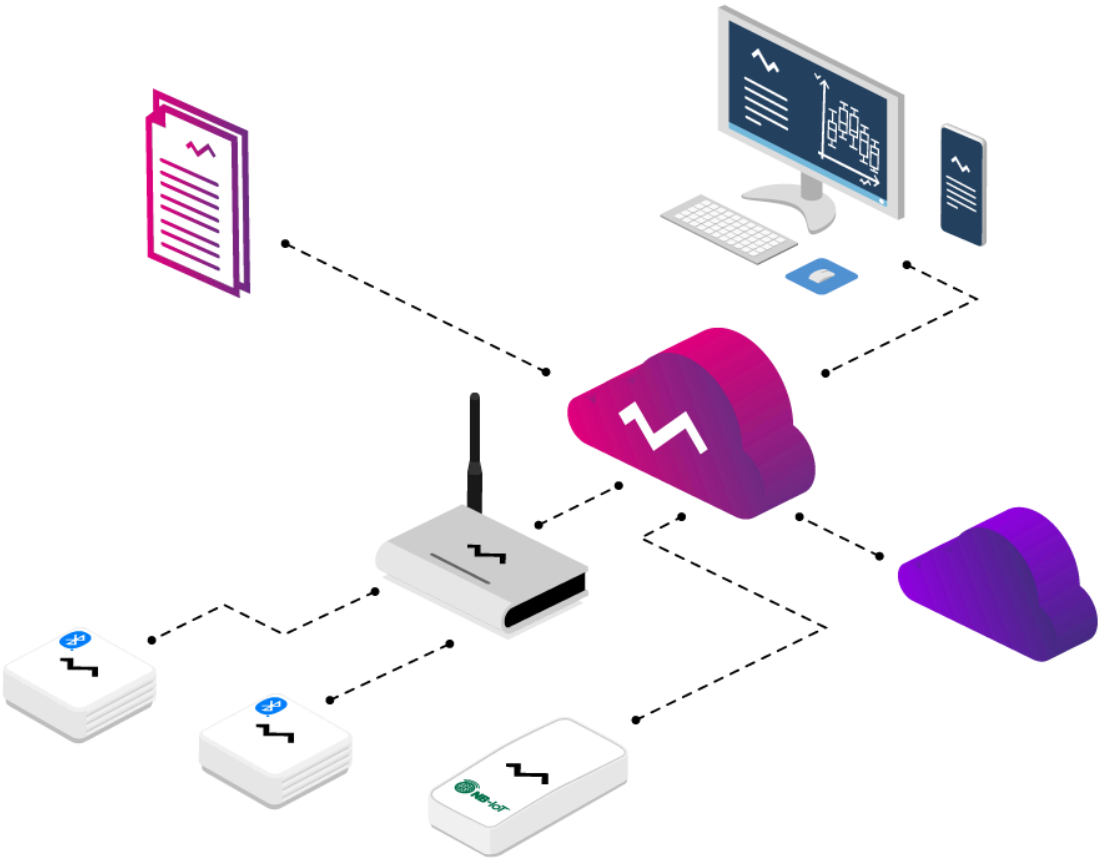
Efento Cloud
User manual



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1. Registration and logging in to Efento Cloud

Using Efento Cloud requires creating an account. To register, go to cloud.efento.io and click “sign up”. You will be asked to provide the data necessary for registration (username, first name, last name, e-mail address, password) and to accept the terms and conditions of using the service. A message with an activation link will be sent to the email address provided. After filling in all the required fields, click Register and then open the verification email sent to your mailbox. After clicking the link in the email, your account will be activated and you will be able to log in.

Users who already have a verified, active account, can skip the steps described above, and log in by entering their email address and password.

2. Organization

Organizations enable the sharing of measurement data from sensors with many users. Additionally, within the Organization, you can create a location structure that allows you to organize your sensors. You can grant the users who have access to your Organization the permissions to view or modify individual locations. The organization has its own unique key, thanks to which specific sensors can be assigned to it. This is done by entering the Organization key in Efento Gateway - a device that sends measurements from wireless sensors to Efento Cloud or directly in NB-IoT sensors. All these steps are described in detail in the next chapters of this manual.

If you have registered with Efento Cloud and are not yet a member of any Organization, you will be asked to create a new Organization and choose its name. After entering this data, you will get full access to managing your Organization, inviting other users to it and configuring sensors. If a new user has been invited to an existing Organization, they will be automatically assigned to it after successful account registration.

3. Configuration of Efento Gateway

Efento Gateway is a device connected to the network that receives the data from Efento wireless sensors within its range and sends it to Efento Cloud. The device can be powered by a USB power supply (5V, 1A) or optionaly PoE (802.3af).

3.1. Configuration of Efento Gateway using the Efento mobile application

The fastest and easiest way to configure Efento Gateway is to configure it using the Efento mobile application. Connect the device to the power supply and the Internet, and then download the Application from the Play Store, run it and log in to your Efento Cloud account. After logging in, enter the main menu of the application (three lines in the upper left corner), then select *Organization settings -> Add sensors -> Bluetooth Low Energy -> Add gateway* and follow the instructions on the screen.

3.2. Configuration of Efento Gateway using a web browser

In order to configure the Efento Gateway using your web browser, connect Efento Gateway to the power supply with a USB cable and to the computer by Ethernet cable. After ensuring power and connection, change the settings of the network card to which the device is connected:

- 192.168.120.0/24 (e.g. 192.168.120.2),
- subnet mask 255.255.255.0).

Then open an Internet browser and go to address 192.168.120.89 (default Efento Gateway address).

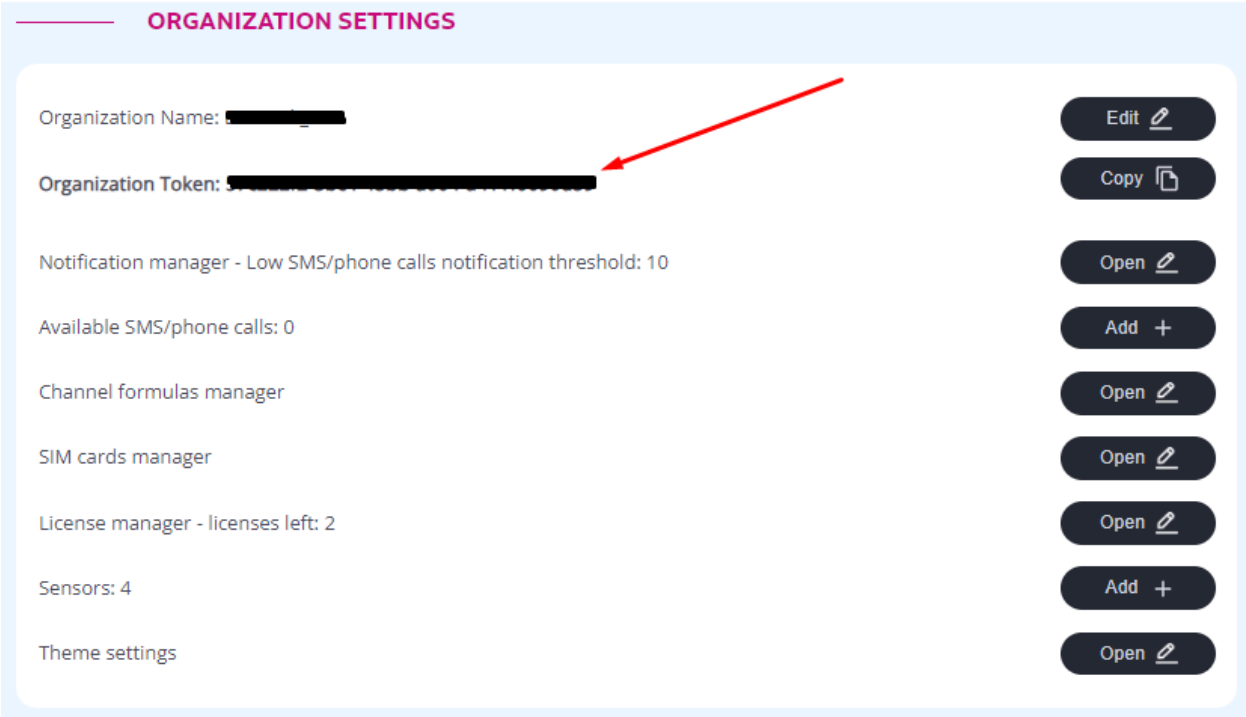
Configure the Efento Gateway, so that it has Internet access. In the *Configuration* section, configure all network settings (IP address of the Efento Gateway, IP address of network gateway, subnet mask, DNS address). Apply all changes by clicking *Save*. Efento Gateway supports DHCP. If you choose option ON next to DHCP, then all network configuration of Efento Gateway will be downloaded from the router (Do not forget to turn on the DHCP on the router!).

After finishing this part of configuration, unplug the Efento Gateway from the computer and connect it to the network with Ethernet cable. Some versions of Efento Gateway can be powered by PoE (Power over Ethernet). If you have a switch / router / injector

that supports PoE technology (802.3af), then you can plug in only Ethernet cable, which will set up a connection to the network and will also work as a power supply. Otherwise, you also have to plug in a USB power supply (5V, 1A).

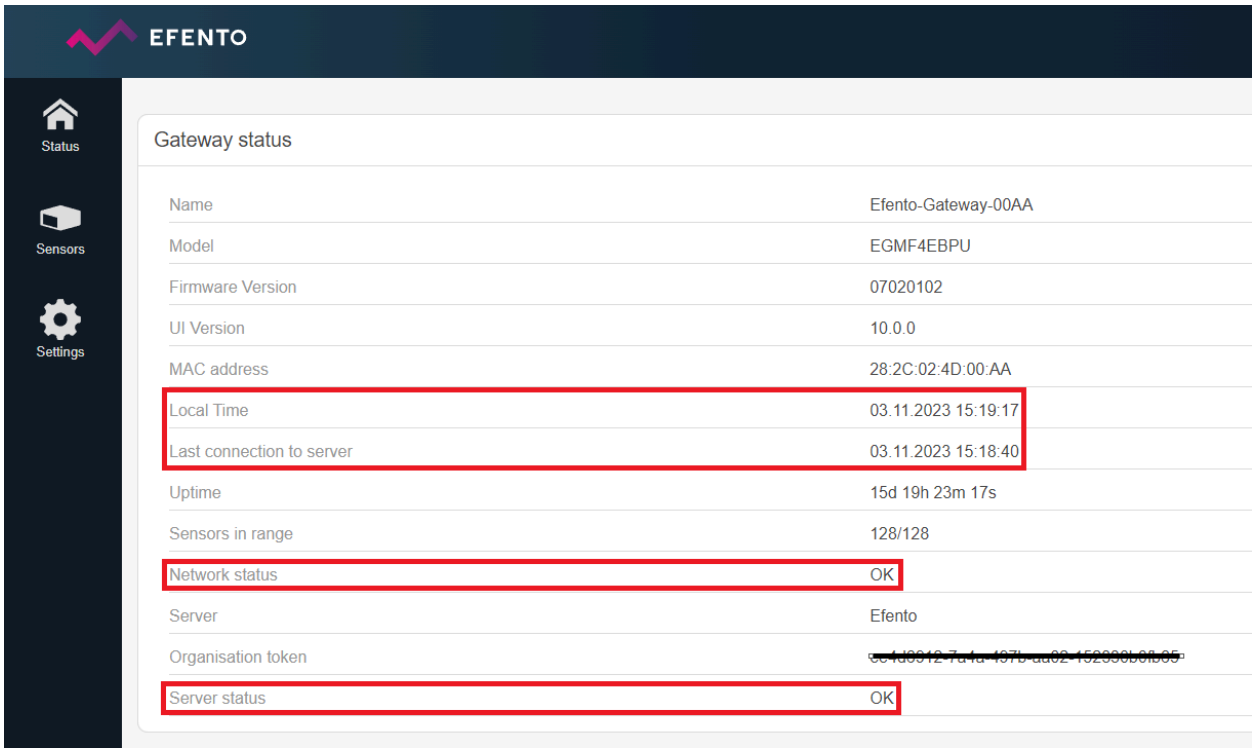
Assigning a gateway to your Organization is done by entering the Organization token. Organization token is a unique number assigned to your Organization. After entering the token in Efento Gateway, measurement data from all sensors within its range will be automatically sent to your Organization's account in Efento Cloud. Data from many Efento Gateways, located even in distant places can be assigned to a single Organization. Thanks to this, measurement data can go to your Organization's account from many facilities, even hundreds of kilometers away from each other.

You will find your Organization token after logging in to your Efento Cloud account. From the menu on the left, select the settings icon (gearwheel) and then *Organization settings*.



Organization token should be entered in the *Token* field in the Efento Gateway configuration page (Settings > Server). After entering the Organization token, measurements from all sensors within the Gateway's range will be automatically sent to the Efento Cloud platform.

If the gateway has been configured correctly, it will be possible to read the date and time of the last connection to the server as well as information about the network and server status in the device status.



4. Configuration of Efento sensors

Configuration of NB-IoT and BLE loggers is possible using the Efento mobile application. The application can be downloaded via the Play store. Launch the application, log in to your Efento Cloud account, go to the main menu (three lines in the upper left corner), select *Organization settings -> Add sensors -> NB-IoT* or *Organization settings -> Add sensors -> Bluetooth Low Energy*, and then follow the instructions on the screen.

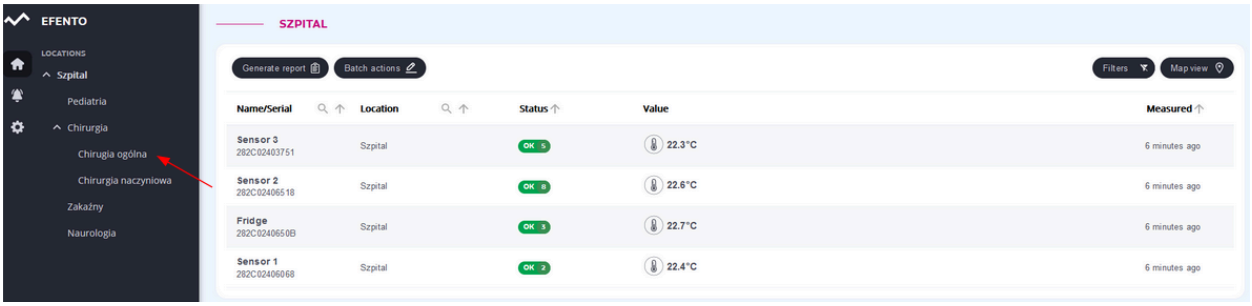
5. Dashboard - preview of sensors added to Efento Cloud

The *Dashboard* presents measurements and other important information about all sensors added to your Organization in the Efento Cloud platform. There you will find:

- Name and serial number of the sensor,
- Location in the structure of the organization to which the sensor is assigned,
- Sensor status with the number of unconfirmed alarms for the given device (active and waiting for confirmation)
- Current sensor measurements
- Information about the time that has passed since the last measurement,

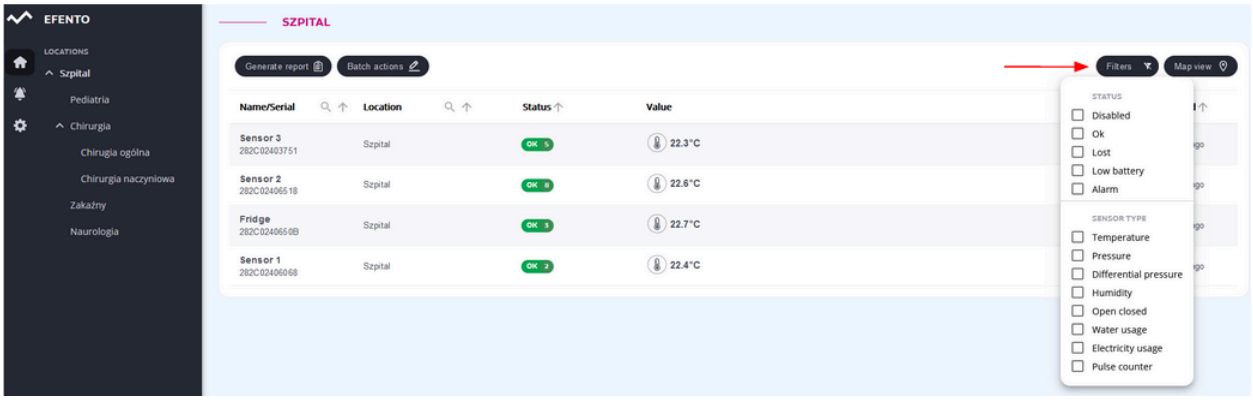
5.1. Filtering

The data displayed in the Dashboard can be filtered so that you can easily find the information you need. The first way is filtering by location. In the *Locations* section, on the left side of the view, select the location you are interested in, and the list of sensors will be narrowed down to those assigned to it. The other described filters only work on sensors from the selected location.



The second way is to search by name or serial number of the sensor. In the header of the table, which presents information about sensors, there is the *Name / Serial number* field. Enter the serial number or the name of the sensor you want to find in this field, and only the results you are interested in, will remain in the list. If several sensors have a similar name or serial number, then by entering its fragment, the names / serial numbers containing the phrase you entered will be automatically filtered out. Next to the names of the other columns in the table, there are arrows that allow you to sort values in descending or ascending. To clear the filter and restore the default sorting, delete the phrase entered in the table header or refresh the page.

You can also sort the sensors according to any value of the list. To do this, click on the arrow symbols next to the desired value (*Name / Serial No.*, *Location*, *Status, Measured*). Using the *Filters* button in the upper right corner of the table you can filter out the sensors of the selected type (e.g. temperature / humidity / pressure) or the sensors according to their status (Disabled / Ok / Lost / Battery / Alarm / No license / Archived). By default, the platform shows all sensors, except for the archived ones.

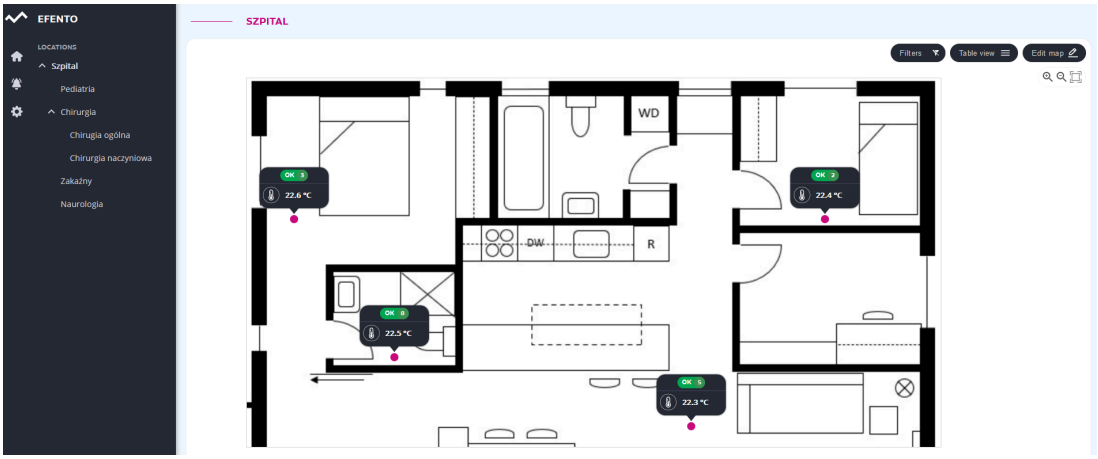


5.2. Location map

The location map allows you to upload a building or room plan and place sensors on it for more convenient monitoring of their condition. The location map can be uploaded by a user with Administrator or Manager permissions. The platform allows you to upload one map for each location. You can preview the sensors together with their location on the map by clicking the *Location map* button in the *Dashboard* tab. The map displays the current status of sensors and measurement results, and clicking on the selected sensor takes you to its detailed data. The map can be freely moved (by grabbing it with the cursor and moving it) and zoomed in/out using the "+" and "-" buttons. The location map can also be displayed in full screen mode by clicking the stretch button.

To change the map image, add / remove / place sensors on the map, click the *Edit* button in the top right corner of the screen. If you haven't added a map before, a blank field will be displayed with the "*Upload +"* button in the middle. Select the file you want to upload and click *Open*. The platform allows you to upload maps / floor plans in PNG, JPG, JPEG, BMP and GIF format, and the maximum file size is 4 MB. For large images, adding the map may take several minutes. Removing a previously added map is as simple as clicking the *Remove map* button in the *Map editing* menu in the upper right corner of the view. To place sensors on the map, select *Add sensors* from the menu,

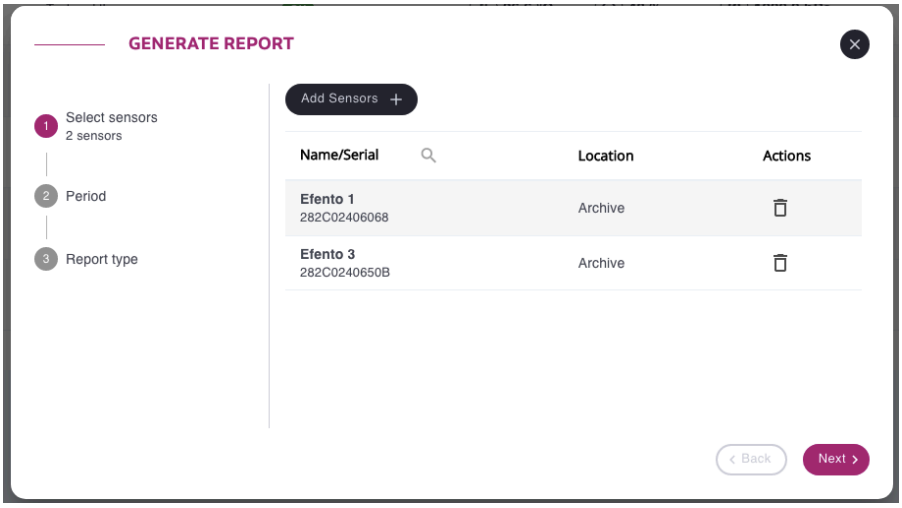
click on the sensors you want to add, then drag them with the mouse cursor to the place of your choice on the map and save the changes with the *Save* button. If you want to edit or remove a sensor, select *Edit sensors* from the map editing menu. After adding a map, it will be visible to all users with access to the given location.



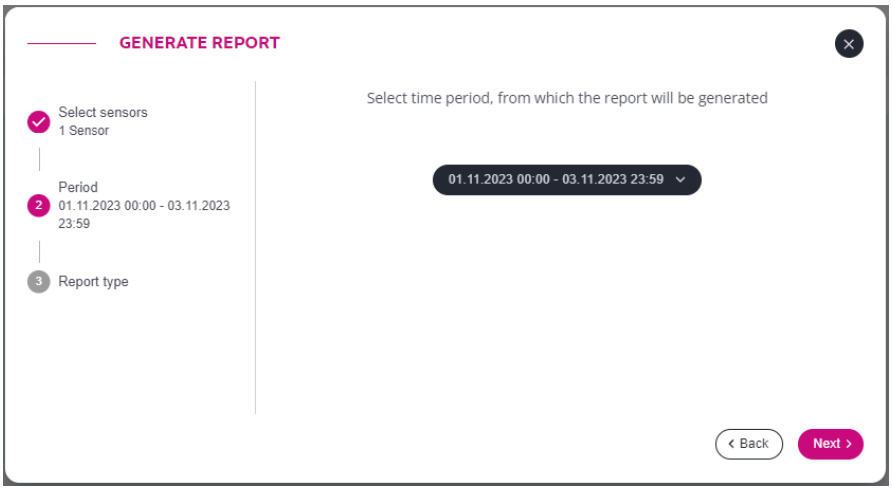
The user can adjust the way of displaying the sensor information to their needs. After clicking the *Edit* button, it is possible to select the information to be displayed: name, serial number, status, current measurements. If all the fields are unchecked, the sensors will be displayed in the form of dots with a color representing their status (green - ok, red - alarm, yellow - low battery, gray - lost).

5.3. Reports

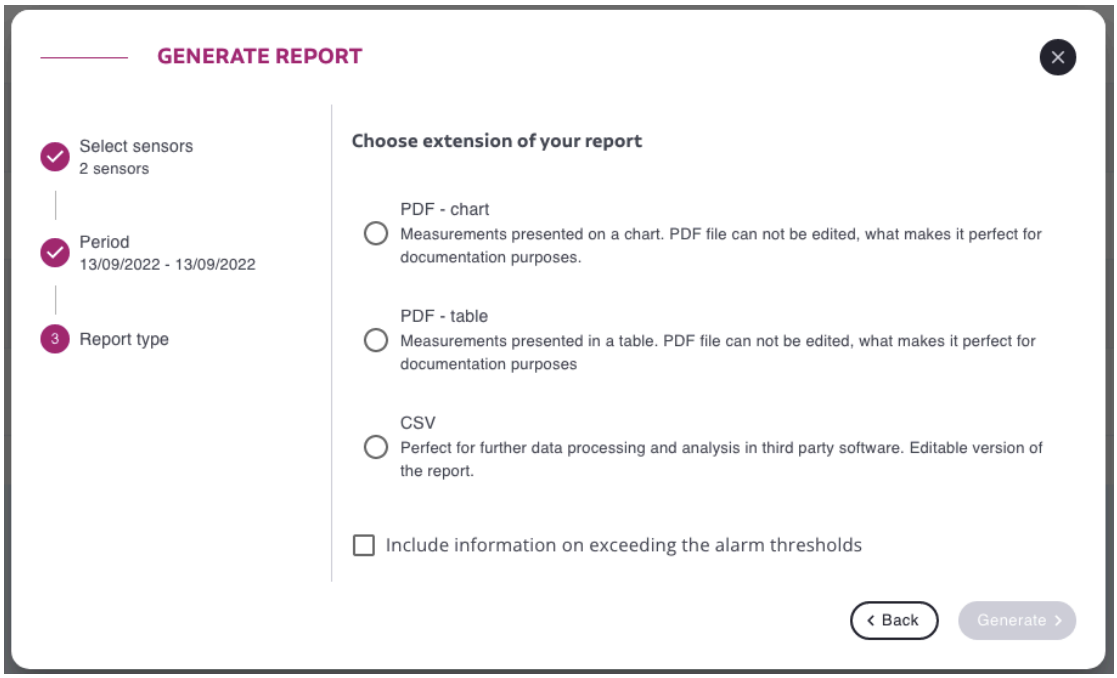
Efento Cloud allows you to export measurements from any period of time, from one or more sensors in PDF (chart / table) or CSV format. To generate a report, press the *Generate Report* button in the upper left corner of the table. Press the *Add sensors* button, and then select the sensors that will be included in the report. The user can select a maximum of 10 sensors that will be included in the report. If there are many sensors in a given location, to find the sensor you are interested in, enter its name / serial number in the search field above the table with sensors. After selecting the sensors, press *Next*.



In the *Period* section, set: the period from which the measurements are to be exported - enter the dates from - to or select a time period from the list (last 7 days, last month, etc.) and save the changes with the *Next* button.

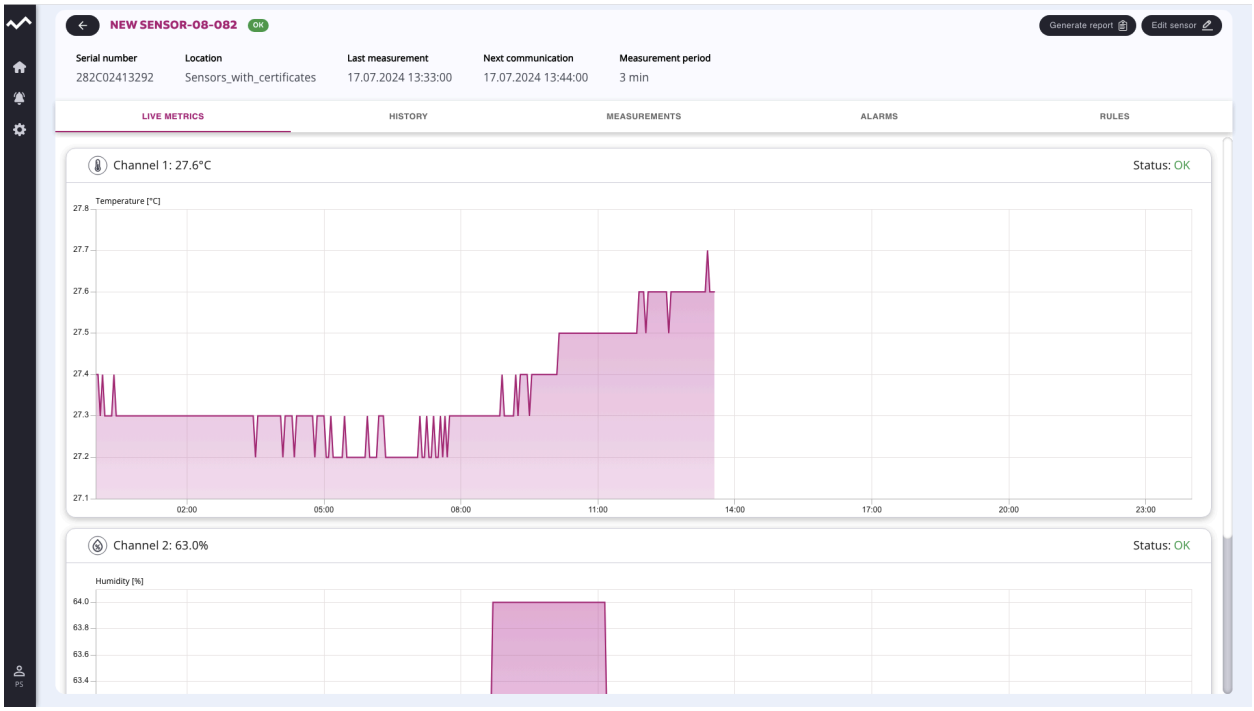


In the third section Report type, select the report type (PDF-chart, PDF-table, CSV). In the case of PDF-table and CSV, it is possible to reduce the number of measurements by selecting the record every 5th, 10th or 20th measurement. Additionally, after checking the checkbox, it is possible to include information about exceeding alarm thresholds in the report. After pressing the Generate > button, the report will be sent within a few minutes to the e-mail address of the user ordering the report, which was provided during registration of the Efento Cloud account.



5.4. Preview detailed sensor data

After clicking on the sensor on the list in the *Dashboard* or on the *Location Map*, you can see detailed information about the sensor: alarm occurrences with date and time, measurement data in the form of a chart and table. Moreover you can also change the sensor settings (NB-IoT devices), download sensor's calibration certificate or export measurements from any period of time in the form of PDF chart / table or CSV report.



The upper section of the detailed sensor view contains information about the device - its name, serial number, location, date and time of the last measurement, date and time of the next communication and its measurement period.

In the *Live metrics* tab you can find the measurements taken by the sensors on the last day. The charts are split into the channels - each channel is presented on a separate chart. In order to browse the historical measurements taken by the sensor go to the *History* tab. The chart presented in that tab allows you to select the channels that will be presented on the chart (by checking the boxes next to the channel type in the upper section of the chart) and the range of the data visible on the chart (by clicking the date picker button in the upper right section of the chart). In order to zoom in the chart, select

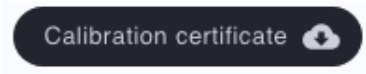
the range with the cursor. To return to the default scale, click the Zoom Out button (four arrows icon) in the upper part of the chart. If alarm rules are set for a chosen sensor, they will be visible on the graph in the form of horizontal lines - the red line represents the upper alarm thresholds, the blue line represents the lower thresholds. Each of the thresholds is described by the name of the rule.

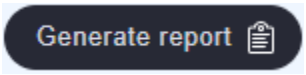
Measurements tab contains the measurements taken by the sensor in a tabular form. In the upper section of this tab you can check the minimum, maximum and mean value in the selected time period for each of the channels. To change the time period click on the date picker button in the upper right part of the view.

Alarms tab contains a list of all types of alarms (a detailed description of alarms can be found in section *Alarms*). Timestamps of the alarm occurrences with the name of the alarm rule are provided here. If the values measured by the sensor get back into the safe range, the user has the option of confirming the alarm in order to mark the occurrence of irregularities and suppress notifications regarding this particular alarm. The alerts may be presented as a table and in the calendar. To switch between the views click on the *Table view* / *Calendar view* buttons.

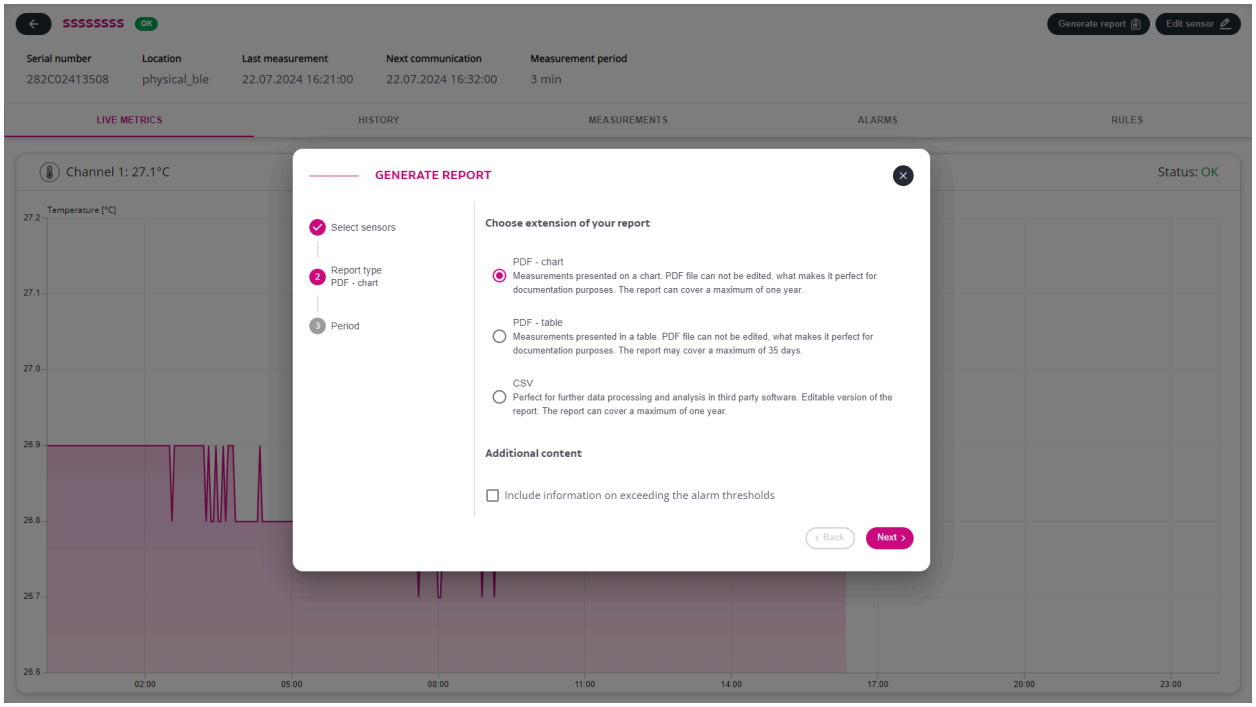
The last tab - *Rules* contains the list of all the rules to which the sensor is assigned. In order to add / remove a sensor to a rule follow the steps described in chapter 8. Alarm rules configuration.

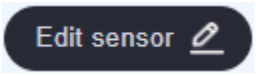
There are three function buttons in the upper right corner of the screen:

- 

- allows you to download the calibration certificate of the selected sensor. This button is only visible if the sensor has a calibration certificate.
- 

- allows you to generate reports with measurements from any period of time. To generate a report, select the start and end date of the report, the content of the report (measurements sent to the platform by the sensor, event list - alarm threshold exceeded, loss of communication with the sensor, etc. and technical information) and the type of report - PDF (chart / table) or CSV. The report will be generated and automatically sent to your email address within a few minutes.

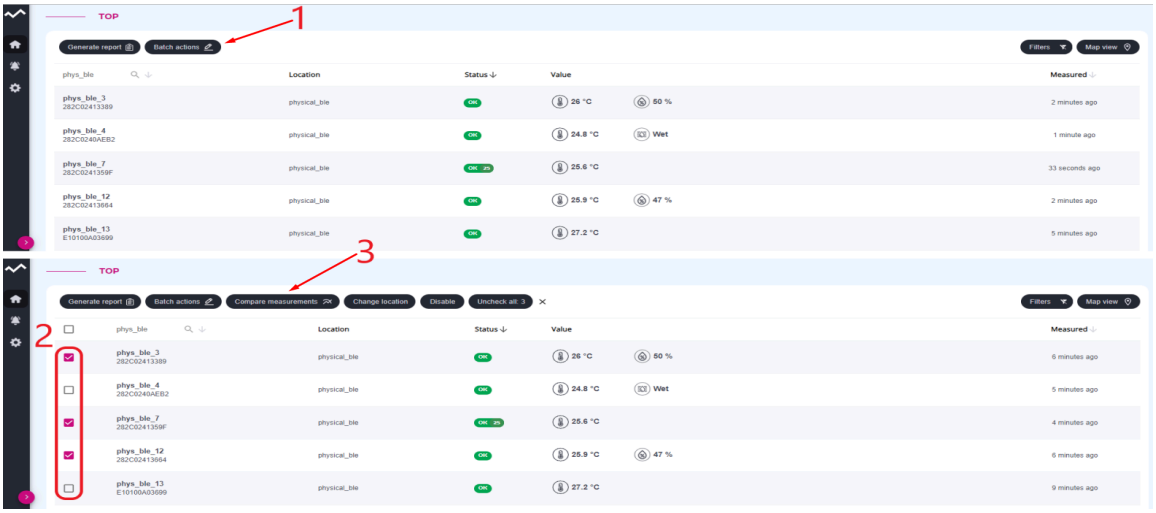


- 

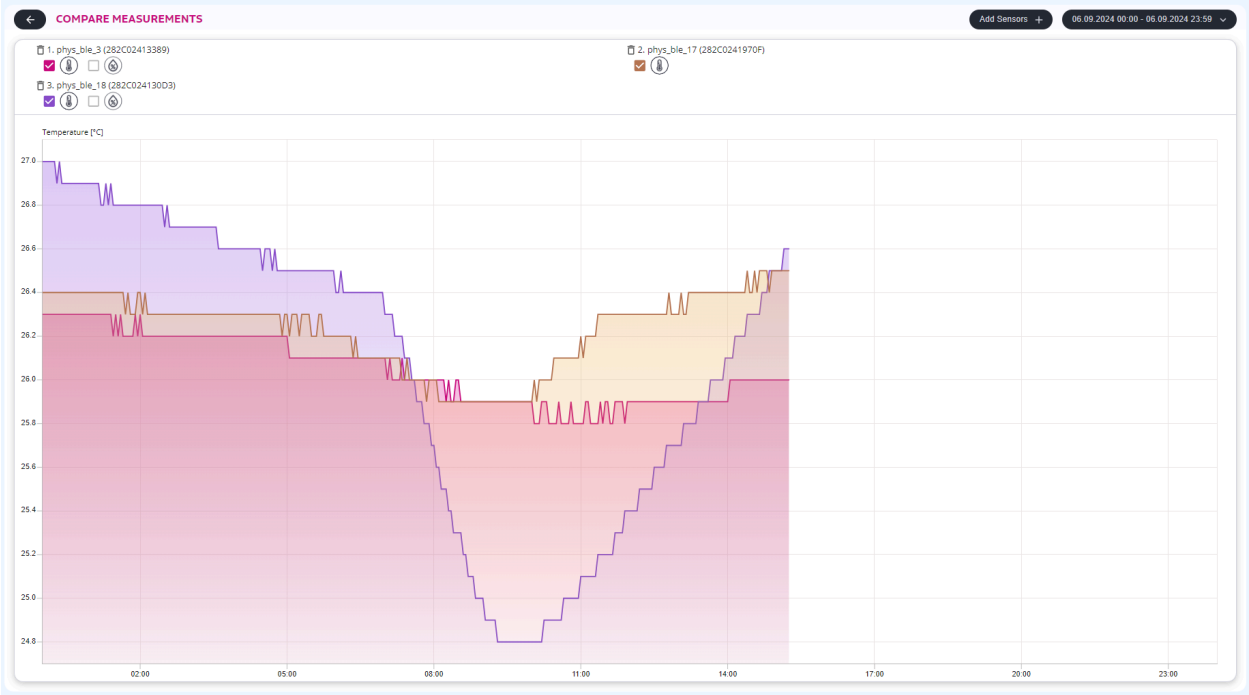
- allowing you to perform basic actions for the selected sensor:
    - Change location,
    - Rename,
    - Formulas - change the settings of the applied formula (the principle of formula operation is described in the *Formulas* chapter),
    - Swap device - replace an old device with a new one while maintaining the continuity of the measurement history,
    - Calibration reminder - set how often Efento Cloud should remind you about the periodic calibration of sensor,
    - Edit configuration - remote change of sensor settings (applies only to NB-IoT devices),
    - Disable - used to put the device to sleep on the platform in order to, for example: eliminate alarms on a day when the sensor will not be used or during service work carried out at the measurement point where the device is located,
    - Archive / Delete - archive measurements and / or remove devices from Efento Cloud.

5.5. Compare measurements

Efento Cloud platform allows you to compare measurements by presenting them on a single chart. This action is possible for **up to 6 sensors**. To compare data from several sensors, press "*Batch actions*" above the table, select the sensors you want to add to the comparison, and then press the "*Compare measurements"* button.

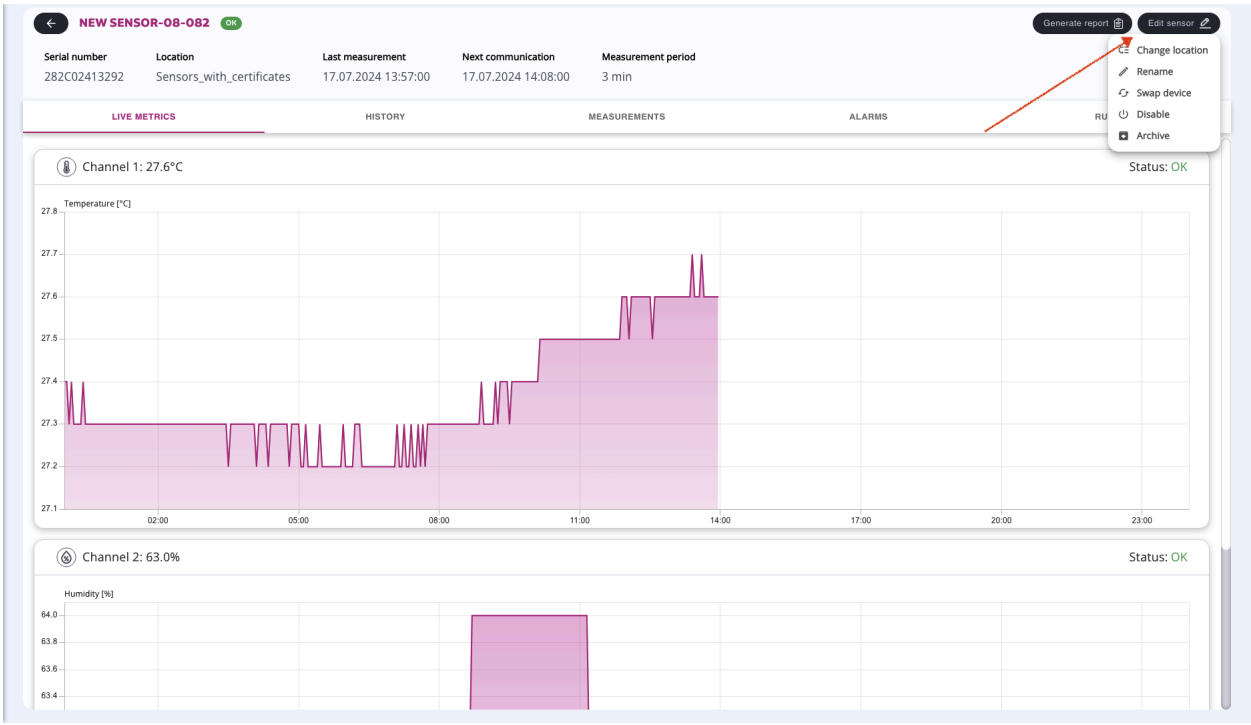


In the measurement comparison view, select the appropriate measurement channels to be displayed in the graph. You can add up to 6 channels of the same type (e.g. 6 x temperature) or two channels of different types (e.g. 1 x temperature and 1 x humidity) to the comparison.



6. Sensor configuration

If the user has Administrator or Manager permissions, the *Edit sensor* button is visible in the upper right corner of the screen in the sensor view. After clicking this button, the user can change the settings of the selected sensor.



6.1. Changing the location of the sensor

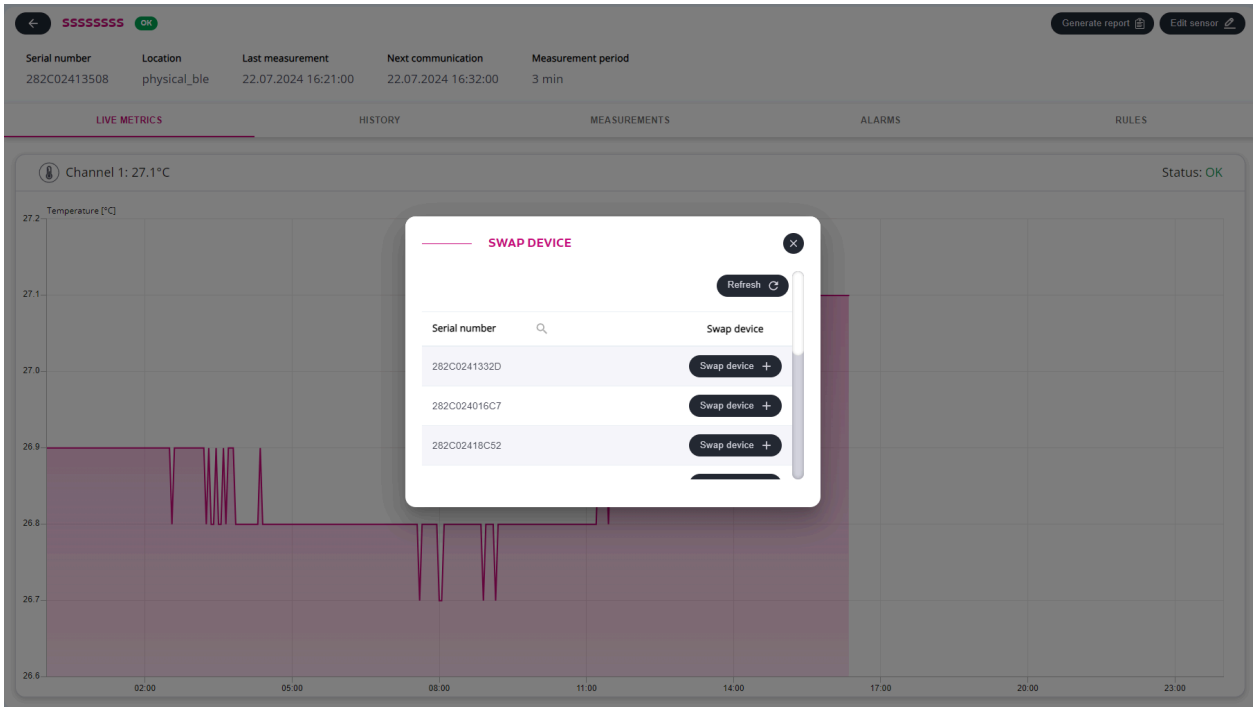
To change the location of the sensor, select *Change location* from the edit menu. In the window that will open, select the new location of the sensor and save the changes with the *Save* button. After saving the changes, the selected sensor will be moved to the new location.

6.2. Changing the name of the sensor

To change the location of the sensor, select *Rename* from the edit menu. In the window that will open, enter the new name of the sensor and save the changes with the *Save* button.

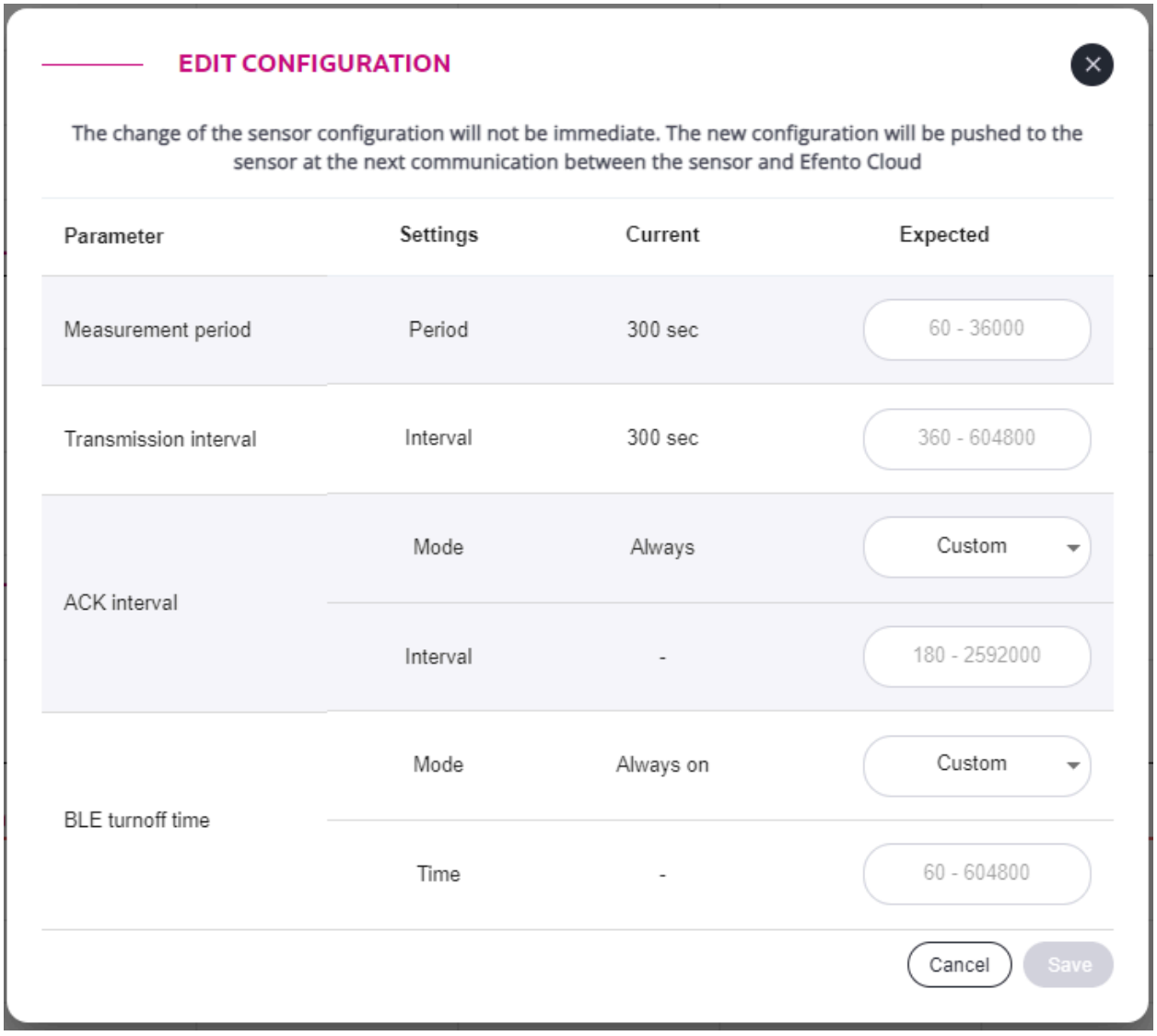
6.3. Replacing a sensor

The sensor replacement function allows the user to easily replace the sensor without losing data and maintaining the continuity of existing measurements, e.g. in the case of periodic calibration of the sensor. Replacing the sensor does not require the purchase of an additional license. To replace the sensor, select *Swap Device* from the sensor editing menu. From the list that appears, select the sensor that will be used for replacement. Measurement data and configuration (alarm rules, automatic reports, webhooks) of the replaced sensor are retained and the new sensor starts sending data. Information about the replacement will be saved in the audit trails.
In the case of analog sensors (4-20 mA / 0-10 V) and pulse counters, it is also possible to change the formula used to convert the measurements. If the device has a configured channel formula, the 'Redefine' button will be displayed, forcing the formula to be attached to the channel of the replaced sensor (more information about formulas can be found in the *Formulas* chapter).



6.4. Changing configuration of NB-IoT sensors

Users can remotely change the settings of Efento NB-IoT sensors. To change the sensor setting select *Edit configuration* from the *Edit sensor* menu. In the dialog, you will see the current configuration on the sensor (column ‘Current’). If you wish to change any of the parameters, set the new value in the ‘Expected’ column and save the changes. The new configuration will be sent to the sensor upon the next communication between the sensor and the server (indicated by the synchronization icon in the ‘Expected’ column).



It is possible to change the following parameters:

- Measurement interval - how often does the sensor take measurements. Value given in seconds and the lower range depends on the type of sensor you have.
- Transmission interval - how often does the sensor send the data to the Efento Cloud platform. Value given in seconds, range: 300 to 604 800 seconds. If an attempt is made to change the sending period to less than 1 hour, after saving the new settings, a dialog box will be displayed warning about the shortened operating time of the device (changing the setting results in faster battery discharge).
- ACK interval - how often should the server confirm the transmission. By default each of the transmission from the sensor is confirmed by the server and we recommend using these settings. Increasing the ACK interval (e.g. confirming only every 2nd transmission) increases sensor's battery life time but may result in data loss and should only be used in specific cases. In order to set the sensor to always request confirmation from the server, set the value to 'Always'. If you wish to set a custom ACK interval, set the value to 'Custom' and key in the ACK interval in seconds, range: 300 to 2 592 000 seconds.
- BLE turnoff time - allows users to remotely disable / enable Bluetooth interface of the sensor. Disabling the Bluetooth interface increases the sensor's battery life time, but the sensor can't be accessed locally with the mobile application. Bluetooth interface can be remotely enabled from the server. In order to set the sensor to always keep the Bluetooth interface on, set the value to 'Always on'. If you wish to set a custom Bluetooth turnoff time, set the value to 'Custom' and key in the turn off time in seconds, range: 60 to 604 800 seconds. Upon receiving the configuration from the server, the sensor will disable Bleutooth interface after the set time.

Important! When you swap the sensor (described in *Replacing a sensor* chapter), the new sensor will download the configuration of the old one from the server and automatically change its settings.

6.5. Disabling / enabling sensors

Disabling the sensor means that the sensor measurements are not saved in the platform, data is not pushed over webhooks and if the set thresholds are exceeded, alarms are not triggered. To disable a sensor select *Disable* from the sensor edit menu. To turn the sensor back on, click the *Enable* button. After the sensor is turned off, it will change its status to "Off" until it is turned on again.

6.6. Archiving / deleting measurements

Efento Cloud allows users to archive and / or remove measurement points.

- Archiving measurement points removes them from the dashboard, rules, reports, etc. but the measurements taken by them can still be accessed by the users. Archived measurement points do not require licenses - licenses used by them are freed and can be used to create another measurement point in Efento Cloud. After archiving a measurement point, sensor that had been assigned to it can be assigned to a new measurement point
- Deleting measurement points removes them completely from the platform. The measurements assigned to them can't be restored. In order to delete a measurement point, it first needs to be archived

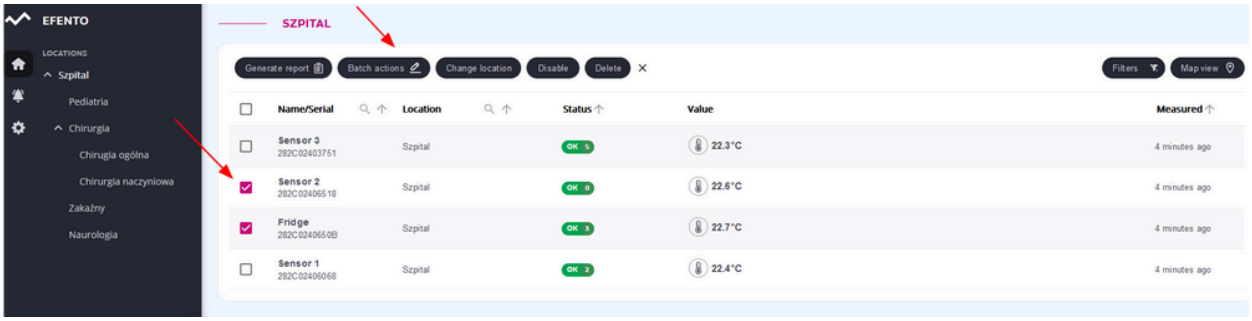
To archive a measurement point select *Archive* from the sensor edit menu. To display all the archived measurement points, on the dashboard go to *Filters* and select devices with *Archived* status.
Archived measurement points can be deleted (select *Delete* from the sensor edit menu) and restored (select *Add sensor* from the sensor edit menu and select the sensor that will be assigned to the measurement point).

6.7. Calibration reminder

This option allows you to define when Efento Cloud should send you a reminder about the sensor calibration. This option is only available for the devices that have a calibration certificate in the platform. You can select one of the three options: remind me 24 months after the calibration certificate issue date, do not remind me about the calibration, remind me in a custom period of time. The last option allows you to enter a value of months after which the platform will remind you about the calibration. The notification about the calibration will be sent a month before the end of the defined period and once the period ends (example: if the calibration reminder is set to 24 months, the platform will send the notification 23 and 24 months from the calibration date). The notification is sent as email to the recipients defined in the Notification manager.

6.8. Batch actions

Some of the operations described above can be performed on sensor groups in the Dashboard view. If you have Administrator or Manager rights, the batch *actions* button is visible in the upper left corner of the table with sensors. After selecting it, a checkbox will appear next to each of the sensors on the list. Select the sensors you want to edit, then select an option from the menu at the top of the table: Remove, change location, or disable sensors.



7. Access - Users and API tokens

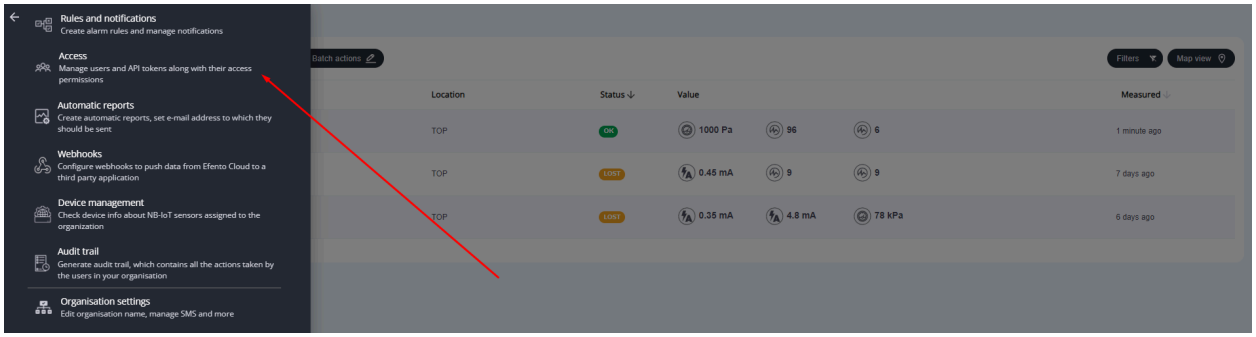
Each user who has access to your Organization in the Efento Cloud platform can be assigned one of three levels of permissions: Administrator, Manager and Analyst. Additionally, you can grant access permissions to each user only to the selected location. That means, the user can be an administrator in one location (i.e. he can edit other users and sensors assigned to this location and its sub-locations) and an analyst in others (i.e. he can only display measurement data from sensors assigned to these locations). When you create a new Organization, you automatically get Administrator permissions to all locations within it. By inviting other users to join your organization, you can assign them any level of permissions to the selected locations.

Each of the authorization groups has access to other platform functions, as shown in the table below:

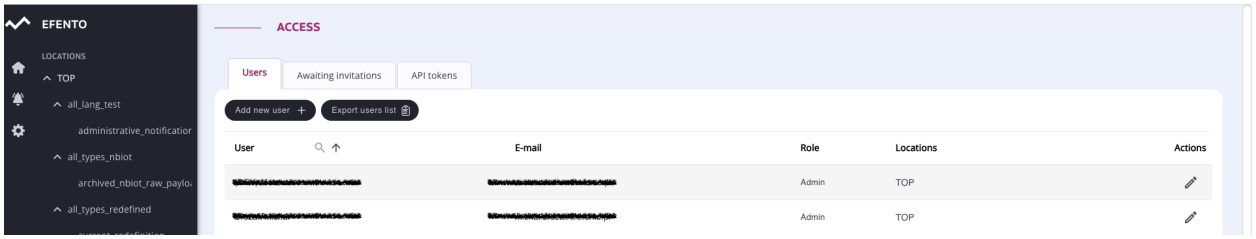
	Administrator	Manager	Analyst
Dashboard preview	✔	✔	✔
Generating reports	✔	✔	✔
Alarm preview	✔	✔	✔
Configuration of automatic reports	✔	✔	✘
Configuration of alarm rules	✔	✔	✘
Sensors, structures and location maps configuration	✔	✔	✘
Webhooks	✔	✔	✘
Formulas	✔	✔	✘
Editing of permissions, adding and removing users / API tokens	✔	✘	✘
System logs preview	✔	✘	✘
Organization account management	✔	✘	✘
Archiving measurements	✔	✔	✘
Notification manager	✔	✔	✘
SIM card manager	✔	✔	✘

7.1. Users management

Adding and editing users is possible in the Access menu by users with Administrator permissions. From the menu on the left, select the settings icon (gear) and then select *Access*.



The table shows all users with access to your organization, along with the permission level they have been granted.

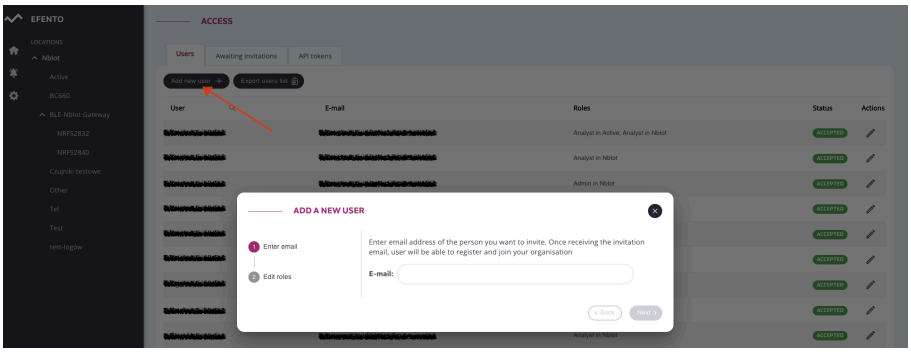


User permissions can be edited by clicking the pencil icon next to the user name. Editing options include changing the user's permission level at specific locations within your Organization. To revoke the user's access to data from your organization, click on the trash can icon. The user account will not be removed from the platform, it will only lose access to your Organization. Only the user can remove the account from the platform completely (described in section *Changing the username, language and password and deleting the account*).

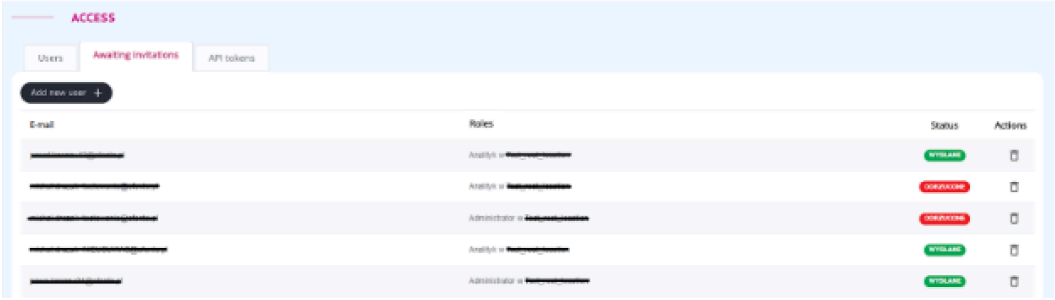
7.2. Adding new users

Adding new users is done using the invitation system. To edit users, select the settings icon (gear) and then *Access* from the main menu on the left. To add a new user to your organization, select *Add New User* in the upper left corner of the table. In the window that appears, enter the email address of the person you want to invite to your

organization and select the permissions level that will be assigned to them once they accept the invitation.

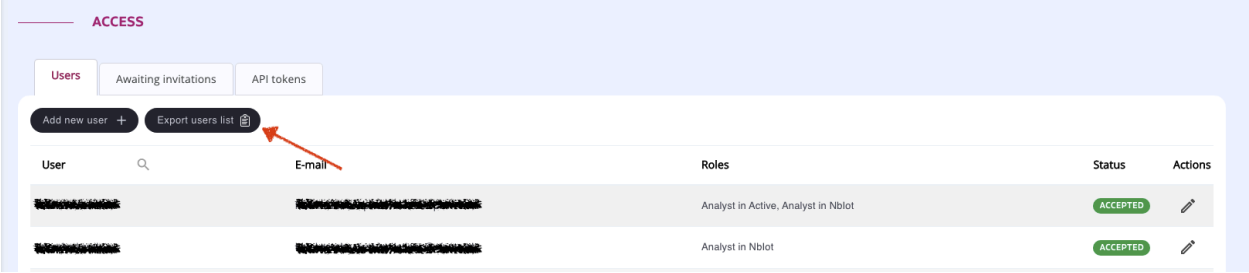


After saving the changes, the invited user will receive an email inviting them to join the Organization. If the invited user does not have an account in Efento Cloud yet, they will have to create one before joining the organization. You can invite any number of users to your Organization and assign them any permissions, but remember that assigning Administrator permissions to a user allows them to fully configure users, sensors, alarm rules and edit your Organization's account. You should not assign these rights to untrusted people. After generating the invitation, a new user will appear in the *Awaiting invitations tab* with the status “SENT”. This means that an invitation email has been sent to the user but the user did not accept the invitation or has not yet registered an account on the platform. After successful registration and/or confirmation of the invitation on the Efento Cloud platform, information about the new user will be transferred to the *Users* tab. If the user declines the invitation, the status will change to “REFUSED”



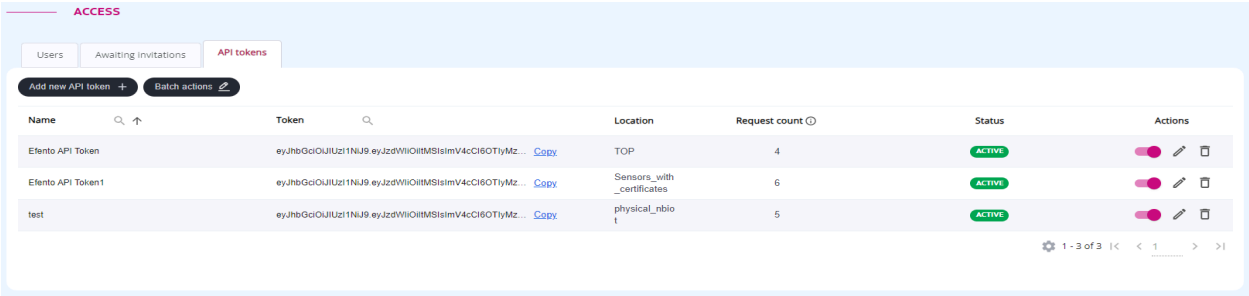
7.3. Exporting users list

To export the list of users as a PDF file, click the *Export users list* button in the upper left corner of the table. The list of users in the PDF file will be sent to the e-mail address assigned to your Efento Cloud account.



7.4 API tokens

API tokens are used to allow third party applications to communicate with Efento Cloud in order to read the data. API tokens provide read only access (get the list of the measurement points, get the measurements, get the alerts). In order to create a new API token select the settings icon (gear) and then *Access* from the menu on the left and click on the *API tokens* tab. Click the *Add API token* button and select the location, to which the API token will provide access. Once the API token is created, its value will be visible on the list in the *API token* tab.



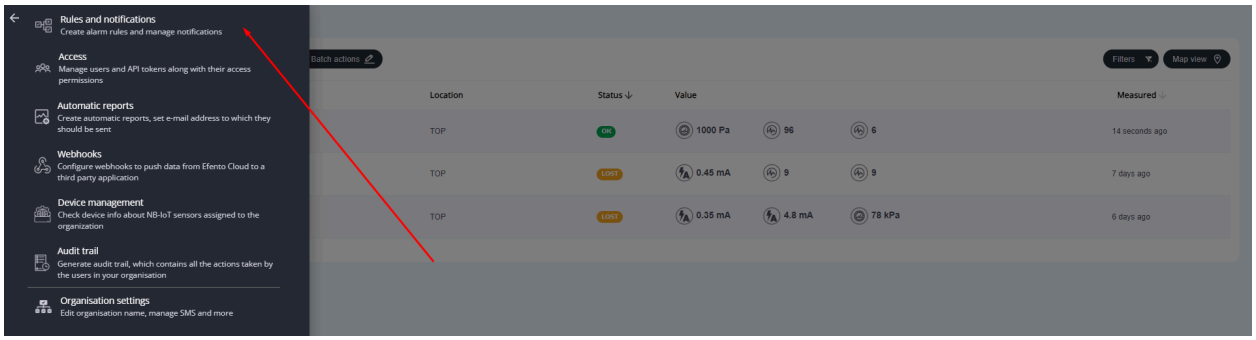
If you want to change the location to which the API token has access, click on the edit (pencil) button. To remove the API token, click on the delete (wastebin) button. To disable the API token, switch off the toggle in the *Actions* column.

You can find more information about Efento API and an example on how to pull the measurements over it in "Efento Cloud - API integration".

8. Alarm rules configuration

The alarm rule is a formula that defines which events in Efento Cloud are to initiate the alarm. The rule consists of a stimulus, condition and action, for example: if the temperature (stimulus) rises above 10 degrees (condition), the platform will send an SMS notification to selected recipients (action). The rules can be configured in any way, e.g. sending notifications to different recipients depending on the exceeded threshold, exceeding the set thresholds is only to be recorded in the system (without sending the notification), etc. Users can also define any number of alarm rules and assign sensors to each rule.

To configure the rule, select *Rules and notifications* from the settings menu. The configuration of alarm rules is available to users with Administrator or Manager rights.



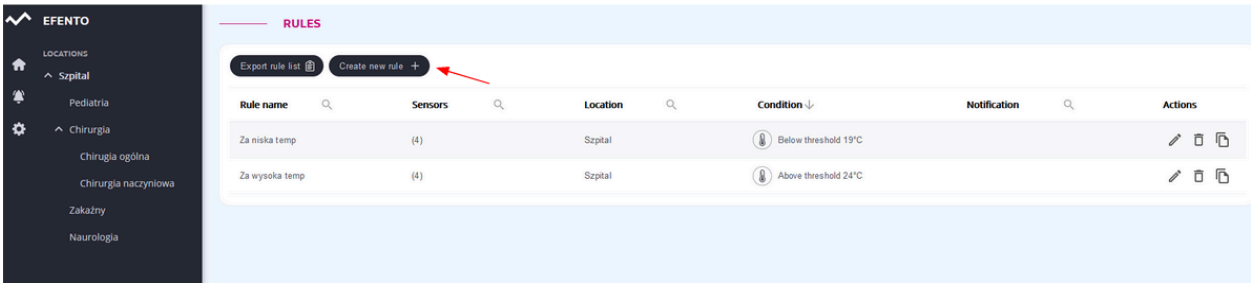
8.1. Types of rules

In the Efento Cloud platform, you can configure several different types of rules depending on the stimulus that initiates the alarm. These are:

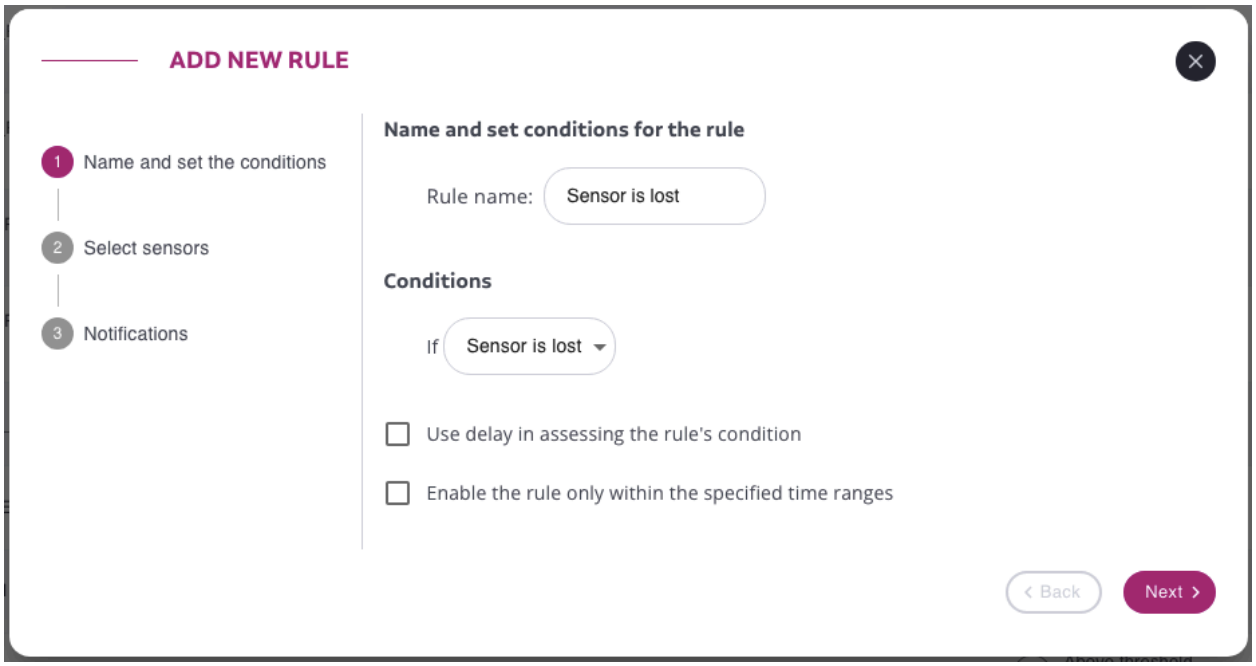
- Exceeding the set threshold (depending on the physical value measured by the sensor, e.g. temperature, humidity or pressure);
- Low power level - if the sensor's battery is low, the platform will notify you about it. After a low battery alarm occurs, the sensor will continue to work for approximately 30 days;
- Lost connection with the sensor - if the platform did not receive new measurements from the sensor in expected time.

8.2. Adding new alarm rules

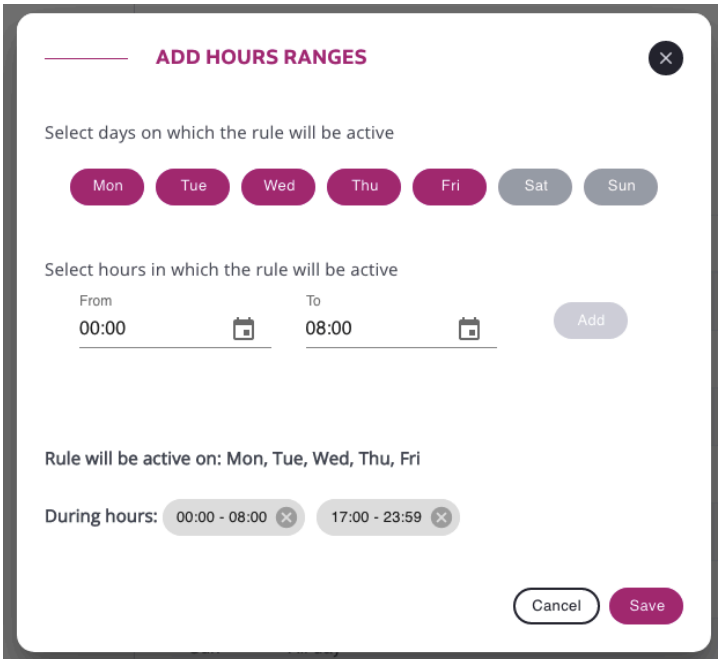
To add a new alarm rule, click the *Add rule* button in the upper left corner of the screen.



The first field to be filled is the name of the rule, which can be any but not longer than 50 characters. Then select what event the alarm should concern (i.e. the stimulus that initiates the alarm). If you have selected the alert type based on measured values, you must also select whether the alarm should concern the upper threshold exceeded (the measurement value exceeds the set threshold) - the Above option, or the lower threshold exceeded (the measurement value falls below the set threshold) - the Below option, and enter the threshold value in the designated box. In the case of rules regarding low battery or loss of connection with the sensor, there is no need to complete any additional fields.

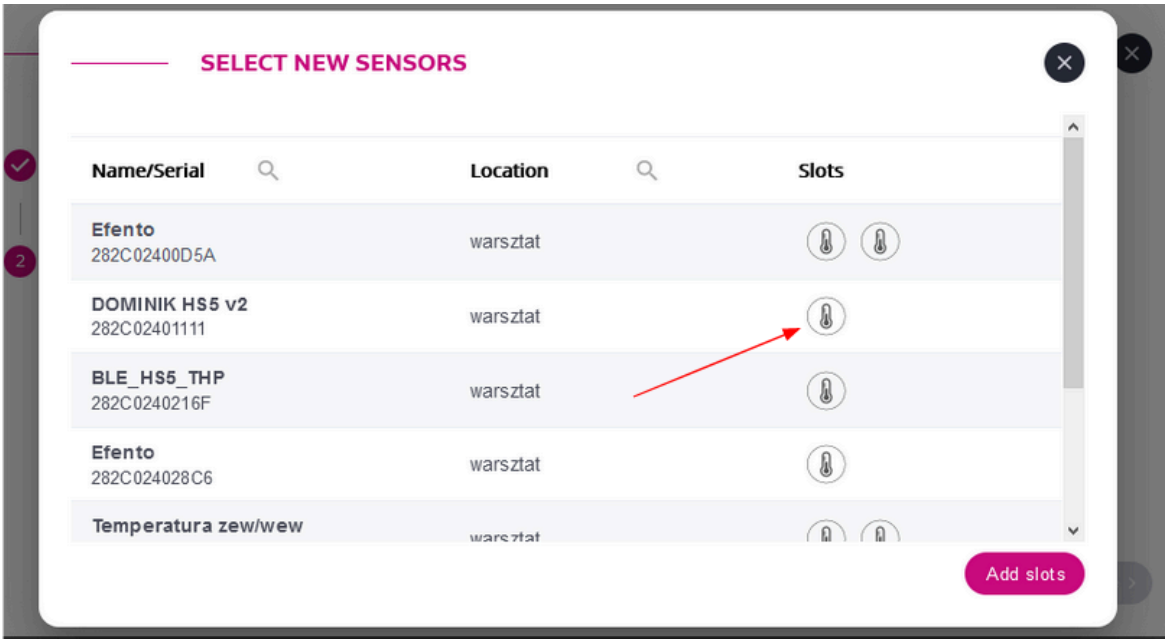


The alert is triggered as soon as the rule's condition is met. If the user needs to add a delay in assessing the rule's condition, the checkbox 'Use delay in assessing the rule's condition' should be checked and the delay in minutes should be set. If the measurement exceeds a predefined threshold and does not fall below the alarm threshold for a set period of time, an alarm will be triggered. If the measurement returns to the safe range within the time defined in this field, the alarm will not be triggered.



By default, the rule will be active 24/7 (no matter at what time, or on what day the measurements received by the platform are above / below threshold, the rule will be triggered and the notifications will be sent). If you prefer the rule to be active only in the selected time periods (eg. Monday to Friday 8 AM to 5 PM or only on the weekends), you can use the rule calendars. In order to enable it, check the checkbox next to *Enable the rule only within the specified time ranges*. The table shows days of the week along with the information, when the rule is enabled. To add hours ranges, click on the *Add hours ranges* button and select days and time ranges, in which the rule will be active. Please note that it is possible to set multiple hours ranges for each day. For instance, if the rule should be active outside the business hours each day of the week, set two time ranges: 00:00 - 08:00 and 17:00-23:59. Click the *Save* button to save changes. In order to remove the time ranges, click the "X" button in the chip containing the hours range you want to remove.

The second step in configuring an alert rule is selecting the sensors it should apply to. In the *Select sensors* section, click the *Add sensors* button and then select which sensors / channels are to be included in the rule by clicking on the icon symbolizing the type of measurement. The selected channels will be marked in pink. Save the changes with the *Add* button. Sensors added to the alarm rule are visible in the configuration summary. If you want to remove any of the sensors, click on the trash can icon in the right part of the window. To save the alarm rule, click the Save button. An alarm rule can be edited at any time by clicking on it on the list of added alarm rules.

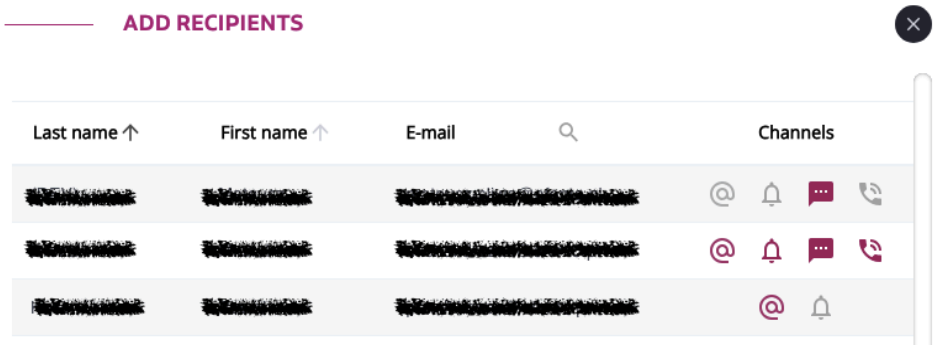


The next step is to add notification recipients. Efento Cloud supports four types of notifications:

- Email - an e-mail message sent to the selected user's address,
- Push notification - push notification sent to Efento mobile application users (**Important! To use this type of notification, the recipient must install Efento mobile application for Android and log into your Efento Cloud account**),
- Phone call - platform calls selected user(s) and informs them that the alert is triggered (To use this type of notification, the user has to have phone number set in their Profile),
- SMS - SMS is sent to the telephone number assigned to the selected user (To use this type of notification, the user has to have phone number set in their Profile),
- Webhooks - JSON sent to a set http address - this notification is designed to integrate Efento Cloud with third party services. An alarm from the Efento sensor can trigger an action in the third party application. Format of the data sent over webhooks is described in chapter *Webhooks*.

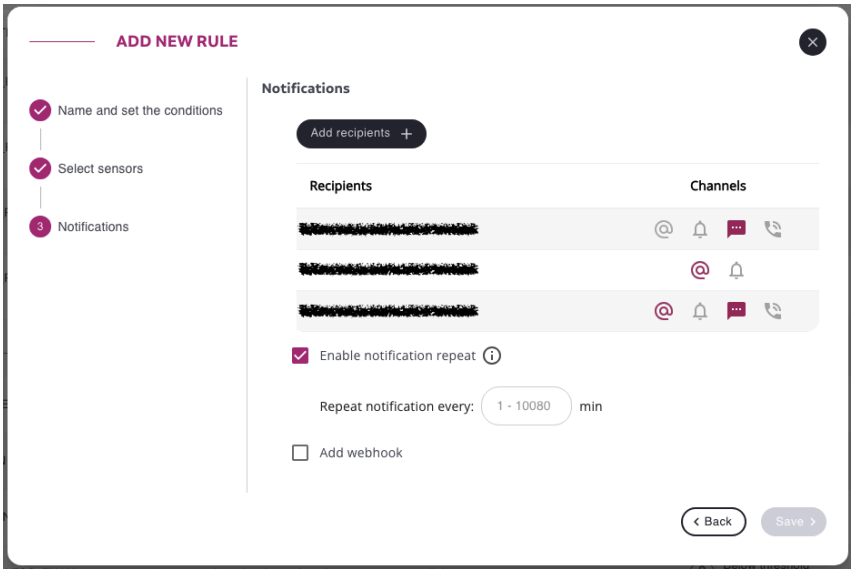
Important! If there are no recipients set in the rule, the alarms will only be displayed on the Efento Cloud platform and notifications won't be sent.

To activate notifications, press the *Add recipients* button and then select the notifications that selected users should receive. Notifications are enabled by pressing the appropriate icons in the last column *Channels* (- email notification, - notification in Efento app, - SMS notification, - phone call).



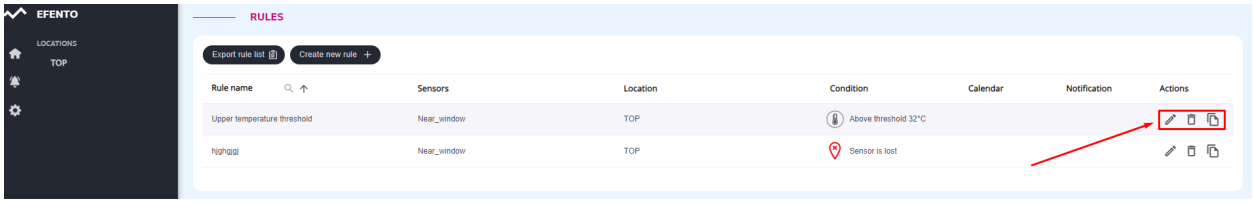
It is possible to add any number of recipients. E-mail, PUSH and webhook notifications are free of charge, but in order to receive SMS or phone call notifications, you must have purchased a pool of available SMS messages / phone calls (a description of how to top up the pool can be found in the *SMS / phone call notifications* chapter).

Important! Phone call notification is repeated three times (5 minute gaps), if unanswered. If the user's mobile phone is out of the network range or switched off they won't get the notification. If the user has voicemail enabled, they also won't be notified.

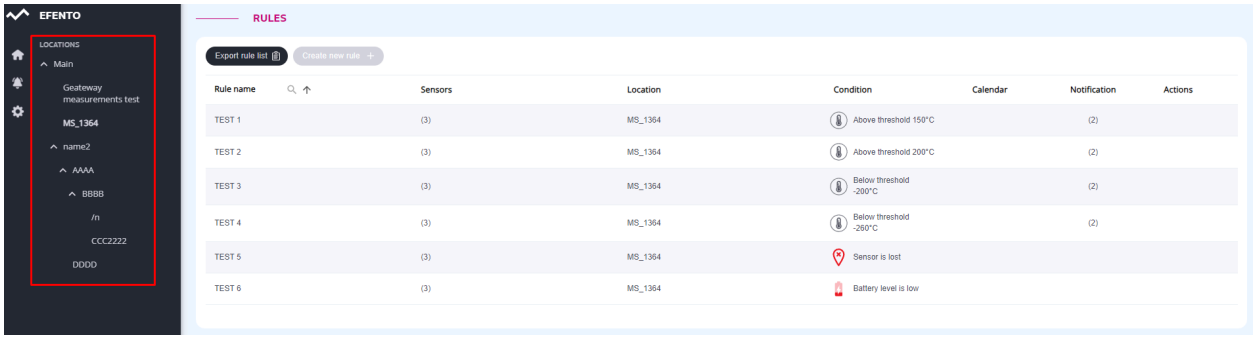


By default, the notifications are triggered once - as soon as the rule's condition is met. If the user wants the platform to resent the notifications during the period when the rule is active (to remind the recipients about that fact), the checkbox 'Enable notification repeat' should be checked and the period of notification repetition in minutes should be set in the 'Repeat notification every:' field.

All configured rules are visible on the list along with information about the value and type of the threshold, recipients and sensors covered by the rule. In the right part of the table, in the Actions column, there are actions that you can perform for a given rule - editing (pencil icon), deleting (trash can icon), cloning. Cloning a rule will create exactly the same rule (same threshold, recipients, sensors). This function is useful, if you want to create many similar rules for selected sensors.

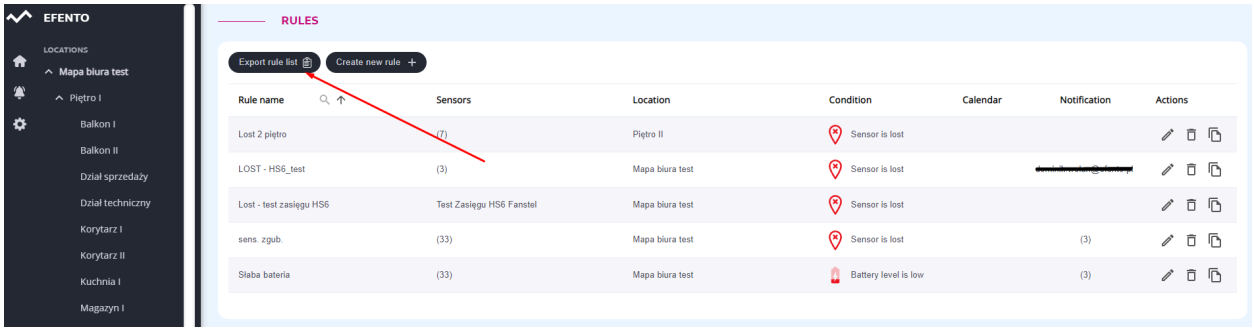


On the left side of the Rules view, there is a location tree that allows you to quickly and easily filter the rules assigned to individual locations. Thanks to this, you can see all the alarm rules concerning the sensors assigned to active location, while other alarm rules are not visible. This allows for convenient grouping of rules, especially in large organizations.



8.3. Exporting rules list

To export the list of the alert rules press the *Export rules list* button. The list of alarm rules in a PDF file is sent to the email address assigned to your account.



Alarm rules listing

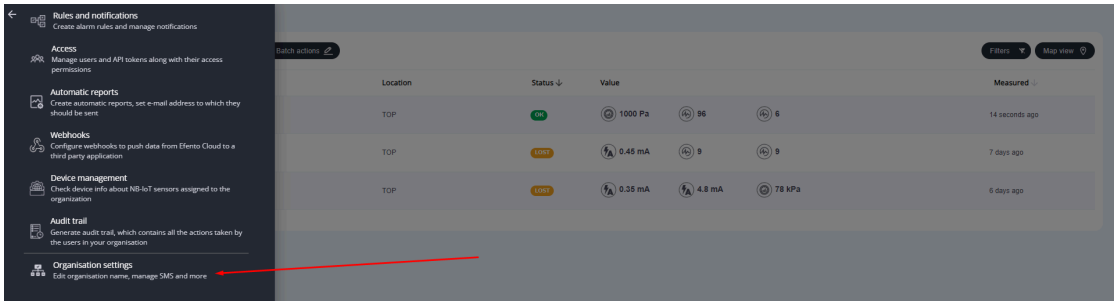
#	Rule name	Sensors	Location	Value	Type	Threshold	Alarm delay [s]	Recipients
1	test_low_battery	PULSECOUNTER	Sensors_ble	Occurred	Low battery		0	
2	test_rule_without_delay_ok	test_binary	test_binary	Occurred	Alarm		0	https://entjamkz38i7p.x.pipedream.net/ Users: Michał Drożak
3	test_rule_with_delay_flood	test_binary	test_binary	Occurred	Leakage		120	https://entjamkz38i7p.x.pipedream.net/ Users: Michał Drożak test test2
4	test_rule_with_delay_ok	test_binary	test_binary	Occurred	Alarm		120	https://entjamkz38i7p.x.pipedream.net/ Users: Michał Drożak
5	test_rule_without_delay_and_cal_flood	test_binary	test_binary	Occurred	Leakage		0	https://entjamkz38i7p.x.pipedream.net/ Users: Michał Drożak
6	test_lost_binary	test_binary	test_binary	Occurred	Lost		0	https://entjamkz38i7p.x.pipedream.net/ Users: Michał Drożak
7	asd	Test_temp_hum, Test_temp_hum_vocc, New sensor	TOP	Less than	Temperature	123.6	0	https://entjamkz38i7p.x.pipedream.net/ Users: test test2 Michał Drożak
8	test	New sensor	TOP	More than	Temperature	322.0	0	https://entjamkz38i7p.x.pipedream.net/ Users: Michał Drożak

9. Configuration

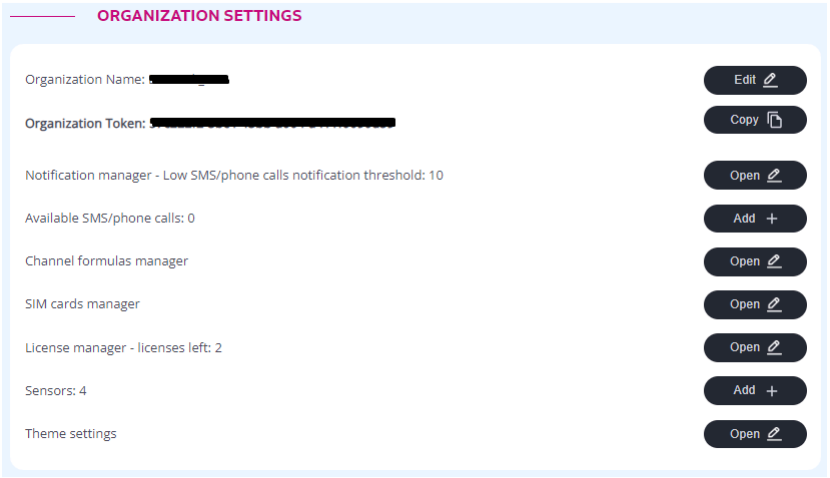
Users with Administrator or Manager permissions have access to the organization configuration.

9.1. Adding sensors

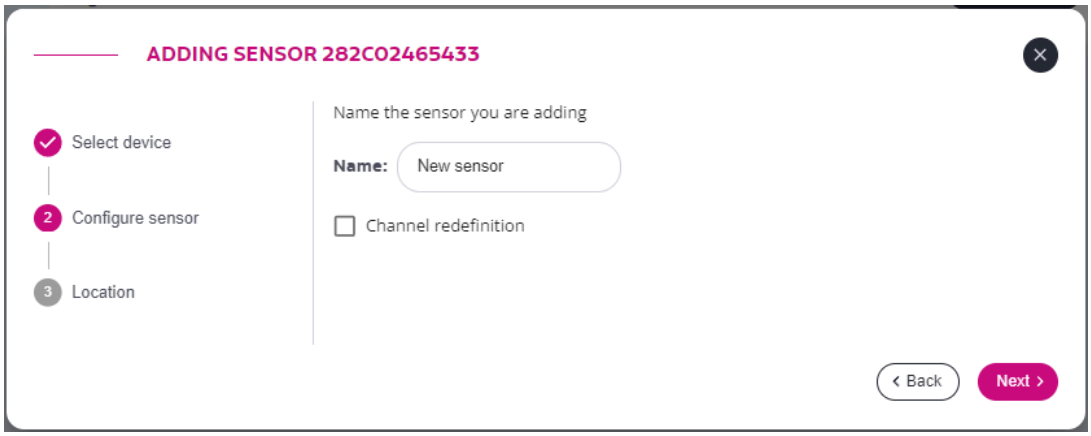
To start saving measurements from sensors in the Efento Cloud platform and to be able to fully use the functions it offers (SMS notifications, automatic reports, etc.), you must activate the sensor in the platform. This is done by adding a License key (Cloud Key) to the organization. This is a unique number that allows you to enter a specific number of registrars in the platform. To add a License Key to your organization, select Organization Settings from the settings menu (the gear icon on the left).



The number of available licenses is shown in the *License manage - licenses left* field. To add sensors, you must have free licenses. Click the *Open* button next to the *License manager* field and after that click the *Add* button in the upper left part of the license manager view. After adding the License key, you can add any sensors as long as you don't exceed the number of licenses you have. Details of the license manager can be found in chapter *License manager* of this manual.



To add sensors, click the *Add* + button next to the *Sensors* field. From the list that appears, select the sensor you want to add, and then give it a name (by default, all sensors are called New Sensor), which will be assigned to a given sensor and displayed on the platform along with its serial number. It is also necessary to select the location to which the sensor will be assigned. After completing these steps, click *Save*.
If the device will ultimately use formulas, the channel redefinition mode should be activated. The description of the activities can be found in the *Formulas* chapter (applies only to 4-20 mA / 0-10 V sensors and pulse counters).



If you want to rename the sensor or move it to another location, you can do it at any time. The description of these activities can be found in chapter *Sensor configuration*.

9.2. Create and manage locations

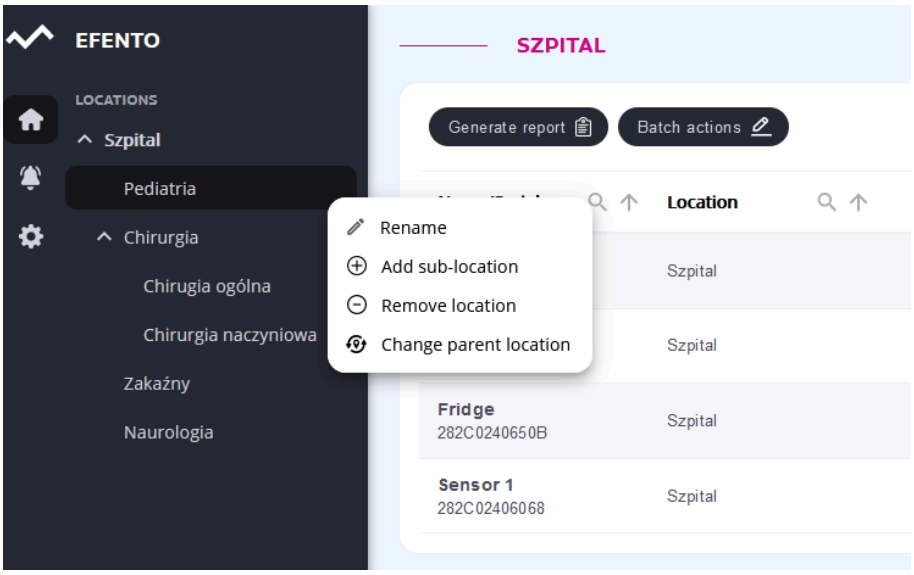
You can easily organize locations and sensors assigned to them. The platform allows you to map the structure of your organization in the form of a tree and assign individual sensors to its branches. The grouping method is not subject to any limitations, you can use a geographical division (eg Country -> States -> Cities -> Objects), functional (eg Object type -> City -> Exact location) or other, better suited to your Organization. Additionally, by assigning permissions to users in your Organization, you can assign them to a specific location. Locations significantly facilitate system administration and give full control over user access.

Location configuration is available to users with Administrator or Manager permissions. Locations are edited from the organization structure panel on the left side of the screen. There you will find a tree of already created locations, the root of which is the root

cannot be deleted (by default, its name is the name of your Organization). All successively added locations are subordinate to and are part of the primary location.

To edit a location, select its name and then click on the three dots on the right. when pressed, the user will have the option to:

- Rename,
- Add sub-location,
- Remove location,
- Change parent location.



To remove a location, select *Remove Location* from the menu.
Important! If a location has sub-locations or any sensors assigned to it, you need to remove them first.

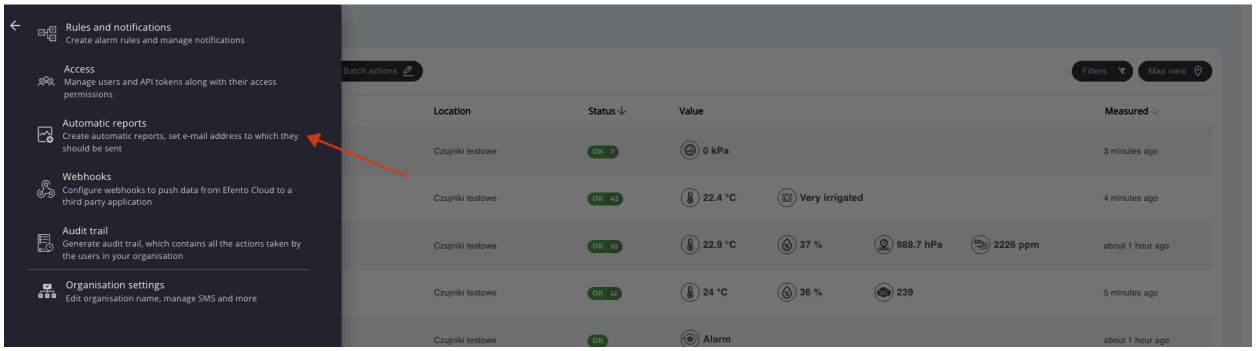
10. Automatic reports

Efento Cloud enables automatic sending of reports in PDF (chart / table) or CSV file format. Reports can be sent to any email address with a selected frequency: once a day, once a week, once a month.

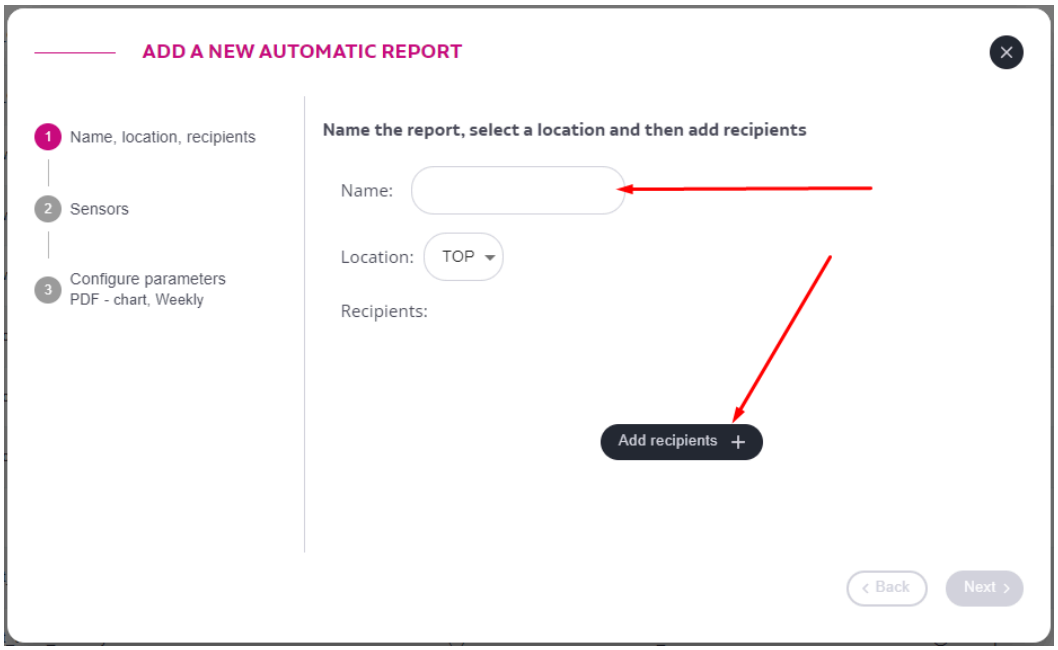
Reports contain measurements taken by sensors, additionally they can contain information about events (exceeded alarm thresholds, loss of communication, low battery level, etc.). The reports can contain every measurement or every 5th / 10th / 20th / 120th / 240th measurement.

10.1. Automatic reports settings

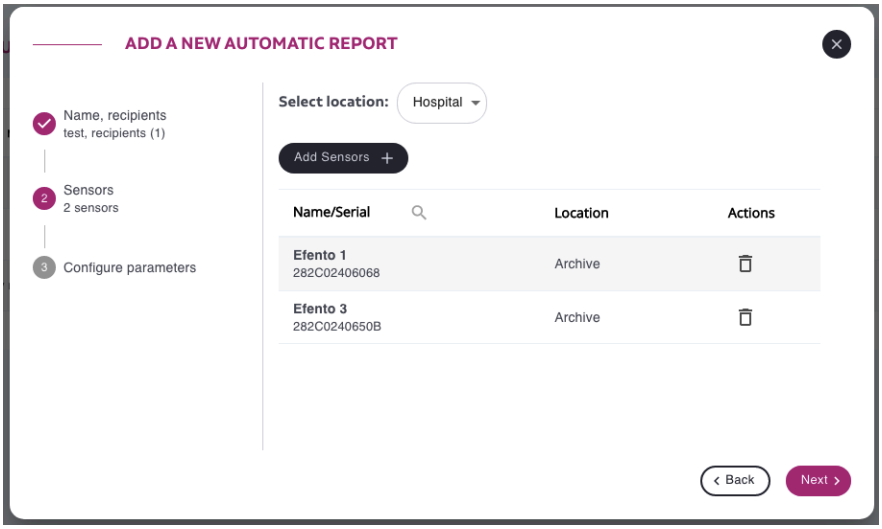
Automatic reports can be configured by users with Manager or Administrator permissions. To configure automatic reports, select Settings (the gear icon) from the menu on the left, and then *Automatic reports*.



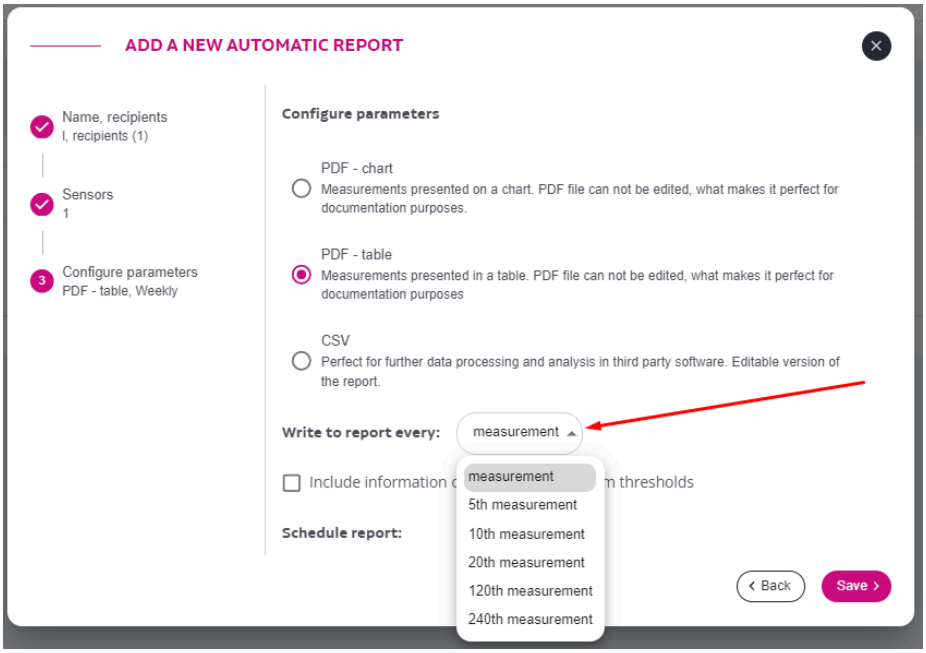
To add a new report, click the *Schedule new report* button located in the upper left corner of the table. In the first stage, enter the name of the new automatic report and add the e-mail addresses of the report recipients by selecting them from the list displayed after pressing "Add recipients +".



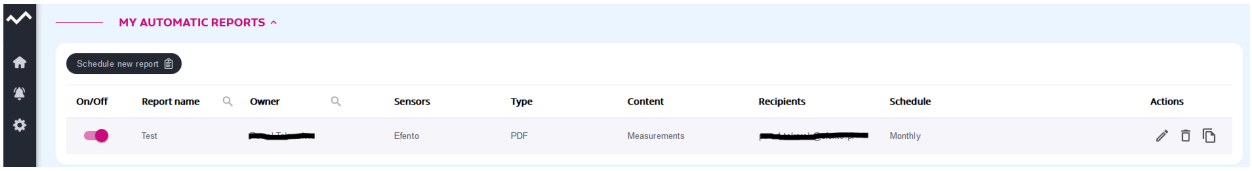
Press the *Add sensors* button and then select the sensors that will be included in the automatic report. You can select a maximum of 10 sensors to be included in the report. If there are many sensors in a given location, to find the sensor you are interested in, enter its name / serial number in the search field above the table with sensors. After selecting the sensors, press *Next*.



The last step is to set the report format (PDF table / chart or CSV) and the reporting frequency (daily, weekly or monthly). After filling in all the fields, press the *Save* button, which will create an automatic report. From now on, the automatic report is active and will be sent with the frequency you set.



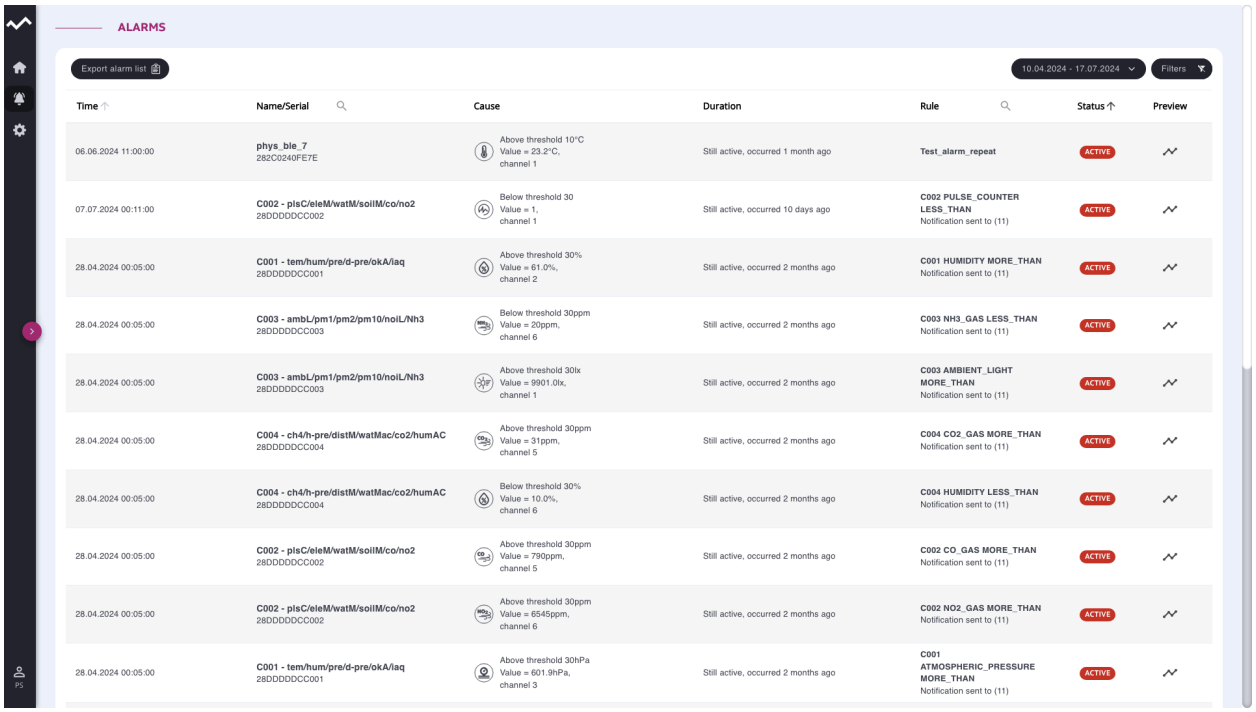
All configured reports are visible in the Automatic reports tab. To delete a configured report, click the trash can icon in the right part of the table with the defined reports. You can also edit a selected report by clicking the pencil icon. If you want to create a new automatic report, similar to a report which is already scheduled, click on the clone icon. Automatic reports can be disabled - to disable a report, use the switch next to the report you want to disable.



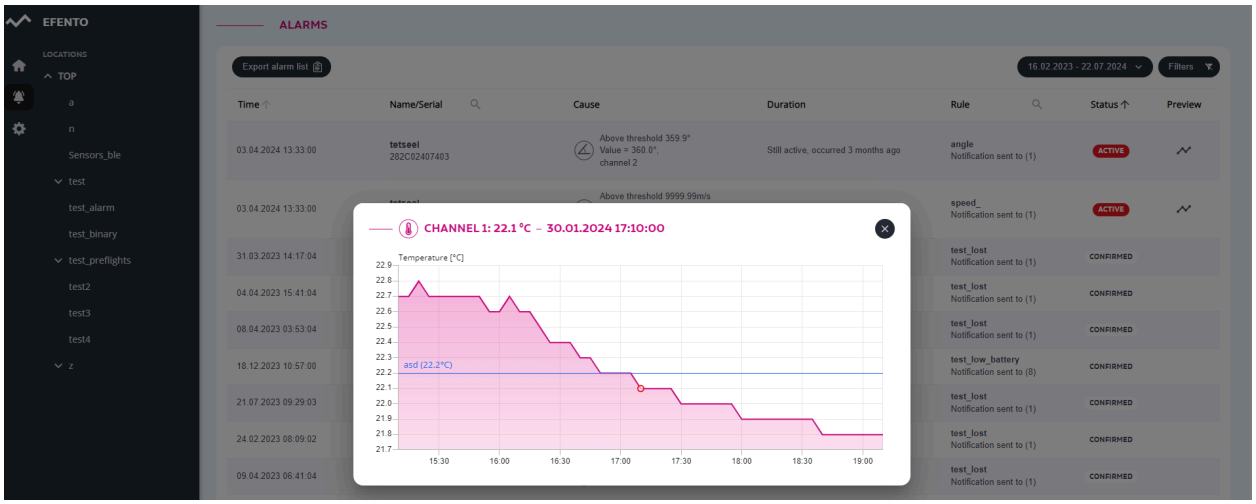
11. Alarms

11.1. Alarms preview

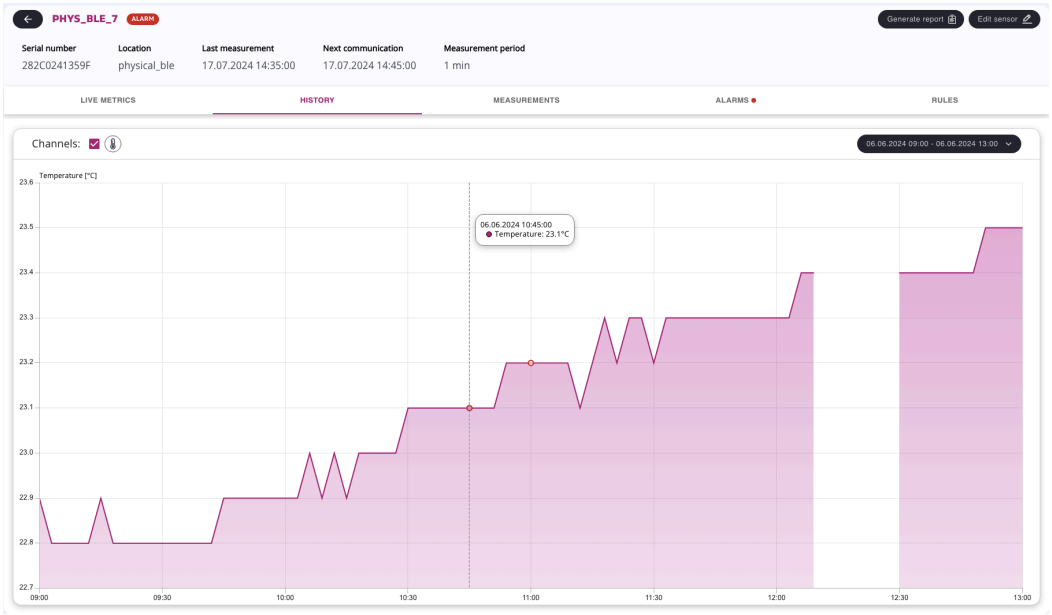
In the Alarms menu, you will find a preview of all alarms currently active and those that have occurred in the past. Each of the alarms on the list has a status: Active (the alarm threshold is still exceeded), Inactive (the threshold has been exceeded in the past and it is not confirmed yet) or Confirmed (one of the organization's users has reacted to the alarm; the rule threshold is no longer exceeded). The alarms can only be confirmed when the measurements sent by the sensor do not exceed the alarm threshold. Alarms can be sorted by date of occurrence, status, alarm type, cause, current sensor measurement, name of rule or recipients of notifications assigned to the alarm. It is also possible to search for specific sensors on the list by entering their name or serial number. It is also possible to limit the date range of displayed alarms. The buttons in the upper right corner of the table with alarms are used for this. Additionally, it is possible to display only the alarms related to the selected location by selecting it from the menu on the left side of the view.



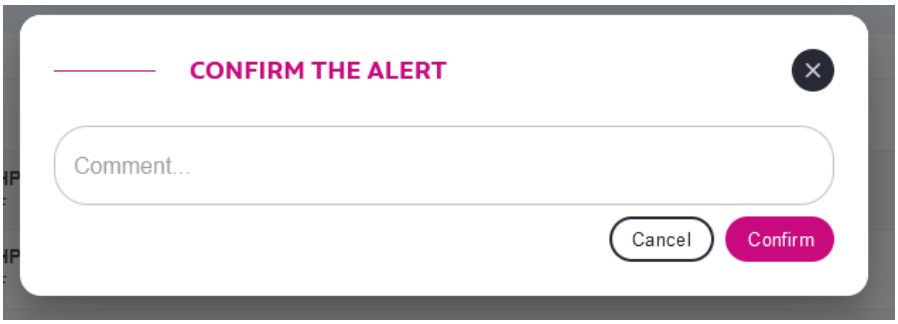
On the right side of the alarms table there is a preview icon (chart symbol). Clicking on it will open a window with a graph showing when the alarm occurred.



It is also possible to preview the sensor's measurements from the period of the alarm occurrence. After pressing the serial number of a device on the alarm list, the user will be redirected to a page presenting detailed data about the device and its complete measurements over a 4-hour period, including the moment of the alarm occurrence, marked with a red circle on the chart.

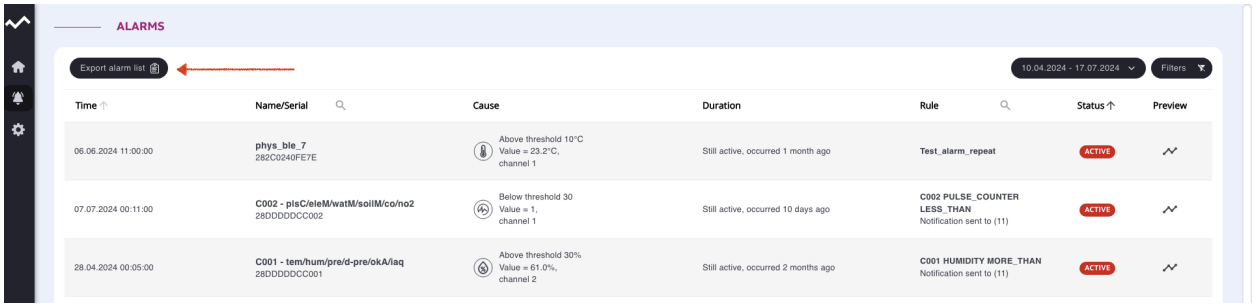


To confirm the alarm, click the *Confirm* button. You can enter a comment about the alarm in the newly opened window. The comment will appear on the alarm list after hovering the cursor over the *Confirmed* status. Entering a comment is optional.



11.2. Exporting alarm list

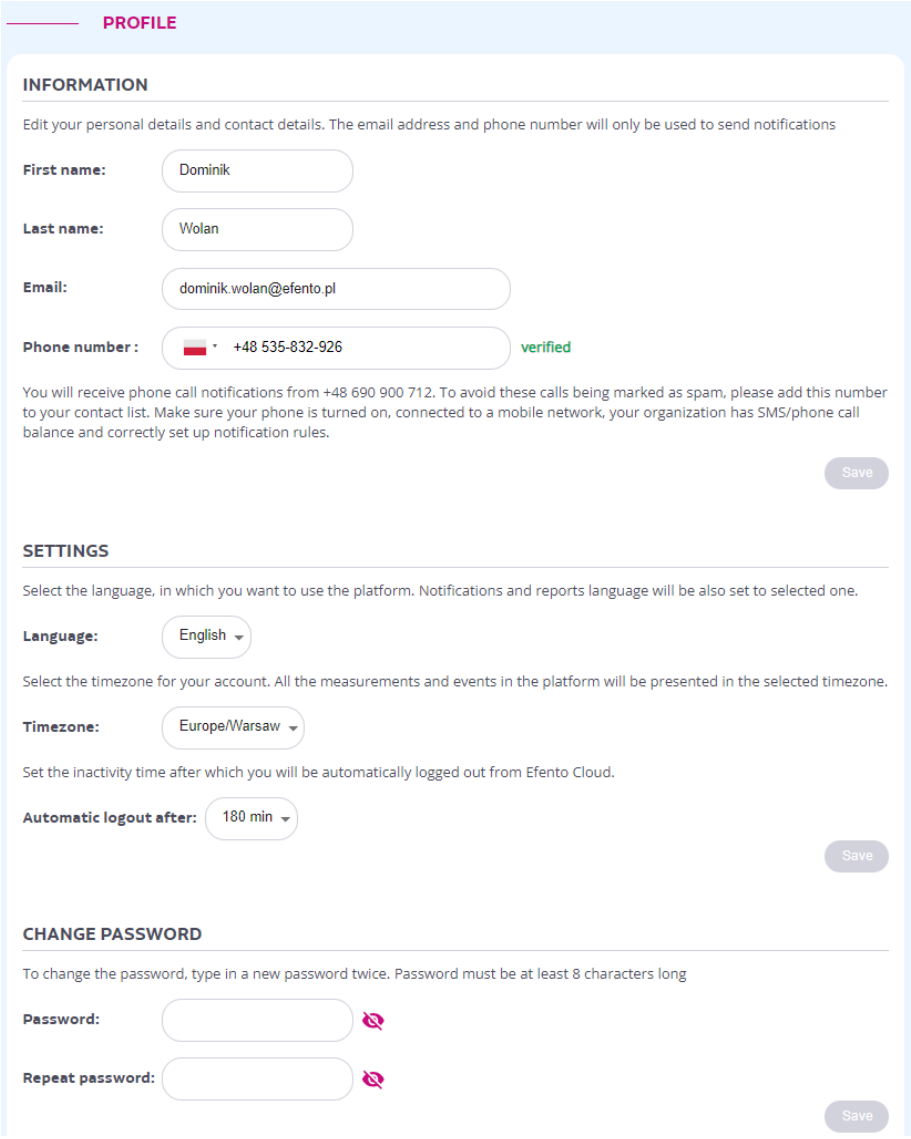
In order to export the alert list, select the time range in the upper right corner of the table and press the *Export alarm list* button. The alarm list is sent in a PDF file to the e-mail address assigned to your account.



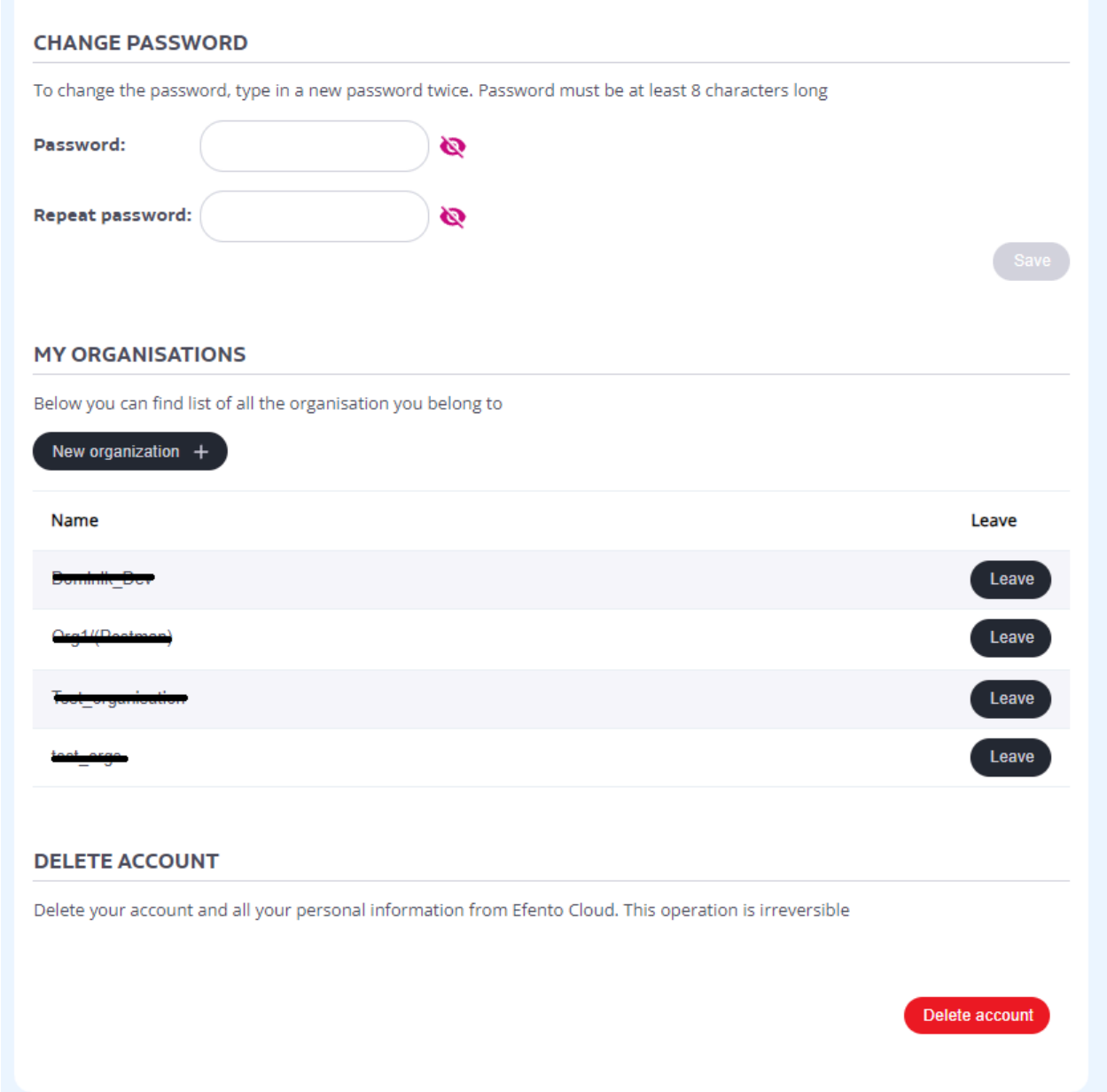
12. Editing user and organization data

12.1. Changing the username, language and password, and deleting the account

To access your profile settings click on your initials in the lower left corner of the screen. There, you have the option to log out of your account or go to your profile settings. In the Profile tab, you can edit your data such as: name, surname, e-mail address, telephone number used to send notifications and password for the Efento Cloud account. It is also possible to change the language and time zone. After making changes, it is necessary to click Save to accept them.

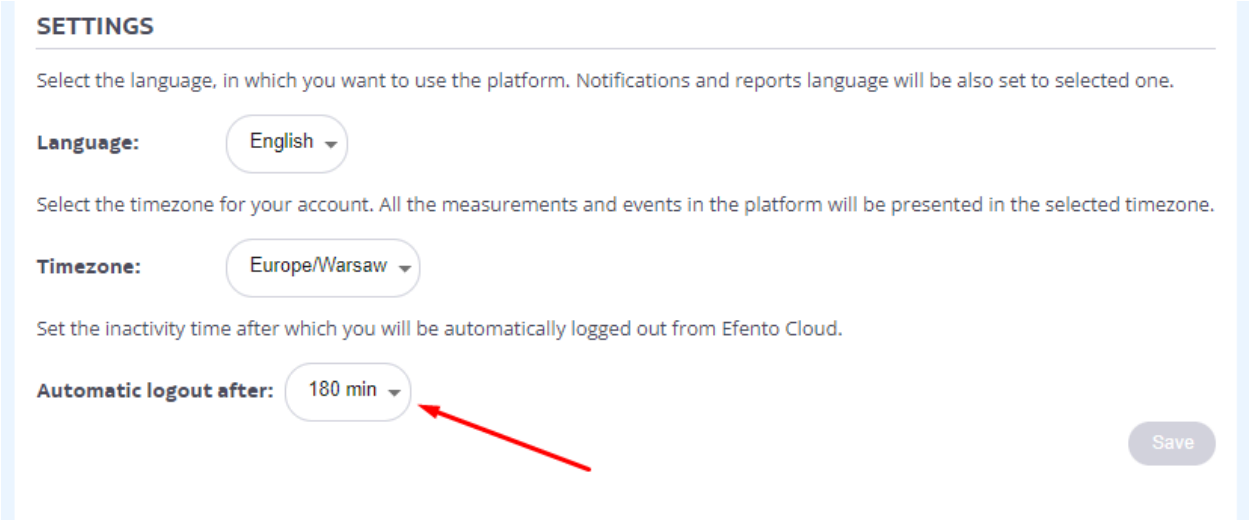


To delete an account, click the *Delete Account* button. This way you will delete your account along with all the information entered in the system (name, surname, e-mail address, password).



12.2. Automatic logout

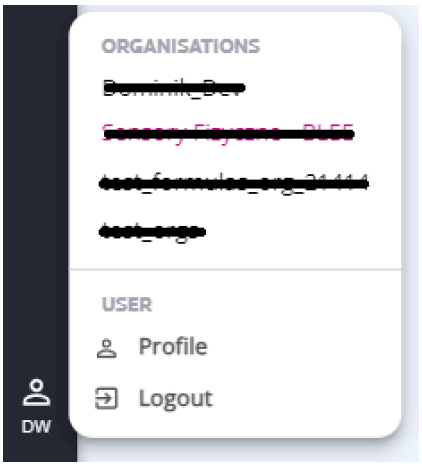
It is possible to set the inactivity time after which you will be automatically logged out from Efento Cloud. Select the inactivity time from the dropdown menu next to *Automatic logout after*. If you want to completely disable the auto logout, set the value to *Disabled*.



12.3. Creating a new Organization and leaving an Organization

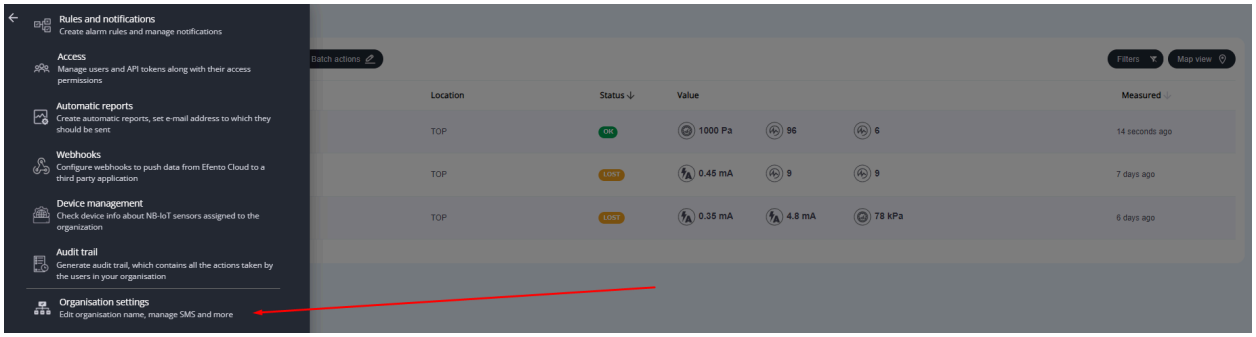
In the Profile tab, you can also leave the selected organization. To do this, in the My Organizations section, click the *Leave* button next to the organization you want to leave. Leaving an organization means losing access to its measurements.
Important! If you are the last member of the organization, when you leave it, it will be removed from Efento Cloud along with all measurements taken by sensors that were added to this organization.

If you want to create a new Organization press the *New Organization* button over the table with all the organizations you belong to. Key in the name of the new organization and save the changes by pressing *Next* button. The list of organizations will be displayed after pressing the icon with the user's initials located in the lower left corner of the screen.



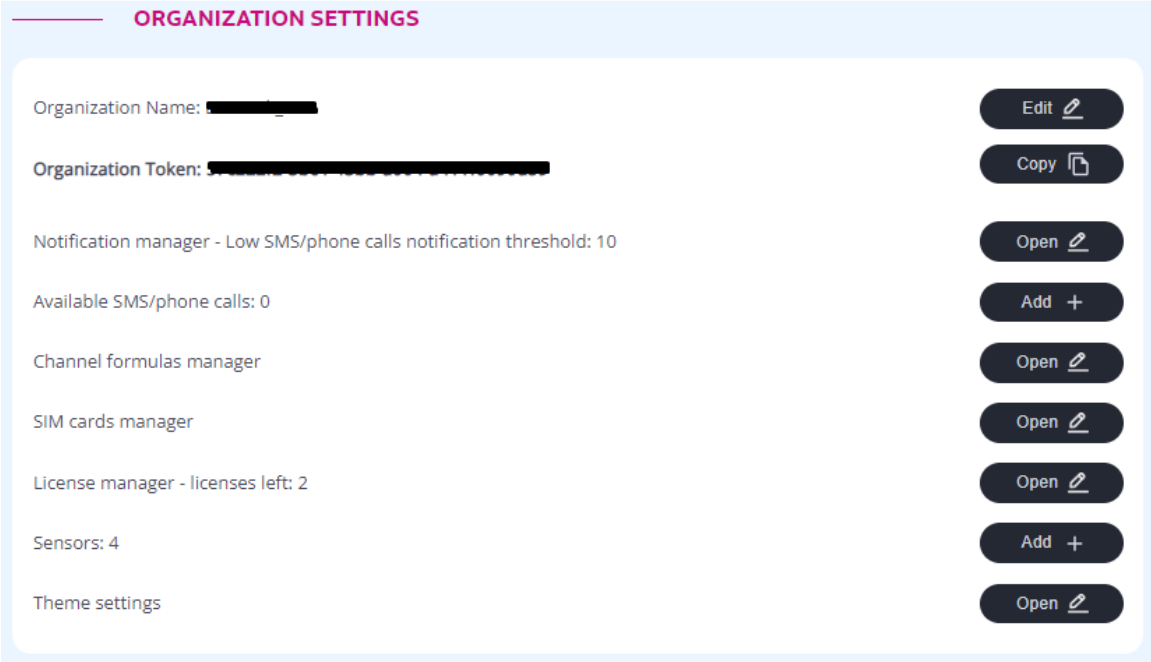
12.4. Changing Organization settings

To make changes to the Organization settings, select Settings (the gear icon) from the menu on the left, and then *Organization settings*.



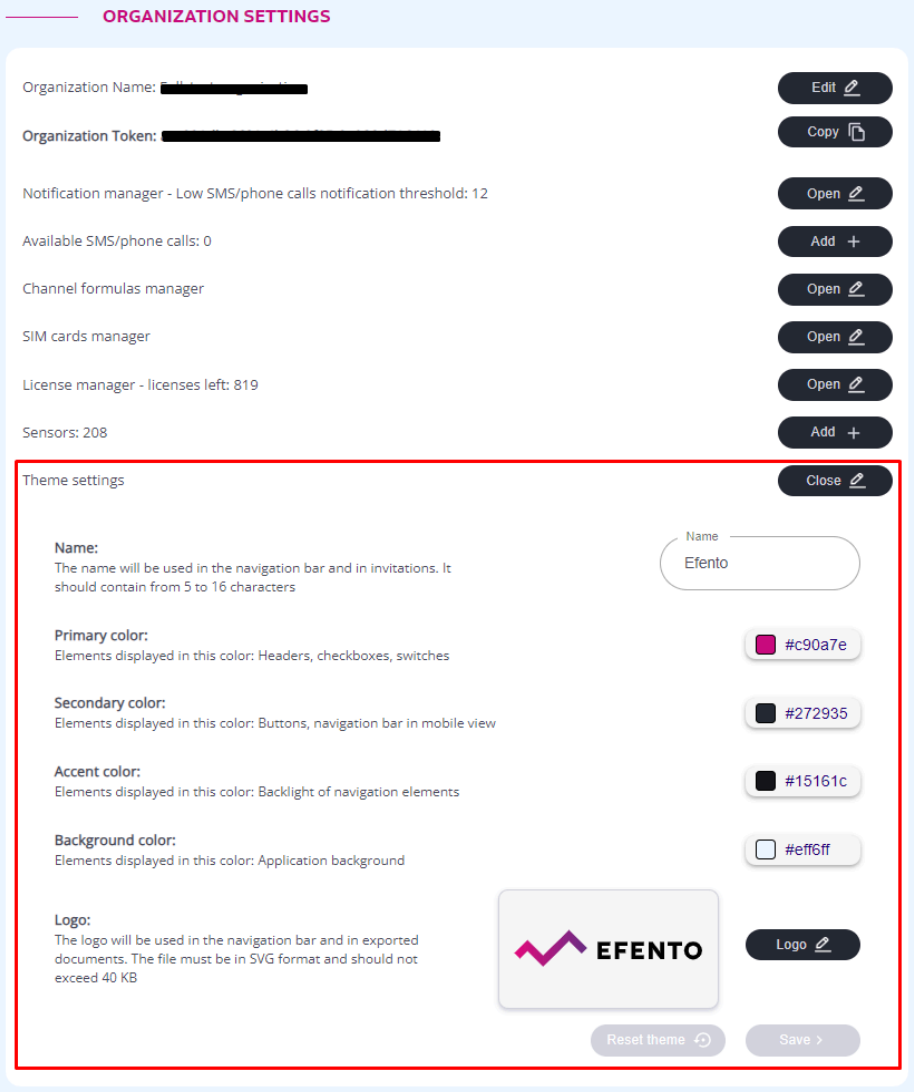
In this view the user can:

- change the name of the organization,
- top up the SMS / phone calls pool,
- go to Channel formulas manager,
- go to Notification manager,
- go to License manager,
- add new sensors,
- view the organization Token.



12.5. Theme settings

In the *Organization Settings* menu, you can individually set the appearance of the organization on the Efento Cloud platform. This will allow you to change the color scheme of the interface and set your own name and logo, which will be displayed on the platform in the navigation bar, in messages received by email and in reports generated by the platform. The file with the new logo must be in SVG format and cannot exceed 40 kB.

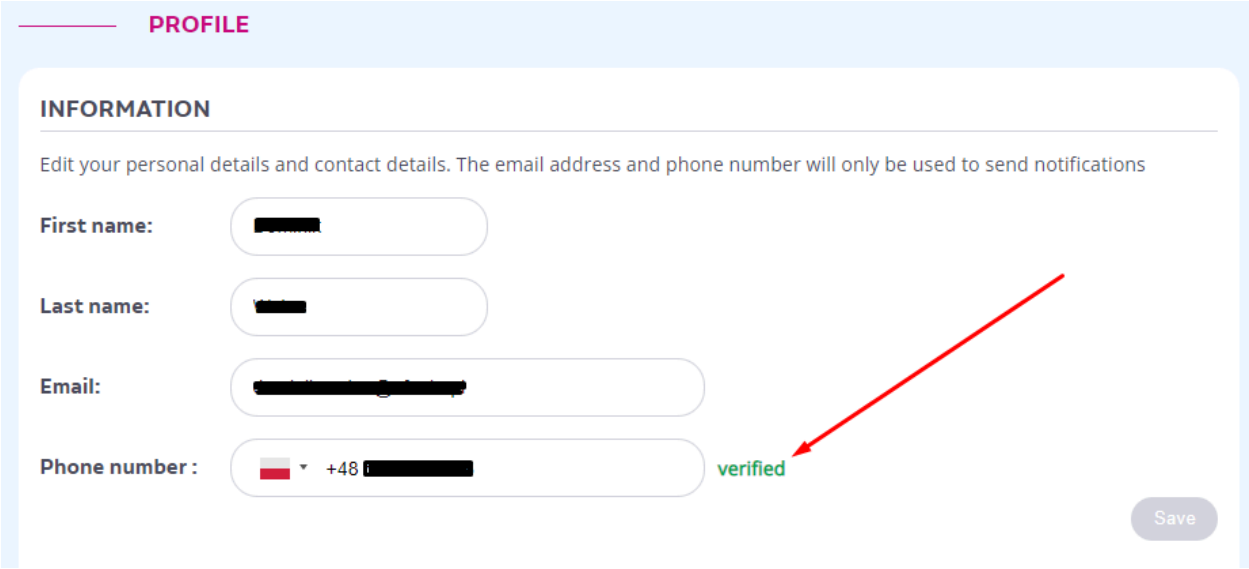


13. SMS / phone call notifications

The Efento Cloud platform allows users to generate SMS / voice alerts to designated user phone numbers.

13.1. Phone number configuration

In order to use alarms via SMS notifications/phone calls, it is necessary to verify the telephone number assigned to the user account. To do this, go to your profile settings and in the Information section, select the appropriate dialing variant and then enter the phone number. A verification code will be sent to the phone number, which must be entered in the next step of adding a phone number. Once your number has been successfully verified, the **"verified"** label will appear in the Information section. From now on, the user can receive SMS notifications and phone calls from alarm rules.

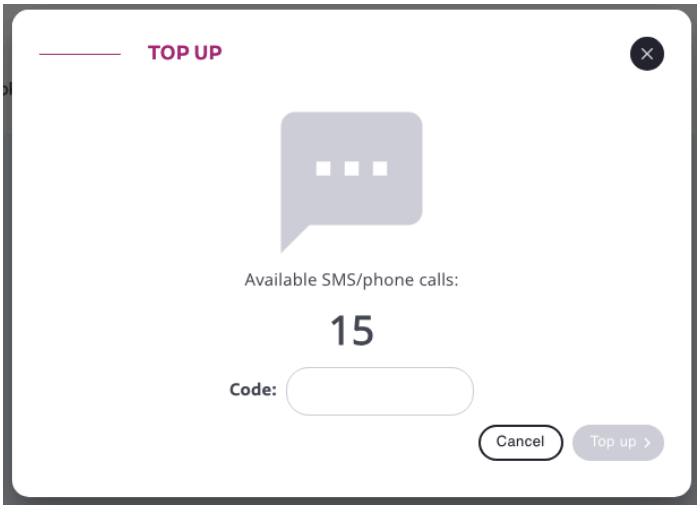


Important! One telephone number can be assigned to several Efento Cloud user accounts.

Updating the users phone number in the Profile settings will automatically update it in all rules. However, if the phone number is removed in the Profile settings, the user will not receive SMS / phone call notifications anymore. The organization's administrator will be notified about it via email.

13.2. Topping up the SMS / phone call pool

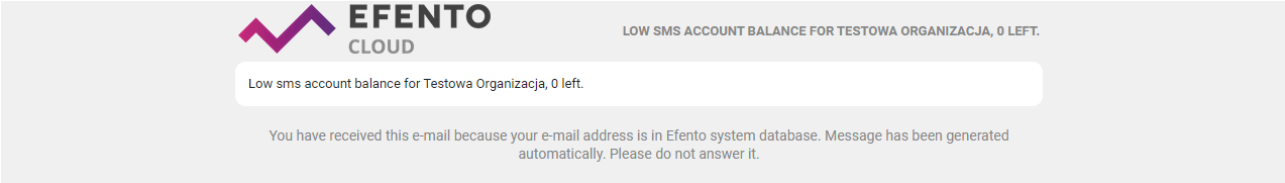
Receiving SMS / phone call notifications requires an available pool. You can check the number of available SMS / calls in the Organization Settings menu. To increase the pool, purchase the appropriate package from Efento, and then enter the received code in the field displayed after pressing the "Add +" button next to the Available SMS / phone calls field, and then accept it by clicking the Top-up button. If the code was correct, the pool of available SMS messages / phone calls will be increased by the specified value.



13.3. Low balance notification

When the number of available SMS messages / phone calls drops below a certain level, an email notification will be automatically sent to the selected users with the information about the current status of the pool. By default, the platform will notify the selected users, if the number of available SMSes / phone calls drops below 10. Notifications will be resent, if the number of the available SMSes / phone calls drops below 5 and 0.
It is possible to set the threshold, at which the notifications will be sent. To change the threshold value and notification recipients, go to Settings -> Organization settings -> Notification manager and enter the threshold value in the Low SMS / phone calls notification threshold field. Efento Cloud will send four notifications:

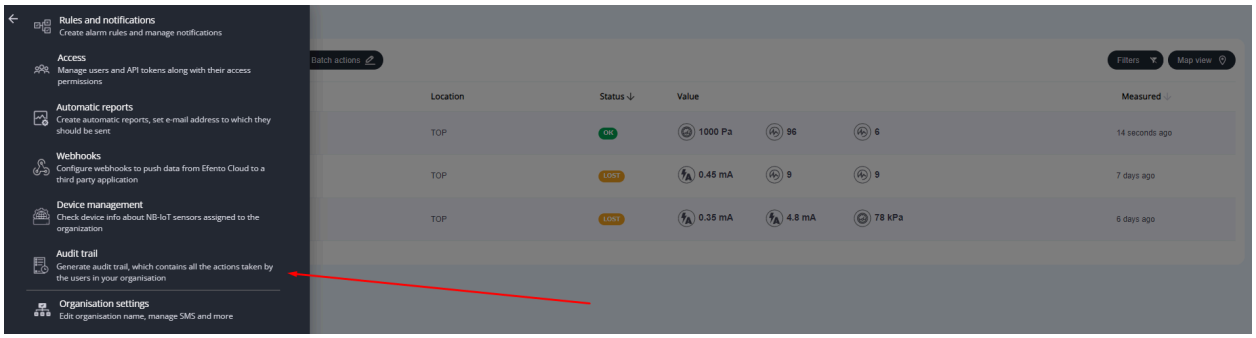
- when the number of available notifications drops to the set value,
- when the number of available notifications drops to 50% of the set value,
- when the number of available notifications drops to 25% of the set value,
- when the number of available notifications drops to 0.



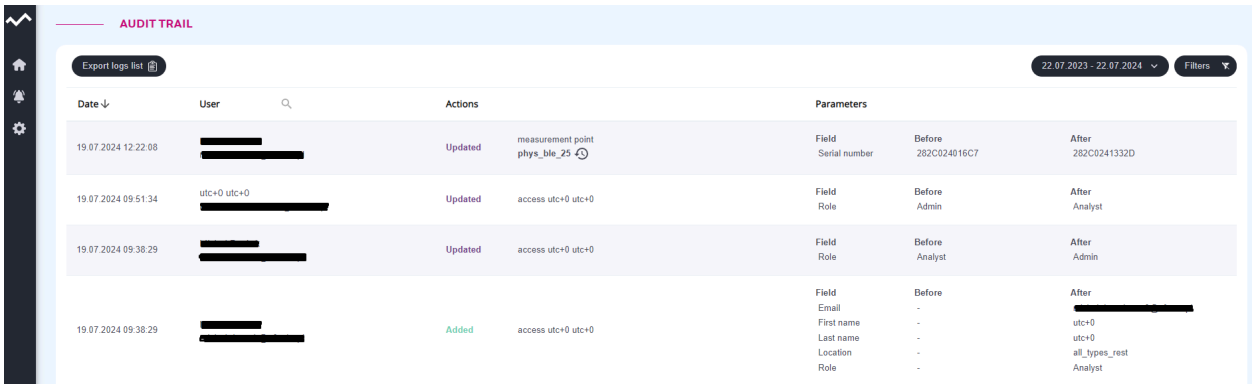
14. Audit trail

14.1. Audit trail preview

Audit trail, is a list of all changes within the organization and can be viewed by the users with Administrator permissions. The Audit trail includes changes in the configuration of the sensors, locations, reports, rules and changes to user / organization settings. To view the Audit trail, from the menu on the left, select Settings (the gear icon), and then *Audit trail*.



The list can be sorted / filtered based on the date of record, the user who made the change or the type of action (added, updated, removed, activated, disabled, notified and expired).



It is possible to check the full history of each item in the audit trails. Click the history icon ( ) next to the item name to open the log of all the actions performed on this item.

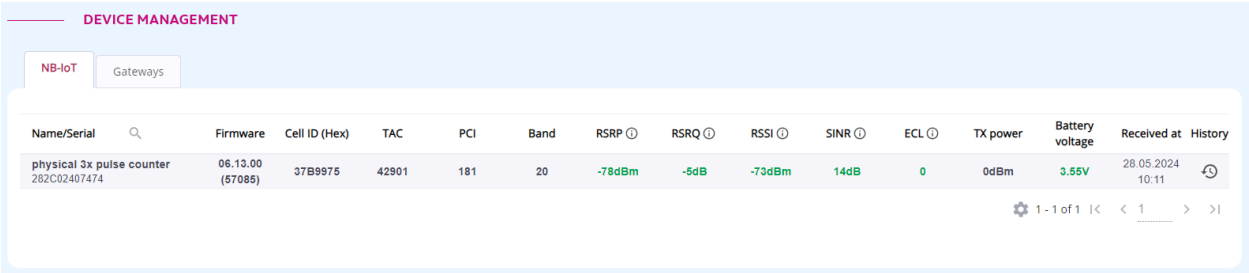
14.2. Exporting the Audit trail

To export the Audit trail, press the *Export logs list* button, the Audit trail will be sent as a PDF file to the email address assigned to your account.

15. Device management

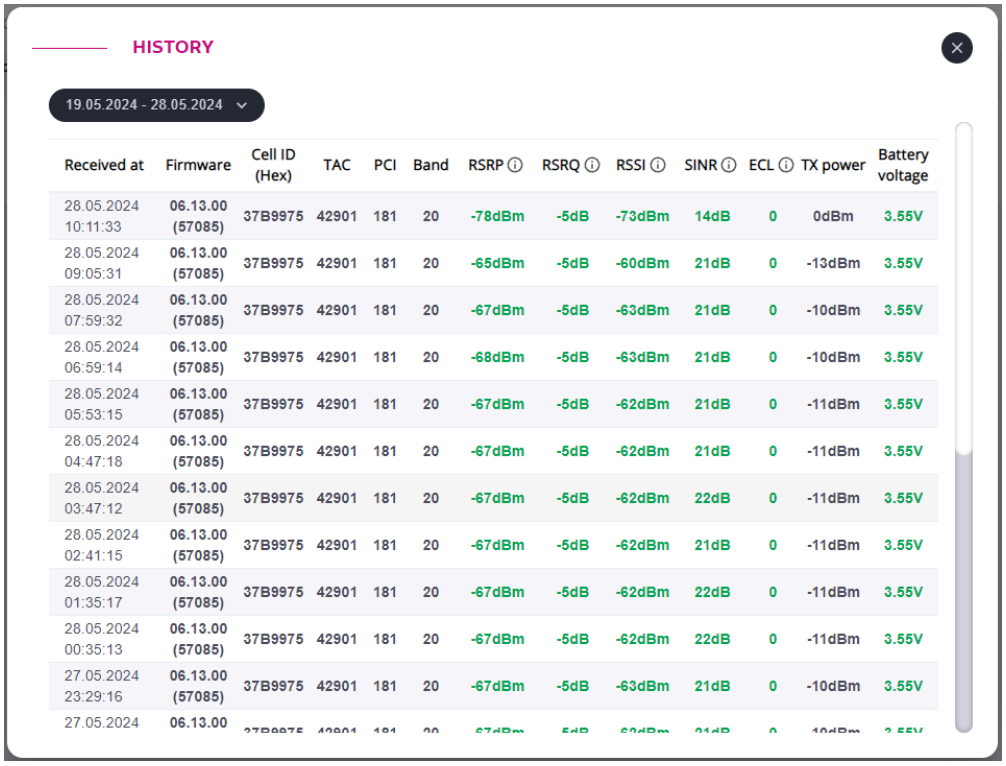
In the device management tab, the user can check information about NB-IoT sensors and Efento Gateways.

15.1. NB-IoT sensors



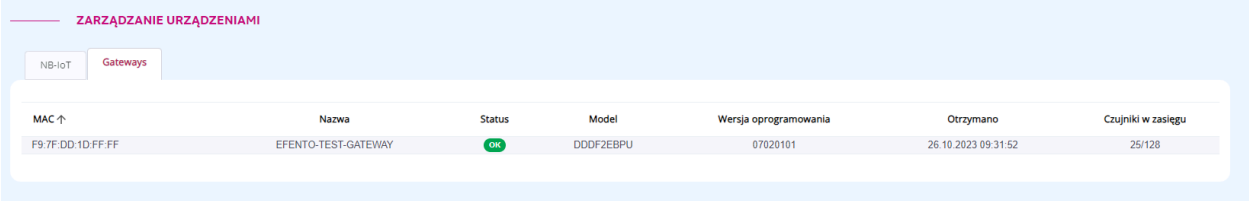
Information located in the NB-IoT tab:

- Firmware - device software version,
- Cell ID (Hex), TAC, PCI - parameters allowing to determine the base station providing NB-IoT communication,
- Band - used by the device to send the data via the NB-IoT network,
- NB-IoT signal quality - the values of the following parameters are highlighted in different colors depending on the range they fall within (**green - very good**, **yellow - medium**, **red - poor**)
    - RSRP - **> -102** | **from -102 to -110** | **< -110**
    - RSRQ - **> -9** | **from -9 to -11** | **< -11**
    - RSSI - **> -75** | **from -75 to -84** | **< -84**
    - SINR - **> 10** | **from 10 to 8** | **< 8**
    - ECL - **0** | **1** | **2**
- TX power - current transmitting power of the NB-IoT module,
- Battery voltage - the last measured voltage of the sensors' battery (the battery qualifies for replacement when its voltage drops below 2.7V),
- Timestamp of the received device information,
- History - allows you to view the above-mentioned historical data. The window view is shown in the screenshot below.



Received at	Firmware	Cell ID (Hex)	TAC	PCI	Band	RSRP	RSRQ	RSSI	SINR	ECL	TX power	Battery voltage
28.05.2024 10:11:33	06.13.00 (57085)	37B9975	42901	181	20	-78dBm	-5dB	-73dBm	14dB	0	0dBm	3.55V
28.05.2024 09:05:31	06.13.00 (57085)	37B9975	42901	181	20	-65dBm	-5dB	-60dBm	21dB	0	-13dBm	3.55V
28.05.2024 07:59:32	06.13.00 (57085)	37B9975	42901	181	20	-67dBm	-5dB	-63dBm	21dB	0	-10dBm	3.55V
28.05.2024 06:59:14	06.13.00 (57085)	37B9975	42901	181	20	-68dBm	-5dB	-63dBm	21dB	0	-10dBm	3.55V
28.05.2024 05:53:15	06.13.00 (57085)	37B9975	42901	181	20	-67dBm	-5dB	-62dBm	21dB	0	-11dBm	3.55V
28.05.2024 04:47:18	06.13.00 (57085)	37B9975	42901	181	20	-67dBm	-5dB	-62dBm	21dB	0	-11dBm	3.55V
28.05.2024 03:47:12	06.13.00 (57085)	37B9975	42901	181	20	-67dBm	-5dB	-62dBm	22dB	0	-11dBm	3.55V
28.05.2024 02:41:15	06.13.00 (57085)	37B9975	42901	181	20	-67dBm	-5dB	-62dBm	21dB	0	-11dBm	3.55V
28.05.2024 01:35:17	06.13.00 (57085)	37B9975	42901	181	20	-67dBm	-5dB	-62dBm	22dB	0	-11dBm	3.55V
28.05.2024 00:35:13	06.13.00 (57085)	37B9975	42901	181	20	-67dBm	-5dB	-62dBm	22dB	0	-11dBm	3.55V
27.05.2024 23:29:16	06.13.00 (57085)	37B9975	42901	181	20	-67dBm	-5dB	-63dBm	21dB	0	-10dBm	3.55V
27.05.2024	06.13.00											

15.2. Efento Gateways



Information located in the ‘Gateways’ tab:

- Name,
- Status - “OK” or “LOST”,
- Model,
- Software version,
- Date and time of received device information,
- Sensors in range - the number of sensors within the range of Efento Gateway, visible via Bluetooth communication.

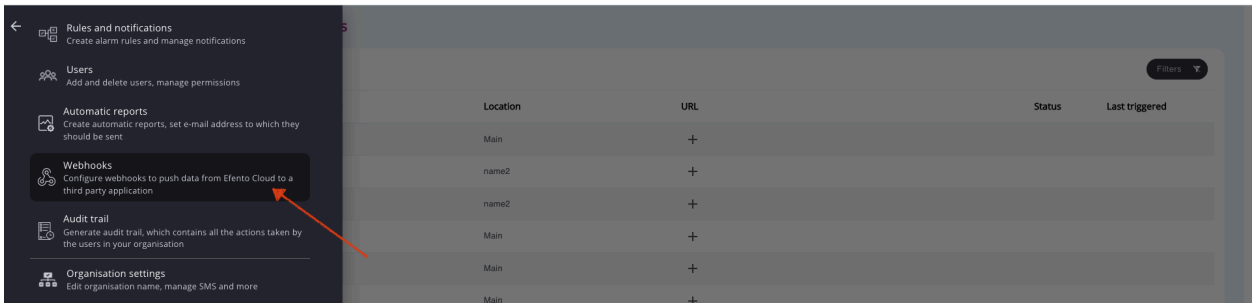
16. Webhooks

Webhooks are used to integrate Efento Cloud with any third party application. There are two types of webhooks available in Efento Cloud:

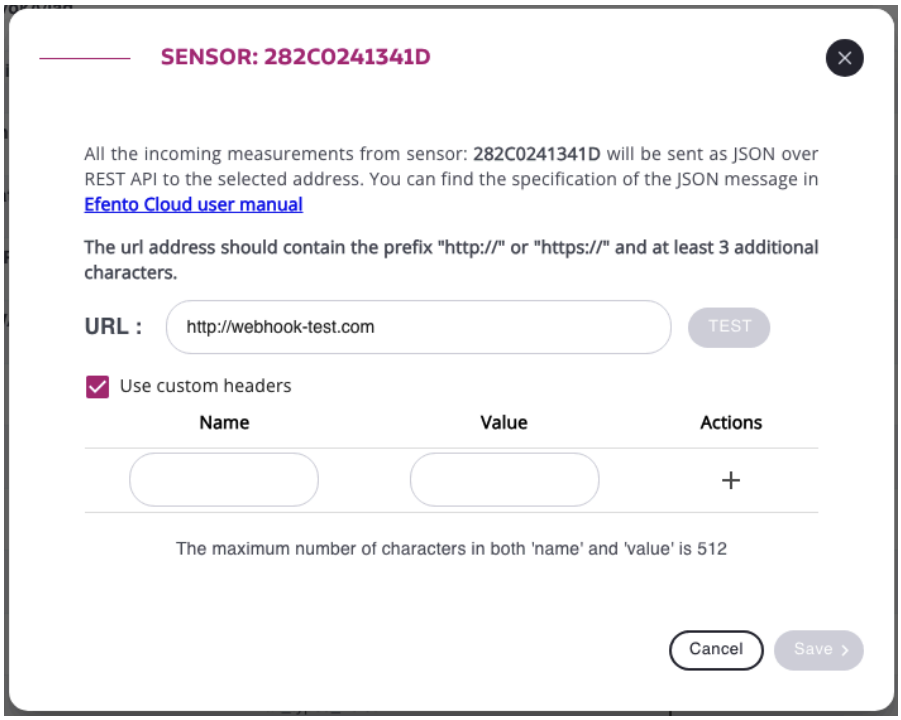
- **Measurement webhooks** - once a new measurement arrives in Efento Cloud, it will be automatically sent as JSON over REST (POST) to the set URL. Efento Cloud allows users to configure a separate URL for each sensor added to the platform (measurement webhooks are described in sections: *Configuration*, *Documentation*, *Extrapolating the measurements*, *Limitations*)
- **Alert webhooks** - if a condition set in the alert rule is met, the webhook is triggered and the data is sent to the set URL (alert webhooks are described in sections: *Configuration*, *Documentation*, *Limitations*).

16.1. Measurement webhooks - Configuration

Webhooks configuration can be accessed by users with Administrator or Manager permissions.
In order to configure webhooks, from the menu on the left, select Settings (the gear icon), and then Webhooks.

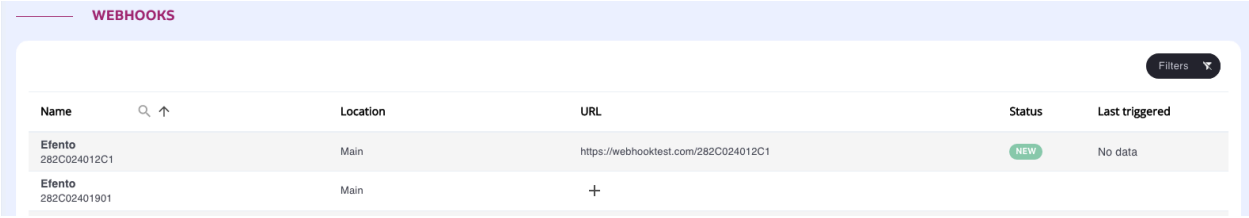


On the list you can see all the sensors added to your organization along with the information, if the webhook is set for this device, when the webhook was triggered last time and what was the received response. To add a webhook, click on the + button in the URL column and add the URL, to which the incoming measurements will be pushed. The URL must contain “http://” or “https://” prefix and at least three characters (including the dots in the URL).



It is also possible to add up to five user's defined headers to the webhook configuration. These headers will be added to each frame sent over webhooks. For each of the custom headers users can define a pair "Name" and "Value", maximum length of each of these parameters is 512 characters.
To add custom headers to the webhook, check the box next to the "Use custom headers" and configure the headers according to your needs.
Before saving the webhook, you can test it by pressing the TEST button. Efento Cloud will send a mock payload to the set address and display the server's response.

Once a webhook is set, it will be visible on the list of sensors along with the information on when it was triggered and status, based on the response received from the third party application.



There are six possible statuses of a webhook:

- New - webhook was configured but never triggered yet
- OK - webhook was triggered and proper response (2XX, e.g. 200, 201) received from the server
- No response - webhook was triggered, but the server did not return any response (timeout)
- Error - webhook was triggered but the server returned response with the code different then 2XX
- Temporarily disabled - Efento Cloud temporarily disabled the webhook. This happens, if the server did not return any response to the webhook five times in a row. In that case Efento Cloud automatically disables the webhook for six hours. After that time the webhook is automatically enabled again.
- Disabled - If Efento Cloud does not receive any response from the server to which it pushes the data for 30 hours, the webhook is automatically disabled and has to be manually enabled by the user.

To edit or remove a webhook, click on its URL. The webhook configuration dashboard allows also searching for the specified measurement point on the webhooks list, filtering the webhooks by their statuses (*Filters -> Status*) and filtering the measurement points based on the webhook assignment (*Filters -> webhook configured? -> Yes* / *No*).

16.2. Measurement webhooks - Payload (JSON) documentation

Efento Cloud sends the measurements as JSON using the POST method. The JSON contains:

- Information about measurement point (ID and its name in Efento Cloud)
- Serial number of the sensor that took the measurements
- Channel types
- Time range of the measurements (from, to)
- Measurement values along with the measurement period, timestamps and statuses

In order to minimize the payload sent over the webhooks, Efento Cloud sends the measurements in the form of Measurement Events. A Measurement Event occurs, if there was a change in the measurement value, measurement period or measurement status.

When receiving the data, the third party application has to extrapolate the measurements. Examples of data extrapolation are included in this user manual in chapter *Extrapolating the measurements*.

JSON is structured as below:


```
{
   "deviceSerialNumber": "282C024FFFFF",
   "firstMeasurementTimestamp": "2023-02-01 08:08:00",
   "lastMeasurementTimestamp": "2023-02-01 08:12:00",
   "measurementPointId": 70437,
   "measurementPointName": "Test sensor",
   "measurementsReceivedAt": "2023-02-01 08:13:28",
   "signalStrength": -47,
   "batteryStatus": "OK",
   "measurementsEvents": [
       {
           "channelNumber": 1,
           "channelType": "TEMPERATURE",
           "events": [
               {
                   "timestamp": "2023-02-01 08:08:00",
                   "value": 21,
                   "period": 60,
                   "status": "OK"
               }
           ]
       },
       {
           "channelNumber": 2,
           "channelType": "HUMIDITY",
           "events": [
               {
                   "timestamp": "2023-02-01 08:08:00",
                   "value": 45,
                   "period": 60,
                   "status": "OK"
               }
```

```
            ]
        },
        {
            "channelNumber": 3,
            "channelType": "PULSE_COUNTER",
            "events": [
                {
                    "timestamp": "2023-02-01 08:08:00",
                    "value": 0,
                    "period": 60,
                    "status": "OK"
                }
            ]
        }
    ]
}
```

`deviceSerialNumber`	Serial number of the sensor that took the measurements
`firstMeasurementTimestamp`	Timestamp (UTC) of the first measurement in the batch
`lastMeasurementTimestamp`	Timestamp (UTC) of the last measurement in the batch
`measurementPointId`	ID of the measurement point in Efento Cloud
`measurementPointName`	Name of the measurement point in Efento Cloud
`measurementsReceivedAt`	Timestamp (UTC) when Efento Cloud received the measurements batch that is sent over webhook
`signalStrength`	Signal strength reported by the sensor
`batteryStatus`	Status of sensor's battery, possible values: ● OK - battery level is good, ● LOW - battery needs to be replaced
`measurementsEvents`	Array of the sensor's channels. Contains measurements taken by the sensor on all its channels.
`channelNumber`	Channel number (a single sensor can have up to 6 channels)
`channelType`	Channel type. Units of the measurement ("value" field) are based on the channel type.
`events`	Array of Measurement Events - measurements taken by a sensor on a particular channel. Includes only the measurements that have different values than the previous ones.
`timestamp`	Measurement Event timestamp (UTC)
`value`	Measurement value. Depending on the "status" value: ● for statuses from OK group, value of the measurement, unit based on the "channelType" ● for status MISSING, the value is always NULL ● for status ERROR, value contains the error code

`period`	Measurement period set on the sensor
`status`	Status of the measurement. Available statuses: ● OK - default status. There are no issues with the measurement ● MISSING - there is a gap in the measurements received by Efento Cloud (e.g. a sensor was out of the gateway's range and did not resent the data yet) ● OK_CALIBRATION_REQUIRED - used for VOC (IAQ) sensors and pulse counters. Information that the measured values may be inaccurate, as the device needs to perform auto-calibration (VOC sensor) or manual calibration (pulse counters) ● OK_ACCURACY_LOW - used only for VOC (IAQ) sensors. Information that the measured values may have poor accuracy, as the device is performing auto-calibration ● OK_ACCURACY_HIGH - used only for VOC (IAQ) sensors. Information that the measured values may have good ● ERROR - the measurement sent by the sensor is out of the specified range. This usually mean that there is a hardware issue with the sensor (e.g. the probe is not connected or the sensor is physically damaged) ● INCOMPLETE - used only for pulse counters, before the first measurement period is completed ● OUT_OF_RANGE - the measurement taken by a sensor is out of the defined range. This usually indicates a hardware issue ● NOT_SYNCHRONIZED - used only for pulse counters. This status indicates that the user did not set the initial value of the pulse counter

16.3. Measurement webhooks - Extrapolating the measurements

In order to minimize the payload sent over the webhooks, Efento Cloud sends the measurements in the form of Measurement Events. A Measurement Event occurs, if there was a change in the measurement value, measurement period or measurement status.
This means that if the value measured by the sensor did not change, it is not included in the JSON. The third party application that receives the data from Efento Cloud has to extrapolate the measurement based on the measurement period (“period” field in the JSON’s objects “events”) and the time range of measurements (“firstMeasurementTimestamp”, “lastMeasurementTimestamp”). Examples:

Changes in the “value” field

Measurement period of the sensor is set to 60 seconds.

1. At 12:00:00 the sensor measured 20°C
2. At 12:01:00 the sensor measured 20°C
3. At 12:02:00 the sensor measured 20°C
4. At 12:03:00 the sensor measured 21°C
5. At 12:04:00 the sensor measured 21°C

Data sent over the webhook contains: 12:00:00 value: 20°C and 12:03:00 value: 21°C, as the measurement values at 12:01:00 and 12:02:00 were the same as the one at 12:00:00 and the value at 12:04:00 was the same as the one at 12:03:00. The JSON will look as below:

```
{
   "deviceSerialNumber": "282C024FFFFF",
   "firstMeasurementTimestamp": "2023-02-01 12:00:00",
   "lastMeasurementTimestamp": "2023-02-01 12:04:00",
   "measurementPointId": 70437,
   "measurementPointName": "Test sensor",
   "measurementsReceivedAt": "2023-02-01 11:46:10",
   "signalStrength": -47,
   "batteryStatus": "OK",
   "measurementsEvents": [
       {
           "channelNumber": 1,
           "channelType": "TEMPERATURE",
           "events": [
               {
                   "timestamp": "2023-02-01 12:00:00",
                   "value": 20,
                   "period": 60,
                   "status": "OK"
               },
               {
                   "timestamp": "2023-02-01 12:03:00",
                   "value": 21,
                   "period": 60,
                   "status": "OK"
               }
           ]
       }
   ]
}
```

Changes in the “period” field

Initially, the measurement period of the sensor is set to 180 seconds. Measurement period was later on changed to 60 seconds.

1. At 12:00:00 the sensor measured 20°C
2. At 12:01:00 the measurement period changed to 60 seconds and the sensor measured 20°C
3. At 12:02:00 the sensor measured 20°C
4. At 12:03:00 the sensor measured 21°C

Data sent over the webhook contains 12:00:00 value: 20°C, 12:01:00 value: 20°C, 12:03:00 value: 21°C. As there was a change in the measurement period at 12:01:00. The “events” array in the JSON will look as below:


```
"events": [
                {
                    "timestamp": "2023-02-01 12:00:00",
                    "value": 20,
                    "period": 180,
                    "status": "OK"
                },
                {
                    "timestamp": "2023-02-01 12:01:00",
                    "value": 20,
                    "period": 60,
                    "status": "OK"
                },
                {
                    "timestamp": "2023-02-01 12:03:00",
                    "value": 21,
                    "period": 60,
                    "status": "OK"
                }
]
```

Changes in the “status” field

Measurement period of the sensor is set to 60 seconds.

1. At 12:00:00 the sensor measured 20°C
2. At 12:01:00 the sensor’s probe was unplugged and the device was not able to take a measurement
3. At 12:05:00 the sensor’s probe was plugged again and the sensor measured 20°C

Data sent over the webhook contains: 12:00:00 value: 20°C (status: OK), 12:01:00 value: 10000 (status: ERROR), 12:05:00 value: 20°C (status: OK). The “events” array in the JSON will look as below:


```
"events": [
                {
                    "timestamp": "2023-02-01 12:00:00",
                    "value": 20,
                    "period": 60,
                    "status": "OK"
                },
                {
                    "timestamp": "2023-02-01 12:01:00",
                    "value": 10000,
                    "period": 60,
                    "status": "ERROR"
                },
                {
                    "timestamp": "2023-02-01 12:05:00",
                    "value": 20,
                    "period": 60,
                    "status": "OK"
                }
]
```

None of the fields (“value”, “period”, “status”) did not change their values in the whole batch of the measurements sent over webhook

In this case the “events” array will only contain a single value. This means that the value was the same for the whole time period defined by "firstMeasurementTimestamp" and "lastMeasurementTimestamp". The JSON will look as below:


```
{
   "deviceSerialNumber": "282C024FFFFF",
   "firstMeasurementTimestamp": "2023-02-01 11:00:00",
   "lastMeasurementTimestamp": "2023-02-01 11:42:00",
   "measurementPointId": 70437,
   "measurementPointName": "Test sensor",
   "measurementsReceivedAt": "2023-02-01 11:46:10",
   "signalStrength": -47,
   "batteryStatus": "OK",
   "measurementsEvents": [
       {
           "channelNumber": 1,
           "channelType": "TEMPERATURE",
           "events": [
               {
                   "timestamp": "2023-02-01 11:00:00",
                   "value": 20,
                   "period": 60,
                   "status": "OK"
               }
           ]
       }
   ]
}
```


In this example, the sensor took 43 measurements (11:00:00, 11:01:00, 11:02:00, …, 11:42:00), but as their value was always 20°C, only the first one was included in the JSON.

16.4. Measurement webhooks - Limitations

There are few limitations that should be considered when using the webhook service:

- It is possible to configure one webhook per measurement point
- The application, to which Efento Cloud sends the data, needs to respond within 10 seconds from the moment when the webhook was triggered
- Efento Cloud does not resend the measurements. If the application that receives the data was not responding the data will not be resent and needs to be pulled using Efento Cloud API
- The only accepted response codes, confirming that the measurements were received are 2XX codes (200, 201, etc.)
- The maximum URL length is 500 characters, including the mandatory “http://” or “https://” prefixes
- It is possible to configure up to five custom headers per webhook
- It is impossible to change the structure of the payload (JSON) sent

16.5. Alert webhooks - Configuration

Alert webhooks are one of the notification types supported by Efento Cloud. To configure an alert webhook create a new rule (described in Alarm rules configuration), select notification type ‘Webhook’, add webhook’s URL and (optionally) custom headers.

16.6. Alert webhooks - Payload (JSON) documentation

Efento Cloud sends the alerts as JSON using the POST method. The alert webhook is triggered twice:

1. when the alarm is activated - the rule’s condition is met (e.g. temperature crossed the threshold)
2. when the alarm is deactivated - the rule’s condition is not active anymore (e.g. temperature got back to the safe range)

The JSON contains:

- Timestamp when the alert was created (condition of the rule was met)
- Timestamp when the alert was revoked
- Organization and location names
- Rule information (name, condition, parameter, threshold value)
- Measurement point information (name and serial number of the sensor assigned to it along with the channel)
- Value of the measurement that triggered the alert and value of the measurement that revoked the alert

JSON is structured as below:


```
{
   "createdAt": "2023-04-25 09:07:00",
   "neutralizedAt": null,
   "organizationName": "Test_org",
   "locationName": "Test",
   "ruleName": "test_above",
   "ruleCondition": "more_than",
   "ruleParameter": "temperature",
   "thresholdValue": 80,
   "measurementPointName": "Fridge",
   "deviceSerialNumber": "28DDDDDD1345",
   "channelNumber": 1,
   "triggeringMeasurement": 90,
   "revokingMeasurement": null
}
```

createdAt	Timestamp (UTC) when the alert was triggered (e.g. measurement received by the platform was over the threshold; sensor was lost)
neutralizedAt	Timestamp (UTC) when the alert was deactivated (e.g. measurement received by the platform got back below the threshold; sensor started sending the data to the platform again). If the webhook was triggered by meeting the rule's condition, this field has 'null' value.
organizationName	Name of the Organisation in Efento Cloud in which the rule is configured
locationName	Name of the location in which the measurement point is located
ruleName	Name of the rule in Efento Cloud
ruleCondition	Rule condition. Available values: ● more_than - measured value is over the set threshold ● less_than - measured value is below the set threshold ● occurred - binary sensor changed its state or low battery / lost rule condition is met
ruleParameter	Type of the rule. Available values: TEMPERATURE, HUMIDITY, ATMOSPHERIC_PRESSURE, DIFFERENTIAL_PRESSURE, ALARM, WATER_METER, ELECTRICITY_METER, PULSE_COUNTER, LOST, LOW_BATTERY, IAQ, FLOODING, SOIL_MOISTURE, CO_GAS, NO2_GAS, H2S_GAS, AMBIENT_LIGHT, PM_1_0, PM_2_5, PM_10_0, NOISE_LEVEL, CH4_GAS, NH3_GAS, HIGH_PRESSURE, DISTANCE_MM, WATER_METER_ACCUMULATIVE, CO2_GAS, STATIC_IAQ, CO2_EQUIVALENT, BREATH_VOC, PERCENTAGE, VOLTAGE, CURRENT, PULSE_COUNTER_ACCUMULATIVE, ELECTRICITY_METER_ACCUMULATIVE
thresholdValue	Value of the threshold set
measurementPointName	Name of the measurement point in Efento Cloud
deviceSerialNumber	Serial number of the sensor assigned to the measurement point
channelNumber	Number of the sensor's channel that triggered the rule
triggeringMeasurement	Value of the measurement that triggered the rule
revokingMeasurement	Value of the measurement that deactivated the alert. If the webhook was triggered by meeting the rule's condition, this field has 'null' value.

Efento Cloud accepts responses with response code 2XX (e.g. 200, 201). All the other response codes are invalid.
Important! If Efento Cloud receives an invalid response code five times in the row, the alert webhook will be disabled and has to be manually enabled by the user in Efento Cloud.

16.7. Alert webhooks - Limitations

There are few limitations that should be considered when using the alert webhooks:

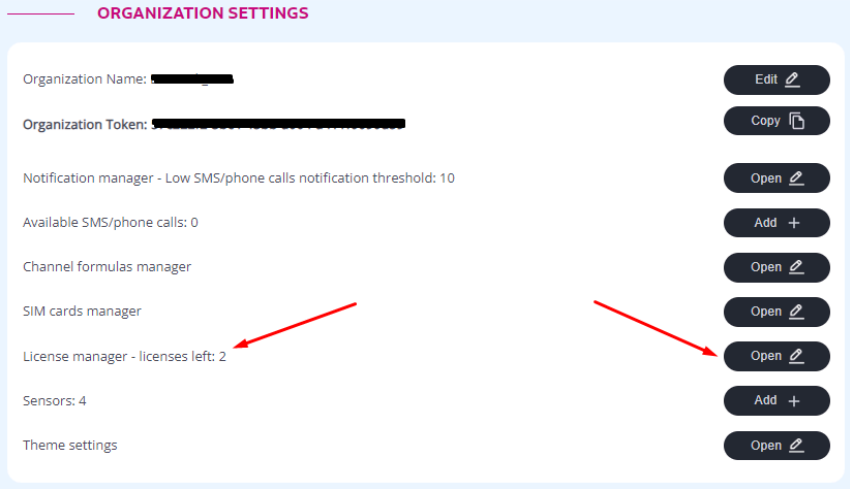
- It is possible to configure one webhook per alert rule
- The application, to which Efento Cloud sends the data, needs to respond within 10 seconds from the moment when the webhook was triggered
- Efento Cloud does not resend the alerts. If the application that receives the data was not responding the data will not be resent and needs to be pulled using Efento Cloud API
- The only accepted response codes, confirming that the measurements were received are 2XX codes (200, 201, etc.). **If Efento Cloud receives an invalid response code five times in the row, the alert webhook will be disabled and has to be manually enabled by the user in Efento Cloud.**
- The maximum URL length is 500 characters, including the mandatory “http://” or “https://” prefixes
- It is possible to configure up to five custom headers per webhook
- It is impossible to change the structure of the payload (JSON) sent

17. License manager

Each sensor that is added to Efento Cloud requires a license. Licenses are added by keying in a License key in Efento Cloud platform. Each License key has two parameters: number of devices and lifetime. When placing an order with Efento, the customer can order licenses with required lifetime and that will allow them to add the required number of sensors. A single License key can generate any number of licenses (e.g. if the customer ordered 5 sensors, he will receive a license key, which, when entered in Efento cloud, allows you to add 5 sensors to Efento Cloud and use them for a period of two years).

17.1. Adding licenses

In order to add licenses, open the license manager: from the menu on the left select *Settings* (gear icon) -> *Organization settings* -> click the *Open* button next to the *License manager*. Press the *Add* button and key in the License key provided by Efento. Once the key is added. The value next to *Licenses left* will increase. After a license is added, you can add Efento sensors to Efento Cloud.



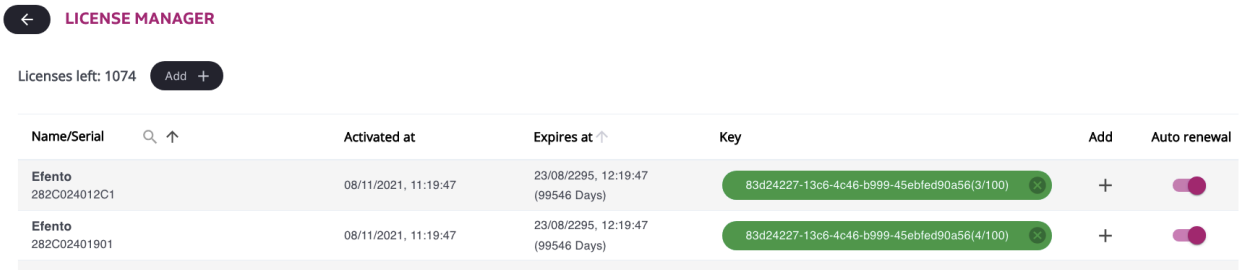
17.2. License lifetime

Each license has a defined lifetime - a period of time in which the sensors assigned to this license can send the data to Efento Cloud. Once the lifetime expires, new measurements coming from the sensor assigned to this license will not be saved and proceeded by Efento Cloud. The user will still have access to the historical measurements and alerts. When the lifetime of the license is expiring, the user will be

notified by email. Email notifications will be sent twice: 1 month before the expiration date and on the expiration day. In order to continue using a sensor whose license is expiring, a new License key has to be provided. **If there are any free licenses (unassigned to any sensors), a license will renew automatically.**

17.3. Managing licenses

Information about all the sensors along with the licenses assigned to them is visible in the License manager.



The list contains the following information:

- Sensor serial number / name
- Activation date - the date when the sensor was assigned to a license key. The license lifetime is counted from this date
- Expires at - license expiration date along with the number of days left
- Key - license key assigned to this sensor. As a single license key may add multiple licenses, there is information in the brackets containing the number of the licenses assigned to this license key

Moreover, there are two configuration buttons:

- Add (“+” button next to each sensor) - allows adding a license key to a particular sensor. If the user selects this option, all the license keys added to the organization will be displayed. The user can assign a particular license to a particular sensor. It is possible to assign multiple licenses to a sensor. In that case, once the currently active license expires, the next one will be automatically used.
- Auto renewal - If this feature is enabled, Efento Cloud will automatically assign a new license key to a sensor once the currently active license expires. **License auto renewal is enabled by default and the user does not need to control the expiration date of the licenses and manually assign the licenses to the sensors. The only thing the user needs to do is key in a new license key to the platform before the current one expires.**

17.4. Detaching license from sensor

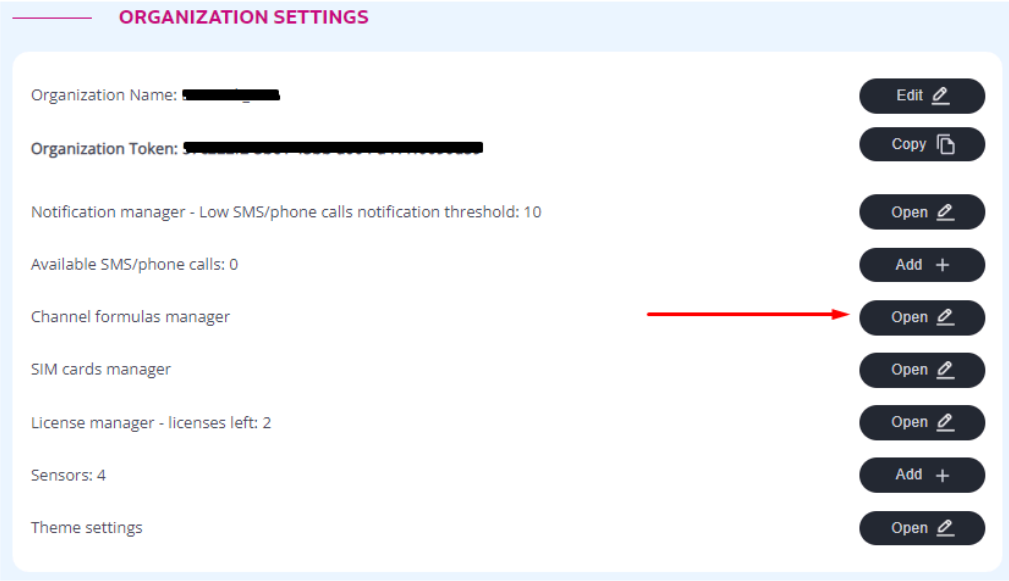
It is possible to detach the license from a sensor. Once the license is detached, it gets back to the pool of available licenses and can be used to add another sensor. The sensor that has been detached from the license, will still be visible in the platform, but the new measurements from this sensor won't be saved and proceeded by Efento Cloud until a new (or the same) license is assigned to it. Detaching license from a sensor does not restart its lifetime (e.g. if a 12 month license was used for 4 months with Sensor 1, once it's detached its remaining lifetime will be 8 months).

18. Formulas

The platform allows converting the measurements from pulse counters, current (4-20 mA) and voltage (0-10 V) sensors into appropriate physical values, making the results displayed in Efento Cloud more readable to the user.

18.1 Channel formulas manager

The Channel Formula Manager allows users to configure formulas in the Efento Cloud organization and is available in the organization settings.

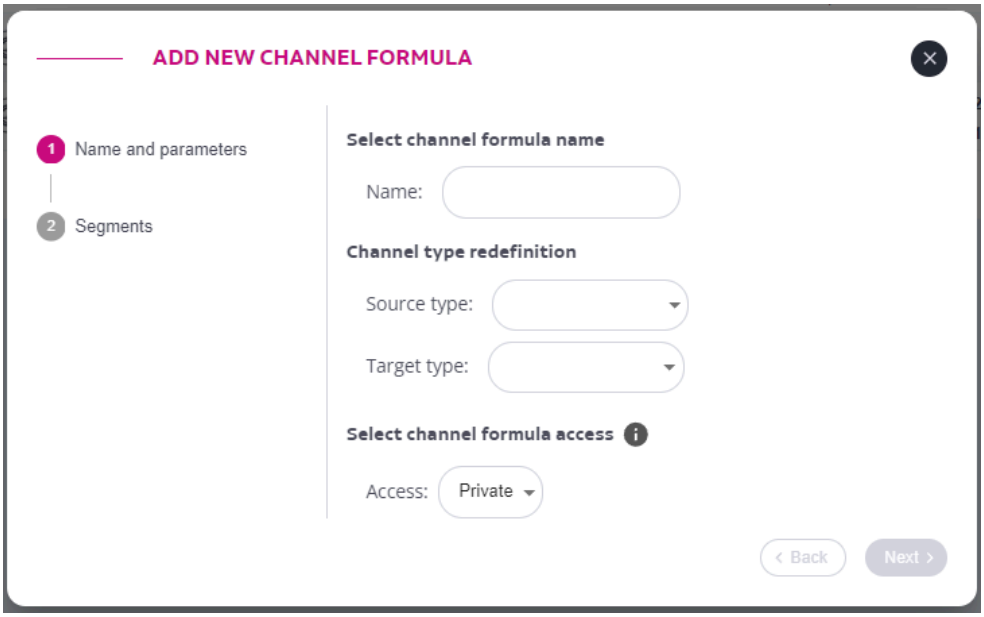


The displayed list shows the current channel formulas. Creating a new one is possible by pressing the 'Add' button located in the upper left corner of the screen, while checking the history of the formula, editing and deleting is possible by pressing the appropriate icon in the 'Actions' column.

Important! To be able to remove the formula, you must detach all sensors from it. Detaching a formula is done by switching channels to another formula or deleting a measurement point from Efento Cloud.

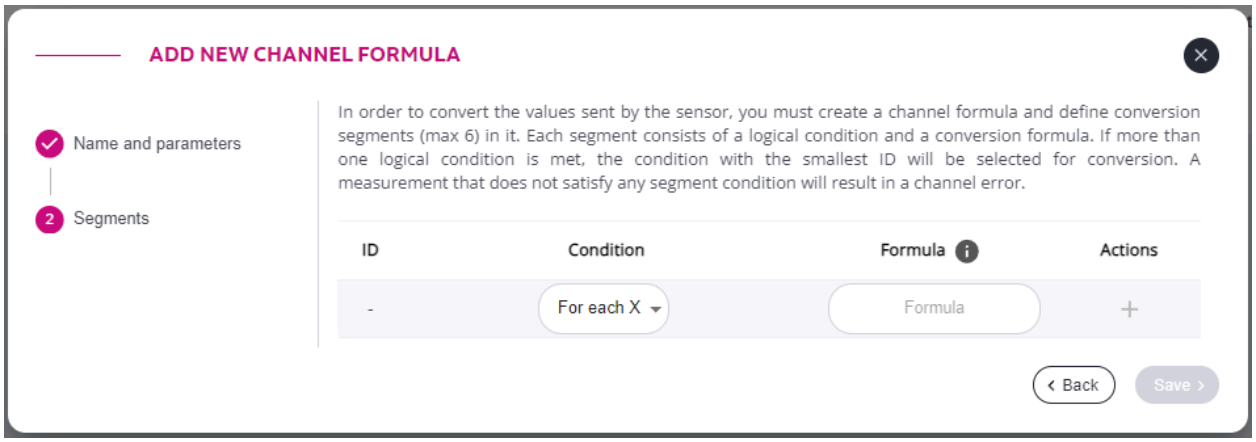
18.2 Adding a formula

In the first stage of creating a new formula, you need to give it a name, check whether the redefinition of the channel type is consistent with the assumptions and set access to the channel formula (*Private* - channel formula can only be edited by its owner, *Public* - channel formula can be edited by any user having access to the formula manager).

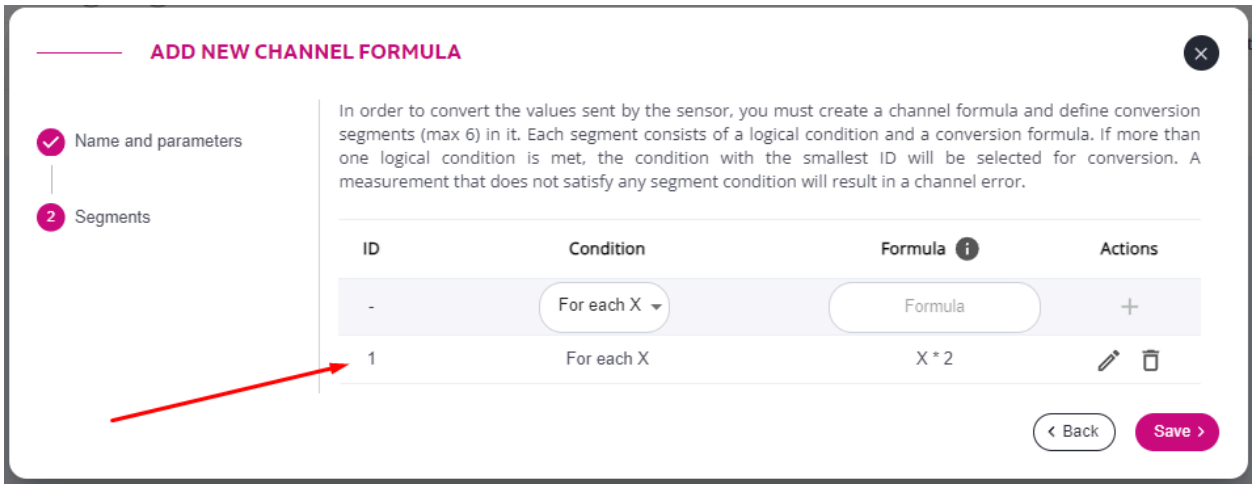


In the second stage, define logical conditions along with formulas used to convert the values sent by the sensor. The conversion formula must be mathematically correct and no longer than 32 characters. To refer to the value sent by a sensor, 'X' character. For example, doubling the value sent by the sensor will be achieved by the formula: X * 2. It is possible to use basic special characters in channel formulas:

- “+” sum,
- "-" difference,
- “*” multiplication,
- “/” division,
- “(“ “)” grouping of expressions.

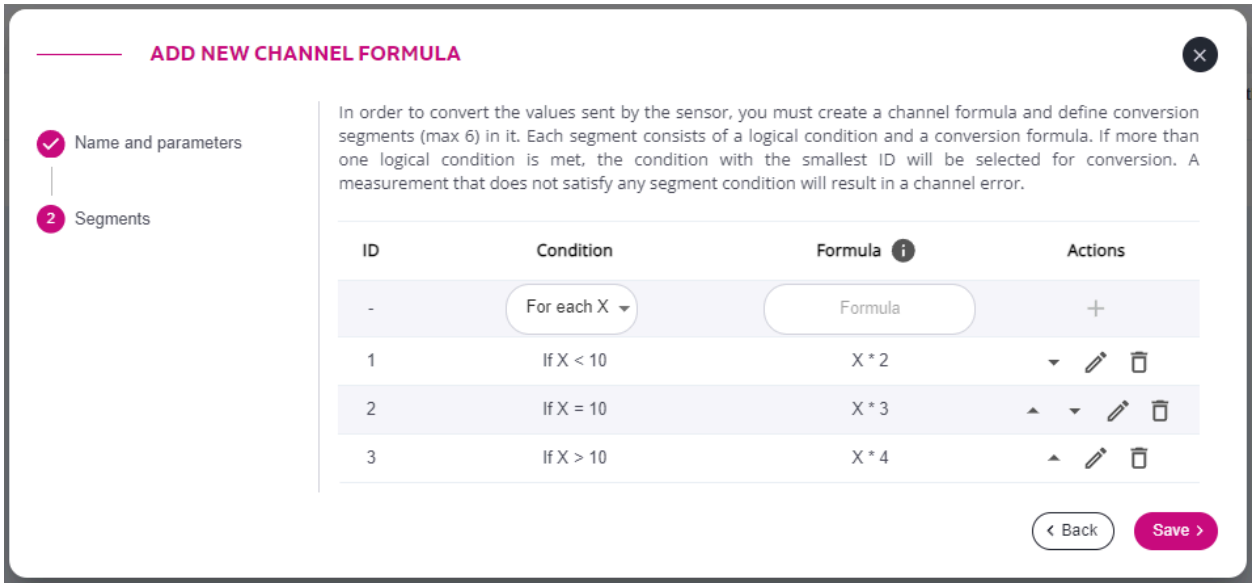


After completing the condition and conversion formula, add the formula by pressing '+' in the last column ('Actions'), which will display the formula condition below, ready to be saved.



It is possible to create several conditions for one formula. For example, for the values sent by the sensor:

- smaller than 10, multiply by 2
- equal to 10, multiply times 3
- greater than 10, multiply by 4

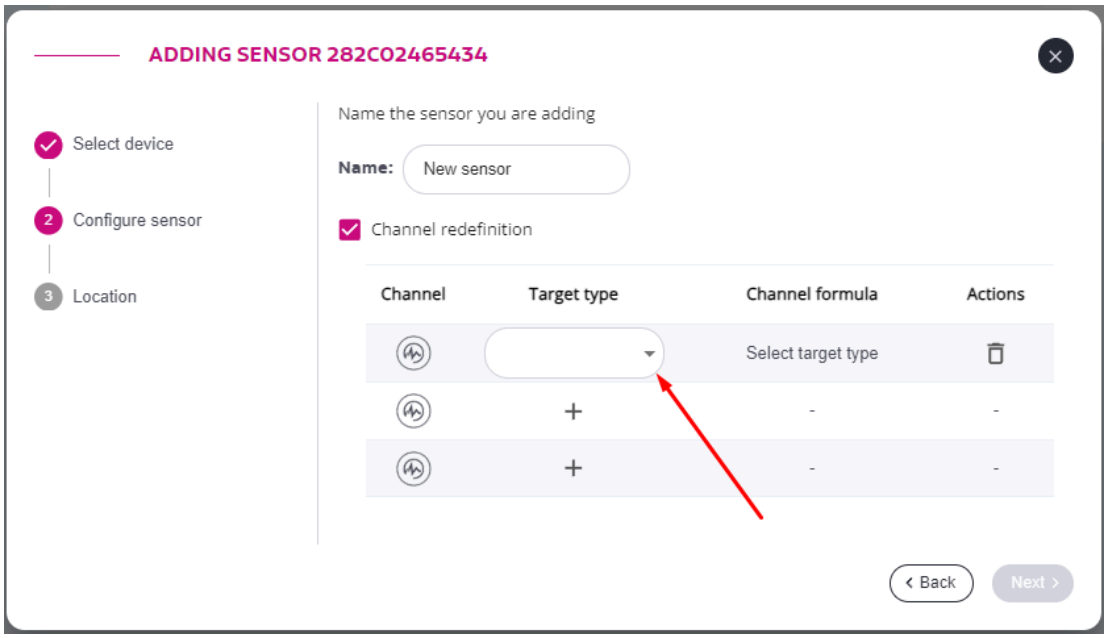


If more than one logical condition is met, the condition with the smallest ID will be selected for conversion.

18.3 Adding formulas to sensor channels

The formulas can be used by 4-20 mA / 0-10 V sensors and pulse counters. Defining channel types and selecting appropriate formulas is possible when adding the device to the platform. Once a sensor is added, it is only possible to change formulas within the same target type. To change the target type of a sensor, remove it from the platform and add it again.

When adding the sensor to the platform, after giving the device a name and checking the "Channel redefinition" checkbox, select the target type of a given channel (the physical value to which the sensor measurement will be converted) and select the formula that will be used for conversion (or create a new formula).

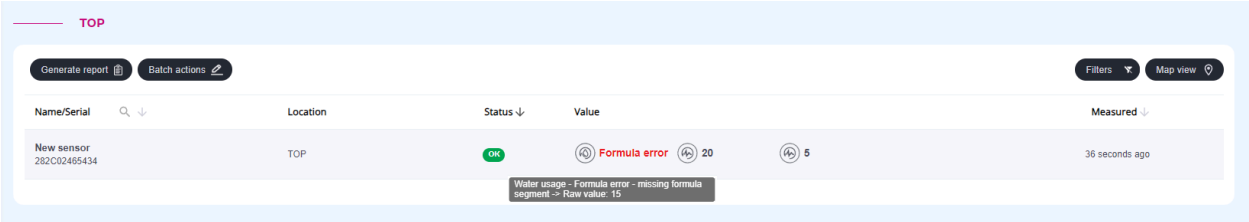


18.4 Formulas errors

If Efento Cloud encounters a problem while re-calculating the received measurement, the user will be informed by displaying the Channel error message on the dashboard. The reason for the error may be:

- division by 0,
- the calculated value is off range,
- received measurement does not meet any defined segment criteria.

To display the details about the value causing the error, hover the cursor over the channel with the red "Formula error" message on the dashboard.



19. Notification manager

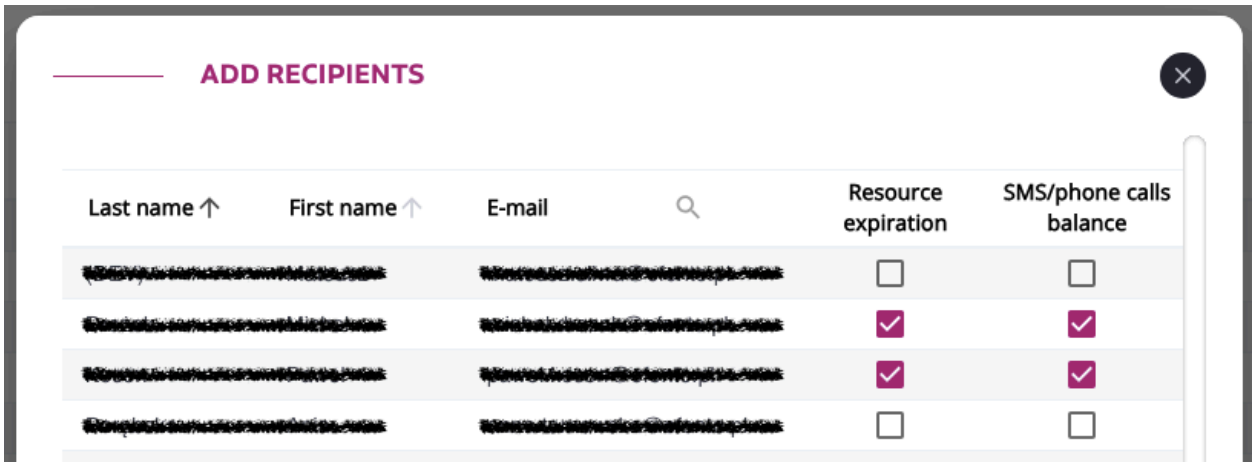
19.1 Types of notifications

Notification manager is used to assign the users to the organization level notifications. These include:

- Resource expiration notification:
  - License expiration - license used by a sensor in the organization is close to the expiration date / expired
  - Sensor calibration reminder - The date of the sensor calibration (defined when adding a sensor to the organization) is due
- Low SMS / phone calls balance - if the number of remaining SMSes / phone calls drops below the level defined in 13.3 Low balance notification.

19.2 Adding users to notifications

To add users to the selected notification type click the “Add recipients +” button. Select which users should be notified about the resource expiration and SMS/phone calls balance by selecting the appropriate checkbox next to the user.



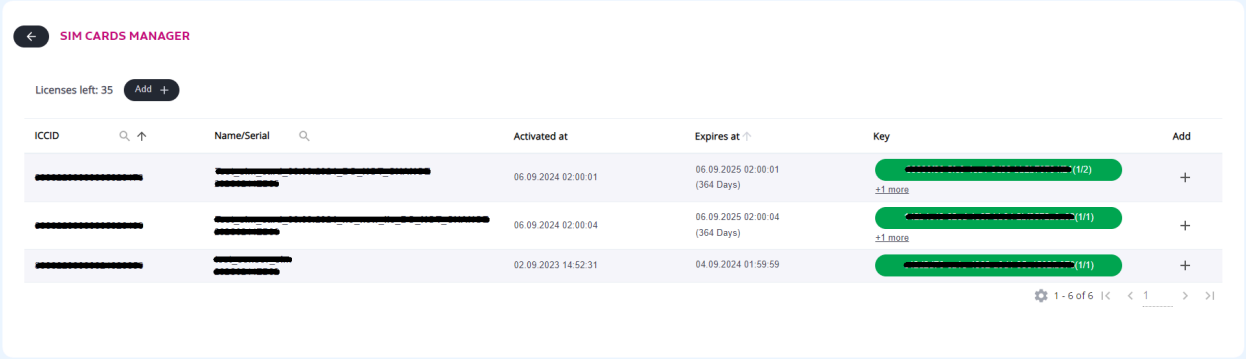
To remove the notification recipients, uncheck the checkbox next to the selected user.

Both types of notifications are sent by email, to the email addresses defined in the users’ profiles when the notification trigger is met (SMS/phone calls balance reaches a set threshold or license / calibration certificate is close to expiration / expired.

20. SIM cards manager

The SIM card manager contains information about SIM cards placed in NB-IoT Efento sensors, added to your organization and is available in the organization settings.

- ICCID - SIM card number,
- Name and serial number of the sensor in which the SIM card is located,
- SIM card activation date,
- SIM card expiration date with additional information in the form of a note (Expired) if the SIM card is no longer active,
- Keys used during SIM card activation / extension along with the history of previous license keys.



License keys can be added individually to a given sensor by pressing the “+” icon in the last column or to the main pool - *Licenses left*, after pressing the “Add +” button located above the first column of the visible table.
If a given sensor has an additional license or the user has a free license in the pool, then after the previous one expires, the card will be automatically extended.

What does it mean that the SIM card will expire?
Efento NB-IoT sensors are equipped with SIM cards, thanks to which they can send data via the cellular network. When purchasing the sensors, you selected the period for which the SIM card is activated. If the SIM card validity is not extended, it will automatically expire on the date specified above.

What happens when the SIM card expires?
The NB-IoT sensor will not be able to send data to the platform, which will prevent the system from working correctly (collecting measurements, notifications of exceedances, etc.).

What should I do to extend the validity of the SIM card?

To extend the validity of the SIM card, please contact our sales department: sales@getefento.com