# Escort TD-BLE User Manual

by tech support

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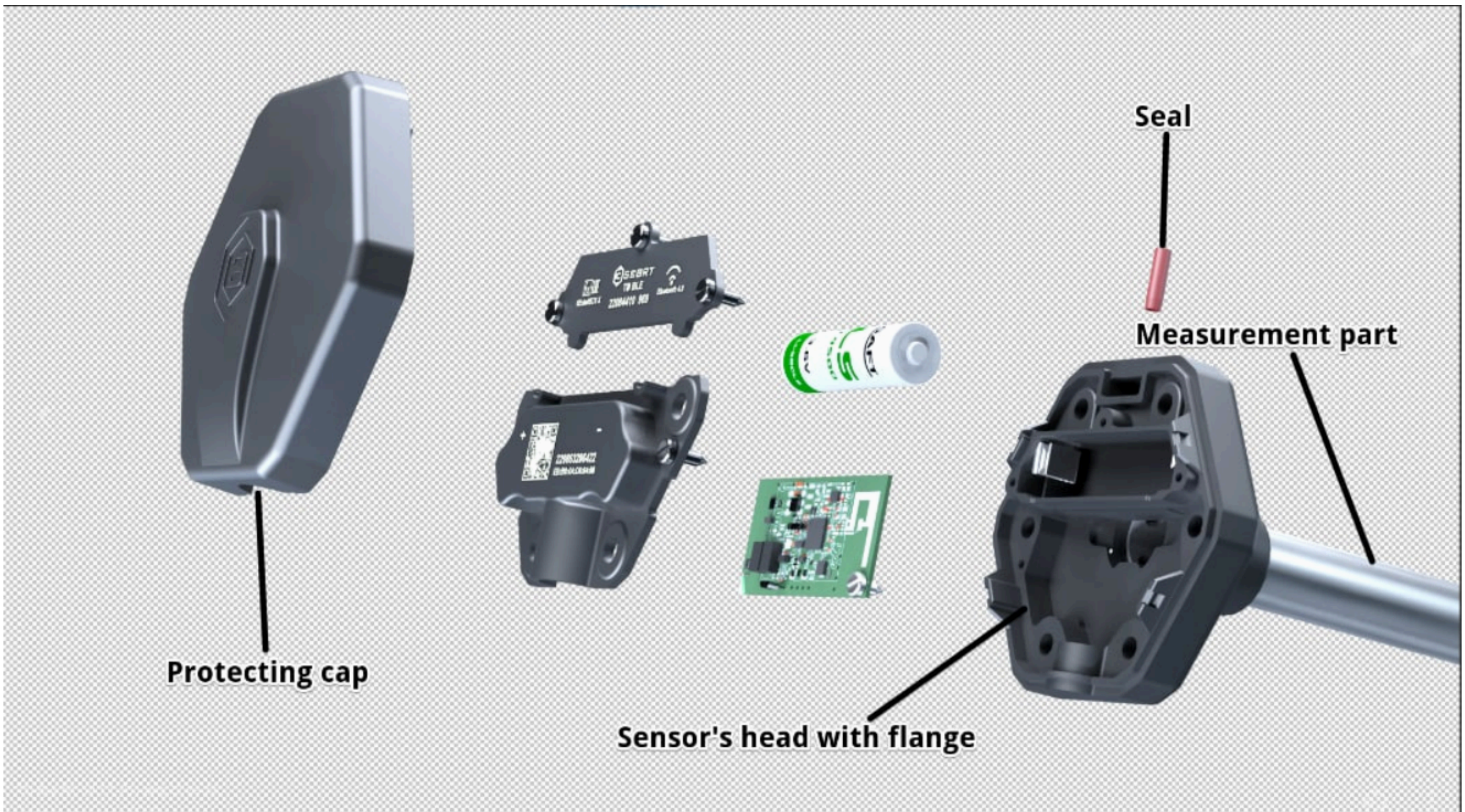


# Connecting a sensor to a smartphone

To configure any TD-BLE sensor, to calibrate it and to do the tank calibration, you need to use Escort Configurator app available on iOS and Android devices (hereinafter - the "**app**").

## Geolocation

Run the configurator. Be sure to give it access to your smartphone's geolocation. Activate the Bluetooth and the geolocation of your smartphone (**Fig. 1**). The app must have access to the geolocation due to the requirements of the AppStore and GooglePlay (**Fig. 2**).

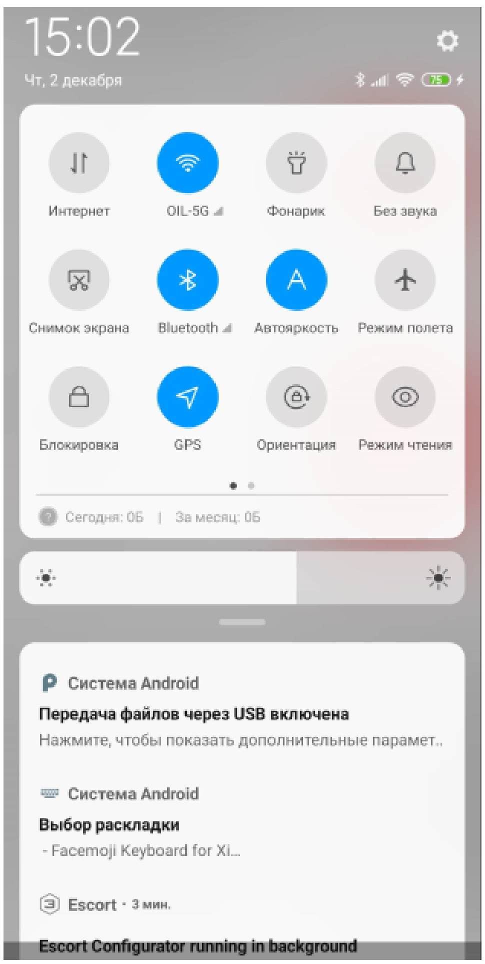



**Fig. 1** GPS (geolocation) and Bluetooth activated

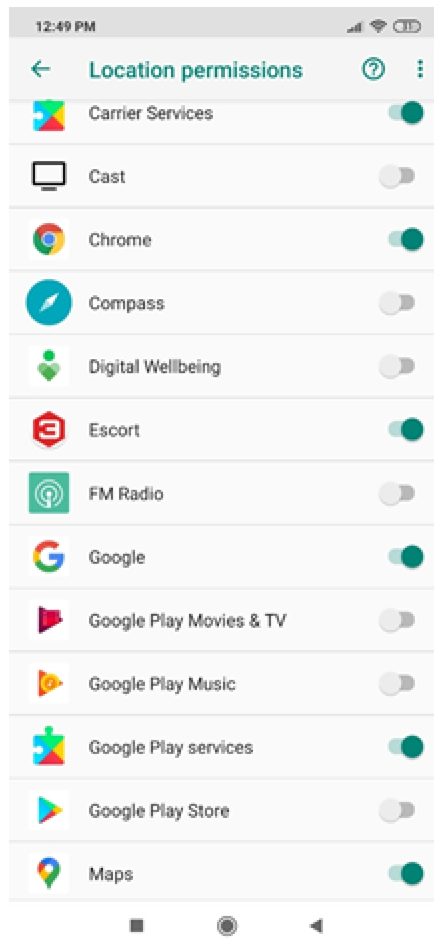



**Fig. 2** Location permissions

# Connecting sensor

Tap on the **Sensor settings** button. Next, select **TD-BLE**.


**Fig. 2** Sensor settings

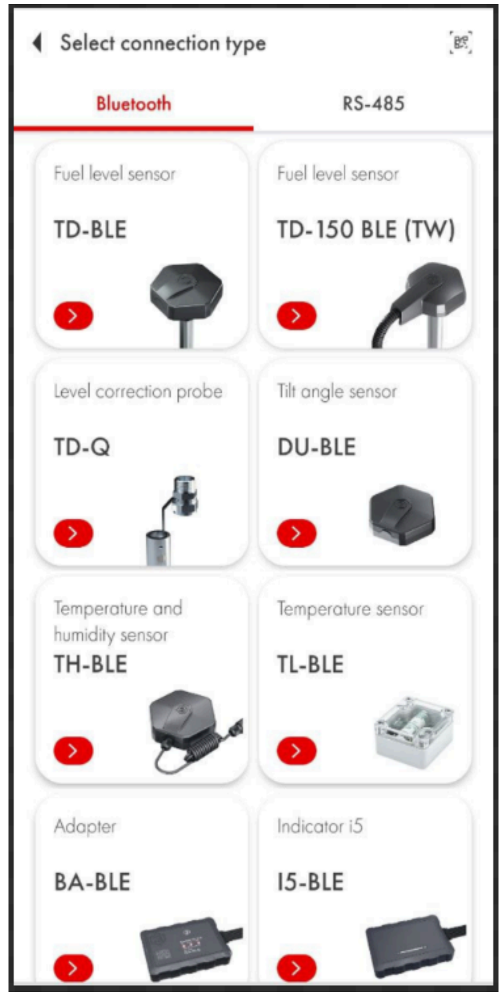



**Fig. 3** Connection and sensor type

Search for a particular sensor by introducing the last 6 digits of its serial number. The serial number can be found on the sensor's head.

Or simply find the sensor you need on the list and tap on the **Connect** button. When using an Android device, you can also tap on the sensor itself to open the dropdown menu displaying the data received in the advertising mode.

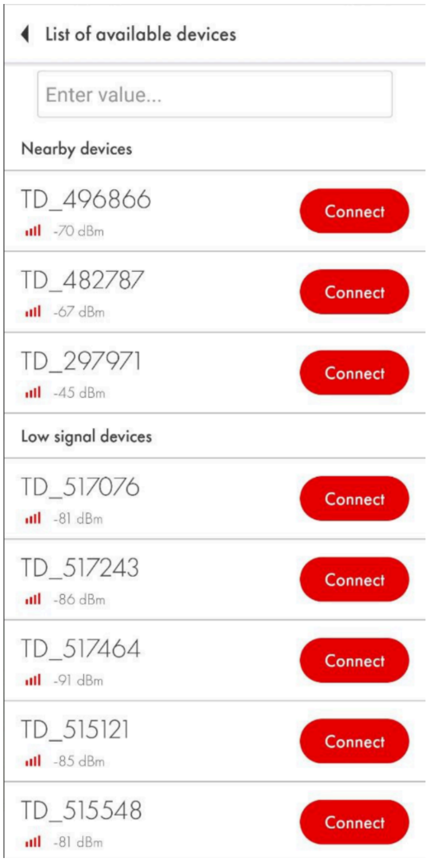



**Fig. 4** Sensor search

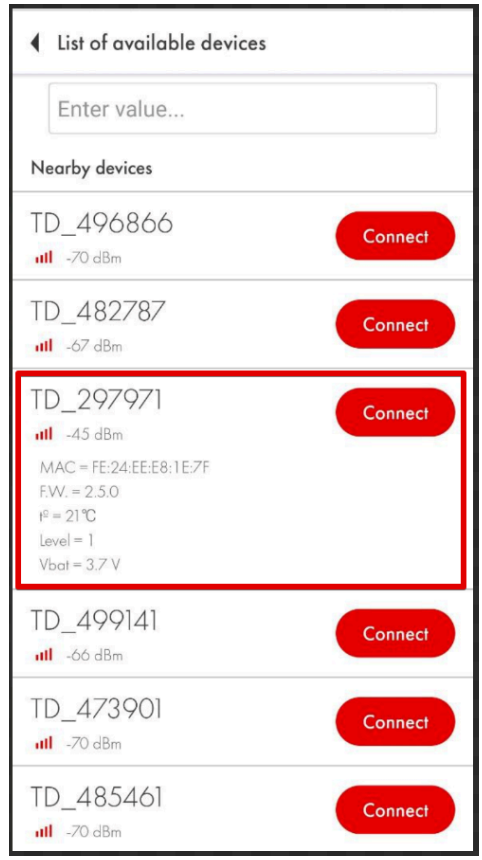



**Fig. 5** Data received in Advertising mode

# Password settings

We strongly recommend setting a password in order to limit the access to the sensor's configuration changing. First time connected to a sensor, the app automatically requests to set a password.

You can set, change or delete a password in the **Additional features** menu (Fig. 5.1)

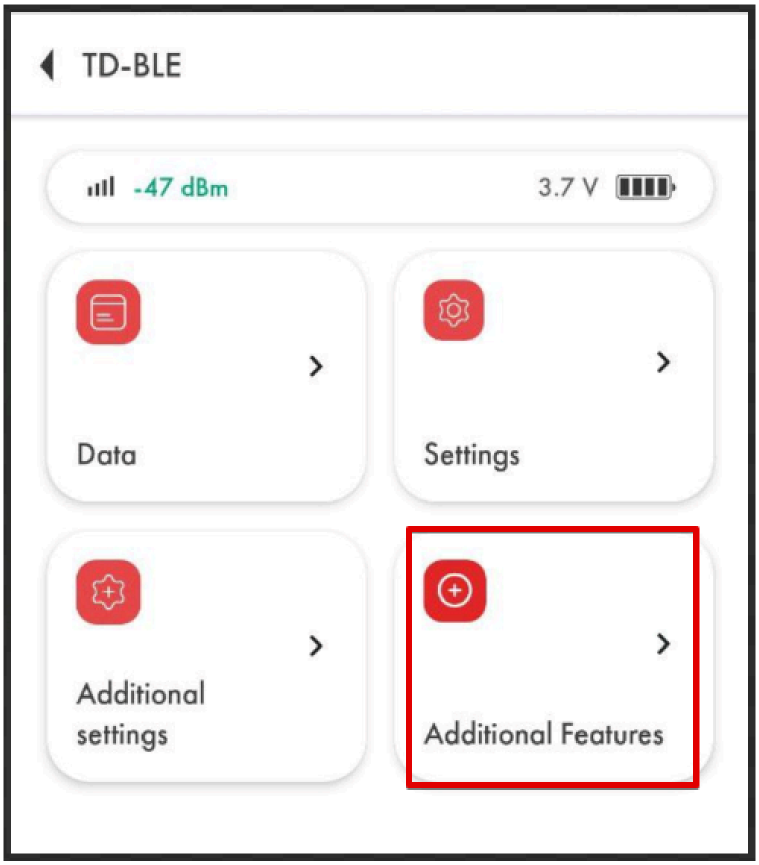



**Fig. 5.1** Additional features menu

In the tab with the password settings enter a password that will be used in the future and hit the **Install** button (Fig. 5.2)

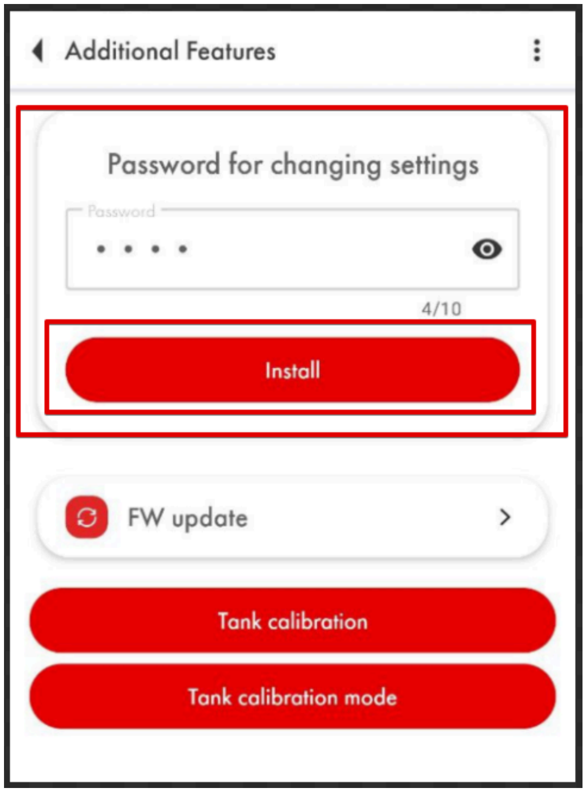



**Fig. 5.2** Password setting tab

**ATTENTION!** The password resetting procedure is quite demanding, so we recommend to set and manage the password responsibly.

To delete a current password you need to enter it in the Password field, then sequentially hit the **Enter** and **Delete** buttons.

**ATTENTION!** The sensor has no default password! If you connect to a sensor for the first time and see a password set in it, please contact the tech support.

# Sensor's main parameters and readings

Once you enter the **Data** tab on the main screen of the sensor you can see the following parameters:

1) The serial number of the sensor
2) Version of the firmware (hereinafter - **FW**) installed on the sensor
3) The **temperature** measured by the sensor
4) The **level** reading - fuel level reading as a value from 1 to 1023 or from 1 to 4095 range; this is not a reading in liters but more on that later
5) **RSSI** - Received Signal Strength Indicator that shows how well your smartphone receives the data from the sensor; this parameter is NOT transmitted by the sensor but is calculated by the device that receives the data from it;
6) **Vbat** or sensor's battery charge (3.5V or more means that the battery is fully charged; 3.2V or lower voltage means that the battery is discharged and has to be replaced);
7) **CNT** or **Raw data** value (its use will be explained next)
8) The **MAC address** of the sensor is used to pair the sensor with the compatible trackers;

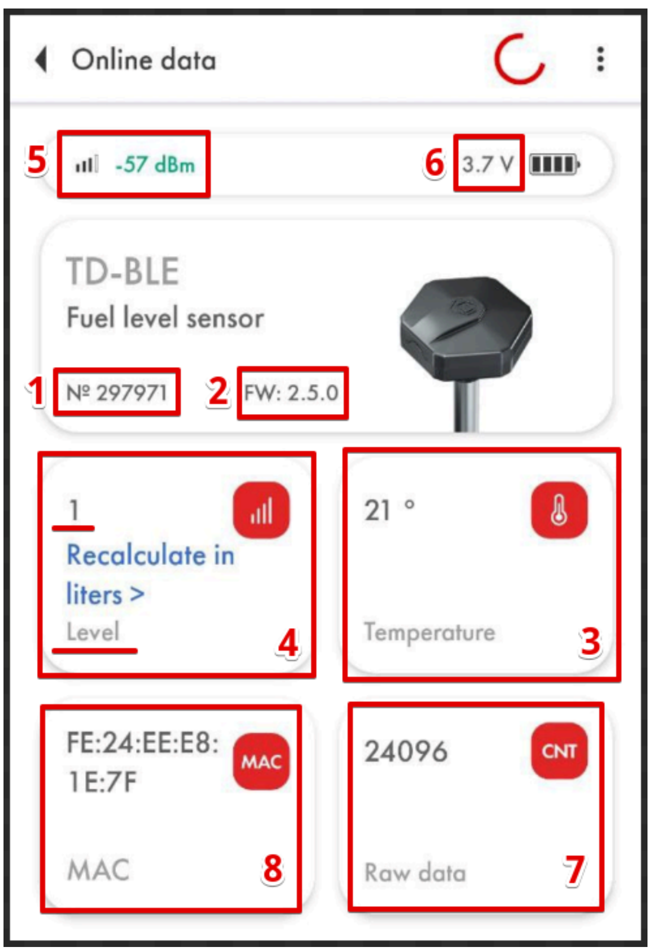



**Fig. 6 Data** tab (Android)

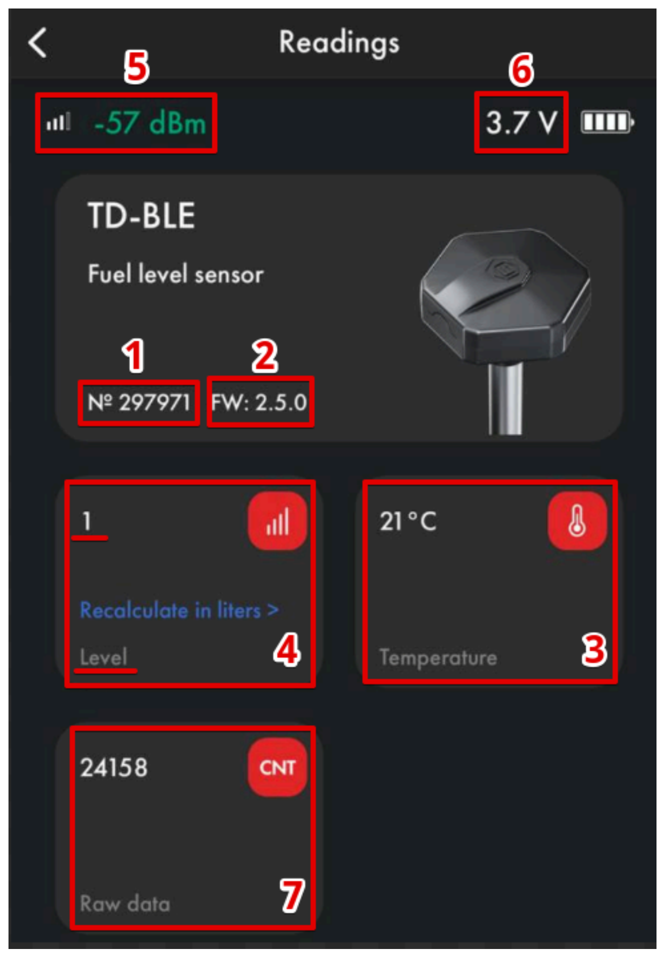



**Fig. 7 Readings** tab (iOS)

**Battery charge drops to 3.2V or lower that last for 10-15 minutes are acceptable** (especially if it happens after the sensor is rebooted by taking its battery out and then putting it back). This happens because all processes that are run by the sensor (level, temperature and battery charge measurement as well as transmission of the BLE data packages) synchronize and, thus, the power consumption of the device increases while the battery voltage decreases.

# Sensor calibration

## CNT. What happens when you calibrate the sensor

After you cut or extend the tubes of the sensor, you need to recalibrate it, i.e. to set its new **Full** and **Empty** calibration values. You can do that in the **Settings** menu **(Fig. 8)**.

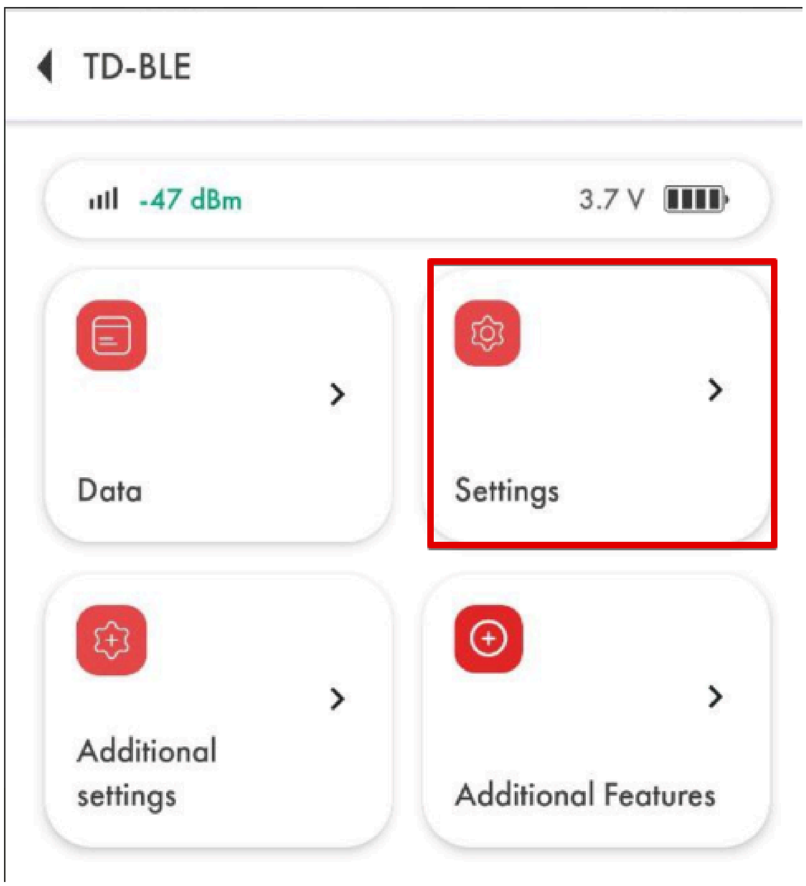



**Fig. 8** Sensor's main screen

The sensor's "raw" readings - current level or CNT - change depending on how much fuel there is in the sensor's tubes.

The CNT is then compared with the Empty and Full values.

If the **tubes are empty** and "**CNT (Fig. 9, 1) ≈ Empty calibration value (Fig. 9, 2)**", the level is displayed as 1.

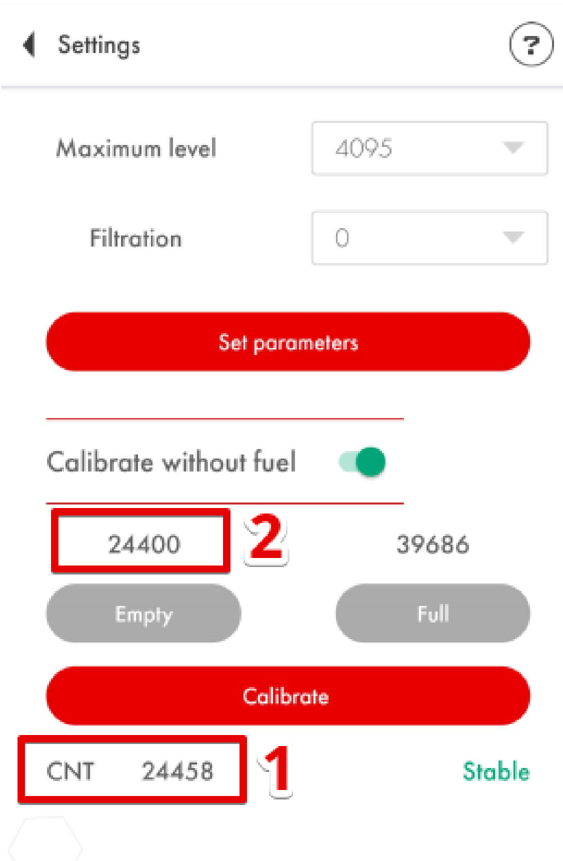



**Fig. 9** CNT and Empty

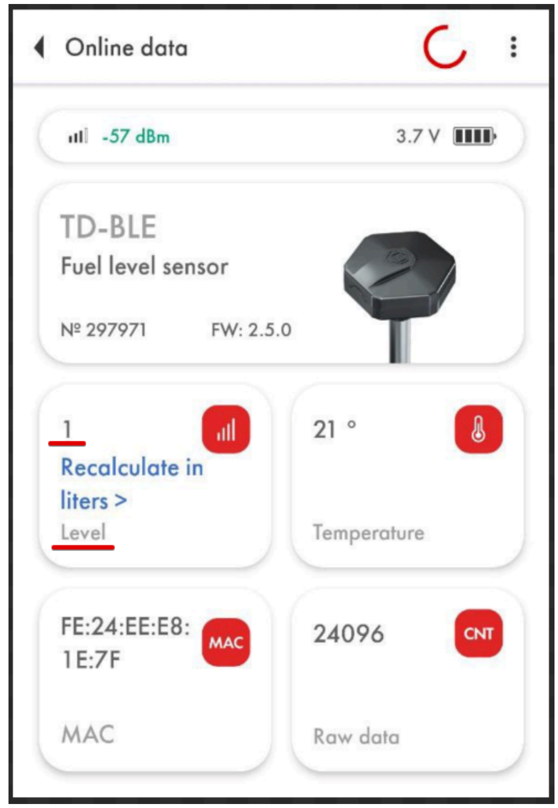



**Fig. 10** Level reading when CNT ≈ Empty

If the tubes are full and "**CNT ≈ Full calibration value**", the level is displayed as 1023 or 4095.

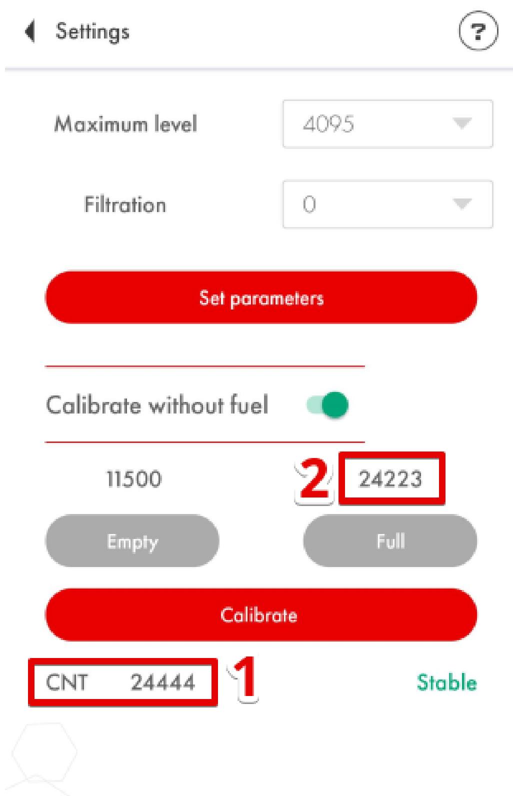



**Fig. 11** CNT and Full

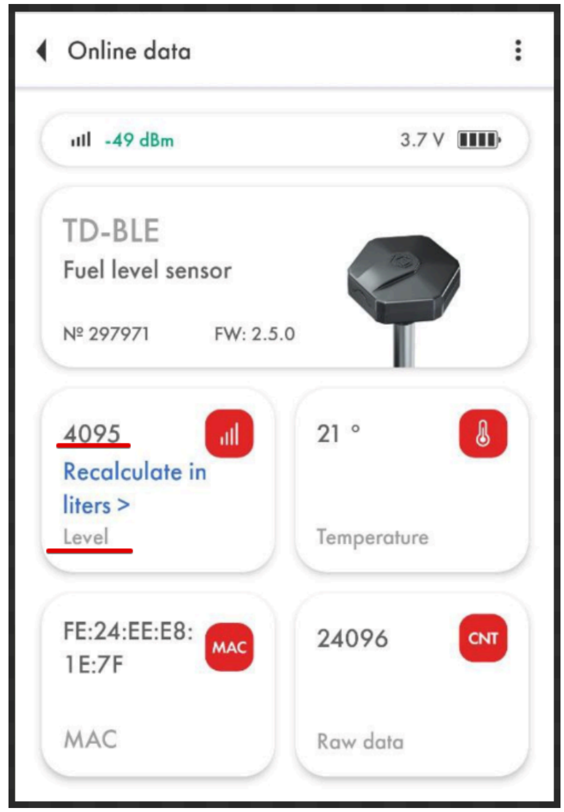



**Fig. 12** Level reading when CNT ≈ Full

Therefore, the CNT must be increasing as the fuel fills the sensor's tubes. It has to be moving from the value close to the Empty calibration value towards the Full calibration value.

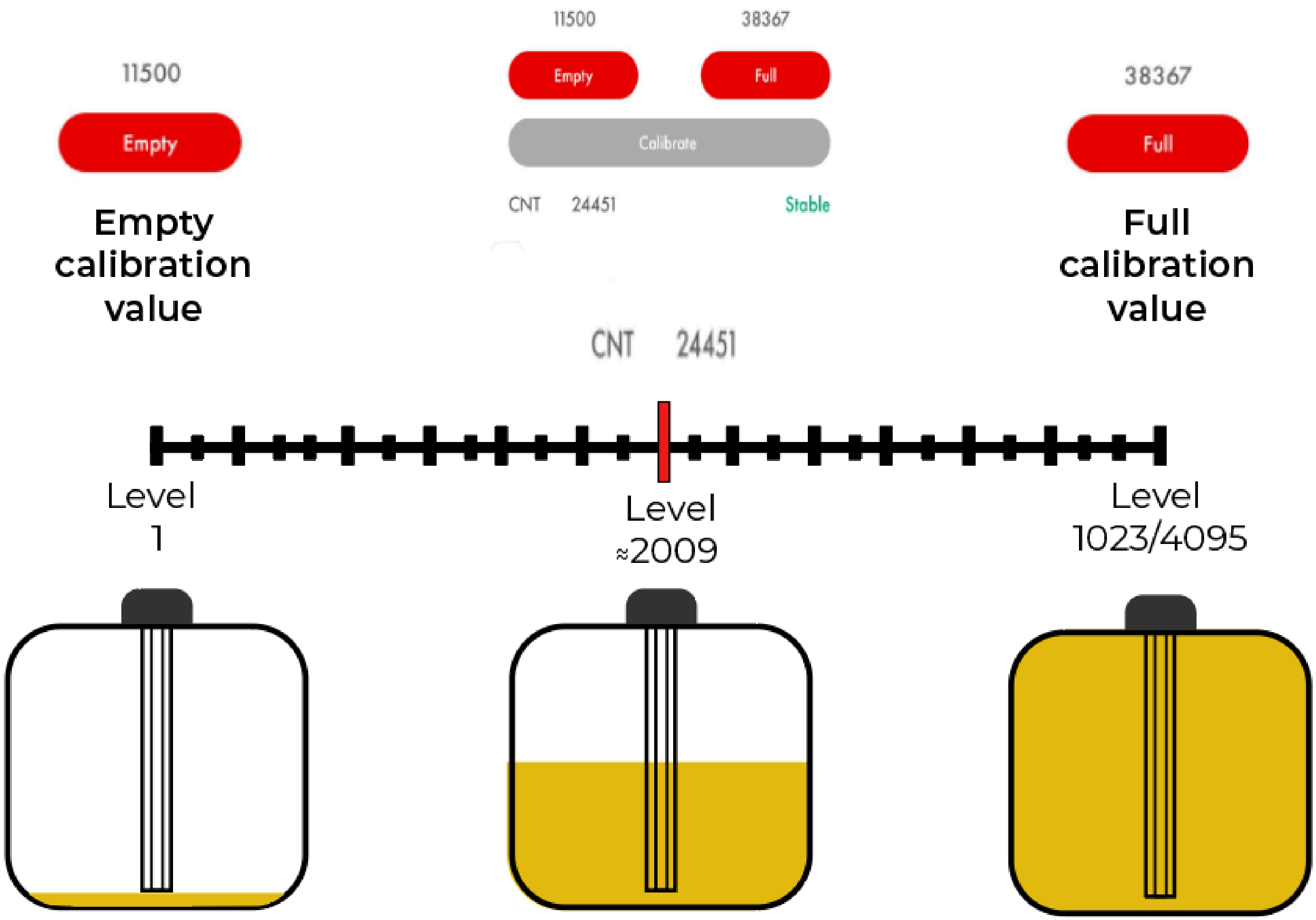



**Fig. 13** CNT, level and physical fuel level

When you calibrate the sensor, the current CNT value is saved as either the Full calibration value (if you press the **Full** button) or as the Empty calibration value (if you press the **Empty** button).

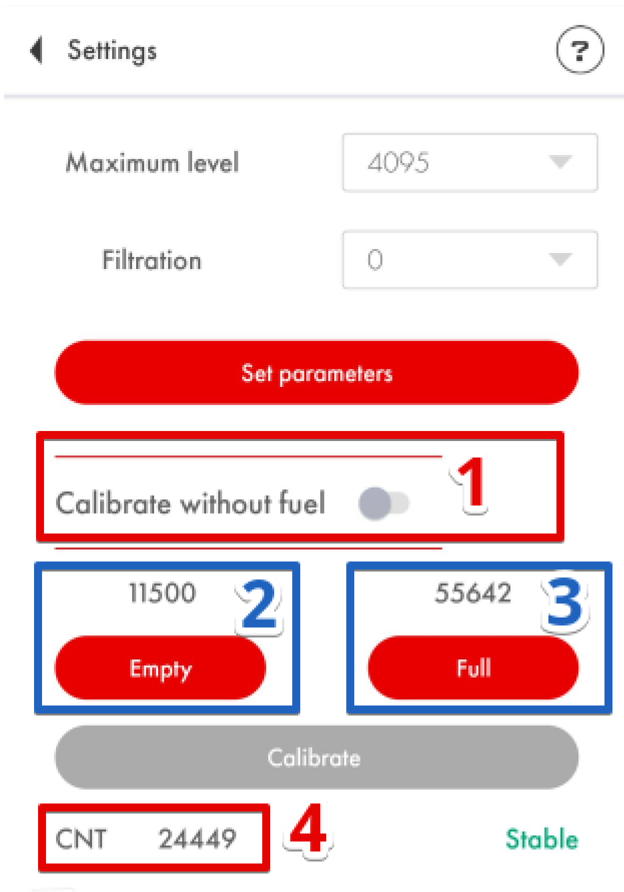



**Fig. 14** CNT and Full **before** pressing Full

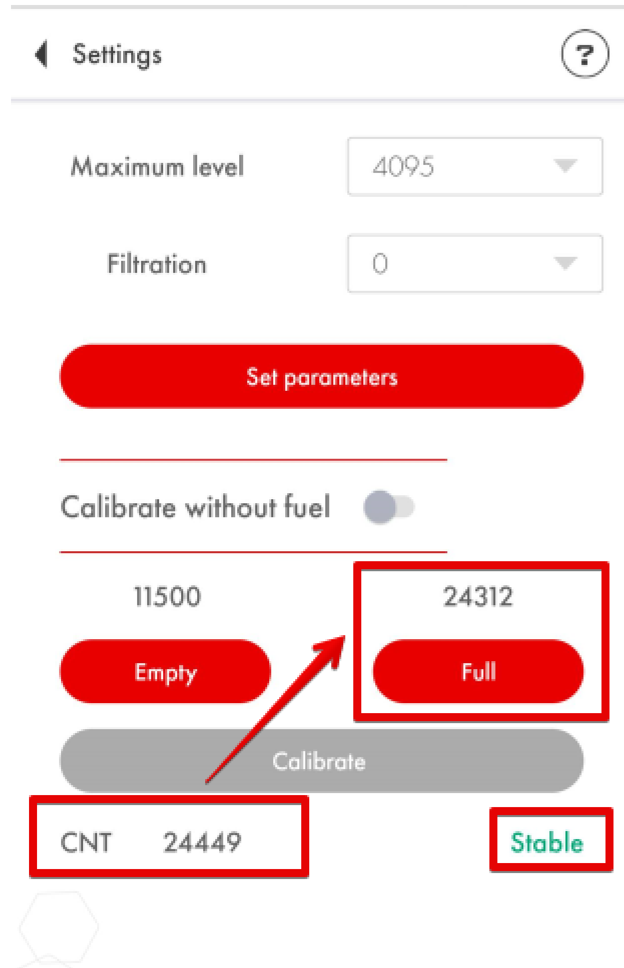



**Fig. 15** CNT and Full **after** pressing Full

## How to and why calibrate sensors?

Initially, the sensor is calibrated at its original length. **Once you change it by cutting or extending the tubes, you need to recalibrate it** i.e. to record the new CNT values that the sensor calculates when its tubes are either full or empty.

That is why you need to:

- Insert the centrator from the sensor's kit into the tubes (**Fig. 16**)

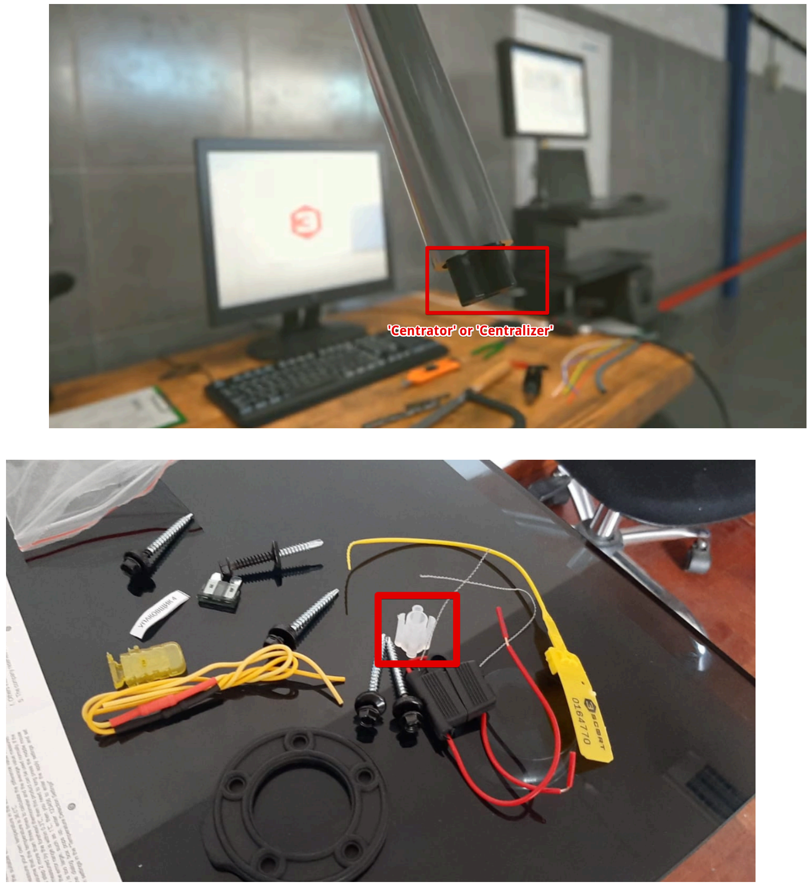



**Fig. 16** Centrator/centralizer

- Fill the tubes with fuel by either covering the drainage hole with insulation tape and turning the device upside down (**Fig. 17**) or by putting the sensor into a recipient so that the fuel reaches the edge of its head (**Fig. 18**). The first way is better.

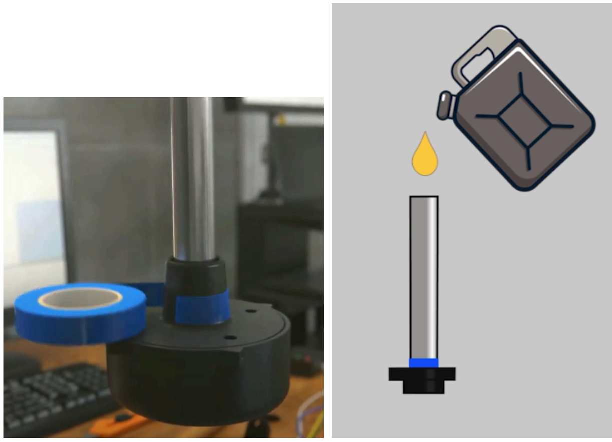


**Fig. 17** Covering drainage hole, turning the sensor upside down and filling the tubes from a jerry can

**Fig. 18** Filling the tubes by putting the sensor into fuel

- Switch off the **Calibration without fuel** tumbler (**Fig. 19**) and press the **Full** button (**Fig. 20**, **1**) when the level is **Stable** or the digit before the last two of the CNT value stops changing (**Fig. 20**, **2**)

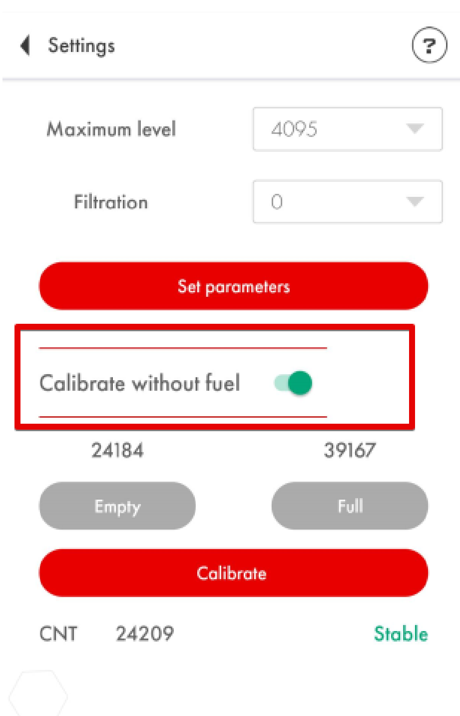



**Fig. 19** Deactivate the Calibrate without fuel option

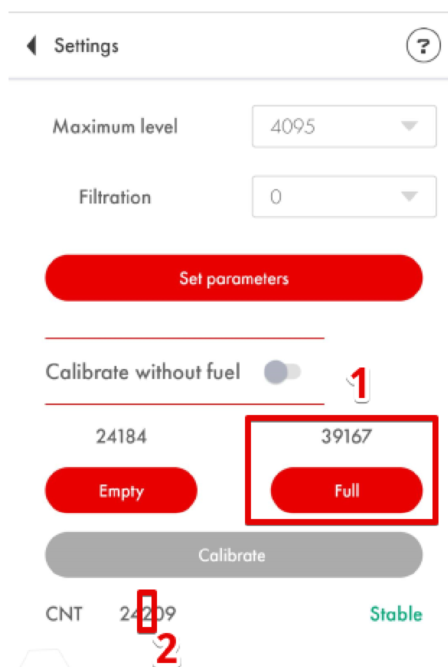



**Fig. 20** Press **Full** when the level is stable

- Next, empty the tubes, wait for 2-3 minutes for the last drops of fuel to get out of the tubes and press **Empty**

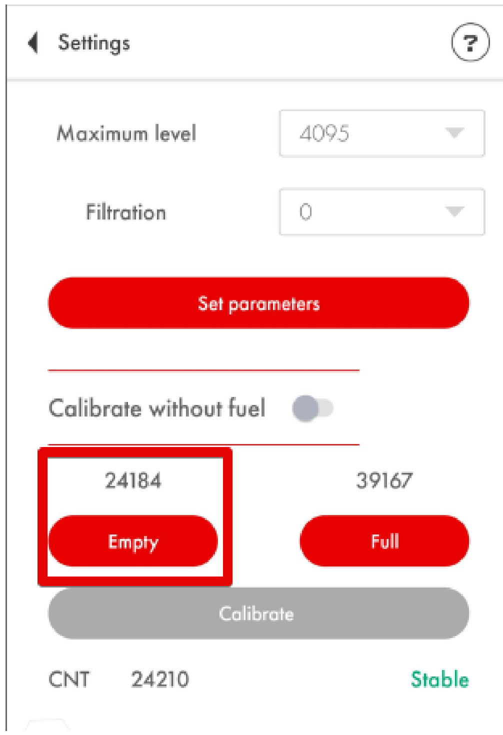



**Fig. 21** Press **Empty** button when the tubes are empty

## Calibration without fuel

Alternatively, you can calibrate the sensor without fuel.

In this case, make sure the sensor's tubes are empty and there is no fuel in its tubes. Leave the **Calibrate without fuel** tumbler active (green) and press **Calibrate**. The values above the Empty and Full buttons will change automatically. **Figures 22** and **23** show change in the calibration values.

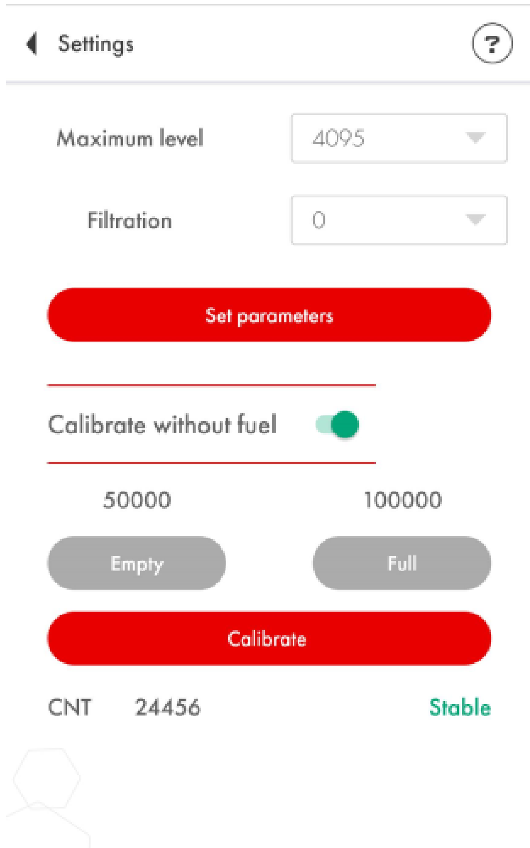



**Fig. 22** Calibration values BEFORE calibration without fuel

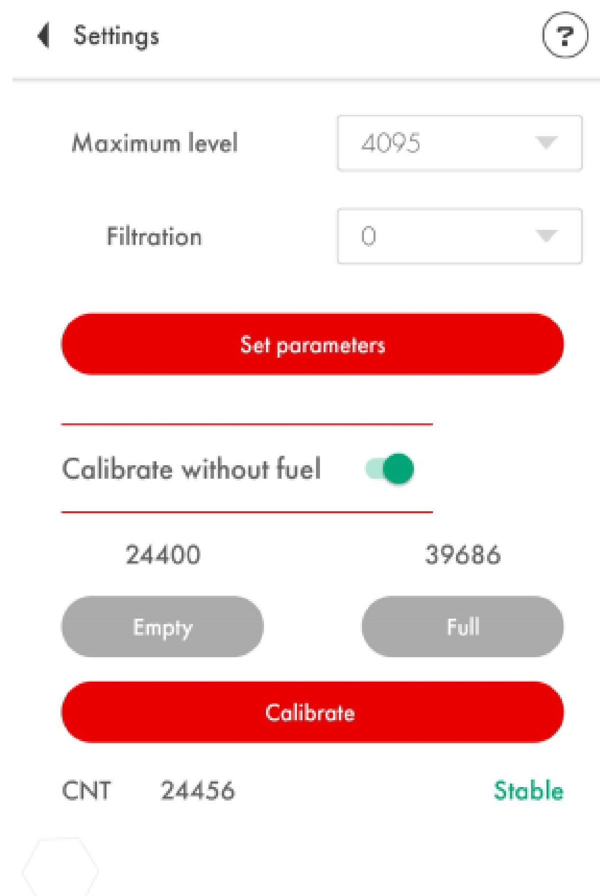



**Fig. 23** Calibration values AFTER calibration without fuel

If you calibrate the sensor without fuel, the measurement range could change a little bit.

Originally there are two measurement ranges:

- From 1 to 1023
- From 1 to 4095

**The sensor never transmits the value of 0. When it is empty, the level is shown as 1.**

Sometimes when you calibrate a sensor without fuel, the range can change from 1...4095 one to the 36...3986 one, for example.

It is nothing to worry about if you do the tank calibration properly.

# When and how to select the 1024 or 4096 range?

The **1...1023 measurement range** is generally recommended for the **sensors shorter than 500 mm**. The 1...4095 measurement range is recommended in all other cases.

To change the range, open the Settings menu and select one of the two ranges in the **Maximum level** dropdown menu (**Fig. 24**). Then be sure to tap on the **Set parameters** (or **Write parameters to device**) button (**Fig. 25**).

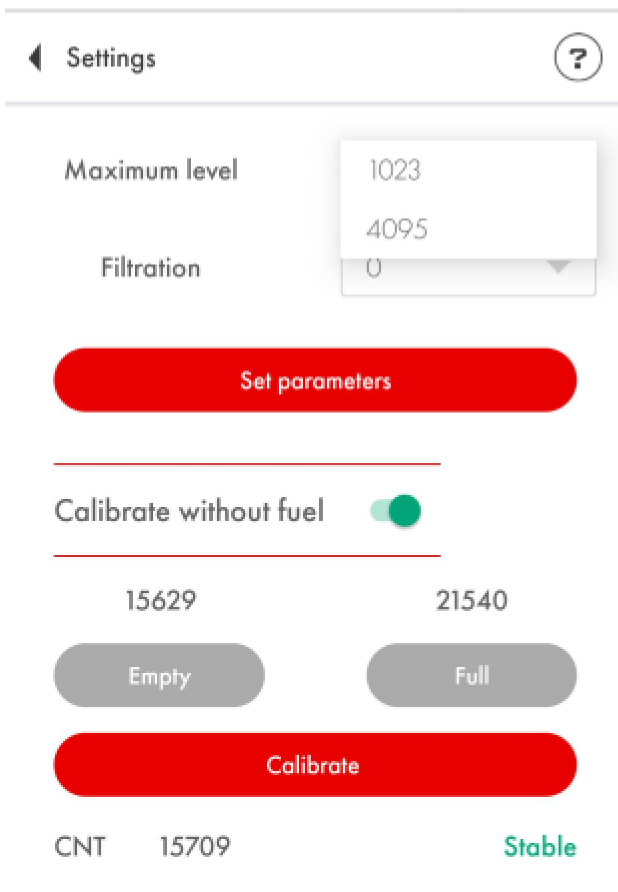



**Fig. 24** Maximum level - select range

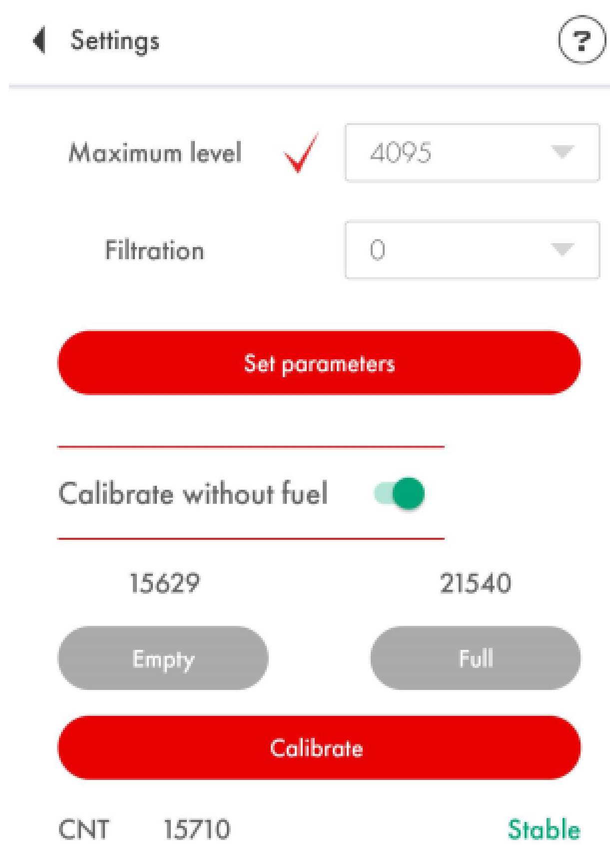



**Fig. 25 Set parameters** to apply the change and remove the red tick

## How to check if the sensor is properly calibrated?

The Empty calibration value must be at least x1.4 lesser than the Full calibration value.

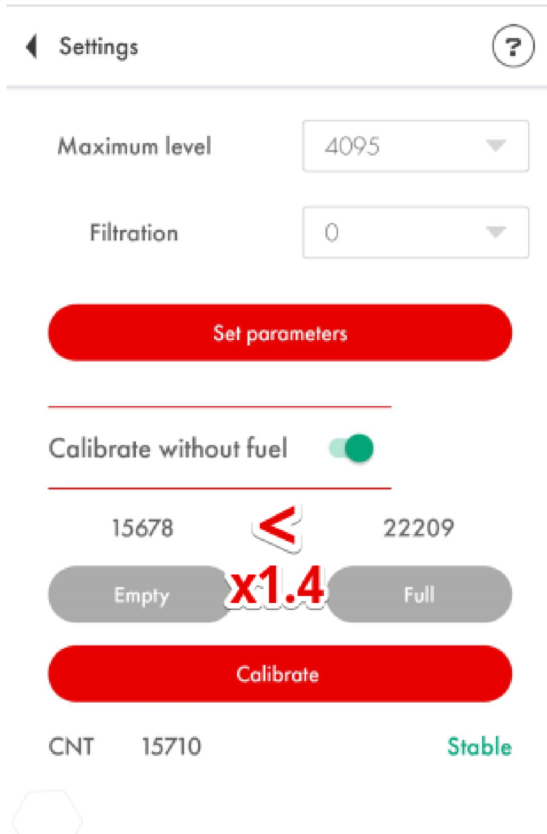



**Fig. 26** Properly calibrated sensor
22 209 (Full) : 15 687 (Empty) ≈ 1.4

# Tank preparation

To prepare the tank, you need to:

- Empty the tank and clean any dirt from it if necessary
- **Remove any fuel vapors and fumes** (especially if it is a gasoline/petrol tank); to do so, you can boil some water in a separate recipient and administer the vapor from that recipient into the tank so it could "push" the fuel vapors and fumes out; be sure to keep the fire used to boil the water far enough from the fuel tank (**Fig. 27**)

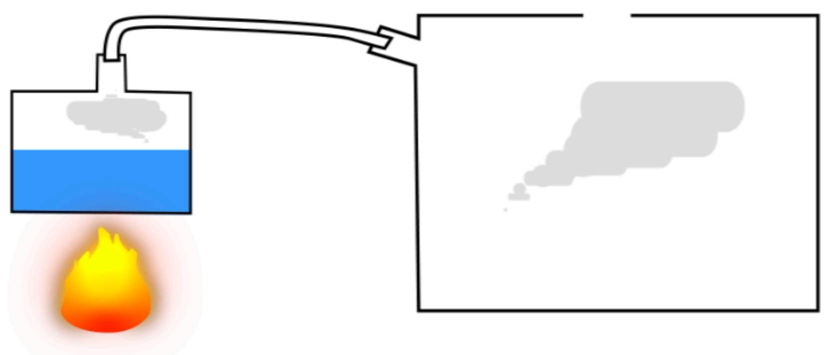


**Fig. 27** Removing fuel vapors

- **Find the geometric center of the tank** (**Fig. 28**) and **drill a little hole** in it using a **ø3mm bit.** Then probe the space around it for any reinforcement plates/ribs or baffles inside the tank using a piece of wire (**Fig. 29**);

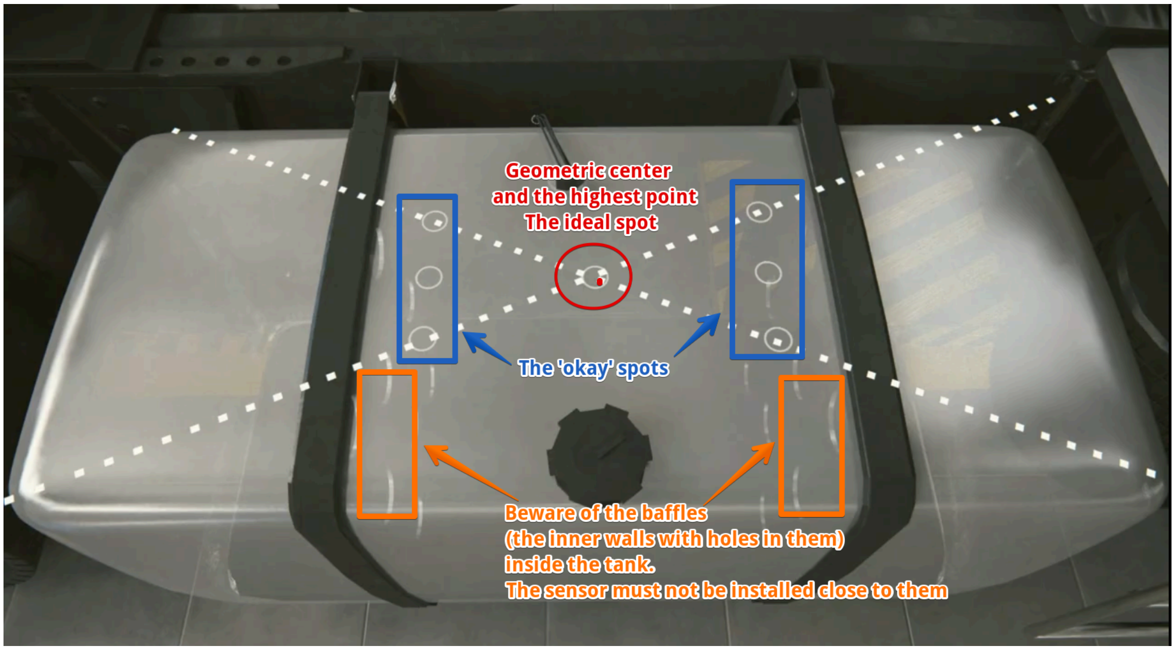



**Fig. 28** Selecting the spot


**Fig. 29** Drilling a hole to later probe for any obstacles inside with a piece of wire

- If the space around the selected spot is clear, **drill a bigger hole with a ø 35 mm bimetallic hole saw**; be sure to tilt the saw a little bit to prevent the cut piece from falling into the tank (**Fig. 30 and 31**). Use a magnet to collect metal shavings and keep them from falling into the tank.

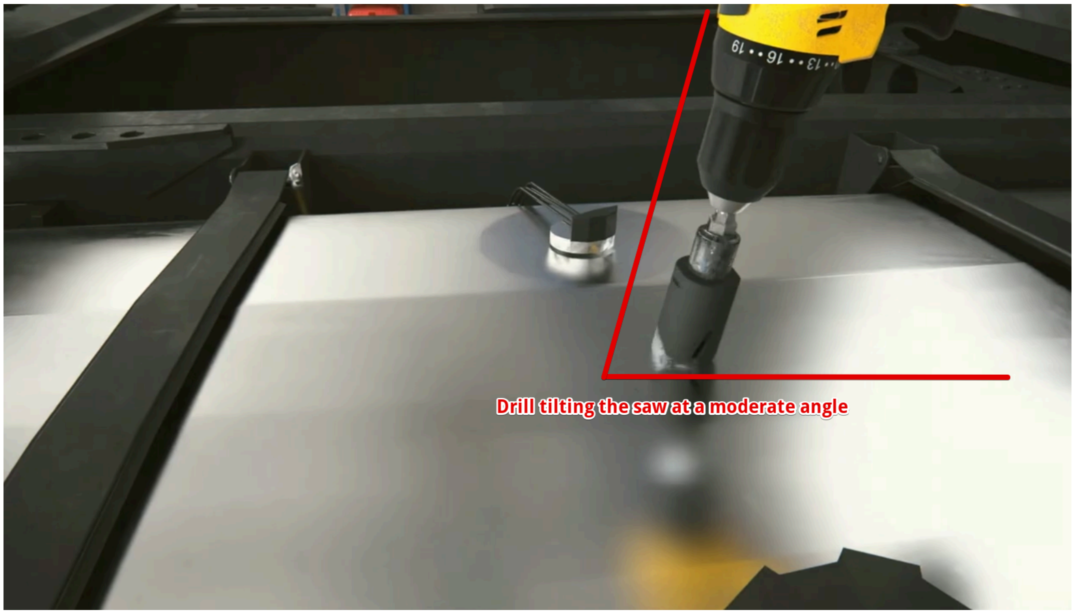



**Fig. 30** Drilling a hole at an angle

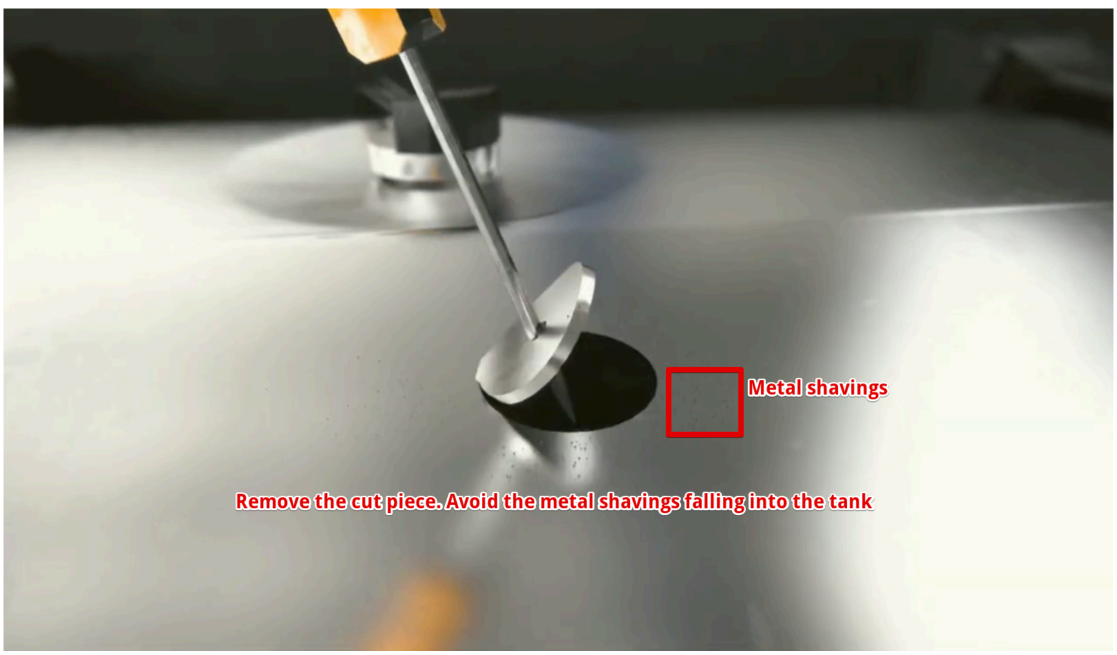



**Fig. 31** Removing the cut piece

If the sensor cannot be installed in the geometric center of the tank, try to pick a spot as close to the geometric center as possible; that spot also must coincide with the point where the tank's height is at its maximum. This way you **minimize the magnitude of the oscillations** in the level readings caused by the fuel's sloshing during trips.

## Why must the sensor be installed in the geometric center of the tank?

**The highest point must be selected** for the sensor to be able **to measure all the fuel** inside the tank **without any blind zones**.

The readings of the sensor installed in the center of the tank will be less affected by the fuel sloshing than the readings of the sensor installed close to one of the tank's walls.

If the sensor cannot be installed in the tank's center, consider installing two sensors - one at each end of the tank. Each sensor will compensate for the fuel surges and drops in the readings of another.

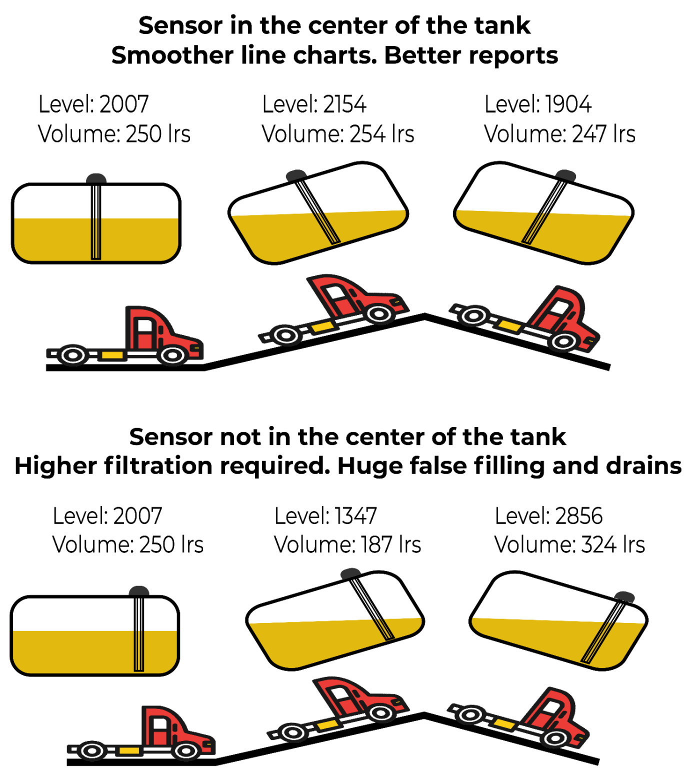



**Fig. 32** Position of the sensor and fuel sloshing

# Sensor adjustment

Before calibrating the sensor, you need to **adjust the length** of its measurement tubes according to the height of the tank by either cutting or extending them. **The length of the tubes** should be calculated based on the **following formula**:

**L = H - 15 mm**,

where **L is the length of the tubes** after they were cut or extended and **H is the height of the tank** at the installation spot.

**ATTENTION!!! The minimum length of the tubes must not be less than 15 cm (150 mm). Otherwise the sensor will not work properly. The maximum length of the tubes can reach 6 m.**


**Fig. 33** Measuring the height of the tank

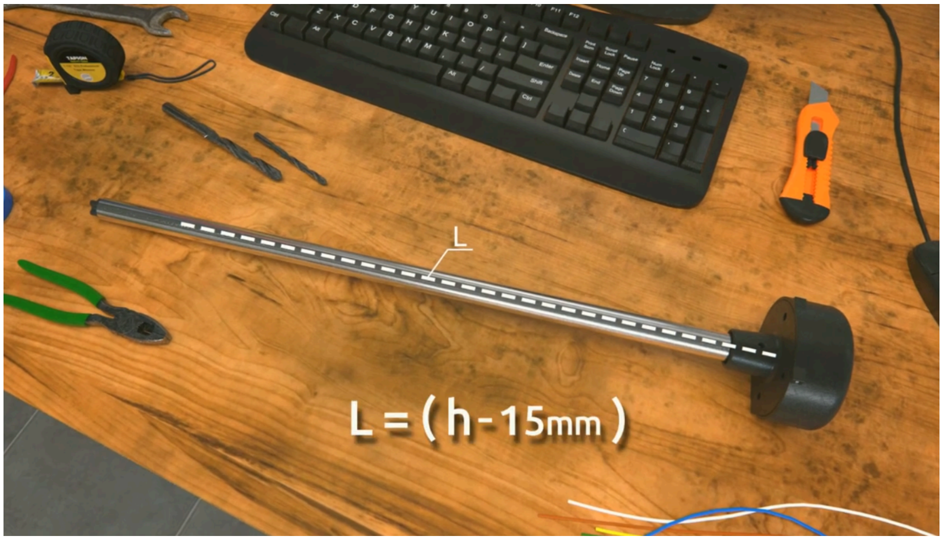



**Fig. 34** Establishing the length of the tubes

To cut the tubes, use a metal hacksaw. Be careful while cutting them and avoid damaging the connection between the tubes and the sensor's circuit inside its head.

**Fig. 35** Cutting the tubes

**Do not let any metal shavings end up stuck inside the tubes: that could provoke a short circuit in the sensor and then you would need to blow the tubes with compressed air through the drainage holes under the sensor's flange.** Treat the cut with a piece of sandpaper to remove any irregularities and burrs.

**To extend the tubes** of the sensor, **use a collet coupling** and an extra piece of tubes.

**Fig. 36** Collet coupling

The collet nuts (the gold-yellow ones shown on the **Figure 36**) connect the parts of the inner tube. Once inserted into the parts of the inner tubes and screwed onto the stud bolt, they don't have to touch but try to drive them as close to each other as possible without breaking the tubes (**Fig. 38**).

**Fig. 38** Collet coupling. Inner coupling

The outer coupling cylinder and its nuts must be tightened up as hard as possible. The outer tubes of the sensor must touch each other.

**Fig. 39** Collet coupling. Outer coupling

**Fig. 40** Collet coupling fixed

Be sure to check out this video on our YouTube channel to see the coupling assembled in real time.

# Tank calibration

Once the sensor's length is adjusted and it has been recalibrated, you need to install it in the tank.

Mount the sensor into the tank driving its tubes through the ø 30-35 mm hole you drilled previously. Make sure that the **gasket** is placed between the sensor's flange and the tank's top surface. Then screw in the self-tapping screws from the sensor's installation kit into the ø 3mm holes you drilled earlier.

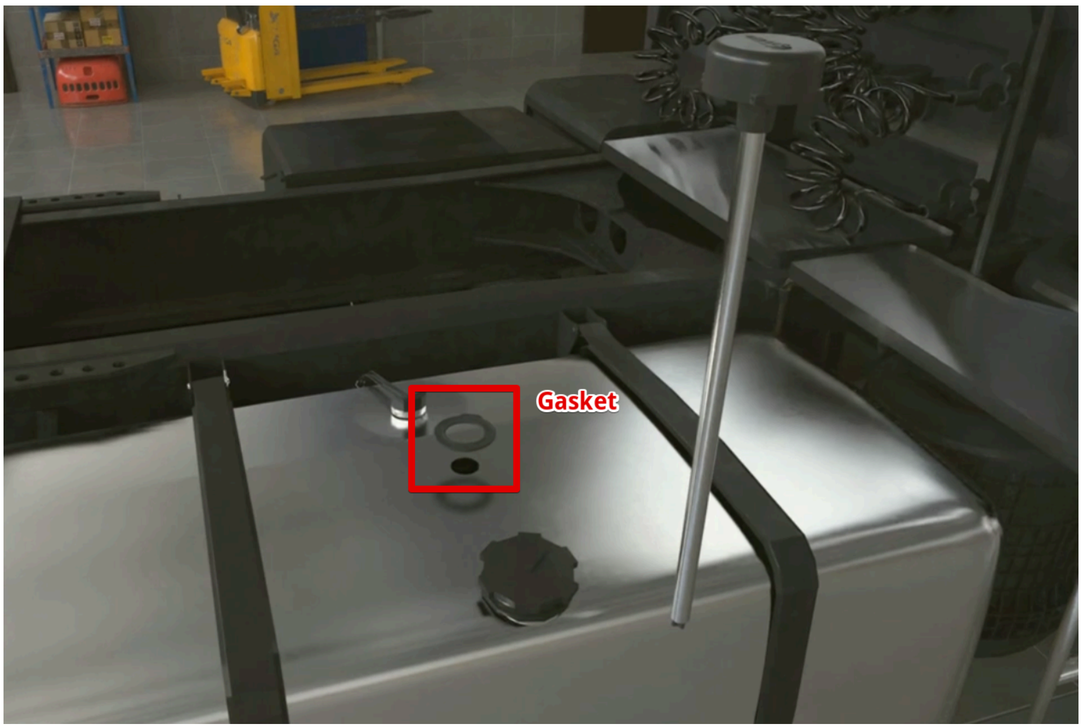



**Fig. 41** Putting the sensor inside tank

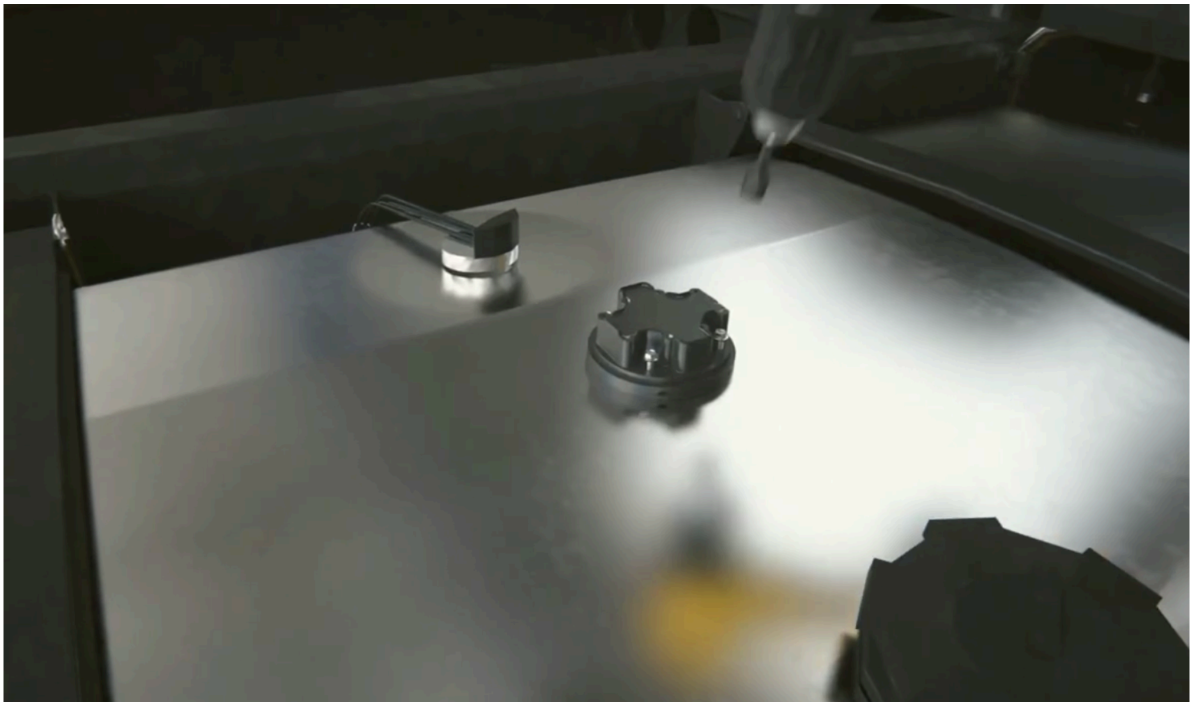


**Fig. 42** Fixing the self-tapping screws

Begin the tank calibration. This procedure results in a level-to-liters or level-to-gallons **table** that enables your monitoring platform **to convert the level readings** the sensor outputs **into liters/gallons** displayed in the reports you get from the platform.

Alternatively, you can save the table in the sensor's memory so that it could output the readings in liters/gallons already. The internal memory of the TD-BLE sensor can store a tank calibration table of 50 rows in total. Normally, the platform's capacity is a lot higher.

Besides, it is easier to adjust or correct any mistakes in the table if it is uploaded onto the platform rather than if it is saved in the sensor's memory.

To create such a table, you need to fill the tank step-by-step adding the fuel into the tank portion-by-portion and recording the level-to-liters(/gallons) correlation after each portion is added using the Tank calibration menu of the app.

Let's say that you need to do a tank calibration for a tank with a total capacity of 100 liters and do that in 10 portions equal to 10 liters each.

To do so, you need to connect the sensor, enter the **Additional features** and tap on the **Tank calibration** button (**Fig. 43**). However, first, make sure that the filtration is set to 0 in the

**Settings** menu (**Fig. 44**). The filtration slows the level calculation down and can increase the time needed to complete the tank calibration.

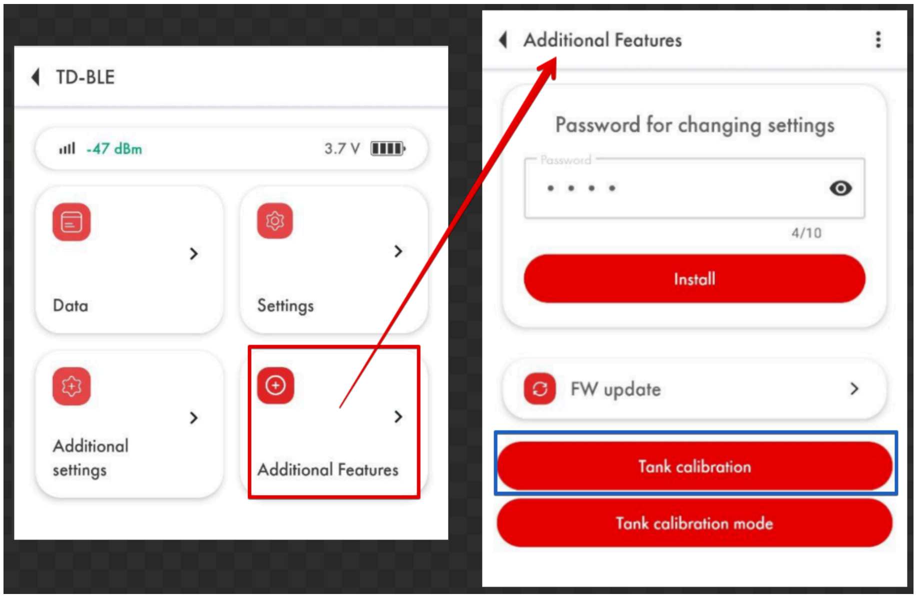



**Fig.43** Entering the tank calibration menu

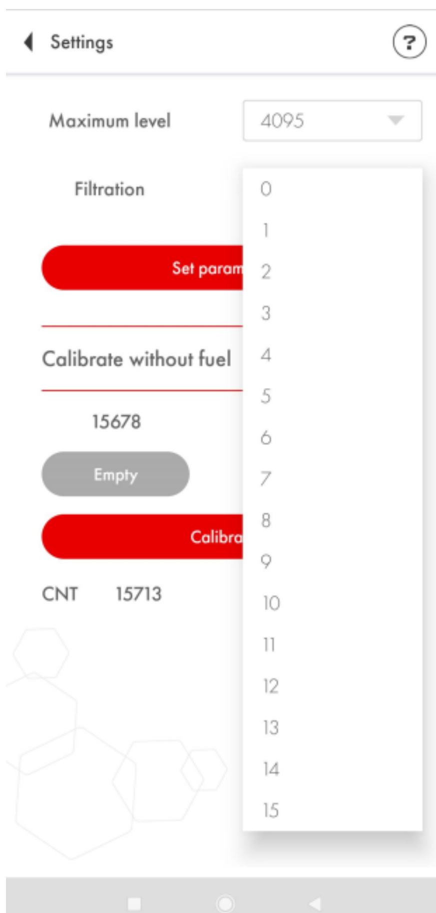



**Fig. 44** Select 0 Filtration and press Set parameters (Write parameters to device)

Next, you can either **Start** creating a new table or select the file you might have already created and **Continue** working with it.

If you press Continue, then you will need to find the table on your Android device where you previously created/placed it. Select another folder via the main menu button (**Fig. 46, 1**) or via the dropdown menu (**Fig. 46, 2**). Find the table and tap on it (**Fig. 46, 3**)


**Fig. 45** Start or Continue

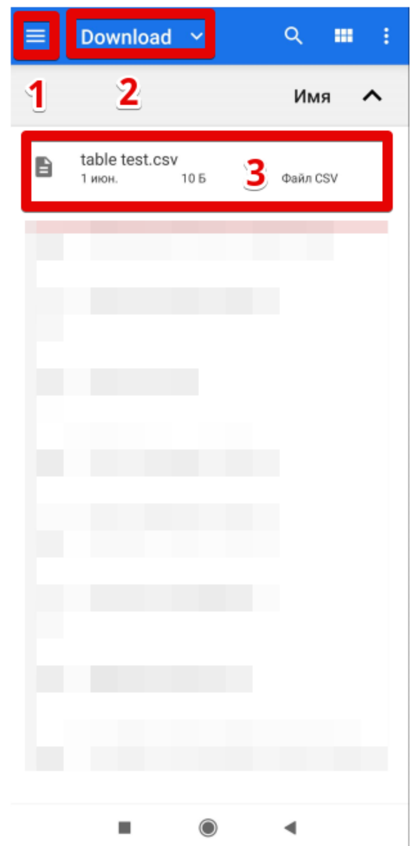



**Fig. 46** Set parameters to apply the change and remove the red tick

If you press **Start**, then, once again, choose the folder in which the table will be saved (**Fig. 47**, **1**, **2**) and press the button to select it (**Fig. 47**, **3**)


**Fig. 47** Selecting folder and creating a new file

Then you can select either **Filling** or **Draining** method (**Fig. 48**, 1, 2). **The filling method is recommended because it tends to be more accurate**.

In case of the draining method you can never be 100% sure of what is the current volume of the fuel inside the tank (**Fig. 49**) and if the tank is 100% full.

Next, give the table's file a name (**Fig. 48**, **3**) and set the portion volume (**Fig. 48**, **4**).

**ATTENTION! Portion volume is not the number of portions! It is the number of liters/gallons each portion will be equal to!** In the example below the tank supposedly contains 100 liters and that volume can be divided into 10 portions of 10 liters. If the tank had a total capacity of 300 liters and the idea was to calibrate it in 10 portions, the Portion volume would have been set as 30 liters.

Once finished with all that, press **Continue** (**Fig. 48**, 5).


**Fig. 48** Select method. Table name. Portion volume

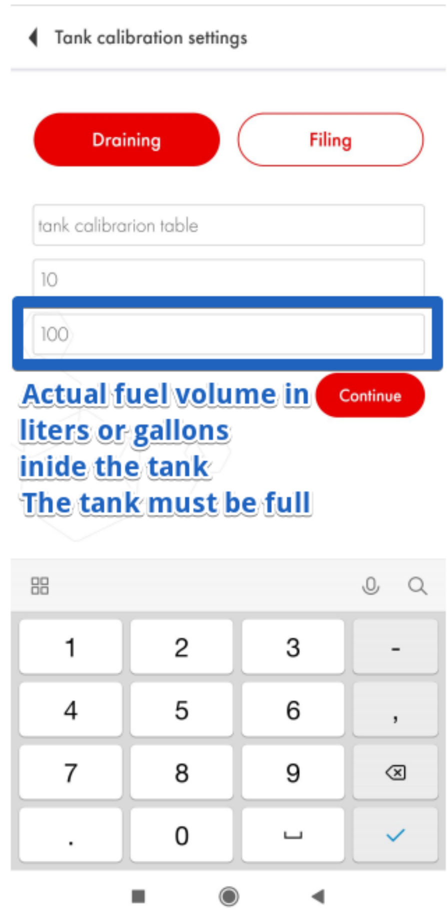



**Fig. 49** Draining method. Actual volume of a full tank

Then you will see the table with the first row that reads 0 liters or gallons and level 1 (**Fig. 50**).

Also, the **Tank calibration mode** will be activated (available in the sensors with the FW 1.3.3 and newer). It means that the **sensor starts measuring the level every 5 seconds** instead of doing so every 10 seconds. It will be working in that mode **for the following 30 minutes**.

Swipe from the top to bottom of your screen to check if the timer is still on (**Fig. 51**).

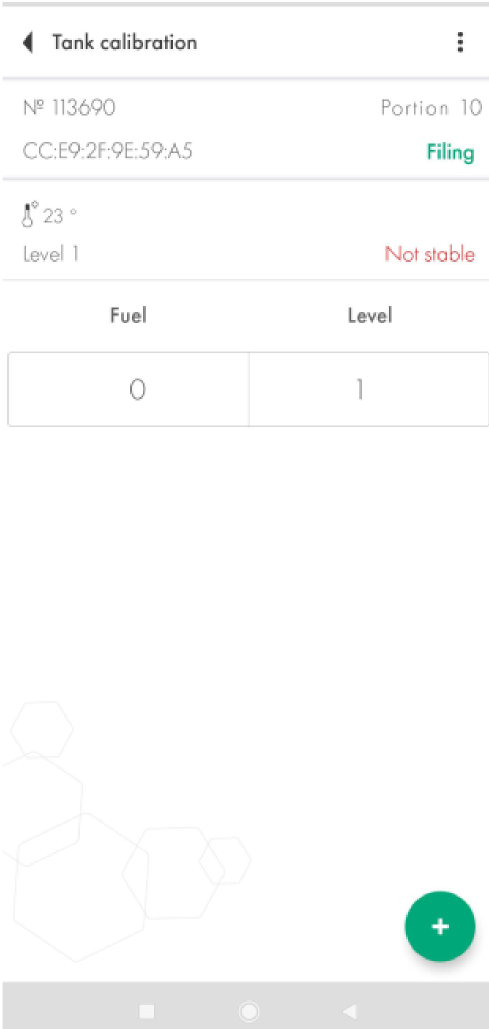



**Fig. 50** First row. 0 liters/gallons and level 1

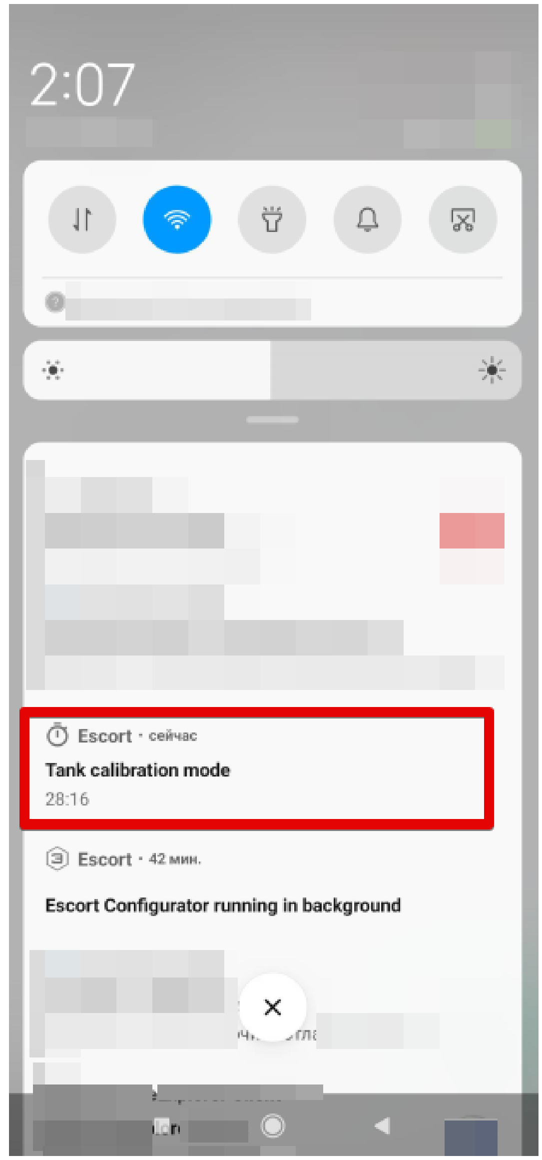



**Fig. 51** Tank calibration mode timer

If the timer runs out before you are finished with the tank calibration, you can reset it by **saving** the table (**Fig. 51**, **1**, **2**) , then going back to the previous menu (**Fig. 51**, **3**) and then pressing **Continue** and selecting the file with the table to continue doing the tank calibration with the timer reset. After you select the file, you will be asked to confirm the method you selected before and confirm or change the portion volume (**Fig. 52**).

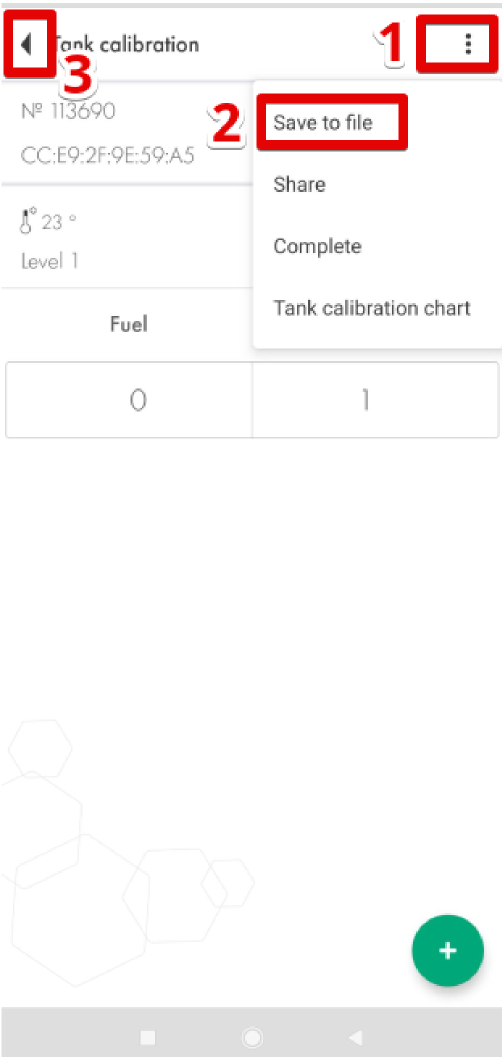



**Fig. 52** Save table and leave

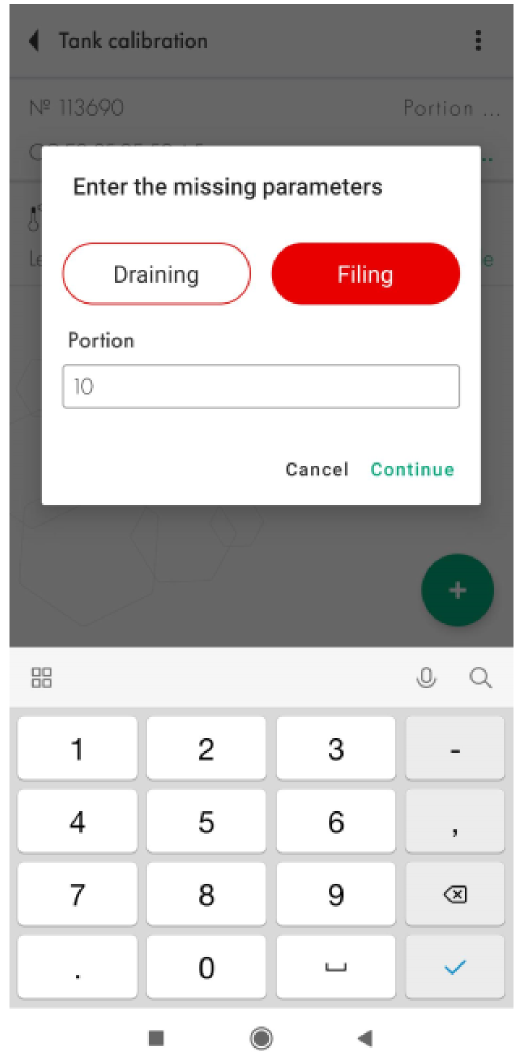



**Fig. 53** Resuming tank calibration

In general, the table is saved automatically after you press the ✚ button.

Next, you need to add the first portion of the fuel into the tank (**Fig. 54**). Once the level has changed (**Fig. 55**, 3) and has been reported to be stable (**Fig. 55**, 4), tap on the ✚ button (**Fig. 54**, 1).

In this example the level (**Fig. 55**, 3) doesn't change because we did not have any fuel to do a real tank calibration when working on this manual. In your case, the level must change and its status must be Stable before you press the ✚ button.

The next row will appear (**Fig. 55**, 2). The **value in the Fuel column** will increase by the value you indicated in the **Portion** box when you created the table or changed it (**Fig. 55**, 3) last time.

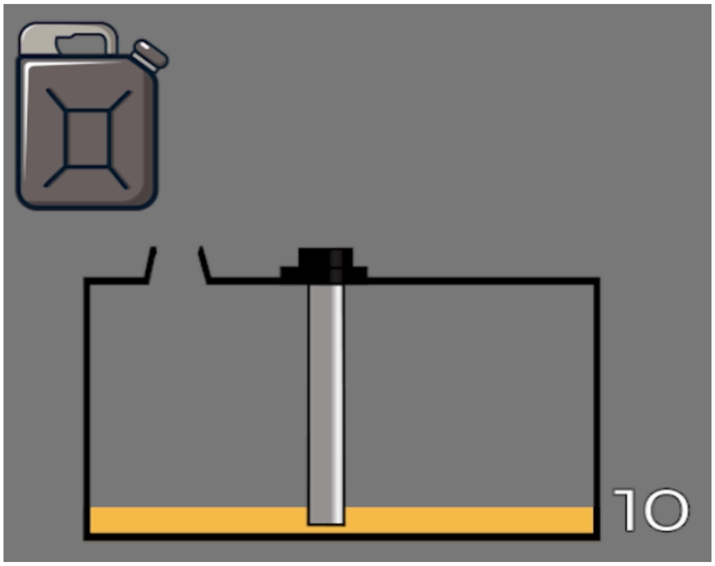



**Fig. 54** Add the 1st portion into the tank

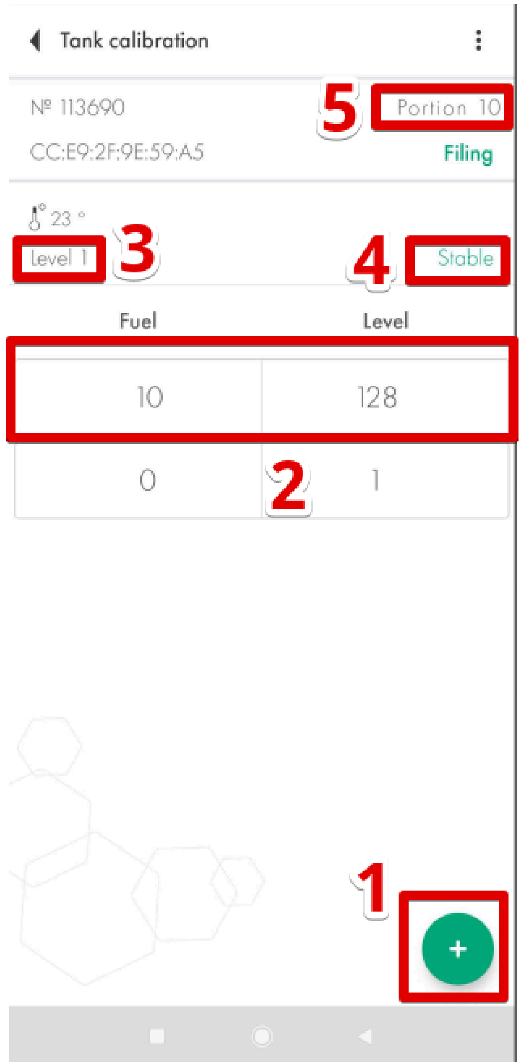



**Fig. 55** Press **+** button and the new row will appear

You can also edit any row by pressing and holding it for a few seconds until a new dialogue window appears (**Fig. 56**). This way you can correct any mistakes that could have been made before.

If you press and hold it and then swipe to the left, the row will be deleted (**Fig. 57**).

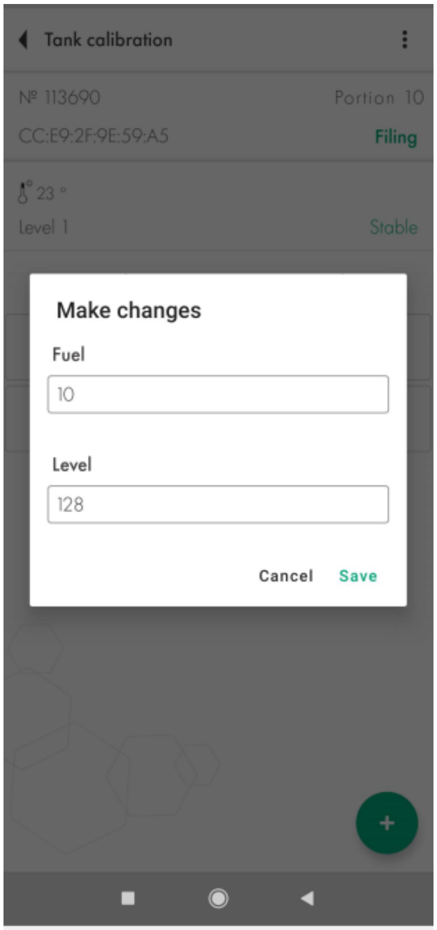



**Fig. 56** Edit the row

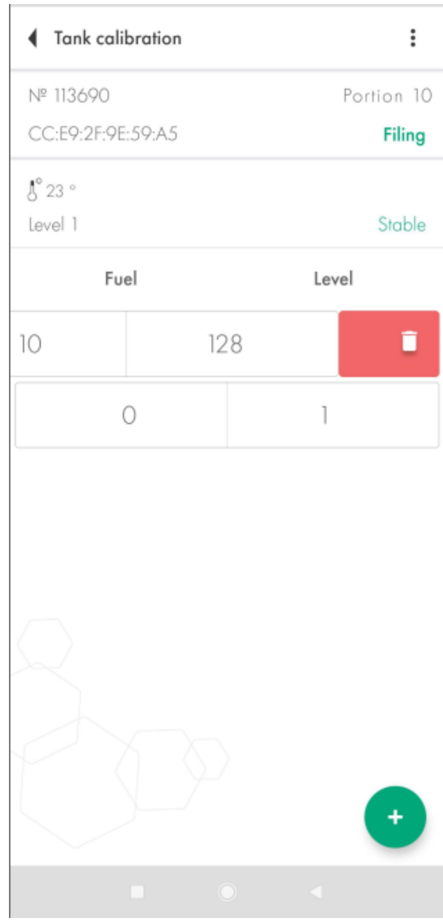



**Fig. 57** Delete the row by pressing, holding and swiping to the left

Then you add another portion of the fuel into the tank (**Fig. 58**). Wait for the level to change and become **stable** and then press the + button again (**Fig. 59**). **Continue until the tank is full.**

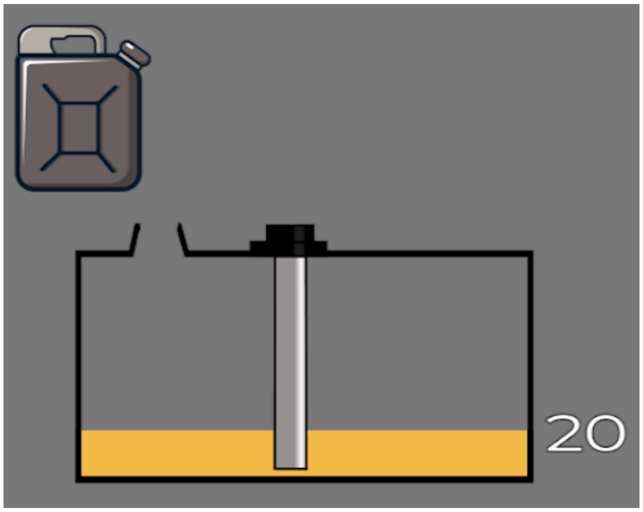



**Fig. 58** Add the next portion into the tank

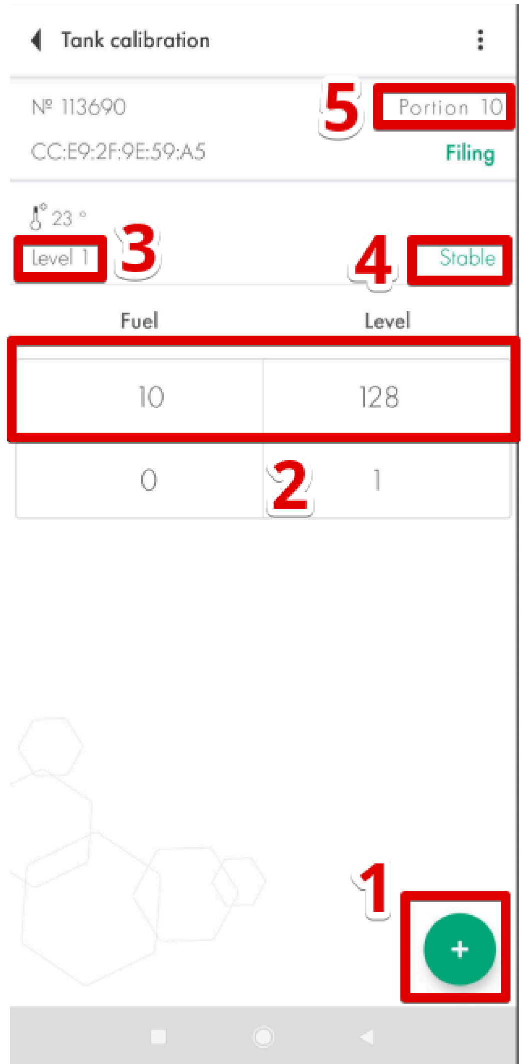



**Fig. 59** Press **+** button and the new row will appear

## What to do if the tank cannot be emptied completely?

If you cannot empty the tank completely, you need to somehow find out how many liters or gallons are already there in it. After that you can manually edit the table so it looked like the example below. Or simply edit the table file before uploading it onto the platform later.

Let's imagine that there are always 10 liters inside the tank that cannot be removed from there so when you put the sensor in the tank, it instantly shows the level 115 instead of 1.

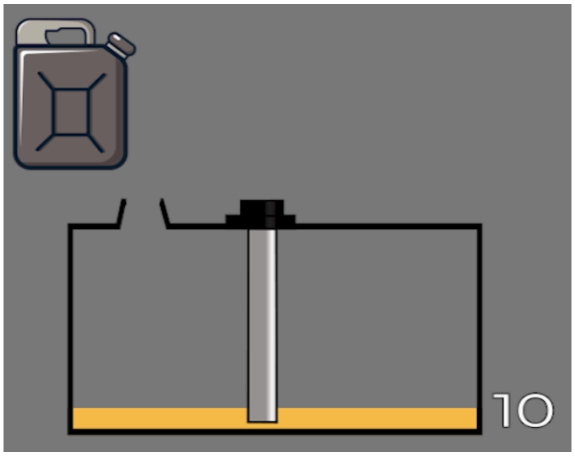



**Fig. 60** Ten liters inside the tank that cannot be removed

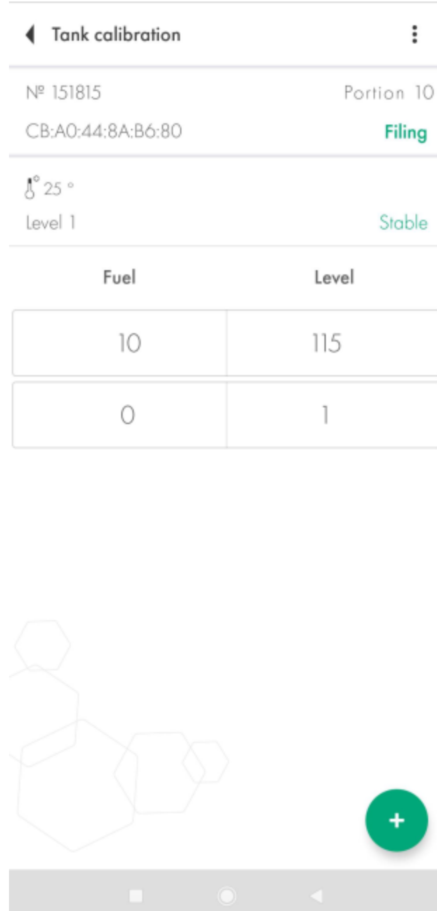



**Fig. 61** The table

You add the first portion into the tank. The level must change from 115 to a different value. If the level value doesn't change, check the drainage holes of the sensor. They could be blocked by an insulation tape you left there after the calibration at full and empty or some surplus of the sealer got stuck in them.

If this happens, the air inside the tubes gets trapped and doesn't allow the fuel go up the tubes.

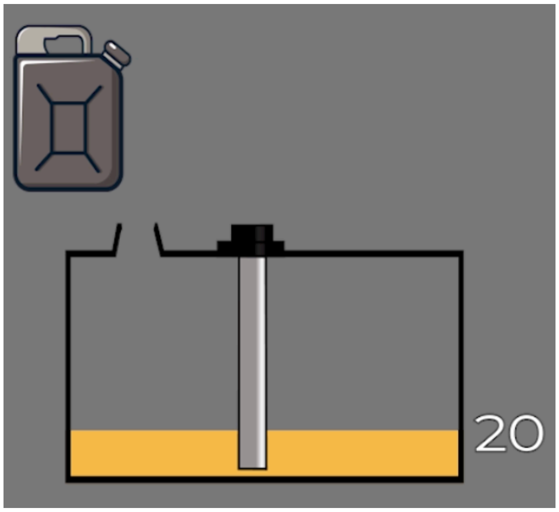



**Fig. 62** Second portion is in

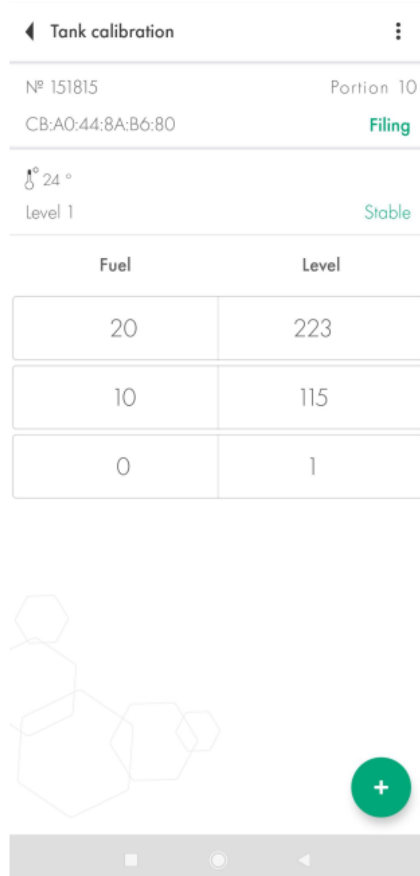



**Fig. 63** The table with two portions

You continue like that until the tank is full.

## Calibrating tanks with complex shapes

If there are some **curves** or other peculiarities in the tank's shape, be sure to **reduce the volume of portions** when the fuel level rises to that peculiarity of the tank. Once past that shape's peculiarity, switch back to the previous volume of portions.

Let's imagine that you do the tank calibration with portions of 10 liters just like before. The level gets to some peculiarity of the tank's shape.

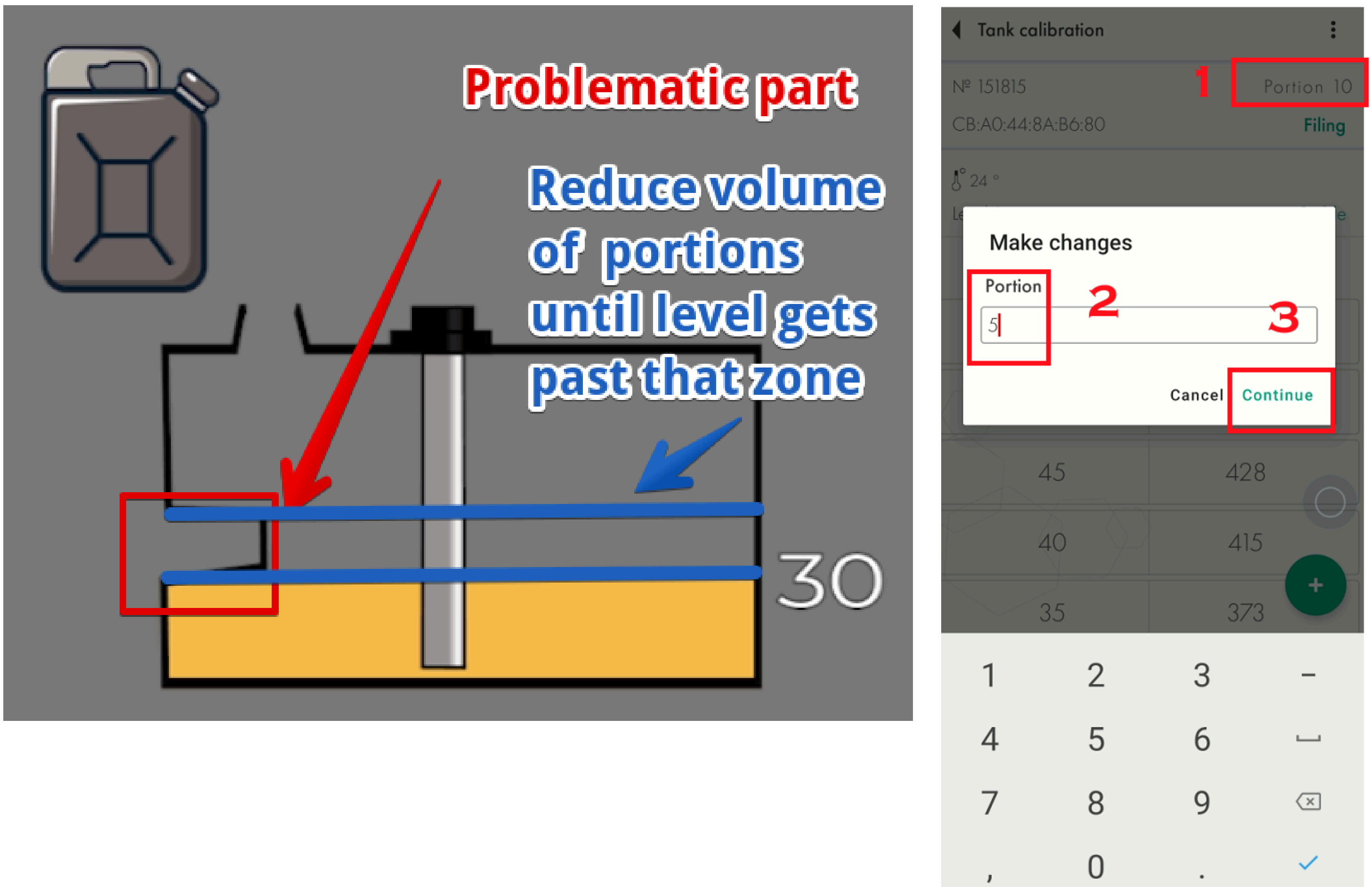



**Fig. 64** Reducing portions' volume

You reduce the portions' volume from 10 to 5 liters. And keep adding the portions until the level is above the problematic part.

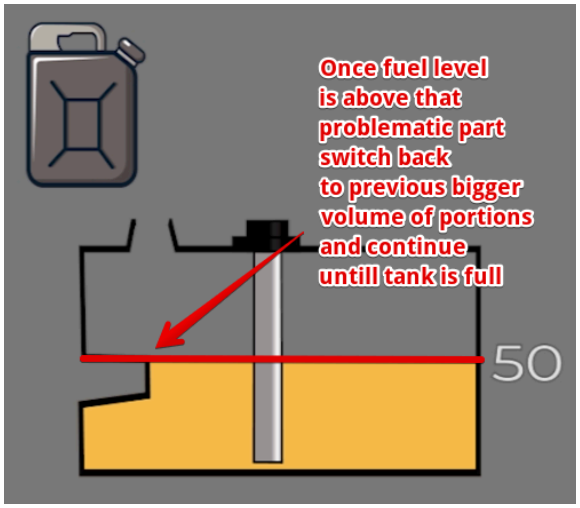



**Fig. 65** Switching to previous portions' volume

When the level is above the problematic part, you can switch back to filling the tank with portions of 10 liters.

When the tank is full, you should have a tank calibration table that looks like the following example.

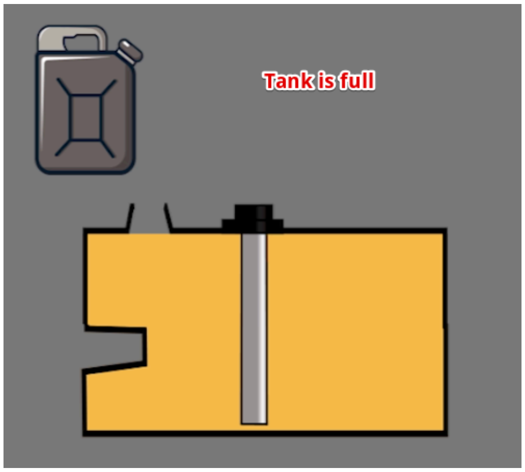



**Fig. 66** Tank filled

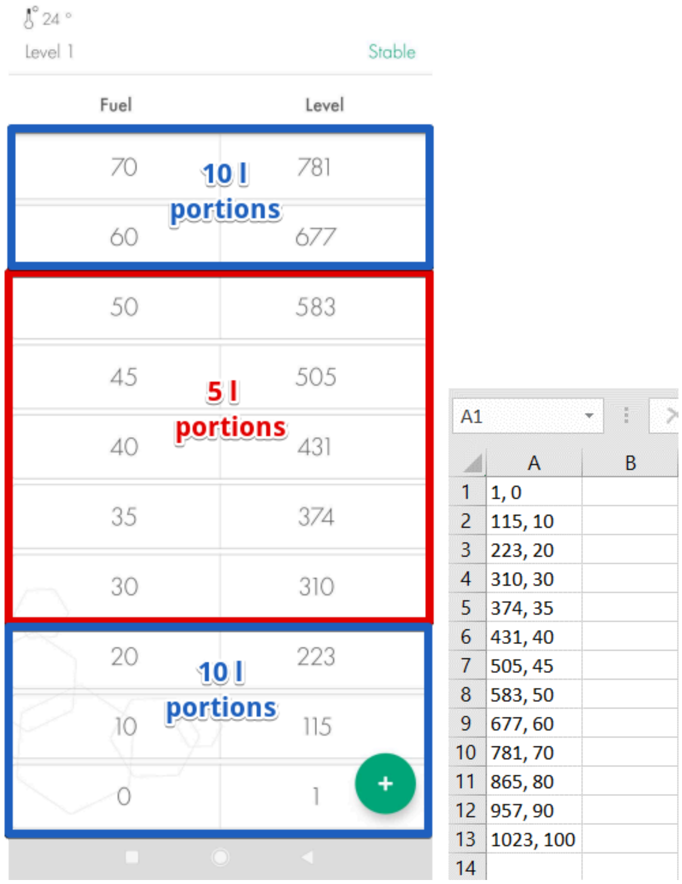
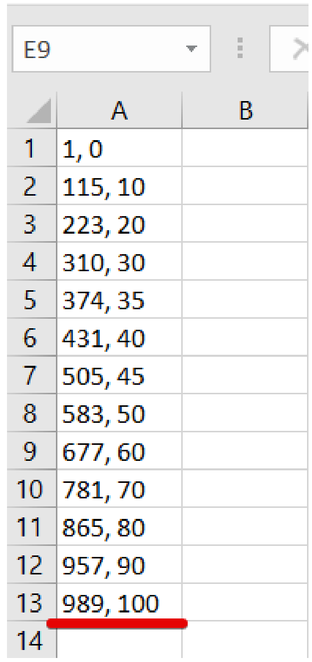



**Fig. 67** Tank calibration table in the app and with all rows in a .csv file

## What to do if the tank cannot be filled completely?

If in your case the level cannot reach 1023 or 4095 because you cannot fill the tank completely because of how it is shaped, don’t worry about that. It is fine if your table ends up looking like the following example although the range from 1 to 1023 was selected.



E9

| | A | B |
|---|---|---|
| 1 | 1, 0 | |
| 2 | 115, 10 | |
| 3 | 223, 20 | |
| 4 | 310, 30 | |
| 5 | 374, 35 | |
| 6 | 431, 40 | |
| 7 | 505, 45 | |
| 8 | 583, 50 | |
| 9 | 677, 60 | |
| 10 | 781, 70 | |
| 11 | 865, 80 | |
| 12 | 957, 90 | |
| 13 | 989, 100 | |
| 14 | | |

**Fig. 68** Tank calibration table in a .csv file

## How many portions to add?

The total number of the portions depends on the tank's total capacity. See the table with our recommendations below.

**Table 1**

**Recommended number and volume of portions for tank calibration**

| Tank´s capacity in liters | Number of portions | Volume of each portion in liters (Tank´s capacity/Number of portions) |
|---|---|---|
| 0-60 | 10-20 | 3-6 |
| 61-100 | 12-20 | 5 |
| 101-500 | 10-50 | 10 |
| 501-1000 | 20-50 | 20 |
| More than 1000 | In accordance with your capabilities. General rule: smaller volume of each portion and bigger number of portions = more precise data | |

The general rule is: **the more portions – the more precise will be the data in the reports on the platform**.

# Filtration

After the tank calibration is over, select the level of Filtration (**Fig. 70**) in the **Settings** menu (**Fig 69**) and tap **Set parameters** (or Write parameters to device).

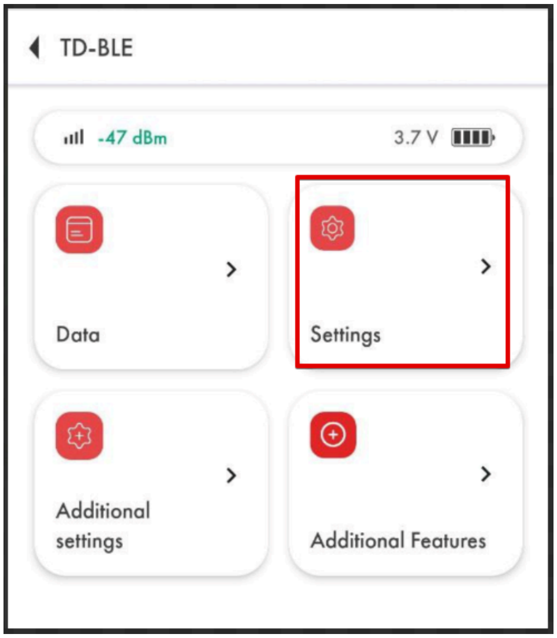



**Fig. 69** Settings

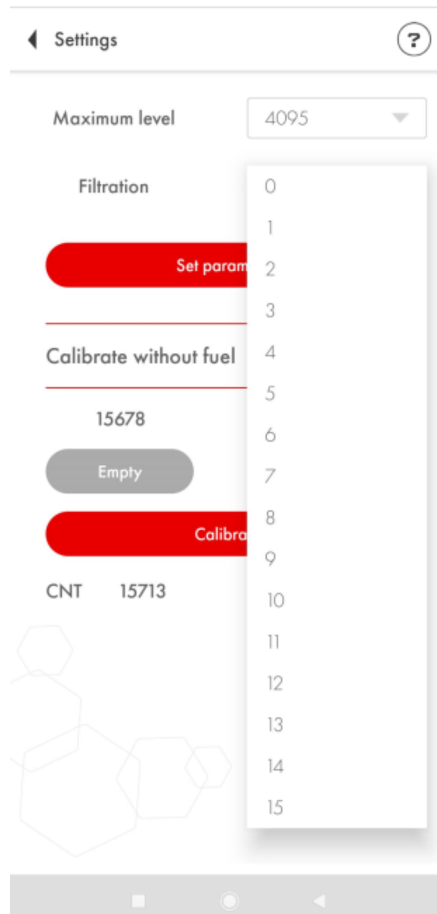



**Fig. 70** Select Filtration and press Set parameters (Write parameters to device)

The following are our recommendations on what level of Filtration to choose for a particular type of vehicle:

**Table 2**

## Filtration recommendations for TD-BLE:

| | |
|---|---|
| 0-1 | Stationary storage units and tanks |
| 2-4 | Trucks driving on good quality asphalt roads |
| 5-7 | Agricultural machinery (tractors, harvesters, etc.) |
| 8-10 | Heavy machinery units operating at querries, mines, open cuts and strips. |

These are some general recommendations.

The general rules are:

- The shorter the sensor (<30cm) the higher must be the filtration level
- The closer the sensor is to one of the tank’s walls, the higher must be the filtration level
- The rougher is the terrain, the higher must be the filtration

The filtration reduces the magnitude of level fluctuations that happen because of the fuel’s sloshing during trips.

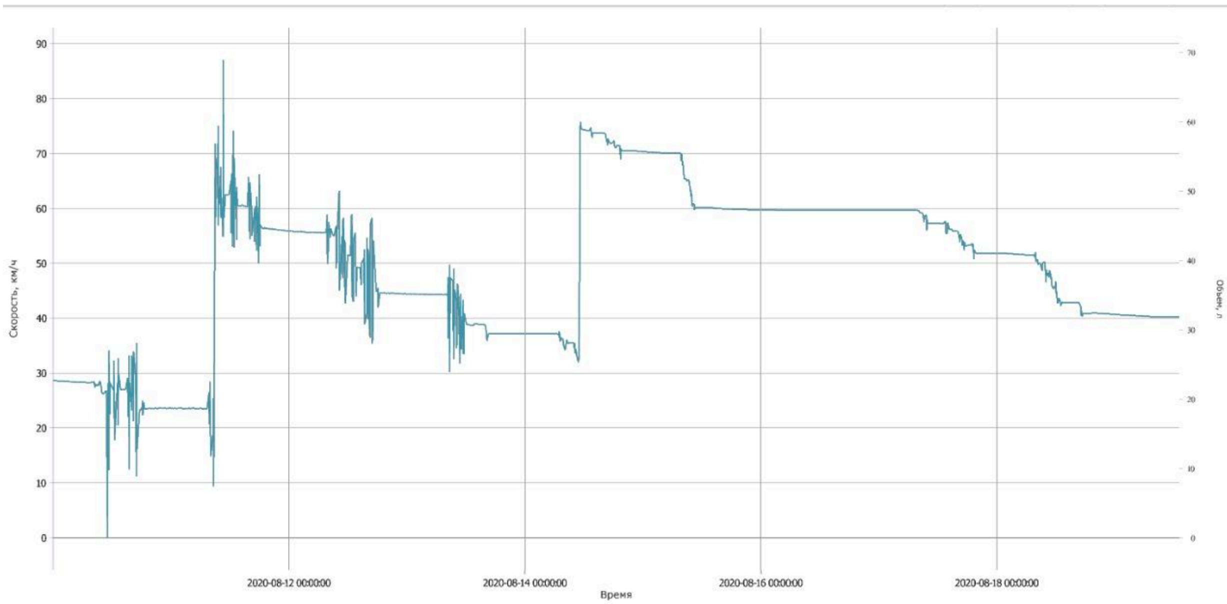



**Fig. 71** Before and after switching the filtration on

# Black Box

For the records saved in the sensor's black box to have proper time codes, be sure to synchronize the time of the black box with the time of your smartphone.

Currently, the app requests you to do that automatically if it detects that the clock of the black box is not synchronized with the time of your smartphone.

But you can do that manually too by opening the **Additional settings** menu (**Fig. 72**) and pressing the **Synchronize time** button.

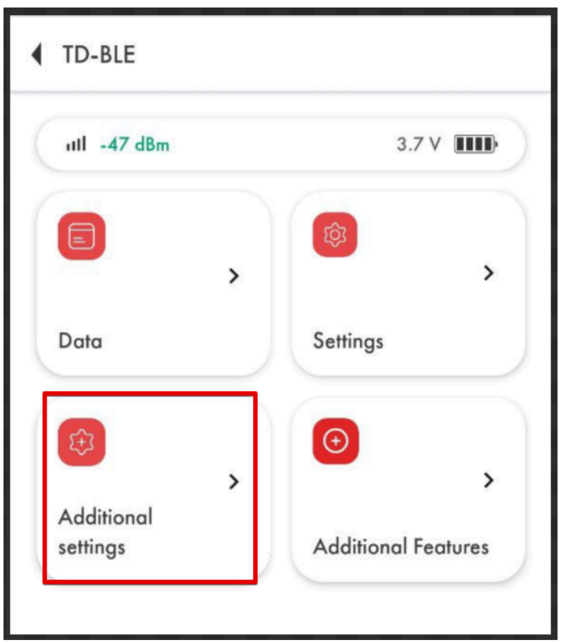



**Fig. 72** Additional settings

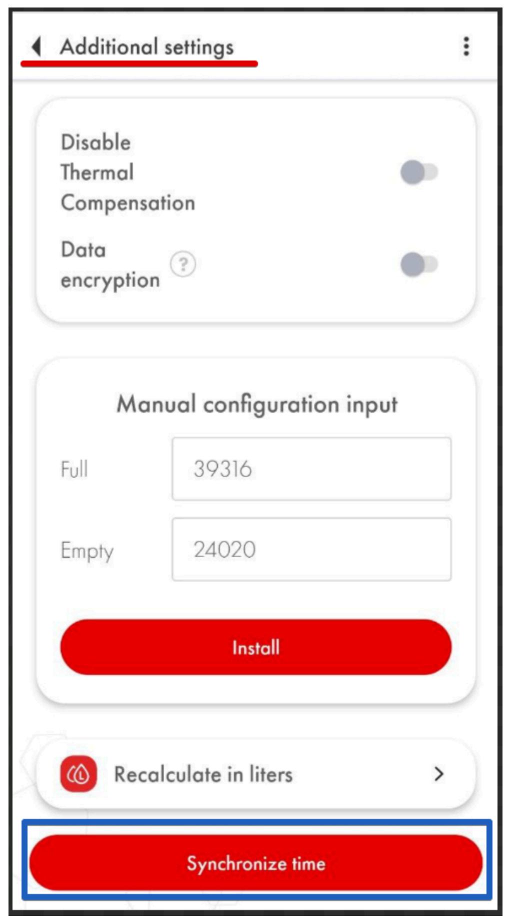



**Fig. 73** Synchronize time

To access the data saved in the sensor's black box, in the **Additional settings** menu tap on the three dots in the upper right corner (**Fig. 74**, **1**) and select **Black box** (**Fig. 74**, **2**).

Then you can select the period in days (**Fig. 74**, 1) and/or hours (**Fig. 74**, 2) and either download the data recorded in that period (**Fig. 74**, 3) or download all data (**Fig. 74**, 4). You can also empty the black box by deleting all records (**Fig. 74**, 5).

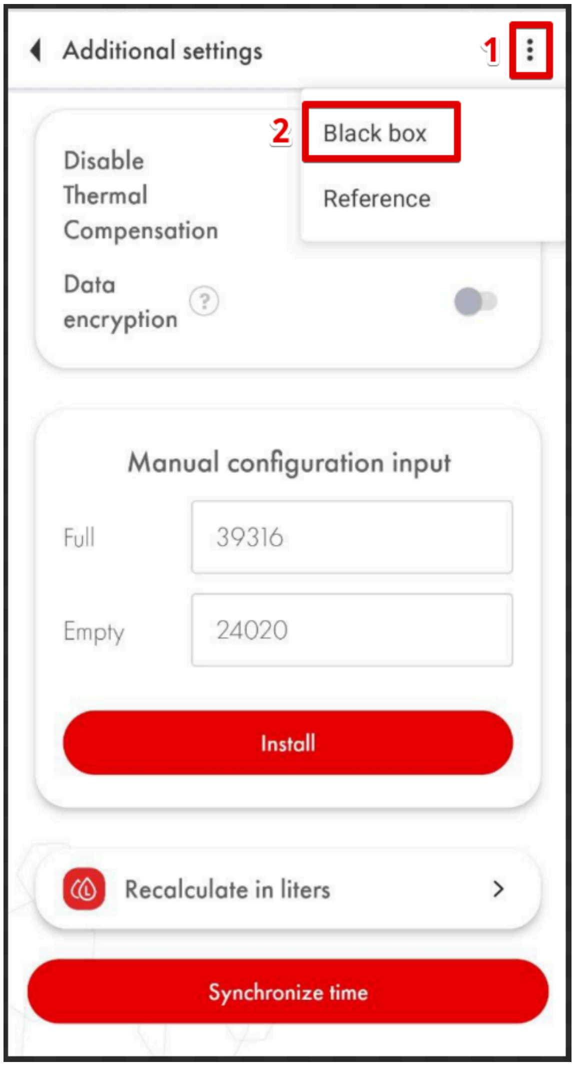



**Fig. 74** Black box

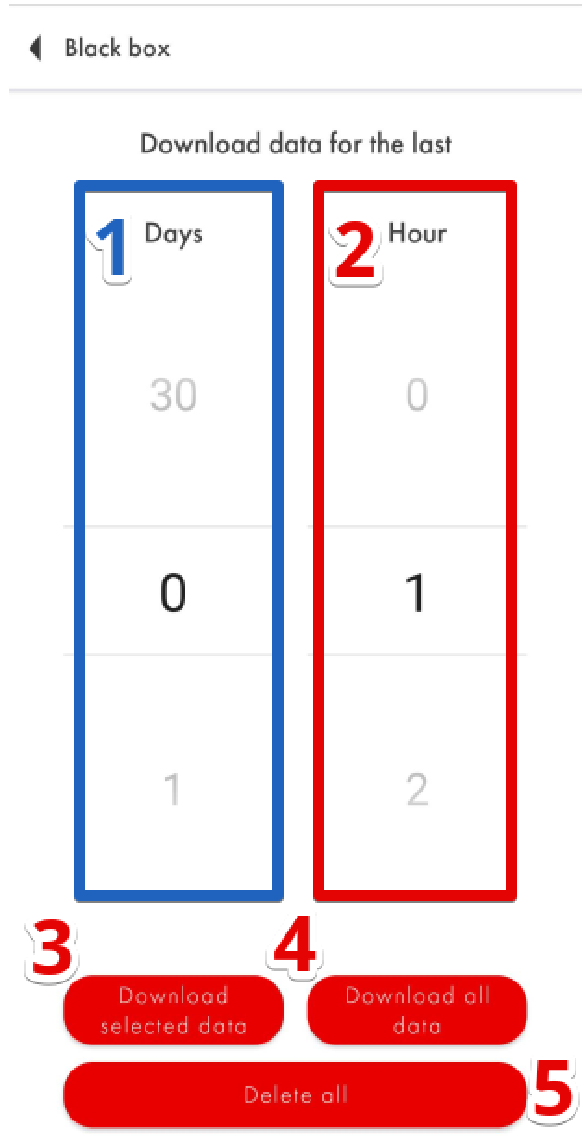
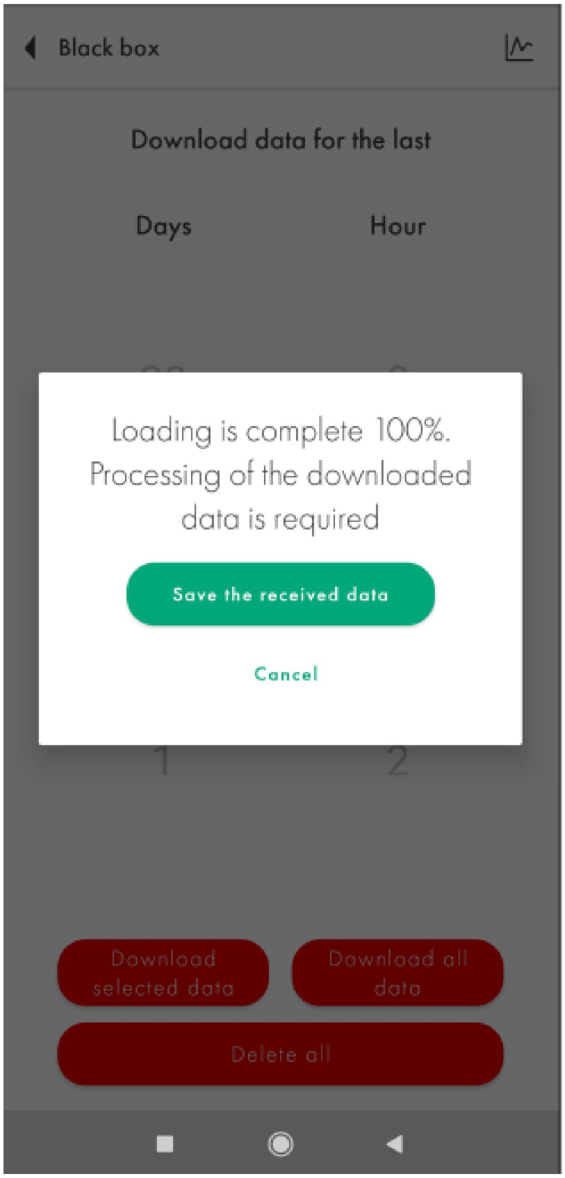



**Fig. 75** Download options

Then tap on the **Save the received data** button. The line chart will be on your display shortly after that.



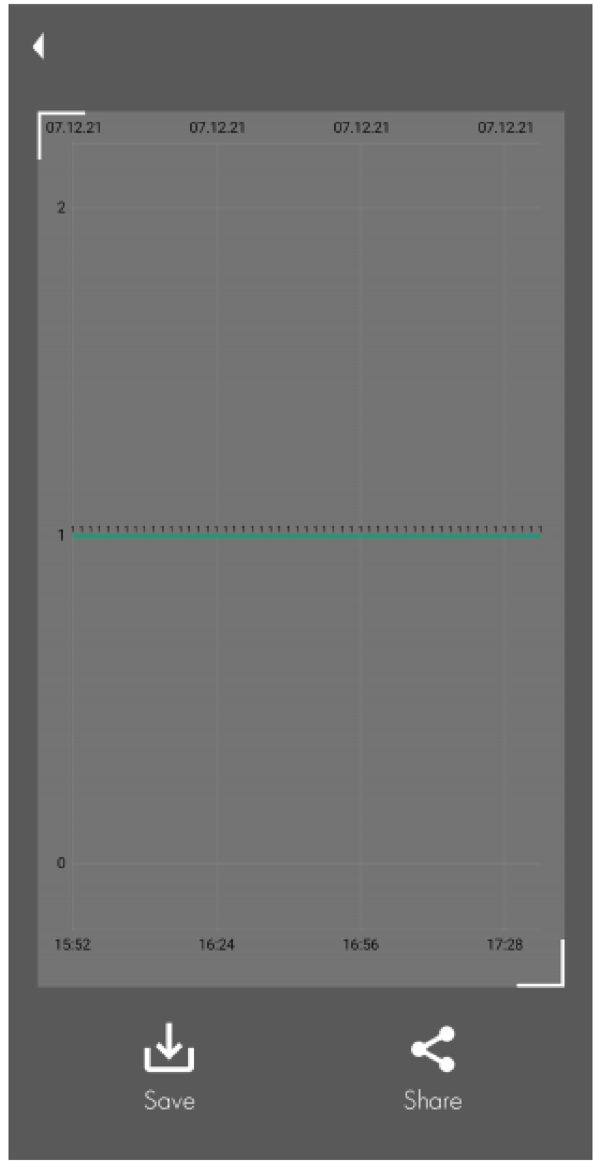




**Fig. 76** Save the received data

**Fig. 77** Line chart

If you saved any data before, you can get it displayed by tapping on the line chart icon in the upper right corner (**Fig. 78**)

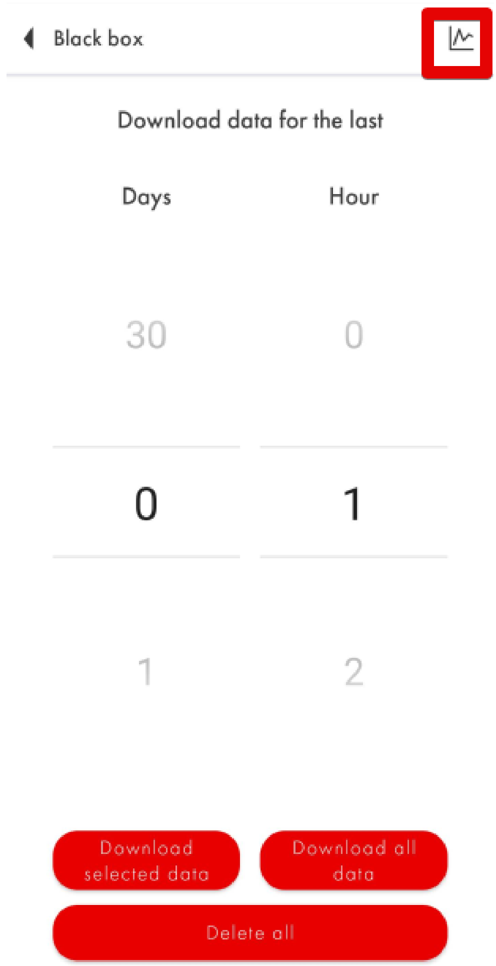



**Fig. 78** Display previously downloaded data

# Additional settings

In the Additional settings menu, you can also control the sensor's thermal compensation function.

**ATTENTION! Do not change the position of the Disable Thermal Compensation tumbler (it must be grey) unless you have some other algorithm applied by the GPS tracker or other device the sensor is connected to or by the platform** (**Fig. 79**, **1**)**.**

Do not activate the **Data encryption** option (**Fig. 79**, **2**) unless you are using a BLE-RS485 adapter/base or you have a confirmation given by the tracker's manufacturer that the tracker supports data encryption of Escort BLE sensors.

## Setting Full and Empty calibration values manually

You can skip the sensor calibration by entering the calibration value of an equally long sensor manually (**Fig. 79**, **3**) and pressing the **Install** button (**Fig. 79**, **4**).

**ATTENTION!!! Setting calibration values manually will likely increase the margin of error of the sensor! We do not recommend using this option!**

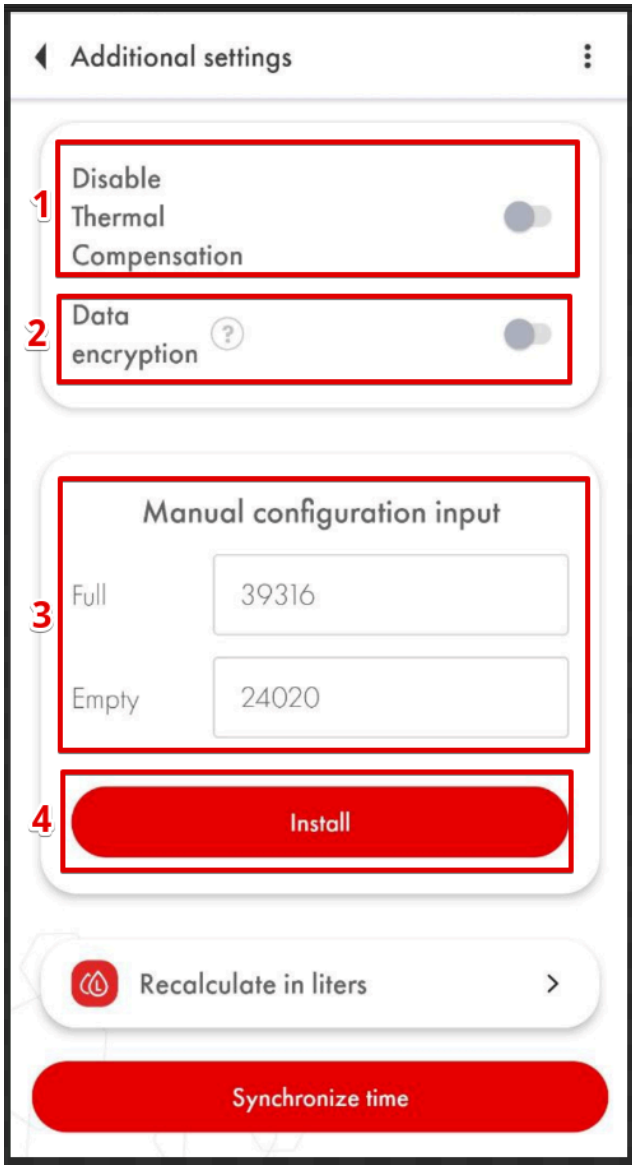



**Fig. 79** Additional settings

## Saving the tank calibration table in the sensor's memory

If you have a tank calibration ready and you want to save it in the sensor's memory so that the sensor could output readings in liters or gallons, you need to open the **Recalculate in liters** menu by pressing the **cog icon** (**Fig. 80**) on the main screen of the sensor or on the **Recalculate in liters** button in the Additional settings menu (**Fig. 81**).

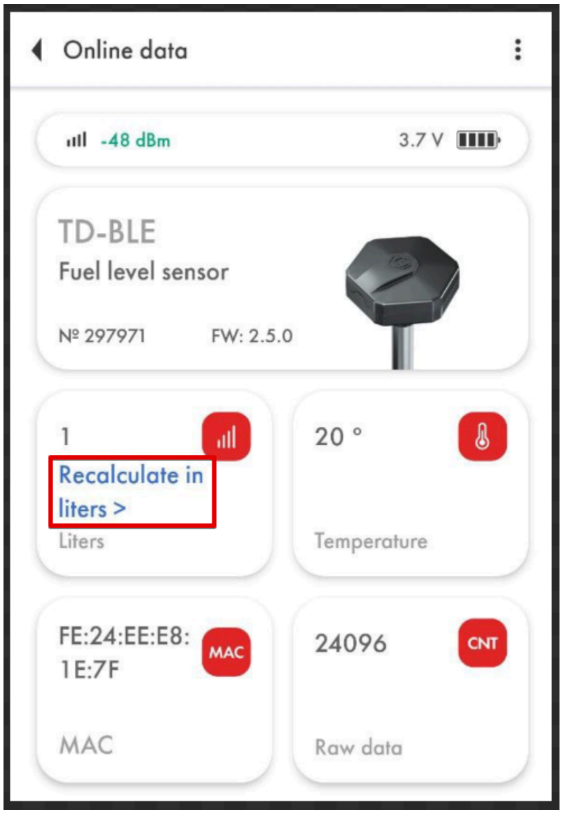



**Fig. 80** Recalculate in liters

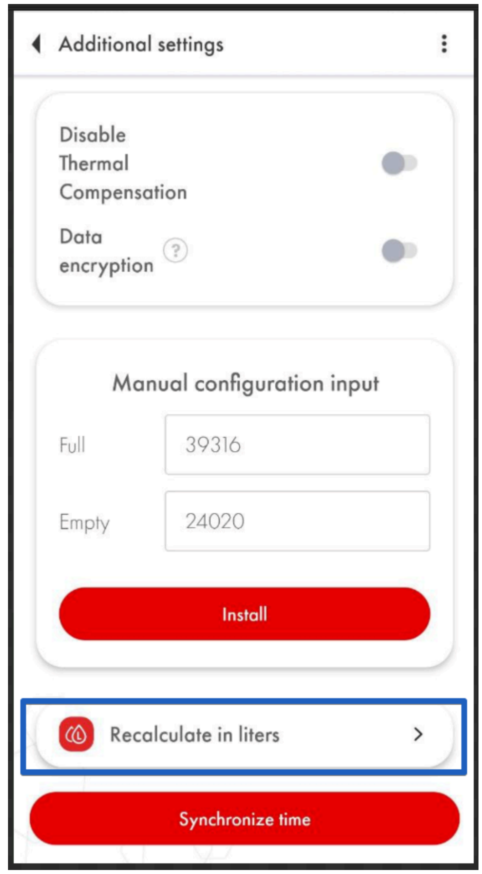



**Fig. 81** Additional settings. Recalculate in liters

Then you can activate the conversion of level readings into liters or gallons and either input the data manually creating new rows or by importing the tank calibration table.

**If the file of the table is inactive - move it into another folder and try again**

Activate the Recalculate in liters tumbler (**Fig. 82**, **1**).

To create the table manually, select the Level (**Fig. 82**, **2**) or Liters (**Fig. 82**, **3**) - these could be gallons or any other volume measurement units - and enter the value (**Fig. 82**, **4**) and tap on the arrow button (**Fig. 82**, **5**). Then press on the **three dots** icon (**Fig. 83**, **1**) and then tap on the **Save into the sensor** option (**Fig. 83**, **2**).

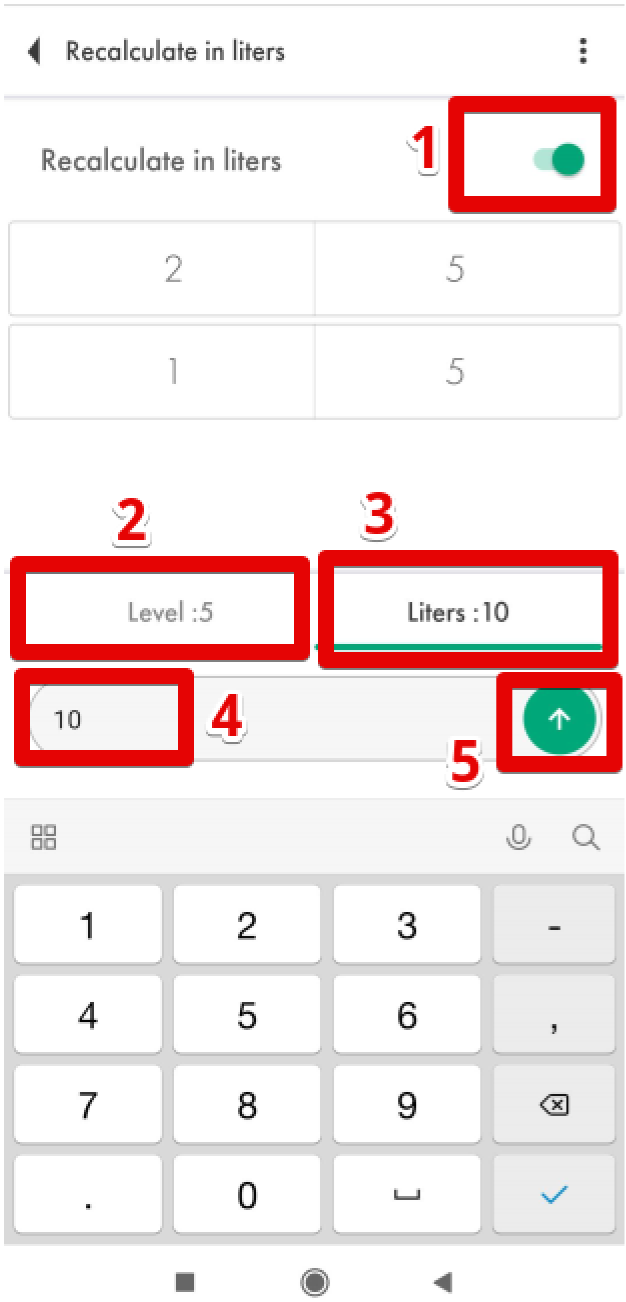



**Fig. 82** Manual input of the table

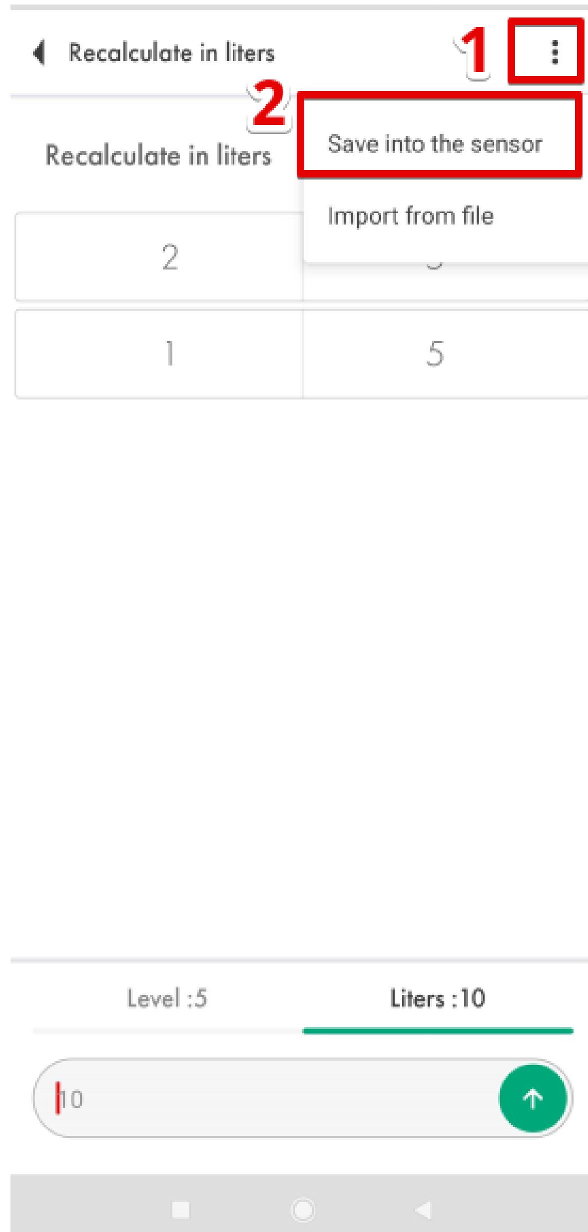



**Fig. 83** Saving table

To import the table from a .csv file you created doing the tank calibration, press on the **three dots** icon (**Fig. 84**, 1) and then tap on the **Import from file** option (**Fig. 84**, 2. After that, find the file with the table on your smartphone and tap on it (**Fig. 85**).

Be sure to save the imported into the sensor as shown on **Figure 83**.


**Fig. 84** Importing table

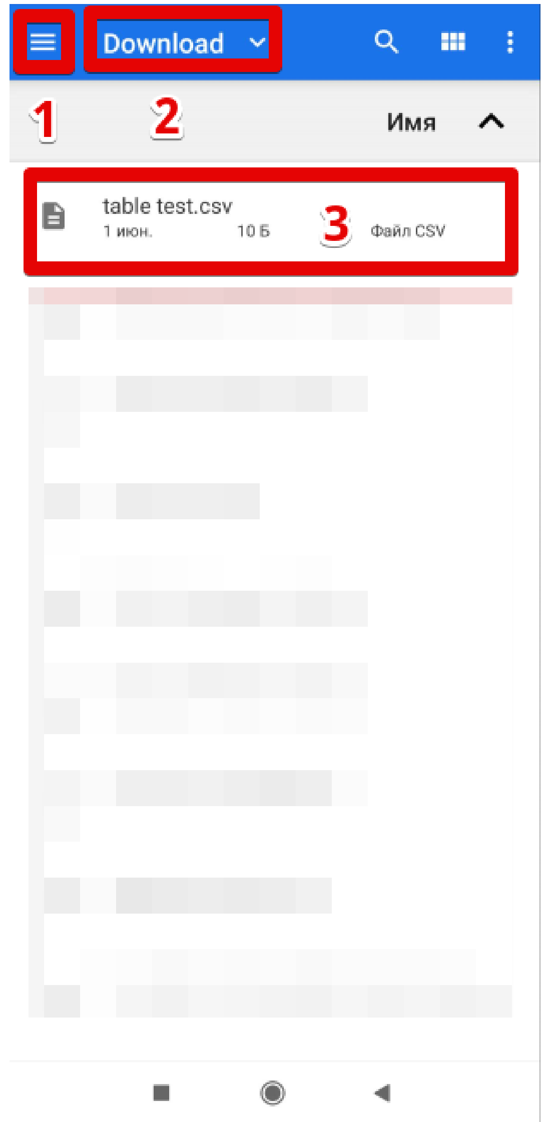



**Fig. 85** Saving table

## The level reading doesn’t change

First of all, check if you by any chance didn’t activate the recalculate in liters option.

If you do so without saving any table in the sensor’s memory, it will not be able to either display the level as is or to recalculate it in liters/gallons.

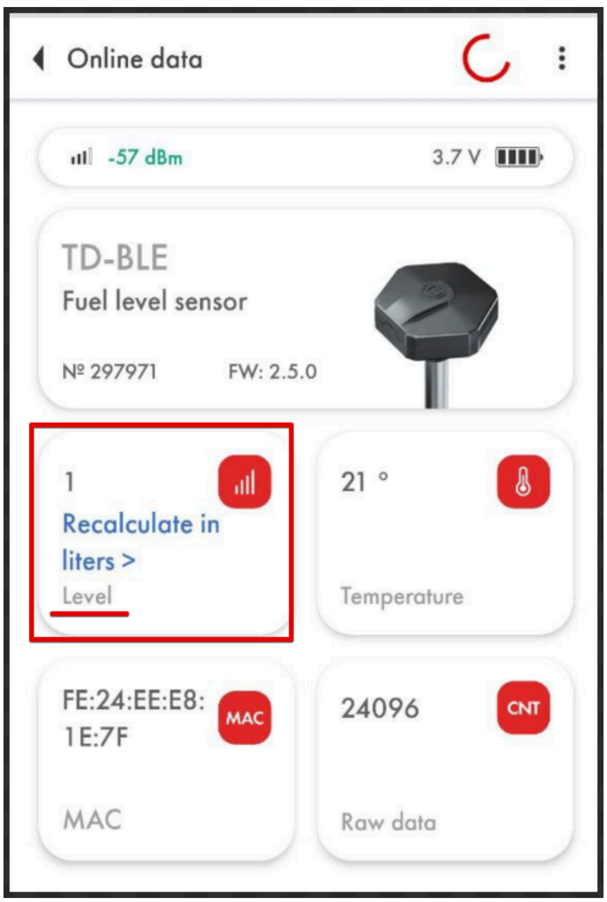



**Fig. 86** Recalculate in liters not activated

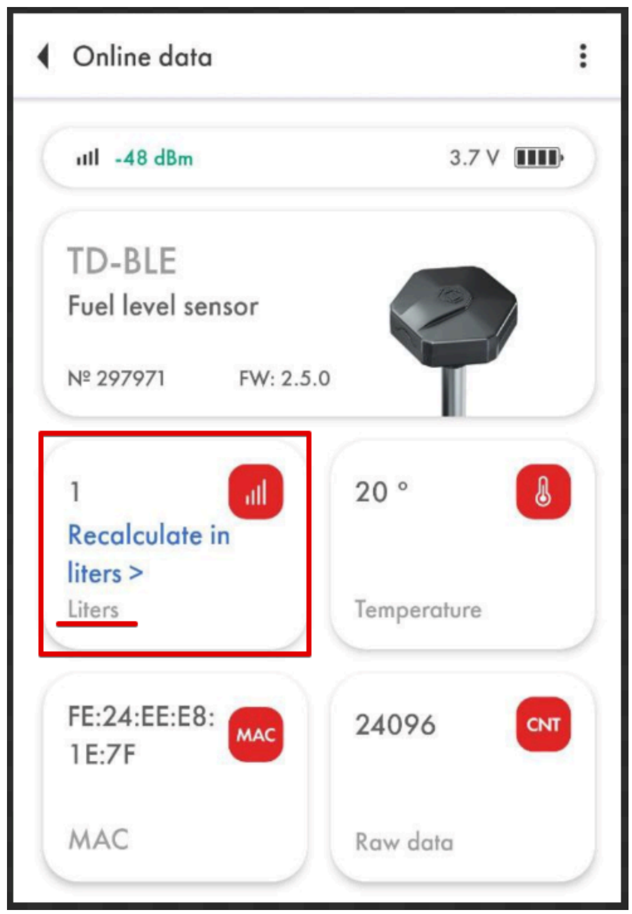



**Fig. 87** Recalculate in liters is activated but no table has been uploaded into the sensor’s memory

Another possible reason could be that the sensor is not properly calibrated and its CNT is below the Empty calibration value. In such a case, recalibrate the sensor.

**Also, if you calibrated the sensor with fuel, it is possible that the drainage hole of the sensor was left covered and the air trapped inside the tubes doesn't allow the fuel to go up the tubes.**

## Level 7000

Level 7000 is an error code for a short circuit. It means that there is some dirt, water, metal shavings or admixtures inside the sensor's tubes. All these can be highly conductive and the sensor is designed to work in an environment with low conductivity (such as fuel).

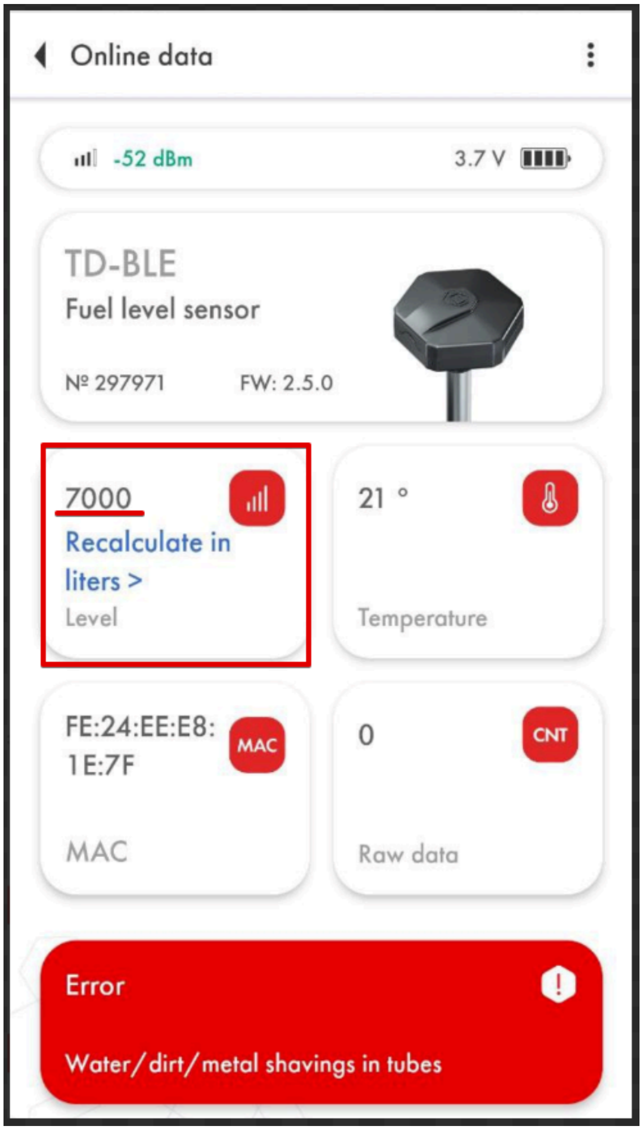



**Fig. 88** Level 7000

You need to clean the tubes of the sensor - preferably with compressed air blowing the sensor's tubes via the drainage hole. Clean the tank and replace the fuel if necessary.

# Level 6500

This code stands for disconnection of the tubes. It could also occur after you cut the tubes so, first of all, try and recalibrate the sensor.

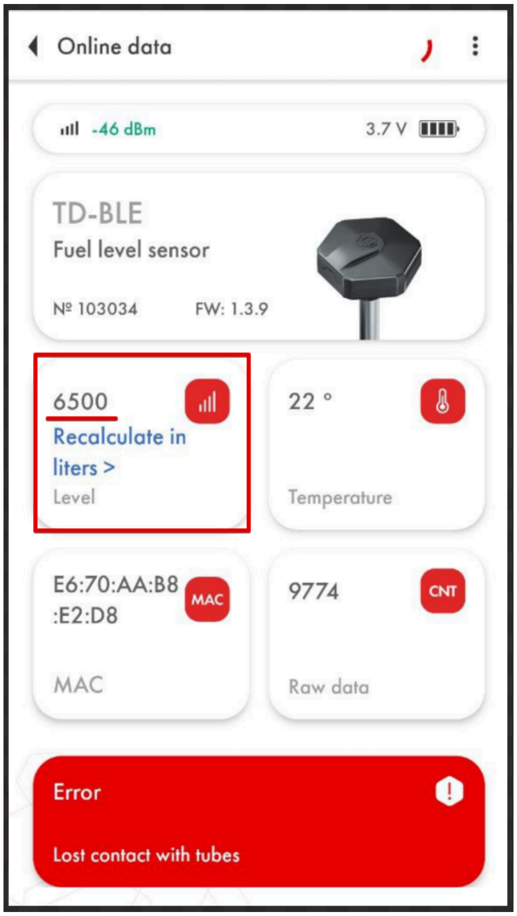



**Fig. 89** Level 6500

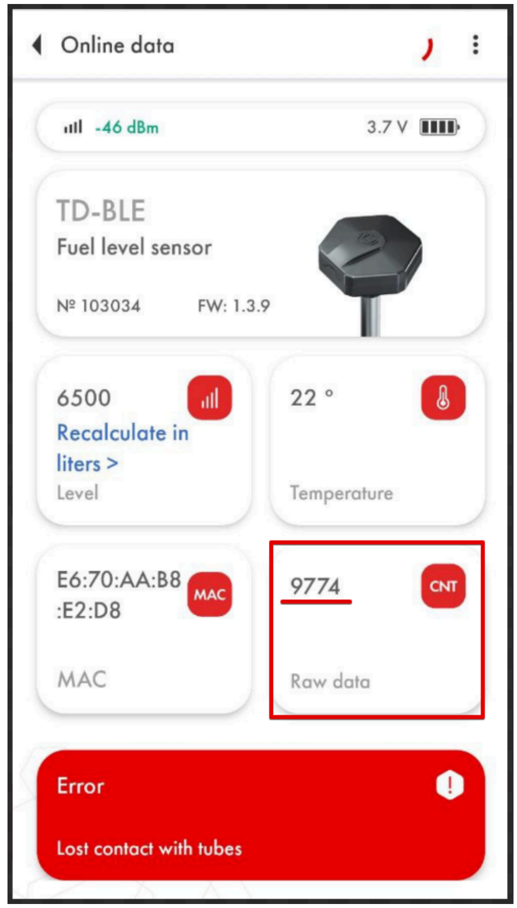



**Fig. 90** CNT below 10 000

If doesn't help, check the CNT. If it is below 10 000, then most likely the tubes are disconnected from the sensor's head indeed.

Take the picture of the sensor's head (the serial number must be clearly visible), its tubes (it must be clearly visible if there is any misalignment of the tubes) and the screenshot of the main screen of the sensor and of the Settings menu and send all those to us.

## The battery replacement process for the 1st generation TD-BLE

Open the sensor's head by removing the screws and the lid.

**Fig. 91** Remove the lid

Cut the upper layer of the sealant without damaging the circuit board beneath it.

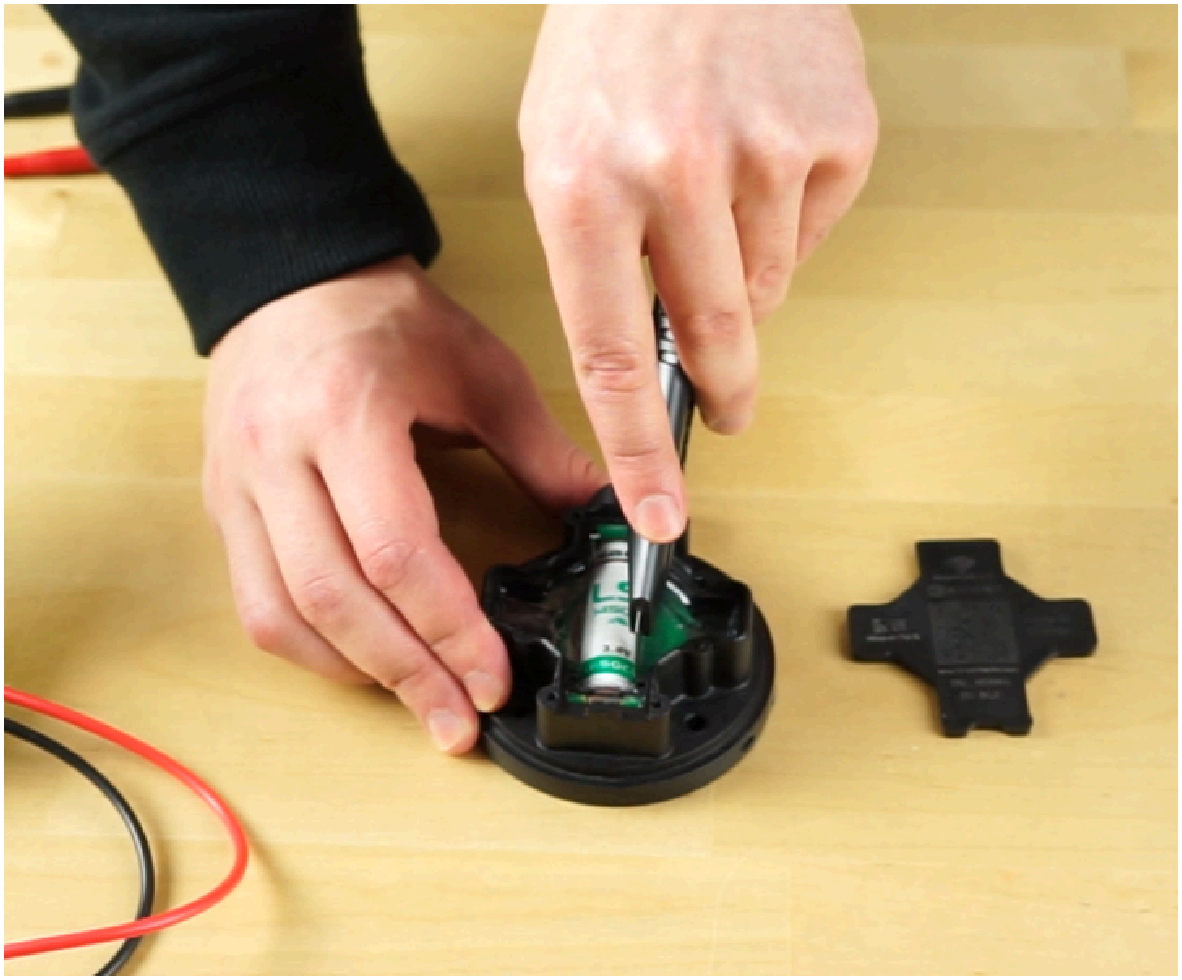


**Fig. 92** Cut the compound

Take the battery out. Replace it with a new one. Check if the sensor is detected by the app.

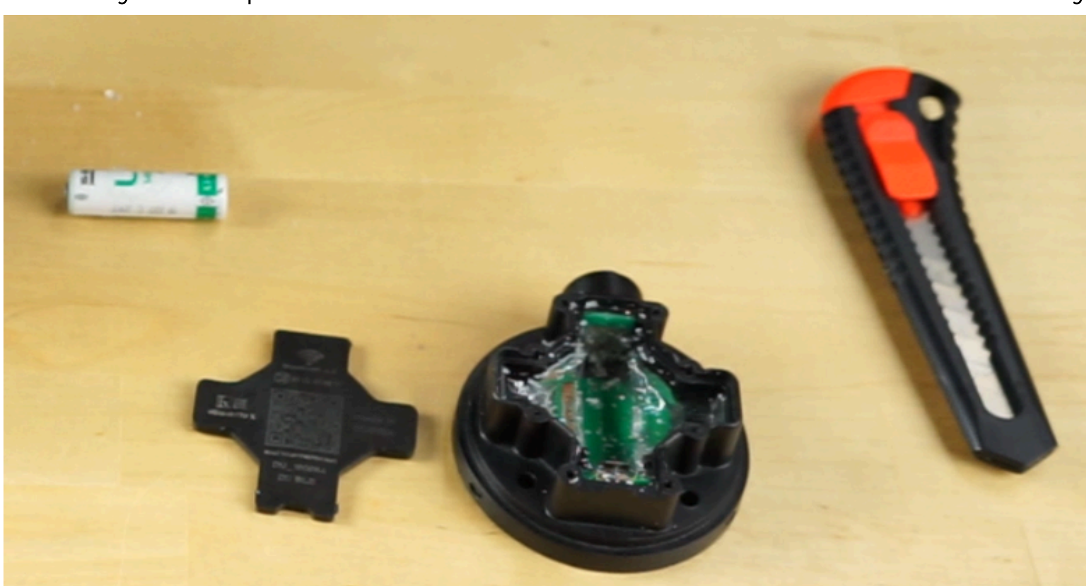


**Fig. 93** Remove the battery. Replace it or put it back

# The battery replacement process for the 2nd generation TD-BLE

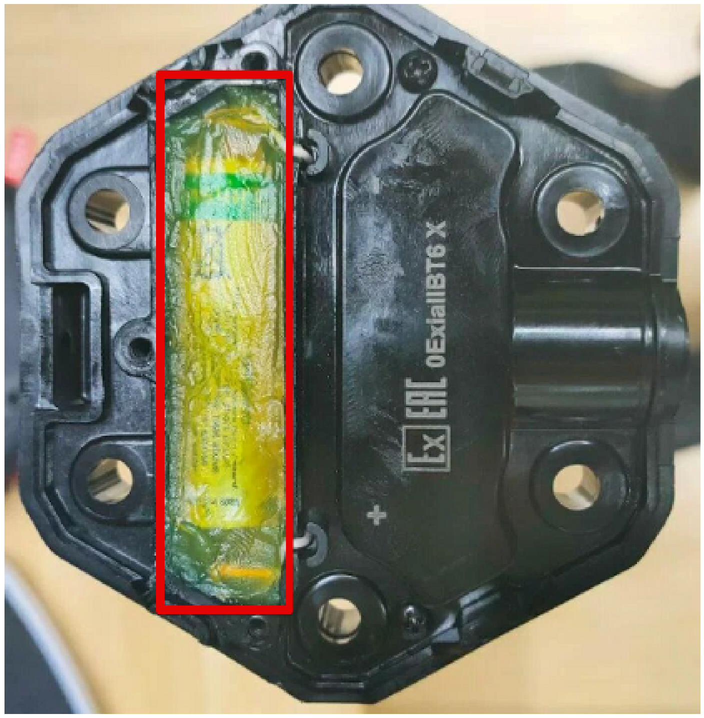
Take off the sensor's protecting cap using a screwdriver or any thin object

Taking off the protecting cap

Take off the cap from the battery holder by unscrewing its self-tapping screws


Sensor’s head without its protecting cap

Carefully extract the top layer of the litol using a thin and not sharp object




The battery holder’s cavity filled with the litol

Extract the battery. Please, note that for the 2nd generation TD-BLE you can also use the **Saft LS17500** battery model, which is different from the model used for the 1st generation sensor.


Saft 17500 and Saft LS14500 battery models

After you replaced the battery and checked the sensor’s functionality with the Escort mobile app, you should fill the battery holder’s cavity with the litol.

# The sensor is not connecting or cannot be detected by the app

First of all, make sure that the sensor is not connected to any other smartphone. It can be connected to one smartphone at a time only.

Then make sure that you have the geolocation activated on your smartphone and the app has the access to it.

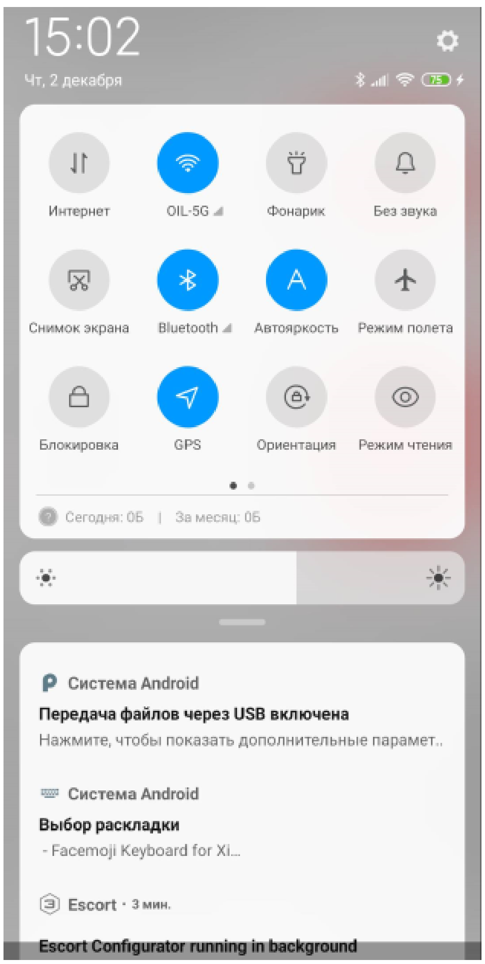



**Fig. 94** GPS (geolocation) and Bluetooth activated

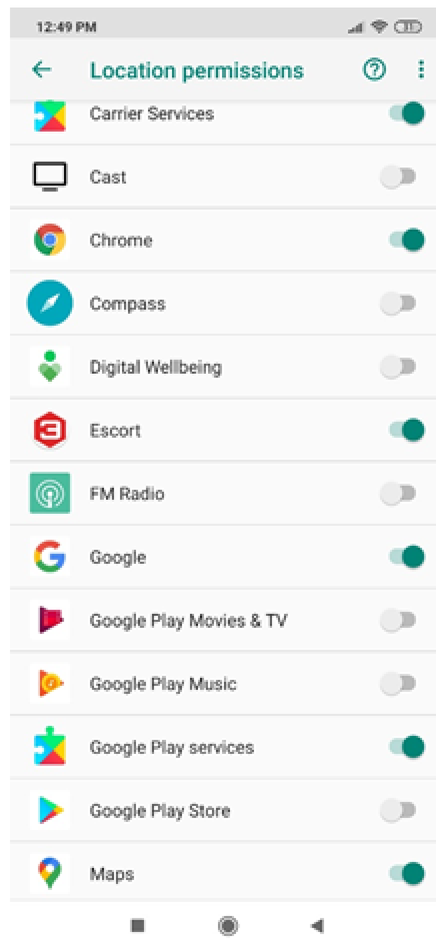



**Fig. 95** Geolocation permissions

Check if the sensor can be detected in the nRF Connect app.

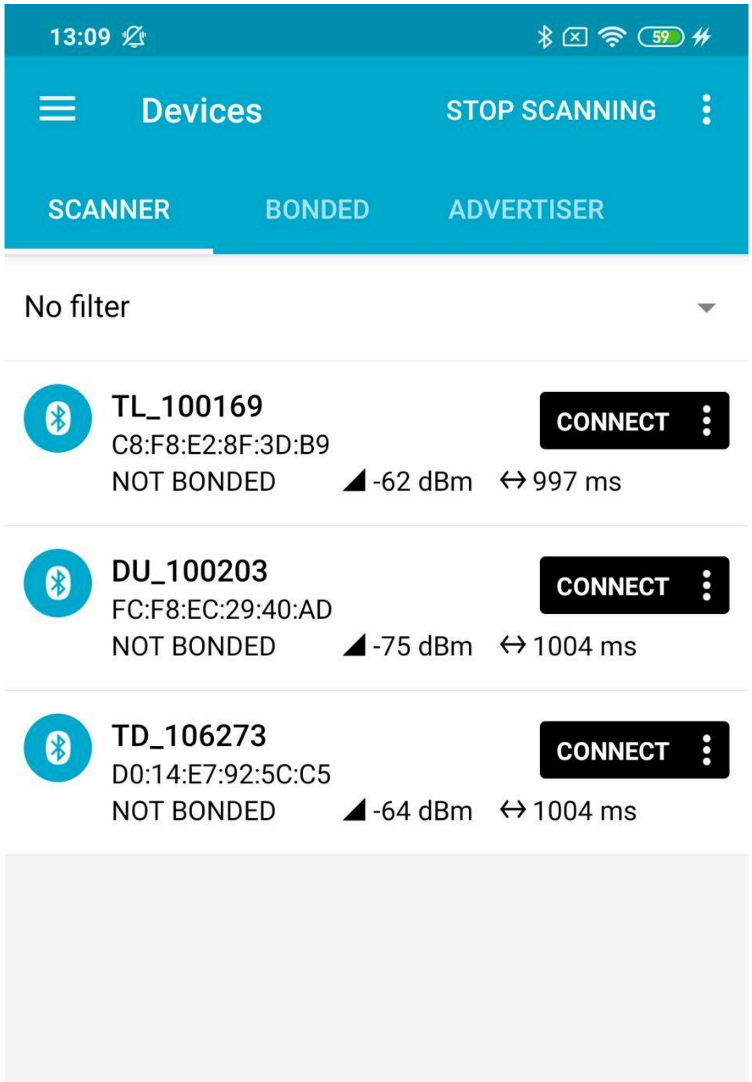



**Fig. 96** nRF Connect app. Be sure to tap on the Scan button (top, right corner)

If it is detected but you cannot connect it by means of Escort Configurator app, check if any other sensor can be connected to the same smartphone.

Next, try and loosen the screws that are holding the sensor in the tank.

If even after loosening the screws the sensor cannot be detected or connected, open its head and remove the battery (**Fig. 91-93**). Check its voltage with a multimeter. If it is at 3.2V or higher, try putting it back and reconnecting the sensor again.

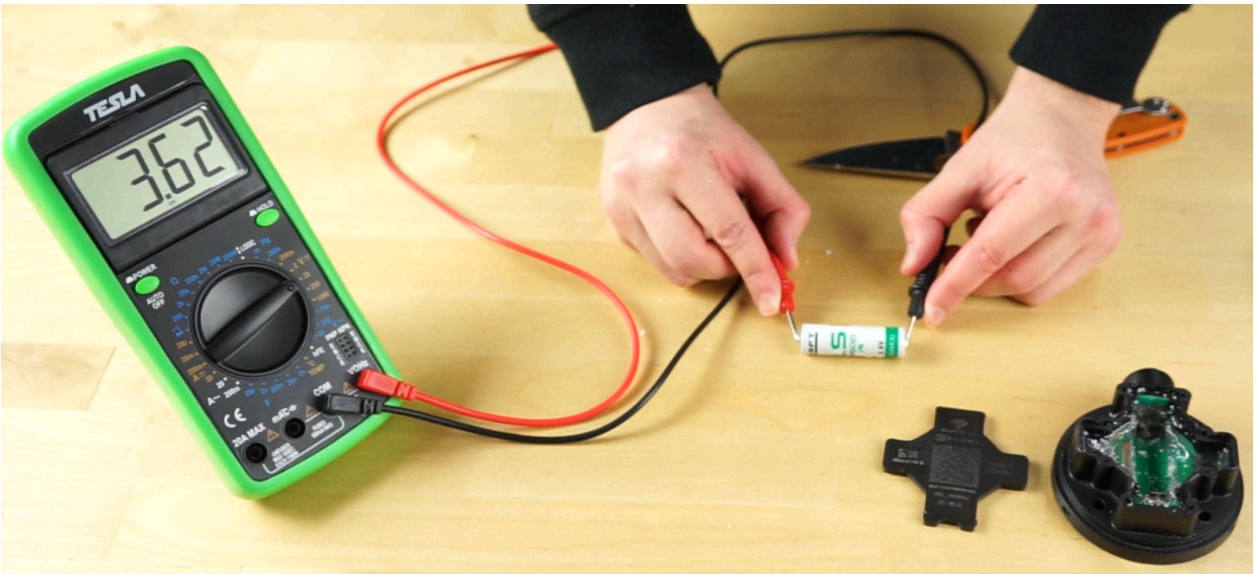



**Fig. 97** Voltage check. **V–** mode selected (20V range);
Black probe - COM socket, Red probe - V socket

If nothing helps, make a video of all these attempts and send it to us.

If the sensor is available for connection after removing its battery and putting it back, then cover the battery with some non-acidic automotive sealant resistant to oil and its derivatives, close the sensor’s head and continue using it.

# Sealing the sensor

## Sealing an old-type TD-BLE

To seal the sensor and prevent anyone from taking it out of the tank without you or your being aware of that, put the sensor's protecting cap over its head and then drive the wire of the seal through fitting holes. Then drive the wire through the seal itself and tighten it around the sensor's cap. Cut the surplus wire as you see fit.

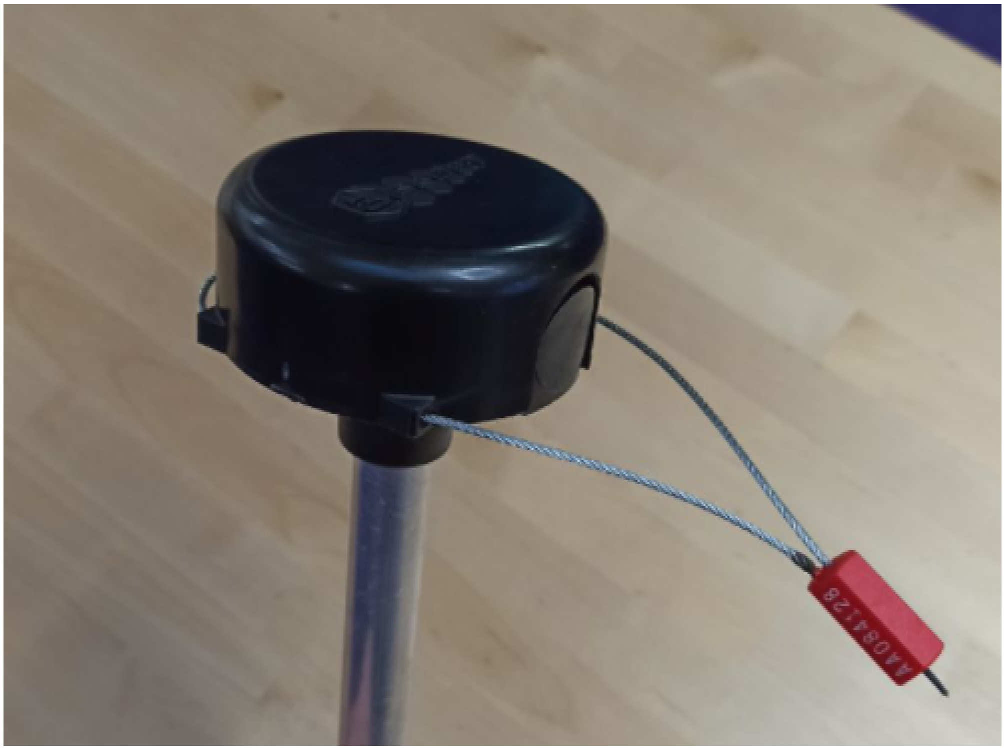


**Fig. 98** Seal before tightening it

# Sealing a current-type TD-BLE

You will need a protecting cap and a seal from the kit

**Fig.99** Protecting cap


**Fig.100** Seal (its covered end)

You should mount the cap on the sensor

**Fig.101** Sensor with protecting cap on it

Then you fully insert the seal into the certain hole, **the seal’s covered end must be outside.**

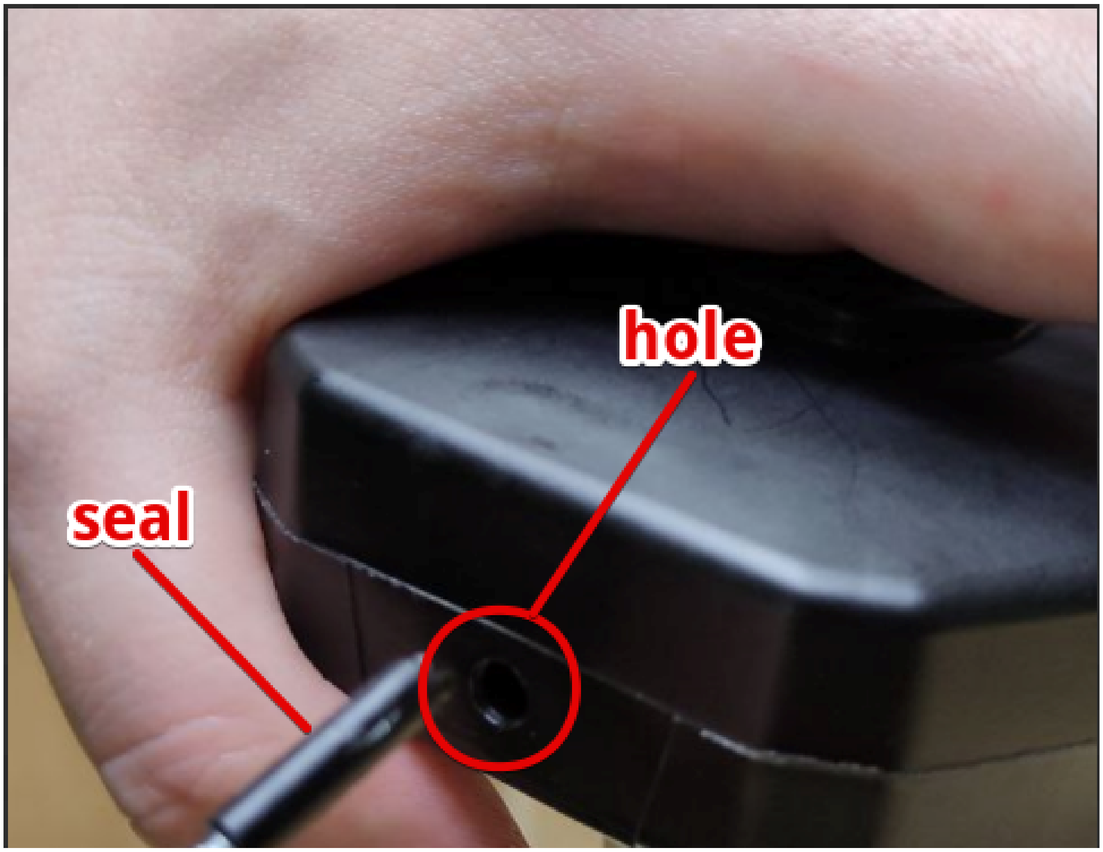



**Fig.102** Sealing sensor

To remove the seal, use a special key from the kit (or any self-tapping screw of the certain size) to screw it into the seal and pull it out.

**Fig.103** Key screwed in the seal

**Fig.104** Extracting the seal

**Fig.105** Seal after extracting (its covered end is damaged)

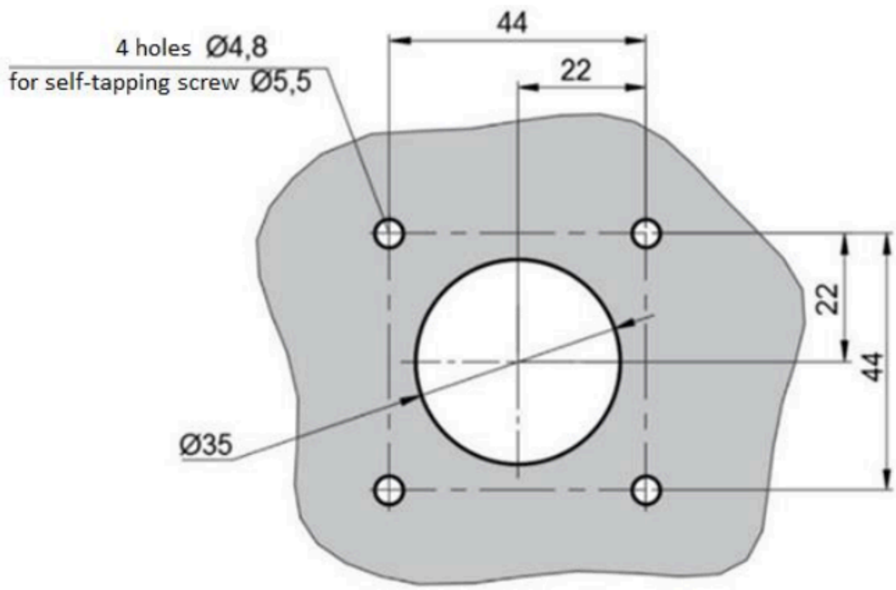
Thus, you cannot remove the seal without damaging it. It provides a sensor with an additional protection.

# Mounting dimensions

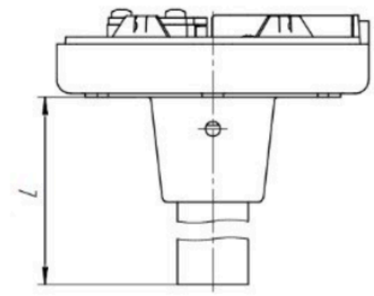
The following is used to prepare place for installation:

✓ bimetallic bit of Ø 35 mm;

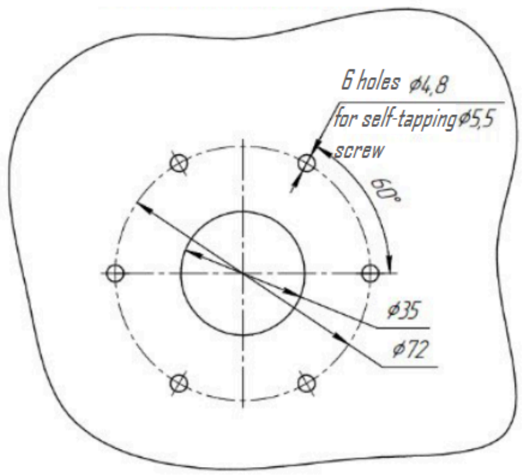
✓ drill of Ø 4,8 mm

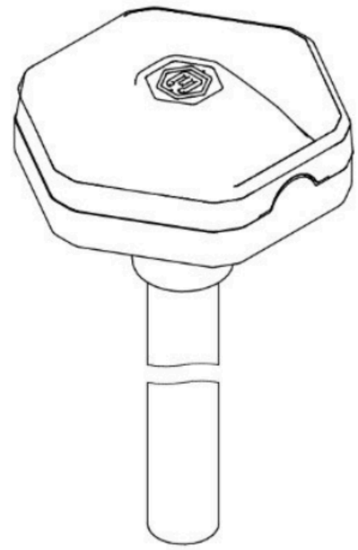


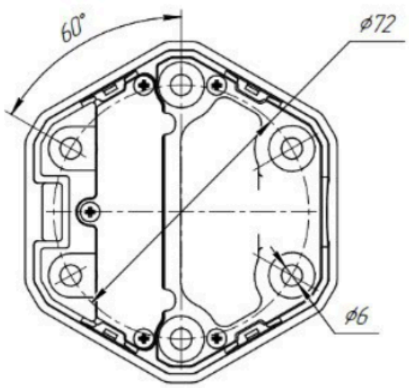

* The diameters of the holes are given for self-tapping screws, if necessary, mark places for another fastening according to the centers of specified holes.




placing the holes on the tank





# How strong to tight up self tapping screws

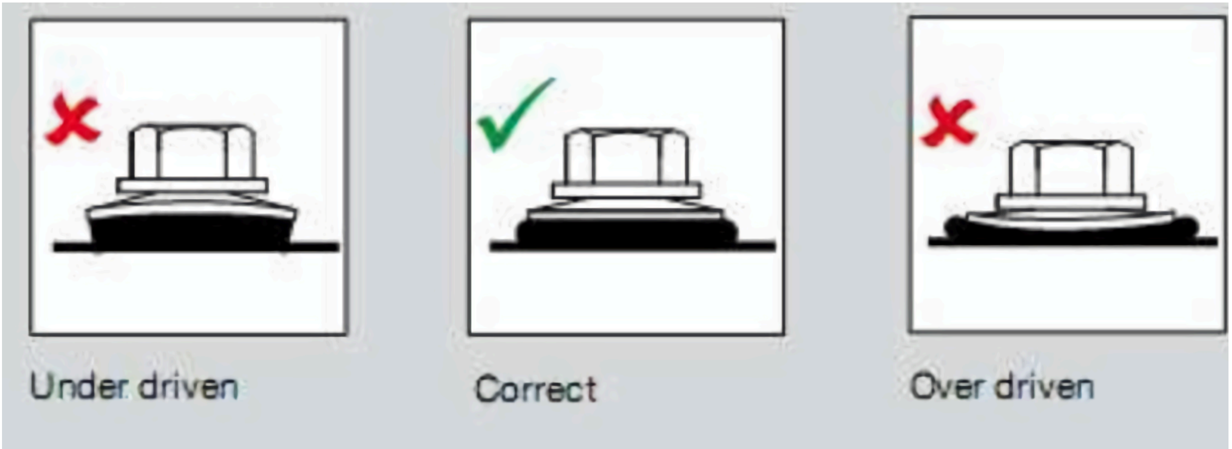



**Fig.107** How strong to tight up self tapping screws

# Particular cases of installing and using TD-BLE

## Tank calibration method for 2 communicating tanks without blocking their connection

First of all, you need to make sure if it's possible to pour the fuel portion in both tanks at the same time; it's a general term for this type of tank calibration. Otherwise, the fuel will be flowing into the other tank very long, so it will take much more time to stabilize the fuel level.

To monitor the fuel level of the both sensors at the same time you should either connect to the sensors with 2 different smartphones or pair the sensors with the RS-485\BLE Base (manual https://docs.google.com/document/d/17j_JGrIgK-otonAPWsdP9p7PPeSYkVYq/edit?usp=share_link&ouid=113197106569288024895&rtpof=true&sd=true) or with the BA-BLE adapter (manual ENG BA_BLE 5.0 LR User Manual ТЕМГ.422133.001 Adapter РЭ 31.05.22.docx - Google Документы)

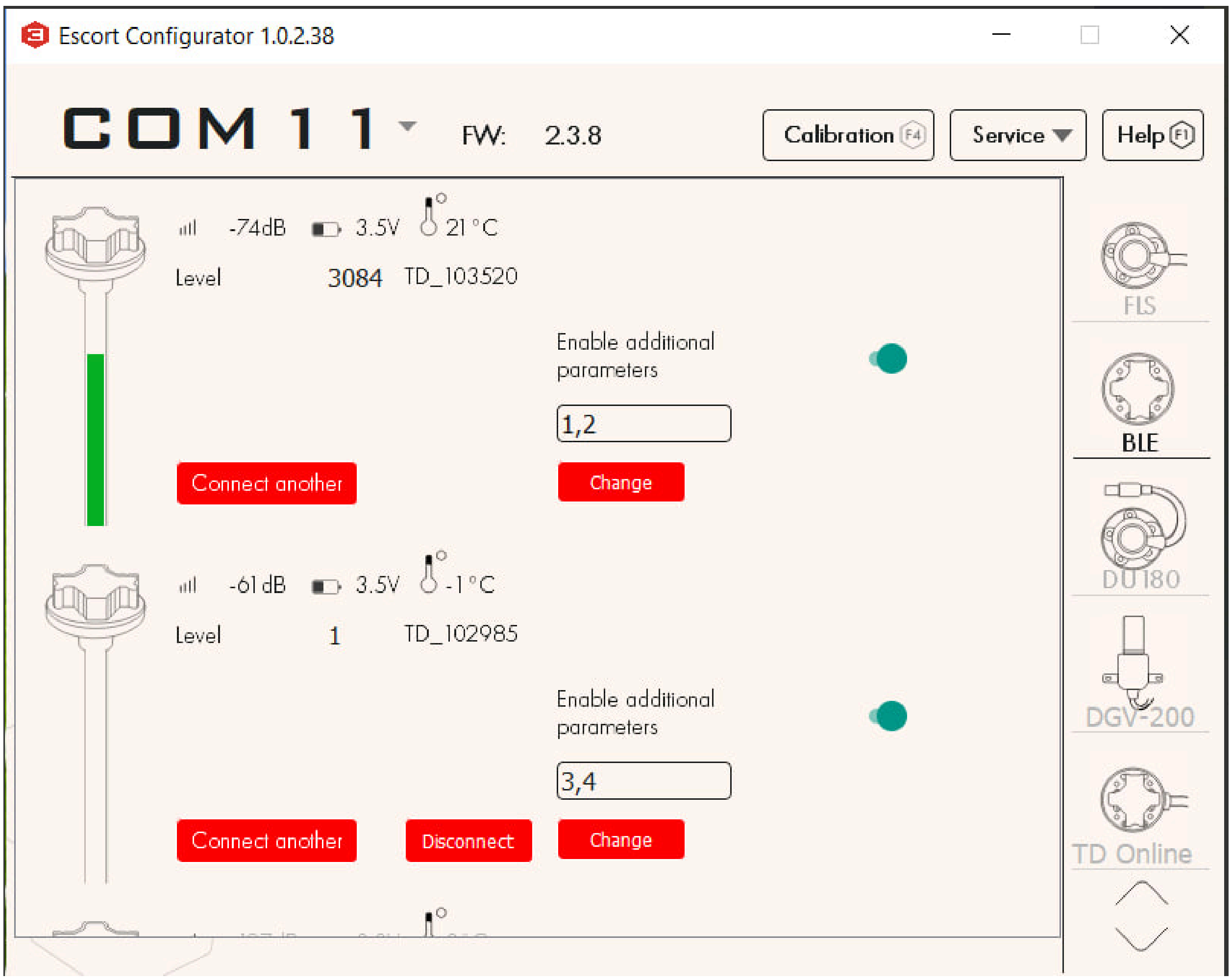



**Fig.108** Viewing the data of the 2 sensors connected to the RS-485\BLE Base

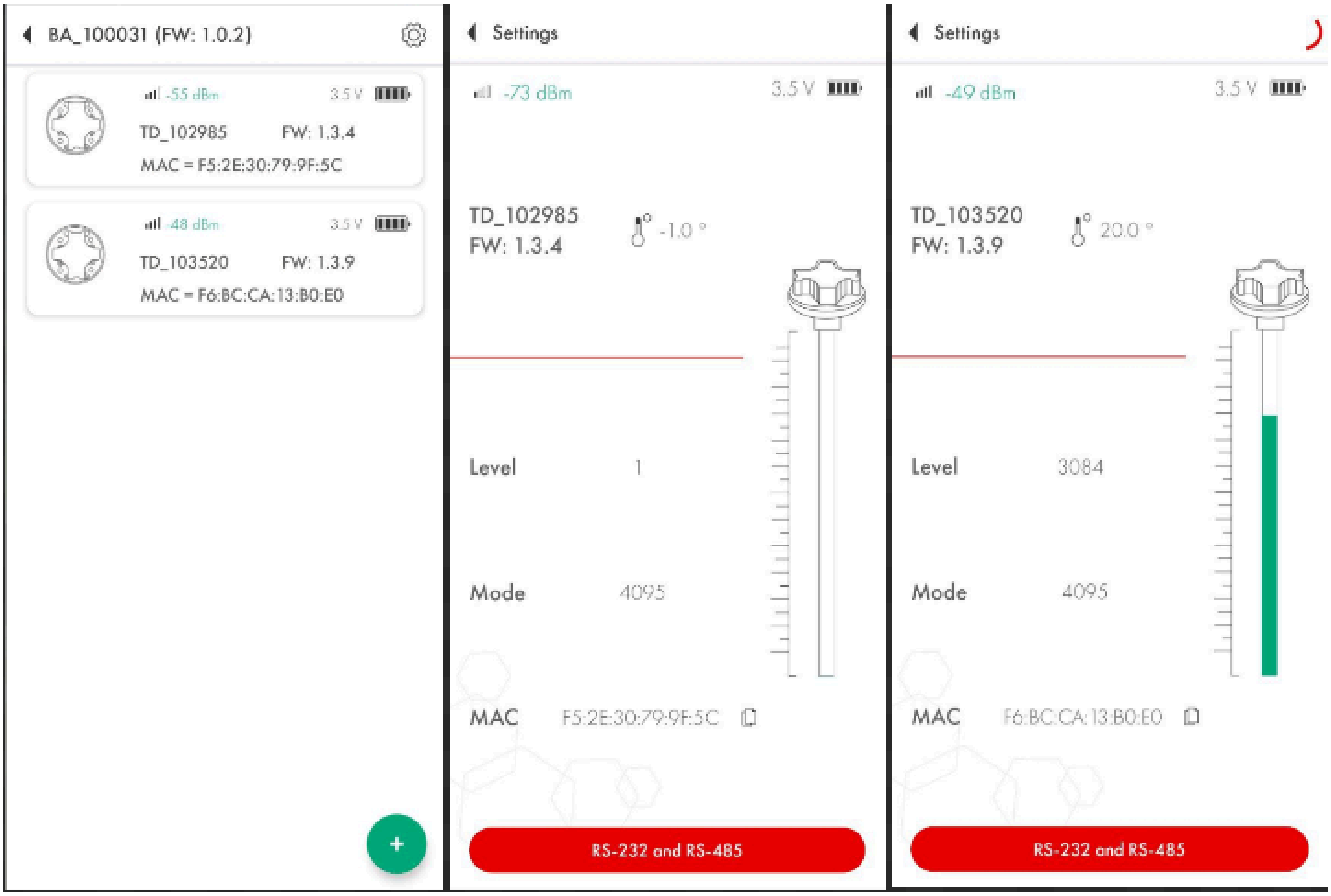



**Fig.109** Viewing the data of the 2 sensors connected to the BA-BLE adapter

Thus, you do the tank calibration by pouring the fuel portions into both tanks at the same time.

## The peculiarities of doing the tank calibration of the tank on a slant with 2 FLS installed

If it's impossible to align horizontally the tank, there is a way to do the tank calibration of the tank on a slant.

Technically, this type of tank calibration is no different from the usual one; you pour the fuel portion, wait for the fuel level to stabilize, write down a step, pour the next one.

However, the details are much more essential, so the action sequence is following:

1. Pour the fuel portions into the tank until the fuel level reaches the measurement tubes of the second sensor, which is higher due to the slant

2. After the fuel reaches the second sensor, reduce the portion in half. **IMPORTANT:** you need to reduce the portion **only** in the tank calibration tables of both FLS, the physical volume of the portion **stays the same**

3. After the tubes of the lower sensor are completely filled with fuel, consider the tank calibration done for this sensor

4. Before resuming the tank calibration with the second sensor, it's necessary to return the nominal volume of the portion (in other words, to double it). **IMPORTANT:** the physical volume of the portion is **still the same** until the tank is completely full and the tank calibration is done

Thus, such calculation tables (tank calibration tables) will be correctly interpreted by a monitoring platform in case you create the third FLS (a virtual one), that will be the sum of the 2 real FLS.

| | |
|---|---|
| 1 | 1, 0 |
| 2 | 367, 20 |
| 3 | 654, 40 |
| 4 | 879, 60 |
| 5 | 1085, 80 |
| 6 | 1281, 100 |
| 7 | 1404, 120 |
| 8 | 1645, 140 |
| 9 | 1804, 160 |
| 10 | 1929, 180 |
| 11 | 2142, 200 |
| 12 | 2322, 210 |
| 13 | 2527, 220 |
| 14 | 2654, 230 |
| 15 | 2887, 240 |
| 16 | 3084, 250 |
| 17 | 3283, 260 |
| 18 | 3444, 270 |
| 19 | 3793, 280 |
| 20 | 4095, 290 |

Here the fuel level reaches the tubes of FLS2

**Fig.110** Example of the tank calibration table for FLS1

| | |
|---|---|
| 1 | 1, 0 |
| 2 | 367, 10 |
| 3 | 654, 20 |
| 4 | 879, 30 |
| 5 | 1085, 40 |
| 6 | 1281, 50 |
| 7 | 1404, 60 |
| 8 | 1645, 70 |
| 9 | 1804, 80 |
| 10 | 1929, 90 |
| 11 | 2142, 100 |
| 12 | 2322, 120 |
| 13 | 2527, 140 |
| 14 | 2654, 160 |
| 15 | 2887, 180 |
| 16 | 3084, 200 |
| 17 | 3283, 220 |
| 18 | 3444, 240 |
| 19 | 3793, 260 |
| 20 | 4095, 280 |

Here the fuel level of FLS1 reaches the max value

**Fig.111** Example of the tank calibration table for FLS2

## Tank calibration method for a tank with variable height

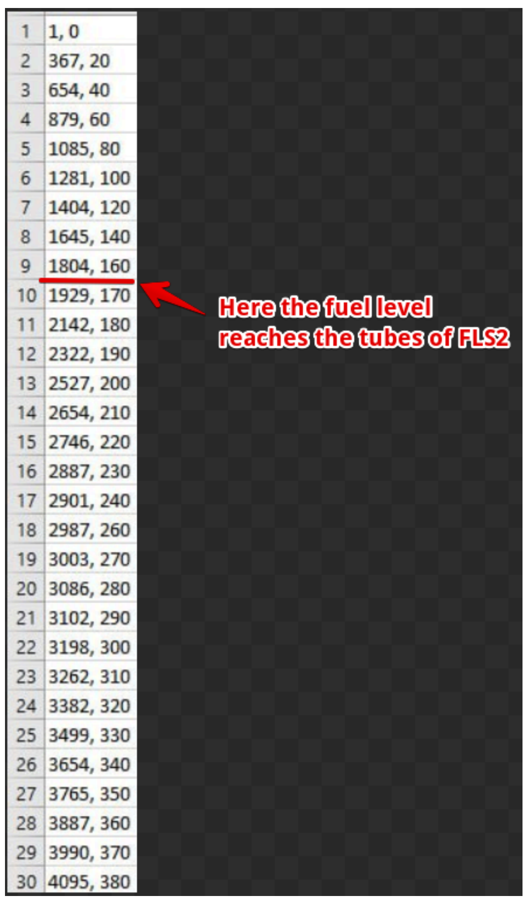
This method is similar to the previous one. The action sequence is following:

1. Pour the fuel portions into the tank until the fuel level reaches the measurement tubes of the second FLS, which is higher due to the height difference

2. After the fuel reaches the second sensor, reduce the portion in half. **IMPORTANT:** you need to reduce the portion **only** in the tank calibration tables of both FLS, the physical volume of the portion **stays the same**

3. Continue the tank calibration this way until the tank is full

Thus, such calculation tables (tank calibration tables) will be correctly interpreted by a monitoring platform in case you create the third FLS (a virtual one), that will be the sum of the 2 real FLS.



| | |
|---|---|
| 1 | 1, 0 |
| 2 | 367, 20 |
| 3 | 654, 40 |
| 4 | 879, 60 |
| 5 | 1085, 80 |
| 6 | 1281, 100 |
| 7 | 1404, 120 |
| 8 | 1645, 140 |
| 9 | 1804, 160 |
| 10 | 1929, 170 |
| 11 | 2142, 180 |
| 12 | 2322, 190 |
| 13 | 2527, 200 |
| 14 | 2654, 210 |
| 15 | 2746, 220 |
| 16 | 2887, 230 |
| 17 | 2901, 240 |
| 18 | 2987, 260 |
| 19 | 3003, 270 |
| 20 | 3086, 280 |
| 21 | 3102, 290 |
| 22 | 3198, 300 |
| 23 | 3262, 310 |
| 24 | 3382, 320 |
| 25 | 3499, 330 |
| 26 | 3654, 340 |
| 27 | 3765, 350 |
| 28 | 3887, 360 |
| 29 | 3990, 370 |
| 30 | 4095, 380 |



**Fig.112** Example of the tank calibration table for FLS1

| | |
|---|---|
| 1 | 1, 0 |
| 2 | 367, 10 |
| 3 | 654, 20 |
| 4 | 879, 30 |
| 5 | 1085, 40 |
| 6 | 1281, 50 |
| 7 | 1404, 60 |
| 8 | 1645, 70 |
| 9 | 1804, 80 |
| 10 | 1929, 90 |
| 11 | 2142, 100 |
| 12 | 2322, 110 |
| 13 | 2527, 120 |
| 14 | 2654, 130 |
| 15 | 2887, 140 |
| 16 | 3084, 150 |
| 17 | 3283, 160 |
| 18 | 3444, 170 |
| 19 | 3793, 180 |
| 20 | 4095, 190 |

**Fig.113** Example of the tank calibration table for FLS2