



Fuel Level Sensor

Installation, Adjustment and Connection Manual

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This instruction establishes the rules and procedures for installation, start-up, adjustment and docking of the ITALON fuel level sensor (hereinafter referred to as the 'Product') and also determines the procedure for calibrating the fuel tank with the sensor installed on it.

1. General instructions

The product is intended for measuring the fuel level in the fuel tanks of vehicles (hereinafter referred to as the 'Vehicle') or stationary fuel storages (hereinafter referred to as the 'Object'), for converting it into analog, frequency and digital signals used by an external device (monitoring system terminal).

Types of controlled fluids: gasolines, diesel fuel and other liquid petroleum products that maintain the state of aggregation in the operating temperature range.

2. Safety measures

Only personnel who have been trained and have valid certificates for the right to conduct this type of work are allowed to carry out installation and commissioning.

When carrying out installation and commissioning, the safety requirements stipulated in the operational documentation of the manufacturer of the object at which work on the installation of the product will be performed must be observed as well as the requirements of the regulatory documentation for this type of facilities.

3. Preparing the product and object for installation and connection

3.1. Checking the completeness of the product¹

1. Open the package. Check the completeness of the product according to the data sheet. If something is missing in the package from the items listed in the product's data sheet, the manufacturer must eliminate the inconsistencies.

2. Inspect the appearance of the product. There should be no visible damage on the product. In case of external damage, the product must be replaced by the manufacturer.

¹ The operation is performed in the case when the user has none of input control service.

3.2. Choosing the place to install the product

Install the product in the object in such a way that the axis of the sensitive element of the product is as close as possible to the geometric center of the object cavity. When installed in such places, the minimum dependence of the measured fuel level on the inclination of the vehicle during the movement is ensured. Ideal and close to ideal installation options are shown in Figs. 1÷4.

Figure 1

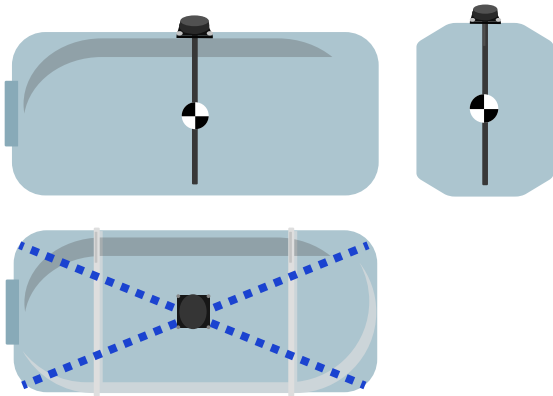


Figure 2

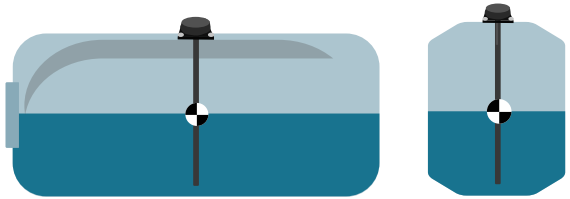


Figure 3

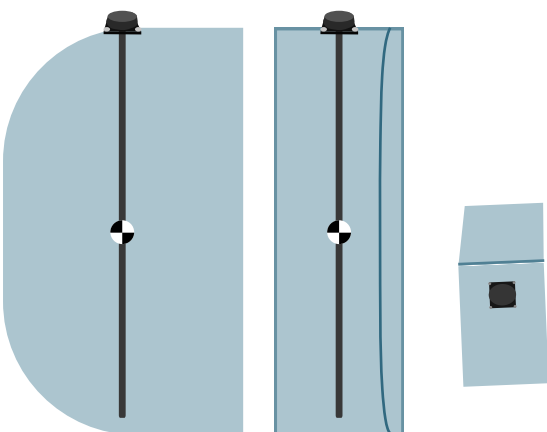
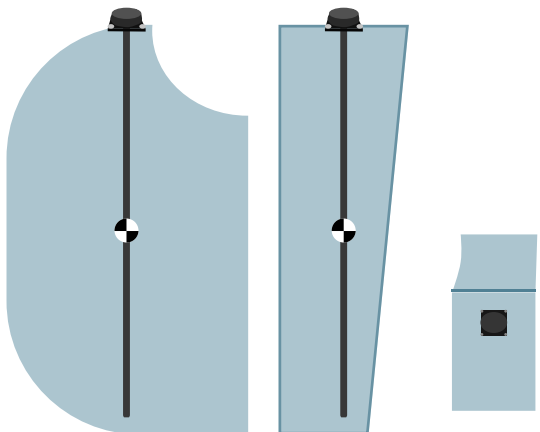
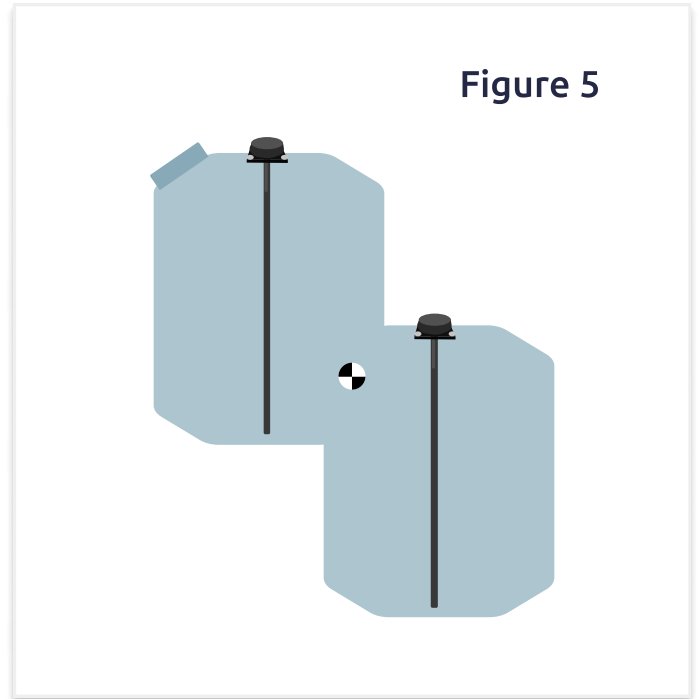


Figure 4



If the product can not be placed in the optimal location and also with a complex object geometry, two or more products are recommended to be installed in the object, and they should be as far apart as possible. In this case, the measuring parts of the products do not necessarily have to be of equal length.

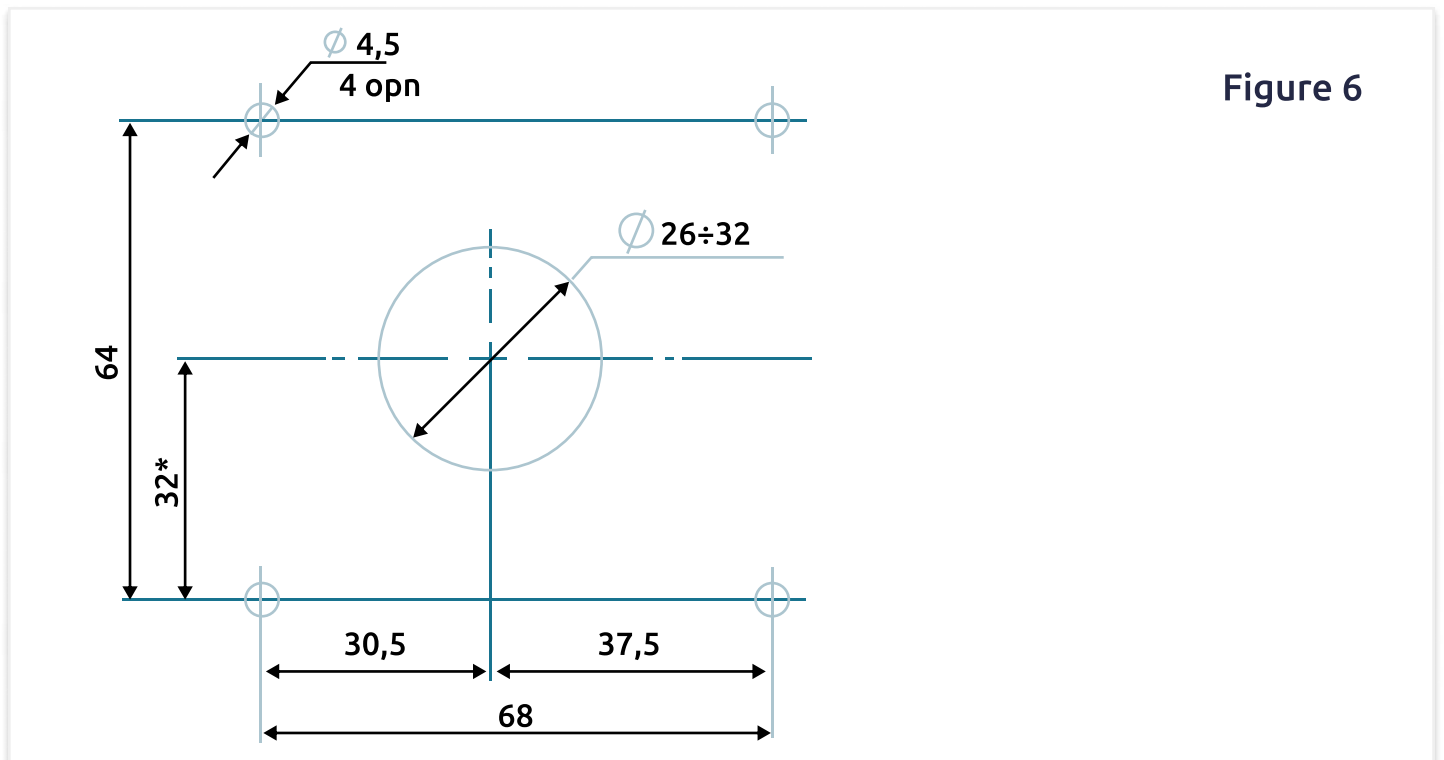
Besides, the method of placing two or more items in an object is the only possible one in the case of a complex (step-like) geometry of the object (Fig.5).



3.3. Preparing the object for installation of the product

Prepare the object for the fitting and welding works in accordance with the requirements of the manufacturer and other regulatory safety documents related to this type of work.

Make holes on the object in accordance with Fig.6. Holes must be oriented with regard to the subsequent placement of the connecting cable.



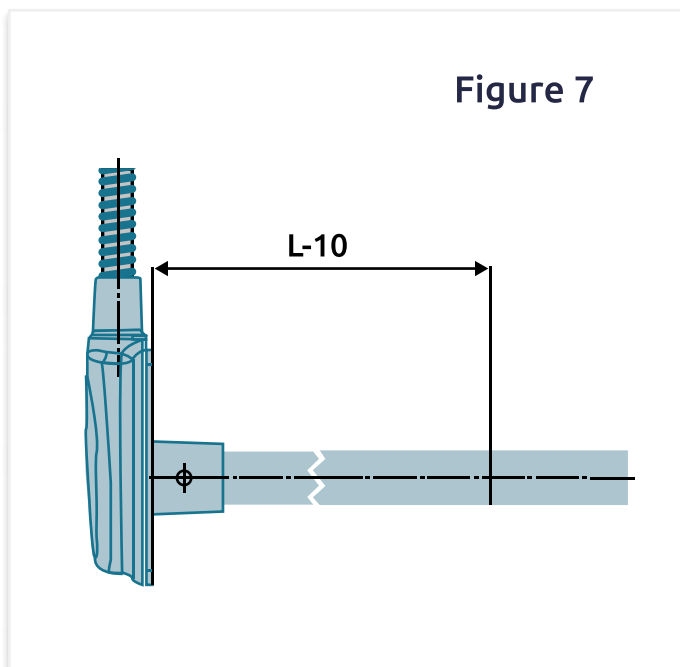
The mounting gasket allows to overlap a hole with a diameter of not more than 44 mm; it must be borne in mind, however, that the execution of an opening with a diameter larger than indicated in Fig. 6 impairs the quality of sealing of the product-object interface and reduces the rigidity of the object structure at the place where the product is installed.

Making a central hole of large diameter makes sense in the case when the product is installed on an object with a non-planar surface of the object-product interface. The minimum permissible radius of curvature of the mating surface of the object is 500 mm (arrow 1 mm).

When installing a product with a sensing element (hereinafter as 'SE') length of 0.8 m and more at vehiclebased facilities, wave-damping partitions are recommended to be installed to relieve shock loads of fuel on the product caused by large speed drops (acceleration, braking) or install the product in protective tubes; the absence of contact of the protective tube or partitions with the sensitive element of the product will be ensured.

The protective tube can be installed on the bottom (the tube is welded to the bottom of the object) or on top. When installing a protective tube, gaps should be provided both in the lower part of the object (to ensure fuel access) and in the upper part (to ensure a reliable gap after refueling the object and its (object) deformation as a result).

3.4. Adapting the sensing element of the product to specific operating conditions



Adaptation of the product's sensitive element consists in cutting it to the length at which the gap between the bottom of the object and the sensitive element is 10 mm.

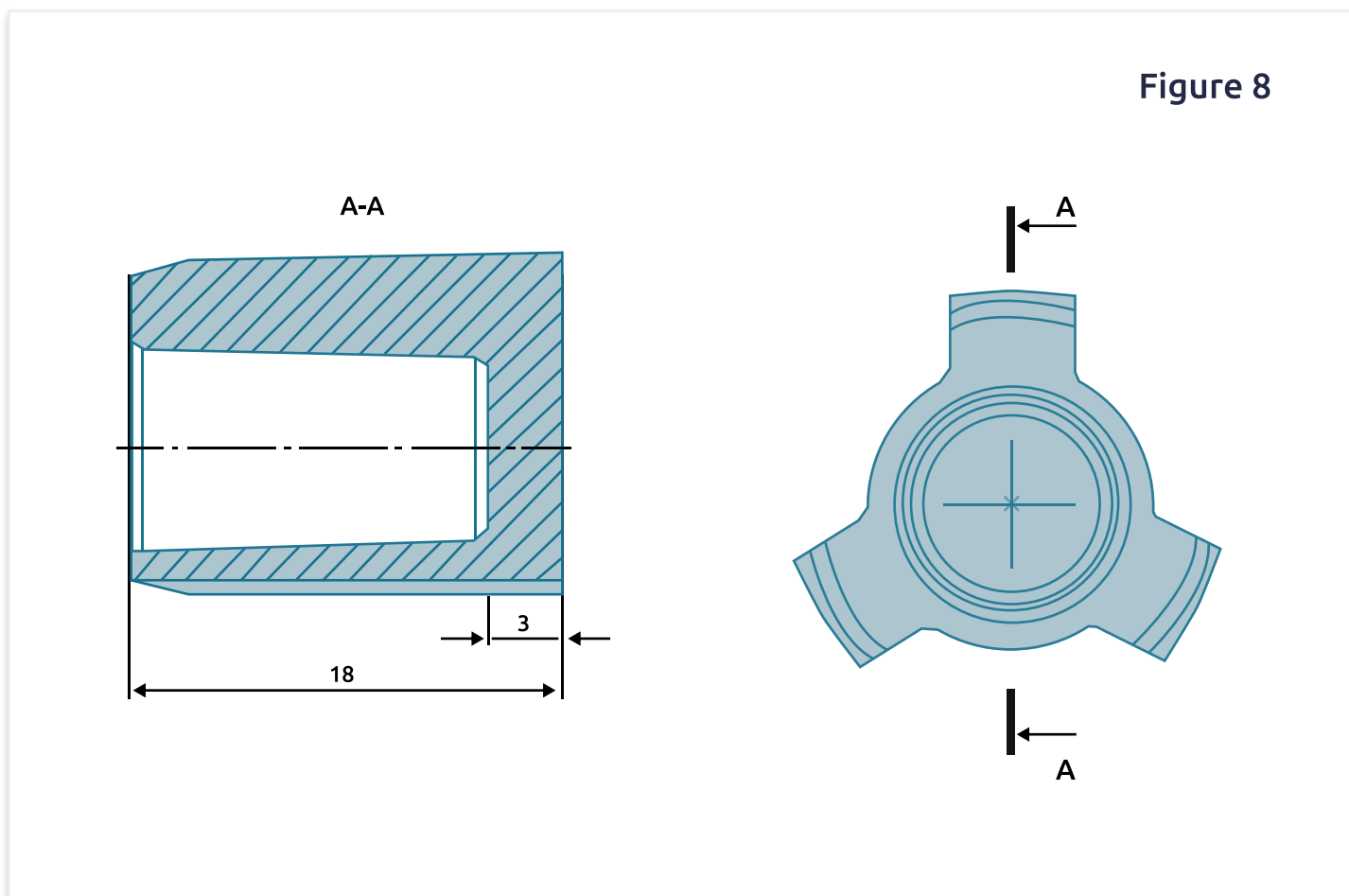
Measure the depth L of the object at the product's installation place, from the bottom to the contact surface.

Cut off the sensitive element to length $L-10$ (see Fig.7). The cutting line must be perpendicular to the axis of the sensing element.

Use the file to strip the ends of the cut elements of the SE (tube and rod) if necessary.

The minimum allowable length of the SE after cutting: 150 mm.

On the SE cut side, install a terminal bushing taken from the set of mounting parts (Fig. 8).



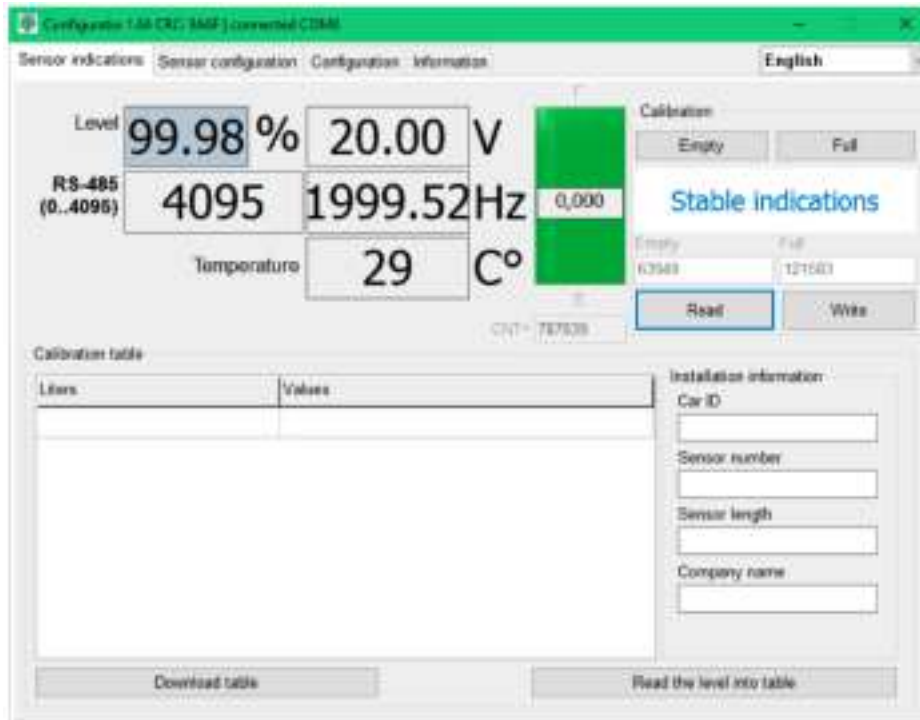
3.5. Using the Configurator Italon to configure the product

(For a detailed description of working with this software tool, see the document “Configurator Italon User Guide”).

Connect the product to a sensor configuration device (SCD). Connect the SCD to a USB connector of the personal computer.

As soon as the Dutconf.exe program started up, a program window opens on the desktop of the PC (Fig.9)

Figure 9



For all operations related to the calibration of the product, averaging of the results is recommended to be disabled (on the tab "Sensor Settings").

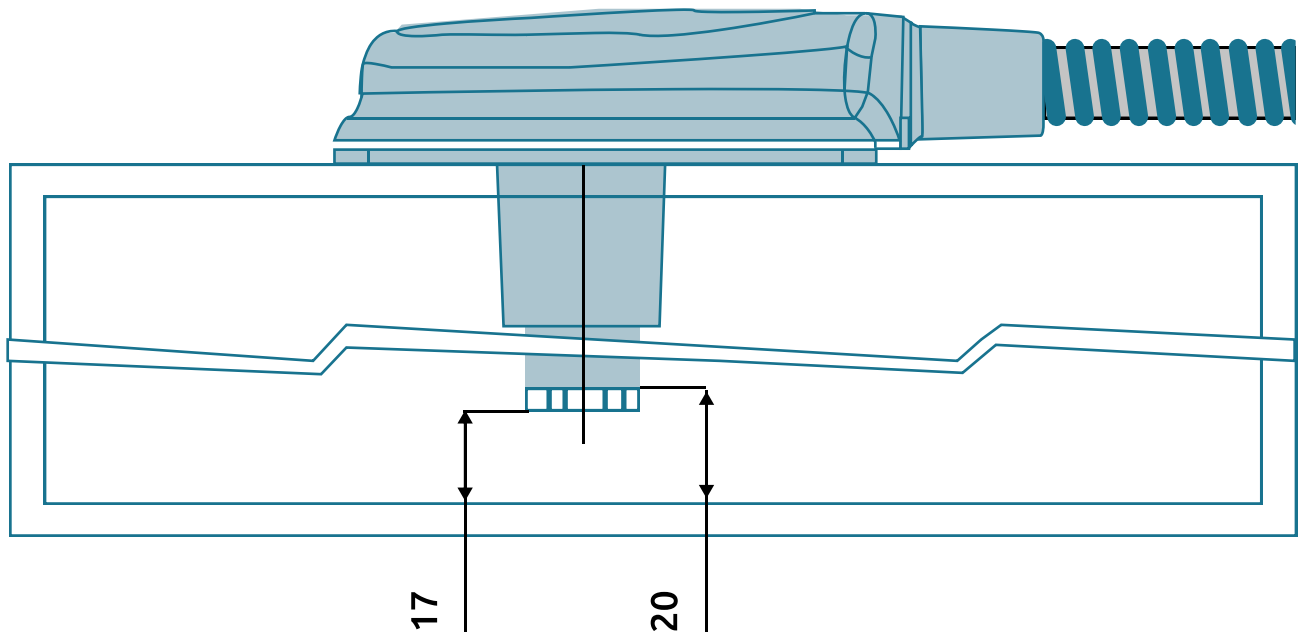
Perform the following sequence to calibrate a full/empty tank:

«Read level» → «Calibrate full tank» → «Calibrate empty tank» → «Record level».

To calibrate the "full" tank, install the product on the measuring tank and pour fuel into it so that the product is immersed in it for the entire effective length (taking into account the wall thickness of the real tank), Fig.10².

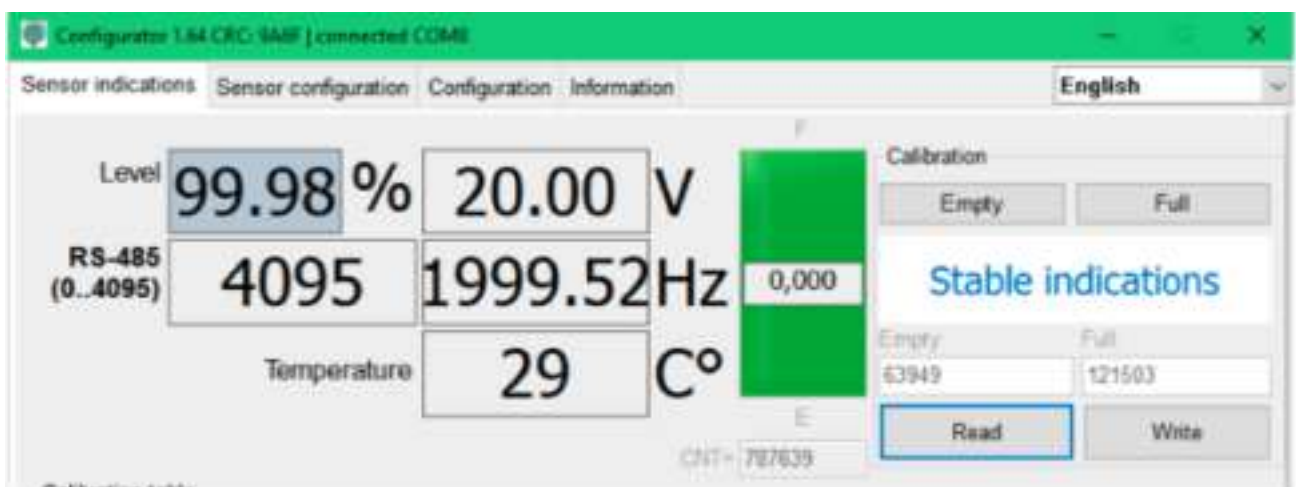
² The method of calibrating the "full" tank is that the bypass hole is plugged and the measuring volume of the upside-down sensor is filled with working fluid. In this case, the error of the calibration of the tank to the height of the working fluid column of 5 ÷ 8 mm is introduced obviously. With a working sensor length of 150 mm, the error will be from 3 to 5%. Therefore, this method should be considered inadequate. It must be admitted, however, that this error is largely compensated for when calibrating a specific product at a specific object at near-maximum working fluid levels.

Figure 10



In the program window, click the “Read” button, wait until the “Readings are stable” message appears (for at least 5 seconds), and click the “Full” button (Fig.11).

Figure 11



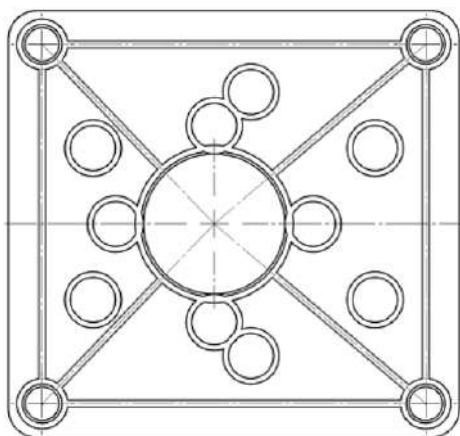
To calibrate the “empty” tank, remove the product from the tank, let the fuel drain (for at least 1 minute), press the “Empty” button. To stop the calibration, press the “Write” button (Fig. 11).

4. Installing the product in an object

4.1. Installing the product

Apply a layer of sealant no more than 1 mm thick to the surface of the mounting³ gasket (Fig. 12) (for reference: the height of partitions of the mounting gasket is 0.8 mm).

Figure 12



Install the mounting gasket on the product so that a layer of applied sealant is between the mounting gasket and the product's base plate.

Apply a layer of sealant with a thickness of not more than 2 mm to the object in the zone bounded by the main and mounting holes (Fig. 6). Part of the sealant pressed out when mounting the product should not block the drainage hole of the product.

Use the self-tapping screws supplied with the product to secure the product to the object. The screw with a sealing hole will be located on the side of the corrugated hose.

4.2. Cable routing

When mounting, the manufacturer's installation cable included in the package or purchased separately shall be used.

On the way of the laid cables, there shall be no heated parts of the mechanisms and components of the vehicle so that the insulation coating of the wires does not melt.

There should be no moving parts of the vehicle's mechanisms on the way of laying the cables.

The minimum allowable bending radius of the FLS corrugated hose (internal) is 40 mm.

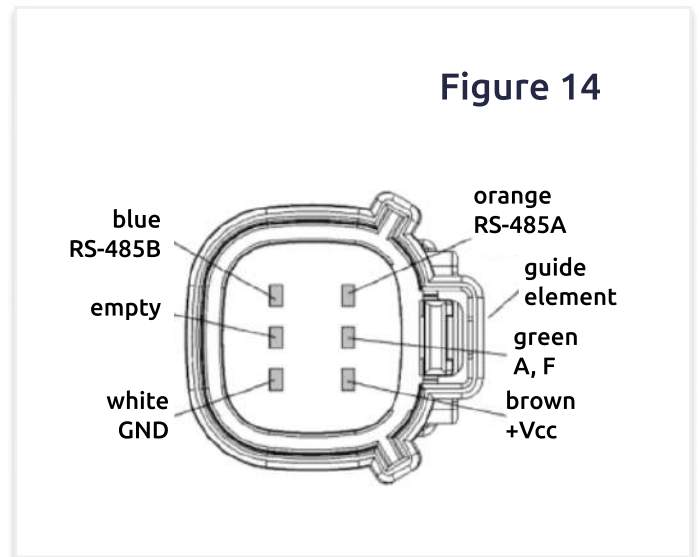
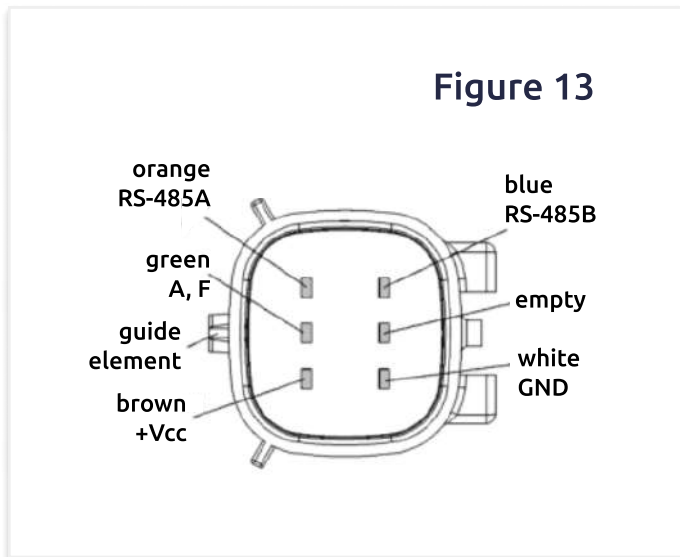
³ The applied sealant must be sufficiently adhesive and be resistant when exposed to high and low temperatures and fluids.

4.3. Connecting to an external device

Connect the product to an external device using one of the connection diagrams (Appendix A) according to a selected data interface.

The purpose of the FLS connector pins and the color marking of the wires are shown in Fig.13.

The purpose of the cable assembly connector pins as well as the color marking of the wires are shown in Fig.14



4.4. Connection to the onboard power supply, installation of a fuse

The product's "-" power lead shall be connected to the "-" power lead of the external device. The "-" power supply circuit of the product and the external device resulting from this connection must be connected either to the vehicle ground or to the battery's "-" terminal (if there is a ground switch on the vehicle and it is required that the product and the external device operate when the vehicle's ground switch is off).

Attention!!! The connection of the product's "-" power lead with the "-" power lead of the external device must be maintained at all possible positions of the various switching elements of the electrical circuits that are external to the product and the external device. Failure to comply with this rule may lead to failure of the product and/or external device. The manufacturer considers violation of the specified rule of connecting the product to an external device and the vehicle's on-board network as a violation of the product's operating conditions and accordingly terminates its warranty.

The "+" power wire of the product must be connected to the "+" of the vehicle's on-board network through the fuse supplied with the product. The fuse holder supplied with the product must be connected to the break of the "+" power supply wire of the product in close proximity to the point of its connection to the vehicle's on-board network. The product is recommended to be connected (via a fuse) to the contact or output of an external device connected to the "+" of the vehicle's on-board network.

Reverse polarity protection is available.

Install a fuse in the fuse holder.

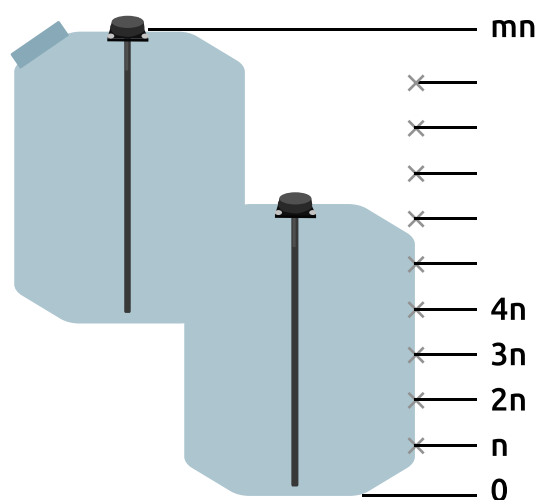
The fuse supplied with the product cannot be used to connect additional external devices to the on-board network (other than the product).

5. Configuring the product

The configuration consists in the calibration of the product i.e. the compilation of a calibration table for each specific "item-object" pair (Fig.15).

When performing calibration, disable filtering (in the "Sensor Settings" tab of the Configurator).

Figure 15



Calibration data reflecting the shape of a specific object is entered in the table located on the tab "Sensor readings" of the Configurator (Fig.16).

The product is recommended to be calibrated with the engine shut off (mechanisms) of the vehicle in order to eliminate errors caused by vibration of the mechanisms, units and parts of the vehicle.

The readings (button "Read level to the table") should be read after the message "Readings are stable" has displayed. Depending on the selected product's operation mode (and the field in Fig.17, respectively), the data are entered into a table in the formats "%", "V", "RS-485 code", "Hz".

Using the "Upload table" button, data can be exported to a text file in the formats of "Fort-Telecom", "Wialon" or "Italon". The file name is generated automatically in the format "Machine number-Sensor number-Sensor length-Company name" (group of fields "Installation Description").

Figure 16

The screenshot shows a software interface for calibration. On the left, a table titled "Calibration table" has two columns: "Liters" and "Values". The table contains five rows of data. On the right, there is a section titled "Installation information" with four input fields: "Car ID" (A001AA77), "Sensor number" (1456200535), "Sensor length" (350mm), and "Company name" (OOO "Sensor"). At the bottom, there are two buttons: "Download table" and "Read the level into table".

Liters	Values
50	3500
40	2345
30	1760
20	1165
10	585

Installation information

Car ID: A001AA77

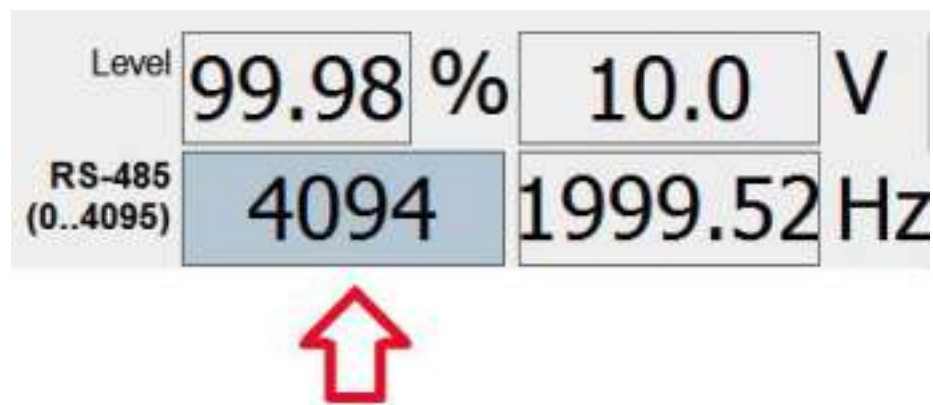
Sensor number: 1456200535

Sensor length: 350mm

Company name: OOO "Sensor"

Download table Read the level into table

Figure 17



6. Sealing

A product mounted on an object is sealed to control its unauthorized dismantling. Sealing should ensure the impossibility of dismantling the product without violating the integrity of the sealing parts.

One of the methods of sealing is proposed below.

- Self-cutting roofing sealing bolt (included in the assembly kit; with a hole in the bolt head) should be located on the side of the product's corrugated hose (Fig.18),
- To seal the corrugated hose with the sensors corrugated hose side press the seal through the plug. The clearance between the seal and the plug shall be minimum. (Fig. 19)
- Wrap a seal (included in the assembly kit) around the entry section of the corrugated hose of the dome of the product and fix it (Fig.18).
- The length of the seal should be sufficient for the wire to fit freely but at the same time the free rotation of the sealing bolt should be excluded,

Figure 18

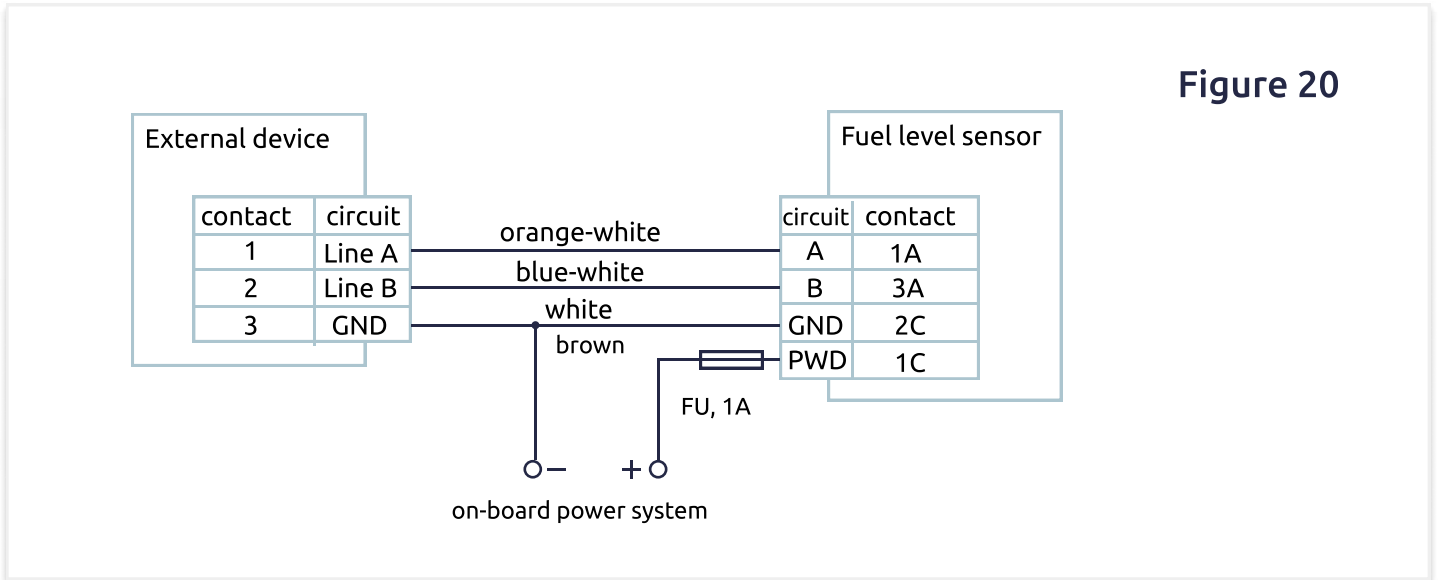


Figure 19



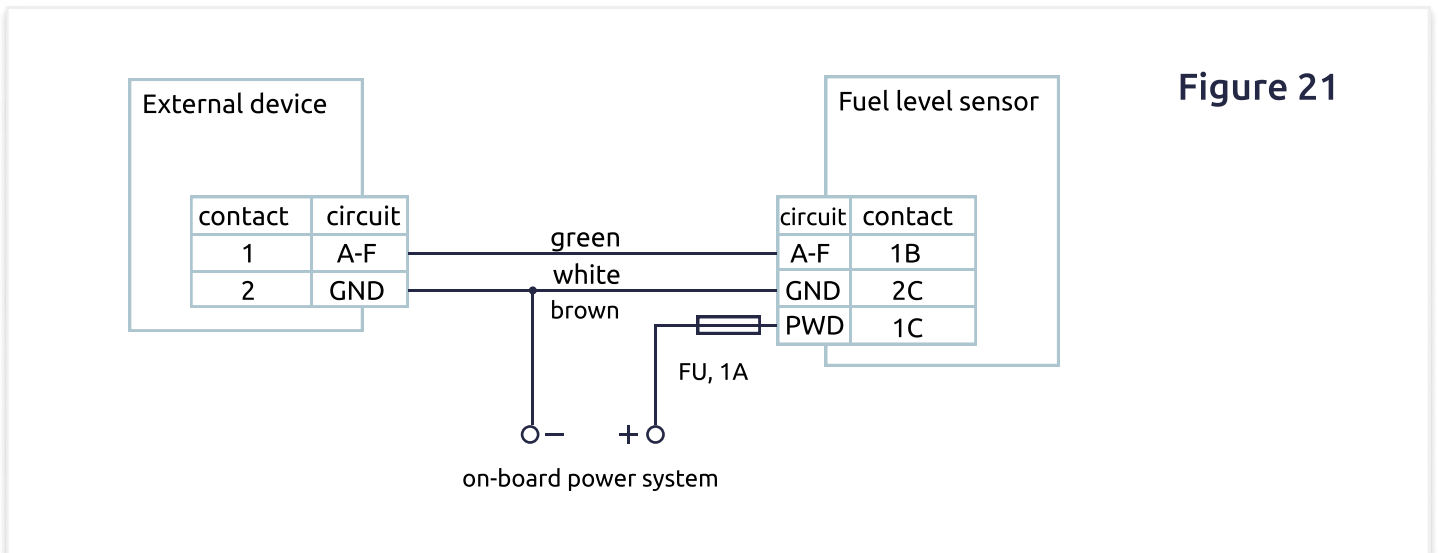
Appendix A

Diagrams of connecting the product(s) to external devices



Diagrams of connecting a product to an external device via RS-485 interface.

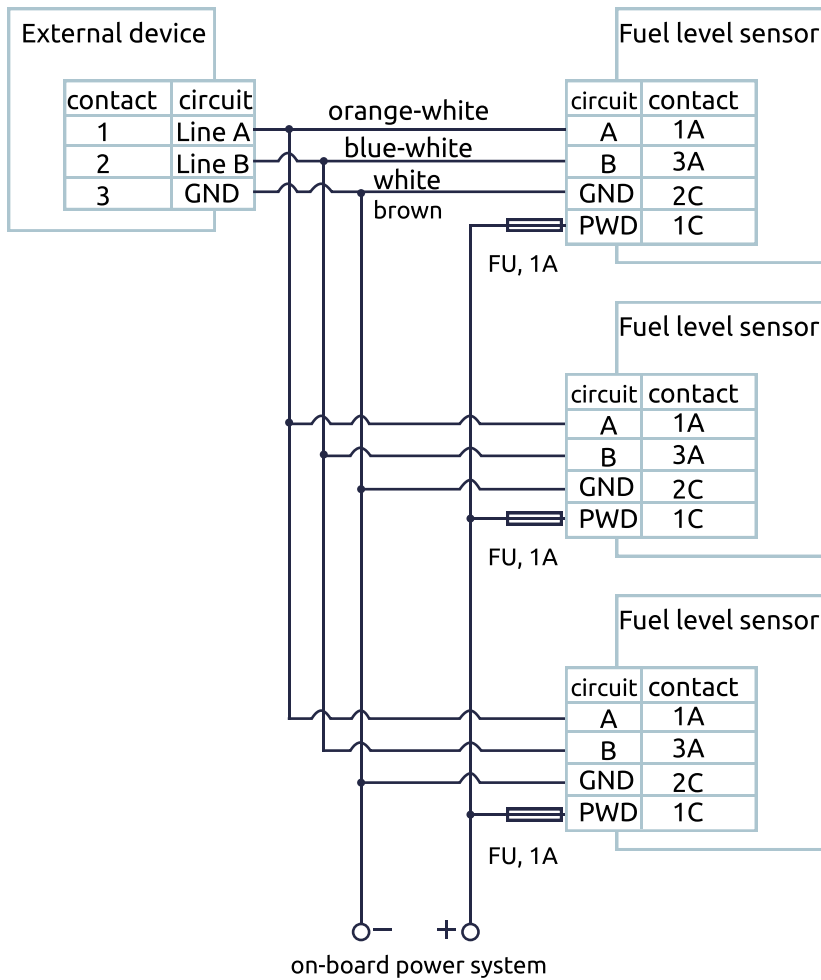
The shown numbers of the external device terminals are imaginary.



Diagrams of connecting a product to an analog input of an external device.

The shown numbers of the external device terminals are imaginary.

Figure 22



Diagrams of connecting several products to an external device via RS-485 interface.

The shown numbers of the external device terminals are imaginary.

Up to 4 products can be connected to one external device according to this diagram.