FUEL RATE MONITOR

Mobile application

USER MANUAL

Version 2.1

TECHNOTON

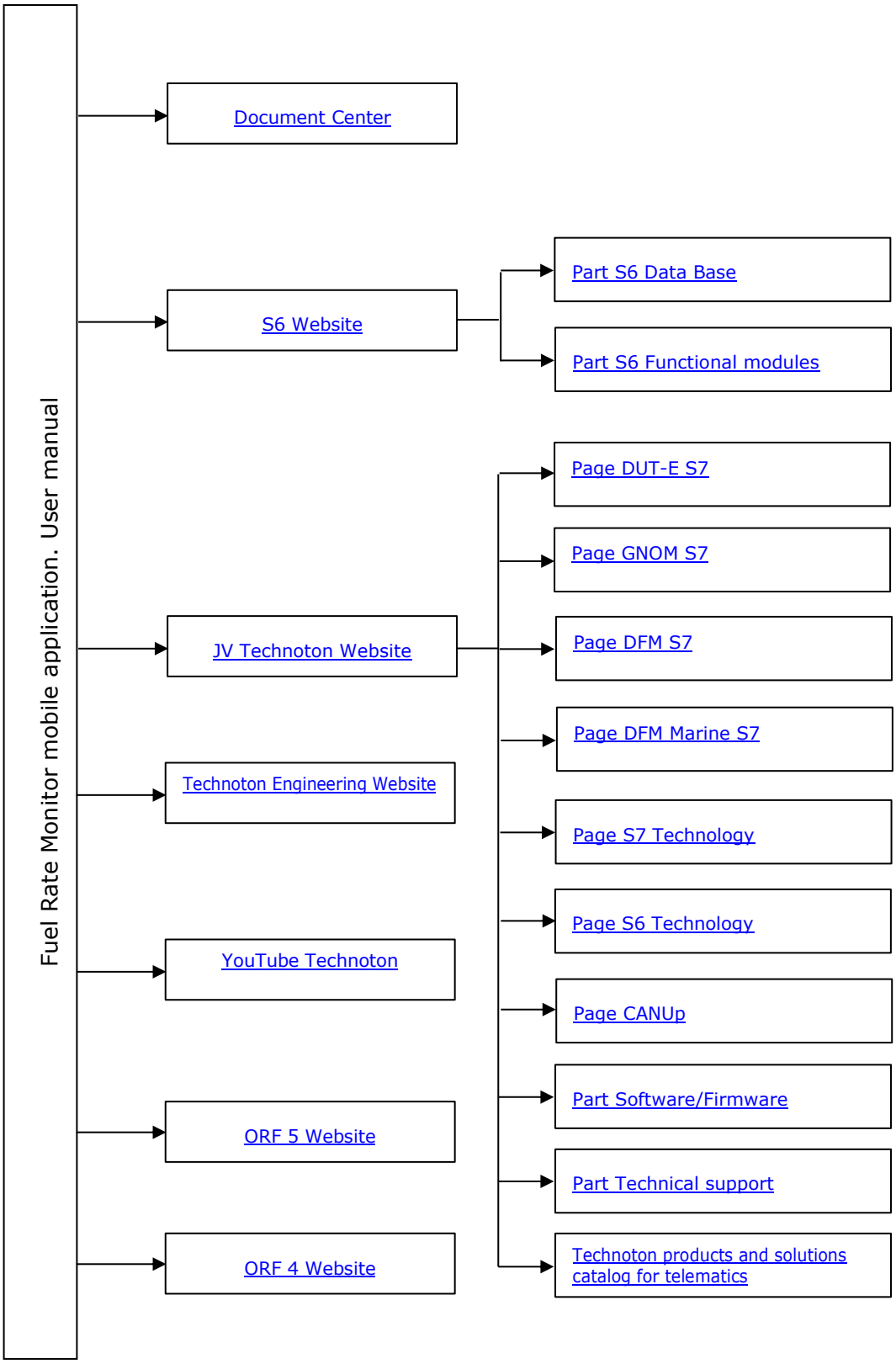
ADVANCED MACHINERY TELEMATICS

Contents

Revision history

Version	Date	Editor	Description of changes
1.0	10.2021	OD	Basic version.
2.0	10.2022	OD	Changes: • A version of Fuel Rate Monitor mobile application for devices based on iOS platform is added. • The procedure for the flow meters firmware update in “Service” mode is described.
2.1	05.2025	OD	Support for the Fuel Rate Monitor mobile application has been discontinued for iOS devices.

Structure of external links



Terms and Definitions

S7 — Technology designed for wireless collection of data from unattended sensors in systems of industrial and automobile Telematics. S7 Technology is recommended for use in facilities where wiring is impossible or hard to install.
S7 Technology implements Bluetooth 4.X Low Energy (BLE) as a communication channel.
S7 Technology provides ultra-low power consumption and a long period of independent operation for smart sensors and other IoT devices.
On the application level, S7 Technology is fully compatible with S6 Technology which uses cabling.
Advantages of S7 Technology:

- Simple design of data transmission protocol;
- Low power consumption, a potential for fully independent operation of sensors for several years;
- Option of data collection by several data recipients at one time.

DFM Marine S7 and DFM S7 fuel flow meters are designed using S7 Technology.

S6 is the Technology of combining smart sensors and other IoT devices within one wire network for monitoring of complex stationary and mobile objects: vehicles, locomotives, smart homes, technological equipment etc. The Technology is based and expands SAE j1939 automotive standards.
Information on cabling system, service adapter and S6 software refer to CAN j1939/S6 Operation manual.

PGN (Parameter Group Number) — is a combined group of S6 parameters, which has common name and number. Functional modules (FM) of the Unit can have input/output PGNs and setup PGNs.

SPN (Suspect Parameter Number) — informational unit of S6. Each SPN has determined name, number, extension, data type and numerical value. The following types of SPN exist: Parameters, Counters, Events. SPN can have a qualifier which allows qualification of parameter's value (e.g. – Onboard power supply limit/Minimum).

Onboard reports (the Reports) — information about vehicle which is returned to a user of Telematics system in accordance with inputted criteria. The Reports are generated by a terminal unit both periodically (Periodic reports) and on Event occurrence (Event report).

Parameter — time-varying or space characteristic of the Vehicle (SPN value). For example, speed, fuel volume in the tank, hourly fuel consumption, coordinates. Parameter is usually displayed in the form of graph, or averaged data.

Server (AVL Server) — hardware-software complex of Telematics service ORF 4, used for processing and storage of Operational data, formation and transmission of Analytical reports through Internet by request of ORF 4 / ORF 5 users.

Event — relatively rare and sudden change in SPN. For example, applying the magnetic field to the fuel flow meter in order to falsify indications of the hourly fuel consumption is the "Interference" Event. An Event can have one or several characteristics. Thus, the "Interference" Event has the following characteristics: date/time and duration of the interference.

When the Event occurs, a terminal unit registers the time of occurrence, which is later mentioned in a report on the event. Thus, the Event is always attached to exact time and place of occurrence.

Counter — cumulative numerical characteristics of Parameter. Counter is represented by a number, which can only grow in time. Examples of Counters: fuel consumption, engine operation time, total distance and other.

Telematics terminal (Tracking device, Telematics unit) is a unit of Telematics system used for reading the signals of Vehicle standard and additional sensors, getting location data and transmitting the data to the Server.

Telematics system — complex solution for vehicle monitoring in real time and trip analysis. The main monitored characteristics of the vehicle: Route, Fuel consumption, Working time, technical integrity, Safety. In includes On-board report, Communication channels, Telematics service ORF 4 / ORF 5.

Vehicle an object controlled within Telematics system. Usually Vehicle means a truck, tractor or bus, sometimes a locomotive or river boat. From Telematics system point of view, stationary objects are also considered to be vehicles: diesel gensets, stationary tanks, boilers/burners.

Unit is an element of vehicle on-board equipment compatible with S6 bus, which uses S6 Technology or S7 Technology.

Information regarding the change in the usage policy of mobile applications for monitoring readings from wireless S7 Technology Units

As of **April 1, 2024, the subscription fee** for all Technoton mobile applications **has been abolished**:

- Fuel Tanks Monitor
- Fuel Rate Monitor
- Axle Load Monitor

All these applications are available for **free** installation on your mobile devices and full use of their features.

Any information related to the subscription fees for mobile applications provided in this document below is now outdated.

Introduction

Recommendations and rules set out in this User Manual apply to the **Fuel Rate Monitor mobile application** (further on — application) developed by Technoton company.

This document contains the purpose, basic features, a description of the application user interface, as well as the procedure of its use for the dedicated purpose.

Fuel Rate Monitor is a powerful software tool for mobile devices which serves for monitoring and record-keeping of readings of DFM S7 / DFM Marine S7 next-generation wireless fuel flow meters.

Distinctive features of Fuel Rate Monitor application:

- analytical processing of data arrays received via Bluetooth Low Energy (BLE) channel from wireless flow meters by means of S7 Technology;
- real-time display of received data on the screen of a mobile device (smartphone/tablet);
- recording real fuel consumption and operation time of fuel consumer – total and in different consumption modes: "Idle", "Optimal", "Overload", "Tampering" and "Interference";
- display of all Counters stored in the flow meter internal memory that were accumulated during the inbuilt battery service life;
- resettable Counters of total fuel consumption and time of fuel consumer operation;
- electronic records book of total fuel consumption indications and time of fuel consumer operation;
- notification of unauthorized interference into the flow meter operation and tampering of its indications;
- function of digital self-diagnostics for flow meter quality control;
- method of differential measurement of fuel consumption for the specified pair of single-chamber flow meters (they may be of different capacity) with an option of separate monitoring fuel consumption in the feed and reverse lines;
- summation of fuel consumption indications of a created group of flow meters;
- remote taking readings of a flow meter mounted in a hard-to-reach location;
- convenient intuitive interface, inexpensive subscription;
- high-quality technical support and documentation.

ATTENTION: While using the application, we recommend to follow the instructions provided in this User manual.

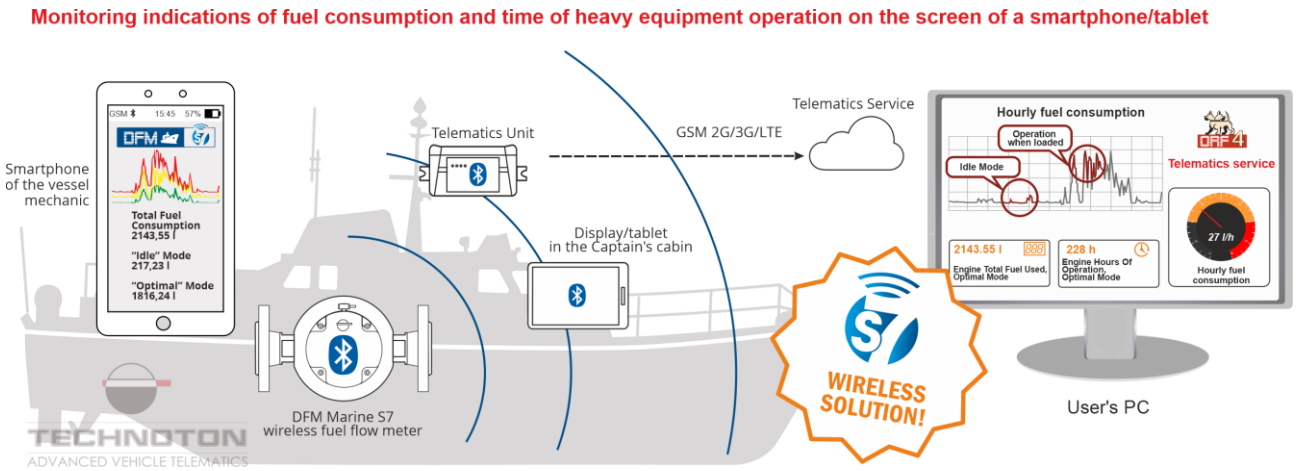
For proper use of the application together with DFM S7 and DFM Marine S7 fuel flow meters, we recommend to undergo corporate trainning.

ATTENTION: Technoton company reserves the right to modify the application specifications that do not lead to deterioration of the consumer qualities, without prior customer notice.

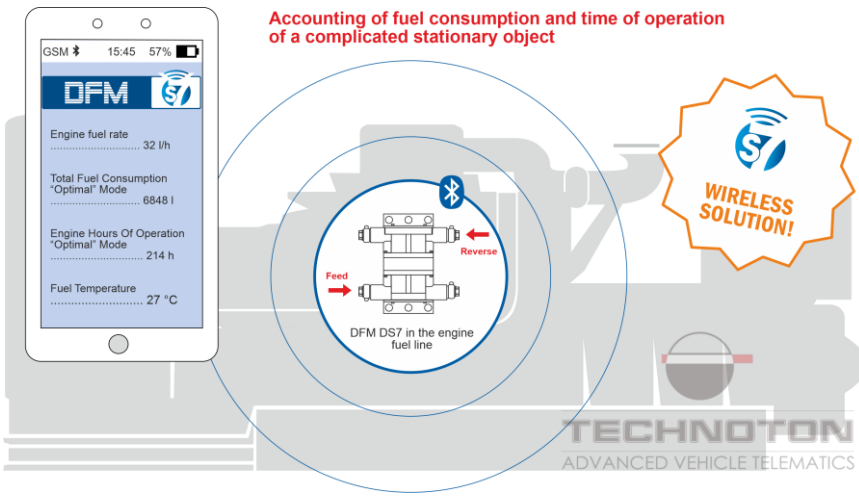
1 Purpose of application and areas of its employment

Fuel Rate Monitor application is designed to load indications of DFM S7 and DFM Marine S7 wireless fuel flow meters on the display of a smartphone/tablet by means of S7 Technology.

Application areas: Monitoring fuel consumption and the period of operation of complicated mobile equipment and fixed objects precisely on site where they operate (see figure 1).



a) wireless monitoring fuel consumption and time of operation of a vessel engine



b) wireless accounting of fuel consumption and time of operation of a diesel generator set

Figure 1 — Examples of areas of application of Fuel Rate Monitor application

2 Functionality

The functionality of Fuel Rate Monitor application enables to exercise:

- monitoring the flow meter ID data, including specifying of:
  - model;
  - serial number*;
  - mode of operation, depending on BLE-module status*;
  - firmware version;
  - MAC-addresses of BLE-module*;
  - received signal level (RSSI) and the time of the latest message reception*;
  - state of charge of the inbuilt accumulator;
- real-time monitoring of:
  - hourly (instant) consumption of fuel flowing through the flow meter measuring chamber, with displaying the numerical value* and the development curve;
  - differential hourly (instant) consumption of fuel flowing through the flow meter measuring chamber, with displaying the numerical value and the development curves of hourly consumption of fuel flowing through "Feed" and "Reverse" chambers**;
  - fuel temperature*;
- accounting indications of:
  - fuel consumption — total and separately for "Idle", "Optimal", "Overload", "Tampering" modes of application;
  - fuel consumption in "Negative" mode**.
  - fuel consumption — total and in "Tampering" mode separately for "Feed" and "Reverse" chambers**;
  - time of fuel consumer operation — total and separately for "Idle", "Optimal", "Overload", "Tampering", "Interference" modes of application;
- reset of Counters of total fuel consumption and time of the flow meter operation***;
- reception of notifications of recorded "Tampering" and "Interference" Events;
- summation of fuel consumption readings of a created group of flow meters;
- displaying current consumer mode of operation regarding fuel consumption;
- monitoring presence/absence of flow meter active malfunctions*;
- registration (logging) of current readings of:
  - hourly fuel consumption and fuel temperature;
  - differential hourly fuel consumption and values of hourly consumption of fuel passing through "Feed", "Reverse" chambers and of fuel temperature**;
- generation of an electronic records book of accounting of total fuel consumption and time of the fuel consumer operation;
- carrying out operations with the flow meter profile;
- selection between the metric / American systems of units of measurement for displaying indications*;
- choosing Russian/English language of the application interface*;
- flow meter inbuilt software update (firmware update).

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* The feature is accessible without subscription to the application.

** Valid only for monitoring indications of DFM DS7 differential flow meters or for indications of a pair of single-chamber flow meters in the differential mode of measurement.

*** Counters are reset only in the memory of the mobile device used. Values of Counters are stored and continue to accumulate in the flow meter internal memory throughout the entire period of its service life.

3 Software/hardware requirements

1) You may use the following mobile devices for work with Fuel Rate Monitor application:

- smartphone / tablet of any producer based on Android 5.0 and higher operating system (further on — Android device).

2) The mobile device you are using should have:

- Bluetooth, version not lower than 4.0;
- Internet access.

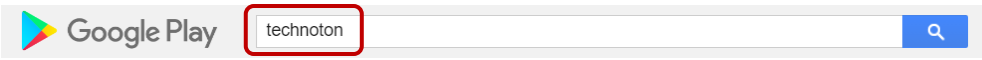
3) Displaying indications on the screen of a mobile device is possible **only after the flow meter activation**. The wireless flow meter is active and ready to run the application from the moment "Operating"/ "Manufacturing" mode is enabled for its BLE-module.
To update the inbuilt software (firmware update)) (see 6.9), the flow meter must be switched into "Service" mode.

You can study the detailed description of DFM S7 / DFM Marine S7 wireless flow meters modes of operation, depending on their BLE-module status, and also study the procedure for their activation in the operation manual of the respective flow meter.

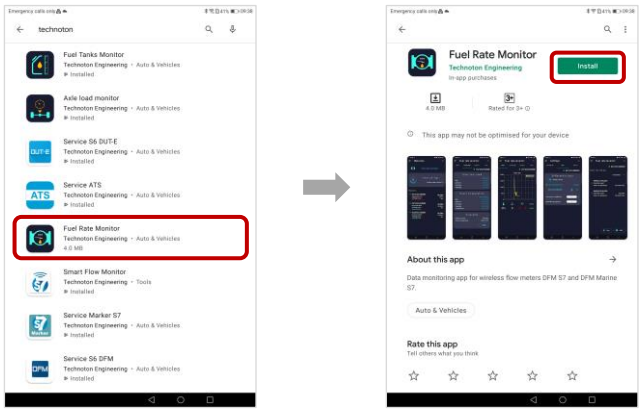
IMPORTANT:
1) To eliminate connection disruption between a wireless flow meter and a smartphone/tablet during your work with the application, you are to make sure there are no sources of electromagnetic interference close to your workplace (radio telephones, video signal transmission units and other wireless devices operating within 2.4 or 5.0 GHz frequency bands, as well as running electric motors, powerful transformers and switching equipment, welding equipment, high-voltage lines etc).
2) The maximally allowed distance between a flow meter and a smartphone/tablet depends on the quality of the Bluetooth module of a specific mobile device.
To assure the stable data transmission, it is recommended that this distance should not exceed 20 m.

4 Procedure for the application installation on the Android device

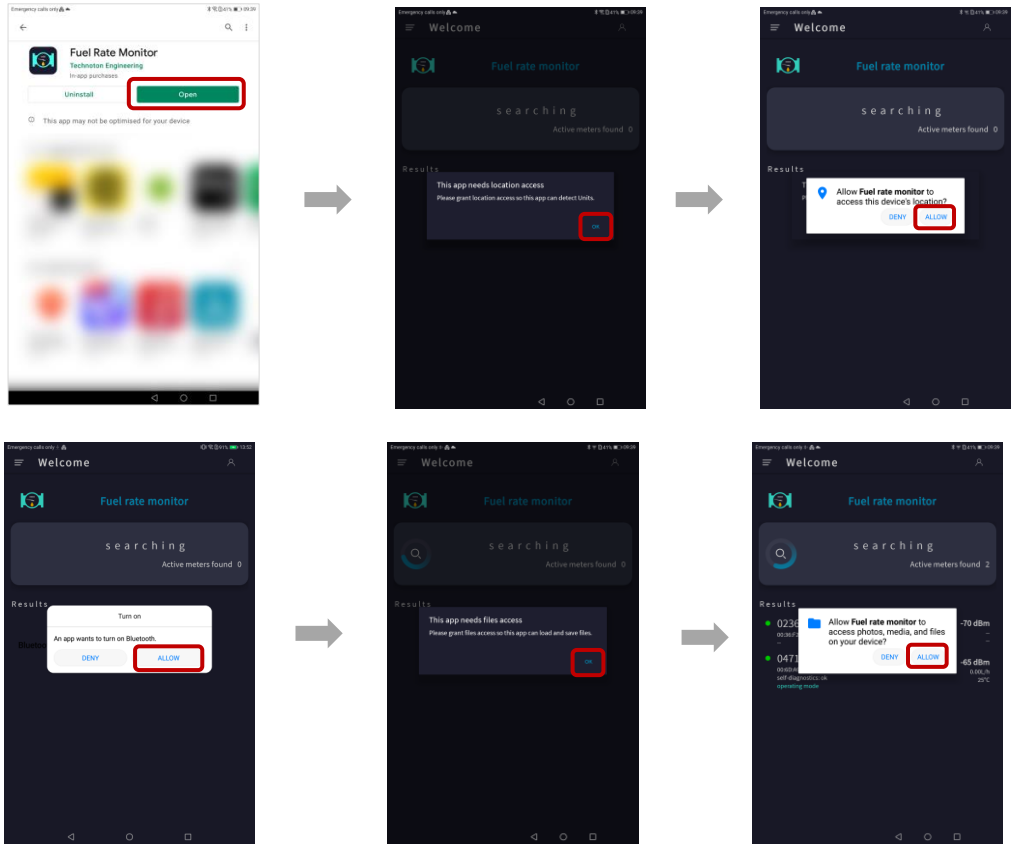
1) Open **Google Play** applications store and enter the search request **Technoton**:



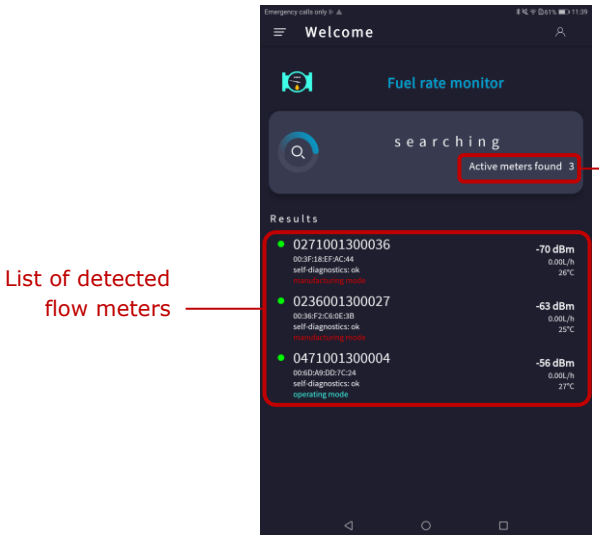
2) Select the line of Fuel Rate Monitor application from the list of Technoton mobile applications and press Install button:



3) As soon as the installation is completed, start the application by pressing Open button and confirm the requested authorizations (activation of Bluetooth, access to geolocation, access to files) that are needed for running the application:



4) After confirmation of all requested authorizations, the application is ready for work and it will automatically search and detect accessible flow meters:



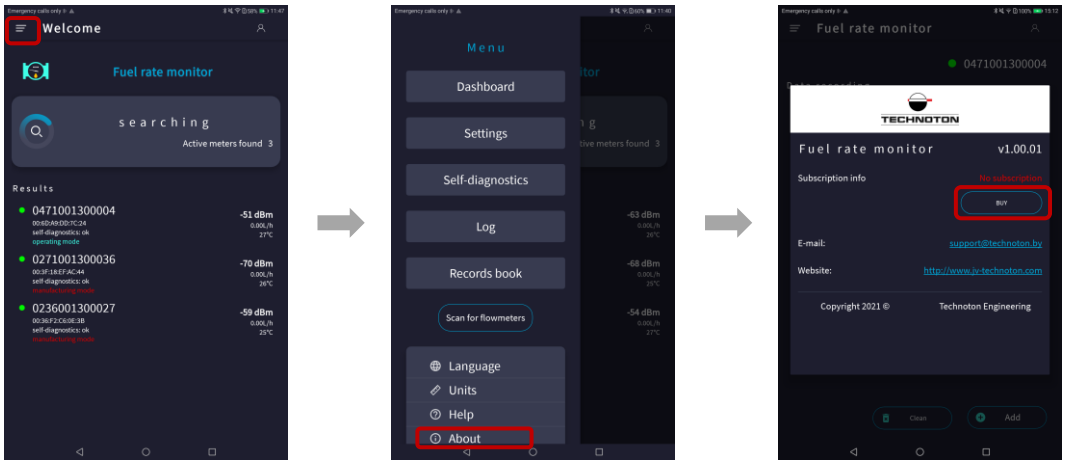
5 Subscription procedure

Only ID data check and serviceability check of detected active flow meters are available in Fuel Rate Monitor application without subscription (see 6.1).

For full-size use of the powerful application functionality (see 2), get the paid subscription with 10 days' test period.

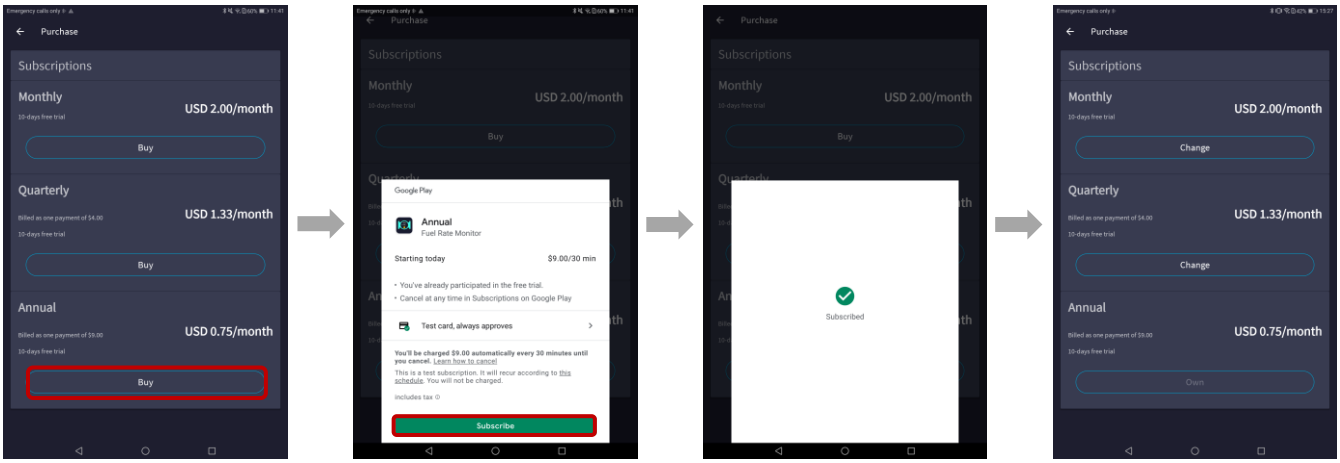
In case you cancel your subscription until the test period is over, the full sum of your payment is reimbursed.

1) Press  icon on the screen, to open the main menu; then press  button in  submenu.



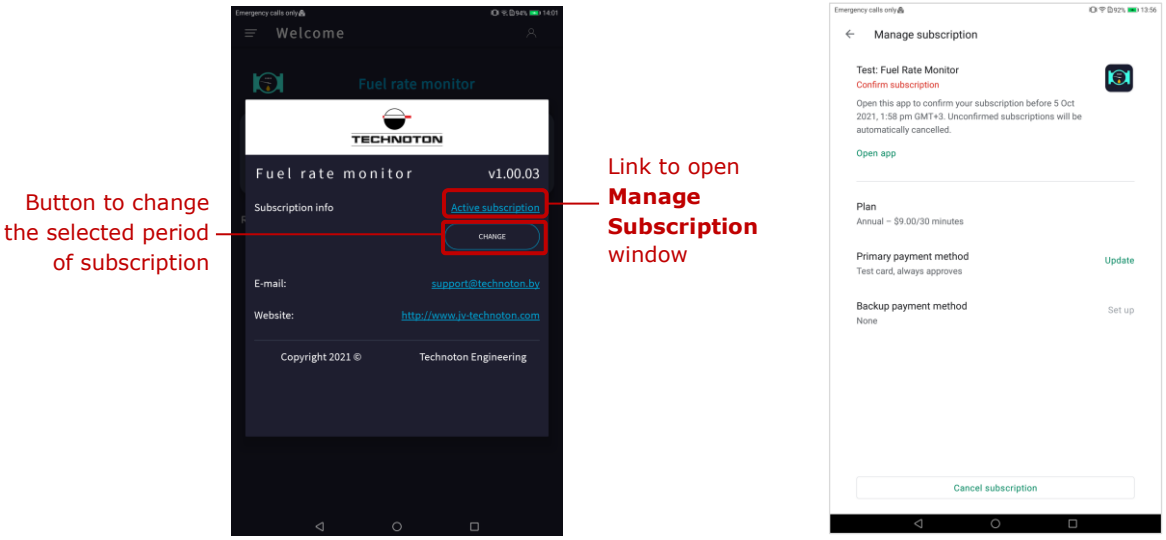
Note — In case the installed application detects active flow meters, to start subscribing, you may press the line of any flow meter from their list. The following operations are similar to the described above.

2) In **Subscriptions** window select the required period of subscription to the application and press the respective  button. In the window of Google Play service that opens, the start of the subscription period and the test period for the application are indicated. By pressing  button, make a payment, after which you are considered subscribed to the application.



3) When you open  submenu next time, some of its elements will assume a different view:

- Instead of No subscription status, Active subscription link will appear. Using it, you may open **Manage subscription** of Google Play service. You are to open the application in this window, before the indicated test period expires, to confirm your subscription. Here, you may also update the method of payment or cancel the subscription.
- Instead of BUY button, CHANGE will appear which serves to open the window to choose the subscription period. In this window, you can change the initially specified period of subscription.



6 Use of application

6.1 Establishment of connection between the flow meter and the mobile device

WARNINGS: All settings specified in Fuel Rate Monitor application are not stored in the flow meter, but saved only in the memory of a smartphone/tablet in the profile file of a specific flow meter (see 6.3).

Start Fuel Rate Monitor application by clicking on  icon in the main menu of the mobile device.

The application will offer to activate Bluetooth (in case it was off) and will open **Welcome** screen. This screen always opens, whenever the application is loaded, and is the starting point during your work with wireless flow meters. It contains **Tools bar** (see 6.2) to perform operations, as well as the search area for search of active flow meters.

Monitoring data from DFM S7 / DFM Marine S7 is possible from the moment the flow meter BLE-module is activated (activation of "Operating"/"Manufacturing" mode of operation).

Each flow meter detected is automatically entered into the list of accessible devices by the application (**Results** list), with displaying the following data (see figure 2):

- serial number **(1)**;
- signal of the time the latest message was received **(2)** (see table 1);
- MAC-address of the BLE-module **(3)**;
- presence/absence of the flow meter active malfunctions **(4)**;
- mode of operation, depending on the status of the BLE-module **(5)**;
- received signal strength indicator (RSSI) **(6)**;
- hourly fuel consumption* **(7)**;
- fuel temperature **(8)**.

Monitoring the data listed above is available for the user without subscription to the application.

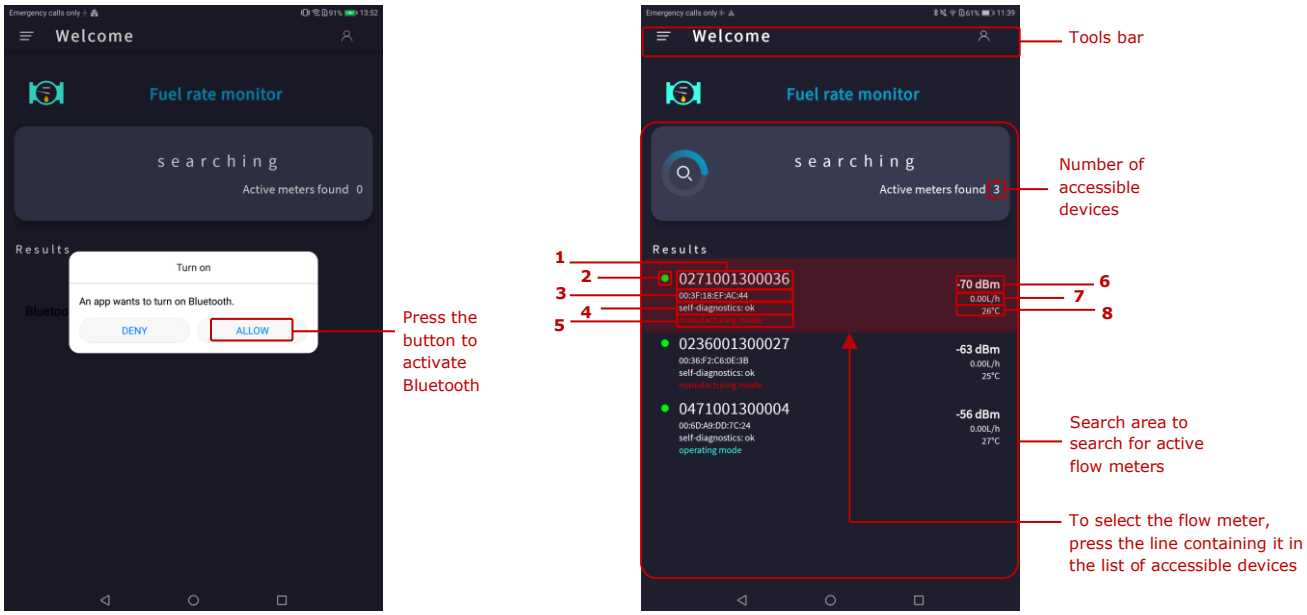
To establish connection with the required flow meter from the list of accessible devices, press the line with its serial number.

During operation, signals of indicator time of receiving last message from the flow meter on the mobile device should be displayed in Fuel Rate Monitor app (see table 1).

* Of differential hourly fuel consumption in case of the differential method of measurement.

Table 1 – Values of signals of time indicator of receiving last message from flow meter

Signal type	Signal color	Signal values
	Green	Less than 20 s passed after receiving last message from the flow meter
	Yellow	(20…40) s passed after receiving last message from the flow meter
	Orange	(40…60) s passed after receiving last message from the flow meter
	Red	More than 60 s passed after receiving last message from the flow meter



a) offer to allow the Bluetooth connection

b) flow meter selection from the list of active devices for monitoring indications

Figure 2 — Establishing connection between the flow meter and the mobile device using Fuel Rate Monitor application

6.2 Interface of application

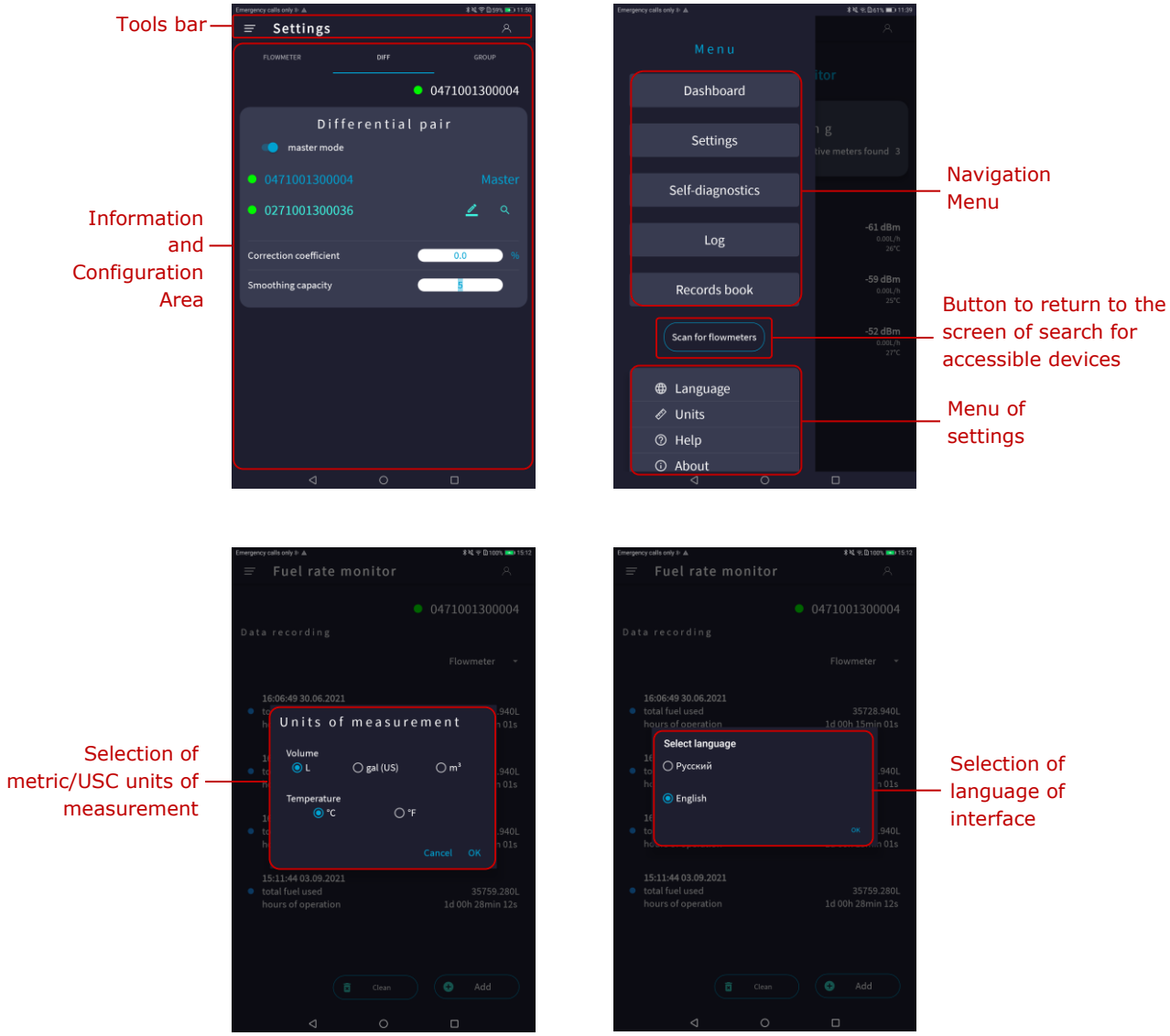
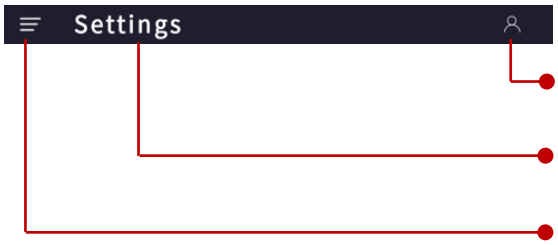


Figure 3 — Interface of Fuel Rate Monitor mobile application

In the **Information and Configuration** area current parameters and settings of the flow meter are displayed.

When working with DFM S7 / DFM Marine S7, Fuel Rate Monitor mobile app operates with data (PGN and SPN) from S6 databases.

In the **Tools bar** area there are the following elements for use during work with application:



Icon to select operations with the flow meter profile.

Description of the selected menu item.

Icon to open the application main menu containing (see figure 3):
- **Navigation menu** (monitoring Parameters, Counters, configuration of notifications of Events, creation of differential pairs of flow meters and groups for summation of indications, maintenance of a records book, diagnostics of malfunctions etc.).
- **Menu of settings** (selection of language of the interface and units of measurement, Help button and displaying information of the application).
- Button to return to the screen of search for accessible devices.

6.3 Operations with the flow meter profile

The flow meter profile is the total of passport data and settings of a specific flow meter.

The **Profile** menu serves to perform operations with DFM S7 / DFM Marine S7 profile. It is opened by pressing  on the **Tools bar** (see 6.2).

The **Profile** menu contains the following options for operations (see figure 4):

-  — is used to load the flow meter profile saved in the memory of the mobile device before. In the window where the file is to be loaded you need to find and select the Profile file (**DFM_S7_*.prf7**);
-  — is used to save the changed settings of the flow meter profile in the mobile device memory;
-  — is used for loading a profile with standard settings.

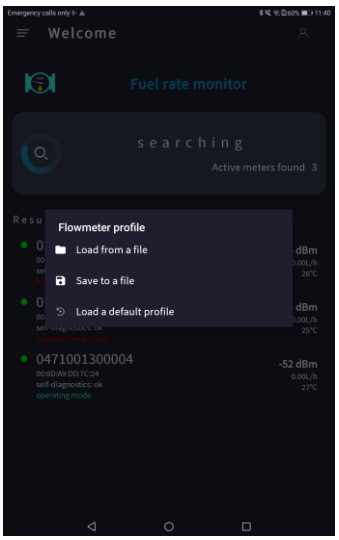


Figure 4 — View of Profile menu Fuel Rate Monitor mobile application

IMPORTANT: All changes of settings made in Fuel Rate Monitor application are not stored in the flow meter, but saved automatically only in the internal memory of a mobile device in the file located in the application installation folder:
\Fuel Rate Monitor (for Android operational system, version lower than 10).
\Android\data\com.fuel_rate_monitor\files (for Android operational system, version from 10 and higher).

Note — If needed, you may save the flow meter Profile file with the file name which is different from the file name assigned by default. However, in this case, the Fuel Rate Monitor application will not be able to find automatically the required profile, when the communication with the flow meter is established.

* Flow meter serial number.

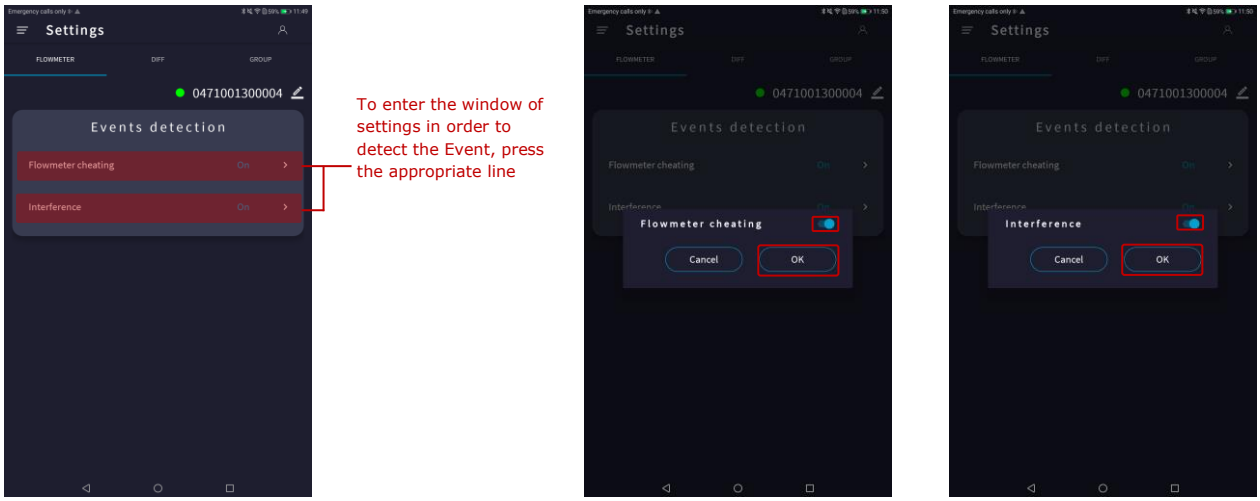
6.4 Configuring Events detection function and displaying recorded Events

Events detection function (**Settings** submenu, **Flowmeter** tab) serves for automatic registration of "Tampering" and "Interference" Events and for user notification of their occurrence, in order to eliminate incorrect indications. By default, this function is off for all Events. To activate it, you must (see figure 5):

- To detect "Tampering" Event, press **Flowmeter cheating** line of the flow meter and move right the slide switch in the opened window of settings.

  This setting serves to protect the flow meter from cheating the flow meter indications; this is aimed at increasing indications of the fuel consumption Counter (e.g. by purging air). Tampering generally results in abrupt increase of fuel consumption exceeding the maximum consumption. In this case, the application automatically identifies enhanced fuel consumption. The fuel consumption Counter operation is then suspended and "Tampering" Counter is activated which records the volume of fuel that has passed through the flow meter at a higher rate. The period of tampering is also counted in the special Counter "Time of operation. Tampering".
- To detect "Interference" Event, press **Interference** line of the flow meter and move right the slide switch in the opened window of settings.

  This setting serves to protect from impact of on the flow meter using magnetic field which is aimed at faking readings of fuel consumed or at suspending its accounting. In case of magnetic field impact, the application detects an attempt of interference; this results in the suspension of increment of all Counters, whereas the period of impact is counted in the special Counter "Time of operation. Interference".



a) tab to configure the Events identification function

b) activation of "Tampering" Event identification

c) activation of "Interference" Event identification

Figure 5 — Settings of the Events Detection function in the Fuel Rate Monitor mobile application

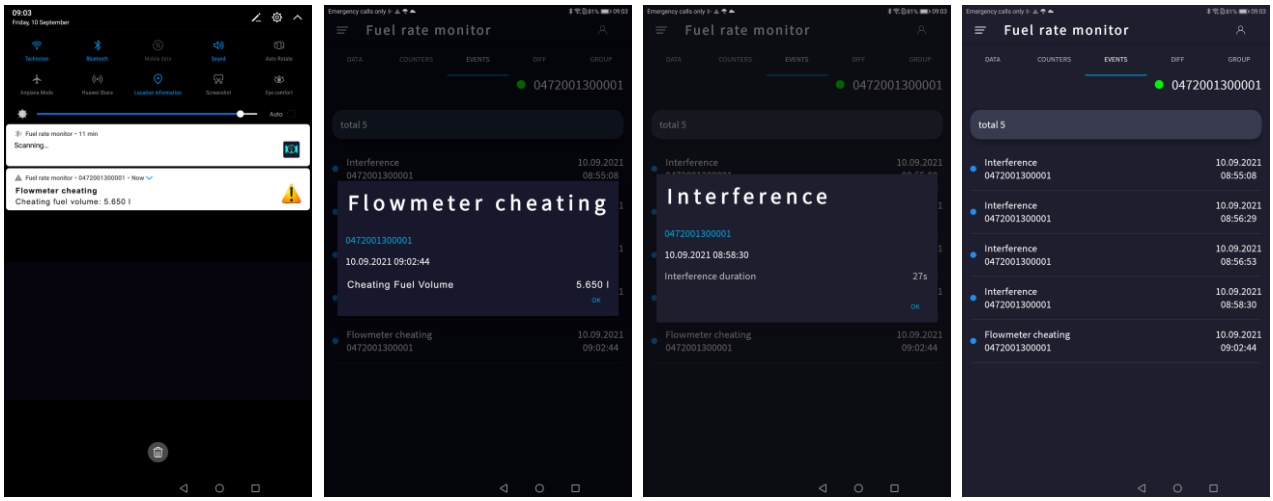
Information windows appearing on the display of a mobile device in case Events occur (see figure 6 a) are accompanied by a sound signal and vibration (in case the sound and vibration signals are switched on in the mobile device employed).

For Events the following information is displayed:

- data and time of the Event occurrence;
- faked volume of fuel consumed (for "Tampering" Event);
- period of interference (for "Interference" Event);
- flow meter number (in case the flow meter operates in the differential pair or in a group).

The list of all Events recorded during work with the flow meter, until the working session with Fuel Rate Monitor is completed, is displayed in **Dashboard** submenu (**Events** tab). To view detailed information on a specific Event from the list, press its line (see figure 6 b).

Information on the latest Event and on the total number of recorded Events is displayed in **Dashboard** submenu (**Data** tab). To switch over to the list of all Events, press the latest Event line (see figure 10 a).



a) examples of the information windows of "Tampering" and "Interference" Events

b) example of the list of recorded Events

Figure 6 — Display Events information in the Fuel Rate Monitor application

For automatic identification of Events during the next session of work with Fuel Rate Monitor application, you need to save the changed flow meter profile (see 6.3) in the memory of the smartphone/tablet used.

6.5 Configuration of Differential pair function and display of differential fuel consumption indications

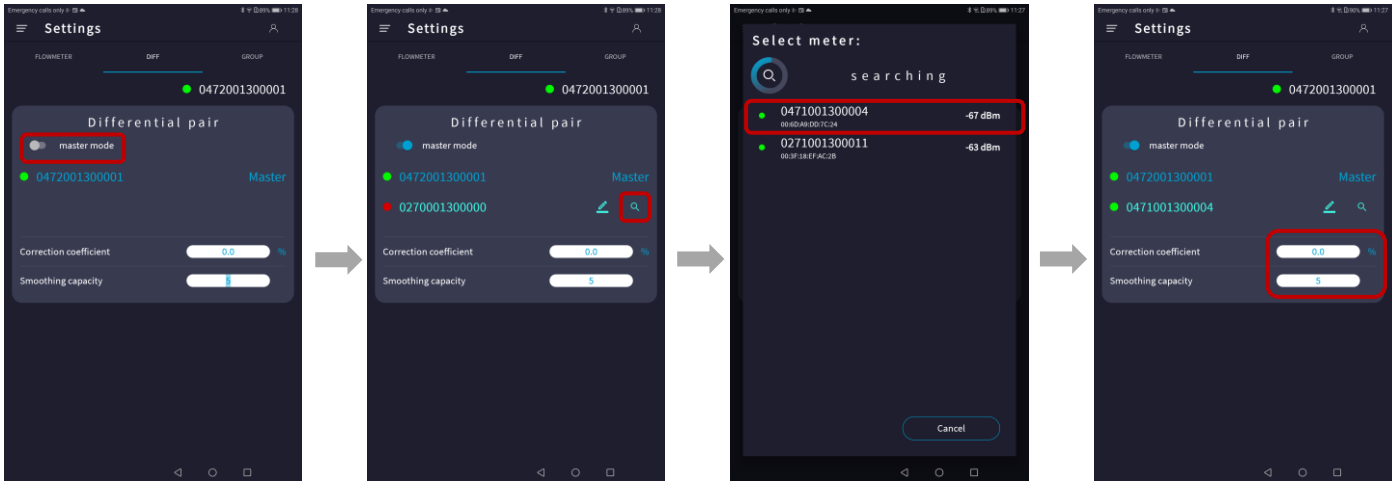
The **Differential pair** function serves to configure measurement of differential fuel consumption in the two fuel lines using a pair of any single-chamber wireless flow meters DFM S7 and/or DFM Marine S7.

Differential consumption — is the fuel consumption calculated by the application as the difference in the fuel consumption measured by flow meters mounted in the feed and reverse fuel lines of the engine (fuel consumer).

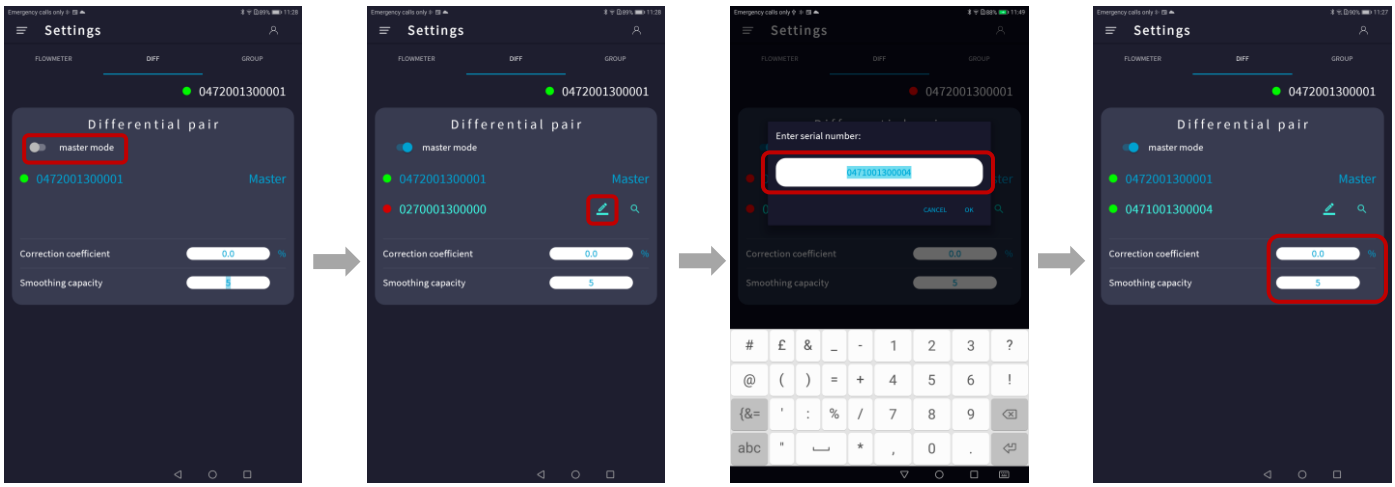
In case of differential measurement, the flow meter mounted in the feed fuel line is always the Master flow meter. The Slave flow meter is the one mounted in the reverse fuel line of the engine. The application displays indications of differential fuel consumption for the Master flow meter.

By default, the function **Differential pair** is off in the application. To activate it, establish connection with Master flow meter (see 6.1). Then, move right the **Master Mode** slide switch in **Diff** tab (**Settings** submenu).

To search for the Slave flow meter and to establish connection with it, press icon and select the required flow meter from the list of accessible devices. In case the Slave flow meter is missing in the list of accessible devices, press icon; next time it will be selected automatically (whenever it is accessible). Enter manually the required serial number in the opening window (see figure 7).



a) selection of Slave flow meter from the list of accessible devices



b) selection of Slave-flow meter by the specified serial number

Figure 7 — Examples of configuring the Differential pair function in Fuel Rate Monitor application

For monitoring indications of the created differential pair, open **Diff** tab (**Dashboard** submenu) in which are displayed in real time during the flow meter operation (see figure 8):

- chart of differential hourly consumption of fuel flowing through the measuring chambers of Master and Slave flow meters.
- charts of hourly consumption of fuel flowing through the measuring chambers of Master and Slave flow meters connected respectively to the feed and reverse fuel lines.
- Values of resettable Counters of differential fuel consumption*:

  - total fuel consumption and time of operation – these are Counters of total differential fuel consumption and time of consumer operation within the whole range of loads, including the engine operation in "Idle" mode.

  - total fuel consumption and time of operation in the "Negative" mode of operation — these are Counters of total differential fuel consumption and time of operation in case the consumption of fuel coming back through the reverse line exceeds the fuel consumption in the feed line.

  Note — The increase of negative fuel consumption is an evidence of increased foaming in the reverse fuel line at high engine rpm. The reason for enhanced foaming is the presence of air in the reverse fuel line caused by decompression or particularities of the fuel system.

Figure 8 — Example of real time display of development curves of hourly fuel consumption and of Counters for the operating differential pair of flow meters

* Counters are reset only in the memory of the mobile device used. Values of Counters are stored and continue to accumulate in the flow meter internal memory throughout the entire period of its service life.

In case there are some malfunctions of the differential pair operation (e.g. in case of connection disruption with Master and/or Slave flow meter or in case of negative fuel consumption), warnings appear in **Dashboard** submenu: 

message (**Diff** tab) and 

sign (**Data** tab**)**.

ATTENTION: During your work with the application you should bear in mind that in **Counters** tab (**Dashboard** submenu) depending on the status of **Differential pair** function, the following values of Counters are displayed:
1) Counters of differential fuel consumption (when Master mode is on).
2) Fuel consumption Counters for the feed fuel line (when Master mode is off).

In case you need, you can specify the following settings for adaptation of the differential pair of flow meters indications for specific conditions of operation (see figure 7):

1) Smoothing capacity (SPN 521671) — Serves to enhance the accuracy of differential measurement in complicated facilities with uneven fuel consumption in feed and reverse fuel lines (e.g. during fuel pushes, high inertness of the fuel system, hydraulic shocks etc.).
The value of the smoothing capacity is chosen experimentally from the range of conventional units **2...100**. Here, one conventional unit correlates with the volume of the measuring chamber of Master flow meter (see DFM S7 / DFM Marine S7 operation manual). Thus, the selected value of the smoothing capacity will correspond to the conventional capacity which is equal to the total of the volumes of the measuring chambers.
In case of even flow rate in feed and reverse lines, it is recommended to enter minimum value of buffer (in majority of cases default value **5** is enough). When unevenness of flow rate in feed and reverse lines is growing, it is recommended to increase value of smoothing buffer.

WARNING: You should remember that whenever the value of the smoothing capacity is increased:
1) Values of the differential fuel consumption Counters recalculated by the application for the Master flow meter may remain unchanged up to a few minutes since the engine is started.
2) After the fuel supply is stopped, the time needed until the indications of Master flow meter Counters are set— no less than 15 s.

2) Correction coefficient (SPN 521434). This parameter allows increasing accuracy of fuel consumption measurement if a user constantly detects derivation (values are too high/low) of measured consumption related to specific conditions of operation (increased vibration of Vehicle, air presence in fuel lines, higher fuel flow in reverse line of nozzles).
For example, if fuel flow meter shows 3 % higher results of measurement, it is necessary to enter consumption correction coefficient equal minus 3 %. If fuel flow meter shows 2 % lower results of measurement, it is necessary to enter consumption correction coefficient equal plus 2 %.
In each particular case related to settings for adaptation of a differential pair of flow meters you may contact Technoton technical support service.
For monitoring indications of the created differential pair of flow meters during the next session of work with Fuel Rate Monitor application you are to save the modified profile of Master flow meter (see 6.3) in the memory of the smartphone/tablet being used.

6.6 Configuration of Readings Summation function and displaying total fuel consumption

The function of **summation of fuel consumption readings** that are measured by a group of any wireless DFM S7 and/or DFM Marine S7 flow meters (up to 10 pcs.), is configured in **Settings** submenu (**Group** tab).
For Master flow meter, the application displays the total value of fuel consumption; indications of Slave flow meters that need to be summed are added to those of Master flow meter.

Flow meters from **Search** area are added to the group of accessible flow meters by pressing button to the right of the serial number of the respective flow meter (see figure 9 a).

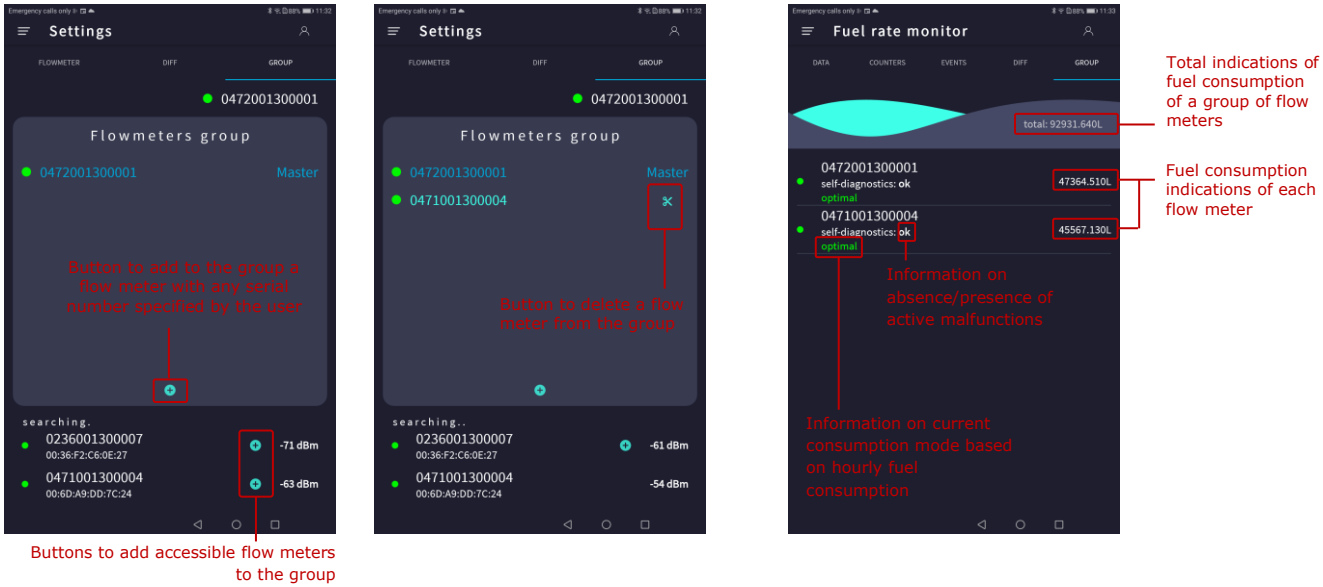
By pressing button in the lower portion of **Flowmeters group** you may add a flow meter with any serial number specified by yourself.

Using button, you may delete the respective Slave flow meter. However, you cannot delete Master flow meter from the group.

For each flow meter of the group are displayed: serial number, current fuel consumption readings and the mode of consumption related to hourly fuel consumption, information on presence/absence of active malfunctions and the indicator of time of receiving the latest message (see figure 9 b).

In case there are flow meter active malfunctions, **(!)** warning sign is displayed near its serial number.

Total indications of fuel consumption for the created group of flow meters are displayed in **Total** field, in the upper right portion of **Group** tab (**Dashboard** submenu).



a) creation of a group of flow meters for summation of readings

b) monitoring total indications of a group of flow meters

Figure 9 — Example of summation of readings of two flow meters in Fuel Rate Monitor application

For monitoring total indications of the created pair of flow meters during the next session of work with Fuel Rate Monitor application, you are to save the modified profile of Master flow meter (see 6.3) in the memory of the smartphone/tablet being used.

6.7 Monitoring and recording readings

For monitoring readings, establish a connection with the required DFM S7 / DFM Marine S7 wireless flow meter from the list of accessible devices (see 6.1).
The following data are displayed in real time in **Dashboard** submenu on the display of the mobile device (see figure 10):

1) Current Parameters (**Data** and **Diff** tabs**):
- hourly fuel consumption;
- differential hourly consumption*;
- hourly fuel consumption in "Feed" and "Reverse" chambers*;
- fuel temperature;
- engine mode of operation regarding fuel consumption.

2) Current values of Counters (**Counters** and **Diff** tabs**):
- total fuel consumption;
- total fuel consumption (resettable);
- total fuel consumption in "Idle" mode;
- total fuel consumption in "Optimal" mode;
- total fuel consumption in "Overload" mode;
- total fuel consumption in "Tampering" mode;
- total fuel consumption in "Negative" mode*;
- total fuel consumption in "Feed" and "Reverse" chambers*;
- total fuel consumption in "Tampering" mode in "Feed" and "Reverse" chambers*;
- flow meter operation time;
- flow meter operation time in "Idle" mode;
- flow meter operation time in "Optimal" mode;
- flow meter operation time in "Overload" mode;
- flow meter operation time in "Tampering" mode;
- flow meter operation time in "Interference" mode.

3) Recorded Events (**Events** and **Data** tabs):
- "Flow meter tampering".
- "Interference into flow meter operation".

4) Information on presence/absence of active malfunctions of the flow meter or of the differential pair* (**Data** tab).

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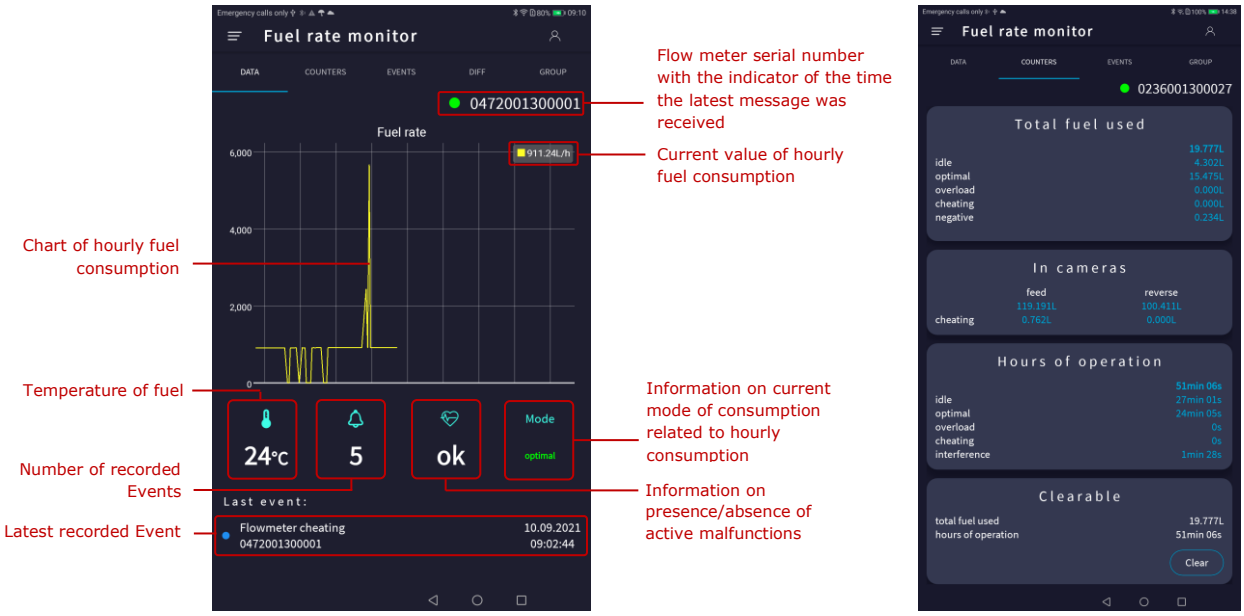
* Valid only for differential mode of measurement.
** In case of monitoring the differential pair of flow meters.



*a) in **Data** tab* *b) in **Counters** tab*

Figure 10 — Example of displaying the flow meter readings in Fuel Rate Monitor application

Detailed description of wireless flow meters output data that are displayed by Fuel Rate Monitor application is provided in DFM S7 / DFM Marine S7 operation manuals.

Tools to record readings:

1) Logging: In **Log** submenu, by moving right **Data logging** slide switch, you may enable registration (logging) current values of hourly, average fuel consumption and fuel temperature, with their recording in the log file. In case of differential measurement, hourly fuel consumption in "Feed" and "Reverse" chambers is also recorded.

Log files names (**.txt**) are generated automatically and contain: date, time of starting data recording and the flow meter serial number.
Log files are automatically placed into the application installation folder in the memory of the mobile device:

\Fuel Rate Monitor\Logs (for Android operational system, version lower than 10);
\Android\data\com.fuel_rate_monitor\files\Logs (for Android operational system, version from 10 and higher).

The maximum number of control points displayed — 200. The number of points recorded in the log file — not limited.
Whenever you tick the **Scrolling** field, each added line of the Parameters will be displayed in the bottom portion of the table. 

button serves to clear the list of all control points registered during logging (see figure 11 a).

2) Electronic records book: By pressing 

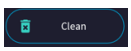
button in **Records book** submenu you may enter current values of Counters of total fuel consumption and time of the flow meter operation or of the differential pair operation into the electronic records book, with recording them into **(*.csv)** file and **(*_DIFF.csv)** file, respectively.

The file name is also generated automatically and contains the flow meter serial number.

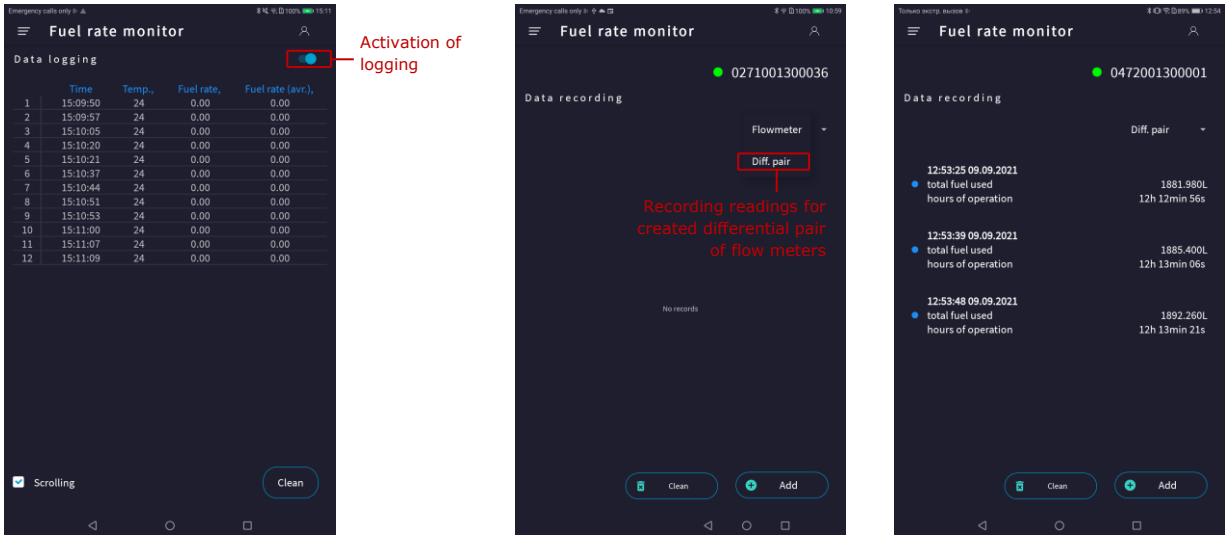
The recorded electronic record book files are automatically placed into the application installation folder in the internal memory of the mobile device:

\Fuel Rate Monitor\Records (for Android operational system, version lower than 10);
\Android\data\com.fuel_rate_monitor\files\Records(for Android operational system, version from 10 and higher).

The number of entries of readings into the records book file is unlimited.



button serves to delete all entries made in the electronic records book (see figure 11 b).



*a) in **Log** submenu* *b) in **Records book** submenu*

Figure 11 — Examples of recording a flow meter readings in Fuel Rate Monitor application

6.8 Malfunction diagnostics

Self-diagnostics submenu in Fuel Rate Monitor application serves to monitor the quality of performance of the selected DFM S7 / DFM Marine S7 fuel flow meter. Names of all flow meter active malfunctions (if any) for the whole working session with the application (see figure 12 b) and their indicators (see table 2) are displayed in the submenu window, in **Malfunctions** area. In case no active malfunctions are detected, the appropriate message in **Malfunctions** area is displayed (see figure 12 a).

You can also monitor the quality of the flow meters performance:

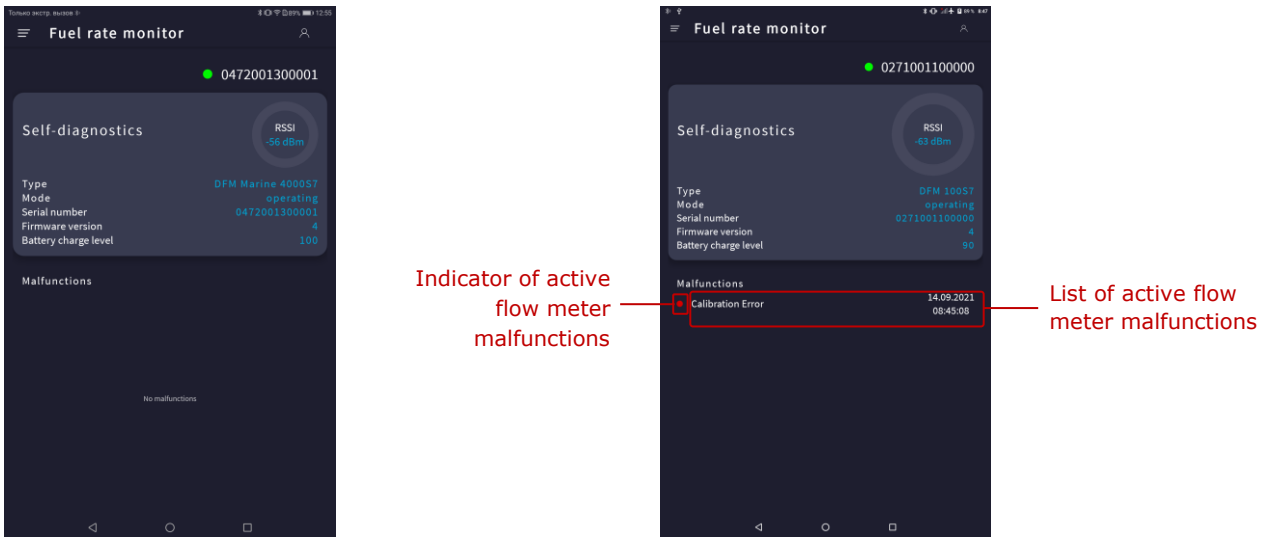
1) In the list of identified accessible devices (**Welcome** screen) (see 6.1) and in **Group** tab (**Dashboard** submenu) (see 6.6), where **Self-diagnostics: Ok** message is displayed under the serial number of each flow meter, in case no active malfunctions are detected; in case there are some, — **Self-diagnostics (!)** is displayed.

2) In **Data** tab (**Dashboard** submenu) (see 6.7), where ok sign is displayed, in case no active malfunctions are detected; in case there are some, — (!) is displayed; in case of malfunctions within the differential pair of flow meters ok D! sign is displayed.

3) In **Diff** tab (**Dashboard** submenu), where in case of malfunctions within the differential pair of flow meters, (!) Differential mode error warning message is displayed.

Table 2 – Meaning of signals of active malfunctions indicator of flow meters

Signal type	Signal color	Signal values
	Red	Active flow meter malfunction identified (see the list of all possible malfunctions in DFM S7 / DFM Marine S7 operation manuals)
	Blue	Active flow meter malfunction eliminated



a) without active malfunctions *b) there are active malfunctions*

Figure 12 — Flow meter quality control in the Fuel Rate Monitor application

6.9 Flow meter firmware update

ATTENTION:
1) The option of firmware update is allowed only for DFM S7 / DFM Marine S7 flow meters which have the firmware version from **6.0** and higher.
2) The firmware update is conducted **only** with the aim of the flow meter improvement recommended by the Manufacturer.
3) To conduct the flow meter firmware update, before it, the flow meter is to be switched into **"Service" mode**. After the firmware update, the flow meter is always automatically switched into "Storage" mode.
4) You can find detailed description of DFM S7 / DFM Marine S7 modes of operation, depending on the status of the BLE-module, in the operation manual of the respective flow meter.

For the flow meter firmware update, perform the following sequence of operations (see figure 13):

1) Copy the firmware file **(*.blf3)** to the mobile device, to the installation folder of Fuel Rate Monitor application, start the application and switch the flow meter into "Service" mode.

The sign of "Service" mode activation is  indicator appearing in the line of the respective flow meter.

WARNING: It should be noted that if during **20 s** after switching the flow meter into "Service" mode its connection with the mobile device is not established, the flow meter will automatically switch back into the previous mode.

2) To establish connection between the Unit and the mobile device using S7 Technology, press the line of the flow meter whose firmware is updated and enter: the login (in the upper field) and password (in the bottom field) in **Authorization** window.

The login by default is — **0**. The password by default is — **1111**. In order to save the password entered (to prevent its entering manually a second time during the next session of work), tick **Remember password** field.

3) After the successful user authorization, the window **Unit**. **Passport** containing the ID of flow meter whose firmware is updated will open. Press 

button, then, confirm the firmware update.

In case the flow meter needs to be disconnected from the mobile device, press 

button.

4) Select the copied firmware file in your mobile device and start the process of loading it into the flow meter memory by pressing 

button.

After automatic checking the file for its integrity and compatibility by the application, the loader window will appear. In case of any errors, the application will issue the appropriate warning. The process of loading the updated firmware might take a few minutes.

button serves to cancel the firmware update procedure. We do not recommend to press this button, unless there is no urgent need for doing so, because aborting the firmware update procedure may result in the flow meter inoperability.

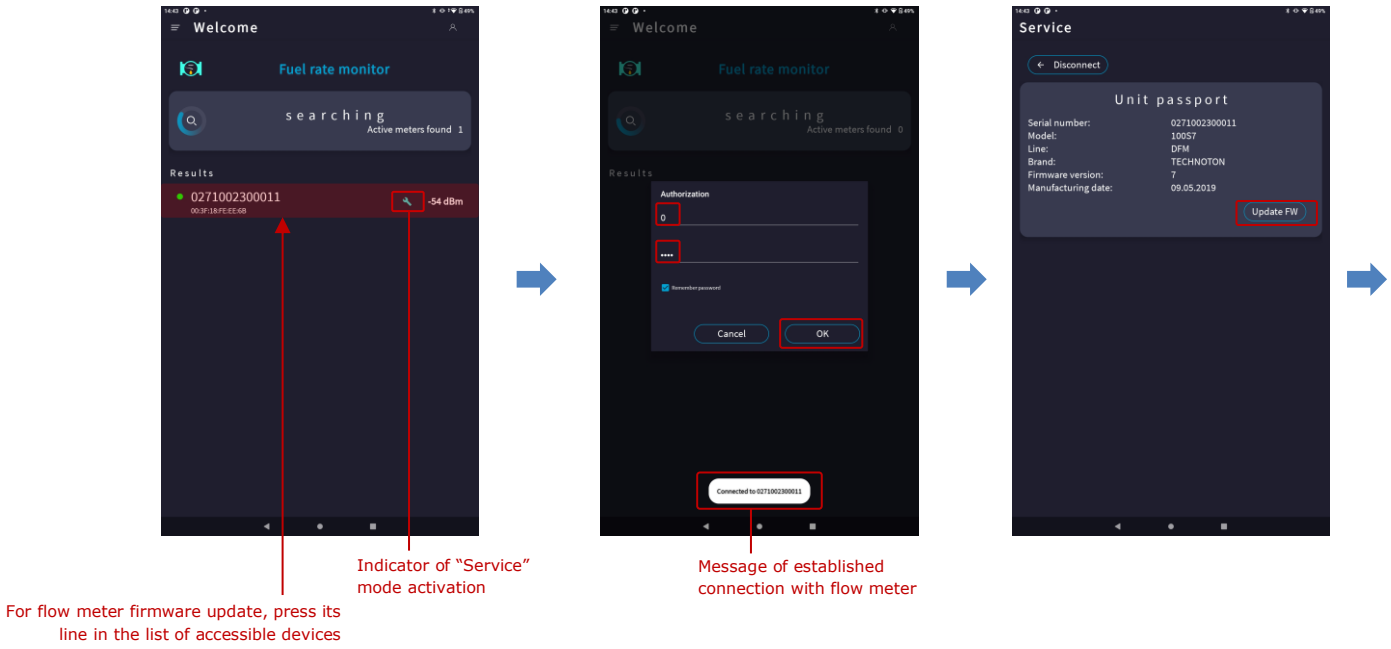
WARNING: To avoid damaging the flow meter, before data loading is completed, **it is forbidden to**:

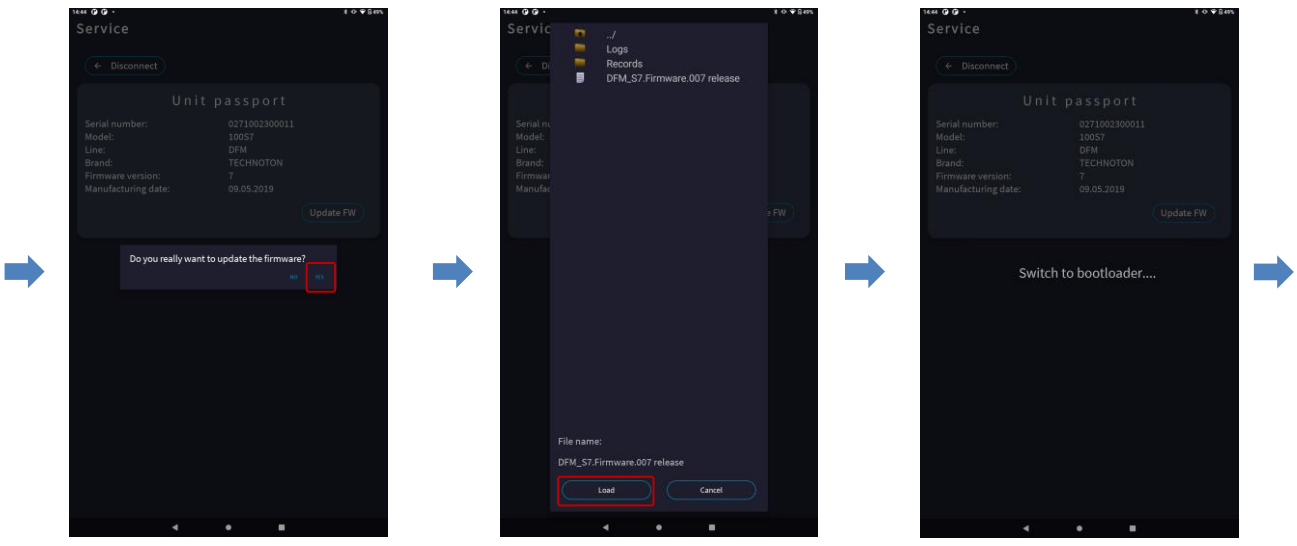
- close Fuel Rate Monitor application;
- switch off the mobile device.

5) After the successful completion of the firmware update procedure, the appropriate message will appear, and the application will automatically disconnect the mobile device from the flow meter. The flow meter that has undergone the firmware update will switch into "Storage" mode. When next time the flow meter is switched into "Operating"/"Manufacturing" mode (see the operation manual for the appropriate flow meter), the new firmware version will be displayed in the **Self-diagnostics** submenu.

If the flow meter firmware update has been completed incorrectly and the current version of the inbuilt software has been damaged, the firmware update should be repeated. In this case, the inbuilt loader is activated which enables to restore the flow meter operability.

If a repeated attempt fails, we recommend to consult Technoton technical support service by e-mail support@jv-technoton.com.





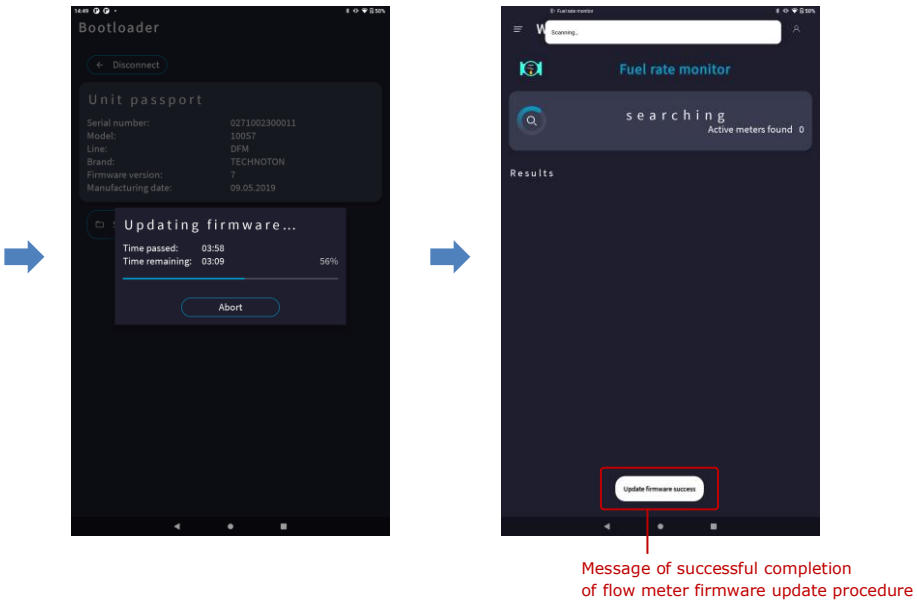
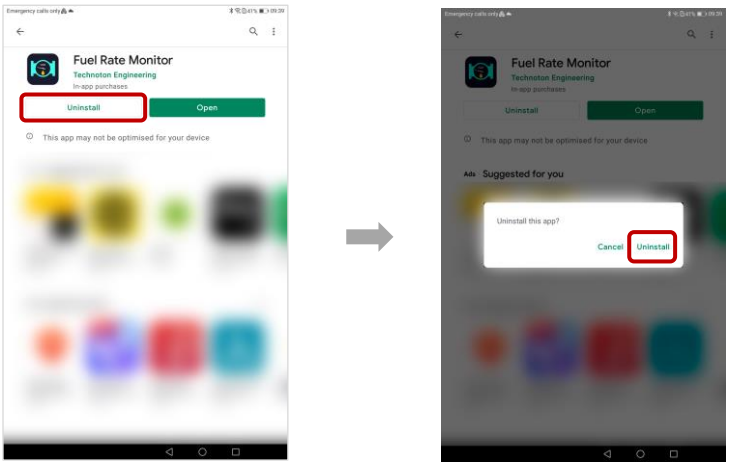


Figure 13 — Procedure for the flow meter firmware update

7 Procedure for deleting the application from Android device

To delete the application, you should open it in Google Play in the smartphone/tablet you are using and press Uninstall button.



You may also use the standard method of deleting Android-based applications: holding  icon with your finger, drag and drop it into **Delete** wastebasket which appears on top of the screen.

Contacts

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support@jv-technoton.com

Annex A
Videography

1) Technoton Advanced Machinery Telematics video.

Link: https://youtu.be/iHOomwMpO0w

2) New DFM Marine fuel flow meter video.

Link: https://youtu.be/PmDcC-ZEoVg

3) Wireless BLE sensors connection to CANUp video.

Link: https://youtu.be/9jg__89B8QY

4) CANUp Telematics gateway video.

Link: https://youtu.be/1PgmVpr1rDw

5) DFM Marine Fuel Flow Meter video.

Link: https://www.youtube.com/watch?v=9lC4_RzfLik

6) DFM Fuel Flow Meter Installation video.

Link Link: https://www.youtube.com/watch?v=ATscYhBsD3c

7) DFM fuel flow meter operation principle video.

Link: https://www.youtube.com/watch?v=RXjvwyy1zlY

8) Interactive animation video **DFM fuel flow meter: selection of mounting scheme, accessories and mounting kit**

Link: https://jv-technoton.com/choosing-installation-scheme-of-dfm-fuel-flow-meters/

9) Check out YouTube channel for other Technoton **videos** at:

https://www.youtube.com/channel/UCq7EF3DHrgl7fOWB2ynsR-A