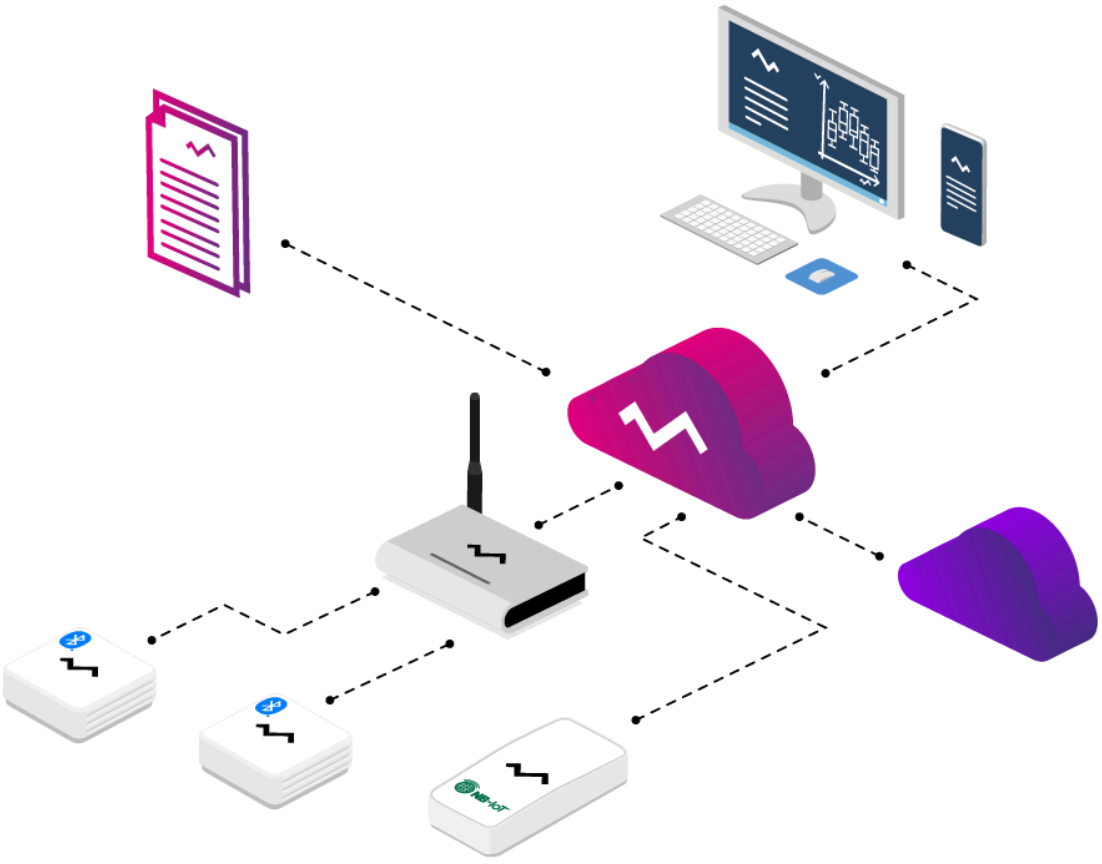
Efento Cloud
User manual



V 3.16

2025-06-11

Table of contents

1. Registration and logging in to Efento Cloud 5
2. Organization 5
3. Configuration of Efento Gateway 5
3.1. Configuration of Efento Gateway using the Efento mobile application 6
3.2. Configuration of Efento Gateway using a web browser (Ethernet gateway only) 6
4. Configuration of Efento sensors 8
5. Dashboard - preview of sensors added to Efento Cloud 8
5.1. Filters 9
5.2. Location map 10
5.3. Reports 11
5.4. Detailed sensor data 13
5.5. Compare measurements 16
6. Sensor configuration 17
6.1. Changing the location of the sensor 18
6.2. Changing the name of the sensor 18
6.3. Swapping a sensor 18
6.4. Adjusting formula settings 19
6.5. Changing configuration of NB-IoT sensors 19
6.6. Disabling / enabling sensors 21
6.7. Archiving / deleting measurements 21
6.8. Calibration reminder 22
6.9. Batch actions 22
7. Access - Users and API tokens 23
7.1. Users management 24
7.2. Adding new users 25
7.3. Exporting users list 27
7.4 API tokens 27
8. Alarm rules configuration 28
8.1. Status-based rules for sensors 28
8.2. Status-based rules for gateways 33
8.3. Exporting rules list 34
9. Configuration 36
9.1. Adding sensors 36
9.2. Create and manage locations 37
10. Automatic reports 38

10.1. Automatic reports settings 39
11. Alarms 42
11.1. Alarms preview 42
11.2. Exporting alarm list 44
12. Editing user and organization data 45
12.1. Changing the username / password, language and deleting the account 45
12.2. Automatic logout 47
12.3. Creating a new Organization and leaving an Organization 47
12.4. Changing Organization settings 48
12.5. Theme settings 49
13. SMS / phone call notifications 51
13.1. Phone number configuration 51
13.2. Topping up the SMS / phone call pool 52
13.3. Low balance notification 53
14. Audit trail 53
14.1. Audit trail preview 53
14.2. Exporting the Audit trail 54
15. Device management 54
15.1. NB-IoT sensors 54
15.2. Gateways 56
16. Webhooks 56
16.1. Measurement webhooks - Configuration 57
16.2. Measurement webhooks - Payload (JSON) documentation 59
16.3. Measurement webhooks - Extrapolating the measurements 64
16.4. Measurement webhooks - Limitations 69
16.5. Alert webhooks - Configuration 69
16.6. Alert webhooks - Payload (JSON) documentation 69
16.7. Alert webhooks - Limitations 72
17. License manager 73
17.1. Adding licenses 73
17.2. License lifetime 73
17.3. Managing licenses 74
17.4. Detaching license from sensor 75
18. Formulas and custom measurement types 75
18.1 Channel formulas manager 75
18.2 Adding a formula 77
18.3 Adding formulas to sensor channels 79
18.4 Formulas errors 80

18.5 Measurement type manager 81
19. Notification manager 83
19.1 Types of notifications 83
19.2 Adding users to notifications 83
20. SIM cards manager 84

1. Registration and logging in to Efento Cloud

To use Efento Cloud, you must first create an account. Visit cloud.efento.io and click "sign up." Enter your username, first and last name, email address, and a password. After you click "Register," an activation link will be sent to the email address you provided. Click the link in the email to activate your account and log in.

If you already have an active and verified account, simply enter your email address and password to log in; skip the steps above.

2. Organization

Organizations allow for measurement data from sensors to be shared with multiple users. They also enable the creation of a location structure for organizing sensors, and allow you to grant view or modify permissions for individual locations to users with access to your Organization.

Upon registering with Efento Cloud, you will be prompted to create and name a new Organization if you are not already part of one. This will grant you full administrative access, including inviting other users and configuring sensors. If a new user is invited to an existing Organization, they will be automatically assigned to it after successfully registering their account.

3. Configuration of Efento Gateway

Efento Gateways are network-connected devices that receive data from nearby Efento Bluetooth Low Energy sensors and transmit it to the Efento Cloud. The two versions of Efento Gateways are: Bluetooth Low Energy - Ethernet and Bluetooth Low Energy - LTE. The Ethernet Gateway can be powered by either a USB power supply (5V, 1A) or a PoE (802.3af) connection, while the LTE Gateway requires a USB power supply (5V, 1A).
For more information about Efento Gateways, please refer to the documentation at getefento.com/support.

3.1. Configuration of Efento Gateway using the Efento mobile application

To quickly and easily set up your Efento Gateway, use the Efento mobile app. First, connect the gateway to power and the internet. Next, download the Efento app from the Play Store, open it, and log in to your Efento Cloud account. Then, tap the three lines in the upper left corner to open the main menu. Choose *Organization settings*, then *Add sensors*, then *Bluetooth Low Energy*, and finally *Add gateway*. Follow the on-screen instructions to complete the setup process.

3.2. Configuration of Efento Gateway using a web browser (Ethernet gateway only)

To set up your Efento Gateway through a web browser, first connect the gateway to a power source using a USB cable. Then, use an Ethernet cable to connect the gateway to your computer. Finally, adjust the settings of the network card on your computer that is connected to the gateway:

- IP address: 192.168.120.0/24 (e.g. 192.168.120.2),
- Subnet mask 255.255.255.0.

Access the Efento Gateway by opening your internet browser and navigating to 192.168.120.89. This is the default gateway address.

To configure your Efento Gateway for internet access, go to the Configuration section and input all the required network settings. This includes the IP address of both the Efento Gateway and the network gateway, the subnet mask, and the DNS address. Click 'Save' to apply these changes.

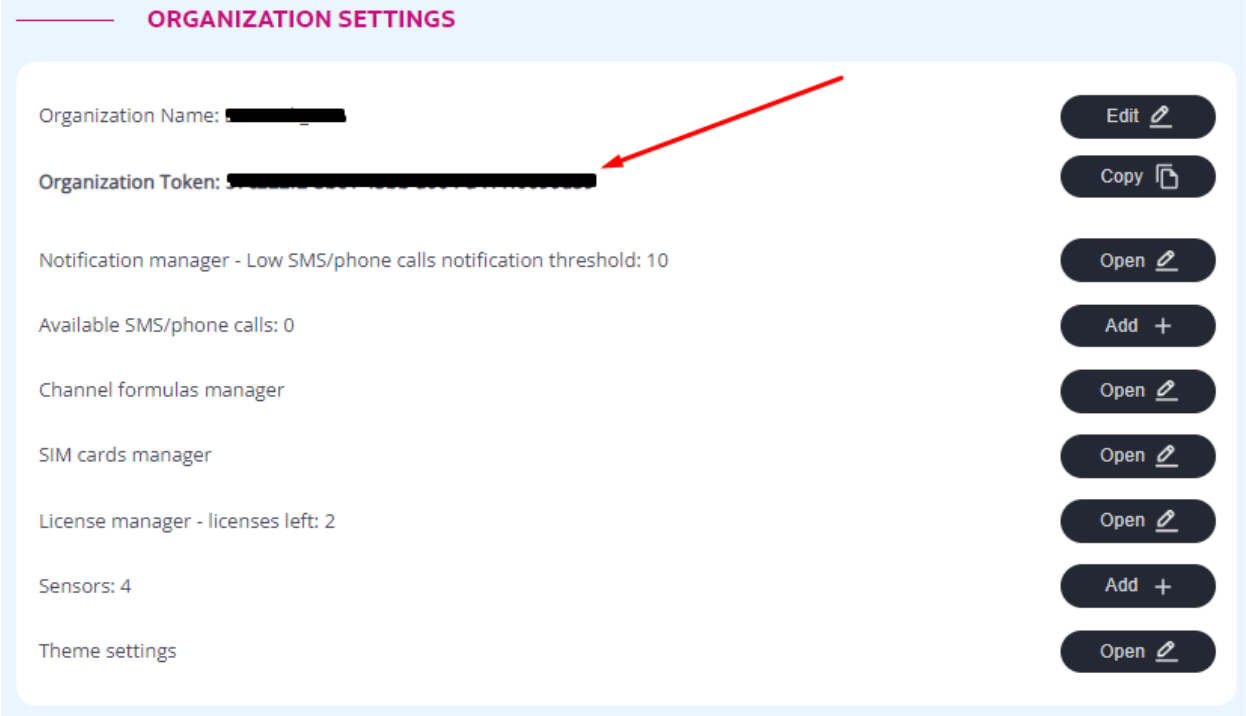
The Efento Gateway also supports DHCP. If you enable DHCP, the network configuration will be downloaded automatically from your router (ensure that the DHCP is enabled on the router).

Once configuration is complete, disconnect the Efento Gateway from your computer and connect it to your network using an Ethernet cable. If your switch, router, or injector supports Power over Ethernet (PoE) 802.3af, the Ethernet cable will provide both network connectivity and power. Otherwise, you will also need to connect a 5V, 1A USB power supply.

An Organization token, a unique number assigned to your Organization, is used to assign a gateway to your Organization. By entering this token into the Efento Gateway,

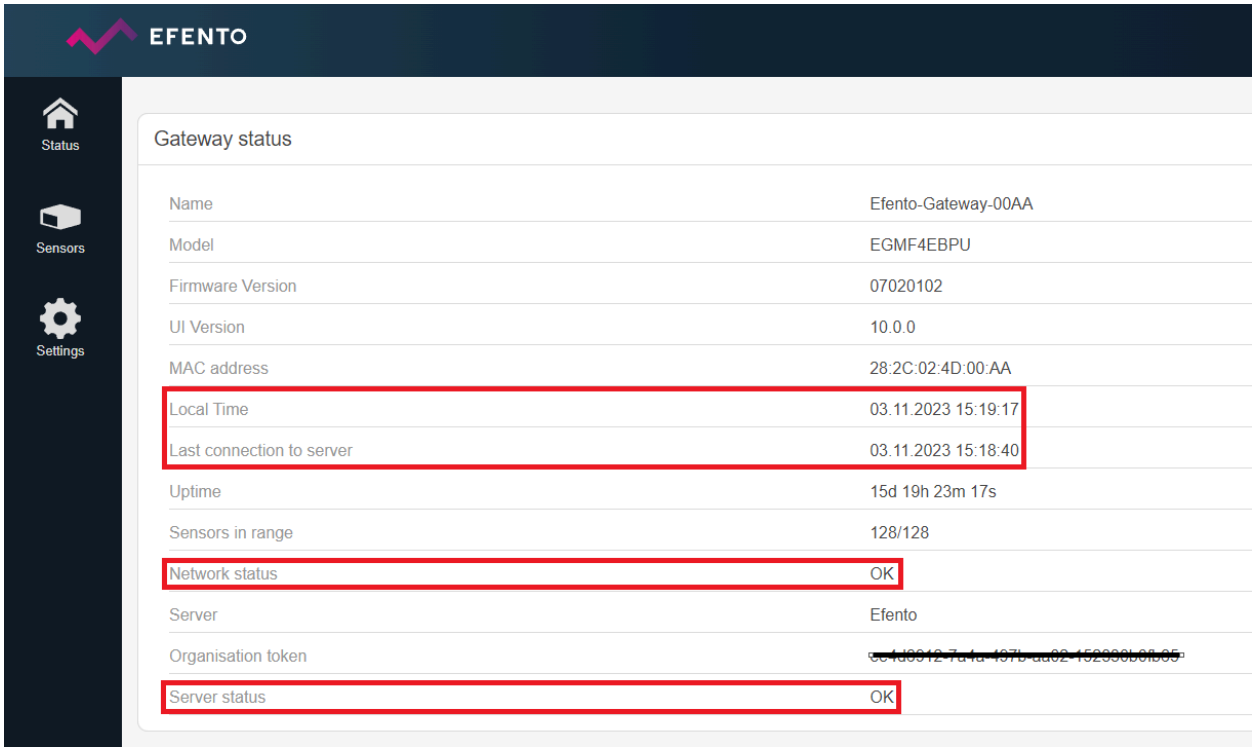
measurement data from all sensors within range will be automatically sent to your Organization's Efento Cloud account. This allows data from multiple Efento Gateways, even those in distant locations, to be assigned to a single Organization, enabling measurement data from numerous facilities to be sent to your Organization's account.

To locate your Organization token, log into your Efento Cloud account. Then, select the settings icon (gearwheel) on the left side menu, and click on *Organization settings*.



To automatically transmit measurements from all sensors within range to the Efento Cloud platform, input the Organization token into the 'Token' field on the Efento Gateway configuration page, found under Settings > Server.

The device status will show the date and time of the last server connection, as well as network and server status information, if the gateway has been properly configured.



4. Configuration of Efento sensors

To configure NB-IoT and BLE loggers, first download the Efento mobile application from Google Play store. After launching the application and logging into your Efento Cloud account, navigate to the main menu. Select *Organization settings* then *Add sensors* and choose either *NB-IoT* or *Bluetooth Low Energy*. Follow the on-screen instructions to complete the configuration process.

5. Dashboard - preview of sensors added to Efento Cloud

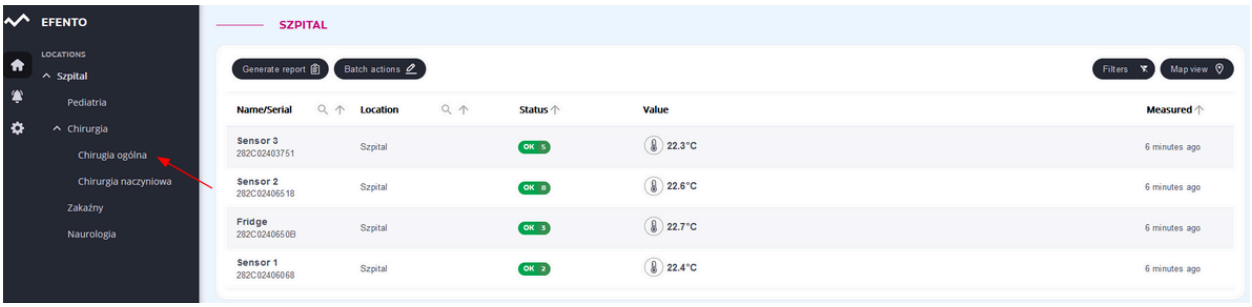
The Dashboard displays the following information for all sensors within your Organization on the Efento Cloud platform:

- Sensor name and serial number
- Assigned location within the organization
- Sensor status, including the number of unconfirmed active and pending alarms
- Current sensor measurements

- Time elapsed since the last measurement

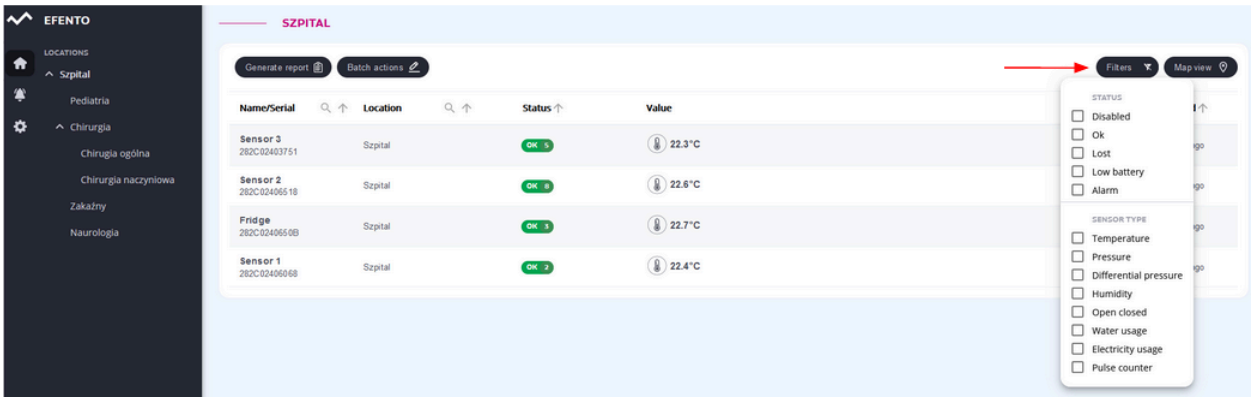
5.1. Filters

The Dashboard's data can be filtered in two ways to help you find the information you need. First, by selecting a location in the *Locations* section on the left side of the view. This narrows down the list of sensors to only those assigned to that location (and its sublocations). Second, by using the available filters, which only work on the sensors in the location you've selected.



The table displays sensor information, sortable by clicking the arrows next to column headers. You can filter the results by entering a sensor's name or serial number (or a fragment of either) into the "Name / Serial Number" field. To clear the filter and restore the default sort, delete the search phrase or refresh the page.

Sensors can be sorted by any value in the list by clicking the arrows next to the value (Name / Serial No., Location, Status, Measured). The Filters button, located in the upper right corner, allows you to filter sensors by type (e.g., temperature, humidity, pressure) or status (Disabled, Ok, Lost, Battery, Alarm, No license, Archived). By default, all sensors except archived ones are shown.



5.2. Location map

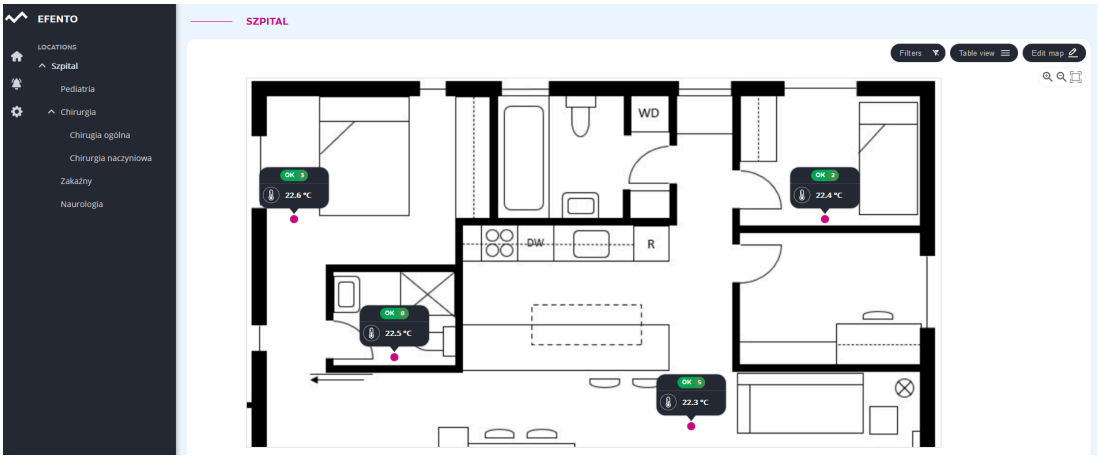
The location map feature enables you to upload a building or room plan and conveniently monitor the status of your sensors by placing them on the map. This feature is available to users with Administrator or Manager permissions, and only one map can be uploaded per location.

To view the sensors and their current status and measurement results, click on the *Location Map* button in the *Dashboard* tab. You can navigate the map by clicking and dragging, and zoom in or out using the "+" and "-" buttons. For a full-screen view, click the stretch button.

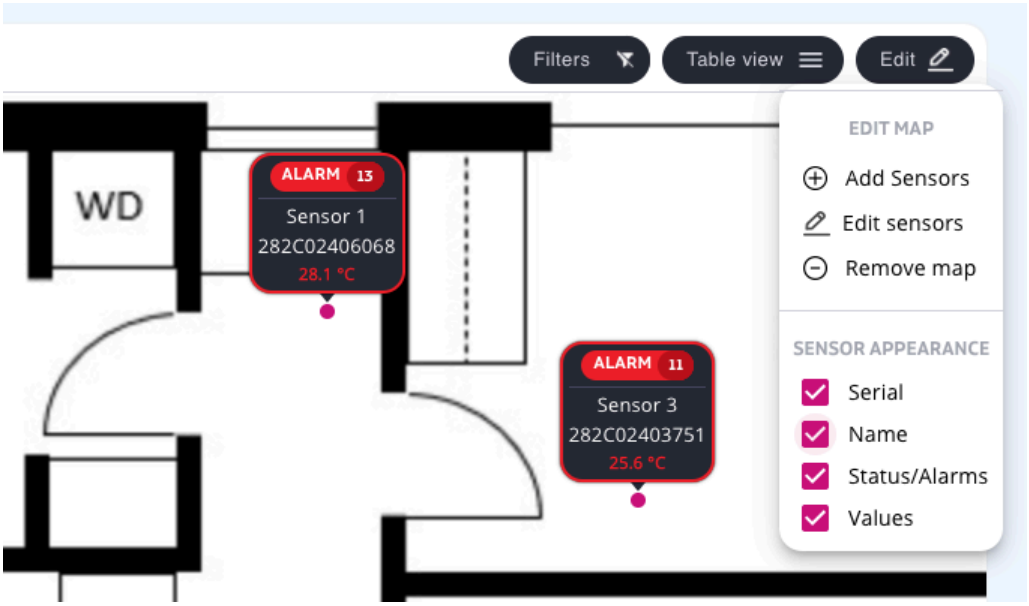
To upload, change, or remove a map image, or to add or remove sensors from the map, click the *Edit* button. Maps must be in PNG, JPG, JPEG, BMP, or GIF format and cannot exceed 4 MB. Adding large images may take a few minutes.

To add sensors, select *Add sensors* from the menu, click on the desired sensors, and drag them to the desired location on the map. Click *Save* to save your changes. To edit or remove a sensor, select *Edit sensors* from the menu.

Once added, the map will be visible to all users who have access to that location.



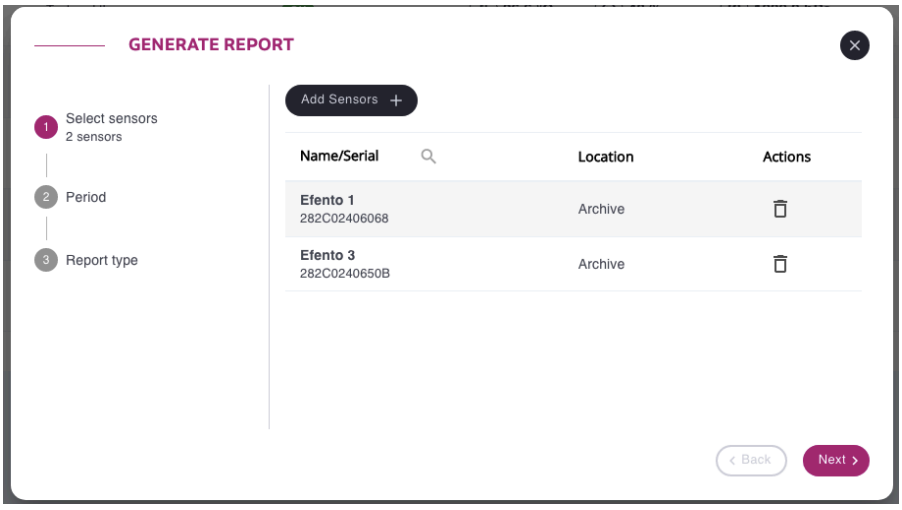
You can customize the display of sensor information. By clicking the *Edit* button, select which details should be shown: name, serial number, status, and current measurements. If all fields are unchecked, sensors will appear as colored dots, with the color indicating their status: green for ok, red for alarm, yellow for low battery, and gray for lost.



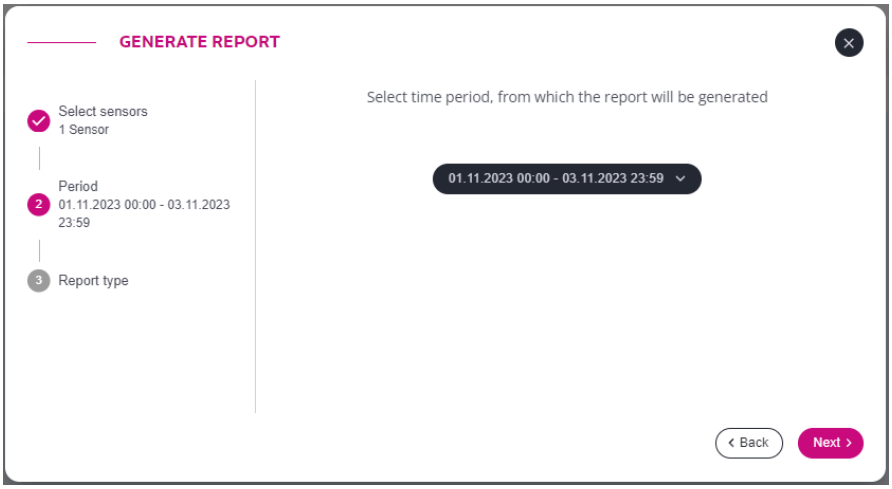
5.3. Reports

To create a report in Efento Cloud, click on the *Generate Report* button located in the upper left corner of the table. Next, select sensors to include in the report by clicking on the *Add sensors* button. If you have a large number of sensors, use the search field above the sensor table to find specific sensors by name or serial number. After selecting

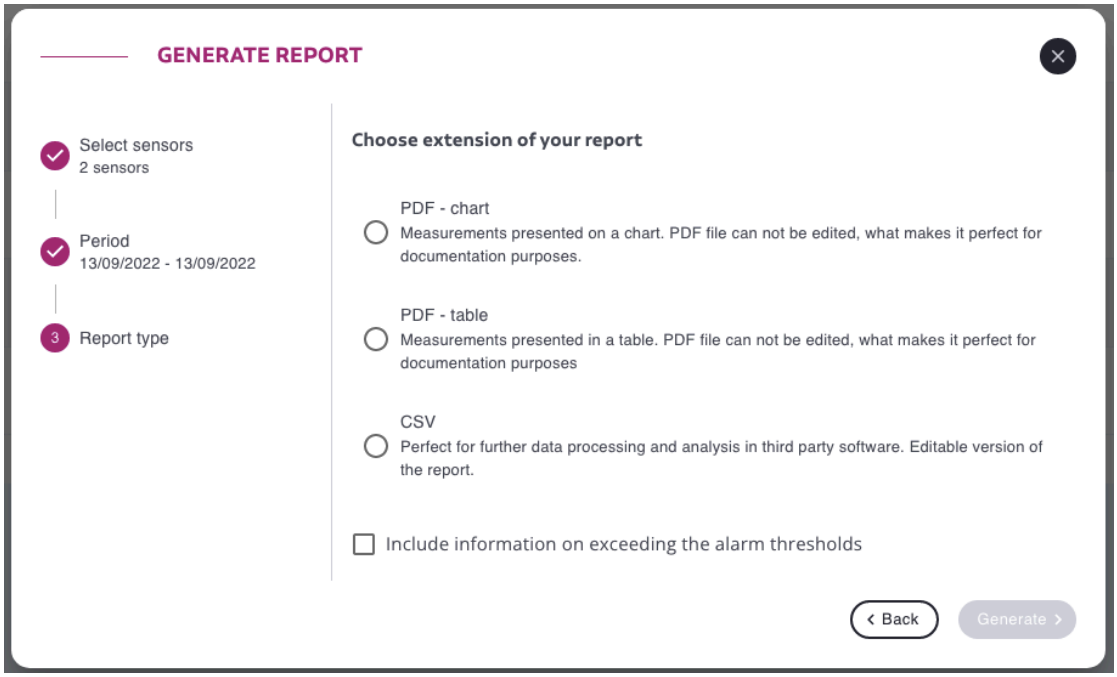
the sensors, click *Next* to proceed. The report can be exported in PDF (chart or table) or CSV format for any specified time period.



Within the ‘Period’ section, define the timeframe for exporting measurements: either input specific start and end dates, or choose a preset duration from the list (e.g., last 7 days, last month). Click *Next* to save your selections.



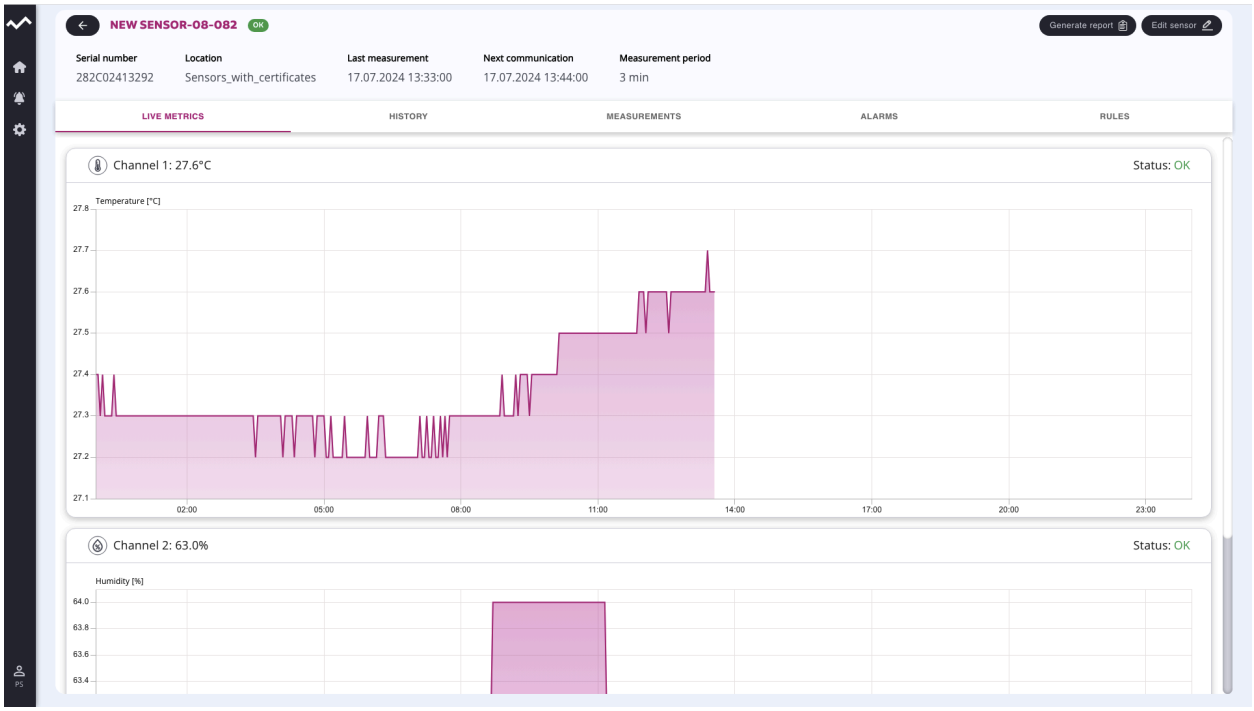
The third section, ‘Report type’ allows you to select the format of the report (PDF-chart, PDF-table, CSV). If you choose PDF-table or CSV, you can reduce the number of measurements included by selecting to record every 5th, 10th, or 20th measurement. You can also include information about exceeded alarm thresholds in the report by checking the appropriate box. After pressing the "Generate" button, the report will be sent to the email address associated with your Efento Cloud account within a few minutes.



5.4. Detailed sensor data

Clicking on a sensor from the Dashboard list or Location Map displays detailed sensor information. This includes:

- Alarm occurrences with date and time
- Measurement data in chart and table format
- Ability to change sensor settings (NB-IoT devices only)
- Downloadable sensor calibration certificate (if available)
- Measurement export from any time period as PDF chart/table or CSV report



The top part of the detailed sensor view displays device information, including name, serial number, location, and the date and time of the last and next measurements, as well as the measurement period. The *Live Metrics* tab shows the previous day's sensor measurements and charts are divided by channel. The *History* tab allows you to view historical sensor measurements and select which channels to display on the chart (using checkboxes). The data range can be chosen using the date picker, and users can zoom in by selecting a range with the cursor, or zoom out using the Zoom Out button (four arrows icon). If alarm rules are set, they will be shown as horizontal lines on the graph (red for upper threshold, blue for lower threshold), each labeled with the rule name.

The *Measurements* tab displays sensor readings in a table. The minimum, maximum, and mean values for each channel within a specified timeframe are located at the top of the tab. To adjust the timeframe, use the date picker in the upper right corner of the view.

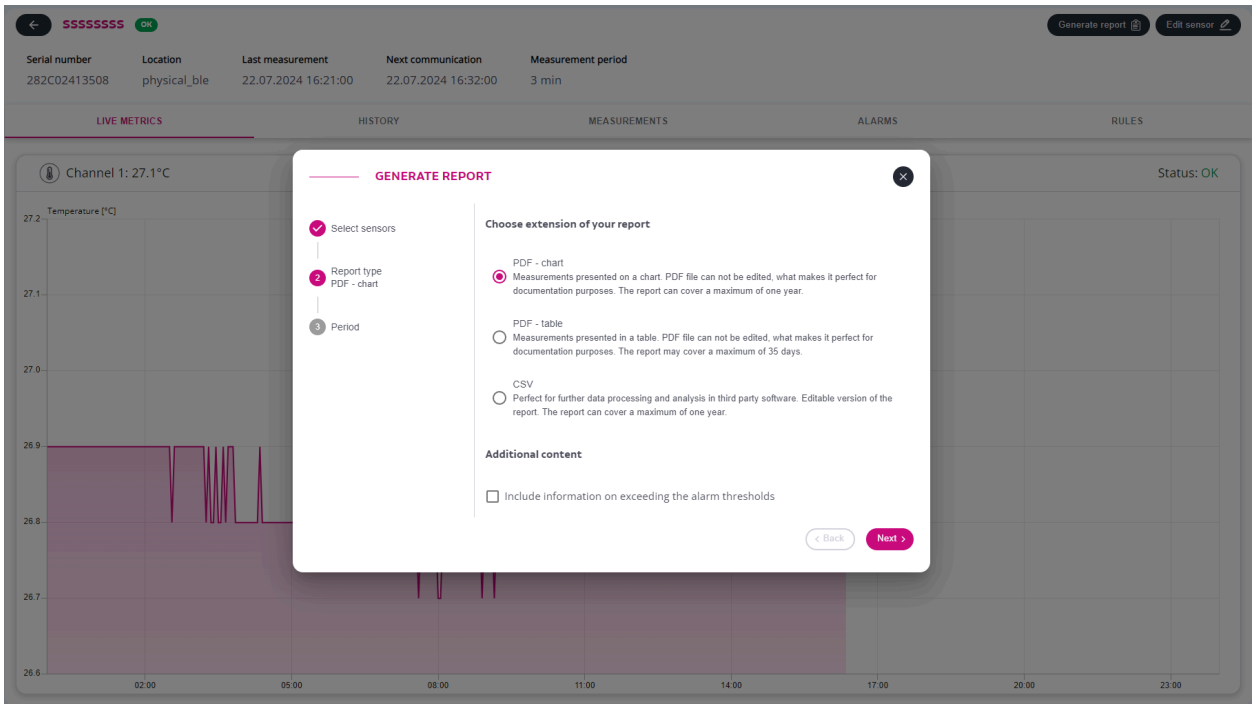
The *Alarms* tab displays a list of all alarm types, including timestamps for each instance and the name of the associated alarm rule. (For a comprehensive explanation of alarms, refer to the Alarms section.) When sensor values return to a normal range, users have the option to acknowledge the alarm to both document the irregularity and halt further notifications for that specific alarm. Alarms can be viewed in either a table or calendar format by clicking the *Table view* / *Calendar* view buttons.

The *Rules* tab displays the list of rules assigned to the sensor. To learn more about adding or removing a sensor from a rule, please refer to chapter Alarm Rules Configuration.

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

- *Calibration certificate* - allows you to download the calibration certificate of the selected sensor. This button is only visible, if the sensor has a calibration certificate.
- *Generate report* - allows you to create customized reports containing measurement data from any specified timeframe. To generate a report, select the start and end dates, the type of information to include (sensor measurements,

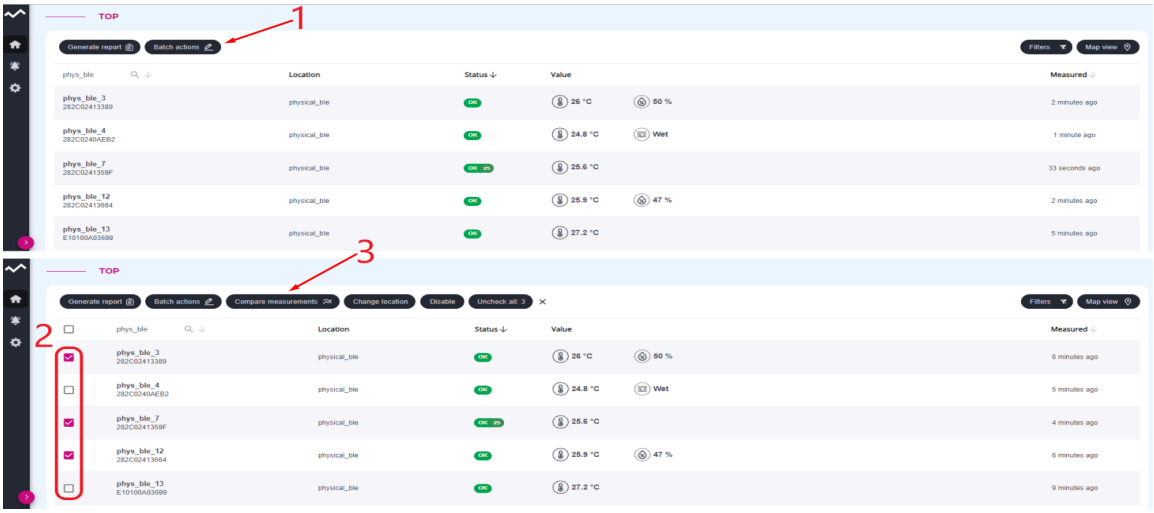
event logs, technical data), and the preferred format (PDF chart, PDF table or CSV). The generated report will be sent to your email address within minutes.



- *Edit sensor* - allows you to perform basic actions for the selected sensor, including:
  - Changing location
  - Renaming
  - Adjusting formula settings (described in the *Formulas* chapter)
  - Swapping the device for a new one while keeping the measurement history
  - Setting or editing calibration reminder
  - Remotely changing sensor settings (NB-IoT devices only)
  - Disabling / enabling the device on the platform
  - Archiving / deleting the device from Efento Cloud

5.5. Compare measurements

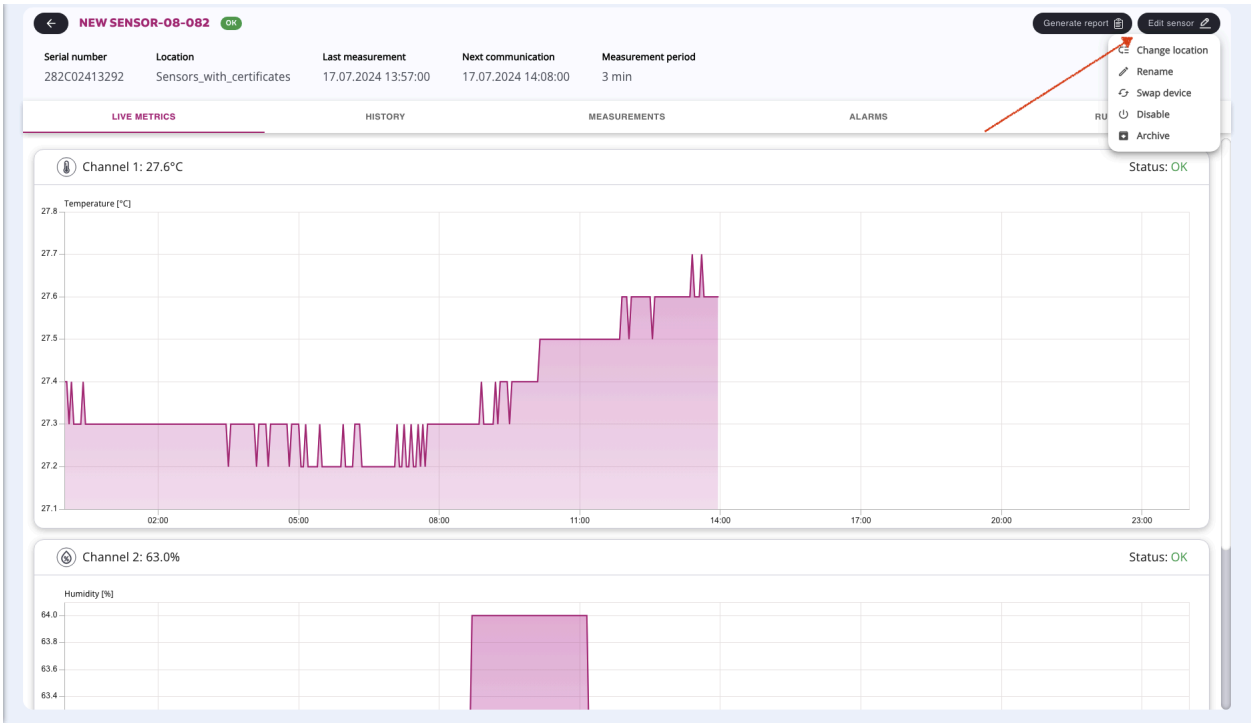
The Efento Cloud platform allows you to compare the measurements of up to 6 sensors on a single chart. To do this, select *Batch actions* above the table, choose the sensors you'd like to compare, then click the *Compare measurements* button.



The graph in the measurement comparison view allows for the display of up to 6 measurement channels of the same type, or 2 channels of differing types. Select the desired measurement channels to be displayed.

6. Sensor configuration

The *Edit sensor* button, located in the upper right corner of the sensor view screen, allows Administrators and Managers to modify the settings of a selected sensor.



6.1. Changing the location of the sensor

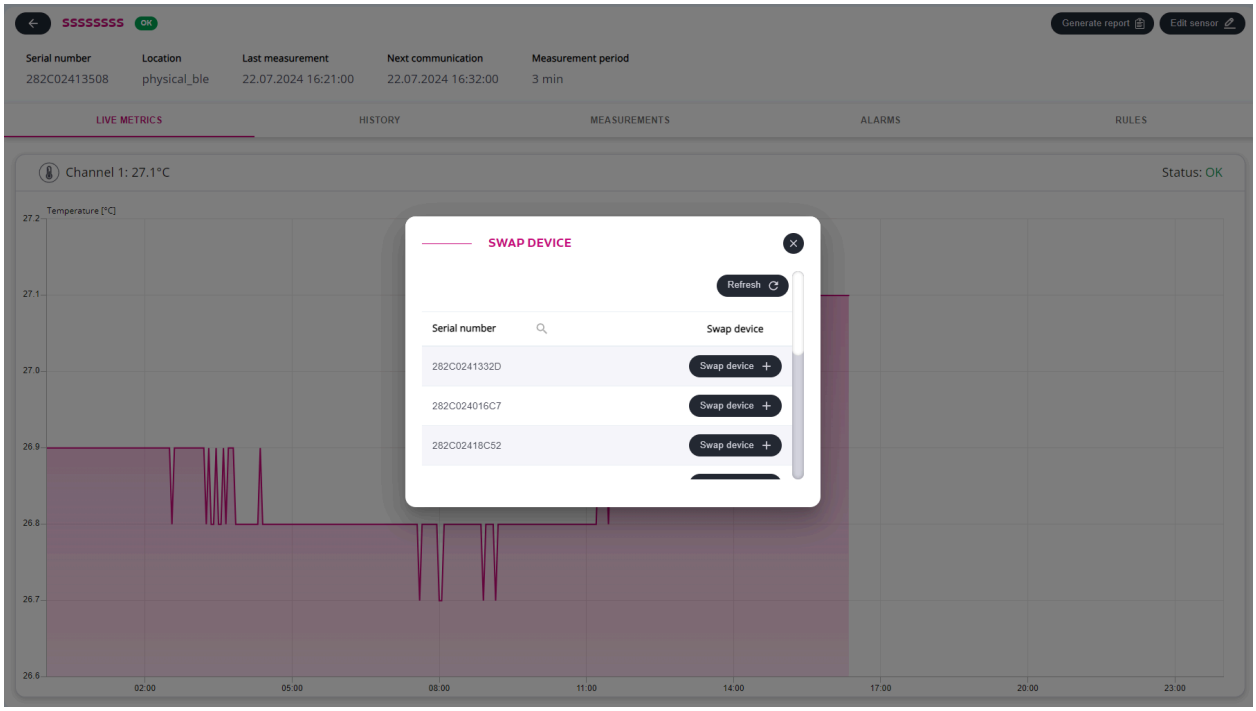
To relocate a sensor, select *Change location* from the edit menu. Then, choose the sensor's new location in the window that appears and click *Save*. The selected sensor will be moved to the new location.

6.2. Changing the name of the sensor

Select *Rename* from the edit menu to change the sensor's name. Then, enter the new name in the window that appears and click *Save* to save the changes.

6.3. Swapping a sensor

The sensor swapping functionality allows users to replace a sensor without losing data or interrupting measurements. This is useful for periodic sensor calibration, for example. Swapping sensors doesn't require an additional license. To swap a sensor, select *Swap Device* from the sensor editing menu.
Then, choose the replacement sensor from the list provided. Measurement data and configuration (alarm rules, automatic reports, webhooks) are retained from the original sensor, and the new sensor will start sending data. Information about the swap will be saved in the audit trails.

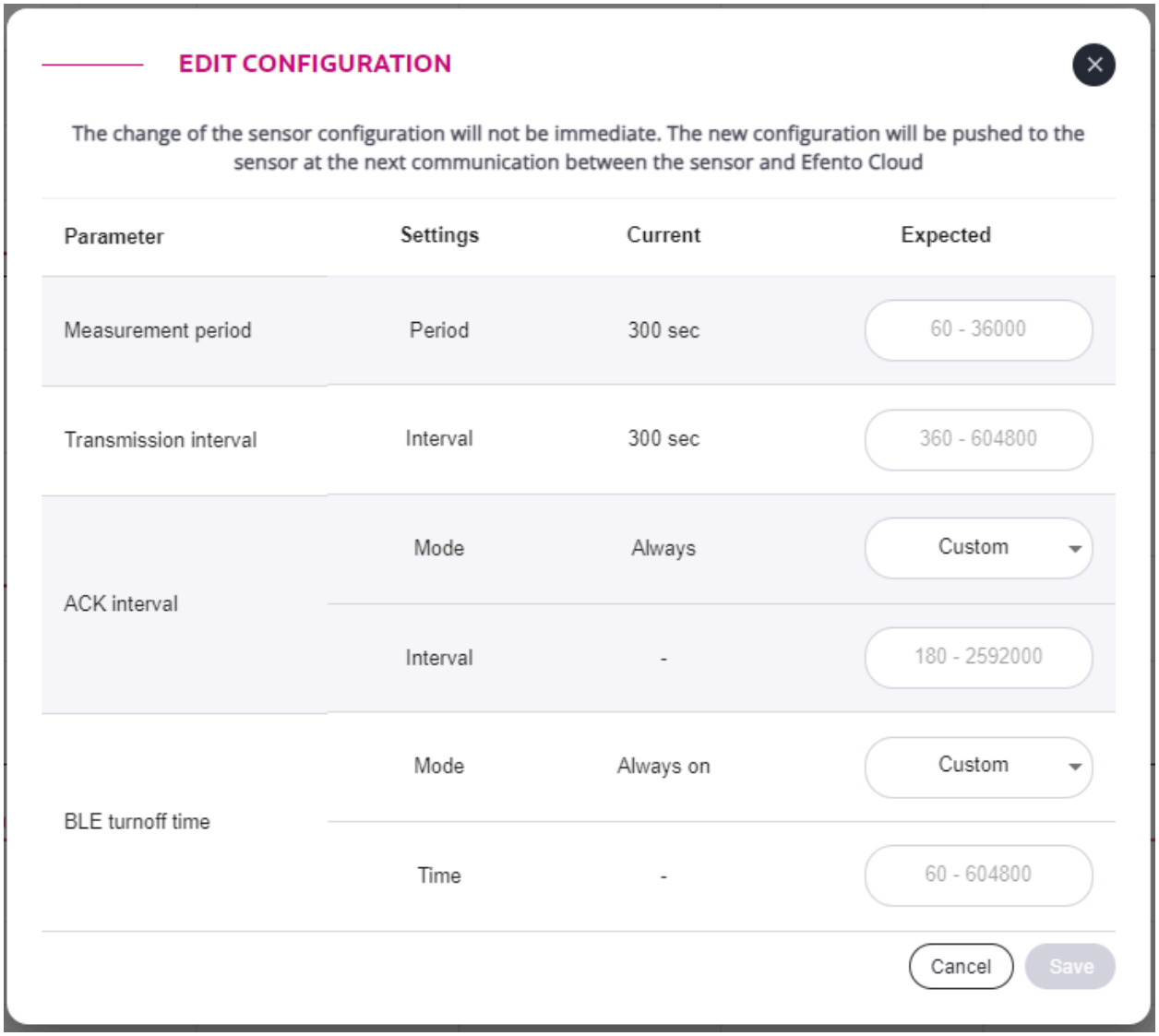


6.4. Adjusting formula settings

For analog sensors (4-20 mA / 0-10 V) and pulse counters, the conversion formula for measurements can be changed. When a channel formula is already configured for the device, the *Redefine* button appears. This button attaches the formula to the channel of the replaced sensor. More information on formulas can be found in the *Formulas* chapter.

6.5. Changing configuration of NB-IoT sensors

Efento NB-IoT sensor settings can be changed remotely by users. To do this, select *Edit configuration* from the *Edit sensor* menu. The dialog box will display the current sensor configuration in the *Current* column. To change a parameter, enter the new value in the *Expected* column and save. The new configuration will be sent to the sensor the next time it communicates with the server (indicated by the synchronization icon in the *Expected* column).



The following parameters can be adjusted:

- Measurement interval: This setting determines how frequently the sensor takes measurements. It is measured in seconds, and the minimum value depends on the specific sensor type.
- Transmission interval: This setting determines how frequently the sensor transmits data to the Efento Cloud platform. It is measured in seconds and has a range of 300 to 604,800 seconds. If the transmission interval is set to less than 1 hour, a warning message will appear, as this will result in faster battery drain.
- ACK interval: This setting determines how often the server confirms data transmission. By default, the server confirms every transmission, which is

recommended. Increasing the ACK interval (e.g., confirming every other transmission) can extend battery life but may also lead to data loss. To always request server confirmation, set the value to "Always." To set a custom ACK interval, set the value to "Custom" and enter the interval in seconds (range: 300 to 2,592,000 seconds).

- BLE turnoff time: This setting allows remote disabling/enabling of the sensor's Bluetooth interface. Disabling Bluetooth extends battery life but prevents local access via the mobile app. The Bluetooth interface can be remotely enabled from the server. To keep Bluetooth always on, set the value to "Always on." To set a custom turnoff time, set the value to "Custom" and enter the time in seconds (range: 60 to 604,800 seconds). The sensor will disable Bluetooth after the set time upon receiving the configuration from the server.

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

6.6. Disabling / enabling sensors

A sensor can be deactivated by selecting *Disable* from the sensor edit menu. This prevents sensor measurements from being saved on the platform, data from being pushed over webhooks, and alarms from being triggered if set thresholds are exceeded. The sensor's status will change to "Disabled" until it is turned back on by clicking the *Enable* button.

6.7. Archiving / deleting measurements

Efento Cloud provides users with the ability to archive or delete measurement points.

Archiving a measurement point removes it from the dashboard, rules, reports, and other areas, but the measurements it has taken remain accessible. Archived measurement points do not require licenses, freeing them up for use with other measurement points. The sensor assigned to an archived measurement point can be reassigned to a new one.
Deleting a measurement point, on the other hand, completely removes it and its associated measurements from the platform. This action cannot be undone. Before a measurement point can be deleted, it must first be archived.

To archive a measurement point, select *Archive* from the sensor's edit menu. Archived measurement points can be viewed by going to *Filters* on the dashboard and selecting devices with an "Archived" status. They can also be deleted by selecting *Delete* from the sensor's edit menu or restored by selecting *Add sensor* from the sensor's edit menu and choosing the sensor to assign to the measurement point.

6.8. Calibration reminder

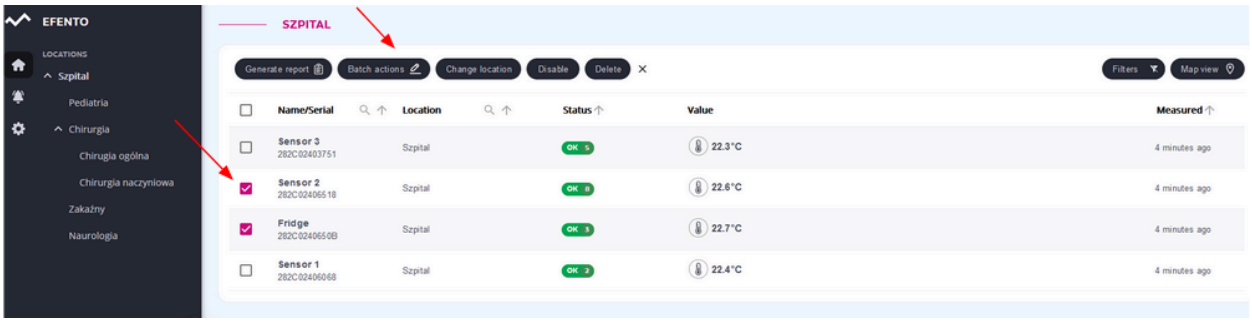
The calibration reminder feature, available only for devices with a calibration certificate, lets you choose when Efento Cloud will notify you about sensor calibration. You have three options:

- Receive a reminder 24 months after the calibration certificate issue date
- Receive a custom reminder, by specifying the number of months after which you'll be notified
- Do not receive any reminders

You'll get a notification email one month before and on the date the specified period ends. For example, if you set a 24-month reminder, you'll be notified at 23 and 24 months. Recipients for these email notifications are managed in the Notification Manager.

6.9. Batch actions

If you have Administrator or Manager rights, you can perform batch actions on groups of sensors in the Dashboard view. To do this, click the *Batch actions* button in the upper left corner of the sensor table. Then, select the sensors you want to edit and choose an action from the menu at the top of the table: *Remove*, *Change location*, or *Archive sensors*.



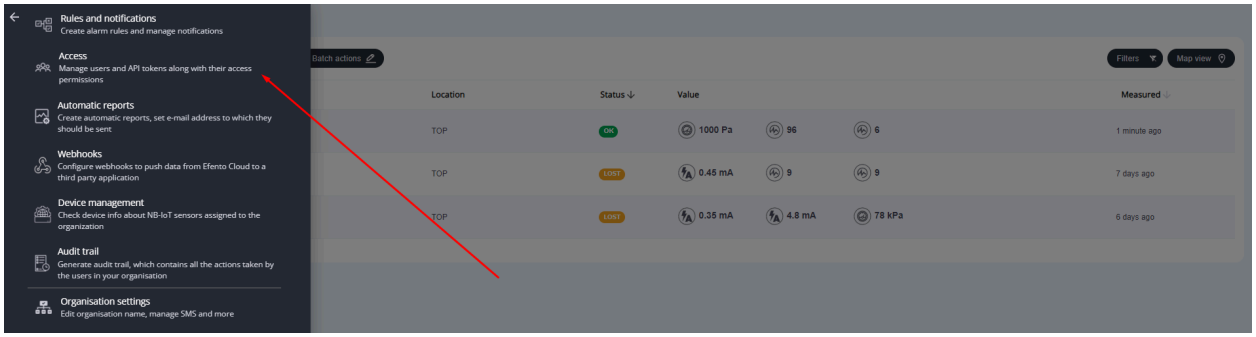
7. Access - Users and API tokens

There are three permission levels for users within an Efento Cloud Organization: Administrator, Manager, and Analyst. The creator of an Organization is automatically designated as an Administrator with access to all locations. Other users can be invited to join the Organization and assigned a permission level and access to specific locations.
The table below illustrates the platform functions accessible to each of the authorization groups.

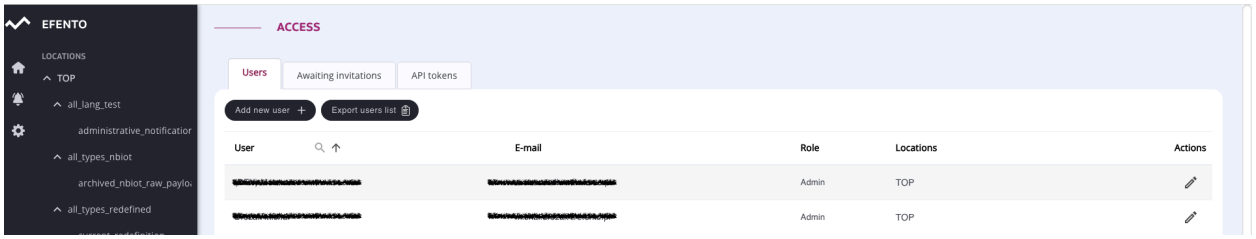
	Administrator	Manager	Analyst
Dashboard preview	✔	✔	✔
Generating reports	✔	✔	✔
Alarm preview	✔	✔	✔
Configuration of automatic reports	✔	✔	✘
Configuration of alarm rules	✔	✔	✘
Sensors, structures and location maps configuration	✔	✔	✘
Webhooks	✔	✔	✘
Formulas / custom measurement types	✔	✔	✘
Archiving measurements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

7.1. Users management

Users with Administrator permissions can add and edit users in the Access menu. To do this, select the settings icon (gear) on the left side of the menu, then select *Access*.



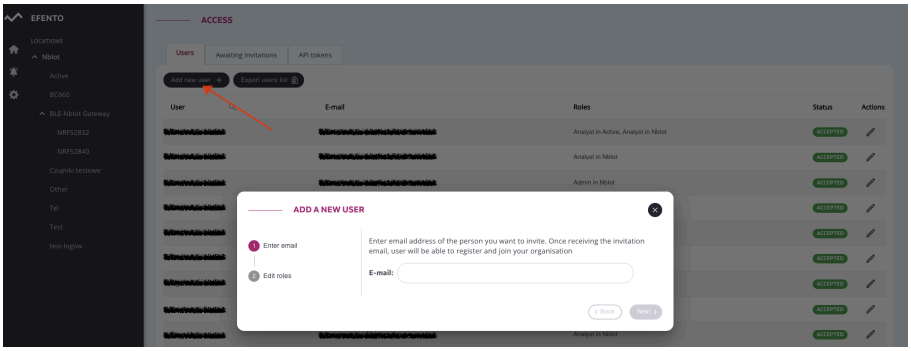
The table displays all users who have access to your organization. It also shows what level of permission each user has.



User permissions can be modified by selecting the pencil icon located in the right side of the table. These modifications include adjusting the user's permission level for specific locations within your Organization.
To remove a user's access to your organization's data, select the trash can icon. This action will not remove the user account from the platform but will revoke access to your Organization. Complete removal of the account from the platform can only be performed by the user (detailed in the section *Changing the username, language and password and deleting the account*).

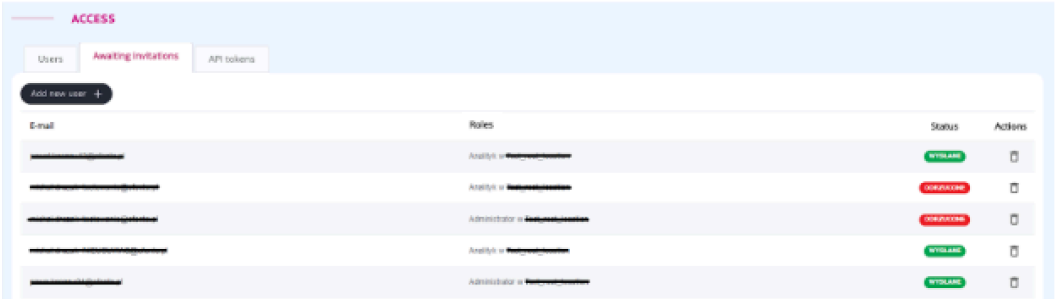
7.2. Adding new users

New users can be added to your organization through the invitation system. To do this, click on the settings icon (gear) in the main menu on the left, then select *Access*. In the top left corner of the table, click on *Add New User*. Enter the email address of the person you wish to invite, and choose their permission level. Once they accept the invitation, the chosen permissions will be assigned to them.



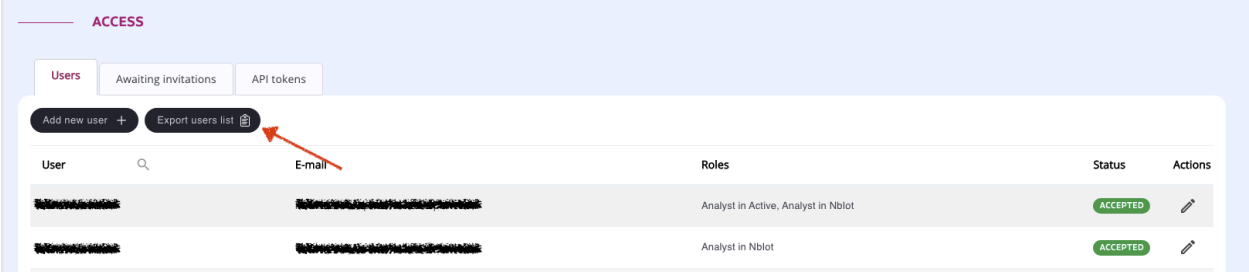
An invited user will get an email to join the Organization. If they don't have an Efento Cloud account, they'll need to create one first. You can invite as many users as you'd like and assign any permissions, but remember that Administrator permissions allow full control over users, sensors, alarm rules, and the Organization's account. Don't give these rights to people you don't trust.

After the invitation is generated, the new user shows up in the *Awaiting invitations tab* with a "Sent" status. This means the invitation email was sent, but the user hasn't accepted or registered yet. After successful registration and/or invitation confirmation, the new user's information moves to the *Users* tab. If the invitation is declined, the status changes to "Refused".



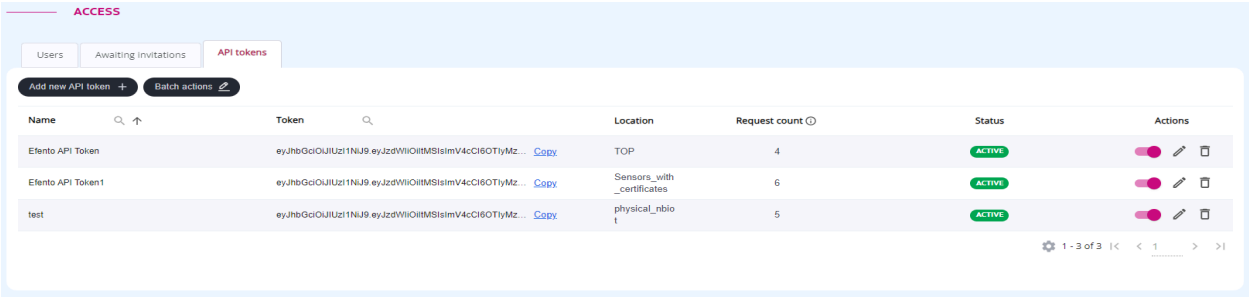
7.3. Exporting users list

Click the *Export users list* button in the upper left corner of the table to send a PDF file containing a list of all users to the email address associated with your Efento Cloud account.



7.4 API tokens

To grant third-party applications read-only access to Efento Cloud data (such as measurement points, measurements, and alerts), API tokens are utilized. Create a new API token by selecting the settings icon (gear), then choosing *Access* from the left menu, and clicking on the *API tokens* tab. Click the *Add API token* button and specify the location for which the API token will grant access. The API token value will be displayed in the *API token* tab list once it is created.



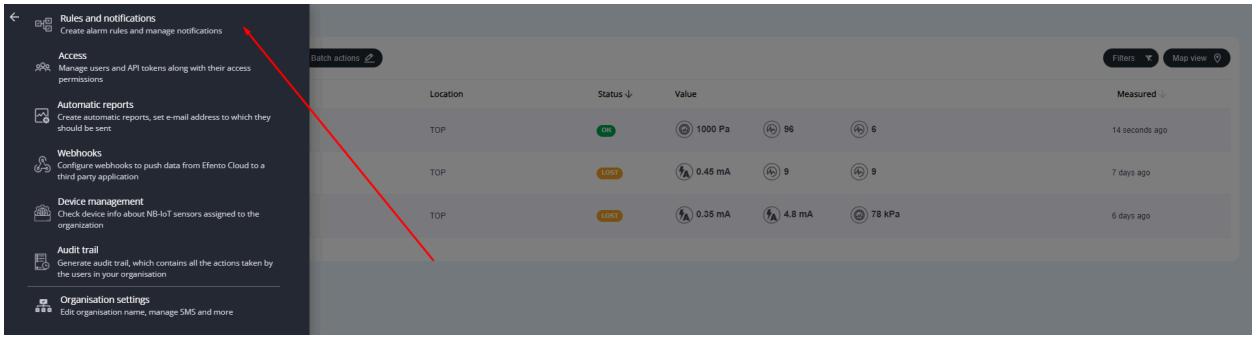
Click the pencil icon to modify the location that the API token can access. Click the trashcan icon to delete the API token. To deactivate the API token, toggle it off in the *Actions* column.

Details on Efento API and a sample of how to retrieve measurements can be found in the "Efento Cloud - API integration" support page.

8. Alarm rules configuration

An alarm rule in Efento Cloud determines which events will trigger an alarm. It consists of three parts: a stimulus (e.g., temperature), a condition (e.g., rises above 10 degrees), and an action (e.g., send an SMS notification). Alarm rules are customizable. For example, different recipients can receive notifications based on different exceeded thresholds, or threshold breaches can simply be logged without sending notifications. Users can create numerous alarm rules and assign sensors to each one.

Users with Administrator or Manager permissions can configure alarm rules by selecting *Rules and notifications* from the settings menu.

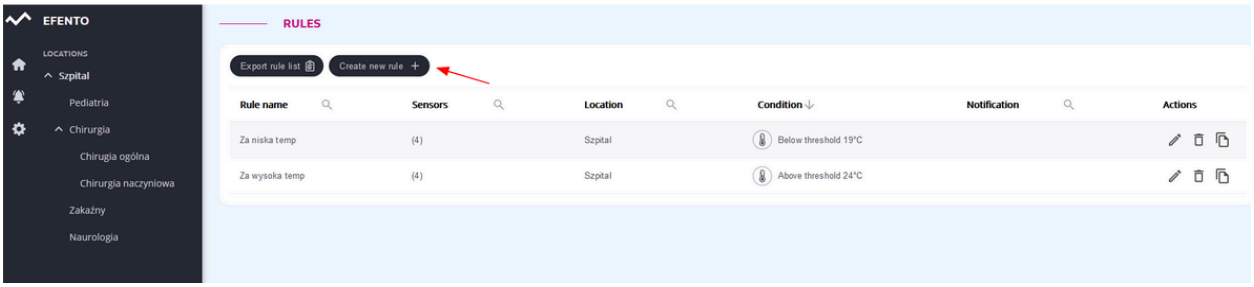


8.1. Status-based rules for sensors

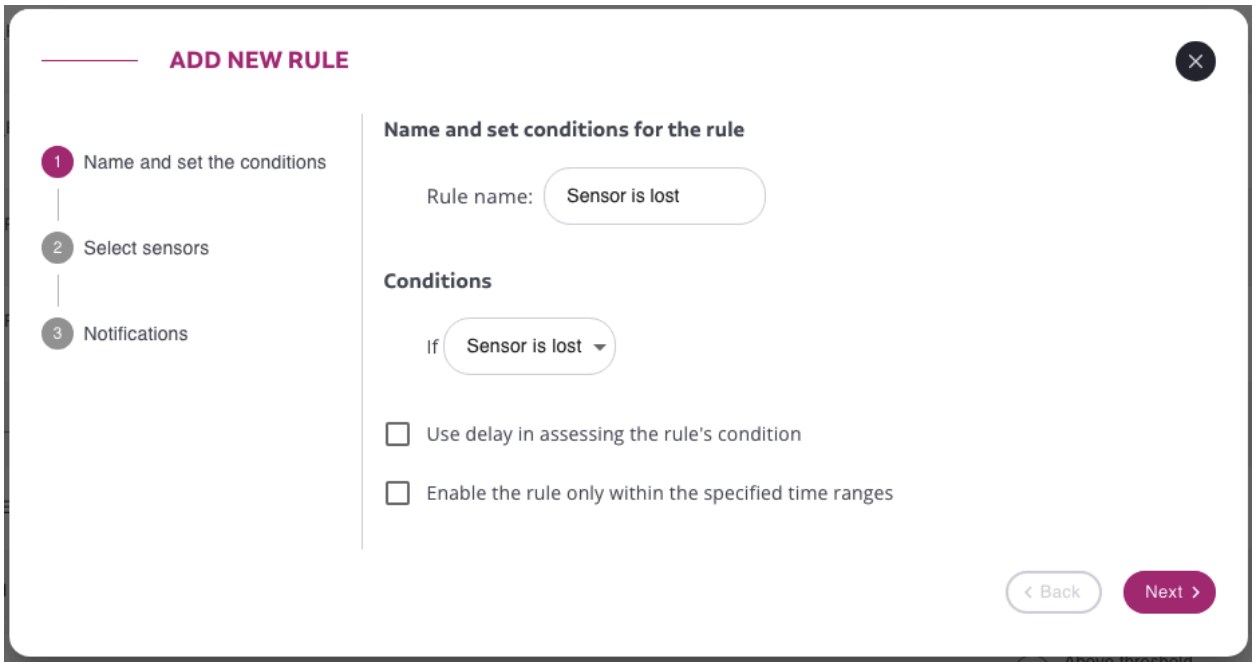
In the Efento Cloud platform, you can configure several different types of rules depending on the stimulus that initiates the alarm. These are:

- 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.

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

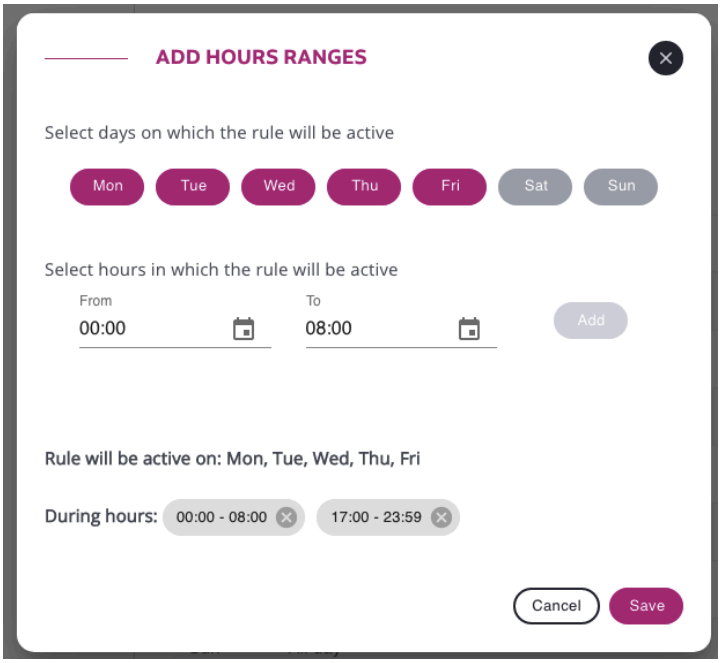


The first field to be filled is the name of the rule, which can be any but not longer than 50 characters. Then select what event the alarm should concern (i.e. the stimulus that initiates the alarm). If you have selected the alert type based on measured values, you must also select whether the alarm 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.



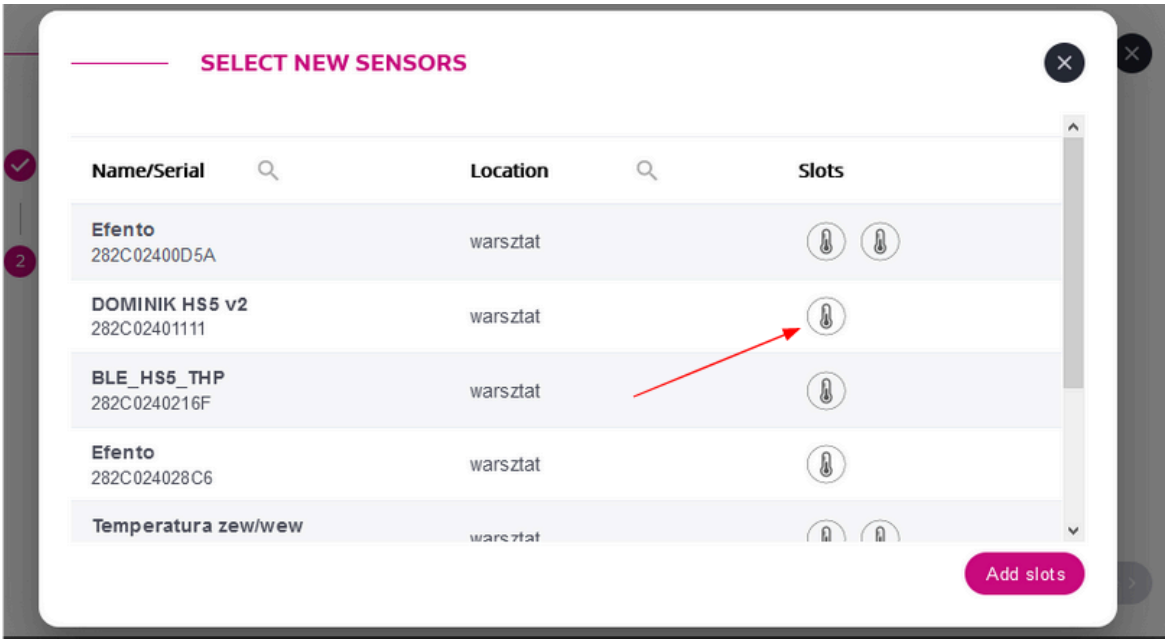
The alert is triggered as soon as the rule's condition is met. If the user needs to add a delay in assessing the rule's condition, the checkbox 'Use delay in assessing the rule's condition' should be checked and the delay in minutes should be set. If the measurement exceeds a predefined threshold and 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.

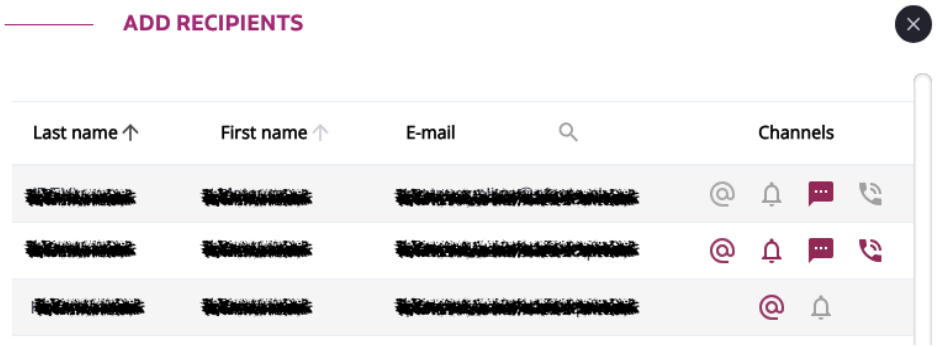


The next step is to add notification recipients. Efento Cloud supports four types of notifications:

- 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 their 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*.

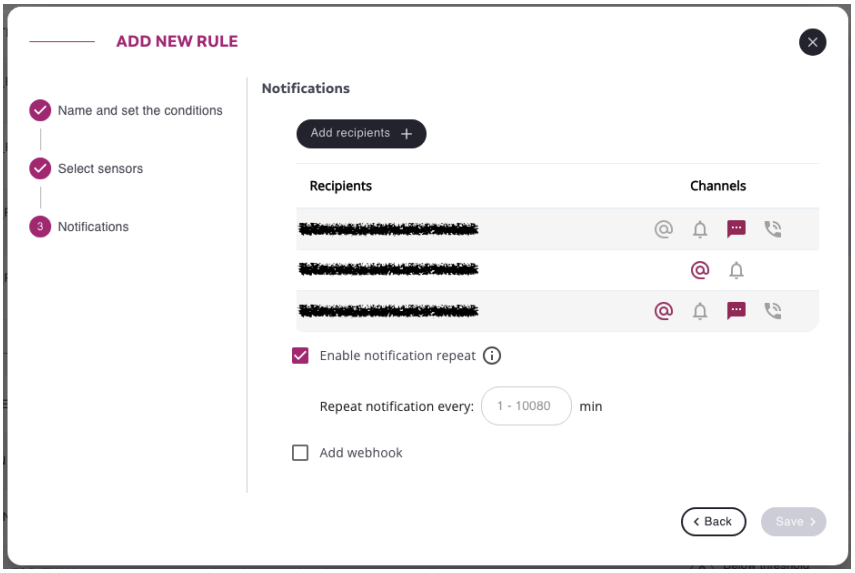
Important! If there are no recipients set in the rule, the alarms will only be displayed on the Efento Cloud platform and notifications won't be sent.

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).



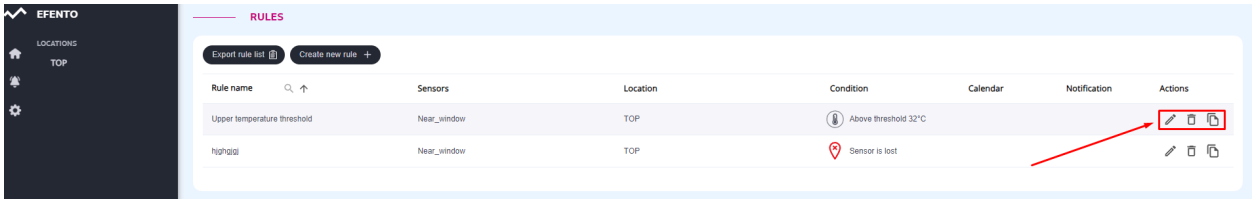
It is possible to add any number of recipients. E-mail, PUSH and webhook notifications are free of charge, but in order to receive SMS or phone call notifications, you must have purchased a pool of available SMS messages / phone calls (a description of how to top up the pool can be found in the *SMS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

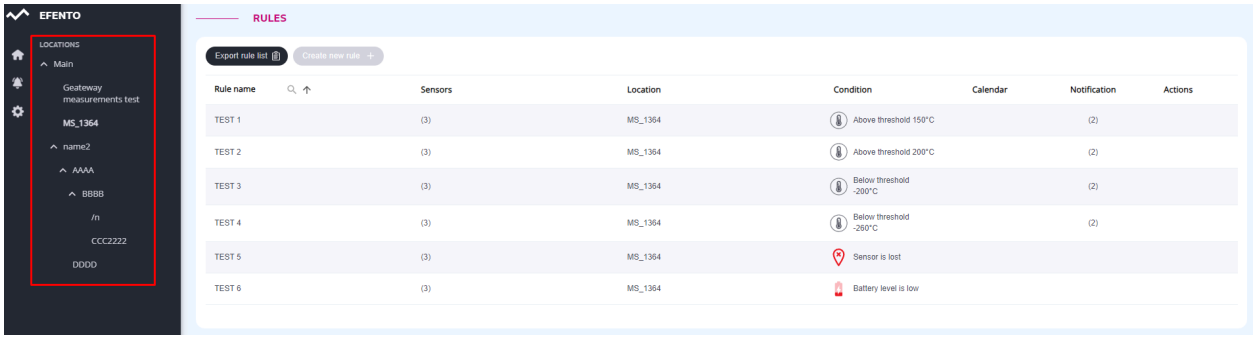


By default, the notifications are triggered once - as soon as the rule's condition is met. If the user wants the platform to resent the notifications during the period when the rule is active (to remind the recipients about that fact), the checkbox 'Enable notification repeat' should be checked and the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



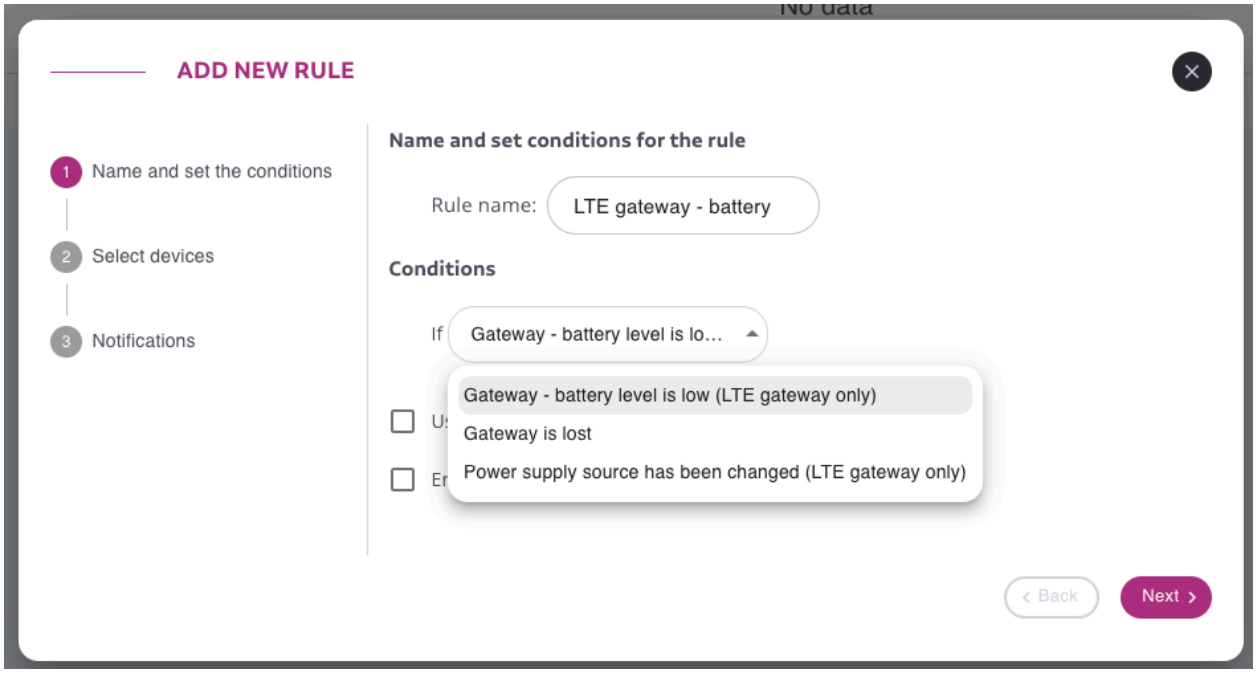
8.2. Status-based rules for gateways

Efento Cloud can monitor the status of Efento Gateways and send alerts to users when those statuses change. The types of alerts that can be configured include:

- loss of connection with a gateway,

- LTE gateway power source changes (from power adapter to backup battery),
- low battery level in LTE gateways.

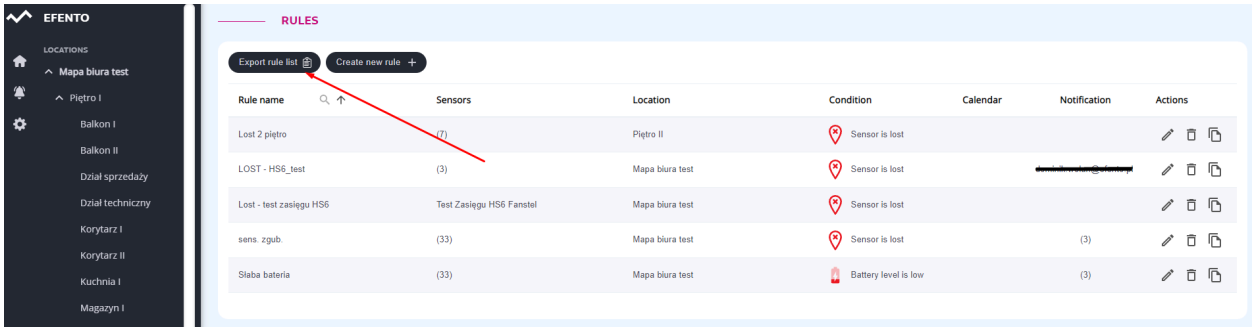
To set up an alert rule for gateways, select *Rules and notifications* from the main menu and navigate to the *Gateways* tab and select the *Add rule* button located in the upper left corner of the screen.



The configuration process for these alert rules mirrors the configuration of alert rules for sensor statuses. This includes the ability to configure identical notification channels (SMS, push, email, phone call, webhooks), calendars, delays, and alert repetition.

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

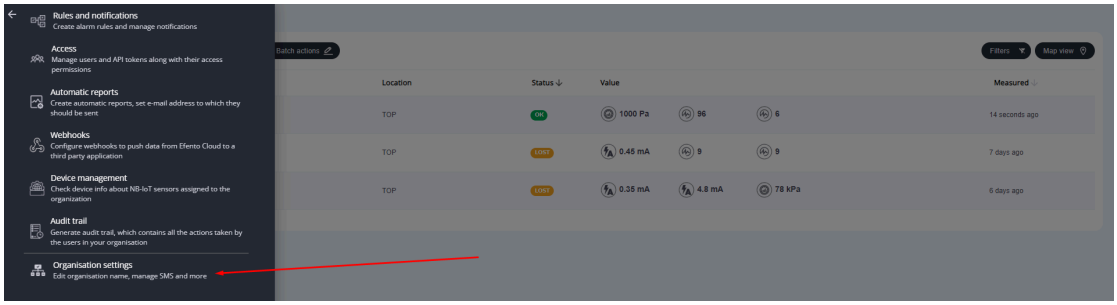
#	Rule name	Sensors	Location	Value	Type	Threshold	Alarm delay [s]	Recipients
1	test_low_battery	PULSECOUNTER	Sensors_ble	Occurred	Low battery		0	
2	test_rule_without_delay_ok	test_binary	test_binary	Occurred	Alarm		0	https://entjamkz38i7p.x.pipedream.net/ Users: Michał Drożak
3	test_rule_with_delay_flood	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

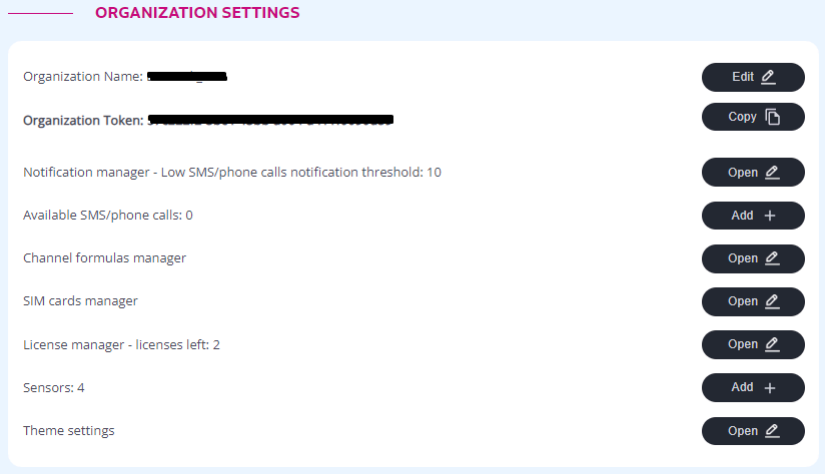
Access the organization settings by clicking on the gear icon in the left menu panel and selecting *Organization settings*. Only Administrators and Managers have access to this configuration.

9.1. Adding sensors

Adding an Activation Code to your organization within the Efento Cloud platform is a necessary step to add sensors and take full advantage of the platform's features. This unique code enables you to incorporate a specific quantity of sensors and notification points, and it also permits SIM card activation for NB-Iot devices. To add an Activation Code, navigate to the settings menu and select *Organization Settings*.

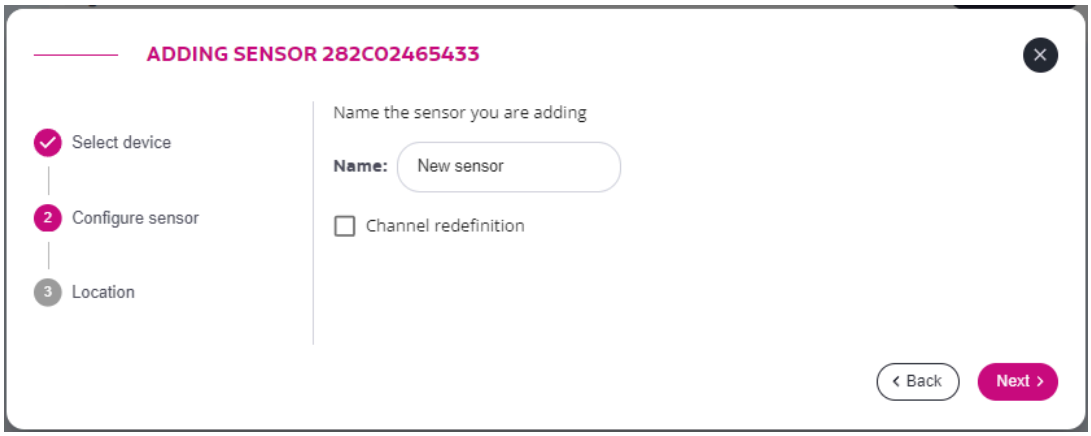


The number of available licenses is shown in the *License manage - licenses left* field. Each license allows you to add one sensor. Click the *Open* button next to the *License manager* field and after that click the *Add* button in the upper left part of the license manager view. After adding the Activation code, you can add any sensor 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.



Click the *Add+* button located next to the *Sensors* field to add your sensors. Choose the desired sensor from the list provided, and assign it a custom name (the default name for all sensors is "New Sensor"). This name, along with the sensor's serial number, will be displayed on the platform. You also need to specify the location for the sensor. Once you've completed these steps, click *Save* to add the sensor.

Important: If you plan to use formulas with this device, make sure to enable the channel redefinition mode. You can find more information about this process in the *Formulas* chapter (this applies only to 4-20 mA / 0-10 V sensors and pulse counters).



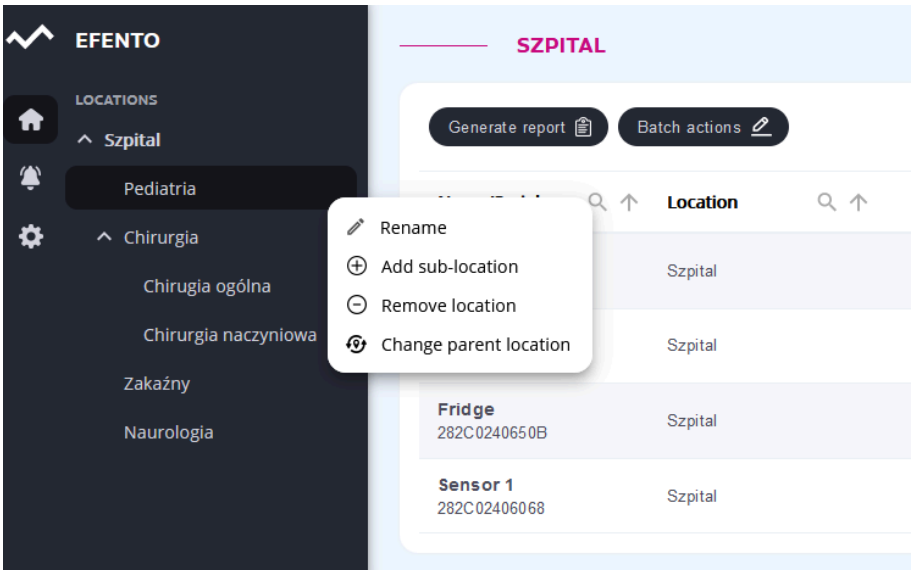
The sensor can be renamed or relocated at any point in time. For a comprehensive guide on how to do this, refer to the Sensor Configuration section.

9.2. Create and manage locations

Effortlessly structure your locations and sensors with our platform's flexible tree-based organization. Create a hierarchy that suits your needs, whether it's geographical (e.g., Country > State > City > Building), functional (e.g., Building Type > City > Location), or any other structure that aligns with your organization.
User permissions can be assigned to specific locations, simplifying system administration and providing granular control over access.

Users with Administrator or Manager permissions can edit locations within the organization structure panel on the left side of the screen. The location tree displays existing locations, starting with the root location (which cannot be deleted and defaults to your Organization's name). Any new locations are added as subordinate parts of the primary location.

Click on the location's name and then select the three dots on the right to edit the location. The following options are available: Rename, Add sub-location, Remove location, and 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.

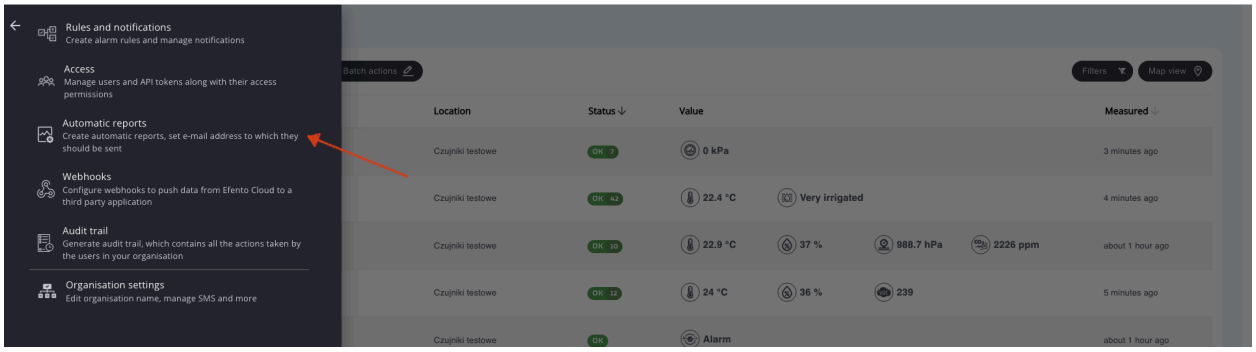
10. Automatic reports

Efento Cloud can automatically send reports in PDF (chart/table) or CSV format to the user's email address. You can choose how often reports are sent (daily, weekly, or

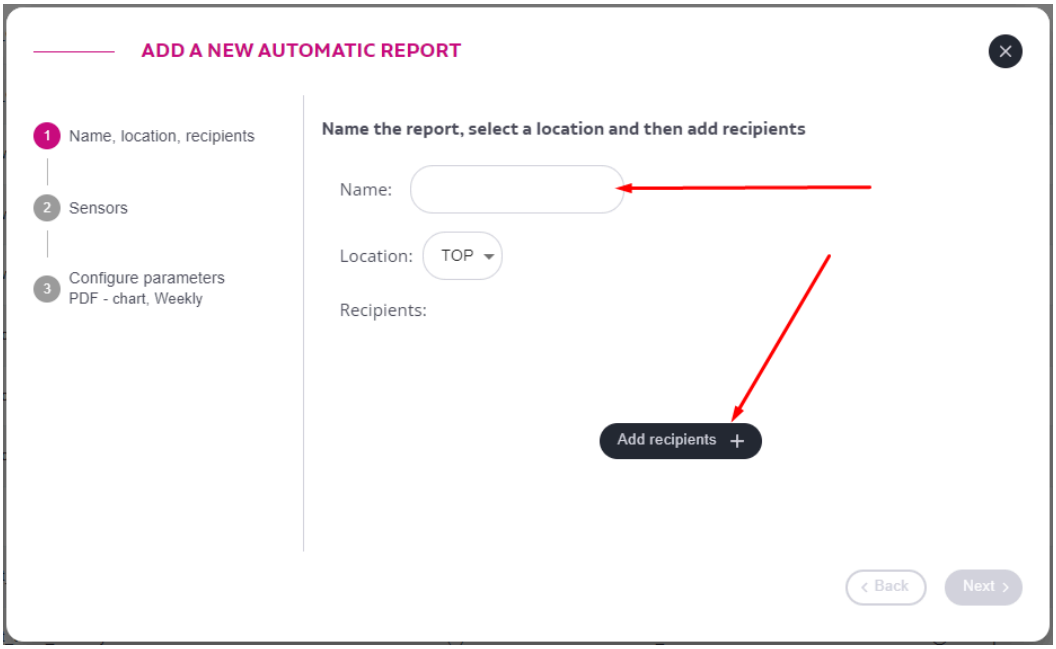
monthly). Reports contain sensor measurements and can include information about events like exceeded alarm thresholds, loss of communication, or low battery. You can include every measurement or only every 5th, 10th, 20th, 120th, or 240th measurement in the reports.

10.1. Automatic reports settings

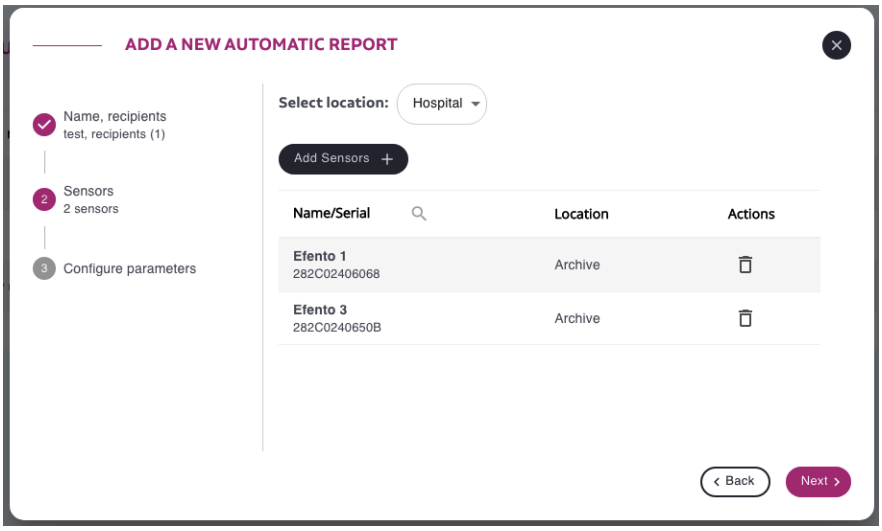
Automatic reports can be configured by users with Manager or Administrator permissions. To configure automatic reports, select Settings (the gear icon) from the menu on the left, and then *Automatic reports*.



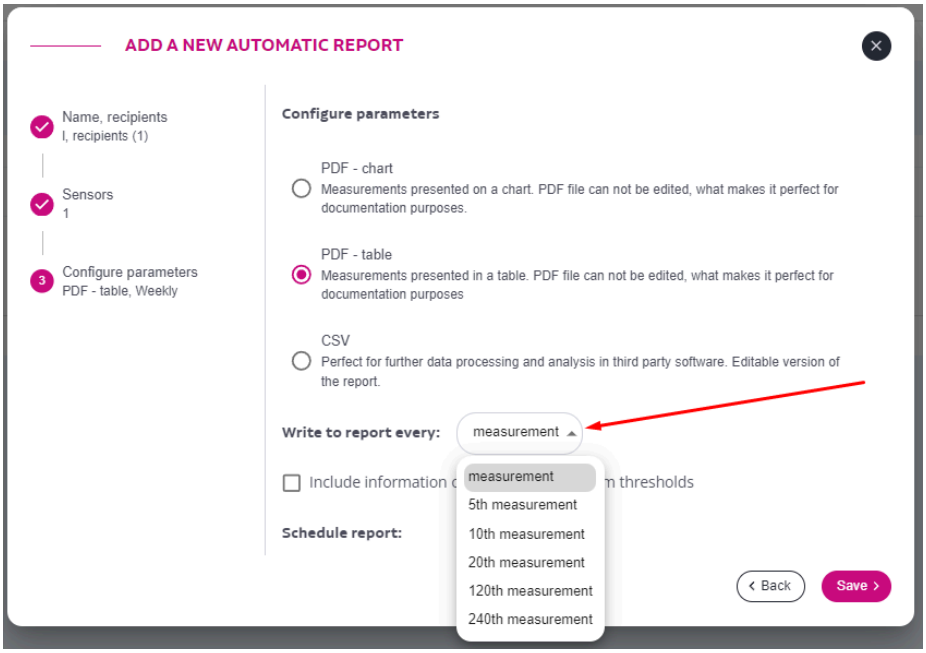
To add a new report, click the *Schedule new report* button located in the upper left corner of the table. In the first stage, enter the name of the new automatic report and add the e-mail addresses of the report recipients by selecting them from the list displayed after pressing "Add recipients +".



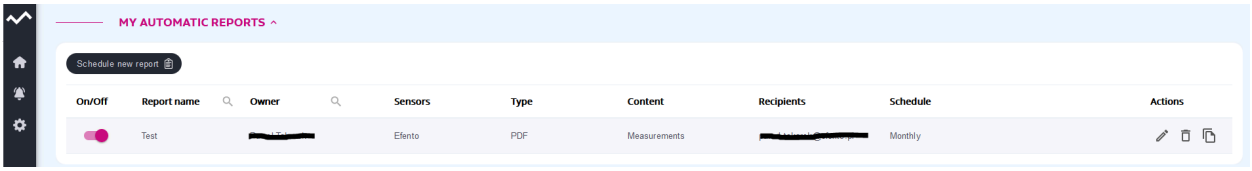
Press the *Add sensors* button and then select the sensors that will be included in the automatic report. You can select a maximum of 10 sensors to be included in the report. If there are many sensors in a given location, to find the sensor you are interested in, enter its name / serial number in the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



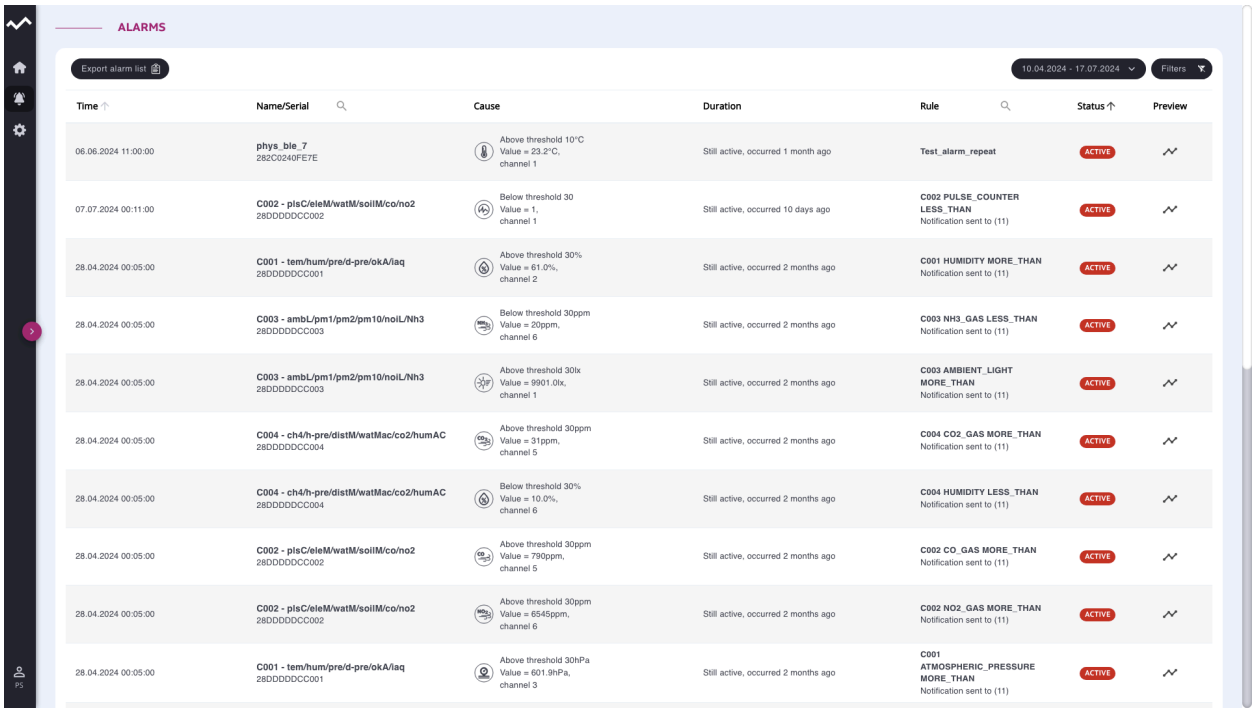
All configured reports are visible in the Automatic reports tab. To delete a configured report, click the trash can icon in the right part of the table with the defined reports. You can also edit a selected report by clicking the pencil icon. If you want to create a new automatic report, similar to a 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.



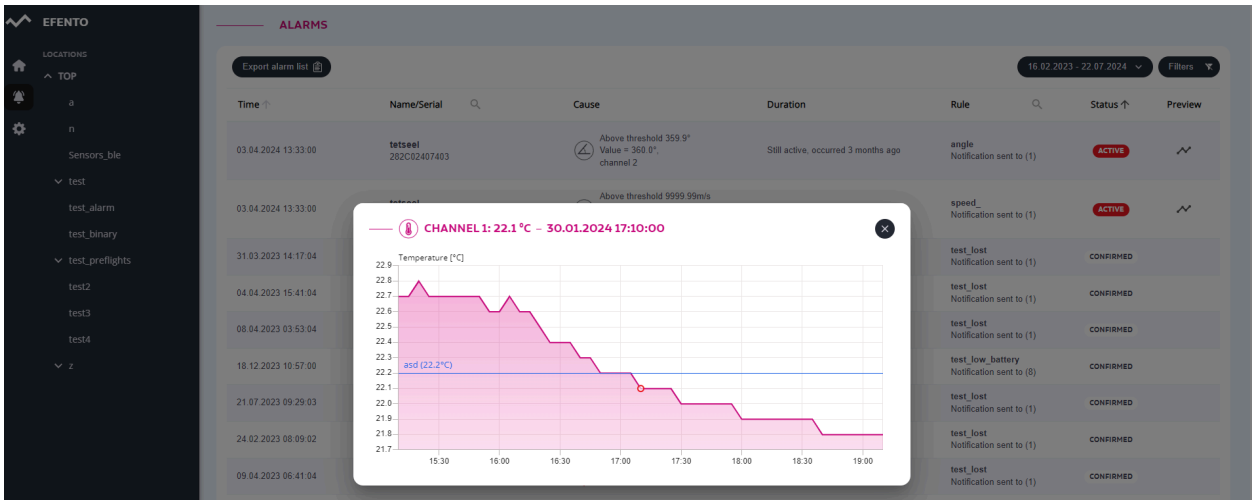
11. Alarms

11.1. Alarms preview

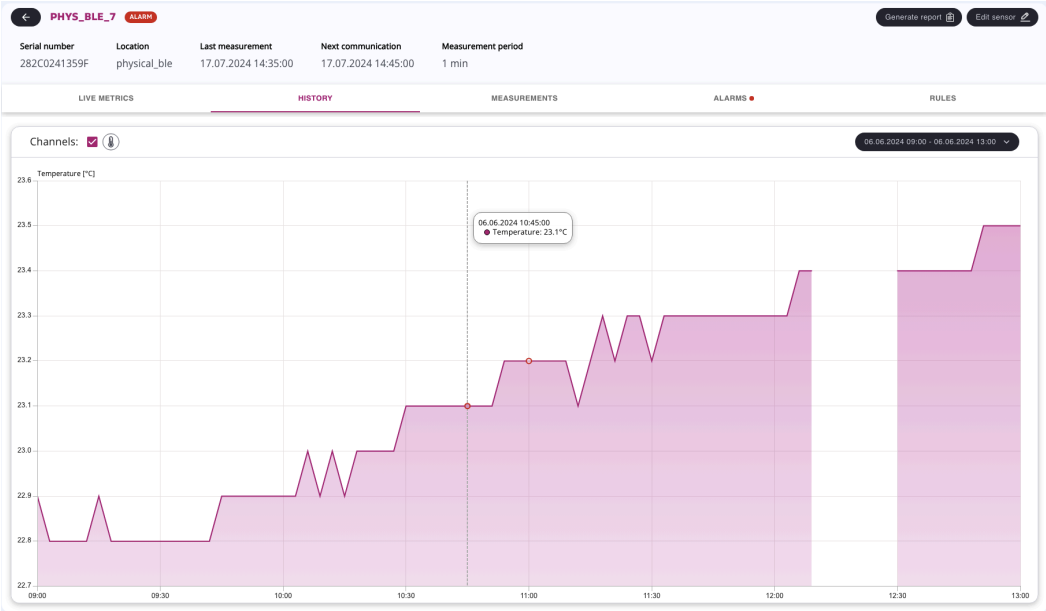
In the Alarms menu, you will find a preview of all alarms currently active and those that have occurred in the past. Each of the alarms on the list has a status: Active (the alarm threshold is still exceeded), Inactive (the threshold has been exceeded in the past and it is not confirmed yet) or Confirmed (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.



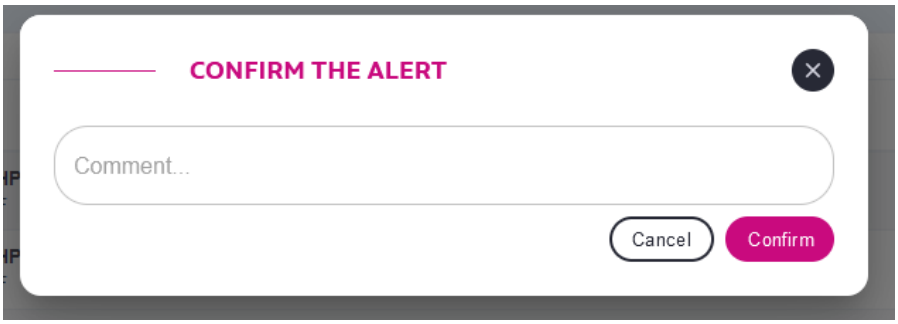
On the right side of the alarms table there is a preview icon (chart symbol). Clicking on it will open a window with a graph showing when the alarm occurred.



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.

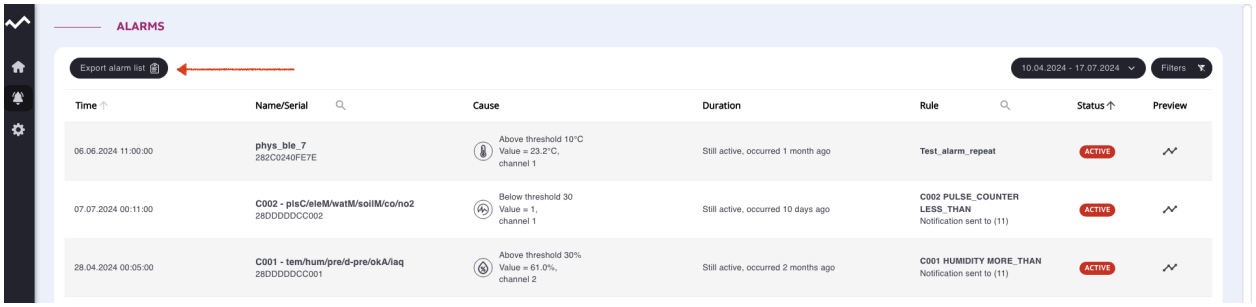


To confirm the alarm, click the *Confirm* button. You can enter a comment about the alarm in the newly opened window. The comment will appear on the alarm list after hovering the cursor over the *Confirmed* status. Entering a comment is optional.



11.2. Exporting alarm list

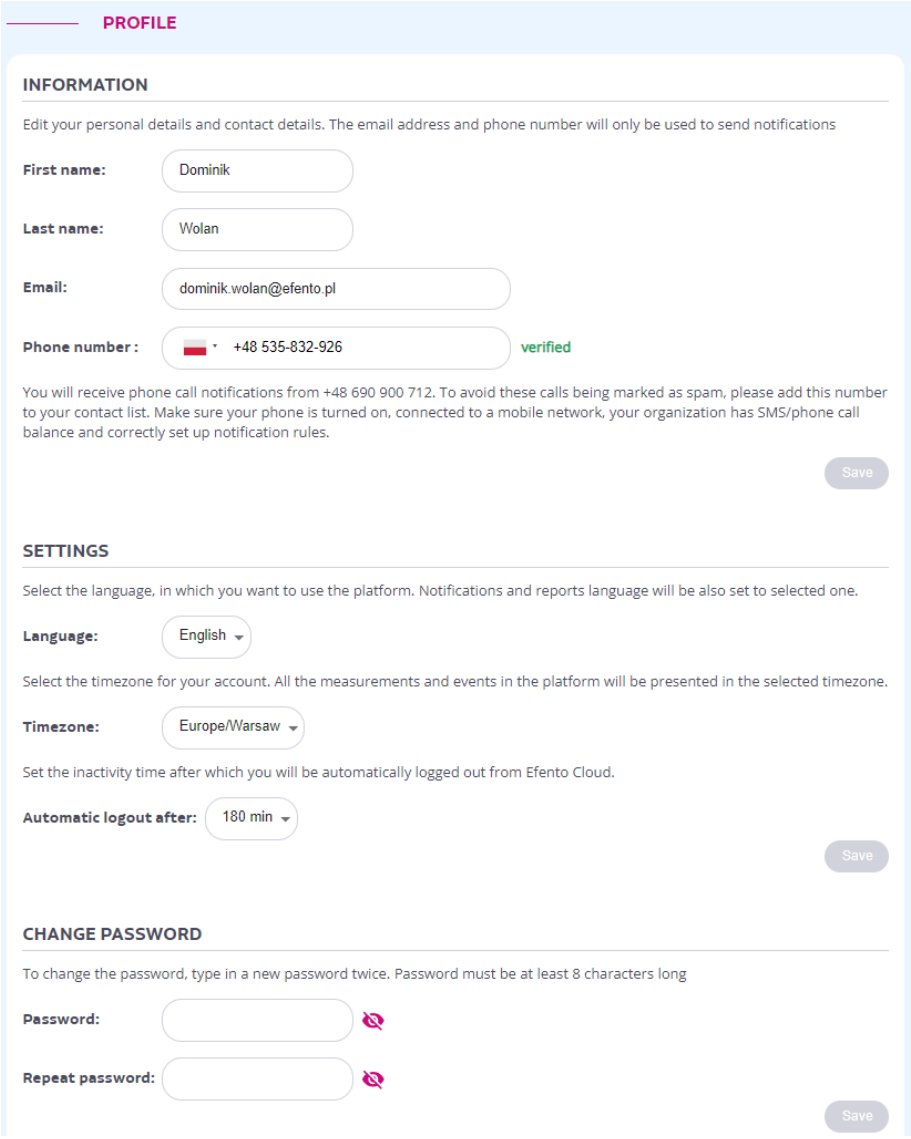
In order to export the alert list, select the time range in the upper right corner of the table and press the *Export alarm list* button. The alarm list is sent in a PDF file to the e-mail address assigned to your account.



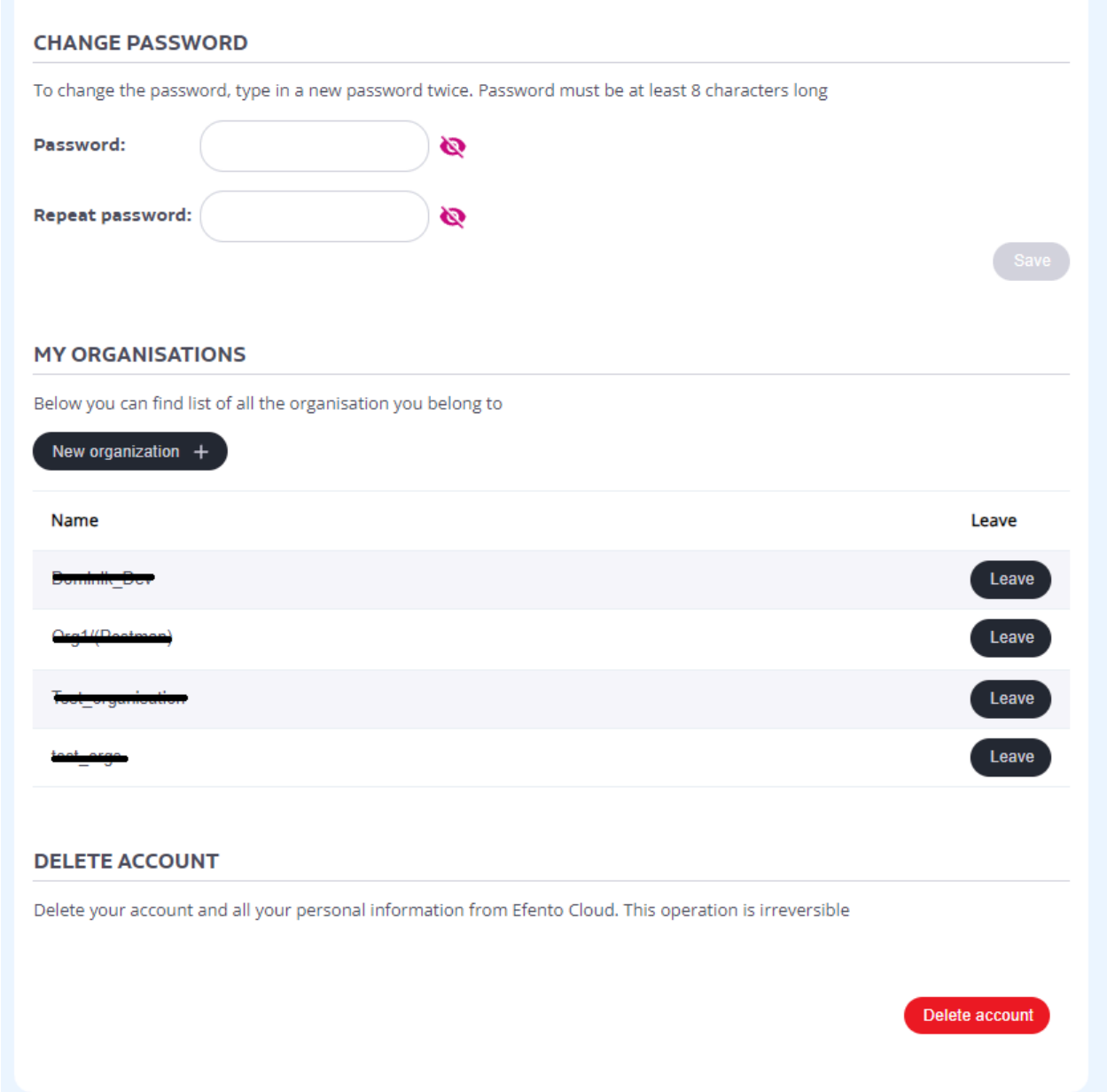
12. Editing user and organization data

12.1. Changing the username / password, language 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.

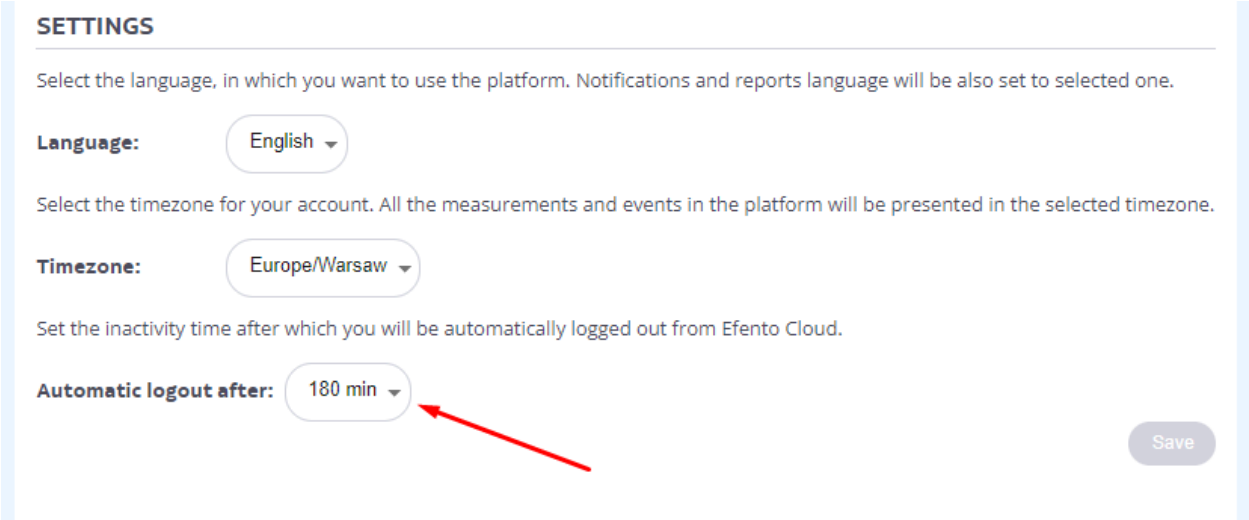


To delete an account, click the *Delete Account* button. This way you will delete your account along with all the information entered in the system (name, surname, e-mail address, password).



12.2. Automatic logout

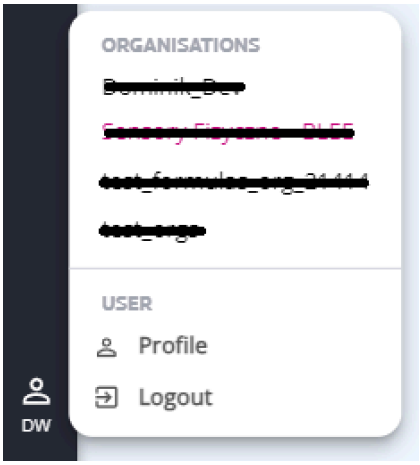
It is possible to set the inactivity time after which you will be automatically logged out from Efento Cloud. Select the inactivity time from the dropdown menu next to *Automatic logout after*. If you want to completely disable the auto logout, set the value to *Disabled*.



12.3. Creating a new Organization and leaving an Organization

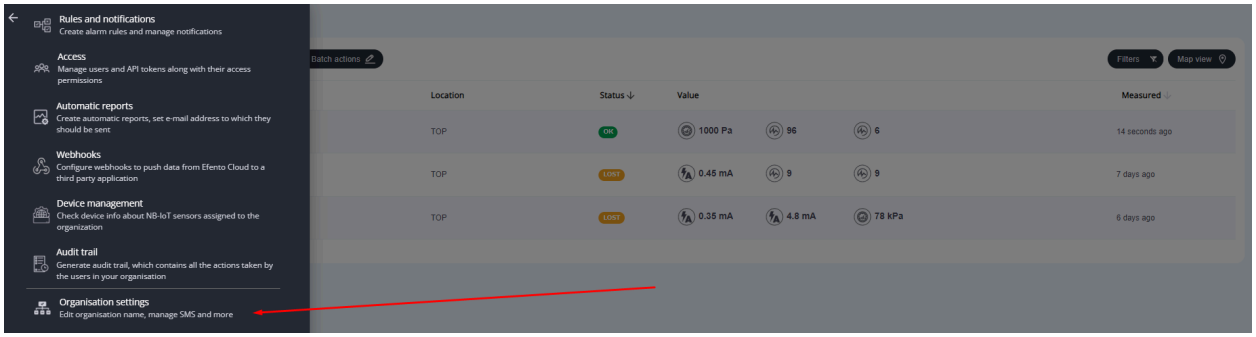
In the Profile tab, you can also leave the selected organization. To do this, in the My Organizations section, click the *Leave* button next to the organization you want to leave. Leaving an organization means losing access to its measurements.
Important! If you are the last member of the organization, 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.



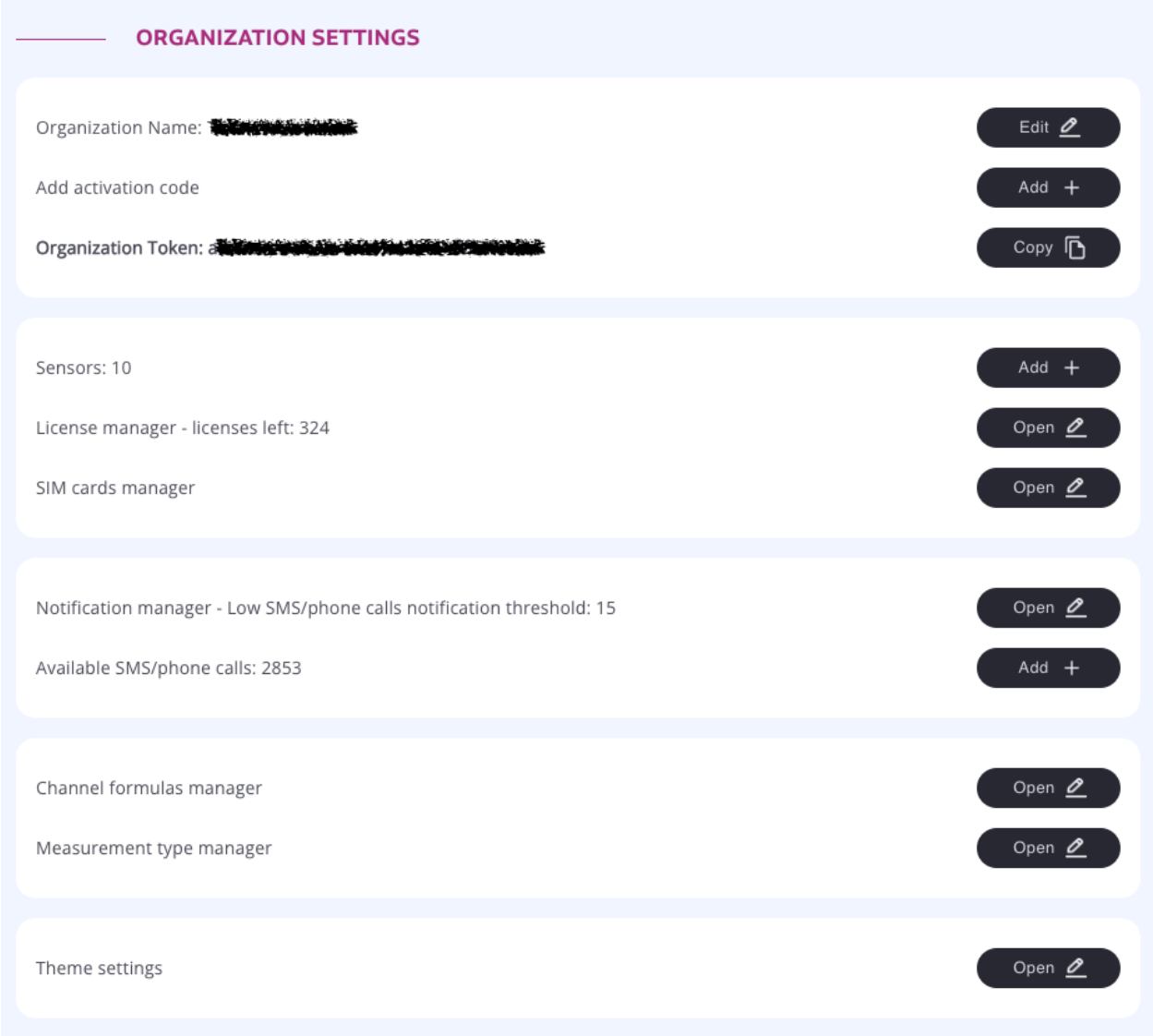
12.4. Changing Organization settings

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



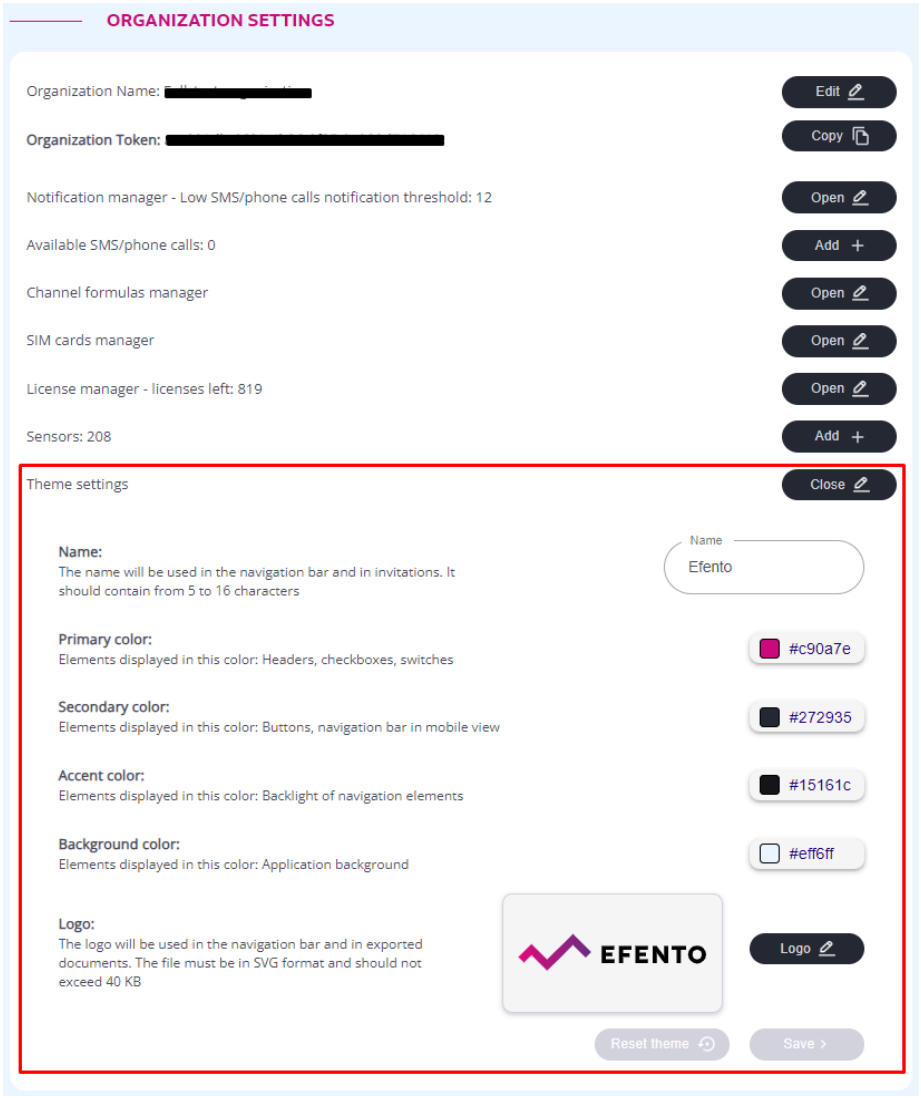
In this view the user can:

- change the name of the organization,
- add new sensors,
- view the organization Token.
- top up the SMS / phone calls pool,
- go to Notification manager,
- go to License manager,
- go to SIM card manager
- go to Channel formulas manager,
- go to Measurement types manager
- change the Theme settings for this organization



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.

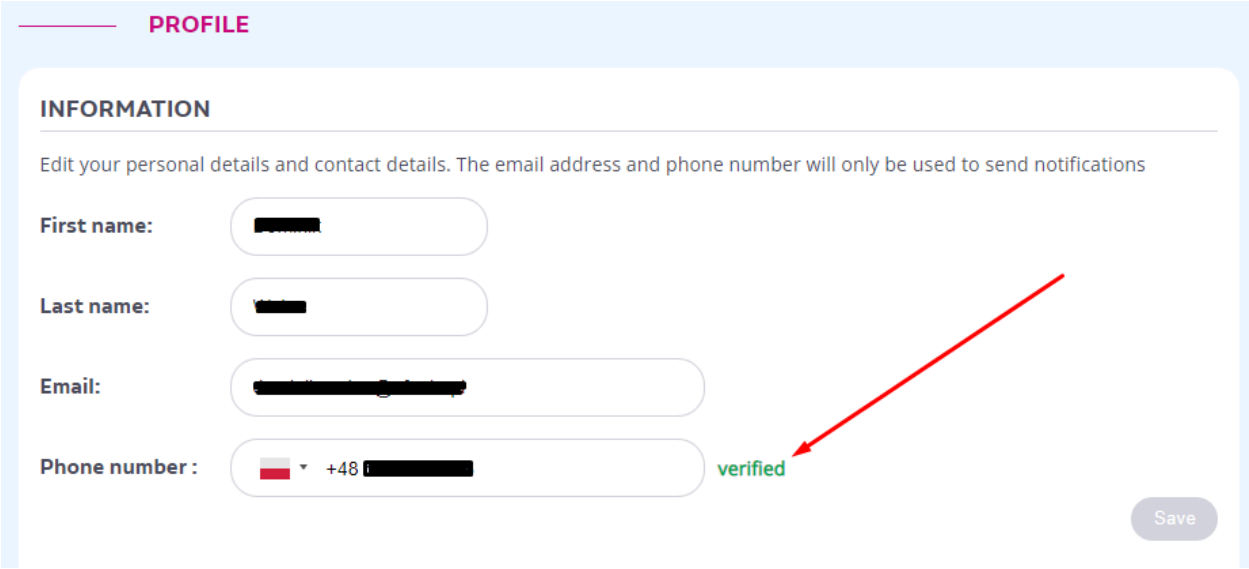

ORGANIZATION SETTINGS
Organization Name:
Edit
Organization Token:
Copy
Notification manager - Low SMS/phone calls notification threshold: 12
Open
Available SMS/phone calls: 0
Add
Channel formulas manager
Open
SIM cards manager
Open
License manager - licenses left: 819
Open
Sensors: 208
Add
Theme settings
Close
Name:
The name will be used in the navigation bar and in invitations. It should contain from 5 to 16 characters
Name
Efento
Primary color:
Elements displayed in this color: Headers, checkboxes, switches
#c90a7e
Secondary color:
Elements displayed in this color: Buttons, navigation bar in mobile view
#272935
Accent color:
Elements displayed in this color: Backlight of navigation elements
#15161c
Background color:
Elements displayed in this color: Application background
#eff6ff
Logo:
The logo will be used in the navigation bar and in exported documents. The file must be in SVG format and should not exceed 40 KB
EFENTO
Logo
Reset theme
Save

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.

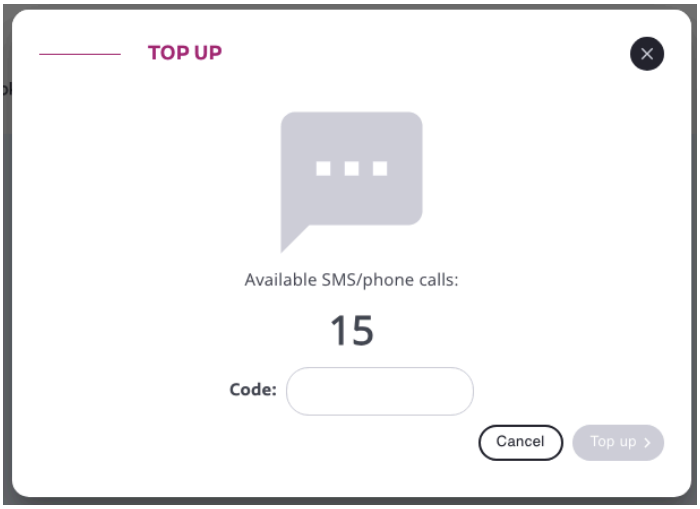


Important! One telephone number can be assigned to several Efento Cloud user accounts.

Updating the user's 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

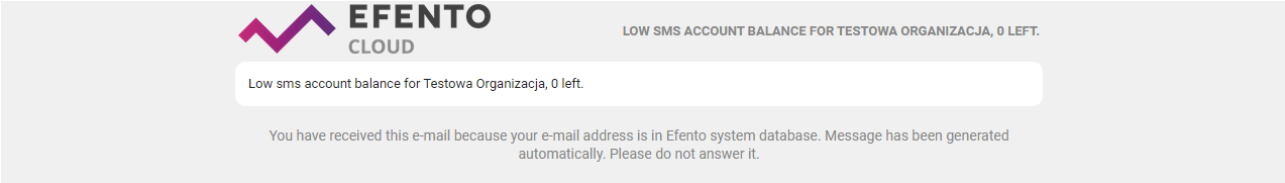
Receiving SMS / phone call notifications requires an available pool. You can check the number of available SMS / calls in the Organization Settings menu. To increase the pool, purchase the appropriate package from Efento, and then enter the received code in the field displayed after pressing the "Add +" 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:

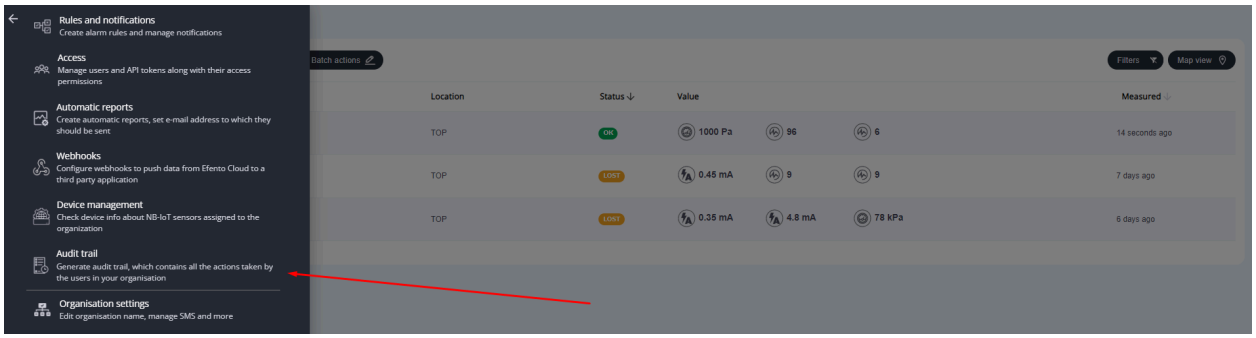
- when the number of available notifications drops to the set value,
- when the number of available notifications drops to 50% of the set value,
- when the number of available notifications drops to 25% of the set value,
- when the number of available notifications drops to 0.



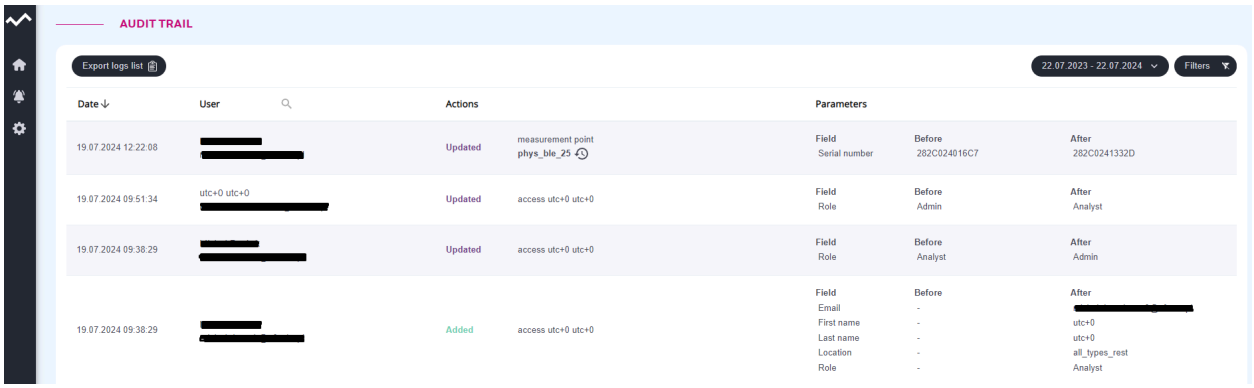
14. Audit trail

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.

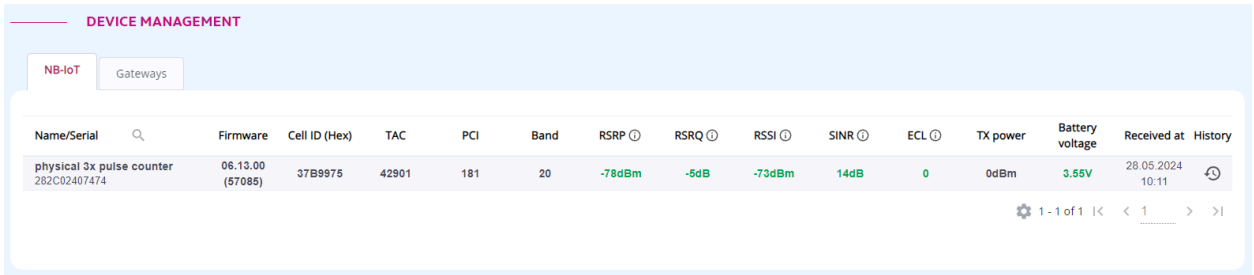
14.2. Exporting the Audit trail

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

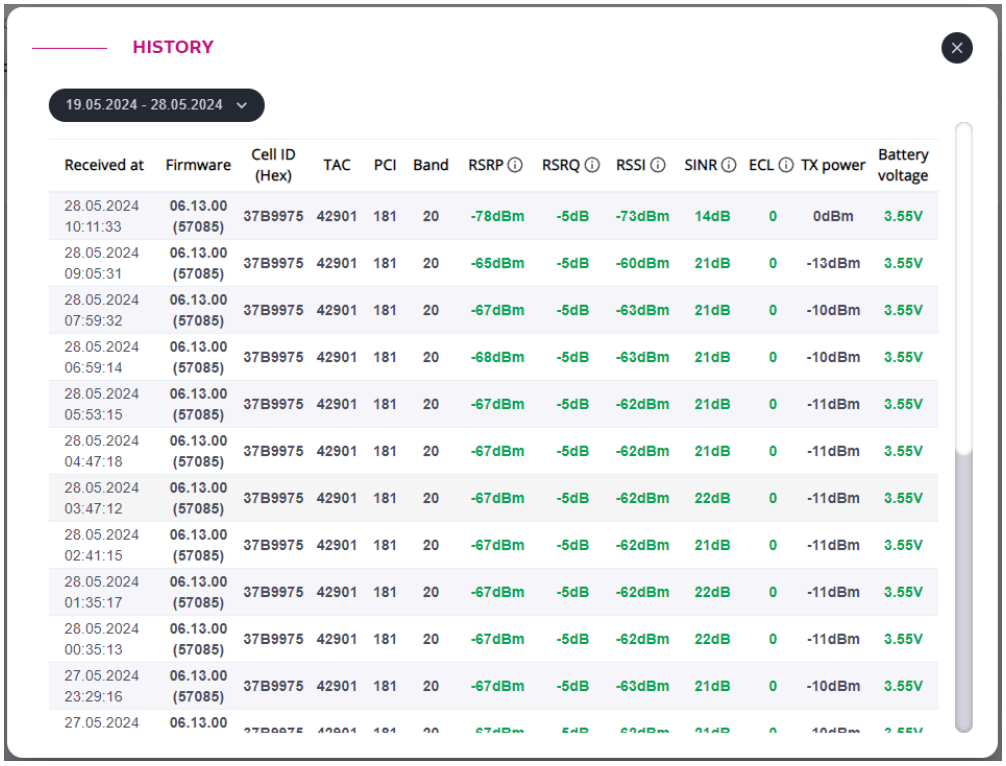
In the device management tab, the user can check information about NB-IoT sensors and Efento Gateways.

15.1. NB-IoT sensors



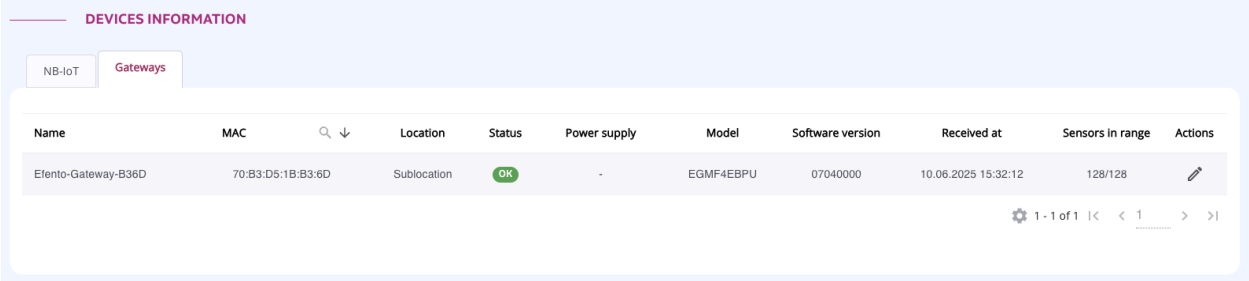
Information located in the NB-IoT tab:

- 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. Gateways



The "Gateways" tab provides the following details:

- Gateway name and MAC address
- Assigned location
- Status: "OK" or "LOST"
- Power supply: USB or backup battery (LTE gateways only)
- Model type
- Software version
- Date and time of the last received device information
- Number of in-range sensors detected
- Edit button - used to change the assigned location

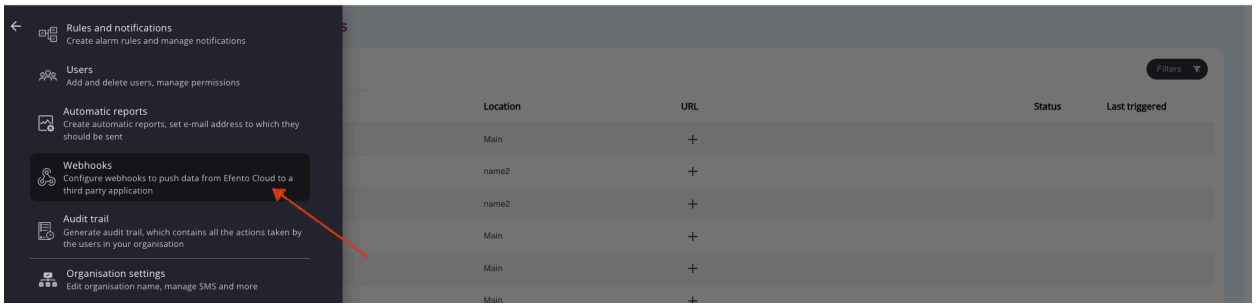
16. Webhooks

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

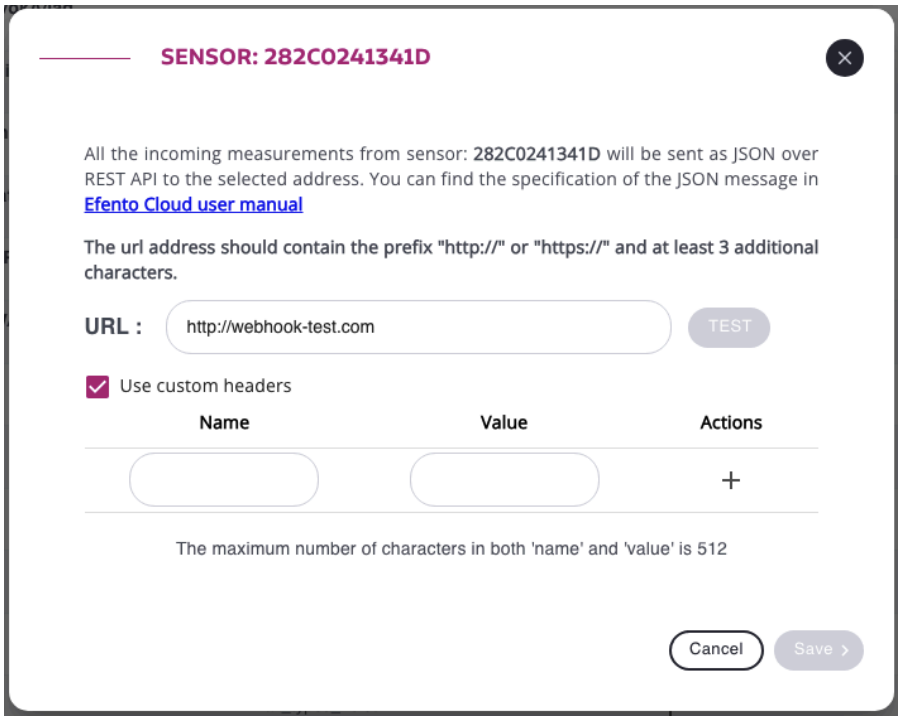
- **Measurement webhooks** - once a new measurement arrives in Efento Cloud, it will be automatically sent as JSON over REST (POST) to the set URL. Efento Cloud allows users to configure a separate URL for each sensor added to the platform (measurement webhooks are described in sections: *Configuration*, *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.

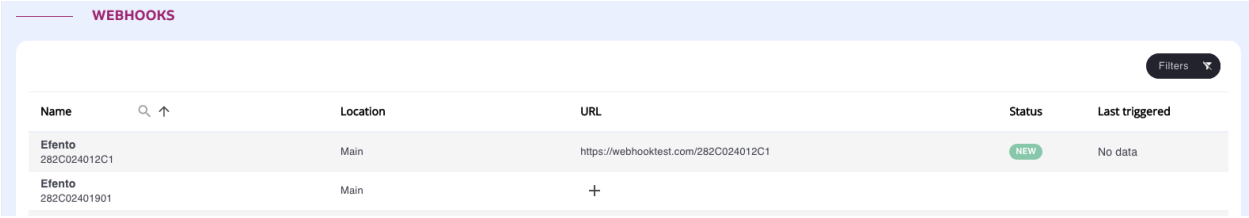


On the list you can see all the sensors added to your organization along with the information, if the webhook is set for this device, when the webhook was triggered last time and what was the received response. To add a webhook, click on the + button in the URL column and add the URL, to which the incoming 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 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

The 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

The 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 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:

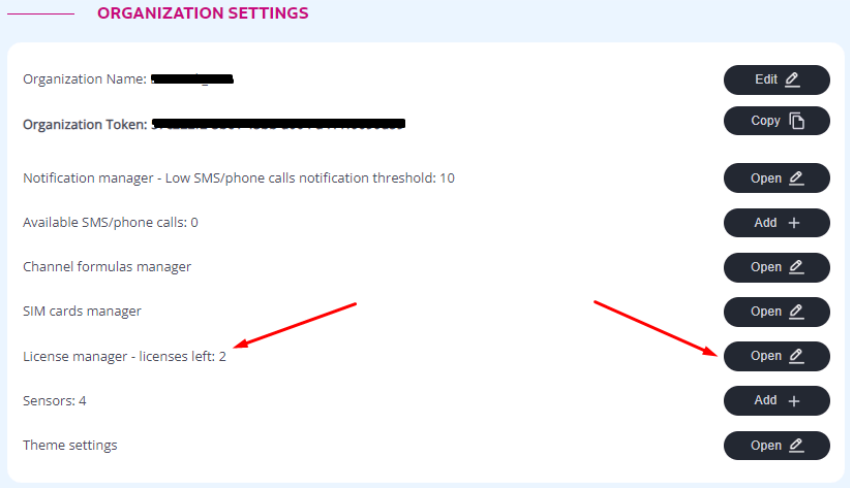
- It is possible to configure one webhook per alert rule
- The application, to which Efento Cloud sends the data, needs to respond within 10 seconds from the moment when the webhook was triggered
- Efento Cloud does not resend the alerts. If the application that receives the data was not responding the 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

To use a sensor in Efento Cloud, a license is necessary. These licenses are activated within the Efento Cloud platform using an Activation code. When ordering from Efento, customers specify the desired license duration and the number of sensors. A single Activation code can generate multiple licenses. For example, an order of 5 sensors would result in one Activation code, which, when entered into Efento Cloud, would enable the addition and two-year usage of 5 sensors.

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 Activation code 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.



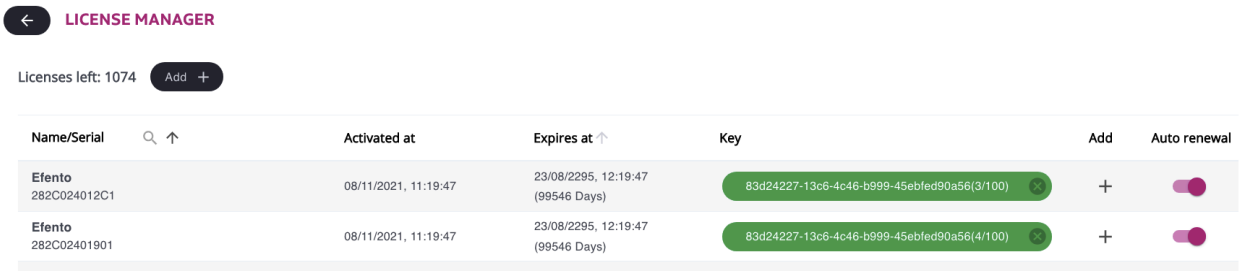
17.2. License lifetime

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 Activation code 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).

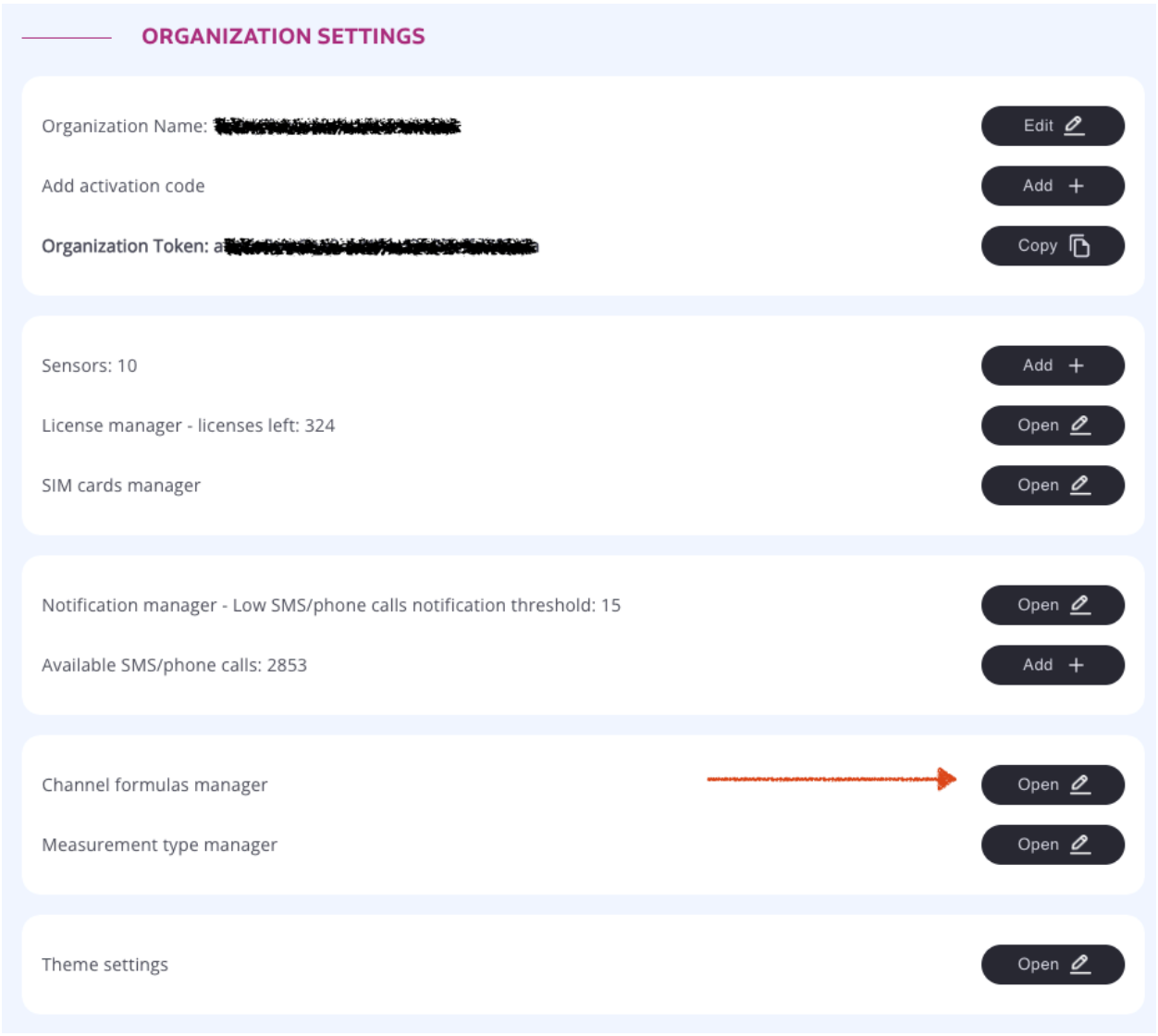
18. Formulas and custom measurement types

Efento Cloud allows users to transform sensor data, such as pulse counts, current (4-20 mA), and voltage (0-10 V) measurements, into understandable physical values. This simplifies the interpretation of results within the platform.

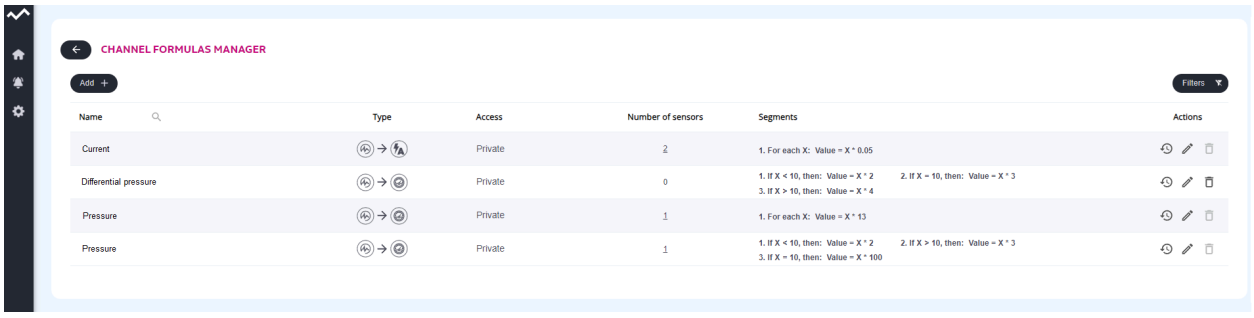
Additionally, users have the ability to create custom measurement types. These custom types can then be utilized to convert raw sensor data into meaningful units, like converting pulse counts to visitor counts or 4-20 mA readings to wind speed.

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.



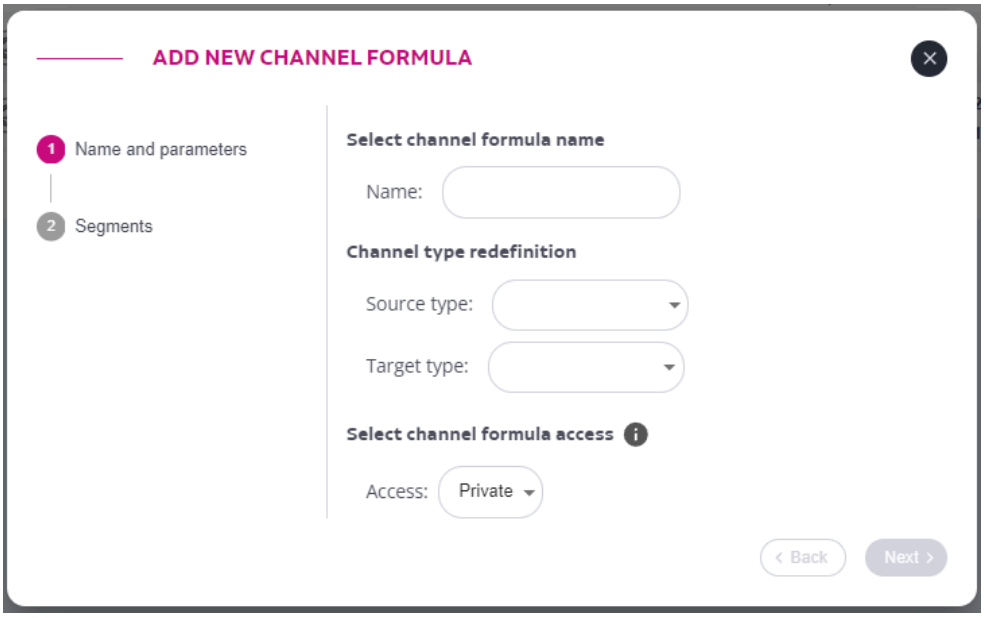
The displayed list shows the current channel formulas. Creating a new one is possible by pressing the 'Add' button located in the upper left corner of the screen, while checking the history of the formula, editing and deleting is possible by pressing the appropriate icon in the 'Actions' column.



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.

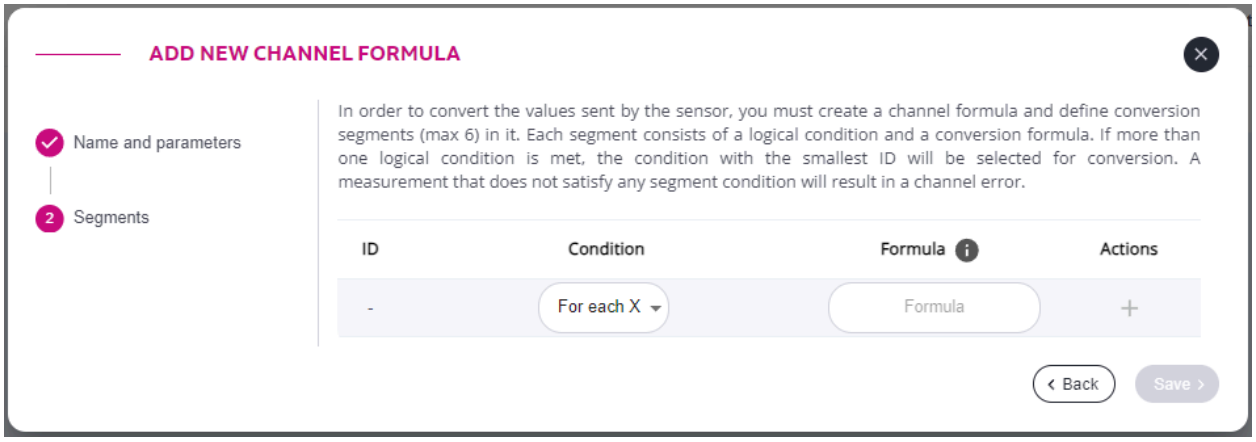
18.2 Adding a formula

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).

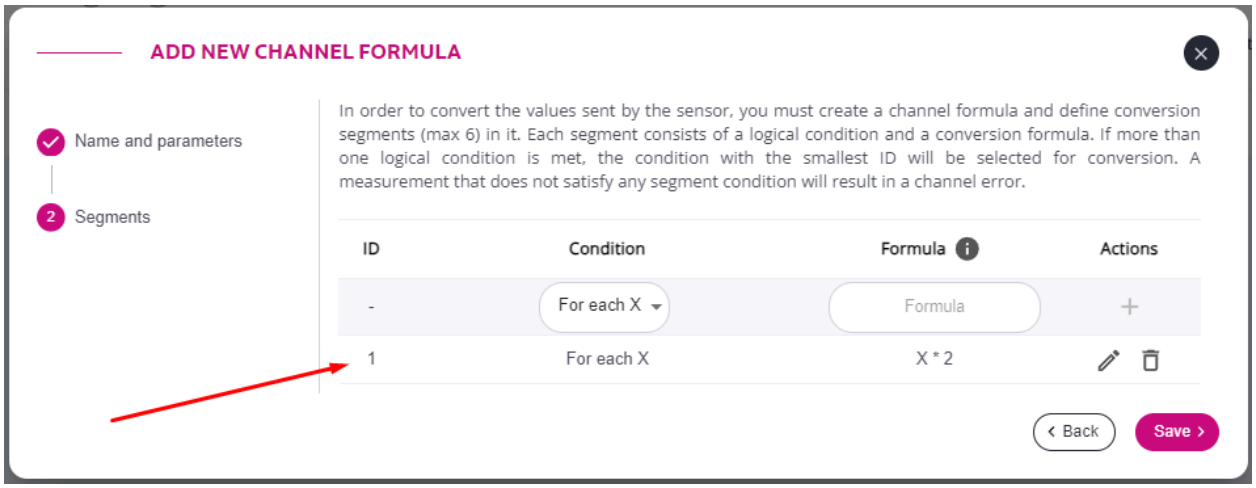


In the second stage, define logical conditions along with formulas used to convert the values sent by the sensor. The conversion formula must be mathematically correct and no longer than 32 characters. To refer to the value sent by a sensor, 'X' character. For example, doubling the value sent by the 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.

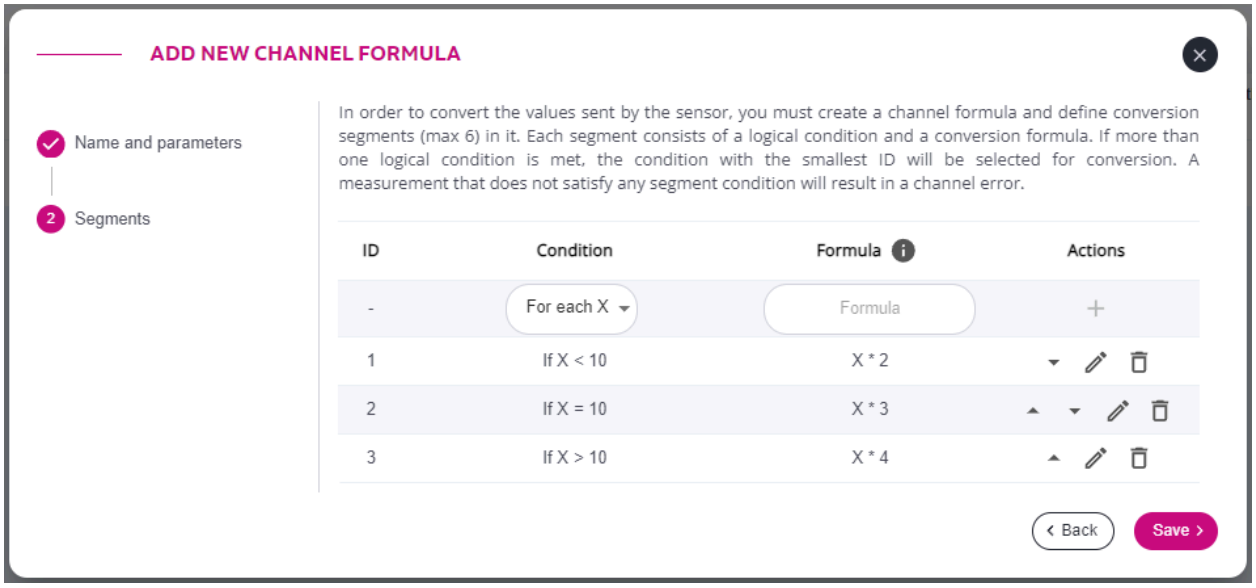


After completing the condition and conversion formula, add the formula by pressing '+' in the last column ('Actions'), which will display the formula condition below, ready to be saved.



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

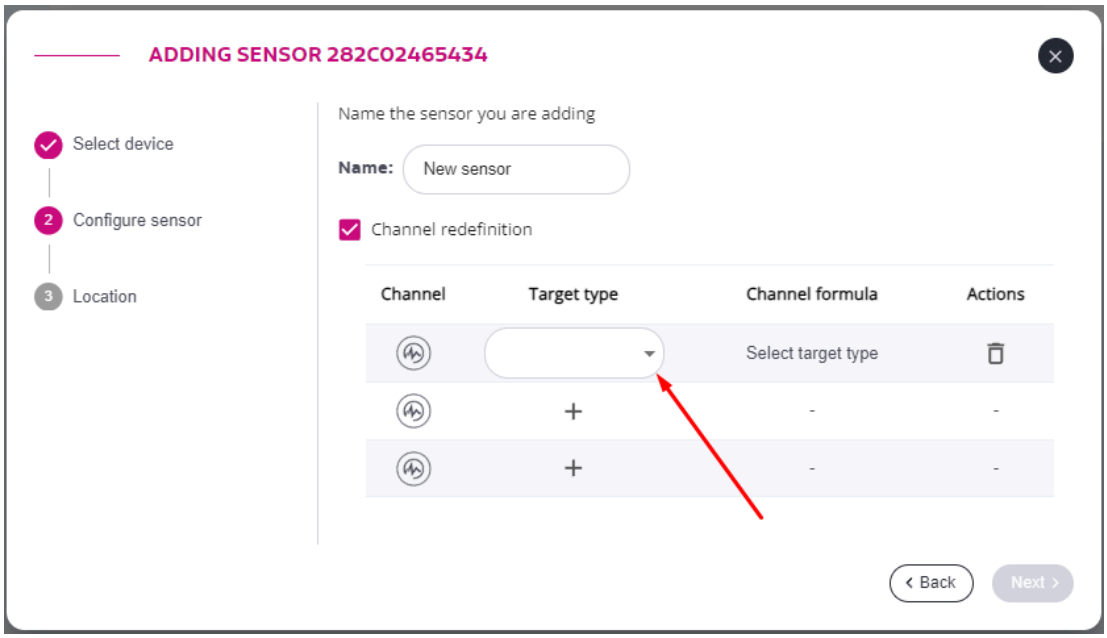


If more than one logical condition is met, the condition with the smallest ID will be selected for conversion.

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).

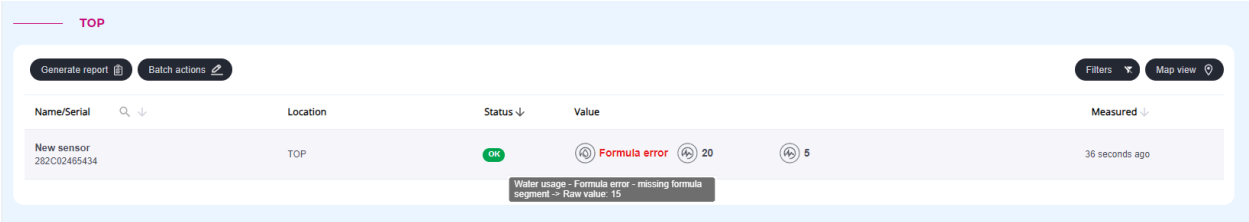


18.4 Formulas errors

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:

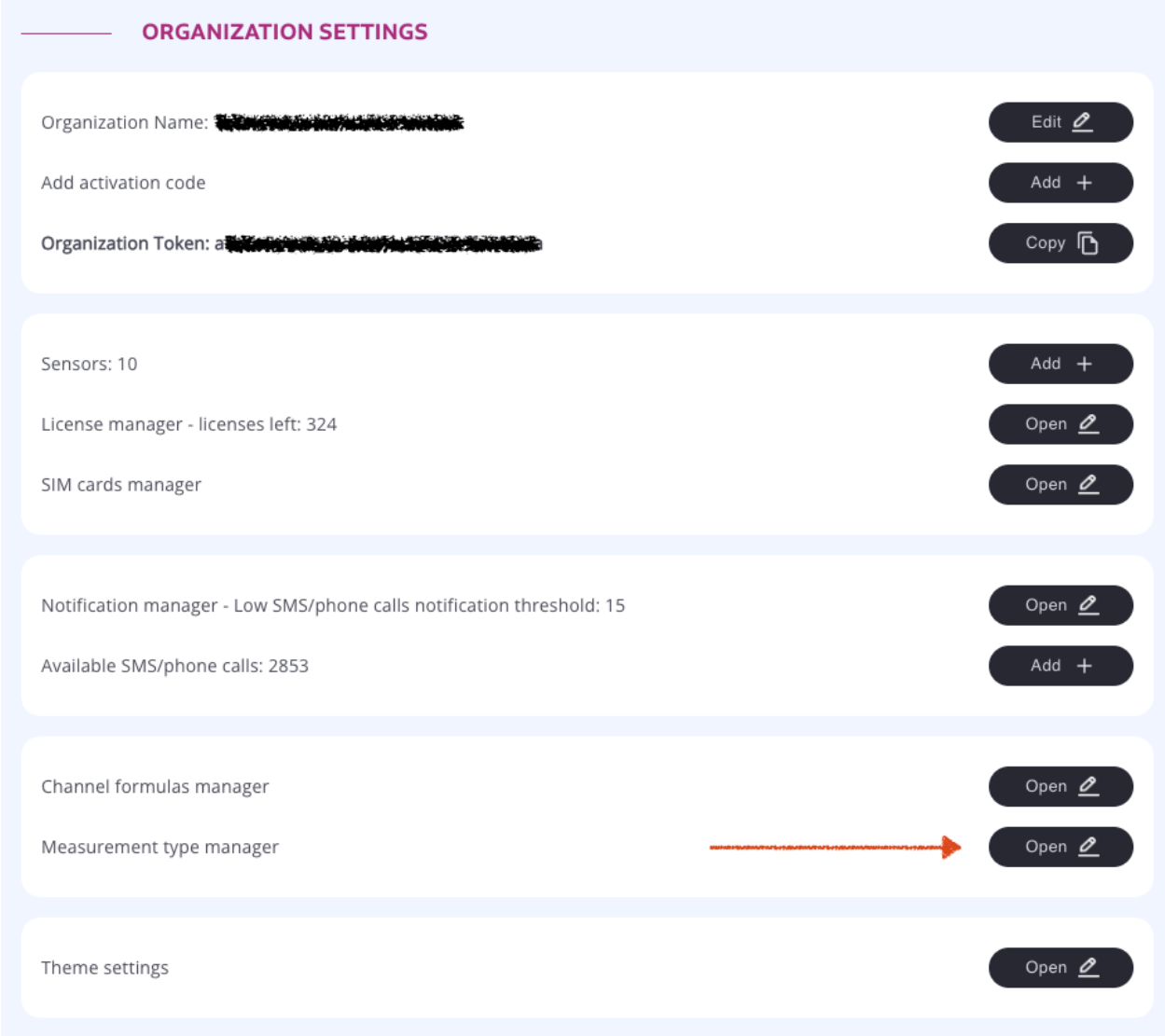
- division by 0,
- the calculated value is off range,
- received measurement does not meet any defined segment criteria.

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.

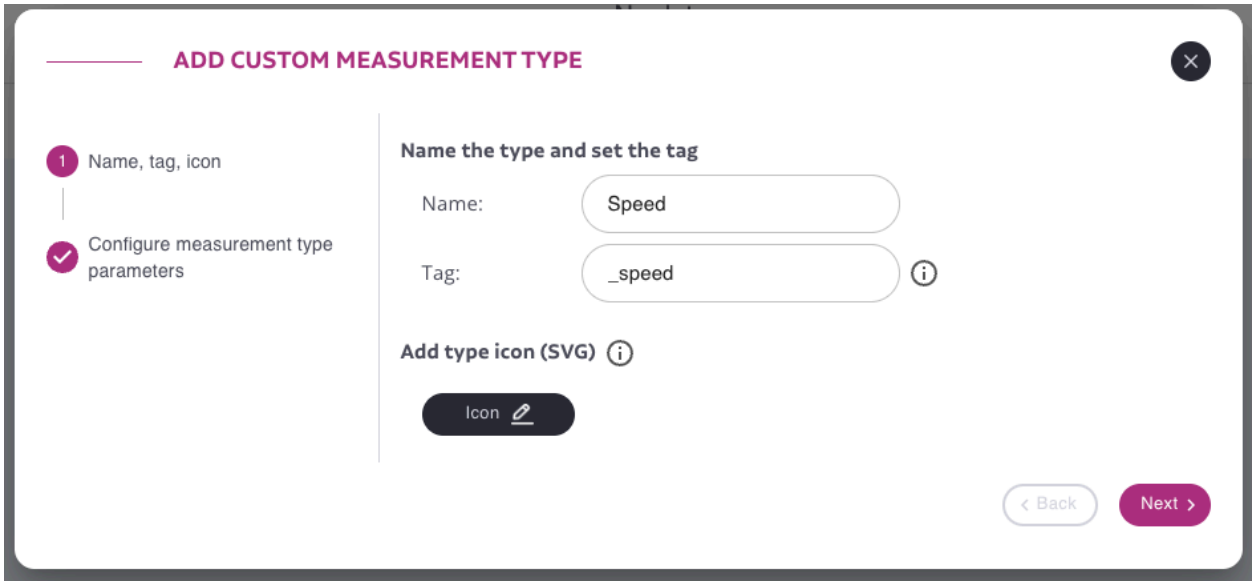


18.5 Measurement type manager

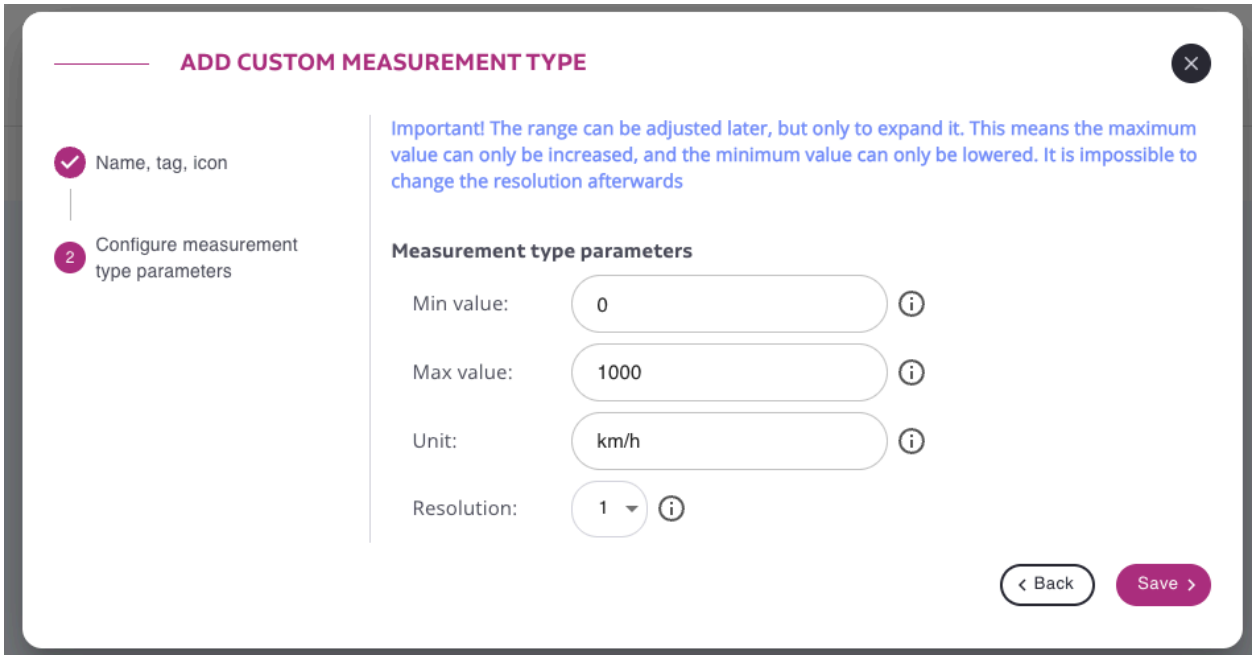
Users can add bespoke measurement types to their Efento Cloud organization through the Measurement type manager, located in the organization settings.



To create a custom measurement type, simply click the *Add+* button. Provide a distinct name and assign a tag. Tags are essential for API and backend communication and must be unique organization-wide. All custom measurement tags begin with "_". Additionally, you have the option to upload a custom icon that will represent this measurement type in Efento Cloud. The icon must be in SVG format. For the best results use square shaped icons.



Measurement types allow configuration of minimum and maximum ranges, units, and resolution. The platform will flag an error if a sensor's reported value (post-formula conversion) exceeds the defined range. Resolution determines the number of displayed decimal places. Once a custom measurement type is established, it becomes available for use within channel conversion formulas.



19. Notification manager

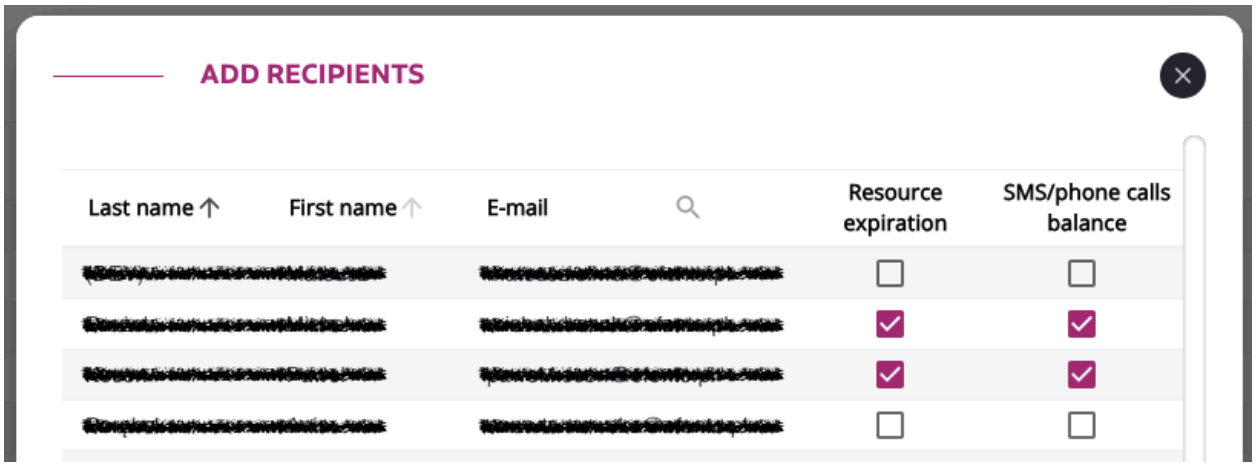
19.1 Types of notifications

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.



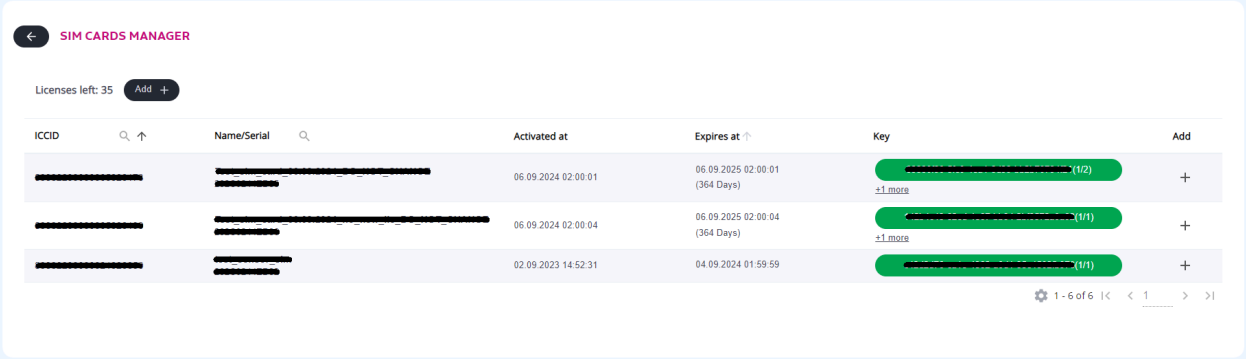
To remove the notification recipients, uncheck the checkbox next to the selected user.

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,
- Activation codes used during SIM card activation / extension along with the history of previous Activation codes.



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

Important! The SIM card must be extended before it expires. If the SIM card expires, it is not possible to extend it.