbols

Abbreviations and Symbols

BIS 20240 — stabilatron-based spark protection unit;

PS — power supply;

OS — operating system;

PC — personal computer;

Software — software;

VH — vehicle;

L — LLS fuel level sensor working length (mm);

L1 — working length of the sensor after cutting to match the specific fuel tank(mm);

M — measurement range (non-dimensional value);

N — numeric code corresponding to measured level value (non-dimensional value);

CNT1 — lower limit of level measurement (non-dimensional value);

CNT2 — upper limit of level measurement (non-dimensional value).

Safety

Only personnel who completed a training course with manufacturer's authorized service company and were subsequently certified by them are allowed to carry out installation and start-up works.

During installation and start-up works it is requested to follow safety requirements specified in operational documentation of the producer of the vehicle on which the product will be installed, as well as the requirements of regulatory documents applicable to this type of equipment.

Preparing for Installation

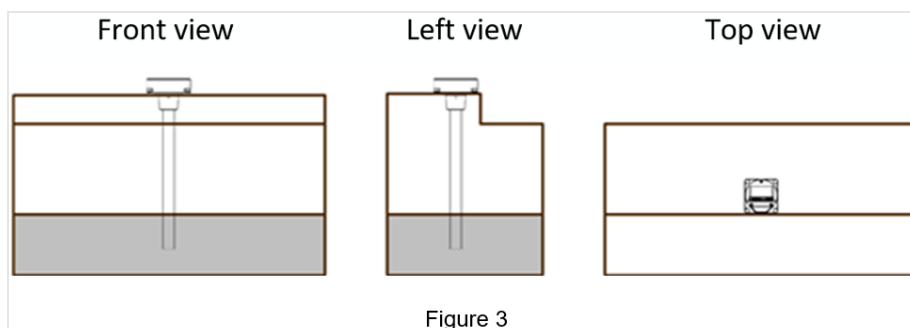
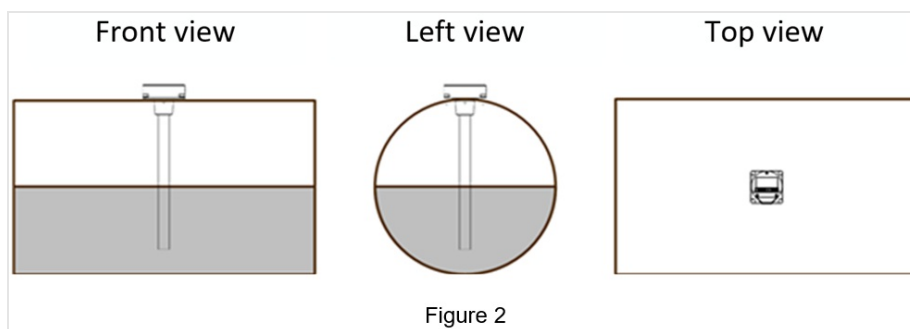
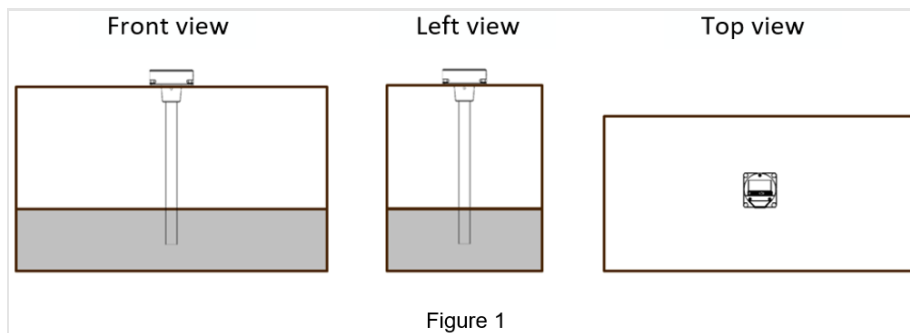
Product Completeness Check

- 1) Open up the packaging. Check completeness as per the datasheet. In case the product does not match the set of components listed in the passport, such a mismatch is resolved by the manufacturers or their representatives.
- 2) Perform visual check of the Product. The Product must have no visible damages. In case a damage is found, the Product must be replaced at the manufacturing facility.

Abbreviations and Symbols

Selection of Location to Install the Product

1) The product should be installed, depending on geometric shape of the tank, at the locations shown in the figures (Figure 1, Figure 2, Figure 3). Product installation at these locations ensures fuel level independence of vehicle inclination.

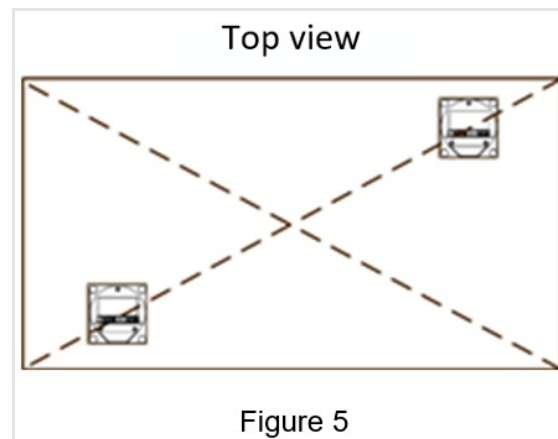
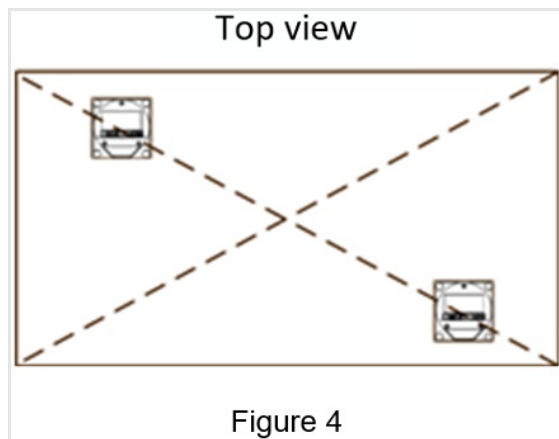


2) If the Product cannot be installed in any of places specified in Figures (Figure 1, Figure 2, Figure 3), the installation place must be as close to any of the specified as possible.

3) Product installation at the locations other than shown in the figures (Figure 1, Figure 2, Figure 3), may cause fuel level dependence on vehicle inclination. For example, for vehicles operating on the high-relief landscape this will mean either overrated or underrated fuel level values.

Installation of two products in one fuel tank allows to significantly reducing fuel level dependence on vehicle inclination. Two products should be installed at the locations shown in the figures (Figure 4, Figure 5)

Abbreviations and Symbols



Selection of Location to Install BIS 20240 (LLS20230)

- 1) Installation of BIS 20240 must be carried out outside of explosion hazard zone, on a smooth surface (e.g. cabin).
- 2) While selecting the location for installation, take into consideration the length of the cable intended to connect stabilitron-based spark protection unit BIS 20240 with an external device (e.g. FMS).

Note. Connection of BIS 20240 with fuel level sensor LLS 20230 should be made only by cable KTZ-XX produced by Omnicomm, where XX – cable length (which can be chosen within the range from 10 to 25m).

Preparation of the Fuel Tank for Product Installation

- 1) When preparing the holes for installation of LLS fuel level sensors:
 - If the fuel tank is used for diesel fuel, it is recommended to fill the tank with diesel fuel to the full before drilling holes — this will minimize the vapor content inside.
 - If the fuel tank is used for gasoline, it should be steamed.
 - When drilling holes without preliminary steaming (appropriate only for tanks used for diesel fuel without any corrosive impurities), it is recommended to coat bimetal bits or drill with grease oil or lithium grease, which will prevent sparking during drilling.
 - If the tank filler neck can be dismantled, tank steaming is not required. Dismantle the tank filler neck and perform installation works far from the fuel tank.

Abbreviations and Symbols



Figure 6

2) Prepare the fuel tank for fitting works following the manufacturer's specification and other safety regulations appropriate to this type of works.

3) Determine the fuel tank type and prepare it accordingly. Fuel tank types:

a. Plastic or metal tank with the wall thickness under 3 mm

The tanks which shape corresponds with the figure (Figure 2) should be prepared in accordance with Appendix E. Prepare the tank for fixing the product by rivets.

Drill holes in the tank: the central hole - by a bi-metal crown $\varnothing 35\text{mm}$ and mounting holes - by a drill $\varnothing 7\text{mm}$ as shown in the figure (Figure 7).

Install the rivets in the prepared holes $\varnothing 7\text{mm}$ with the help of a riveter. A detail description of rivets installation is given in Appendix C.

Abbreviations and Symbols

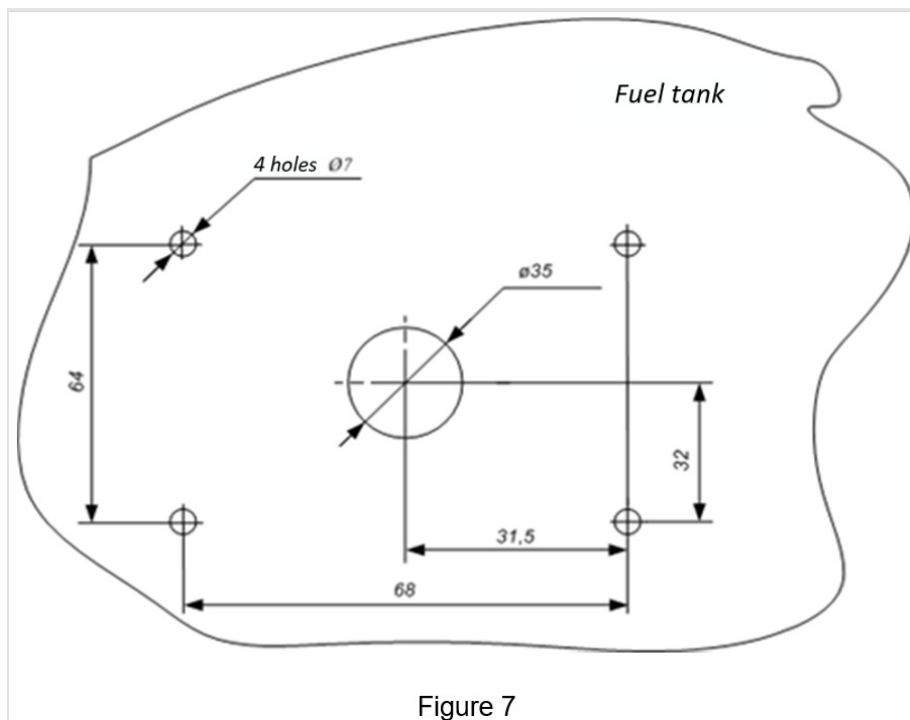


Figure 7

It is not recommended to use self-tapping screws to fix the product onto a metal or plastic tank with the wall thickness under 3mm. This type of fixation cannot ensure reliability of product attachment to the tank.

b. Metal tank with wall thickness over 3mm

Prepare the tank for product installation on a threaded joint.

The tanks which shape corresponds with the figure (Figure 2) should be prepared in accordance with Appendix E.

Drill holes in the tank: the central hole - by a bi-metal crown $\varnothing 35\text{mm}$ and mounting holes - by a drill $\varnothing 4\text{mm}$ as shown in the figure (Figure 8).

Make an M5 thread with the help of an M5 tap.

Abbreviations and Symbols

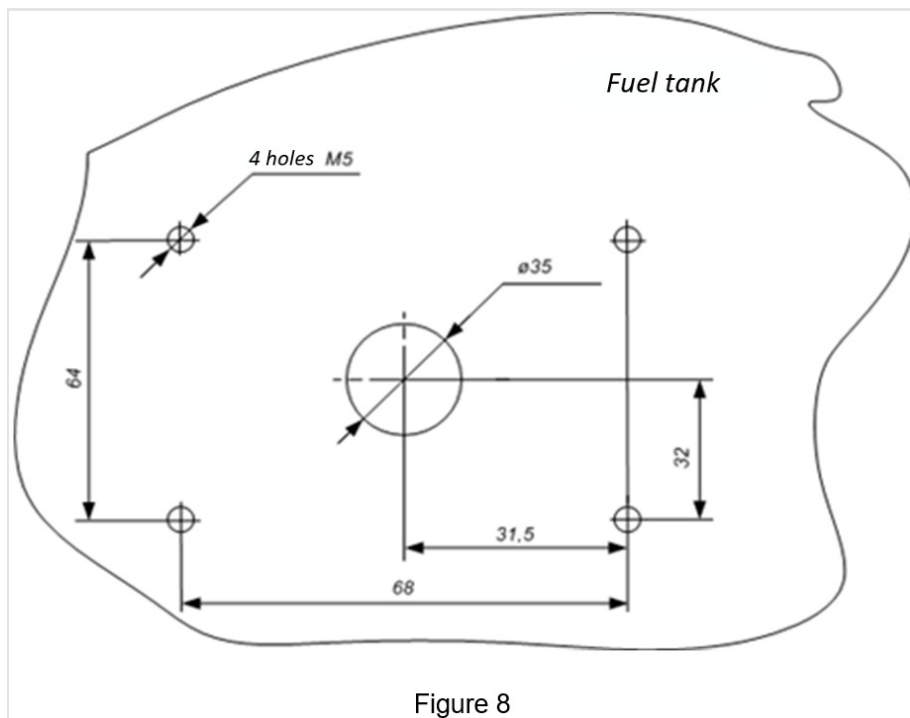


Figure 8

c. Plastic tank with wall thickness over 3 mm

Drill holes in the tank: the central hole - by a bi-metal crown $\varnothing 35$ mm and mounting holes - by a drill $\varnothing 4$ mm as shown in the figure (Figure 9).

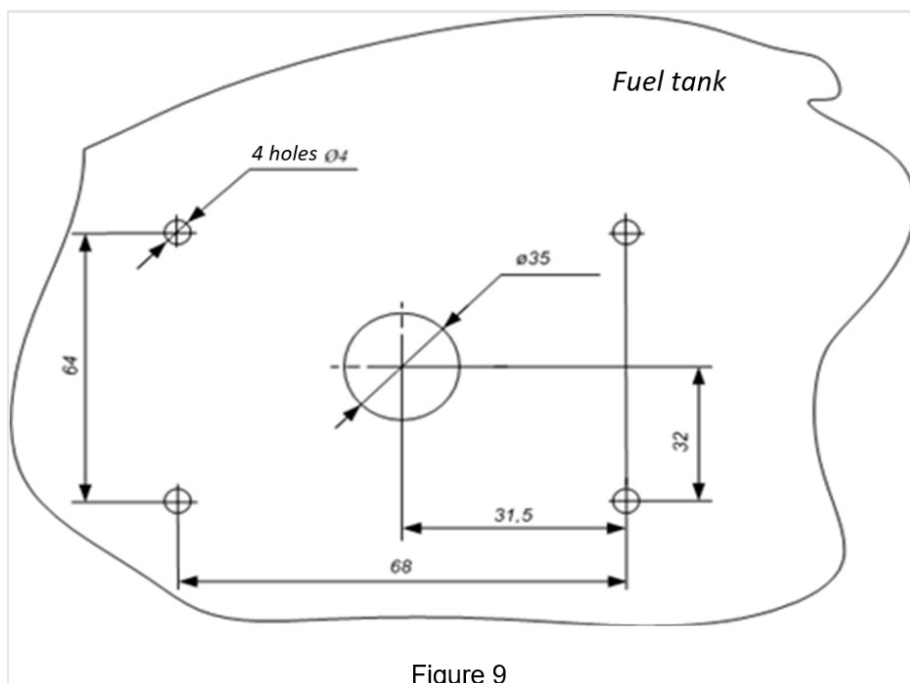


Figure 9

Product Cutting to Match the Specific Fuel Tank

1) Measure the depth of the tank by moving a measuring bar down into the central hole intended for the sensor.

Abbreviations and Symbols

2) On the working length of the product L , measure length $L1$ equal to the depth of the tank minus 20mm.

Minimum allowable length of the measuring probe cutting is 150 mm.

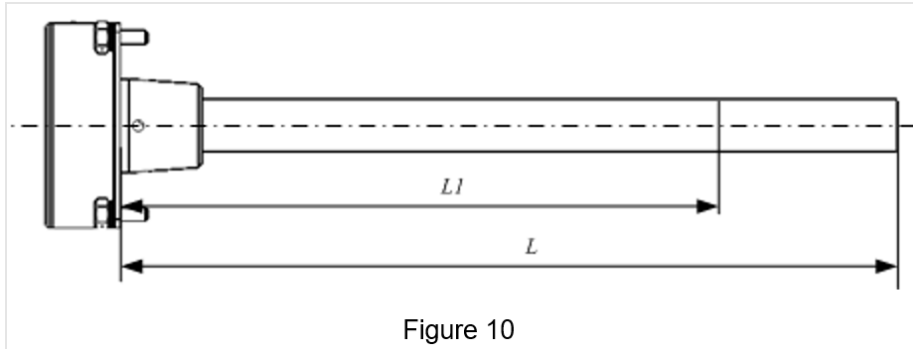


Figure 10

4) Cut the product at length $L1$ by a hack-saw so that the line of the cut is strictly perpendicular to the longitudinal axis of the product (Figure 10).

5) Fill the 1/4 to 1/5 of the sealing cap with a sealant (supplied). Recommended sealants are listed in the Appendix J.

6) Put the plastic isolating cap included into the product delivery set on the central rod of the product.

Note: When using the sensor without cutting, it is necessary to take off the rubber transportation cap and put on the plastic isolating cap using sealant.

Setting the Product with Omnicomm Configurator

Connect the Product to the PC following the connection diagram (see Appendix E), using the REUSABLE TOOL-UNU (Figure 11) or Omnicomm UNU-USB (Figure 12).

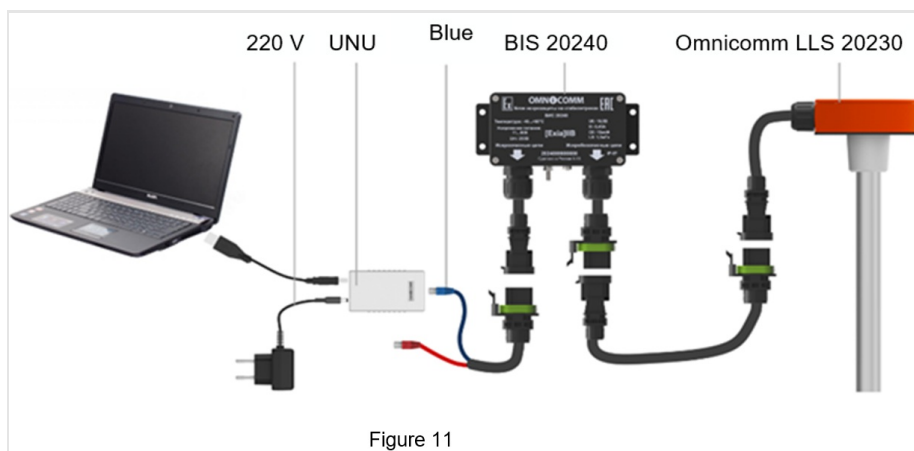


Figure 11

Abbreviations and Symbols

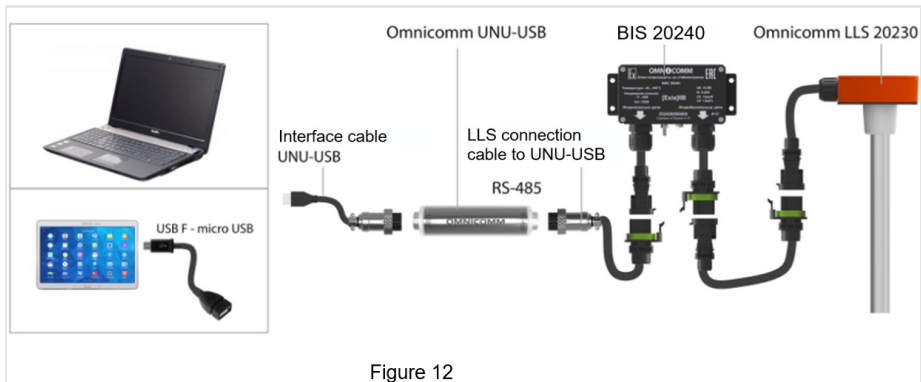


Figure 12

Run Omnicomm Configurator. In the window (Figure 13) select equipment — “Sensor”.



Figure 13

If the message “Equipment not found” is displayed in the main window, try changing connection configuration or operation mode.

Empty/Full Calibration

Perform calibration with fuel which the fuel level sensor will operate in.

- 1) Pour fuel into the measuring container
- 2) Immerse the sensor in fuel, to the full length of the measuring probe
- 3) Wait for the green indicator “Stable” to appear. Press “Full” to set the value corresponding to a full tank
- 4) Take the sensor out of the container and wait while fuel will be flowing off the measuring probe for 1 minute. Press “Empty” to set the value corresponding to an empty tank
- 5) Press “Save”

Configuring General Settings

Installation and Deinstallation

“Settings” tab, “Configurable Parameters” section:

“**Network address**” (1 to 254) – set the sensor network address. If several sensors are connected to one external device, each of them should have unique network addresses.

“**Max. level (1...4095)**” — select the maximum sensor reading. Default value – 4,095.

“**Min. level (0...1023)**” — select the minimum sensor reading. Default value – 0.

“**Filtration**” – set the output signal filtration parameters:

- “No” – no filtration. Used for filtration by an external device.
- “Minimum” filtration is used when the device is installed in stationary fuel storages and non-mobile machinery
- “Average” filtration is used when the vehicle operates under normal road conditions
- “Maximum” filtration is used when the vehicle operates under harsh road conditions

“**Automatic data output**” – select:

- “No output” – no data output without request
- “Binary” – autonomous binary data output
- “Character” – autonomous character data output
- “Data output interval” (1 to 255 seconds) – set the autonomous data output interval

“**Heavy exploitation conditions**” mode – switch on to enable additional measurement filtration that considers harsh conditions

“**Baud rate**” – select data exchange rate when communicating with an external device. Default value – 19200 bit/s.

Installation and Deinstallation

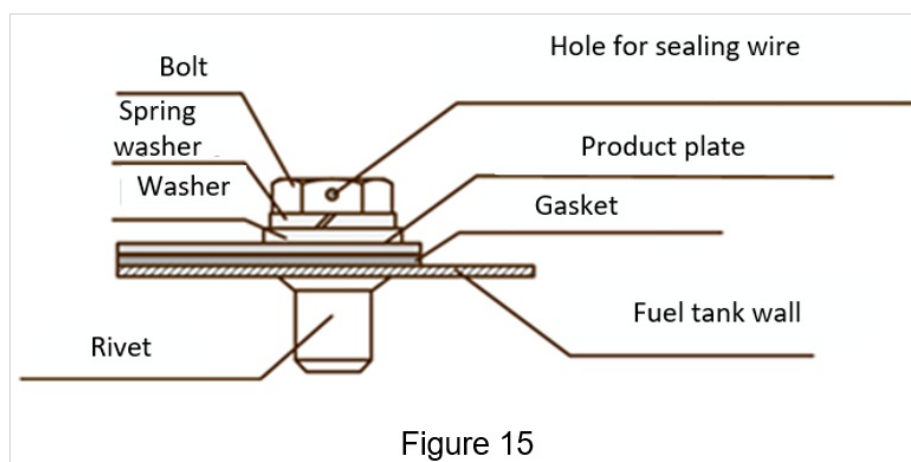
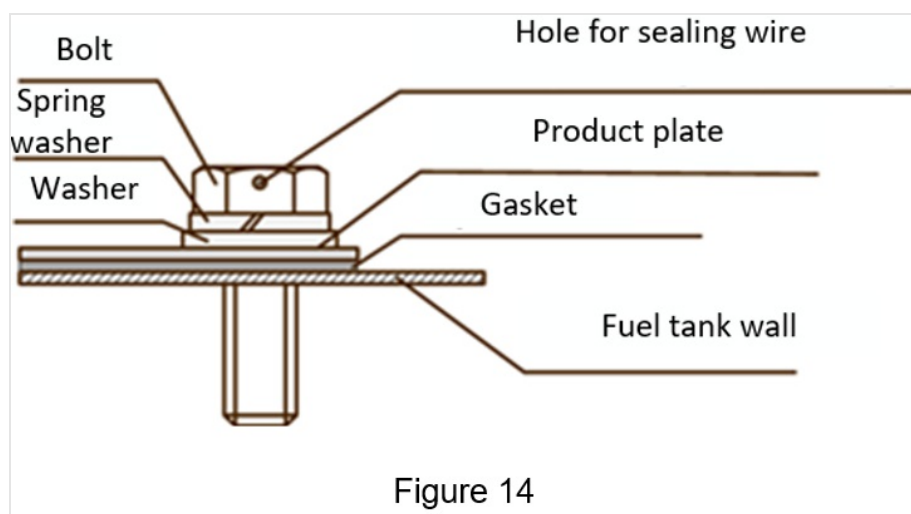
To make the works go smooth, it is recommended to perform product setting prior to installation works (see Paragraph 5).

Product Installation

Installation and Deinstallation

For tanks which shape corresponds with the figure (Figure 2), installation should be carried out in accordance with Appendix E.

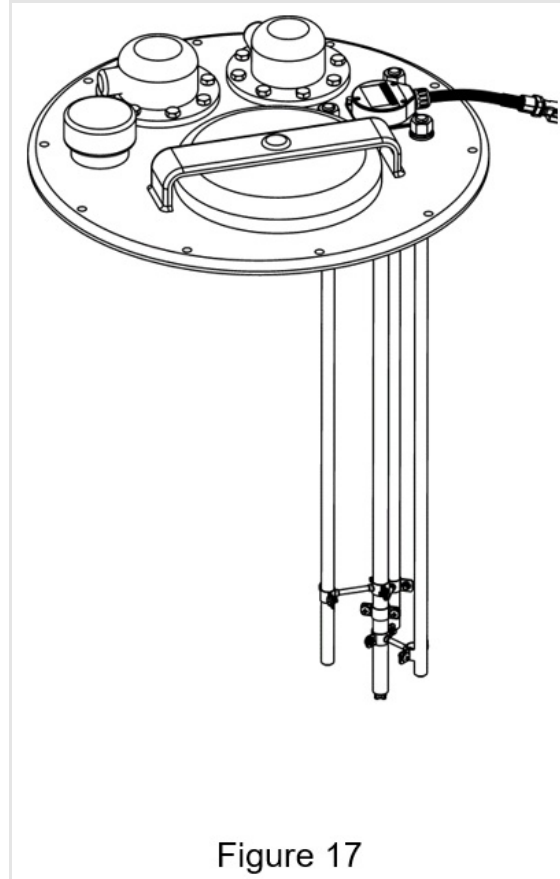
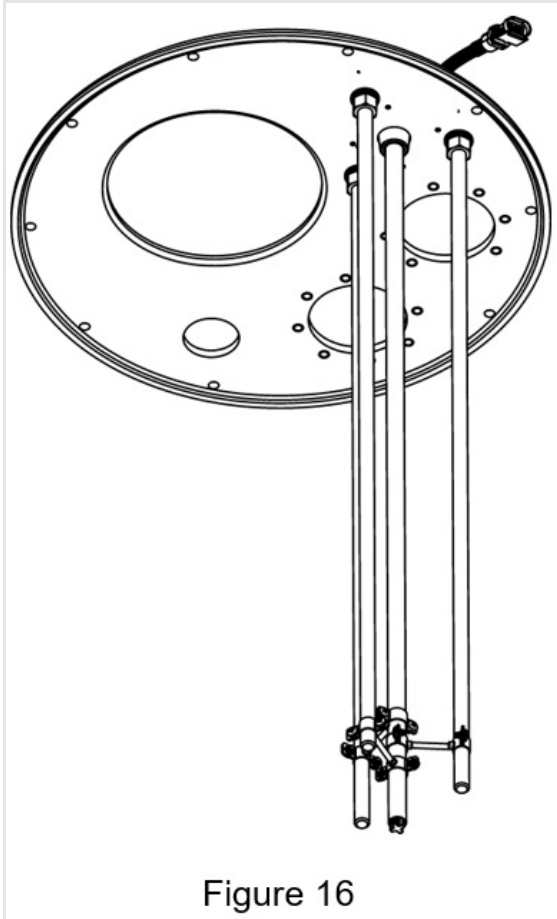
- 1) Put the gasket included into the product delivery set on the measuring part of the product (Figure 24).
- 2) Install the product into the tank.
- 3) Fix the product to the tank by bolts, having preliminary installed the washer and the spring washer as shown in the figures (Figure 14, Figure 15). The bolts should be tightened by a spanner.



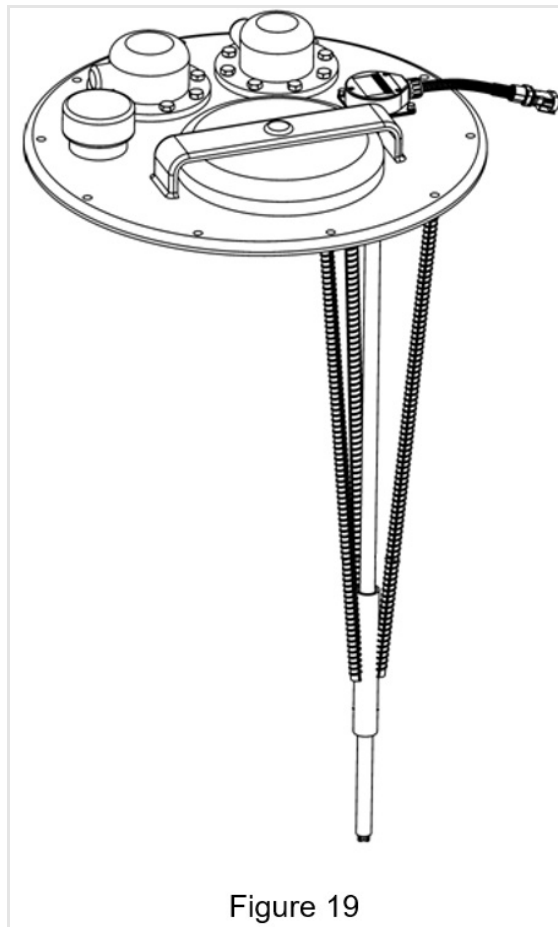
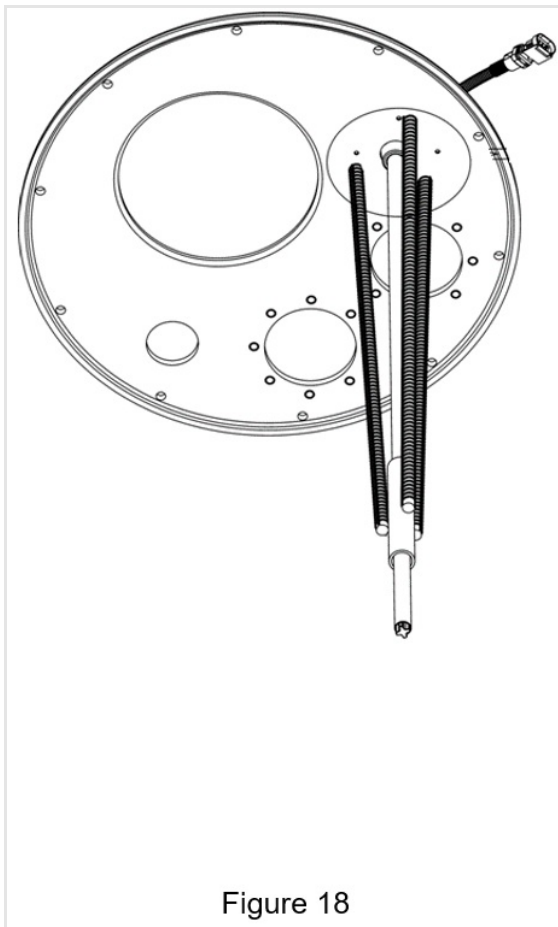
- 4) When the product is installed on plastic tanks with wall thickness over 3mm, the product must be fixed by a self-tapper included into the delivery set. Self-tapper tightening strength should be such that the rubber washers put on the self-tapping screws are not crumpled or burst.
- 5) When installing the Product with the measuring part length over 1.5 m into fuel tanks of special vehicles (e.g. petrol tankers, diesel locomotives it is necessary to

Installation and Deinstallation

ensure that there are no fuel wave shocks during sharp acceleration and breaking operation of the vehicle. For this purpose, it is recommended to install the products near wave suppressing partitions, or the measuring part of the LLS fuel level sensor should be reinforced in one of the following ways: with steel pins (Figure 16, Figure 17); collars or steel rods (Figure 18, Figure 19), or installed onto the flange.



Installing BIS 20240 (for LLS 20230)



IMPORTANT! Strengthening the measuring part of the LLS fuel level sensors is only allowed for removable filler caps. Refer to the Appendices K, L for the detailed description of methods for strengthening the measuring part of the LLS fuel level sensors.

Installing BIS 20240 (for LLS 20230)

1) Fix BIS 20240 on selected surface by self-tapping screws or bolts according to installation dimensions (Figure 35, Appendix F). 2) Make an electric connection of BIS 20240 to the vehicle body or to the Ground bus terminal (with earthed element of stationary fuel storage structure) with a copper wire with the cross-section of at least 4 mm².

The electrical resistance of the conductor between the body of BIS 20240 and the body of the vehicle or Ground bus terminal should not exceed 0.1 Ohm.

Connection

Connection

The Products must be connected to an external device as per the connection diagrams (see Appendix G).

Two LLS 20230 fuel level sensors can be connected to one BIS 20240 spark protection unit with the KTZ splitter and two KTZ cables (Figure 41), provided that BIS 20240 voltage is at least 12 V (when connecting BIS 20240 to the on-board power supply, FTC AVL unit, or third-party AVL unit).

When connecting the BIS 20240 spark protection unit to the battery, the BR15 galvanic insulation unit (Figure 42) must be used.

Requirements for Cable Laying

1) For installation, use the cables produced by Omnicomm - either those included into the delivery set or those purchased separately. 2) For connection of the LLS 20230 fuel level sensor and the BIS 20240 spark protection unit on Zener diodes, use only KTZ-xx cable (xx stands for the cable length determined at the time of purchase request).

Use of self-made cables or KTZ cable cutting or extension is FORBIDDEN.

3) To connect the BIS 20240 spark protection unit on Zener diodes to an external device, use a crinkled cable produced by Omnicomm (to be purchased separately). If needed, the cable connecting with the external device can be either extended or cut.

4) Ensure that cable laying routes are free of heated parts and units of the vehicle to avoid cable insulation fusing.

5) To prevent cable damage, the cable should be routed in a pipe or duct.

Connection



Figure 20

- 6) Ensure that cable laying routes are free of heated parts and units of the vehicle to avoid cable insulation fusing.
- 7) The purposes of connector pin-outs and cable wire colors are illustrated below (Figure 21).

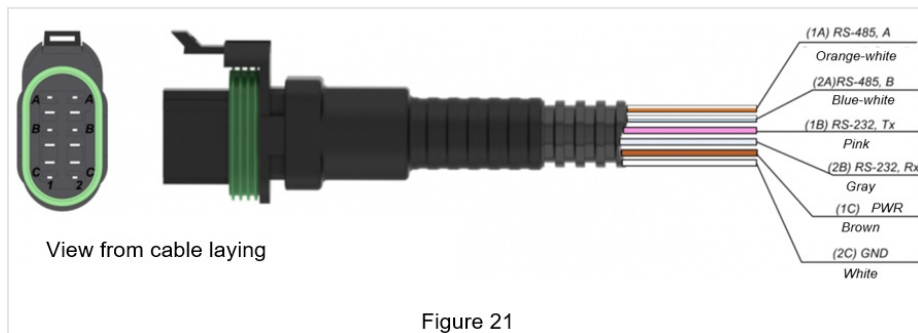


Figure 21

GND supply circuit (white wire) of BIS 20240 must be connected to the vehicle body only.

Installing the Fuse

- 1) The fuse is intended to protect on-board network of the vehicle against short circuit caused by a breakdown in product wiring.
- 2) Connect the fuse holder to the feeding cable of the product in the immediate vicinity of the power circuit of the vehicle.

Connection

- 3) Install the fuse into the fuse holder.
- 4) When installing the LLS 20230 fuel level sensor with BIS 20240, the fuse is installed in the power circuit of BIS 20240.

Calibrating Fuel Tank

Fuel tank calibration is required to ensure that numeric code produced by the product corresponds with the fuel volume in a given fuel tank.

Fuel tank calibration is the process of filling the empty tank with fuel until the tank is full with certain step of filling, and recording product readings in a calibration table.

The tank may be calibrated by draining.

Calibration of the tank with one Omnicomm LLS sensor: 1. Empty the fuel tank

2. Connect the Omnicomm LLS fuel level sensor to a PC or tablet PC with a UNU device or UNU-USB, as illustrated in Figures (Figure 11, Figure 12)

3. Run Omnicomm Configurator on a PC or tablet PC Select "Tank Calibration" operating mode

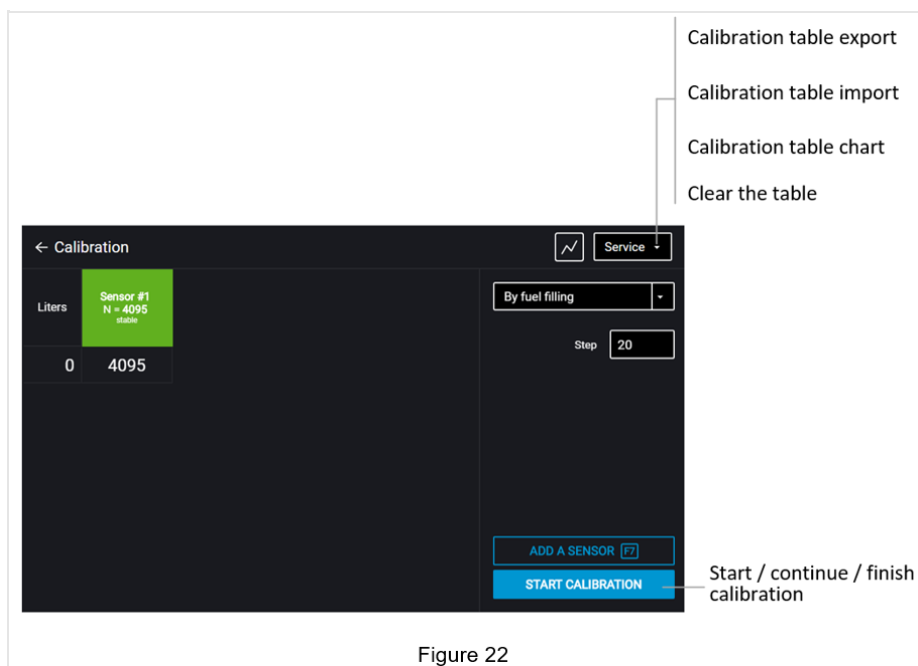


Figure 22

If the sensor reading column is not displayed, press "Add Sensor". Select Omnicomm LLS sensor type. Enter the sensor network address that was set during configuration.

4. Set the flow interval in liters If the fuel tank geometry is non-linear and/or has widenings or narrowings, for better accuracy, it is recommended to follow the lower calibration step by using lower-dosage (higher-resolution) measuring containers.

5. Press "Start/Continue Calibration"

Connection

6. Fill in the fuel volume equal to the flow interval Fill 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 a Row" The filling volume equal to the predefined flow interval will be displayed in the "Liters" column. The value equal to the filling volume will be displayed in the "Sensor" column.

8. Press "Add a Row"

9. Repeat steps 7, 8, and 9 pursuant to the number of control points. The minimum recommended number of control points is 20.

10. Press "Finish the Calibration"

11. Save the calibration table to a calibration file (.ctb)/ an Omnicomm Online file (.xml)/ to the Terminal/ or to the Indicator, by pressing "Service" - "Export" or F2 button at the keyboard.

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

Calibration of a tank with several Omnicomm LLS 20230 sensors will be similar to calibrating a tank with one sensor. Before you start the calibration, add the required number of Omnicomm LLS sensors and enter their network addresses. All sensors are calibrated at one time. Use a KTZ splitter to connect multiple Omnicomm LLS sensors to a PC.

Commissioning of Installed and Connected Equipment

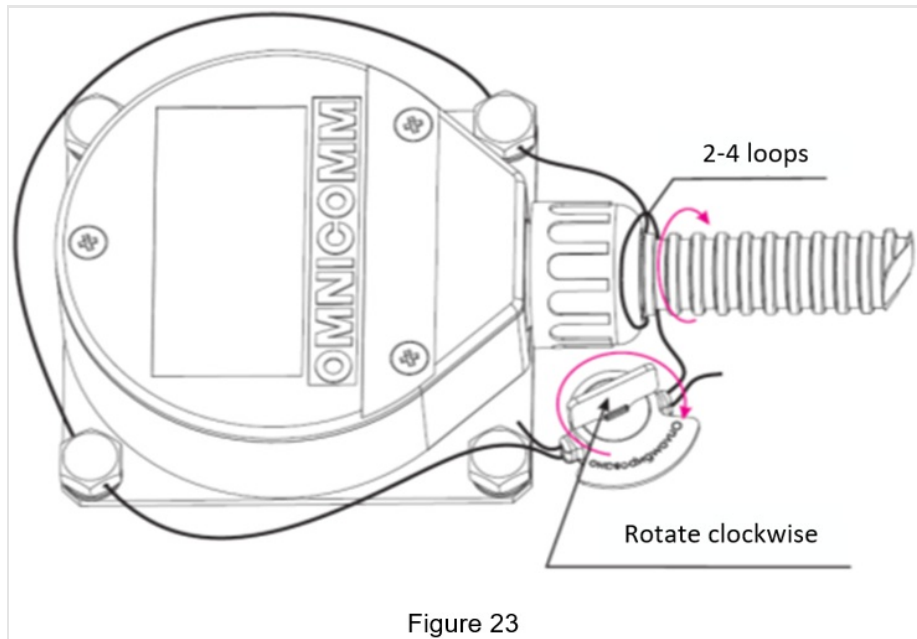
Sealing

Installing a Protective Sealing on the Product

Installation of the seal is intended only for the products fixed with the help of bolts.

- 1) Overlap the holes of the inner ratchet with external holes of the seal.
- 2) Pass the sealing wire through the holes in two bolts, wrap the wire around the metal hose as it is shown in the figure (Figure 23), and pass the ends of the wire through the holes of the seal.
- 3) Spin the wire by rotating the handle of the ratchet clockwise to achieve complete tension.
- 4) Break off the ratchet handle.

Connection



For Omnicomm LLS 20230 sensors the bolt or self-tapping screw may be sealed:

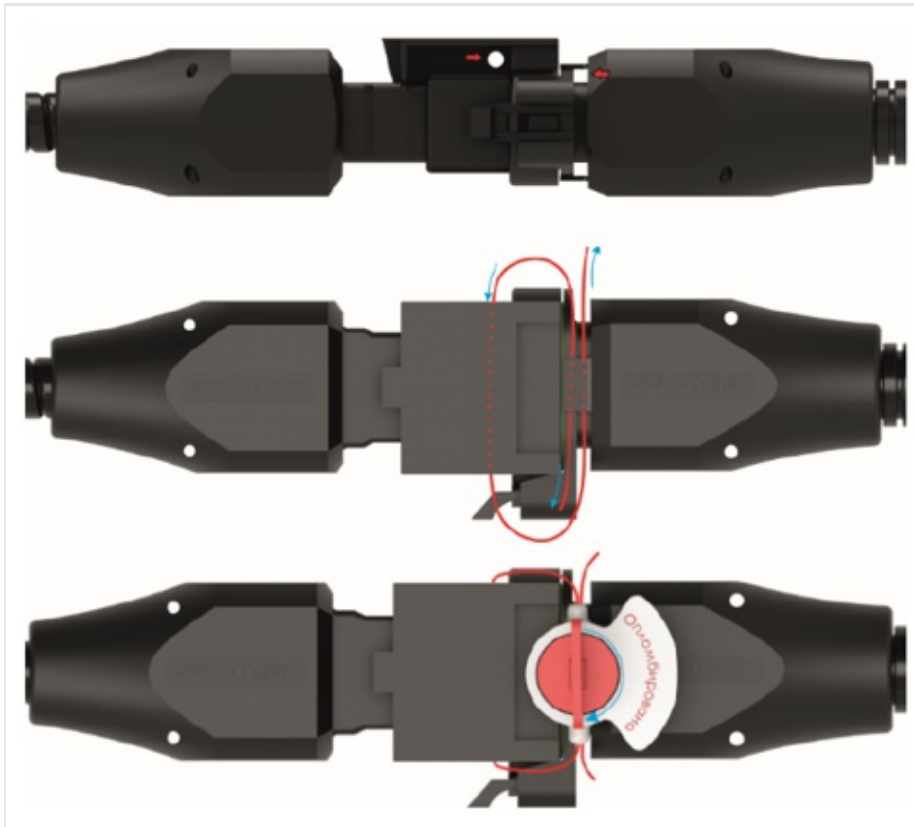


1. Install the bolt or self-tapping screw through a hole in the seal
2. Close the seal cover with a snap
3. Add the seal and cover numbers to the report

Installing Protective Sealings on Connectors

1. Put the sealing wire through the holes in the connectors and in the rotary seal
2. Twist the seal tab to tighten the wire
3. Tear the seal tab off

Connection



List of Commissioning Documents and Document Processing Procedure

1) Once the product is sealed, an Installation Certificate is produced. The Certificate should contain the following information:

- customer company name (company that requested installation);
- contractor company name (company that performed installation);
- installation date;
- list of performed works;
- vehicle make;
- state number of the vehicle;
- installation object failures;
- serial number of the product(s);
- seal numbers;
- full names of the installing and accepting parties.

Connection

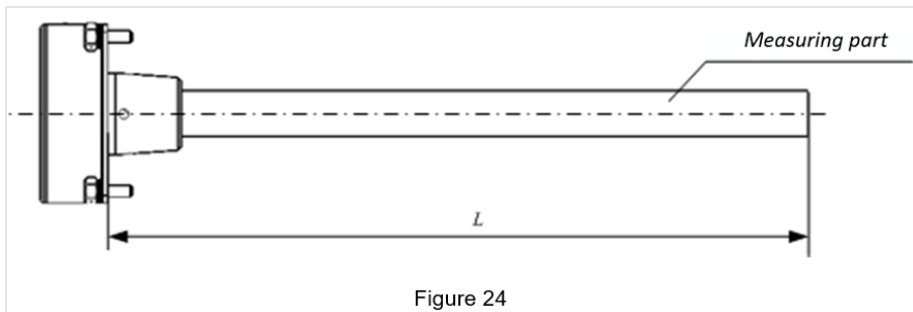
Appendix A. Terms and Definitions

Working length of the product – length L shown in the figure (Figure 24).

Scale – virtual component of the product representing a ranked row of marks corresponding to a sequential row of magnitudes of physical quantities along with associated numbering.

Product measurement range (M) – number of product measurement intervals belonging to the range from 0 to 4095. $M = L/d$, where L – working length of the product (mm), d – scale factor (mm).

Offset (OFFSET) – offset of the reference point of the measurement range. $OFFSET = (l/d)$, l – offset value (mm), d – scale factor (mm).



Connection

Appendix B. Required Equipment and Tools

Table 1:

No.	Name	Quantity	IM Section	Note
Tools:				
1	Bimetal crown $\varnothing 35$ mm	1 pce	3.4	
2	Shank for the crown	1 pce	3.4	
3	Metal drill $\varnothing 7$ mm or $\varnothing 4$ mm	1 pce	3.4	$\varnothing 7$ mm for rivets, $\varnothing 4$ mm for bolts
4	Measuring bar	1 pce	3.5	The length not less than the length of the tank
5	Hacksaw	1 pce	3.5	
6	Wrench (8 mm)	1 pce	3.5	
7	Riveter	1 pce	3.5	To install on rivets
8	Screw tap M5 with a holder	1 pce	3.5	To install on bolts
Accessories:				
9	Protective seal	2 pcs	7.1	+1 item for BIS 20240
10	Sealing wire $\varnothing 0.7$ mm	under 0.8 m	7.1	

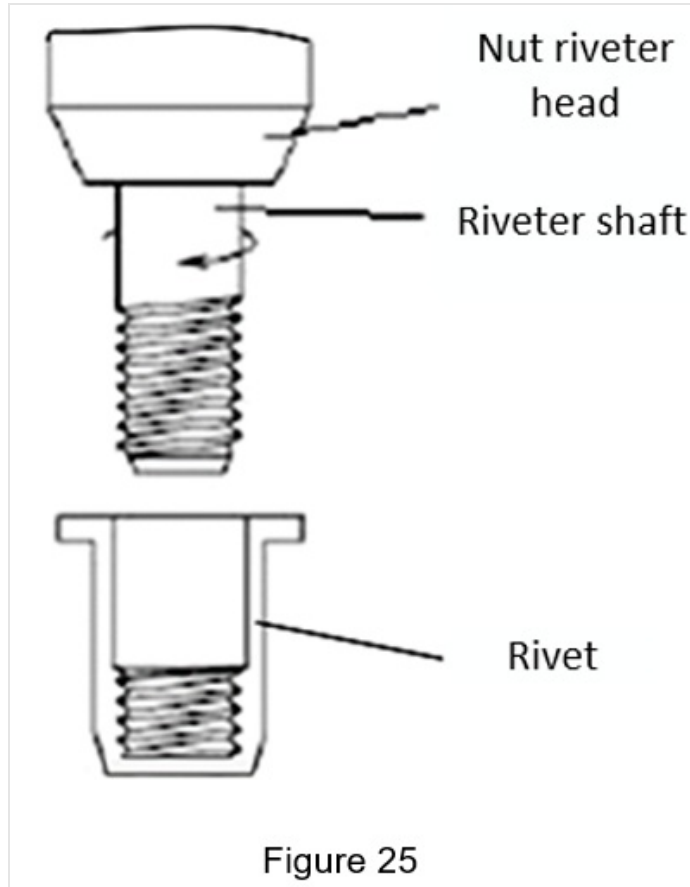
Connection

No.	Name	Quantity	IM Section	Note
Tools:				
11	IBM Personal Computer, compatible with OS Windows XP	1 pce	3.6	
12	Omnicom Configurator	1 pce	3.6	Produced by Omnicomm
13	UNU device (with a wire set)	1 pce	3.6	Produced by Omnicomm
14	UNU USB device	1 pce	3.6	Produced by Omnicomm
15	DC power supply unit (10–15) V, 0.5 A	1 pce	3.6	Supplied together with UNU
16	Measuring container	1 pce	3.6	height \geq L1
17	Fuel	1 pce	3.6, 6	
18	Calibration container	1 pce	6	See section 6 for recommended volume
19	Silicone hermetic for external works	100 g	Appendix E	To install on circular tanks

Connection

Appendix C. Installing Nut-Type Rivets

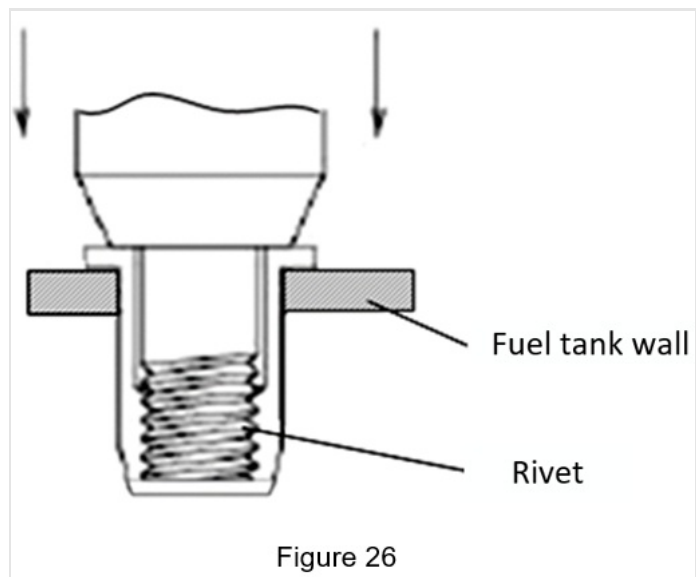
Screw the rivet on the shaft of the nut riveter (Figure 25). The rivet should be screwed to the full depth.



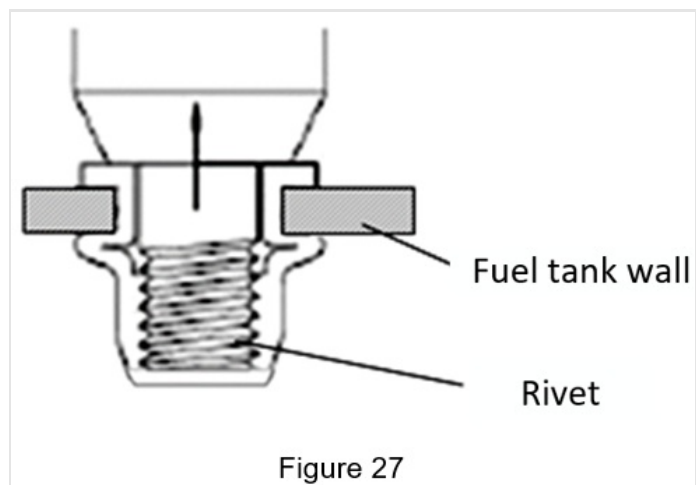
Install the rivet in the hole (Figure 26), so that it is strictly perpendicular to the plate of the sensor and the wall of the tank and any skewing is avoided.

Make sure there is no gap between the plate of the fuel level sensor LLS and the rivet.

Connection



Unscrew the nut riveter shaft out of the rivet (Figure 27).



Unscrew the riveter pin from them rivet (Figure 28).

Connection

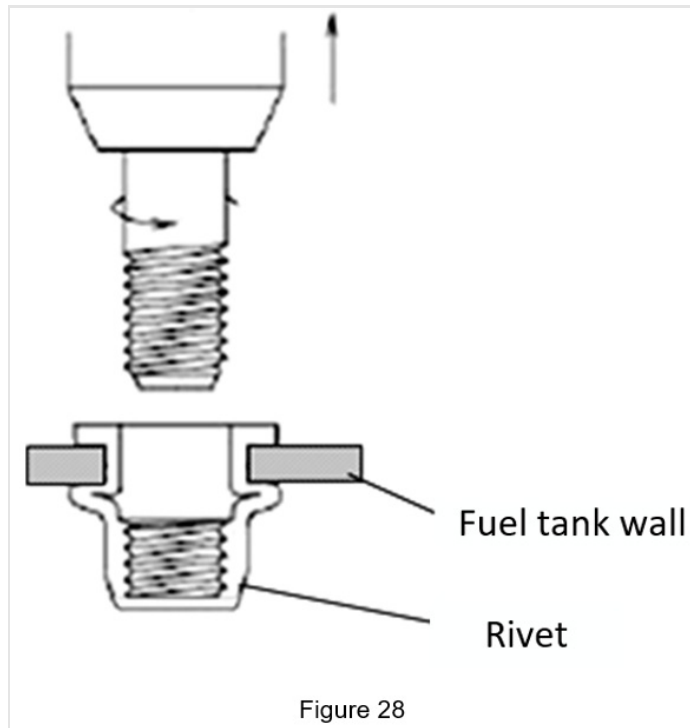
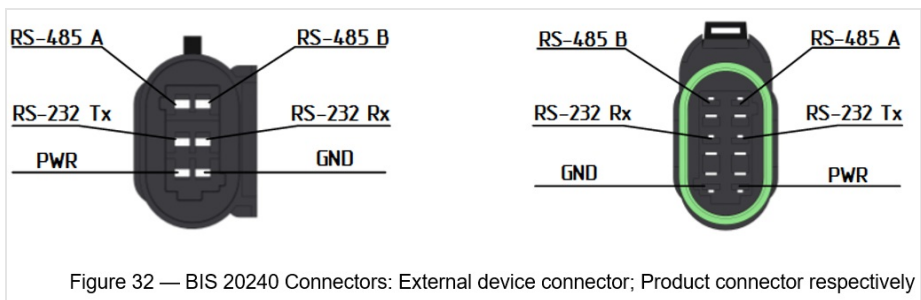
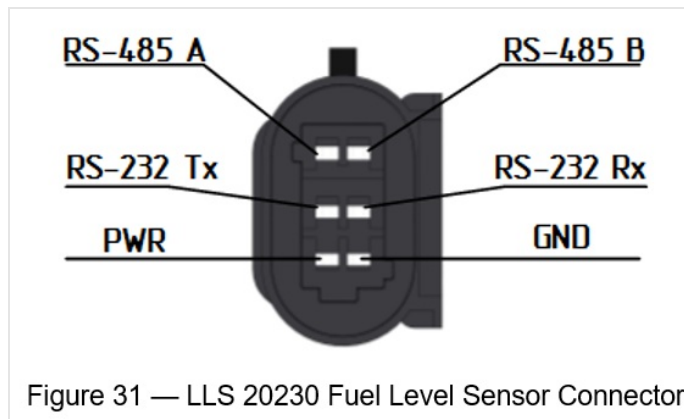
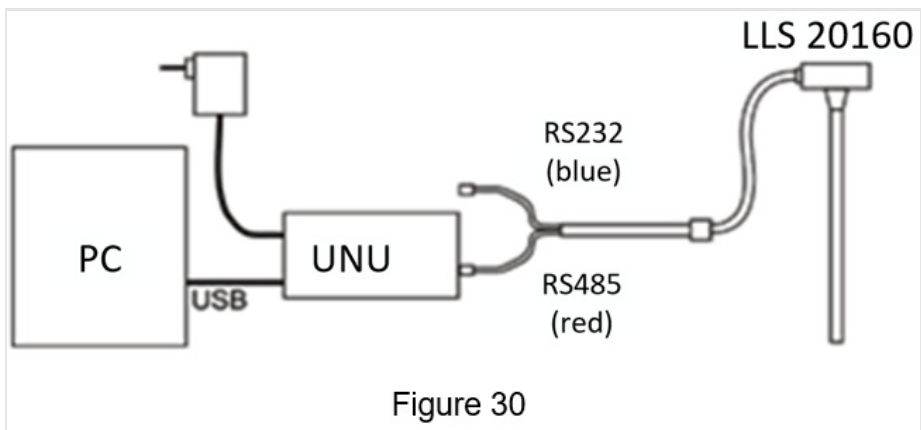
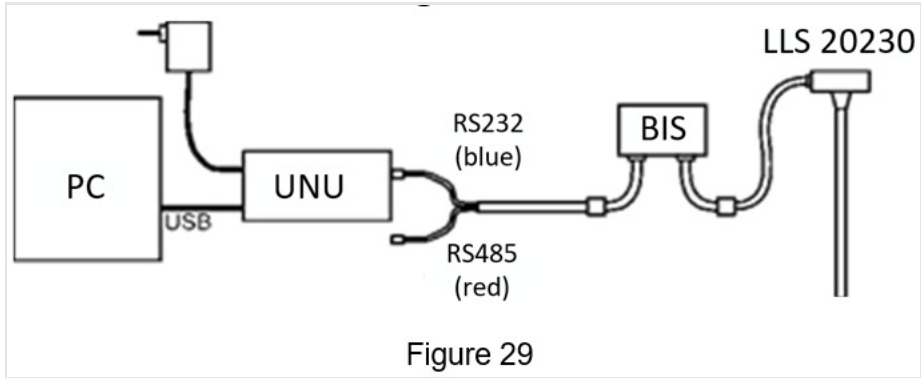


Figure 28

Checks rivet installation quality. To do so, take the bolt included into the installation elements kit and exercise a test bolt driving. If the bolt is tight to drive or cannot be driven to the maximal depth, it is necessary to drill the rivet out and install a new one.

Connection

Appendix D. Connecting the Product to a PC



Connection

Appendix E. Procedure for Circular Tank Preparation for Product Installation and Installation Process

Mark the holes for mounting the product taking into account the tank curvature. Place the bolt into the hole for product mounting so that the bolt is perpendicular to the surface of the tank (Figure 33).

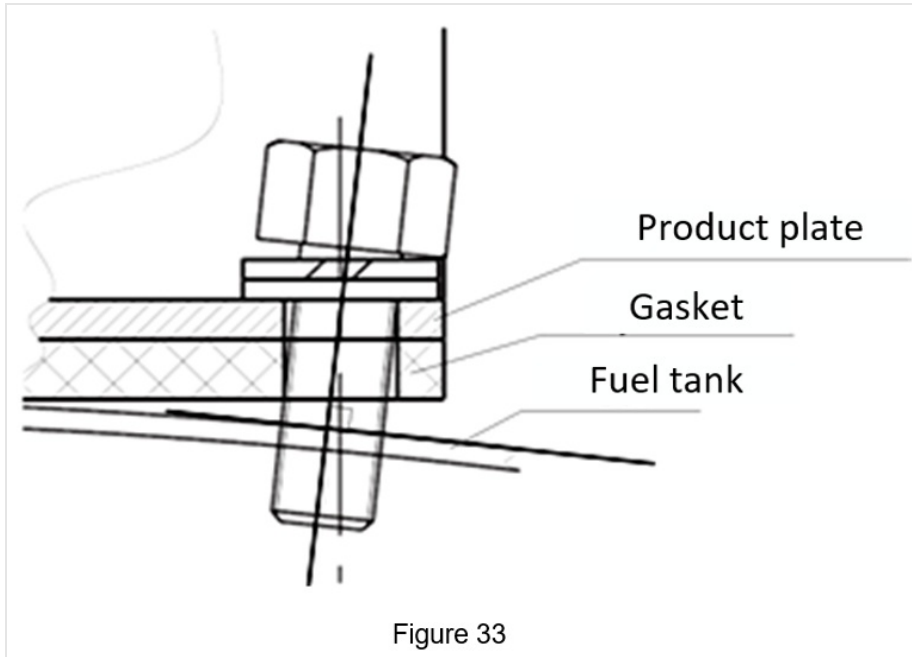


Figure 33

Drill holes in accordance with the selected type of the tank and method of fixing the product to the tank.

Apply a thin layer of sealant between the plate of the product body and the rubber gasket. Put the gasket on the product. Apply hermetic to the prepared tank as shown in the Figure (Figure 34). The thickness of sealant layer should be at least 5mm.

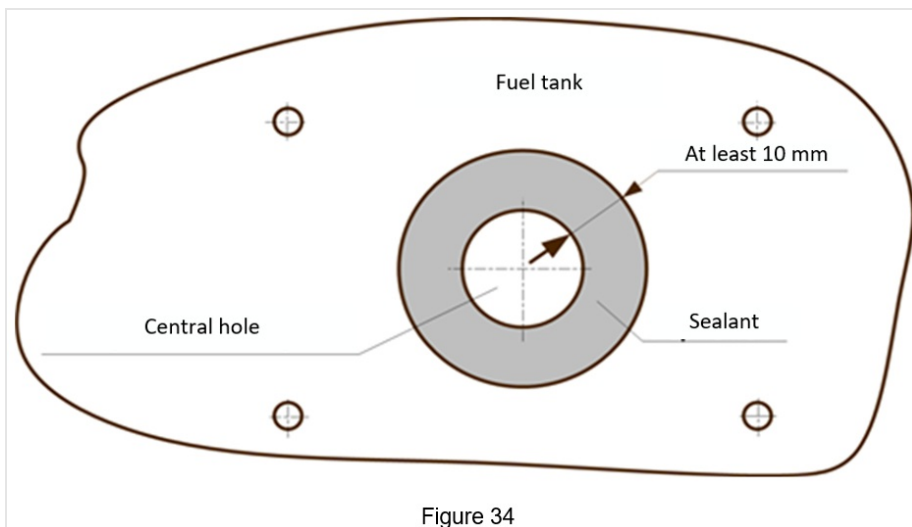


Figure 34

Perform installation in accordance with selected fixation method (see Section 4).

Connection

Visually check the leak tightness of the connection. If there are gaps between the gasket and the tank, fill them out with Sealant.

Connection

Appendix F. BIS 20240 Installation Dimensions

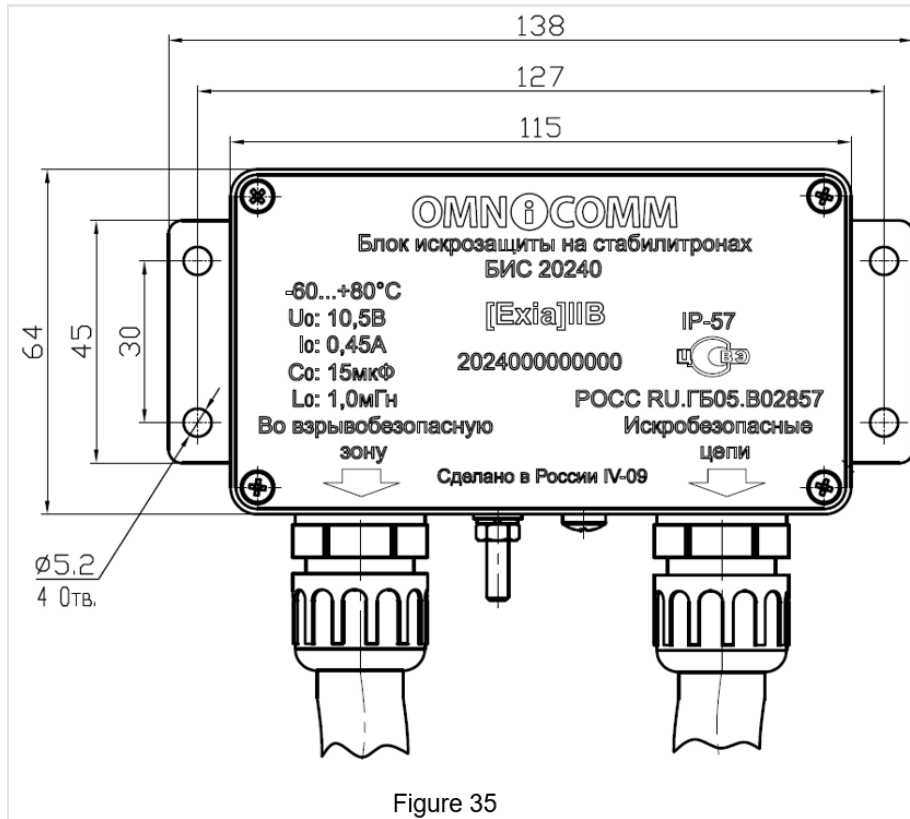


Figure 35

Connection

Appendix G. Diagram of Product(s) Connection with an External Device

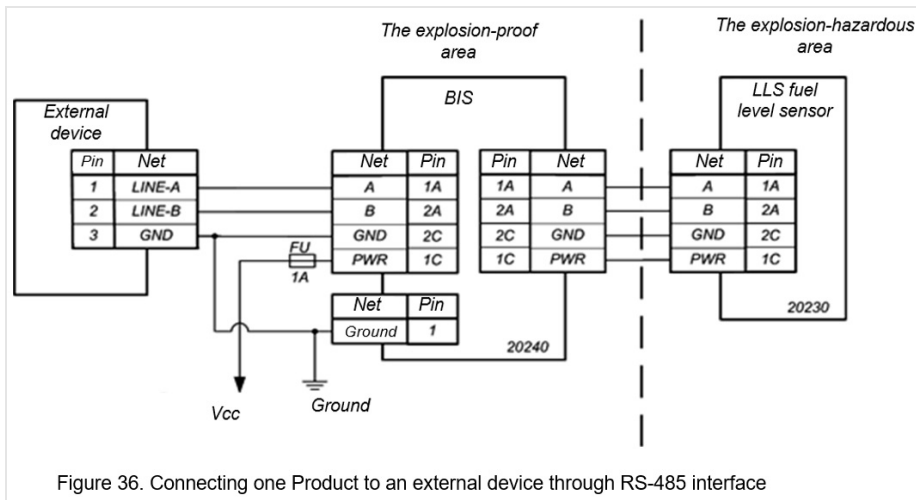


Figure 36. Connecting one Product to an external device through RS-485 interface

The GND power supply circuit (white wire) of BIS 20240 should be connected to the vehicle's body or to the battery, using the BR15 galvanic isolation unit.

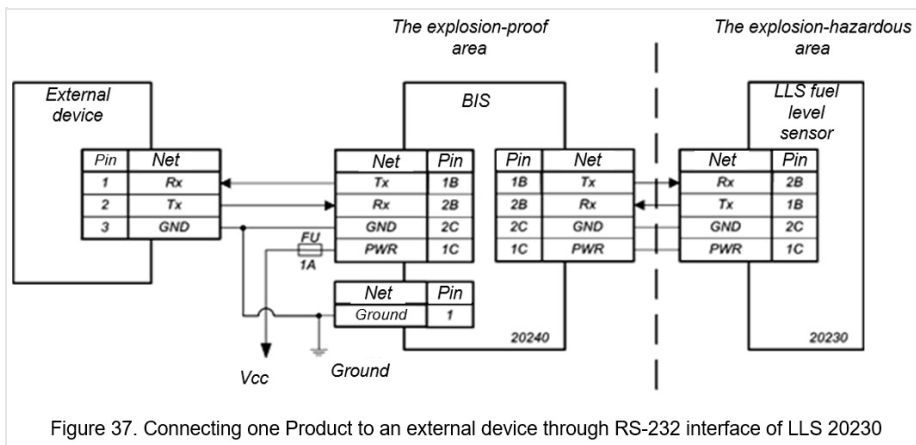
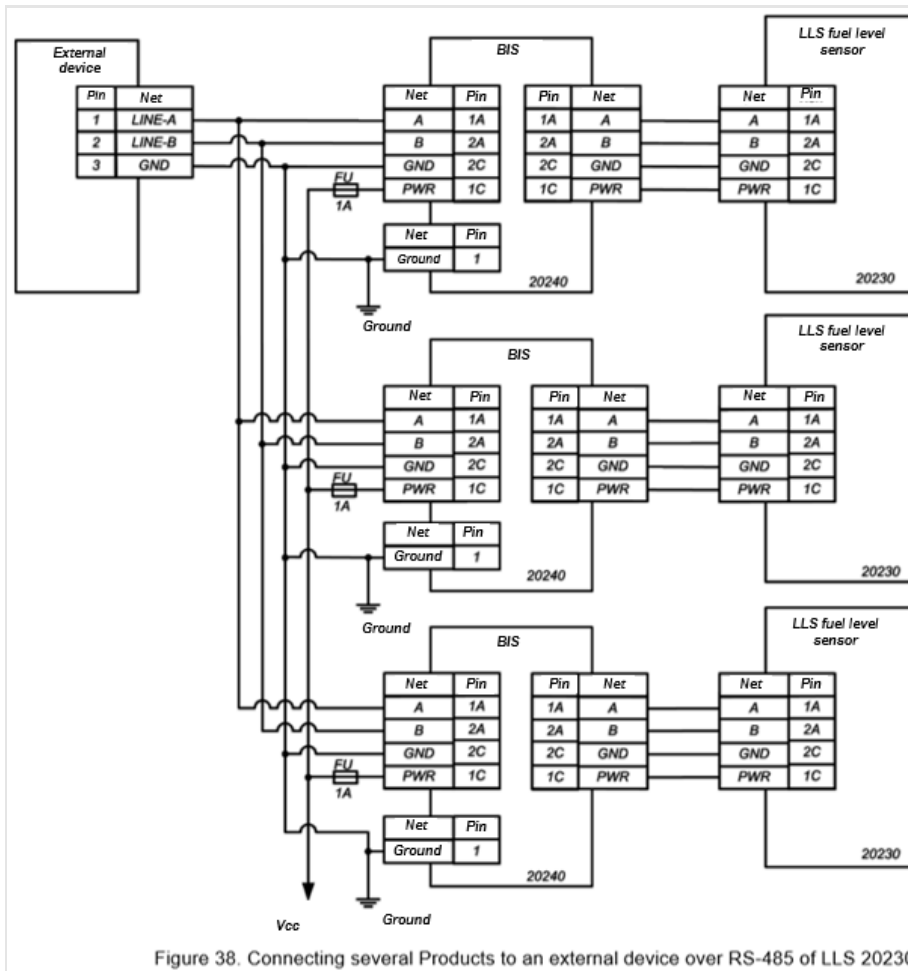


Figure 37. Connecting one Product to an external device through RS-232 interface of LLS 20230

The GND power supply circuit (white wire) of BIS 20240 should be connected to the vehicle's body or to the battery, using the BR15 galvanic isolation unit.

Connection



The GND power supply circuit (white wire) of BIS 20240 should be connected to the vehicle's body or to the battery, using the BR15 galvanic isolation unit.

Note. This connection diagram applies to connection of 2 to 4 Products to one external device.

Connection

Appendix I. Example of Setting Offset Values and Measurement Range

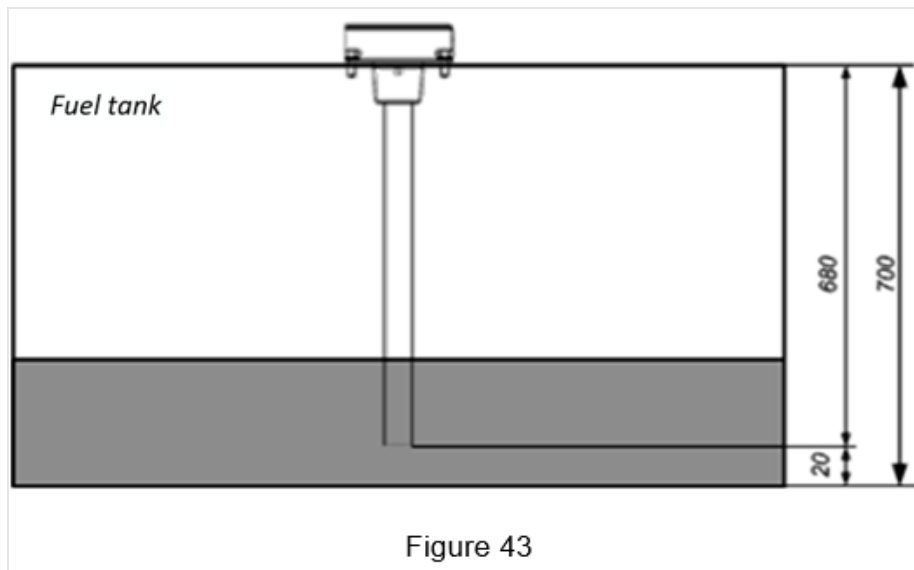
Initial data:

Fuel tank with the installed Product (Figure 43)

Fuel tank depth: 700 mm

Sensor working length: 680 mm

It is required to set the product in such a way that the fuel level is measured in millimeters with the scale factor of 0.5 mm.



Solution:

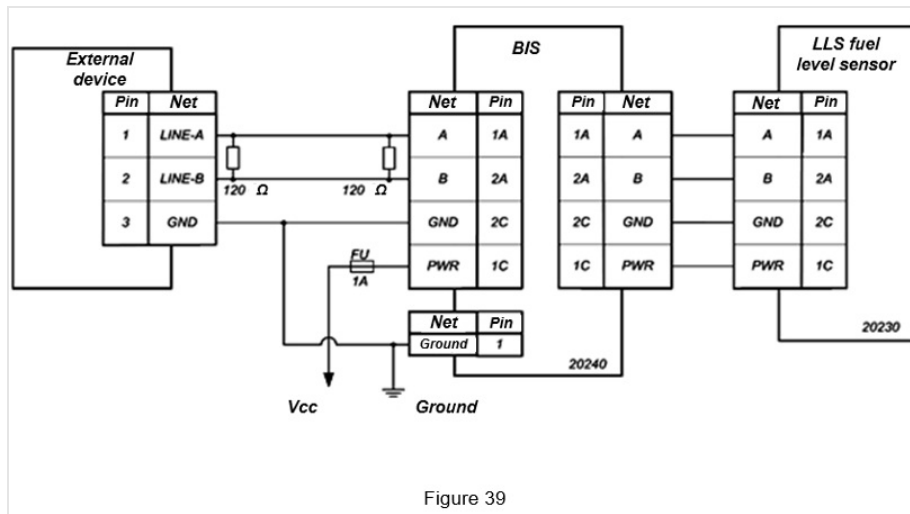
Set measurement range value: 1,360;

Offset value: 40.

Therefore, the level value is reduced to millimeters with the scale factor of 0.5mm.

Connection

Appendix H. Diagrams for Connection to Installed Terminating Resistors

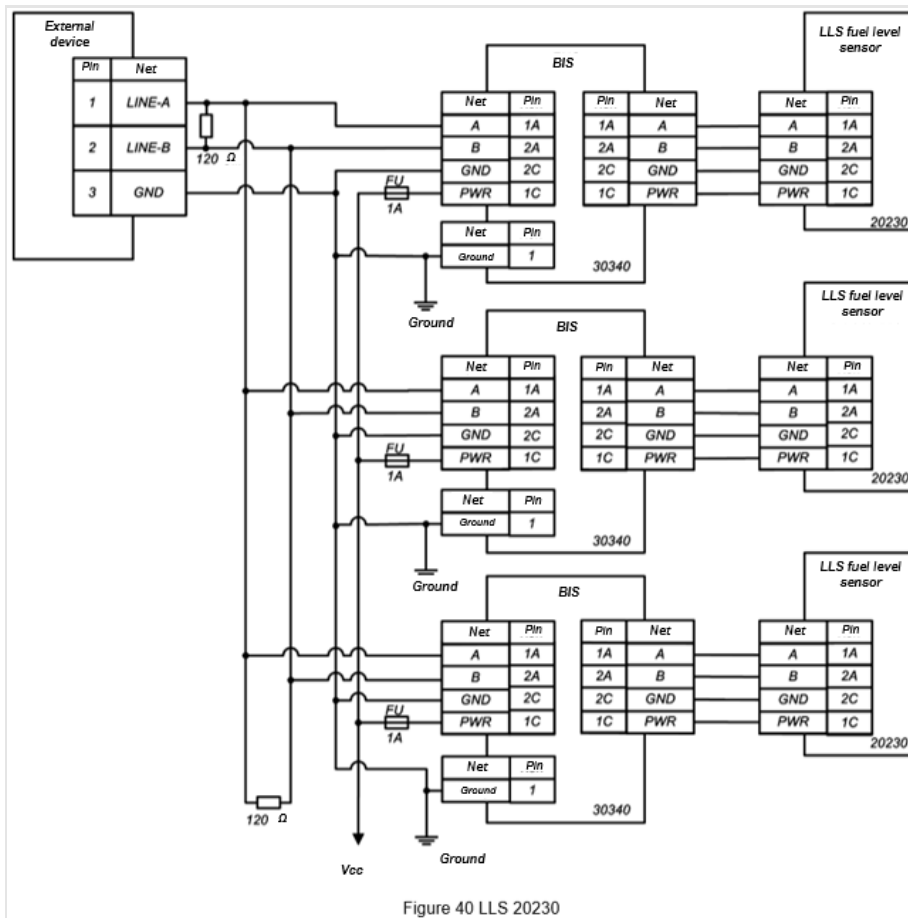


Note. Terminating resistors must be installed as close to external device/Product connectors as possible.

External device may include a terminating resistor. In such cases it is not required to install a terminating resistor from the external device side. Presence of a terminating resistor in the external device is determined on the basis of the external device documentation.

The GND power supply circuit (white wire) of BIS 20240 should be connected to the vehicle's body or to the battery, using the BR15 galvanic isolation unit.

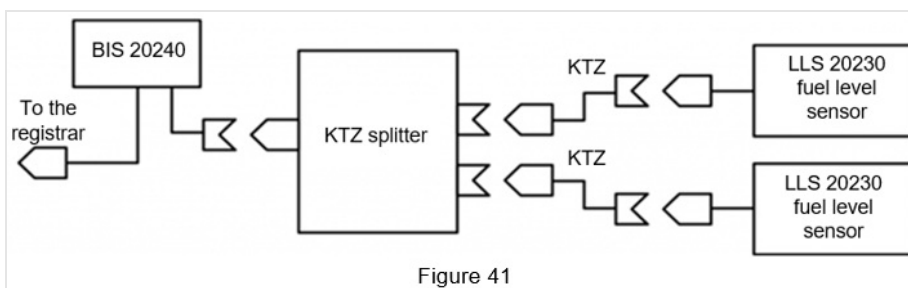
Connection



Note. The number of products connected to one external device in this diagram is from 2 to 31.

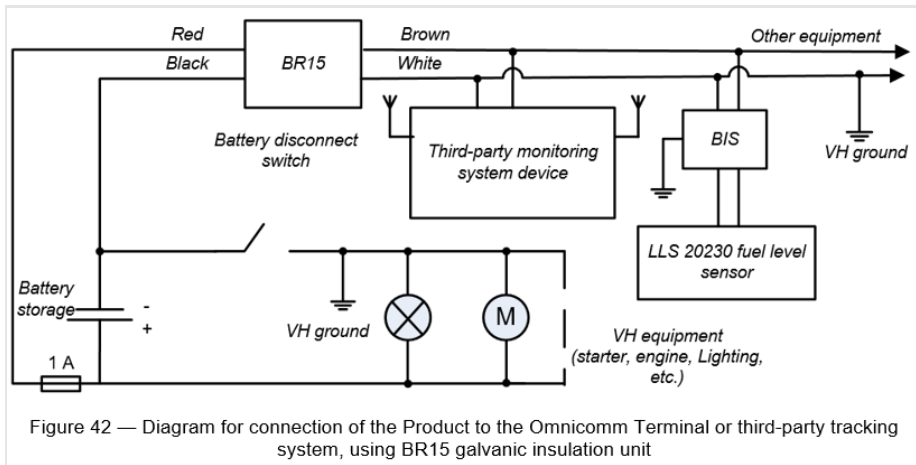
External device may include a terminating resistor. In such cases it is not required to install a terminating resistor from the external device side. Presence of a terminating resistor in the external device is determined on the basis of the external device documentation.

The GND power supply circuit (white wire) of BIS 20240 should be connected to the vehicle's body or to the battery, using the BR15 galvanic isolation unit.



Note. This connection diagram applies if BIS 20240 voltage is min 12 V.

Connection



Connection

Appendix J. Sealants Recommended for Installation of the LLS Fuel Level Sensors

The list of sealants is given in accordance with the operational recommendations.

- 1. PERMATEX™ MotoSeal® Black gasoline-proof sealant**
- 2. ABRO™ Black silicone sealant**
- 3. ABRO™ Red silicone sealant**
- 4. ABRO™ Blue silicone sealant**
- 5. PERMATEX™ MotoSeal® Red gasoline-proof sealant**
- 6. PENTELAST-1161 automobile sealant (red)**

Connection

Appendix K. Measuring Part Strengthening for LLS Fuel Level Sensors

IMPORTANT! Strengthening the measuring part of the LLS fuel level sensors is only allowed for removable filler caps.

Option 1. Strengthening the measuring part of LLS fuel level sensors using steel pins and collars.

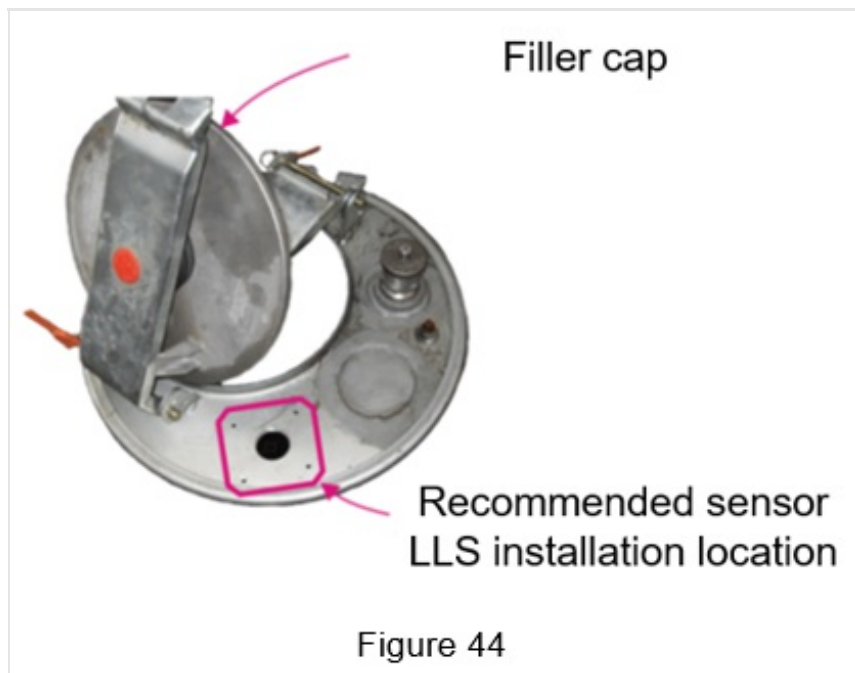
Materials used:

- 3 x M6 Ø16 female steel collars
- 3 x M6 Ø20 female steel collars
- DIN 975 M16 threaded pin – 3x2...3 m (depending on the size of the installed LLS fuel level sensor)
- DIN 975 M6 threaded pin (1 m)
- 6 x DIN 934 M16 nuts
- 6 x DIN 125 Ø17 flat washers
- 6 x DIN 127 Ø16.2 grovers (spring washers)
- Automobile sealant

It is forbidden to use plumbing collars with rubber seals that are not intended for use in aggressive environments.

Installation procedure: 1. Remove the filler cap. 2. Do 3.2, 3.4, 3.5, 3.6 with due regard to the recommended LLS fuel level sensor installation place on the filler cap (Figure 44).

Connection

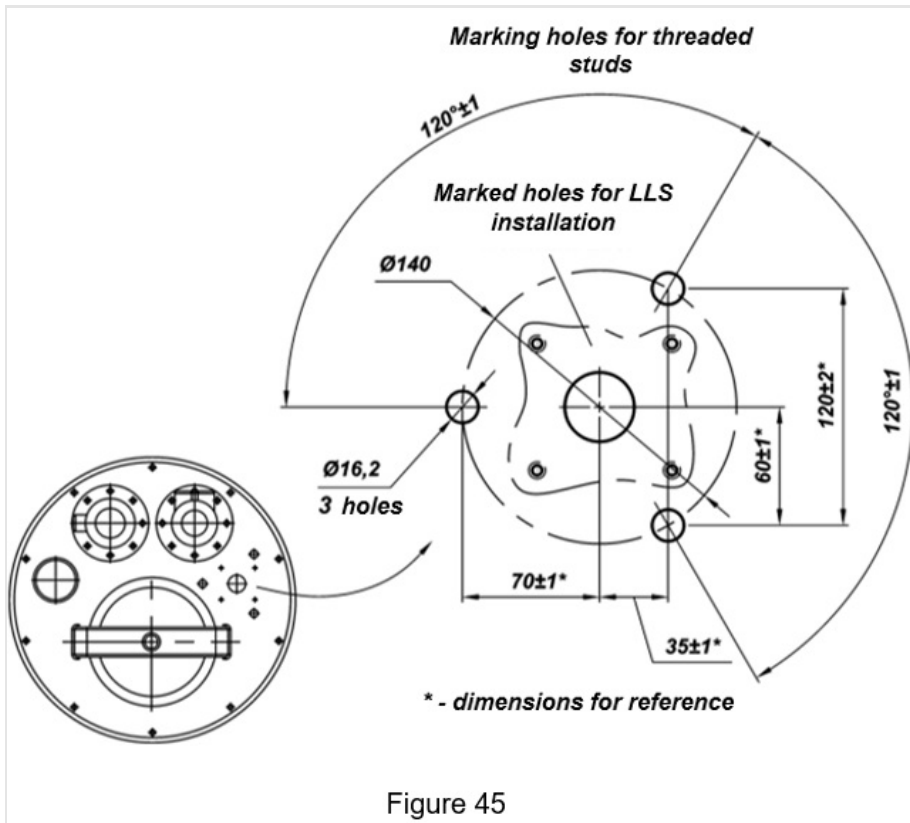


3. Drill holes for the DIN 975 threaded pins as illustrated in Figure (Figure 45). The dimensions provided are for reference only and depend on the specific design of the filler cap.

All types of work associated with making holes, cutting, welding, and soldering should be performed in a well-ventilated area, at a safe distance from combustibles and lubricants.

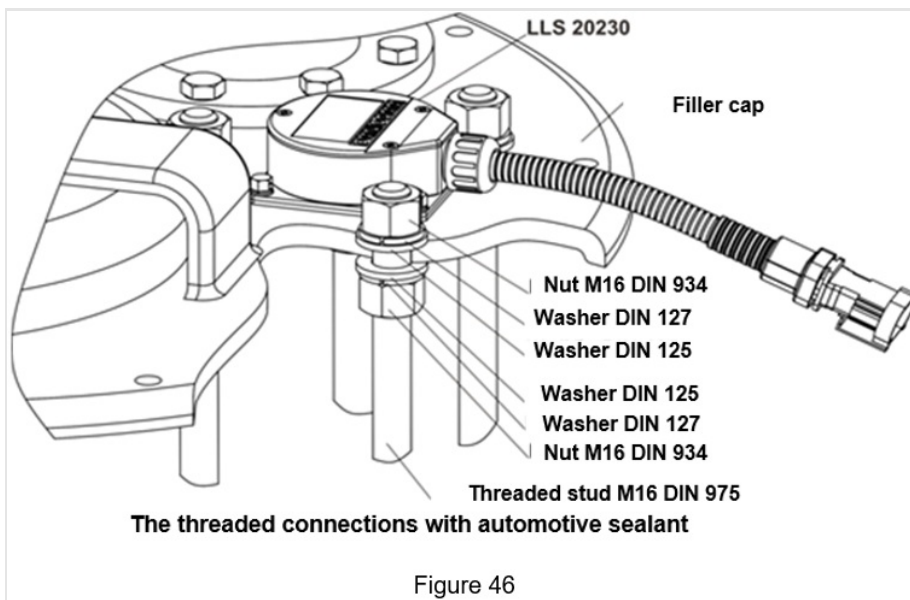
4. Cut the threaded pins to the desired length. Threaded pin length must be 20-40 mm shorter than the length of the LLS fuel level sensor.

Connection



5. Install and secure the LLS fuel level sensor on the filler cap, according to the Section. 4.1

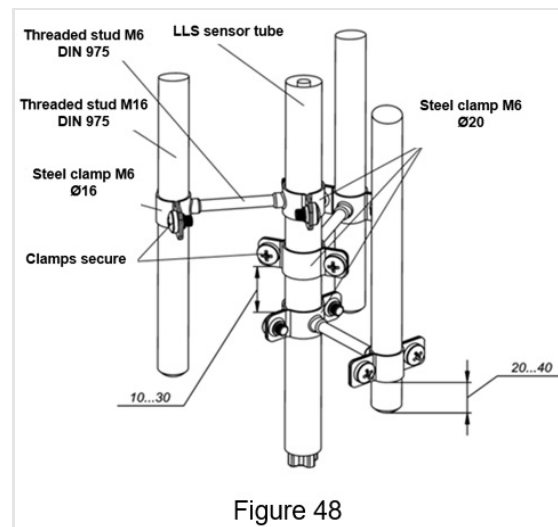
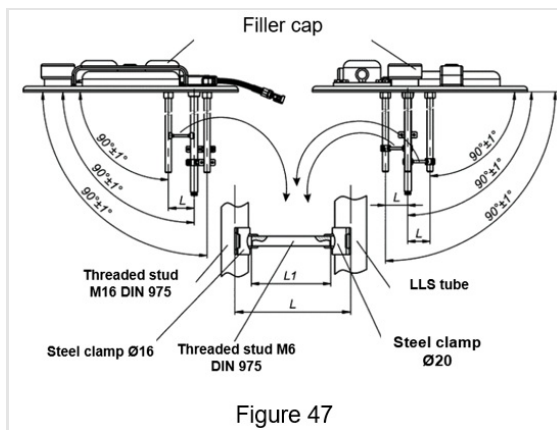
6. Install three threaded pins as illustrated in Figure (Figure 46).



7. Determine the length (L1) of the DIN 975 M6 threaded pin, as illustrated in Figure (Figure 47).

Connection

- Attach the threaded part of the $\varnothing 16$ collar to the $\varnothing 16$ threaded pin.
- Attach the threaded part of the $\varnothing 20$ collar to the measuring part of the LLS fuel level sensor.
- Determine the L1 length, by inserting any $\varnothing 3 \dots 4$ stud into the threaded holes of the clamps, and comparing the dimensions (linear and angular) indicated in fig. (Figure 47)



8. Cut the DIN 975 M6 threaded pins to the length L1.
9. Assemble steel collars as illustrated in Figure (Figure 48).
10. Fit the filler cap on the vehicle's fuel tank, with the LLS fuel level sensor and the reinforced structure installed.

Option 2. Strengthening the measuring part of LLS fuel level sensors with steel rods.

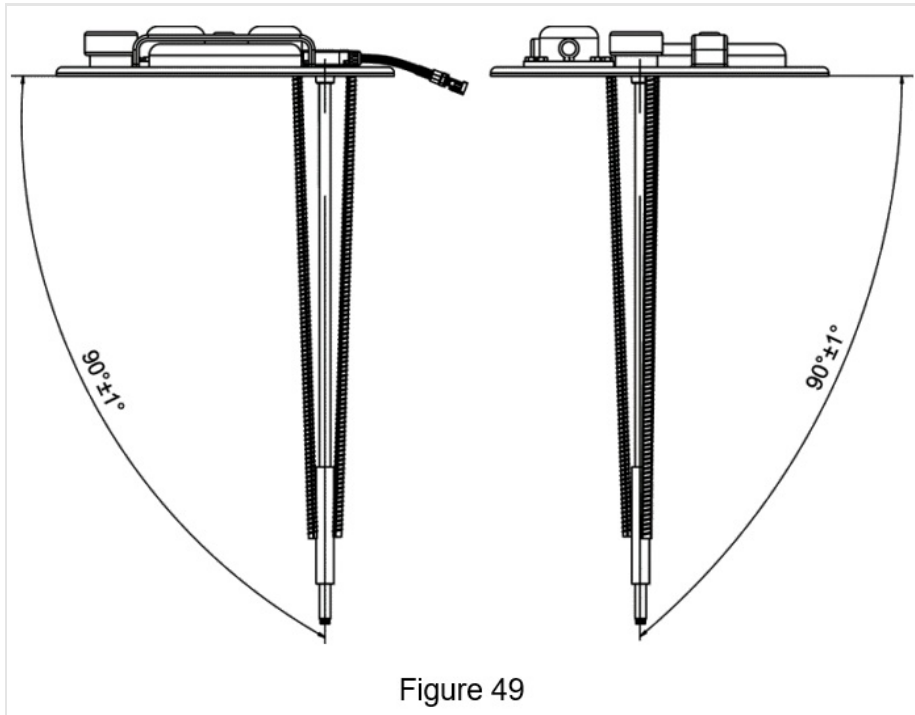
Materials used:

- Steel rods GOST 5781-82; GOST 10884-94 Recommended diameters of the rods: 12; 14; 16 mm. – 3x2...3 m.
- Steel pipe GOST 8731-78; GOST 3262-75 Recommended pipe diameter (external diameter x wall thickness): 28x2.5; 30x3; 32x4 mm. – 300 mm.

Installation procedure:

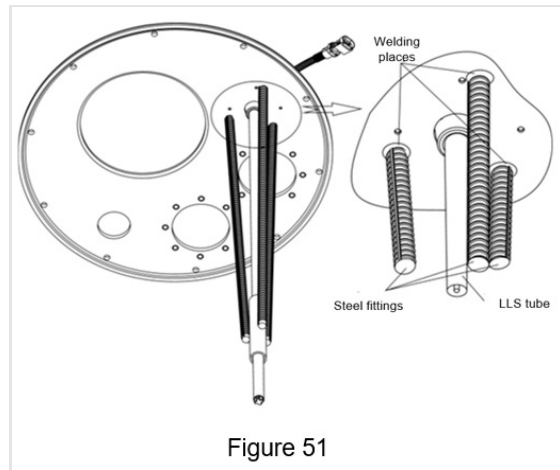
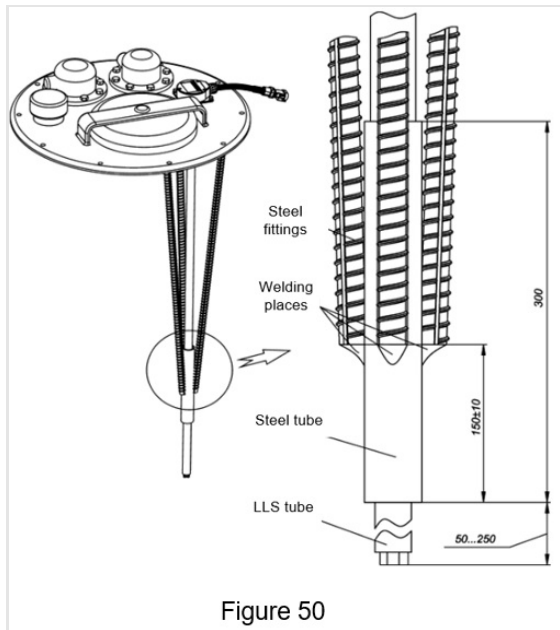
1. Remove the filler cap.
2. Do 3.2, 3.4, 3.5. 3.6
3. Install and secure the LLS fuel level sensor on the filler cap, according to the Section. 4.1

Connection



4. Perform welding works as illustrated in Figures (Figure 50, Figure 51), following angle dimensions illustrated in Figure (Figure 49).

All types of work associated with making holes, cutting, welding, and soldering should be performed in a well-ventilated area, at a safe distance from combustibles and lubricants.



5. Fit the filler cap on the vehicle's fuel tank, with the LLS fuel level sensor and the

Connection

reinforced structure installed.

Option 3. Strengthening the measuring probe of LLS fuel level sensors with a flange.

See Appendix M.

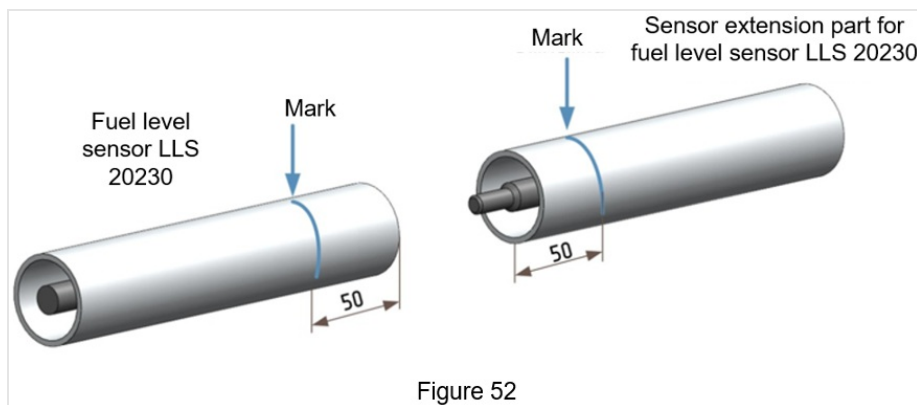
Connection

Appendix L. Installing LLS 20230 Fuel Level Sensors 3 to 6 m in Length

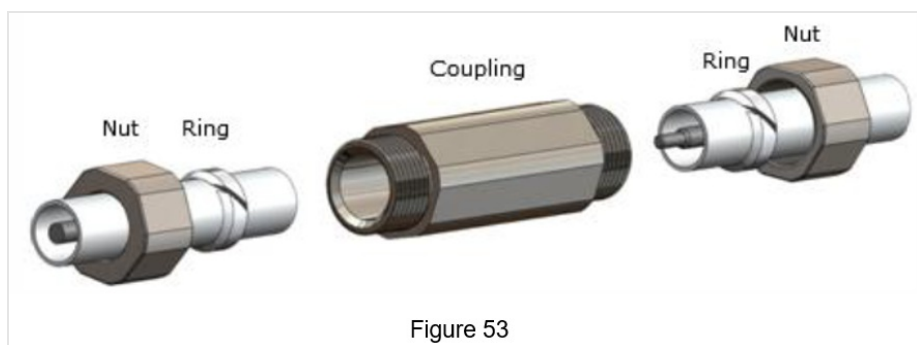
Determine the necessary length of the fuel level sensor LLS 20230 and cut off the sensor extension part.

Attention! The sensor extension part should be cut off only from the side without a thread.

Place the fuel level sensor LLS 20230 and the sensor extension part as shown on the Figure (Figure 52). Measure 50 mm from the end of each part and make marks.

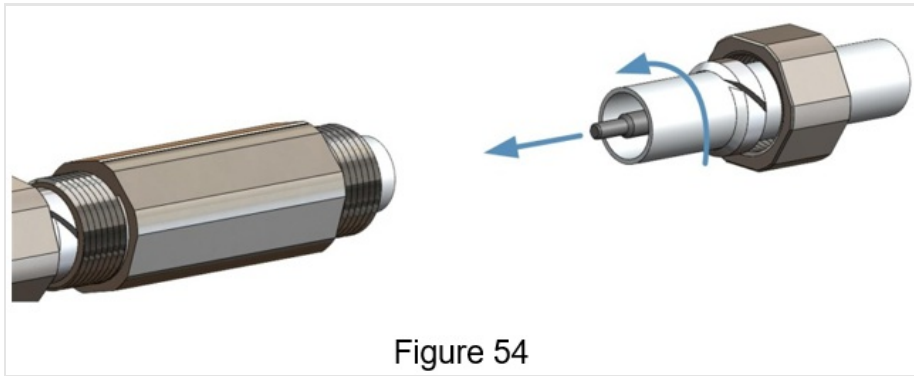


Put the nut, the ring, and the coupling on the fuel level sensor LLS 20230; put the nut and the ring on the sensor extension part (Figure 53).

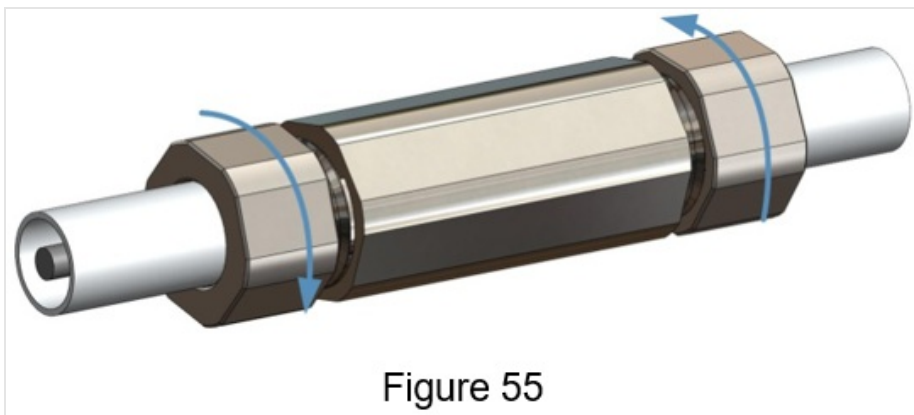


Shift the nut, the ring, and the coupling according to the fuel level sensor LLS in a way to provide the obstacle free access to the thread of the extension part of the fuel level sensor LLS. Match and tighten the central pivots (Figure 54). A gap between the tubes should not exceed 10 mm.

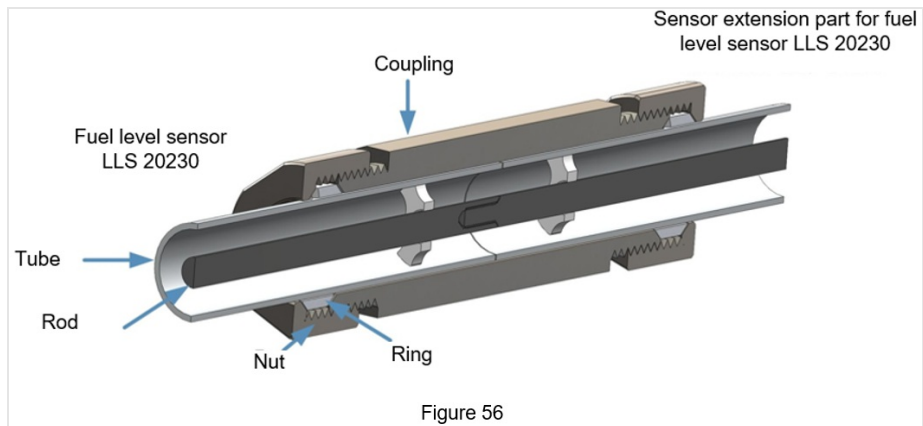
Connection



Set the rings and the coupling according to the marks. Consecutively tighten the nuts by a nut wrench of the size 32, holding the coupling.



Make sure that there is no backlash or rotation between the tubes of the sensor.



Attention! It is prohibited to carry the fuel level sensor LLS, holding it by the sensor extension part (Figure 57).

Connection

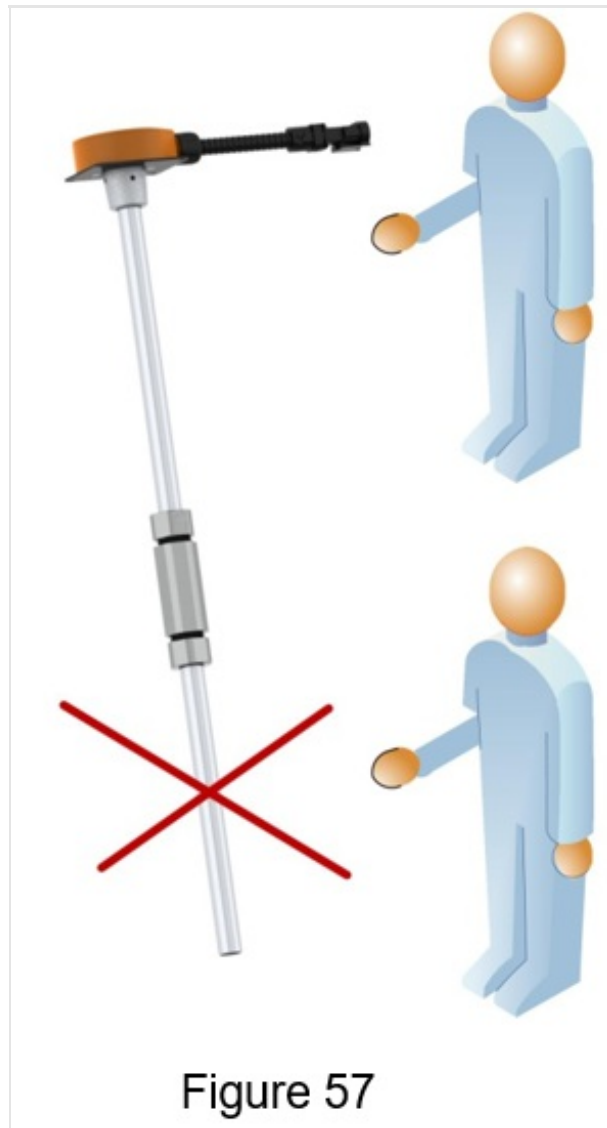
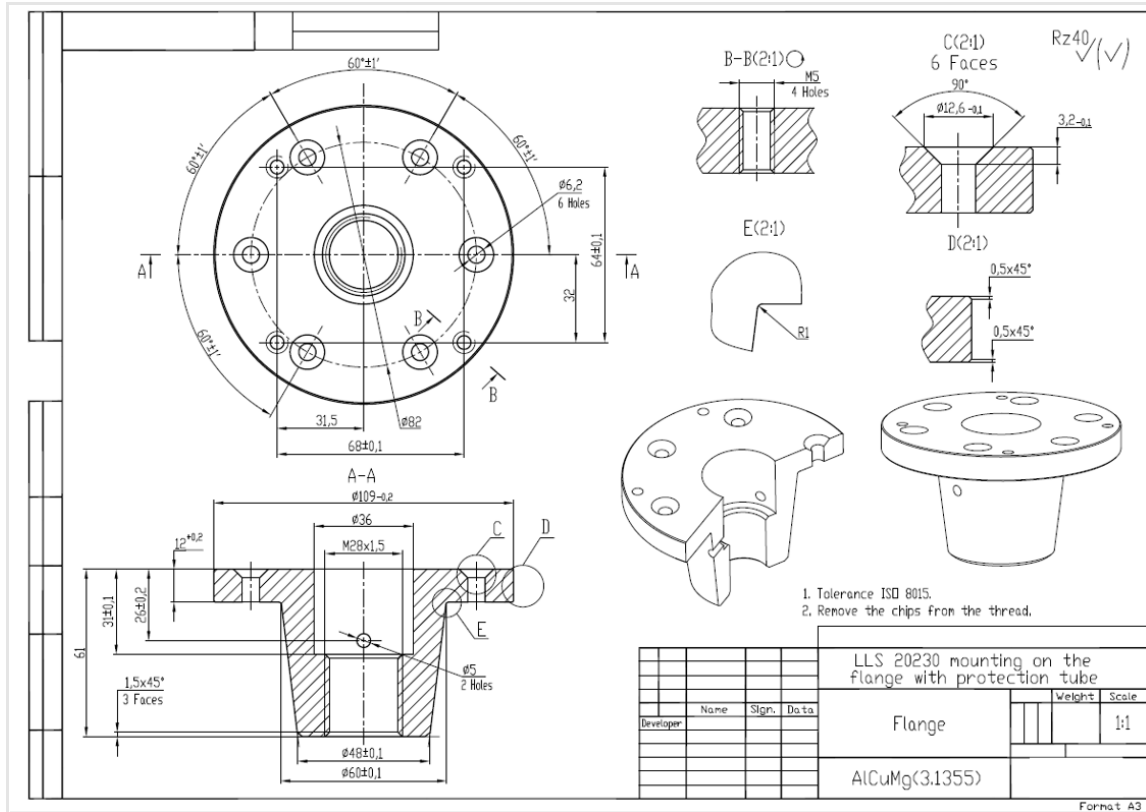


Figure 57

Connection

Appendix M. Strengthening Flange for LLS 20230 Fuel Level Sensor



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