E3METER Monitoring Software User Manual

Data Concentrator 6.2 revA

Riedo Networks Ltd

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Table of contents

1 Introduction **1**
- 1.1 How to read this User Manual . . . 1
- 1.2 Capacity management . . . 2
- 1.3 Billing . . . 2
- 1.4 Safety . . . 2
- 1.5 Easy installation . . . 2

2 Accessing your Data Concentrator (CTR) **3**
- 2.1 Connect to Data Concentrator . . . 4
- 2.2 Secure connection to web page . . . 4
  - 2.2.1 Self-signed Certificates . . . 5
    - 2.2.1.1 Google chrome . . . 5
    - 2.2.1.2 Firefox . . . 6
    - 2.2.1.3 Microsoft Edge . . . 7
    - 2.2.1.4 Microsoft Internet Explorer . . . 8
- 2.3 Welcome screen . . . 9
- 2.4 User login . . . 9
  - 2.4.1 User rights . . . 10

3 Overview of Monitoring Software **13**
- 3.1 Software menu structure . . . 13
- 3.2 Basic elements . . . 14

4 Initial setup **15**
- 4.1 Configure IP address . . . 16
- 4.2 Configure NTP (Time Server) . . . 16
- 4.3 Add license . . . 17
  - 4.3.1 CAL . . . 17
  - 4.3.2 Feature license . . . 17
- 4.4 Firmware upgrade of Data Concentrator . . . 18
- 4.5 Firmware upgrade of Meters . . . 19
- 4.6 Remote Assistance . . . 19

5 Adding meters **23**
- 5.1 Adding IPS . . . 23
  - 5.1.1 Adding meters automatically . . . 23

5.1.2 Adding meters manually . . . 24
5.2 Adding PRO meters manually . . . 25
5.2.1 USB adapter . . . 25
5.2.2 Modbus TCP/RTU gateway . . . 26

6 Data Concentrator pages **27**
6.1 Visualization and configuration features . . . 27
6.1.1 Groups . . . 27
6.1.1.1 Edit groups . . . 28
6.1.1.2 Flags . . . 30
6.1.1.3 Group selection . . . 31
6.1.1.4 Grouped by . . . 32
6.1.2 Bar chart . . . 33
6.1.3 Tooltip value . . . 33
6.1.4 Marker . . . 34
6.1.5 Phase Balance viewer . . . 35
6.1.6 Navigation in time . . . 35
6.1.6.1 User interface . . . 35
6.1.6.2 Navigation in bar chart . . . 36
6.1.6.3 Navigation in preview window . . . 36
6.1.6.4 Time selection . . . 36
6.2 Analyzer . . . 37
6.2.1 Residual Current Monitoring . . . 38
6.3 Metering . . . 39
6.4 Environment . . . 40
6.5 Assignment . . . 41
6.6 Configuration . . . 42
6.7 Alarms . . . 44

7 Reporting **45**
7.1 Generating Quick reports . . . 46
7.2 Templates . . . 47
7.3 Transfer . . . 48
7.4 Reports . . . 50

8 Alarms **53**
8.1 Setting thresholds . . . 53

9 Events and Notifications **57**
9.1 Concept . . . 57
9.2 Notification panel . . . 58
9.3 Notifications . . . 59
9.3.1 Outgoing Events . . . 59
9.3.2 Transfer . . . 60
9.4 Event viewer . . . 61

10 Advanced setup **63**
10.1 Configure SMTP (mail server) . . . 63
10.2 Configure SNMP . . . 64
10.3 Configure FTP (Backup Server) . . . 65
10.4 Configure PLC . . . 66
10.5 Configure Modbus . . . 67

10.5.1 USB adapter . . . 67
10.5.2 Modbus TCP/RTU gateway . . . 68
10.5.3 Configuration parameters on the Moxa MB3180 gateway . . . 68
10.6 Storage Management . . . 70
10.7 Reboot . . . 71
10.8 Changing user rights . . . 71
10.9 System Log . . . 71

11 Bulk modification **73**
11.1 Bulk Assignment . . . 73
11.2 Bulk Configuration . . . 74
11.3 Bulk alarm setting . . . 74
11.3.1 Combination of different features . . . 75

12 Technical support **77**

13 Legal notice **79**

14 Annex **81**
14.1 Time granularity in bar chart . . . 81
14.2 Synchronous polling . . . 81
14.3 Accessing data per SNMP . . . 82
14.3.1 Download MIB browser . . . 82
14.3.2 Open MIB browser . . . 82
14.3.2.1 Connect to Data Concentrator . . . 83
14.3.2.2 Accessing average power . . . 84

15 Revision log **87**

Index **89**

CHAPTER 1

Introduction

Dear user, thank you for having chosen the E3METER® Monitoring System. E3 stands for Energy, Environment and Efficiency with the goal to increase productivity for your data center monitoring.

The aim of the E3METER® products is to provide the following main functionalities:

- *Capacity management*
- *Billing*
- *Safety*

1.1 How to read this User Manual

This User Manual provides information about the configuration options of the E3METER® Monitoring System. For those who want to create a basic configuration it is recommended to read the following chapters in the sequence presented hereafter:

- *Introduction*
- *Accessing your Data Concentrator (CTR)*
- *Initial setup*
- *Adding meters*
- *Data Concentrator pages*

For those interested in all details, we recommend reading through the entire user manual and considering the table of contents and index in order to navigate to the specific area of interest.

1.2 Capacity management

Capacity management provides information about the remaining power capacity of a specific rack or data center element. By consulting historic data, this allows the user to forecast by when the available power capacity will be reached and when or where it makes sense to add further data center resources. This information allows you to optimize the installation / maintenance of your system and the involved costs.

1.3 Billing

Electrical power consumption in an average data center represents more than 50% of the running costs. The billing functionality allows you to know how much energy was consumed by which participant and to accurately bill the respective amount of energy to each participant. The billing functionality provides the exact number of kWh consumed per unit of time.

1.4 Safety

A fully configured E3METER® Monitoring System provides Alarm functionality. Alarm functionality can be configured on the measured parameters: current, temperature and humidity. When the observed parameter reaches the configured alarm threshold, the system immediately notifies the user with an event. One additional safety function consists in phase balancing. Since individual phases can be monitored and analyzed, this information can be used during commissioning or maintenance. You use this information in order to add new devices without exceeding a safety limit for a phase current, preventing from impacting on the system.

1.5 Easy installation

The communication with the meters and Data Concentrator is done via powerline which does not require for additional cabling. Devices can be automatically paired with the Data Concentrator and parameters can be configured for multiple elements at once (bulk configuration/edit). The software comes pre-configured and can be upgraded automatically for both the Data Concentrator and the meters.

These elements make it a plug and play system and allow to get started quickly.

CHAPTER 2

Accessing your Data Concentrator (CTR)

In order to access your Data Concentrator for the first time you need to read the IP address of the Data Concentrator on the display on the front panel. First check how your Data Concentrator is connected. It is either connected into a network using DHCP or via static address or not yet connected to a network but directly connected to your PC. By default the Data Concentrator is configured to use DHCP / AutoIP. When the Data Concentrator is connected per AutoIP, make sure to wait for one minute after connection until you read the IP address of the Data Concentrator.

Two different network connections are shown below.

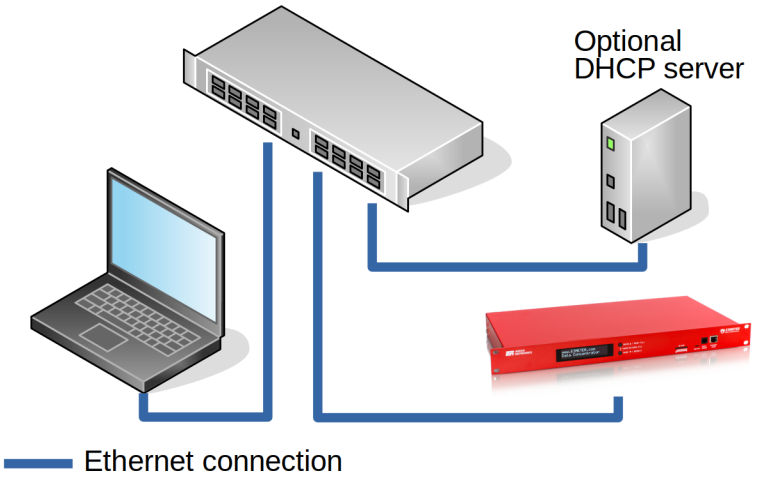


Fig. 1: Connection method 1 in a network with optional DHCP server.

Fig. 2: Connection method 2 in a setup with direct connection using Auto IP.

Note: If the Data Concentrator is connected directly to the PC, make sure to configure *Link Local* in the network configuration of your Linux PC or Mac network card. On your windows PC stick to the option *Automatic* to get an IP address.

Caution: The Ethernet Port of the Data Concentrator is not compatible with Power over Ethernet. Please deactivate Power over Ethernet on the port of the switch / router that will be connected to the Data Concentrator **before** connecting the Ethernet cable. PoE can cause the electronic of the Data Concentrator to malfunction or even destroy it.

2.1 Connect to Data Concentrator

Push the mode button on the front of the Data Concentrator until the IP address is being shown. Then, open your web browser and connect to your Data Concentrator using its IP address and a secure connection (HTTPS).

The following shows a possible URL to be entered in the navigation bar

- *https://192.168.1.251*

Note: When using Zero Configuration (Bonjour), it is also possible to resolve the address with the serial number of the Data Concentrator. For this you need to enter the URL https://serial#.local in the navigation bar. A possible URL would be https://ctr-005756.local.

2.2 Secure connection to web page

The connection to the web page of the Data concentrator is secured and encrypted using HTTPs. In order to achieve this, a self-signed SSL certificate needs to be accepted in your web browser. With this secured connection you can assure that your valuable data is not accessed maliciously by others. When connecting for the first time to your Concentrator web page, you will be asked to accept that SSL certificate. You need to navigate to the *advanced* section and accept the self signed SSL certificate. The following sections show

examples of how this looks like in the web browsers Chrome, Firefox, Microsoft Edge and Microsoft Internet Explorer.

Caution: When accepting the default certificate, make sure that it is issued from the Organization Riedo Networks Ltd.

Note: Customer certificates will come in a later version of the firmware.

2.2.1 Self-signed Certificates

The images below show the windows of the certificates for Chrome browser and Firefox.

2.2.1.1 Google chrome

When connecting to the IP address of the Data Concentrator, the chrome browser will notify you about a non private connection. You need to click on *ADVANCED*.

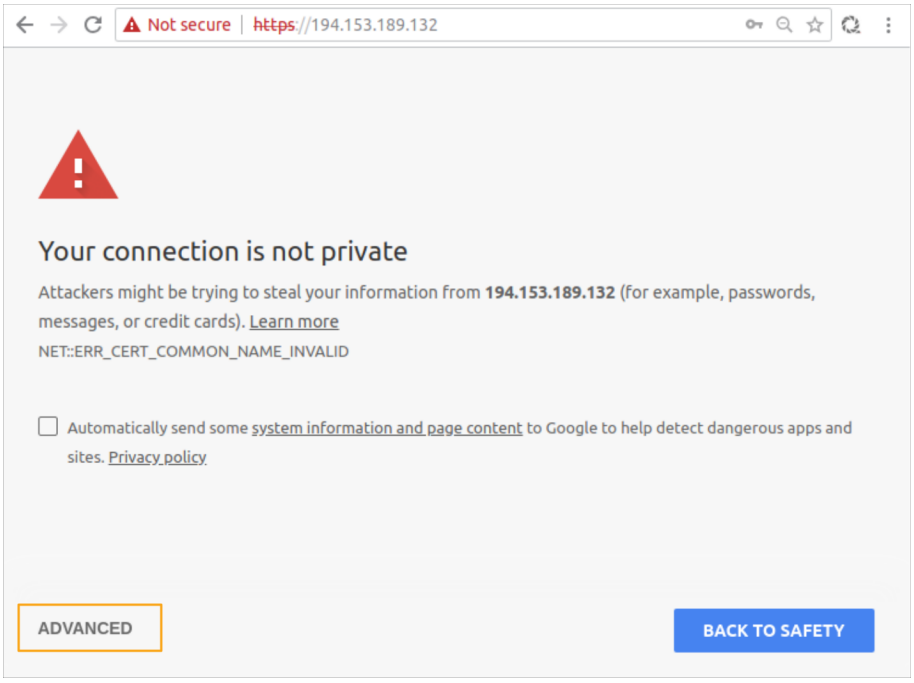


Fig. 3: Self-signed certificate in Chrome connecting via IP address to the Data Concentrator

After clicking on the Advanced button you will need to click on *Proceed to IP address (unsafe)* which will connect you to the web server of your Data Concentrator.

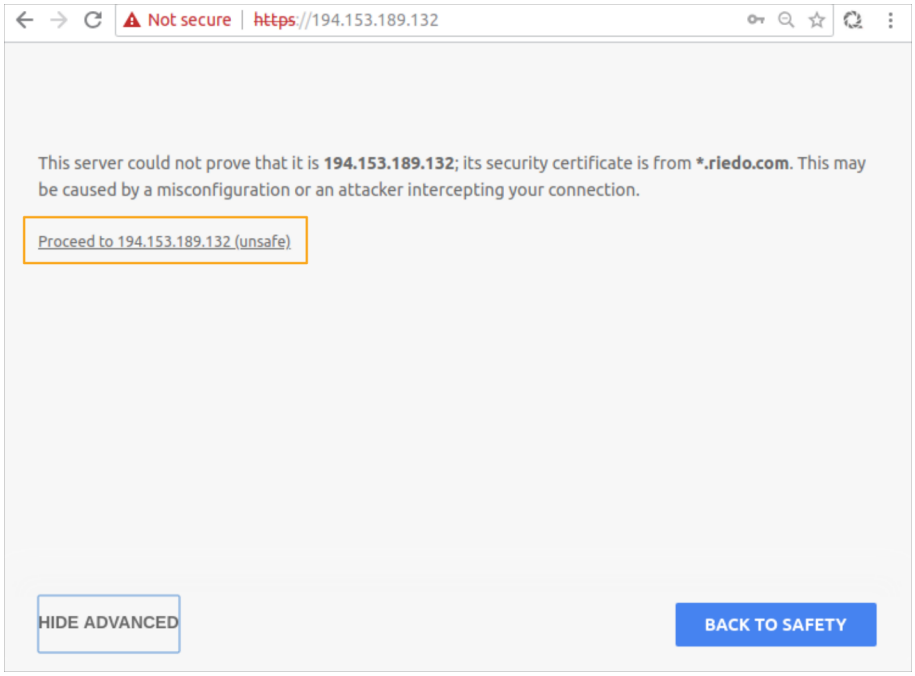


Fig. 4: Self-signed certificate in Chrome showing advanced options

2.2.1.2 Firefox

When connecting to the IP address of the Data Concentrator, firefox browser will notify you about a non private connection. You need to click on *Advanced*.

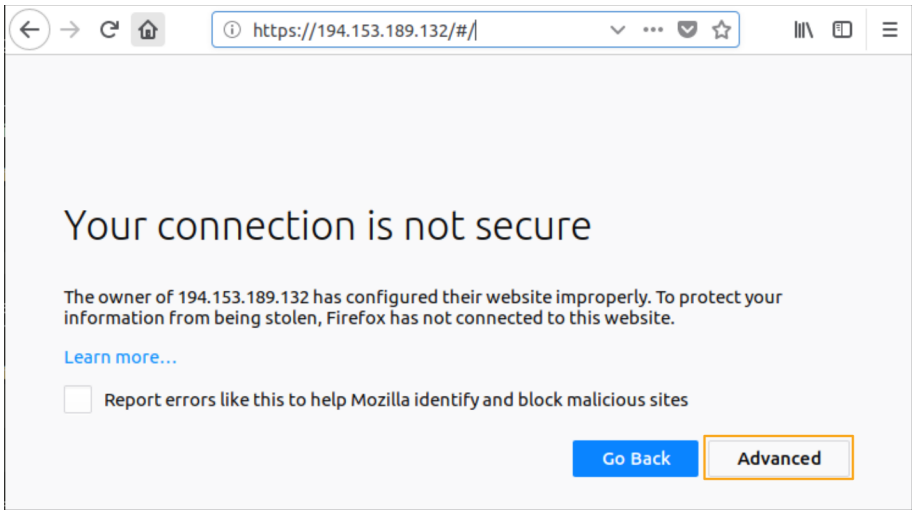


Fig. 5: Self-signed certificate in Firefox

After clicking on the *Advanced* button you will need to click on the *Add Exception...* button in order to proceed to the web page.

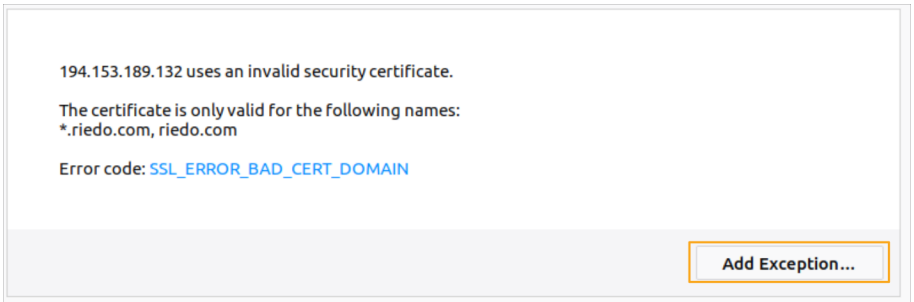


Fig. 6: Self-signed certificate in Firefox showing *Advanced* options

In the last step you need to confirm the security exception for the IP address of the web server of your Data Concentrator.

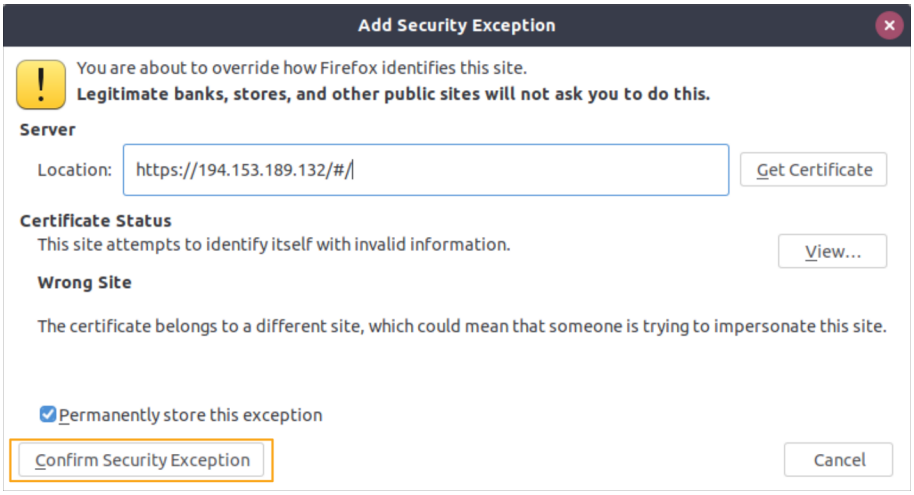


Fig. 7: Security exception in Firefox

2.2.1.3 Microsoft Edge

When accessing the Data Concentrator within Microsoft Edge you will see the picture below and need to follow the steps similar to the web browsers Chrome and Firefox.

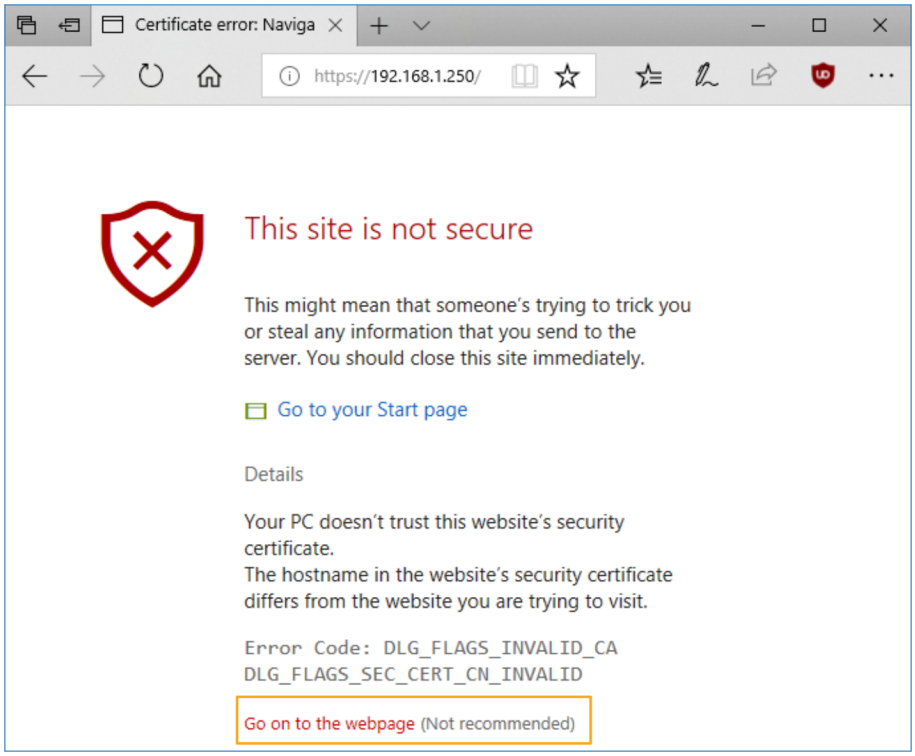


Fig. 8: Microsoft Edge security certificate

2.2.1.4 Microsoft Internet Explorer

When accessing the Data Concentrator within Microsoft Internet Explorer you will see the picture below and need to follow the steps similar to the web browsers Chrome and Firefox.

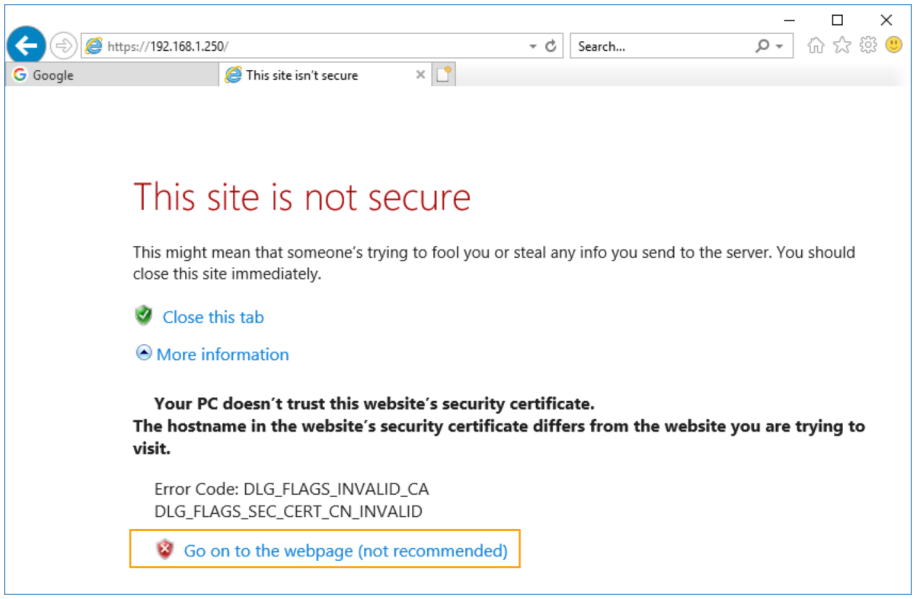


Fig. 9: Microsoft Internet Explorer security certificate

2.3 Welcome screen

The image below shows the start screen of the Data Concentrator, asking to log in.

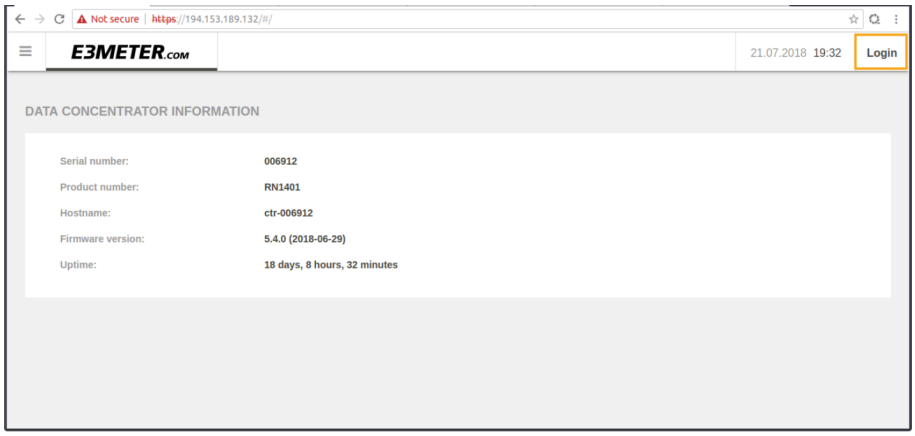


Fig. 10: Welcome screen of the Data Concentrator when no user is logged in.

As long as you are not logged into the Data Concentrator, the menus are not accessible. Once you are logged into the Data Concentrator, your user name is shown instead of the login button.

Note: The user interface runs on the following web browsers: Google Chrome, Firefox, Microsoft Internet Explorer (version 11), Microsoft Edge, Safari (version 7 or higher).

2.4 User login

Login is done by clicking on the *Login* button and specifying the user name and password.

The default login is **admin** and the default password is **admin** as well.

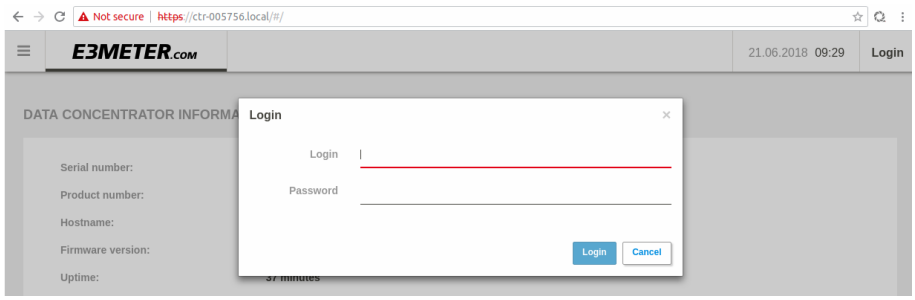


Fig. 11: Blank user login window with user name and password to be entered

After the first login please change the password in *User login* under *Modify* as shown in the pictures below:

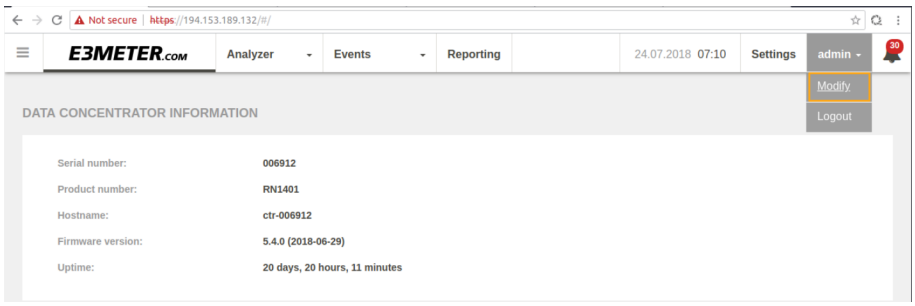


Fig. 12: Accessing User Login modification

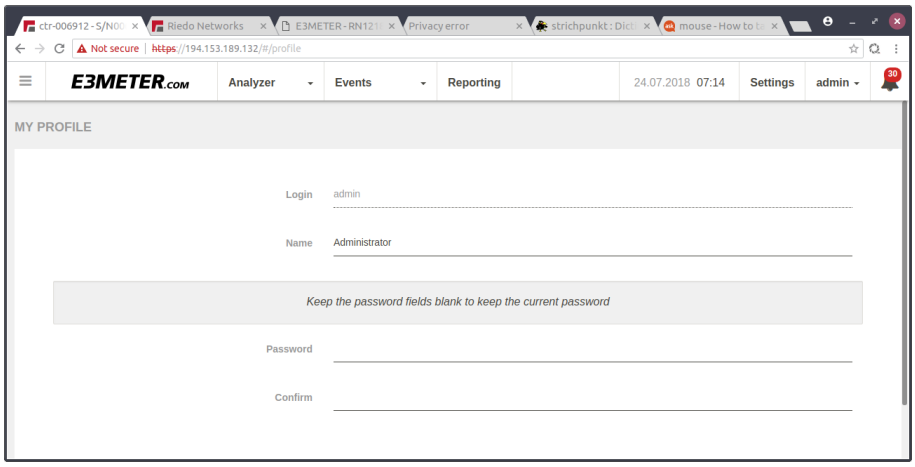


Fig. 13: Modification of user Login

Once a user is logged to the Data Concentrator, the name of the currently logged user is shown on top right and the Menu window shows the functions available to the recent user.

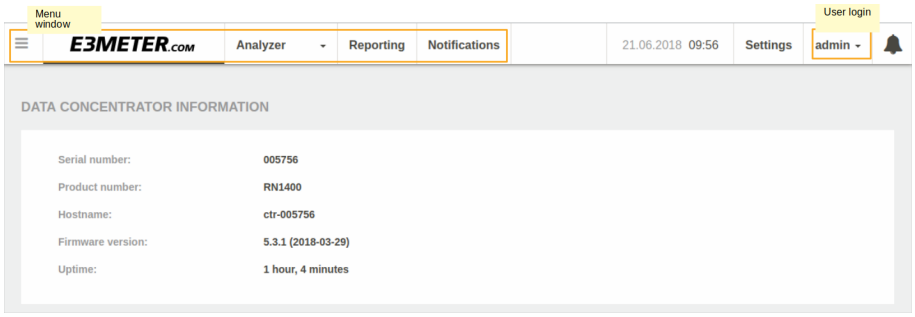


Fig. 14: Welcome screen with user *admin* currently logged in.

In order to change user rights you need to be logged in as Administrator. How to change user rights is indicated under advanced settings, see *Changing user rights*.

2.4.1 User rights

The user rights are summarized in the table below.

Table 1: User Roles

User role	view data	Generate quick report in Metering pages	Notifications/ Assignment/ Reporting	Configure system	Edit user
Administrator	YES	YES	YES	YES	YES
Super user	YES	YES	YES	NO	NO
User	YES	YES	NO	NO	NO

CHAPTER 3

Overview of Monitoring Software

This chapter provides information about the software features. Both the different menus of the software and the main elements of the software are explained in the next sections.

3.1 Software menu structure

The diagram below gives an overview of all the software menus and sub-menus which will be explained later on throughout the User Manual.

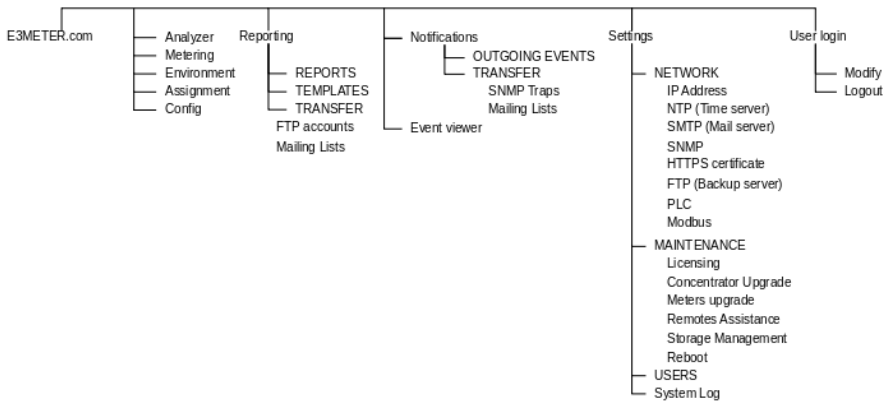


Fig. 1: Data Concentrator overall menu structure

3.2 Basic elements

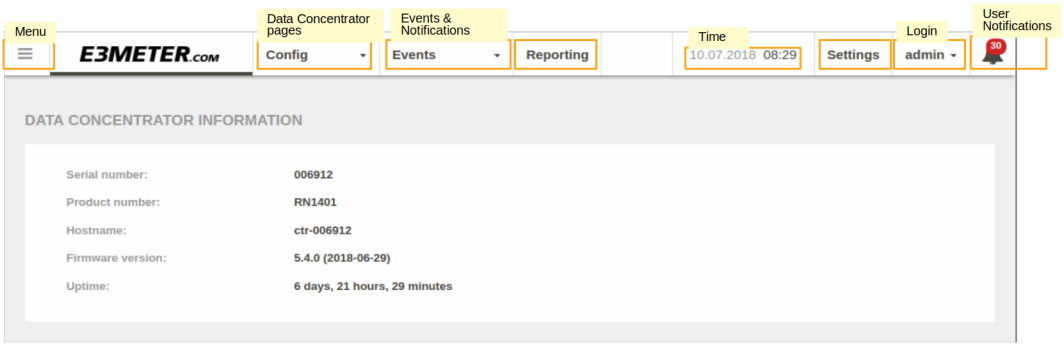


Fig. 2: Software basic menus

Note: The picture above depicts what a user with Admin user rights will see. User access rights are defined in the previous section *User rights*.

In the picture above the basic menus of the Software are indicated after having gained access via login. Depending on your user rights, you won't see all of the above mentioned menus and details. Starting from left to right a short overview of the menus and functionalities is given with a reference to the corresponding chapters.

Menu: Will provide you with the detailed informations or group possibilities, see *Groups*.

Data Concentrator pages: Provides the detailed information of the Data Concentrator to analyse data or configure the system, see *Data Concentrator pages*.

Events and Notifications: Allows configuring the events and how to be notified. Furthermore allows browsing all the events from historical data with the event viewer, see *Events and Notifications*.

Reporting: Provides all the details on report generation and management of templates, see *Reporting*.

Time window: Provides the time selection window for analysis of historical data.

Settings: In this menu, the different settings of the system can be edited. The settings are split into *Initial setup* and *Advanced setup*.

Login: The Login window allows to log into the system and is explained in *User login*.

Notification panel: Shows the last 30 events, see *Notification panel*.

CHAPTER 4

Initial setup

This chapter provides information about how to get to the initial setup of a running system. The information present in this chapter will guide you through the configuration parameters which are mandatory for running a basic system.

For editing parameters explained within this chapter, you need to click on settings first (1.) and second click on the left menu (2.), which will reveal the different configuration parameters.

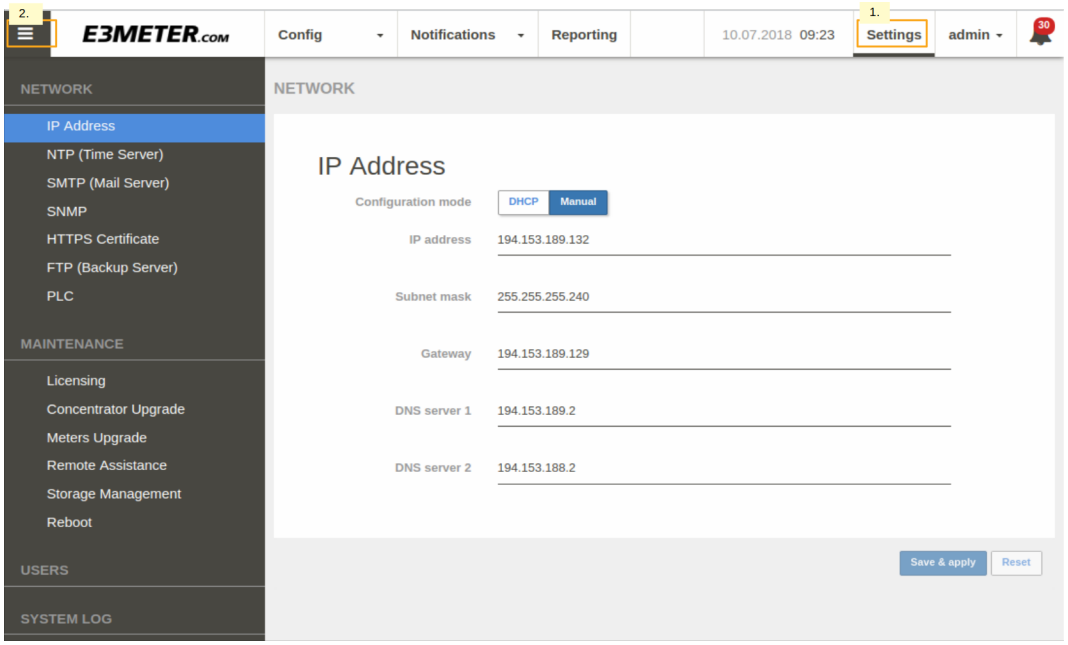


Fig. 1: Steps to follow to access initial setup

Note: The advanced configuration parameters will be shown in the section *Advanced setup*.

4.1 Configure IP address

The IP address Configuration mode of the Data Concentrator can either be configured as DHCP (automatic) or Manual (static).

If the IP address Configuration mode is set to DHCP, the received parameters will be displayed.

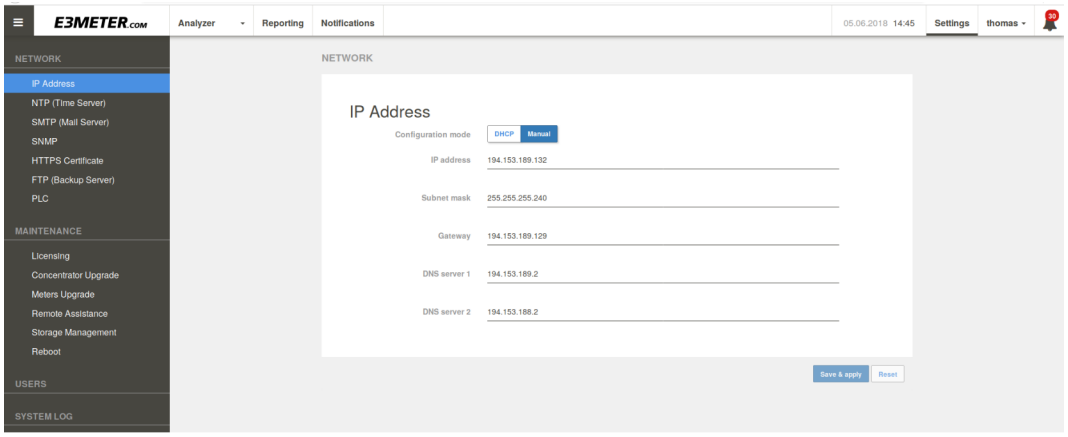


Fig. 2: IP address settings

If the IP address Configuration mode is set to Manual, all the following parameters need to be configured:

- *IP address*
- *Subnet mask*
- *Gateway address (optional)*
- *DNS server 1 (optional)*
- *DNS server 2 (optional)*

Please ask these parameters from your network administrator.

> **Caution:** If no DNS server is configured, as a consequence the host-names won't be resolved and the IP addresses (instead of host-names) need to be entered for NTP (Time Server), FTP (Backup Server), etc...

4.2 Configure NTP (Time Server)

The Data Concentrator uses a global time base (NTP) for the time base of the historical data. Without any valid NTP server, no historic data will be logged. Due to this fact it is recommended to configure multiple NTP servers so that in case one is not reachable the system will be able to switch to another time server. The NTP server can be configured either as url or IP address.

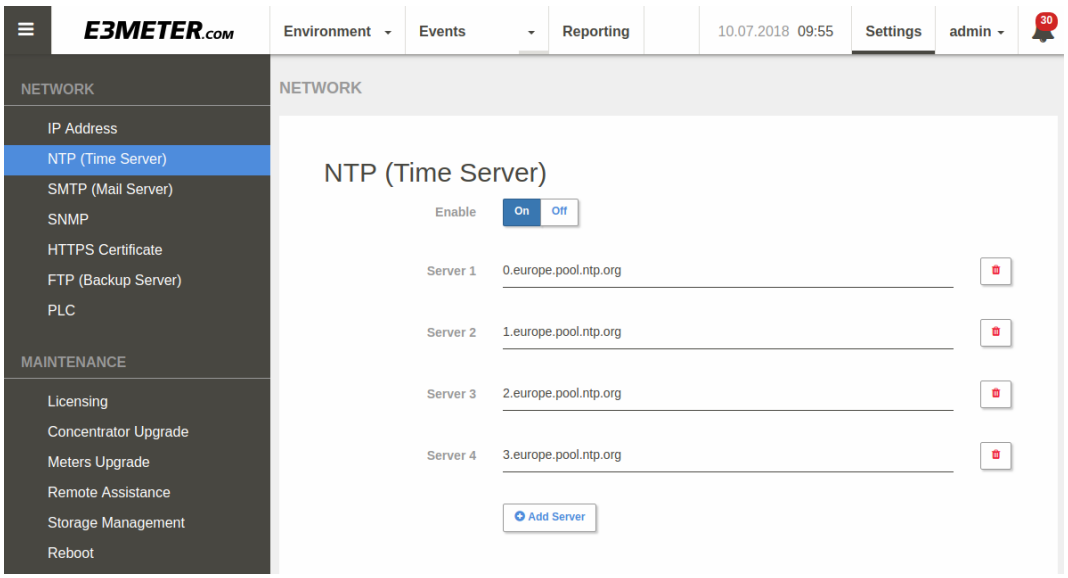


Fig. 3: NTP settings

Important: If the NTP server tick box is selected to be off or none is configured, the Data Concentrator won't store historic data. Only the data currently in the RAM will be shown in the Analyzer window, which is roughly the last 4 hours available in the volatile memory. When installing a Data Concentrator from scratch, ntp servers are pre-configured. Depending on your network infrastructure, these time servers that need to be reached via the internet, might be blocked. In that case, configure your own ntp server, that you can reach based on your network infrastructure.

4.3 Add license

E3METER® devices provide two types of license.

- CAL (Client Access License)
- Feature license

Both types of licenses can be purchased from Riedo Networks Ltd.

4.3.1 CAL

CAL are required, one per meter that is interfaced. CAL license can be purchased for 10, 50 and 100 meters.

4.3.2 Feature license

Feature licenses are available for two different features, Reporting and Alarm.

The Report license allows to generate the reports with the configured templates and get the results.

Note: You can configure the entire Reporting feature to validate the formatting of your report, but the data values in the report will all be zero as long as you have no valid license for *Reporting*.

The Alarm license allows to generate alarms. Without a valid Alarm license, Alarms won't show the detailed information in the notification panel. Furthermore Alarms won't be sent per email neither per SNMP trap without a valid license.

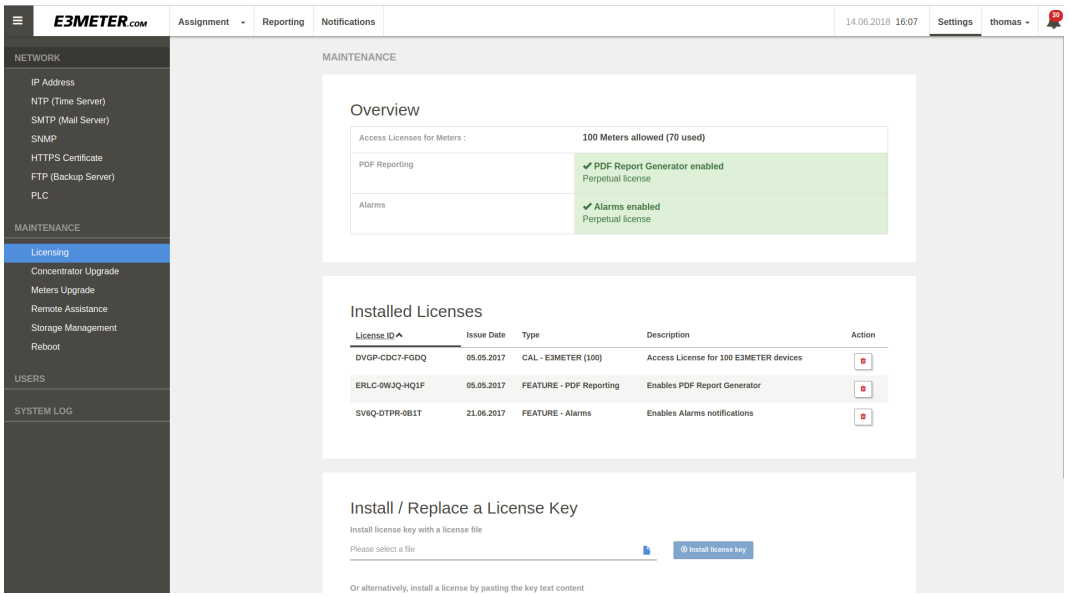


Fig. 4: License management of Data Concentrator

4.4 Firmware upgrade of Data Concentrator

It is possible to either automatically or manually check whether the current firmware is the latest. In the same section the Data Concentrator can be upgraded to a specific revision of the firmware. For a manual check, simply click on the Check for updates now button.

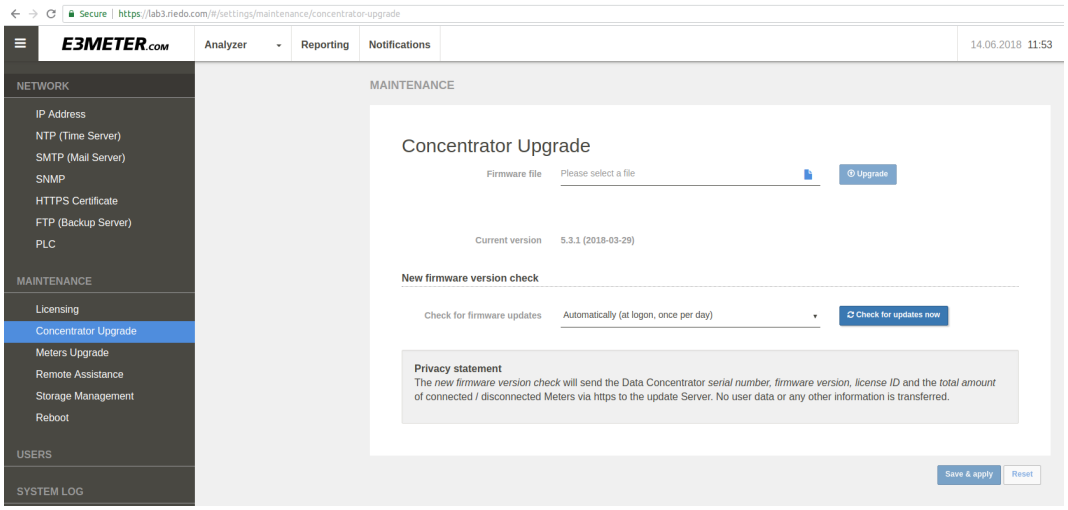


Fig. 5: Firmware upgrade of Concentrator

4.5 Firmware upgrade of Meters

The Data Concentrator provides the functionality to automatically upgrade the Firmware of all paired meters if this functionality is configured. Clicking on the link to *Meters configuration* allows getting an overview of the meters paired to your system with information about each specific meter and the different versions and furthermore whether the Firmware is currently being updated.

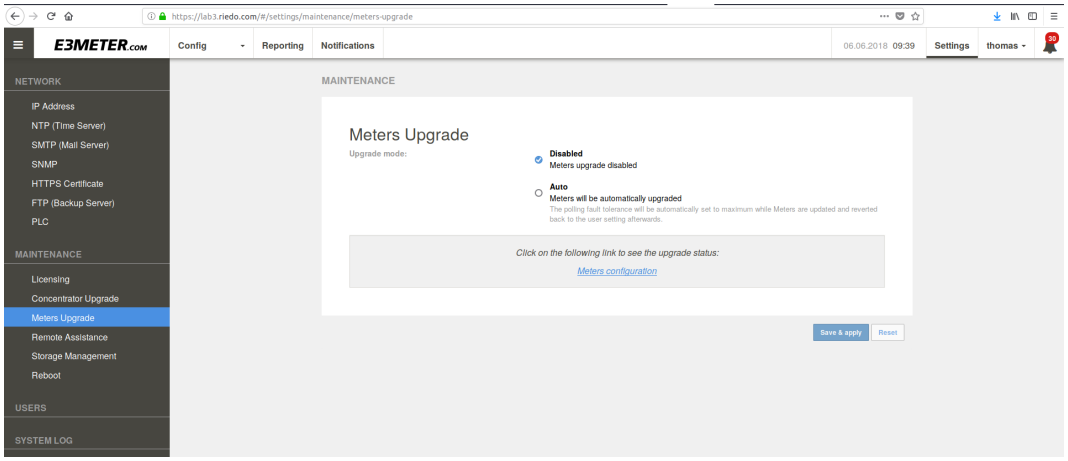


Fig. 6: Firmware upgrade of meters

Attention: It is highly recommended to set the Meters Upgrade to Auto. This functionality will save you a lot of time and assure that the meters firmware is up to date. By upgrading the meters firmware automatically, you benefit from bug fixes and from new features.

4.6 Remote Assistance

The following image indicates, the connection for remote assistance.

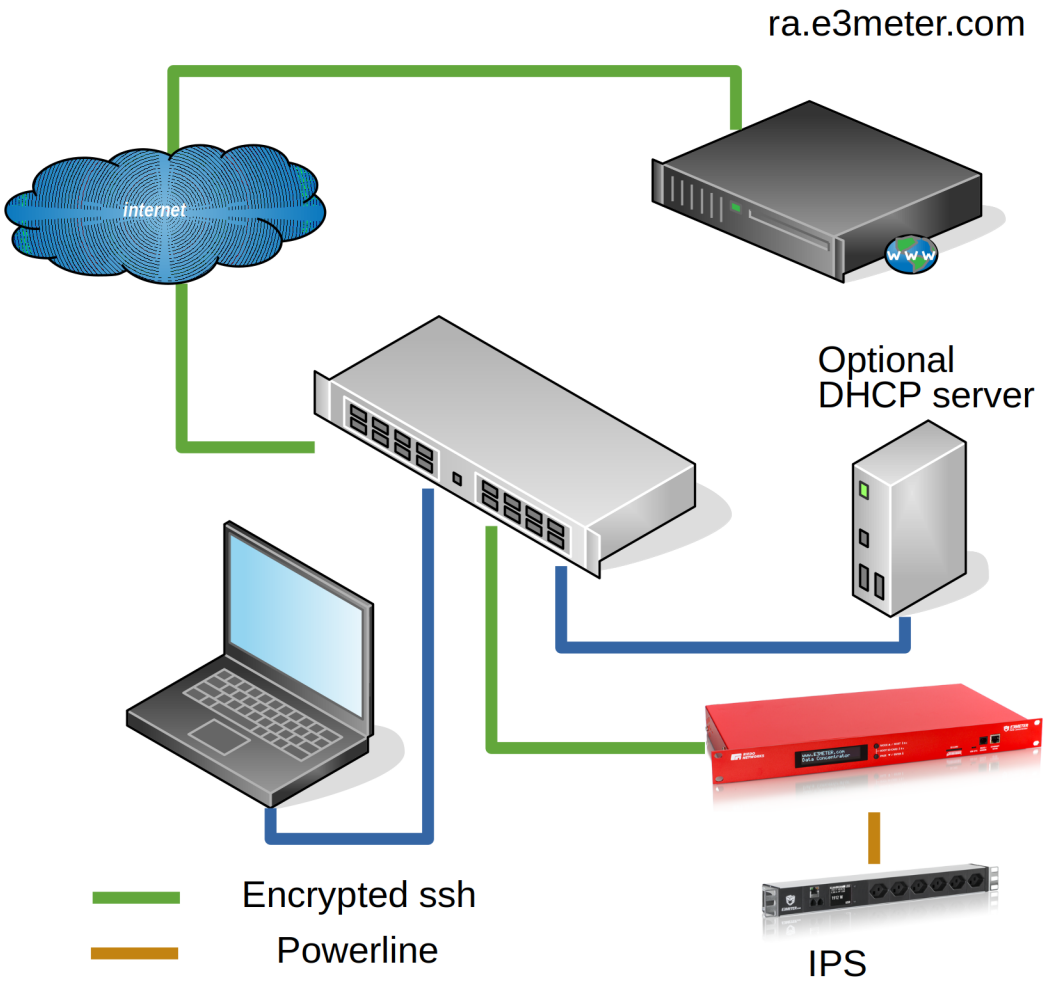


Fig. 7: Secured connection from ra.e3meter.com to the Data Concentrator for remote assistance

It is possible to get remote assistance from Riedo Networks Ltd in case of a problem. The advantage of the remote assistance is that Riedo Networks Ltd can access the Data Concentrator while the latter operates in the normal environment.

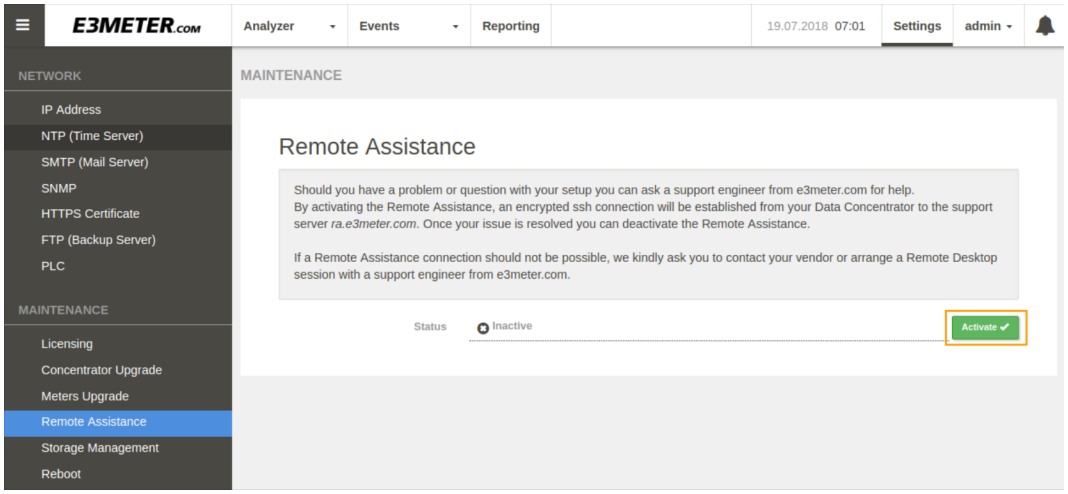


Fig. 8: Activation of remote assistance

For this you have to activate the Remote Assistance option. This allows Riedo Networks Ltd to establish a secure connection over the internet to the Data Concentrator. This will only work if the necessary ports for the secure, encrypted connection are open. If for security reasons opening the access is not possible, the user can provide the logs to Riedo Networks Ltd, see *System Log*.

CHAPTER 5

Adding meters

This chapter explains how to add meters to the system. The concept of the E3METER® consists of meters that are paired to the Data Concentrator. Pairing can be done either manually or automatically. A meter can only be paired to one Data Concentrator.

Note: One or multiple meters can be added. The *Add meter* button is only visible if Auto Admission is not active, see *Configure PLC*.

5.1 Adding IPS

5.1.1 Adding meters automatically

Adding meters with the auto admission method is a convenient method for pairing many meters to a Data Concentrator without having manually to enter their serial number. Automatic admission is enabled as explained in *Configure PLC* with the configuration option *Meters auto admission*.

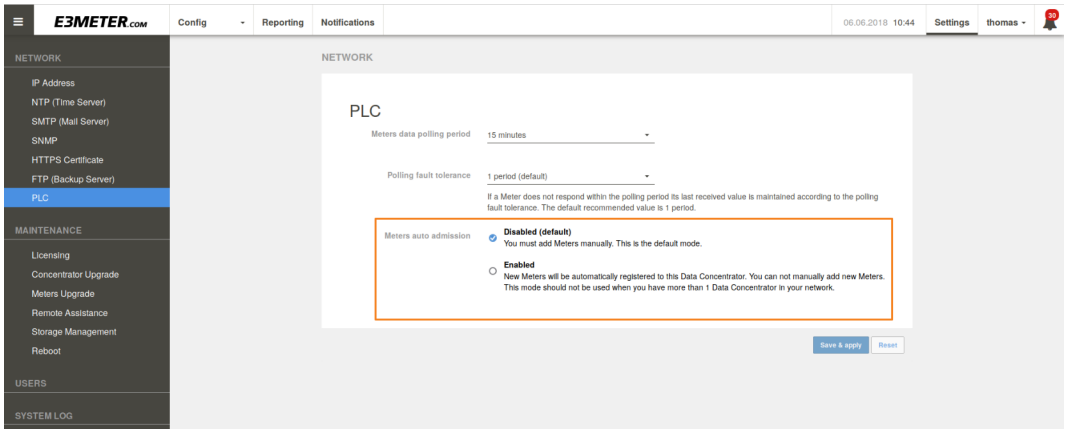


Fig. 1: Adding Meters automatically using Meters auto admission functionality.

Caution: In the case where multiple Data Concentrators are used in the same system, you need to be careful that meters are not automatically added to the wrong Data Concentrator. Therefore it is recommended to disable the *Meters auto admission* function by default and only enable one Data Concentrator within the same system at once for this function, which prevents from adding meters to the wrong Data Concentrator.

5.1.2 Adding meters manually

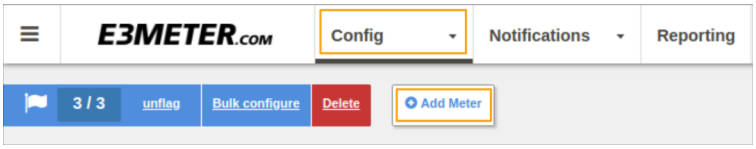


Fig. 2: Select adding meters in the Config page

Via the Config menu you will have the possibility to pair meters manually by clicking on the Add Meter button. This opens up a new window where meters can be added by entering their serial numbers.

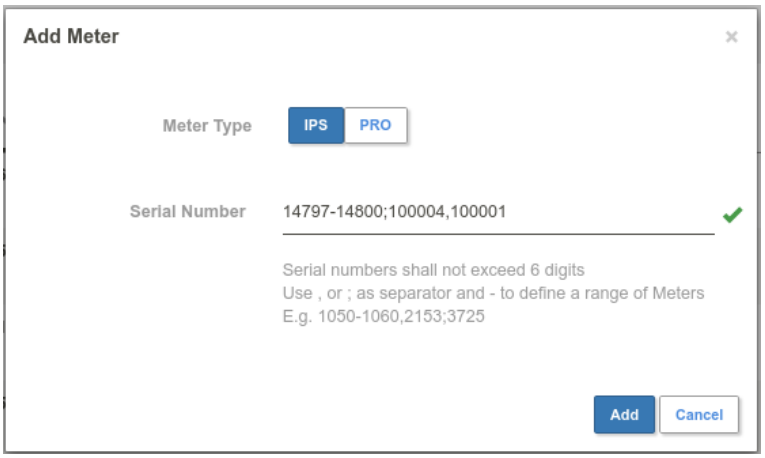


Fig. 3: Adding meters manually by defining serial numbers

If you have multiple meters to be added you can either separate multiple ones with comma ‘,’ or semicolon ‘;’ or define a range of serial numbers with hyphen ‘-‘.

5.2 Adding PRO meters manually

Within this chapter the two methods of adding PRO meters to the E3METER system are explained. All PRO meters use Modbus RTU for communication. Either the PRO meters are connected directly to the CTR using a USB to RS-485 converter or over a Modbus gateway. In the case when interfacing via the gateway, the PRO meters communicate via Modbus RTU to the gateway and the gateway via Modbus TCP to the CTR.

In order to add PRO meters first click to Add Meters and then select PRO as shown in the picture below. Then select the interface and Modbus address to be added.

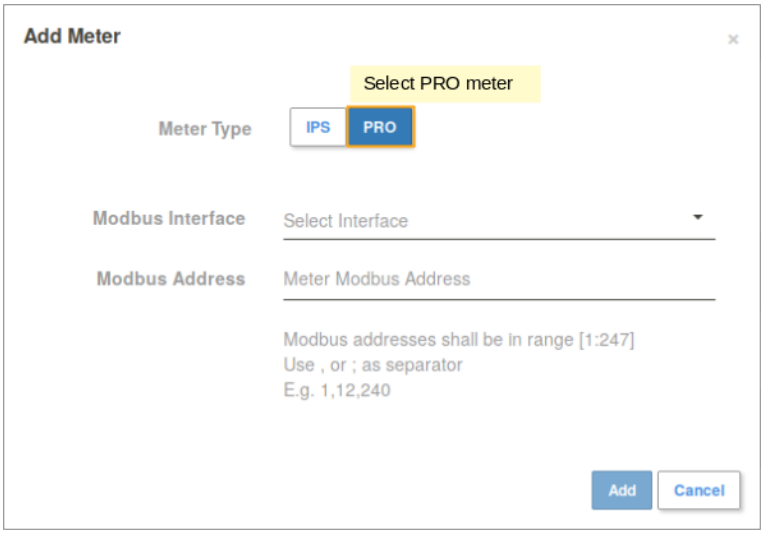


Fig. 4: Select to add PRO meter

Note: PRO meters are delivered with the Modbus address configured as the last 2 digit of their S/N, e.g. Meter with S/N 025715120**98** is configured with Modbus address 98.

5.2.1 USB adapter

In the Data Concentrator installation guide, information is provided about how to connect the USB to RS-485 converter RN1079. If more than one converter need to be connected to the Data Concentrator it is required to connect a USB hub to the USB OTG connector and connect the multiple converters to the hub.

The PRO meters have to be connected on the USB adapter A to A (pin 22), B to B (pin 23). The hardware connection diagram is shown here below.

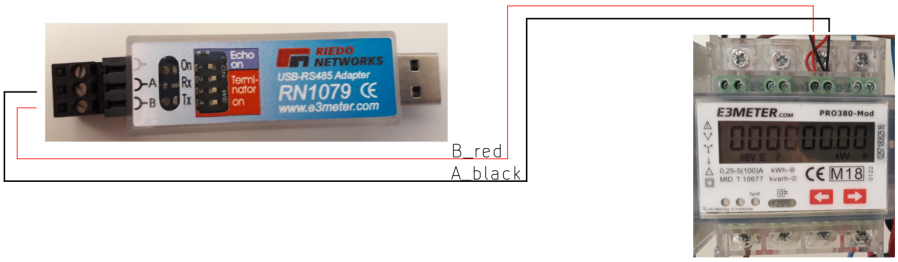


Fig. 5: PRO meter connection per USB adapter on CTR

5.2.2 Modbus TCP/RTU gateway

For the gateway connection with the Moxa MB3180 the PRO meters have to be connected on the Modbus RTU side R+ (pin 3) to A (pin 22), R- (pin 4) to B (pin 23). The hardware connection diagram is shown here below.

Fig. 6: PRO meter connection via gateway

Note: We currently only support Moxa MB3180 as a Modbus TCP/RTU gateway.

CHAPTER 6

Data Concentrator pages

The Data Concentrator pages provide information about the meter's data values and allow configuring system parameters. Depending on the section that is selected within the Monitoring Software, different visualization or configuration options are shown.

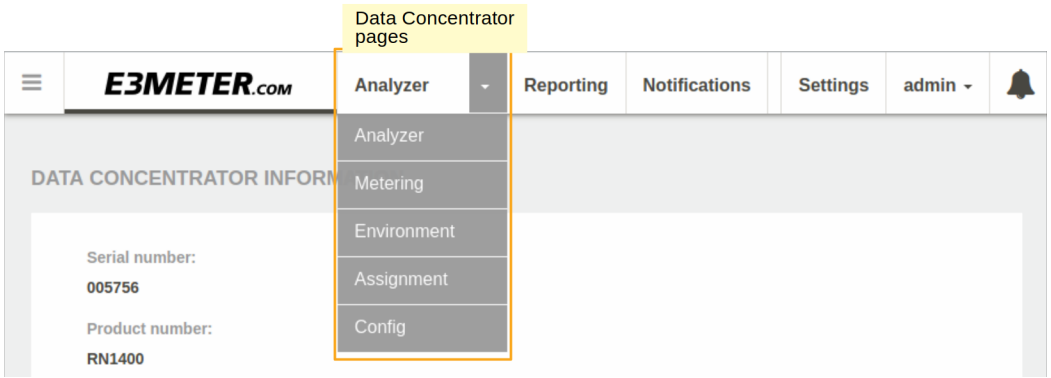


Fig. 1: Data Concentrator pages menu showing the different available pages

6.1 Visualization and configuration features

The following section explains the main features of the web page for visualization of data and configuration of the system.

6.1.1 Groups

Meters can be grouped based on different Categories and Groups. Categories contain Groups and Groups contain meters. One meter can only be part of one Group, one Group can only be part of one Category.

Fig. 2: Menu icon

Groups are accessed by clicking on the Menu icon and visible on the left panel of your web browser as shown in the picture below.

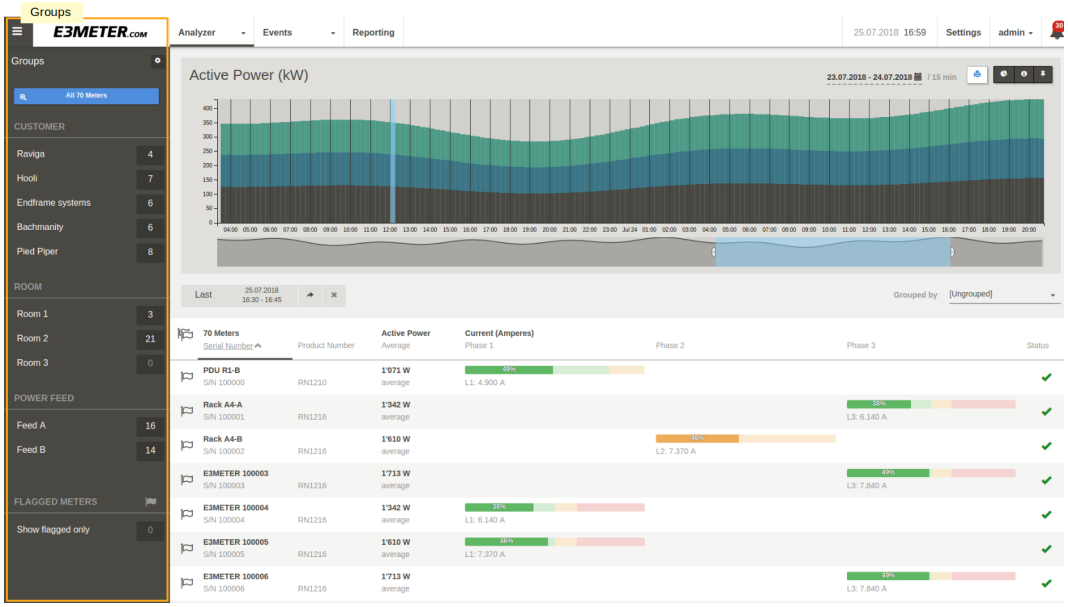


Fig. 3: Groups are shown on the left of the browser window

6.1.1.1 Edit groups

Note: When you configure a Data Concentrator from scratch, there are no categories defined. After adding new groups they are empty as well. Assigning meters to categories and groups needs to be done in the *Assignment* section.

Groups can be edited by clicking on the software setting symbol , which will open the following menu.

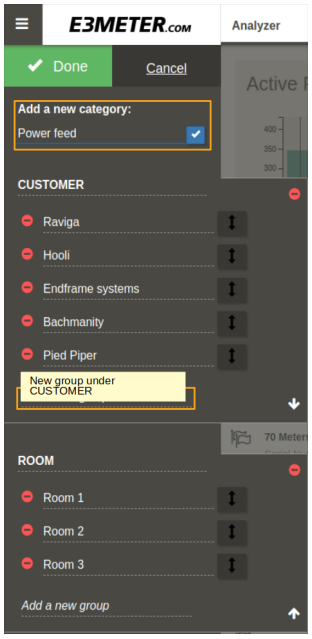


Fig. 4: *Edit groups* window

In the *Edit groups* window shown here above, we can see a configured category *Customer* with the different groups *Hooli*, *Raviga* and so on.

Within the *Edit groups* window it is possible to:

- Add a category/group
- Rename category/group
- Reorganize the position of category/group
- Delete category/group

Add is done by entering the new information in the *Add a new category* respectively *Add a new group* field. You confirm your entry either with *Return* on your keyboard or by clicking on the CONFIRM symbol.

Rename is done by clicking on existing names and edit them.

Reorganize is done with the arrow symbols. Categories are moved either with the UP or DOWN arrow symbol. Groups instead are moved by drag and drop of the UP-DOWN arrow symbol.

Delete is done by clicking on the MINUS symbol, which is possible for both category and group.

Changes are saved by clicking on the Done button. Changes can be canceled by clicking on the Cancel button. The following picture shows the result after adding a category Floor with three groups.

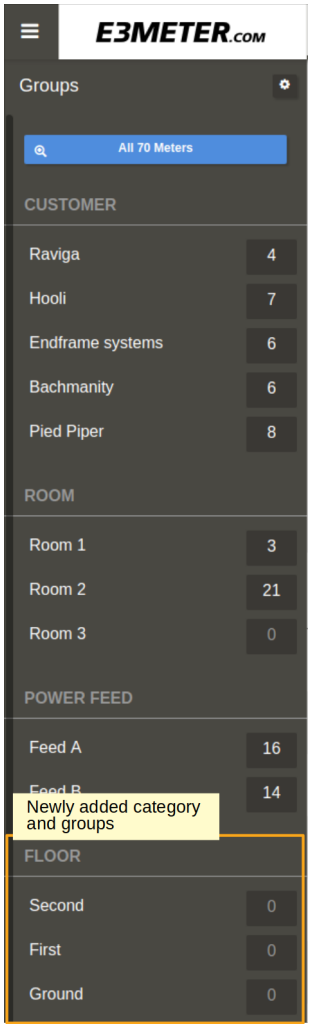


Fig. 5: Resulting window after having made changes in *Groups edit* window

6.1.1.2 Flags

Flags are a handy method for selecting individual meters. In the list of meters, there is a flag symbol for each individual meter. By clicking on the flag, the corresponding meter is flagged and indicated with the flag filled with blue color . An active flag can be removed by clicking on the flag symbol resulting in a non-filled flag . The picture below shows an example with three meters that have been flagged.

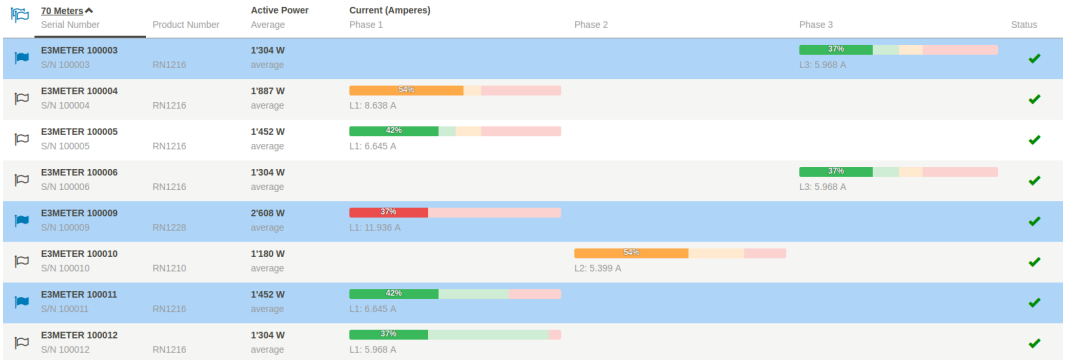


Fig. 6: Defining flags to meters

6.1.1.3 Group selection

Single or multiple groups can be selected thus reducing the number of meters to be shown for data visualization and configuration. The selection is done by clicking on one or multiple groups which adds them to the selection, respectively removes them from the selection if previously already selected. After applying changes to the group selection, the data shown is a subset of the overall data. In the following example only the 7 meters assigned to the *Hooli* group are shown.

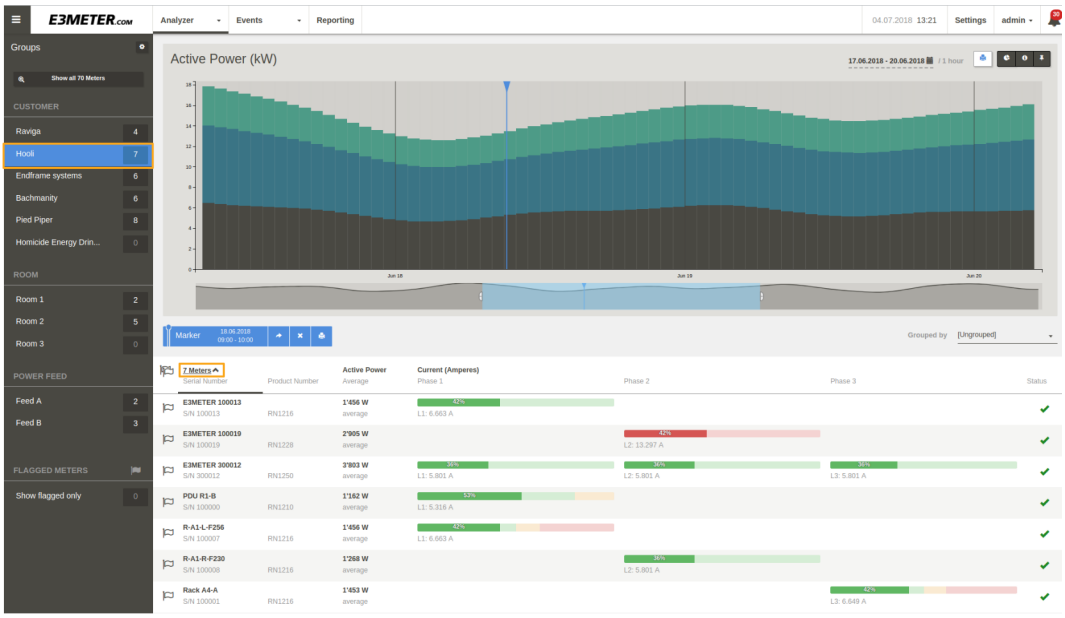


Fig. 7: Group selection with customer group *Hooli*

The group selection can also be based on flagged meters. For this, you need to select *Show flagged only*. Next, to this group selection option, the number of flagged meters is indicated.

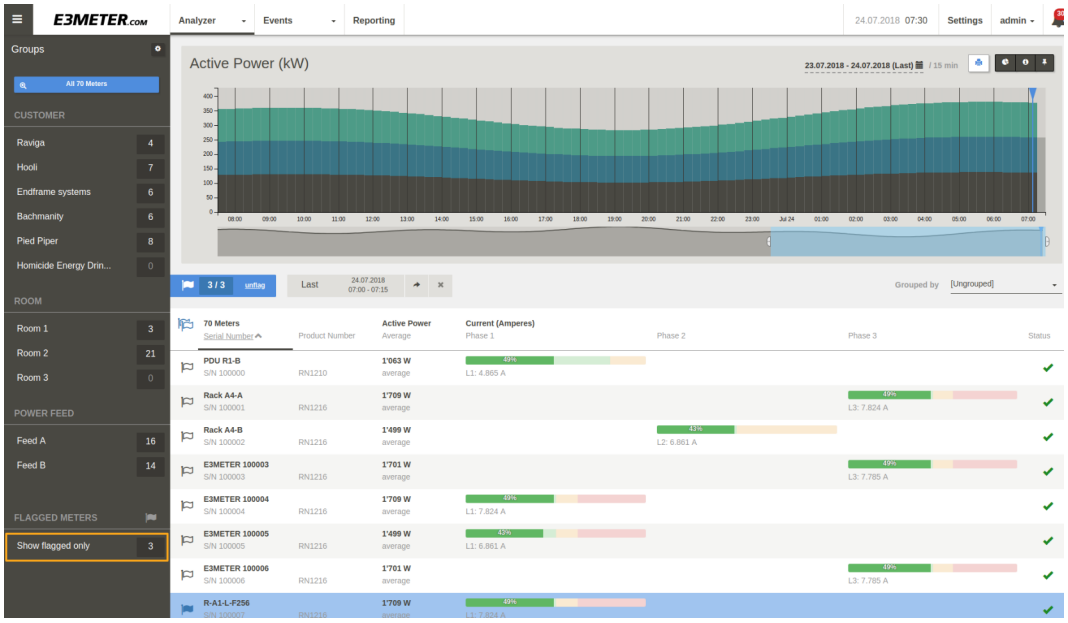


Fig. 8: Group selection for *Show flagged only*.

Attention: If clicking on the *Show flagged only* group selection, **only** the flagged meters are shown. All previously selected groups will be removed in the Groups menu.

Once the flagged meters are selected, the group entry for the flagged meters changes to *Toggle flagged only*. By clicking on it, the flagged meters will be removed from the group selection and the still active group selection will be shown.

Flagged meters and group selection can be combined. On top of the meter information window the number of flagged meters that are selected over the total of flagged meters are explained.

6.1.1.4 Grouped by

Within the Data Concentrator pages, it is possible to group meters by category. By clicking on the *Grouped by* button this will group the meters based on the selected group. For instance, they can be grouped by the customer as indicated in the picture shown below. First, all meters from customer *Raviga* are shown, second meters from customer *Hooli* and so on.

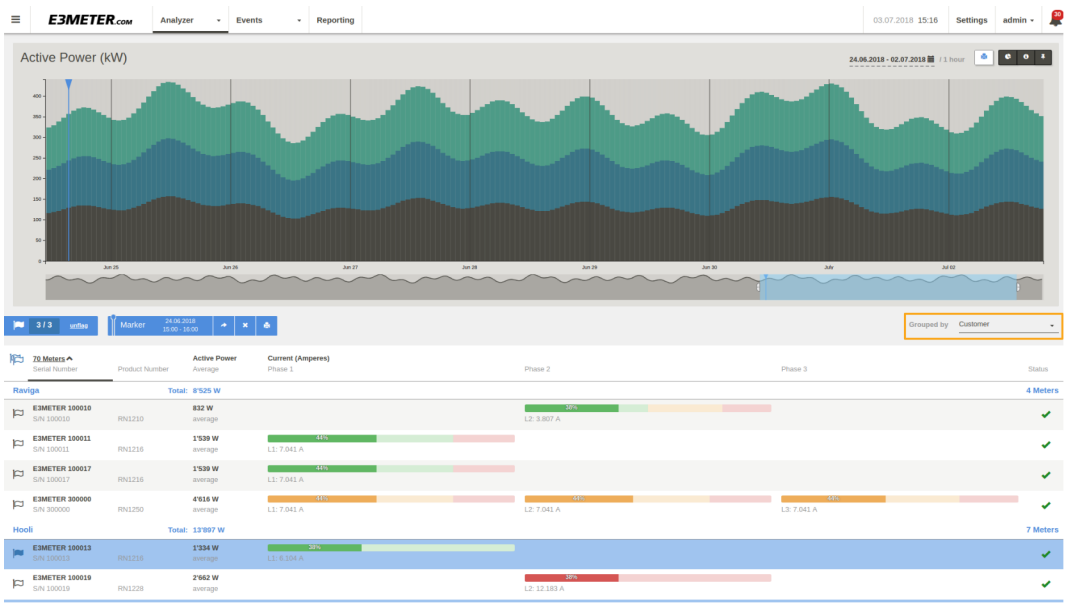


Fig. 9: Meters grouped by customer

6.1.2 Bar chart

In the bar chart, each bar indicates the power or energy measured per phase with a different color per phase.

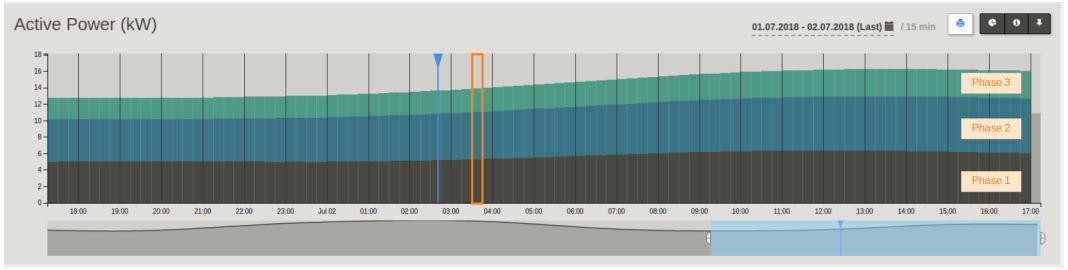


Fig. 10: Bar chart with bars indicating the measured values

6.1.3 Tooltip value

The tooltip value shows the value of the bar that you are currently pointing over in the bar chart. The tooltip value can be activated or deactivated by clicking on the info icon symbol in the Graph elements.

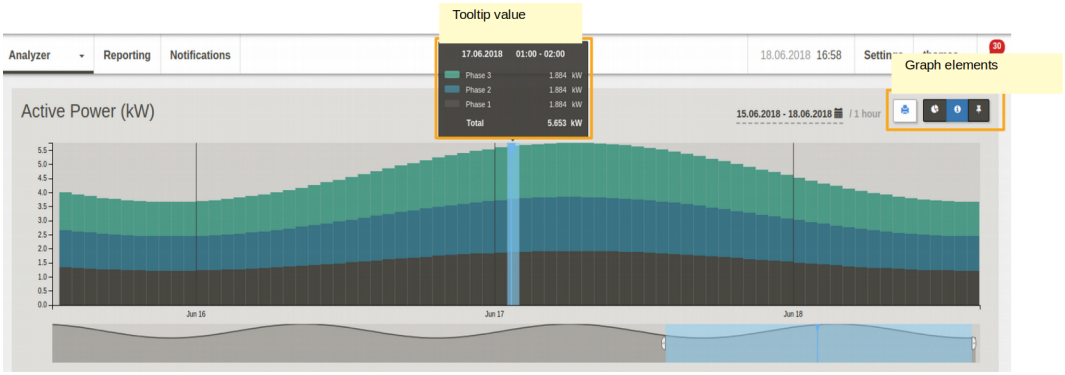


Fig. 11: Tooltip value

6.1.4 Marker

By clicking on the bar chart you activate the marker which provides the values for a specific time period of the historical data. The time period shown is based on the data polling period, see *Configure PLC* for how to configure the data polling period. In order to visualize a different time period, you can click on the bar chart which repositions the marker.

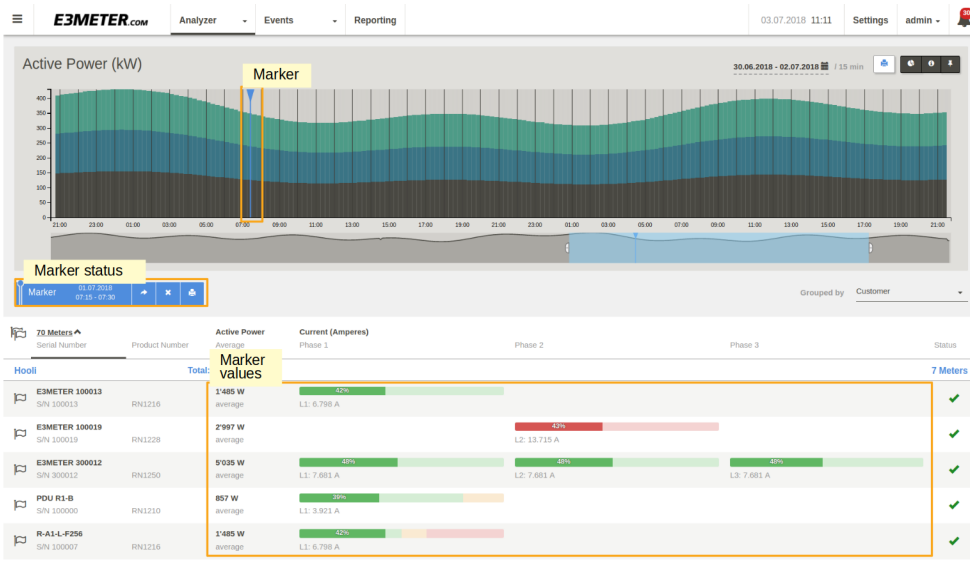


Fig. 12: Meter values corresponding to the marker position.

The marker status bar shows the time period to which the marker is associated and allows to do some operations. Clicking on the little arrow symbol pointing towards the right makes jump the marker to the middle of the bar chart window. Clicking on the x icon symbol will move the marker to the last received value. The printer icon will open up an export window for the marker data. Information about how to generate reports is explained in section *Reporting*.

Note: Currently the printer icon is not available for the last received value.

6.1.5 Phase Balance viewer

The phase balance viewer provides the active power per phase for all selected meters over the specified time interval. The phase balance is expressed as a ratio of the phase power divided by the sum of the power of all three phases in percent (%). This value is expressed for the time period selected in the bar chart. If the time selection is changed, the phase balance values are recalculated. The phase balance viewer can be activated or removed by clicking on the pie chart symbol within the Graph elements. By clicking on a phase in the phase balance viewer, the corresponding phase is shown or hidden in the bar chart.

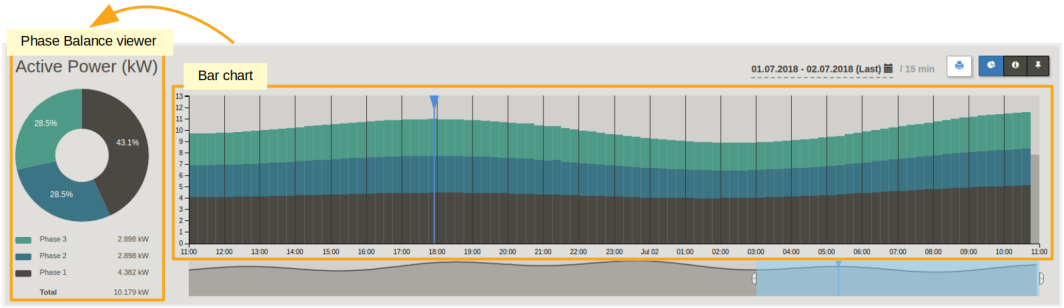


Fig. 13: Phase balance viewer and associated data

6.1.6 Navigation in time

When accessing historical data, one important element is the navigation in the time base. Multiple ways are possible depending on the user interface selected. The different options are explained more in detail in the following sections.

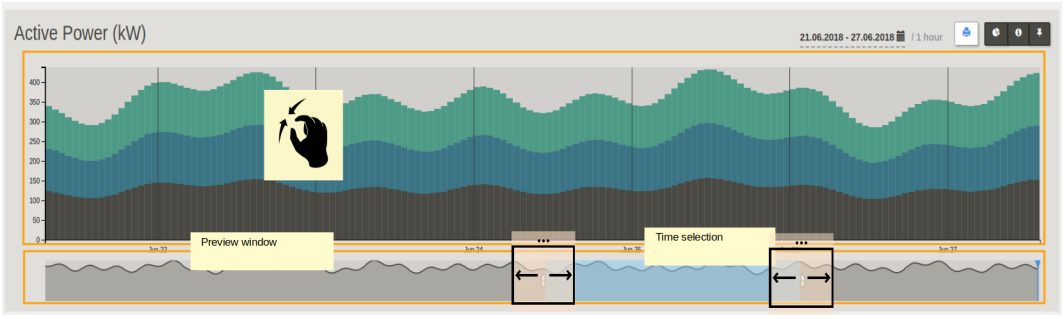


Fig. 14: Bar chart with navigation possibilities.

6.1.6.1 User interface

Navigation is achieved both by mouse interface or with touch gestures. In the table below you find an overview of the different functions and their respective user interface.

Function	Mouse interface	Touch gestures
Navigate in time with zoom through bar chart	Scroll mouse wheel	Pinch / spread
Navigate in time by sliding bar chart	Click and hold to move the bar chart right and left	Select and slide bar chart right and left
Navigate in time with time selection window	Click and move border(s) of time selection window	Select and Pan
Move around time selection window	Select the time selection window and and move it around	Select time selection window and Pan

6.1.6.2 Navigation in bar chart

As a first option for navigation in time, the time base can be squeezed or extended within the bar chart. This can be achieved either with the mouse or with touch gestures. Scrolling with the mouse wheel for the mouse interface, respectively pinching and spreading for the touch interface. While acting on the time base, the result is updated in the preview window accordingly. The portion of historical data shown in the bar chart is shown in the preview window.

6.1.6.3 Navigation in preview window

As a second option for navigation in time, the time selection window can be moved around within the preview window. This is achieved by moving around the entire time selection window towards the left for older data values or towards the right for newer data values. Furthermore, you can define the start and stop of the time shown in the bar chart by moving the left and right extremity of this time selection.

Fig. 15: Time selection within the preview window.

6.1.6.4 Time selection

As a third option for navigation in time, you have the possibility to click on the time selection at the top right of the bar chart and enter the time of interest for the start and stop as shown in the picture below. The basic usage is to click once on the calendar to select the start date and click a second time to select the stop date. When clicking twice on the same date, this date is selected to be shown. When clicking on a month the selection start is from the first of the month to the last day of the month available in the historical data. Dates can be entered by inserting a start date manually e.g. 1.1.2016 and 30.05.2018 on the top of the time selection window. The shortcuts on the right of the time selection window allow to select in a convenient way the predefined time periods. Once the date is selected you need to click on Apply

, and the data indicated on the bar chart will be recalculated accordingly.

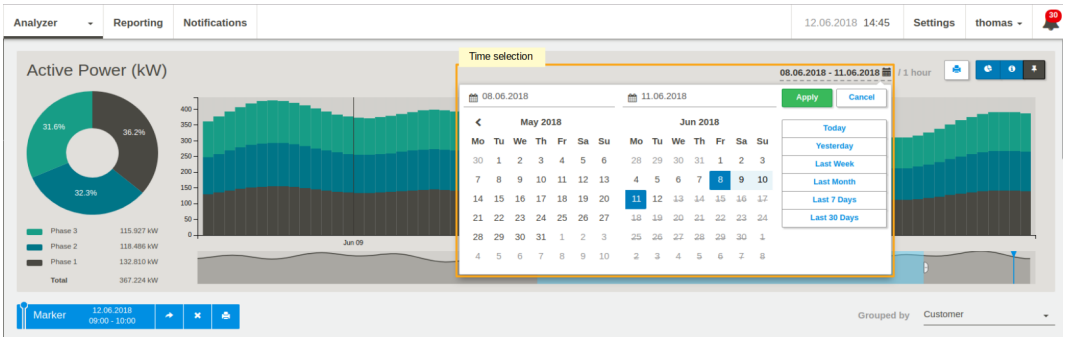


Fig. 16: Time selection

Note: Navigation in historical data can take some processing time because the Data Concentrator needs to load the selected data from the internal storage.

6.2 Analyzer

The Analyzer page main usage is for capacity management of your system. It shows the Active Power and phase current(s) of the meters over the selected time interval. This page allows you to analyze the power and current as well as the phase balance. For a specific rack with a maximum allowed power rating it is important to know the current situation and whether there is still some margin.

Power measured is the average (RMS) Active Power. By clicking on the horizontal bargraph of the current, the thresholds for the Alarms can directly be configured. More details about Alarm configuration are explained in the *Alarms* section.

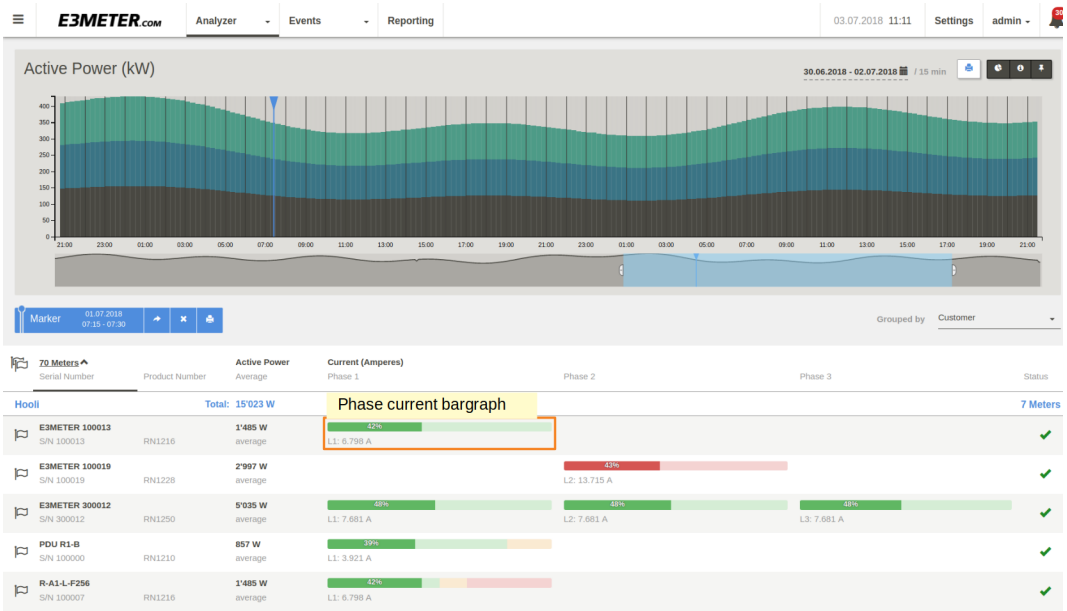


Fig. 17: Bargraph showing value of current and the alarm thresholds

All information that is visualized can be exported. For more information consult the *Report-*

ing section.

6.2.1 Residual Current Monitoring

For selected meters with Residual Current Monitoring feature (RCM), their peak residual current values both for DC and AC RMS are shown underneath the bar chart. The residual current monitoring indicates whether there is a leakage current between the supply and the return. The thresholds are fix values and set to 6mA DC and 30mA AC RMS. If the residual current monitoring exceeds these values an alarm is generated which is shown both on the *Notification panel* and the *Event viewer*.

The information of the Residual Current Monitoring is also retrievable via SNMP as explained under *Accessing data per SNMP*, this information field was added to the MIB starting from software version 5.5.

Below an example of RCM is shown with the value shown underneath the bar graph, the event in the Notification panel as well as the event in the Event viewer.

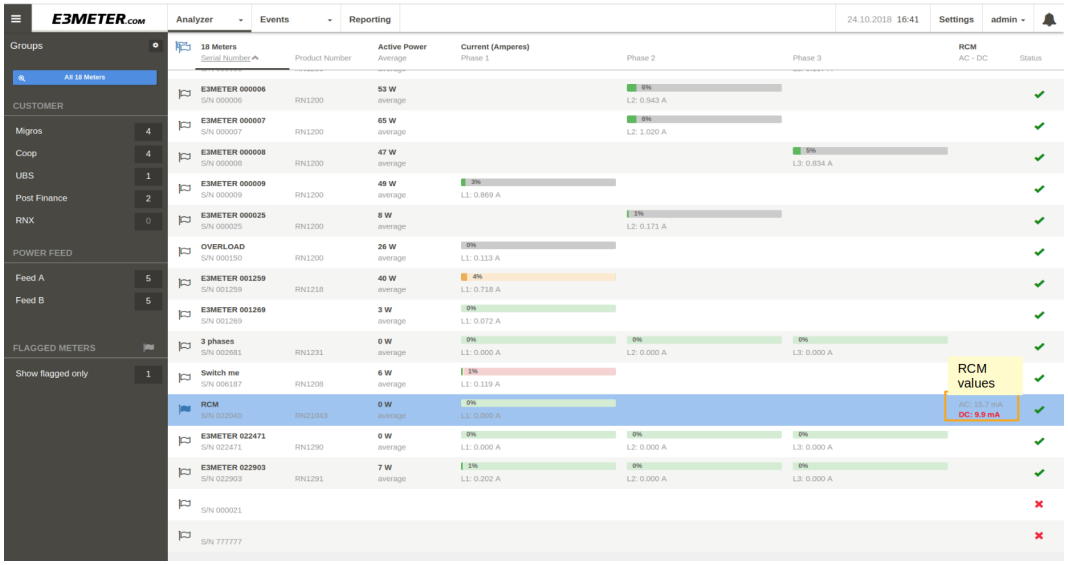


Fig. 18: RCM values underneath bar graph

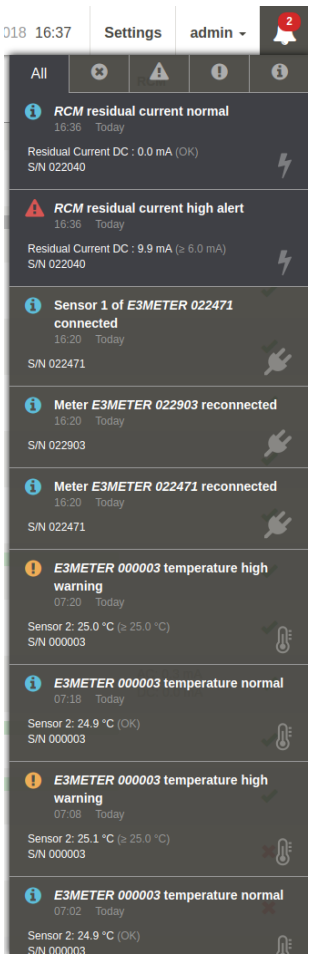


Fig. 19: Notification of RCM alarm message

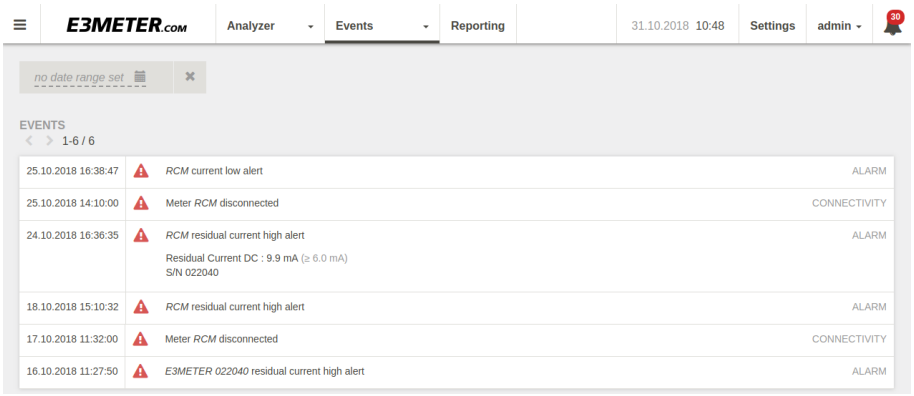


Fig. 20: RCM current high alert as seen in Event Viewer

6.3 Metering

The Metering page provides an overview of the total Active Energy, Reactive Energy (L) and Reactive Energy (C). The Energy shown is the total of the Energy consumed since the meter has been installed and up to the time selected. The phase balance viewer is useful in terms of analyzing the energy consumption per phase.

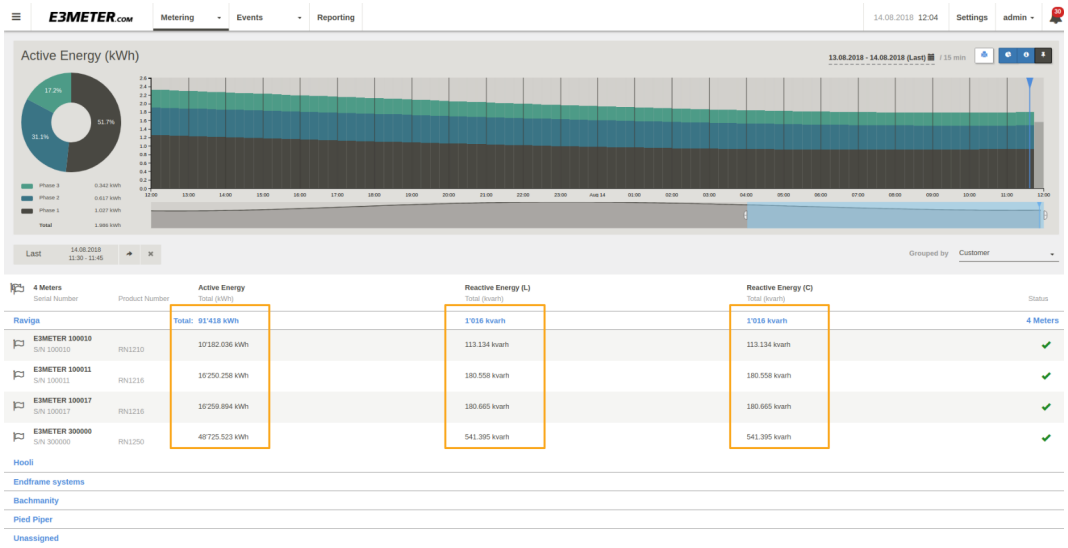


Fig. 21: Metering showing the energy consumption for the selected meters

With metering it is possible to bill the corresponding amount of energy to each specific customer.

Note: For PRO meters only the active Energy is available within the Data Concentrator software.

6.4 Environment

The Environment page provides an overview of the environmental data which are temperature and relative humidity per meter. In the preview window the temperatures maximum and minimum are shown for the selected meters. As a result the temperature minimum and maximum envelope is shown. Underneath the diagram for each meter the calculated average values for the defined period are shown both for temperature and relative humidity. By clicking on horizontal bargraph of the temperature or relative humidity, the thresholds for the Alarms can directly be configured. More details about Alarm configuration are explained in the *Alarms* section.

The analysis of the temperature envelope is useful in terms of safety, since the difference between the indicated minimum an maximum values compared with the thresholds, shows the margin in terms of the temperature.

Fig. 22: Environment showing maximum and minimum temperatures for selected meters and the corresponding average values of the meters in the selected time frame

Within the temperature envelope curve, a color code is used. In case two or more sensors are selected, light blue is the indication for the maximum and minimum of only one sensor, dark blue for the remaining sensors.

Note: In case there is only one single temperature sensor selected, the envelope is indicated in dark blue.

Attention: It is not possible to visualize a graph of the relative humidity. Only the computed average values per sensor are indicated in the bar graph.

6.5 Assignment

The Assignment page shows the assignment of meters to the categories and groups. Here it is also possible to edit the assignment for each individual meter.

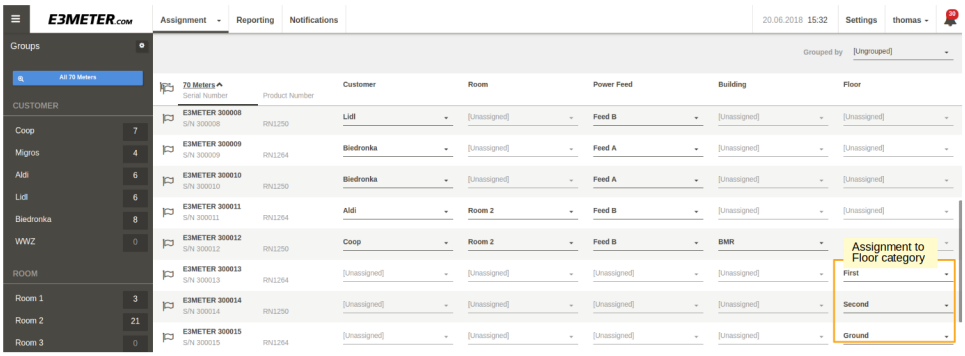


Fig. 23: Assigning meters to exemplary category *Floor*

This assignment is shown in the *Groups* menu where it can be used to create a group selection according to Group information.

It is possible to assign multiple meters at once. For detailed information please consult *Bulk Assignment*.

6.6 Configuration

Under the Config page, the status of each meter is indicated with the detailed information. More importantly in the Config page, it is possible to delete specific sensors, set relay status and assign the phase for the measurement. For a mono-phase meter, it is possible to configure which phase it is connected to (L1, L2 or L3).

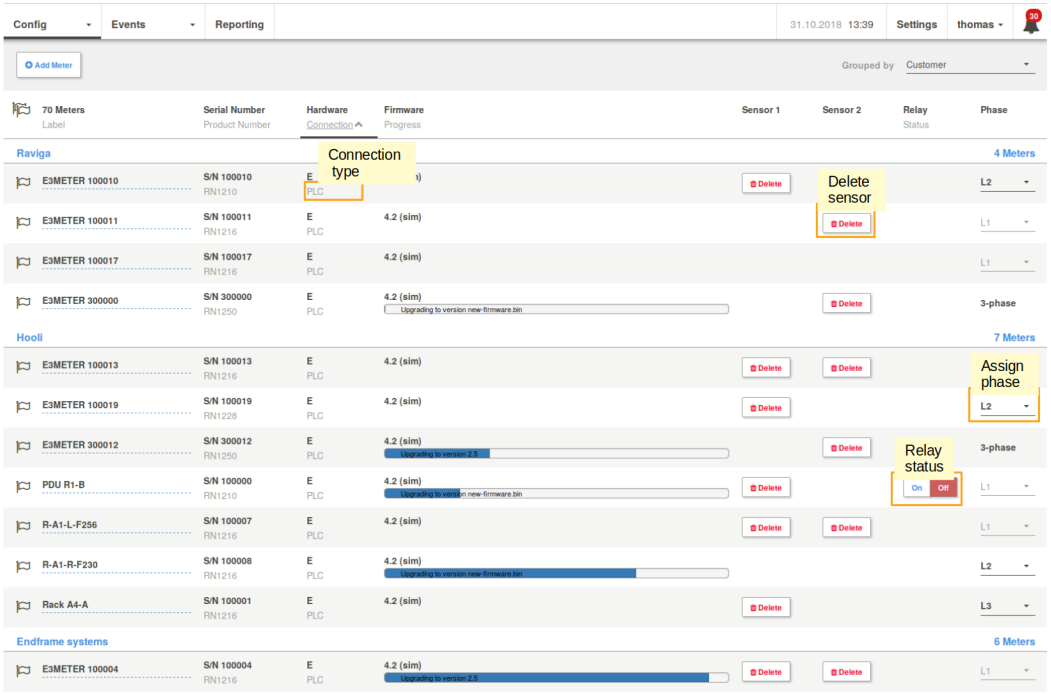


Fig. 24: Configuration of meters

Hint: When removing a sensor from a meter, the system generates an event. Under the Config page, you have the possibility to delete a specific sensor which has the effect that no event will be generated if this specific sensor is removed from the meter. This method allows removing intentionally a sensor and not generating an event, whereas a broken sensor connection to the meter will be signaled with an event.

It is possible to configure multiple meters at once. For detailed information please consult *Bulk Configuration*.

In the configuration page under the Hardware column, starting with software version 5.5, the Connection information was added which indicates how a meter is connected to the Data Concentrator. A meter can be connected either via PLC, Ethernet or Modbus physical connection where the latter is only possible for PRO meters.

Note: In the case of Modbus connection we have the information #01:006 for example. Where the first 2 digits after the '#' indicate the Modbus interface as explained under *Modbus TCP/RTU gateway*. The 3 digits after the ':' indicate the Modbus address. This is indicated in the picture shown here below.

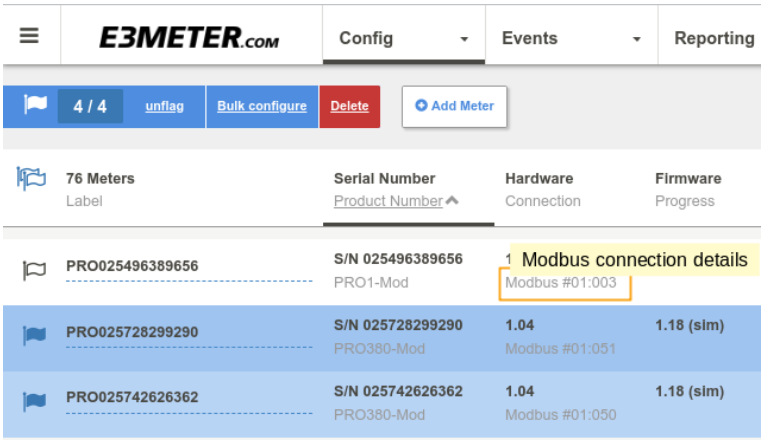


Fig. 25: Modbus Connection information shown under the configuration page

6.7 Alarms

Alarms are configured under the Analyzer or Environment page within the bar graph by clicking on it. You will find detail information about Alarm configuration in the *Alarms* chapter.

CHAPTER 7

Reporting

The Reporting feature allows generating customized reports as PDF or CSV export, based on the recorded values of the meters. Information about energy consumption, peak power and other parameters will be reported over a user specified time interval.

This concept is shown in the picture below.

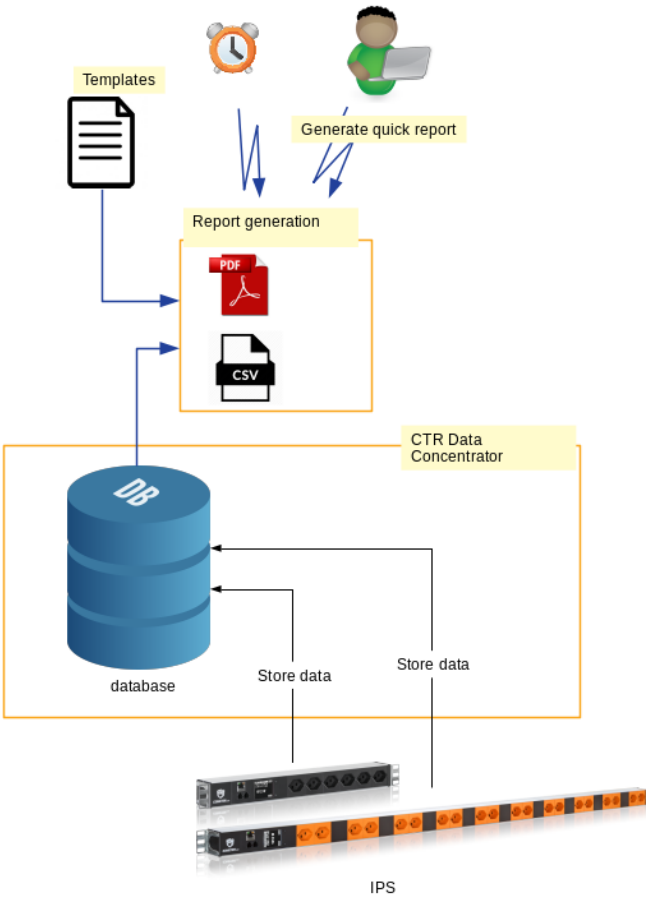


Fig. 1: Reporting concept showing the data flow

Other than scheduled reports, a user can generate a quick report. When the report is scheduled, the CSV export or the PDF output is sent automatically to the defined mailing list and / or FTP server.

7.1 Generating Quick reports

In the *Analyzer*, *Metering* and *Environment* pages *quick reports* can easily be generated. Below is explained how go generate a quick report for data of the displayed time period and marker data.

- Quick report of the data corresponding to the displayed time period in the graph
  1. Click on the printer button on top of the bar chart
  2. In the opened window chose a template
  3. The report can be previewed or directly downloaded
- Quick report of the data corresponding to the marker position
  1. Place the marker
  2. Click on the printer button on top of the meters list
  3. In the opened window chose a template

4. The report can be previewed or directly downloaded

Note: The Quick reports contain all the visible meters (i.e. Group filters are taken into account).

7.2 Templates

All the existing templates are listed in the Templates window. You can copy, edit or delete PDF templates.

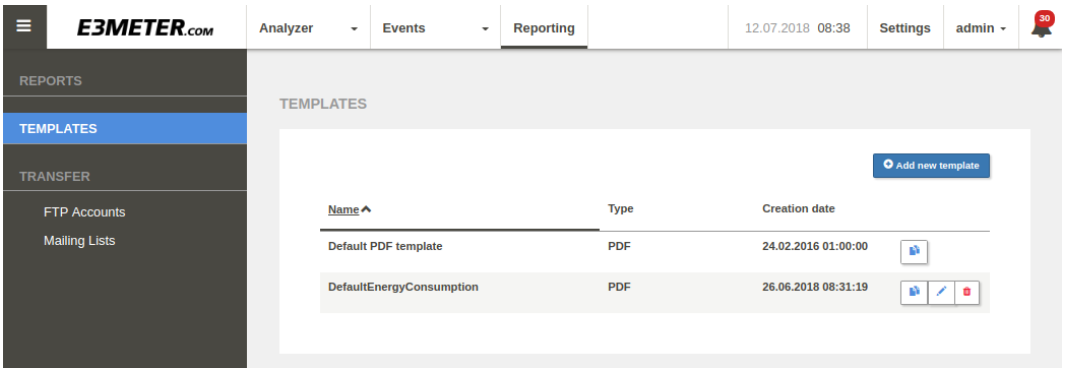


Fig. 2: Templates window

When you click either on Add new template or edit for an existing template the template editor will open which will look as in the image shown below.

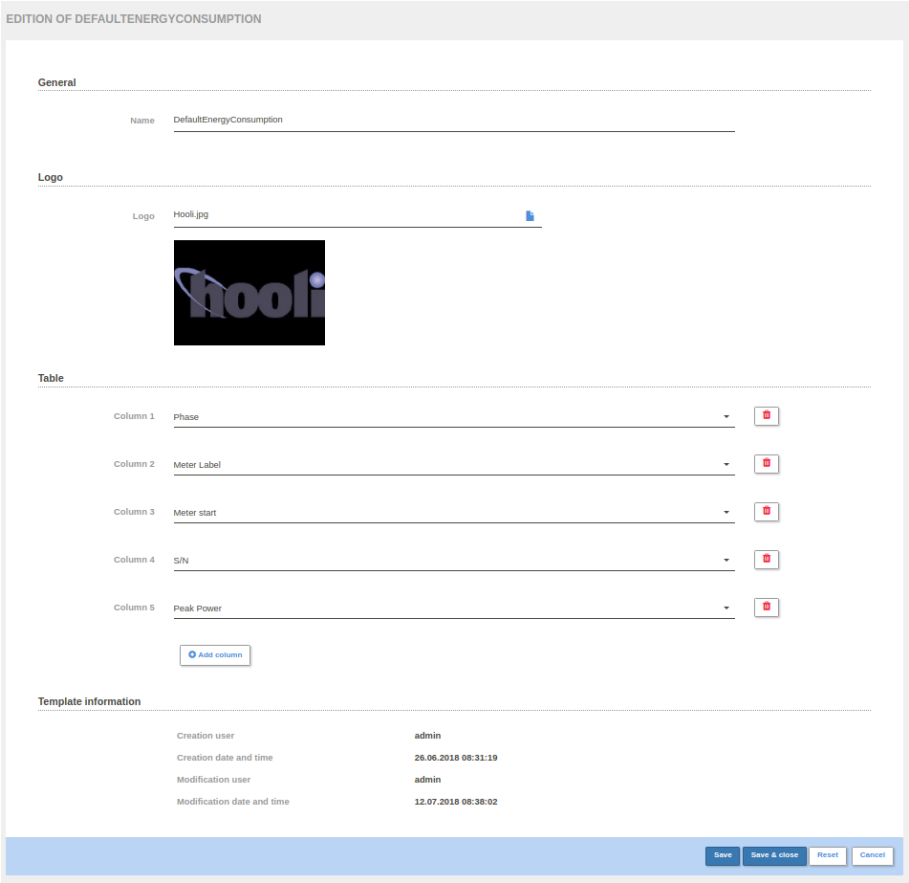


Fig. 3: Edit of a template for PDF report

The template editor allows adding new customized PDF templates with:

- Uploading a custom logo (.jpg or .jpeg format)
- Selecting the columns of the template report

Note: CSV export provides all available fields. The CSV template can't be customized.

7.3 Transfer

Within Transfer all FTP accounts and mailing lists are available. It is possible to add, edit and remove FTP accounts and mailing lists.

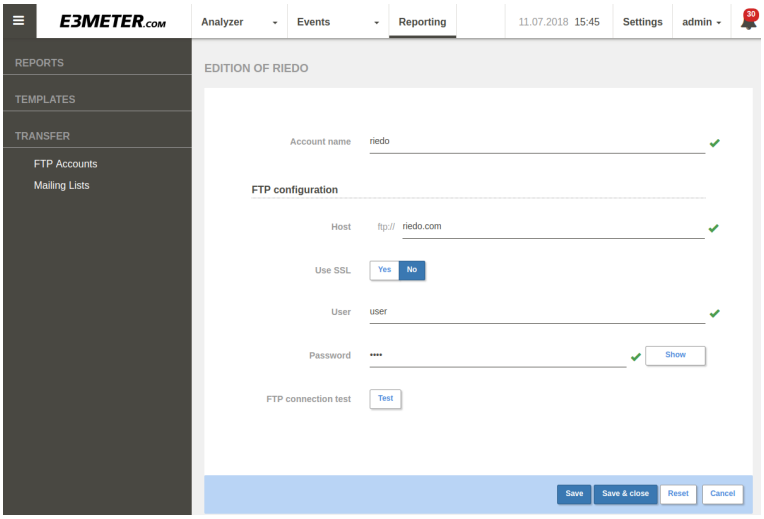


Fig. 4: Configuration of FTP account

Note: Only one single FTP account can be added.

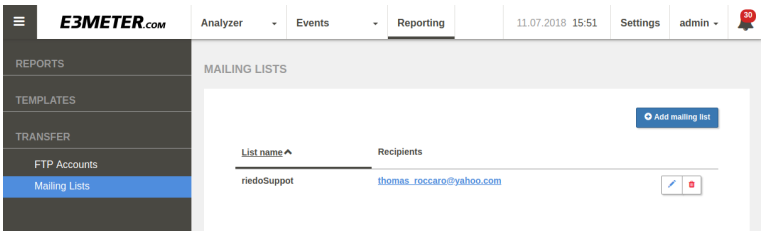


Fig. 5: Configuration of mailing list

Note: A mailing list can contain one or several email addresses.

The mailing list is accessed either by clicking on **Add Mailing list** or clicking on the edit symbol of the mailing list that will be edited.

In the opened edit window for the mail list you have to enter the individual email address(es) for your mailing list.

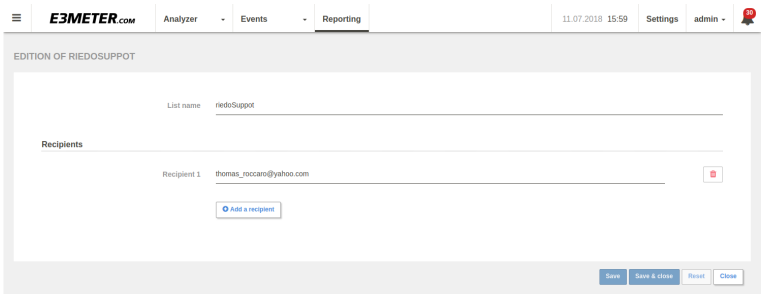


Fig. 6: Edit email parameters for a new email list.

7.4 Reports

All the existing reports are listed in the Reports window and their status is shown in the column **Enabled**. You can add new reports, preview, copy, edit or remove reports. When adding a new report, you have to fill in the Report settings and the Report contents. In the Report contents you can select meters, categories or groups. When disabling a report, it won't be scheduled and sent.

Note: For CSV export no preview is available.

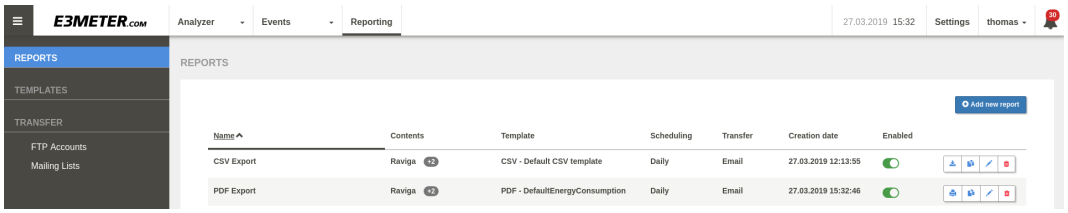


Fig. 7: Report window

All the enabled reports will be generated automatically according to the configured Scheduling interval and sent to the recipients defined in Transfer. These reports are called **scheduled reports**.

Note: For PDF reports, a separate page is generated for each group, with the total calculated per group.

A report is based on settings which define the scheduling and transfer as shown below.

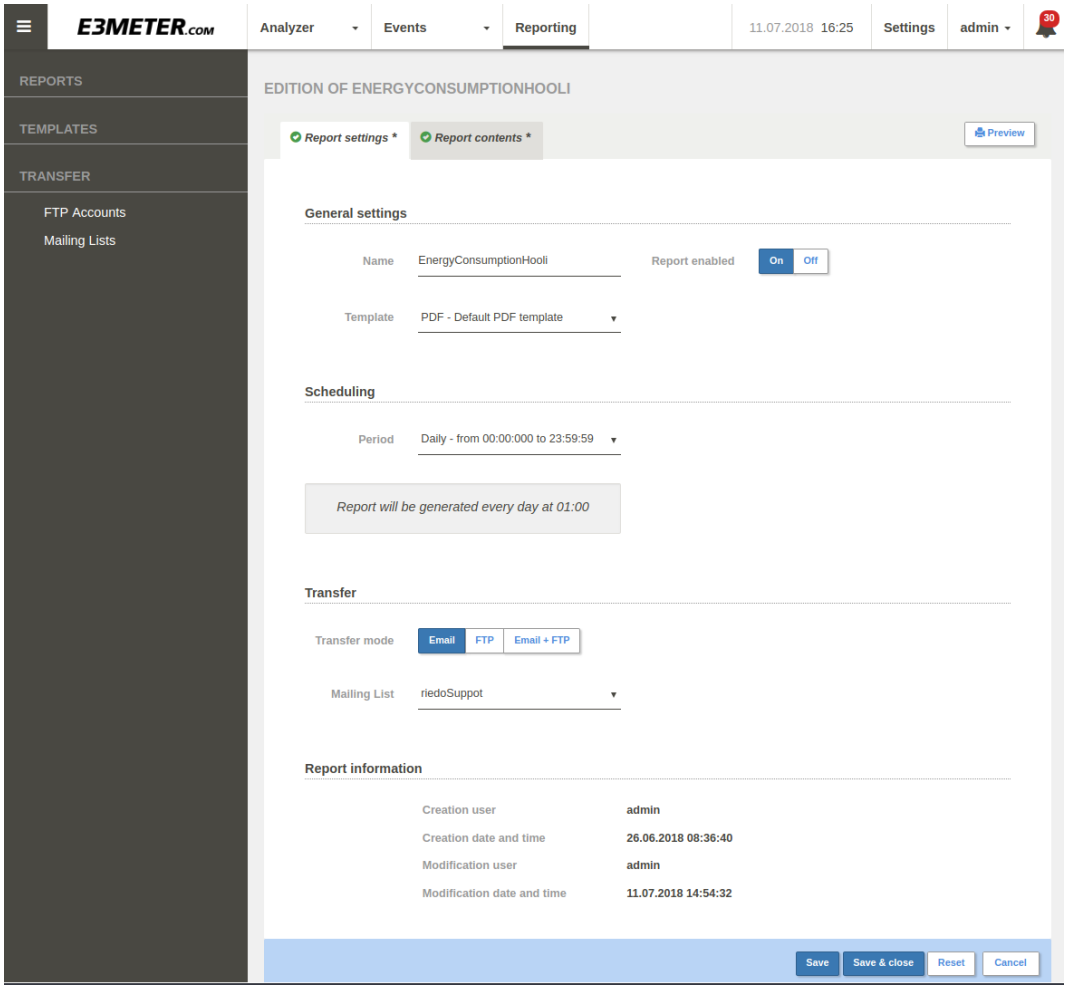


Fig. 8: Example for settings of report

The content of a report needs to be defined stating which categories and groups are used for the report.

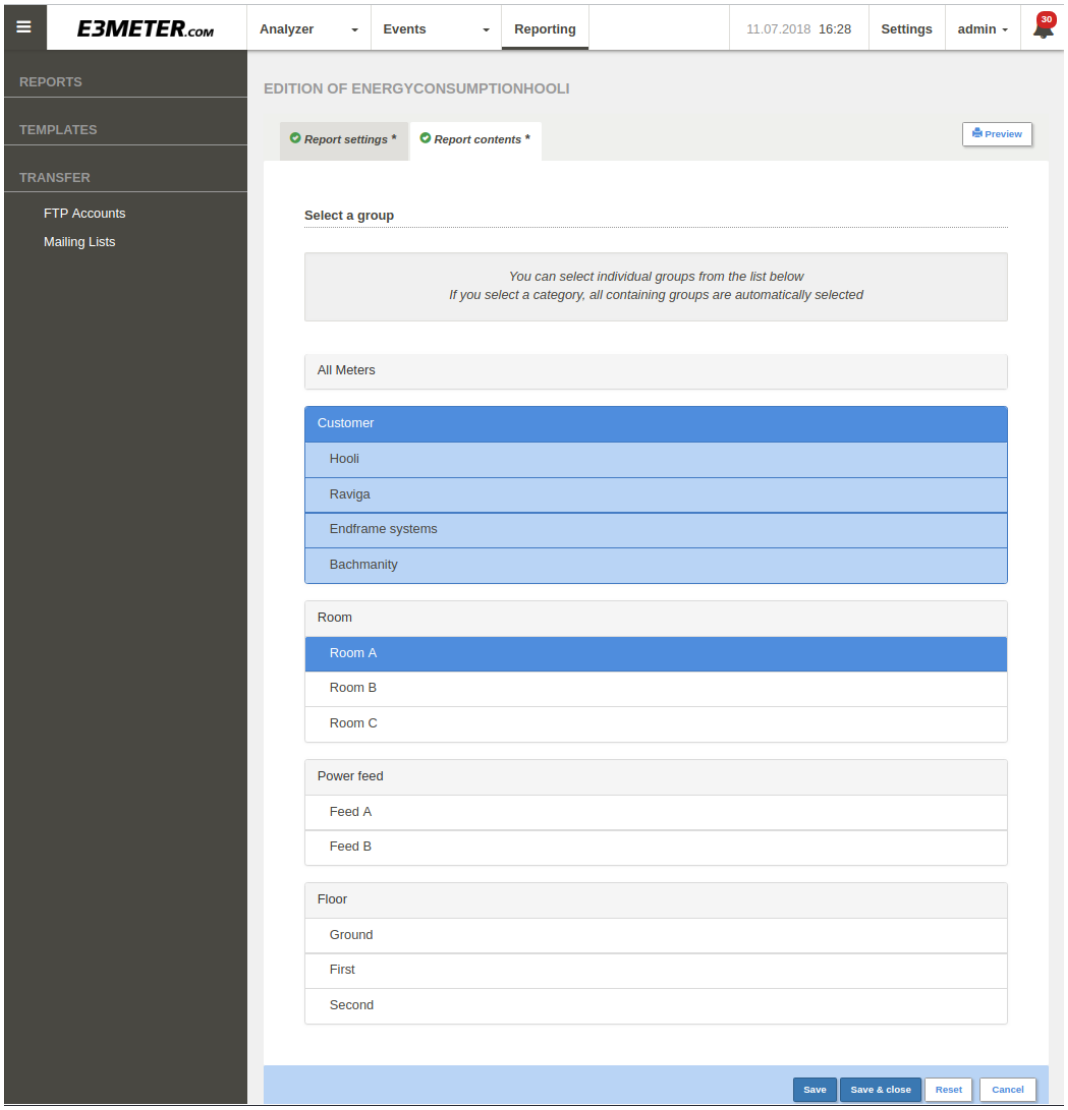


Fig. 9: Example for content of report

CHAPTER 8

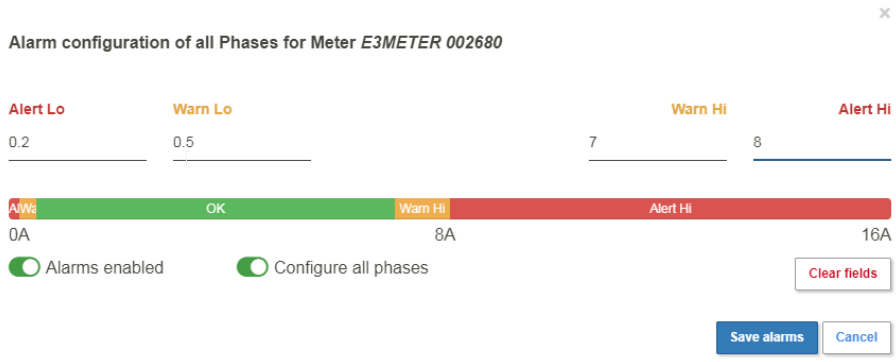
Alarms

8.1 Setting thresholds

Alarm thresholds can be configured on current, temperature and relative humidity.

Click directly on a meter's bar chart in the meters list (in *Analyzer* or in *Environment*) to configure alarms.

The alarm configuration dialog is opened (example of a 16A meter):



In this dialog the alarms for each meter can be configured:

- Setting up to 4 thresholds:
  - Alert Lo (low)
  - Warn Lo (low)
  - Warn Hi (high)
  - Alert Hi (high)
- Alarms can be enabled or disabled.

- In case of 3-phase meters the configuration can be done for each phase individually or for all 3 phases together.
- With *Clear fields* the alarms are removed.
- *Save alarms* saves the new or changed configuration.

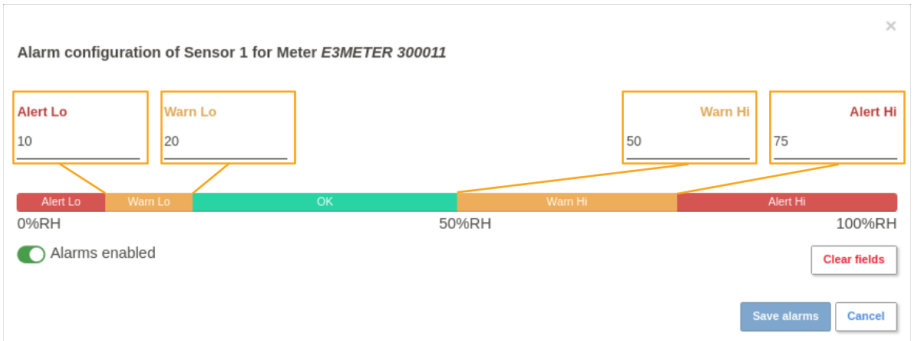


Fig. 1: Alarm levels and where the defined threshold is associated

Note: If you want to omit a specific alarm threshold, simply don't fill in the value which leaves that alarm threshold unconfigured.

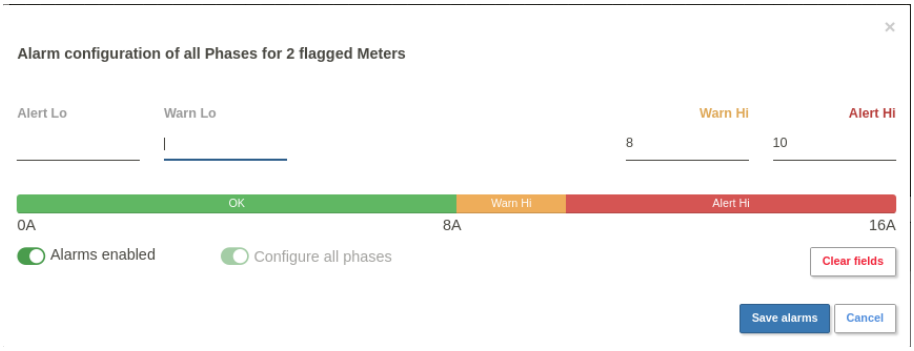


Fig. 2: Alarm threshold levels Alert Lo and Warn Lo not set

Compared to when all alarm thresholds are set

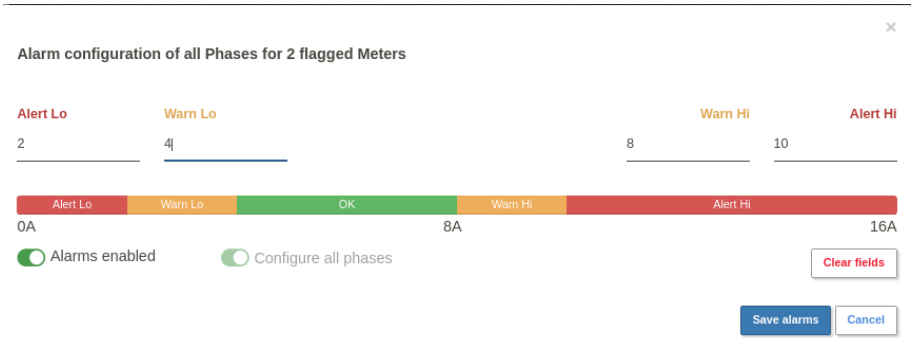


Fig. 3: All four alarm threshold levels set

By flagging several meters, you can perform a bulk configuration for all flagged meters. See *Bulk alarm setting*.

CHAPTER 9

Events and Notifications

9.1 Concept

The system generates events and notifications when pre-configured thresholds are reached. The main concept is summarized in the picture shown below.

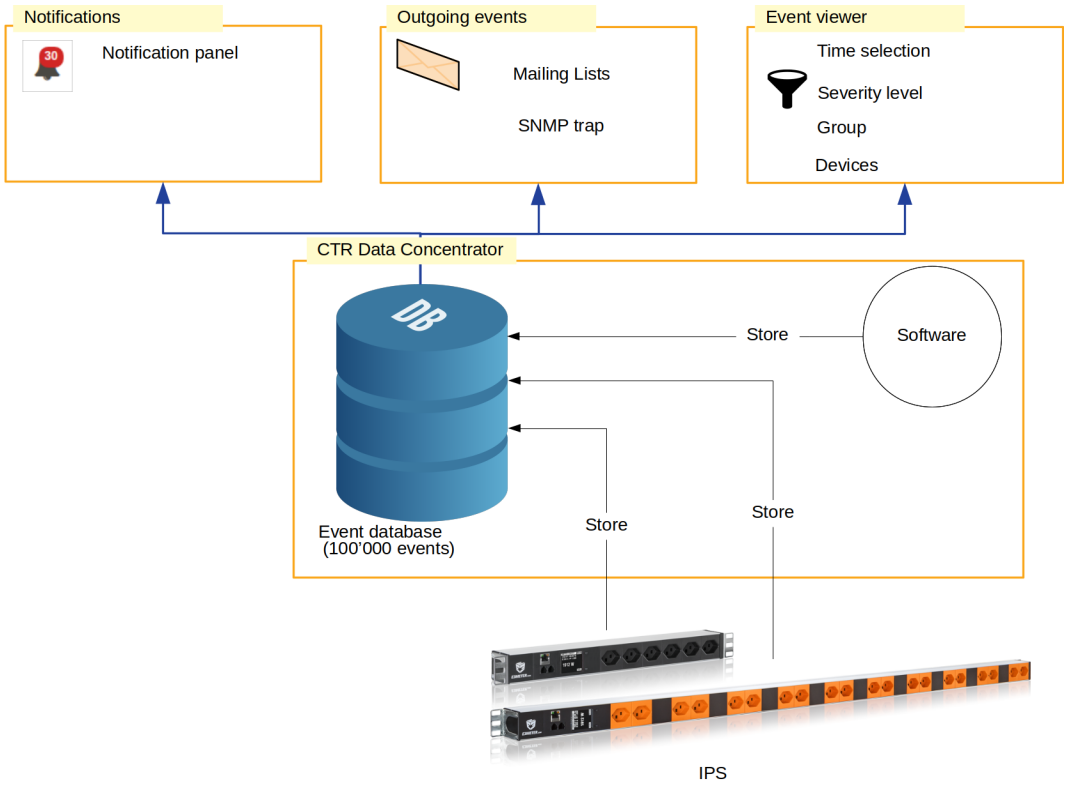


Fig. 1: Event and notification concept.

The Data Concentrator software and each meter generate events which are stored in the data

base of the Data Concentrator for a maximum of 100'000 events. The oldest events will be overwritten with the newest ones, once the data base is completely filled. Based on the event database you can either get event information on the notification panel, configure outgoing events or have a look on all events in the event viewer. Details will be explained in the following sections.

9.2 Notification panel

Clicking on the notification icon opens the notification panel (see example below) which displays a list of the latest events.

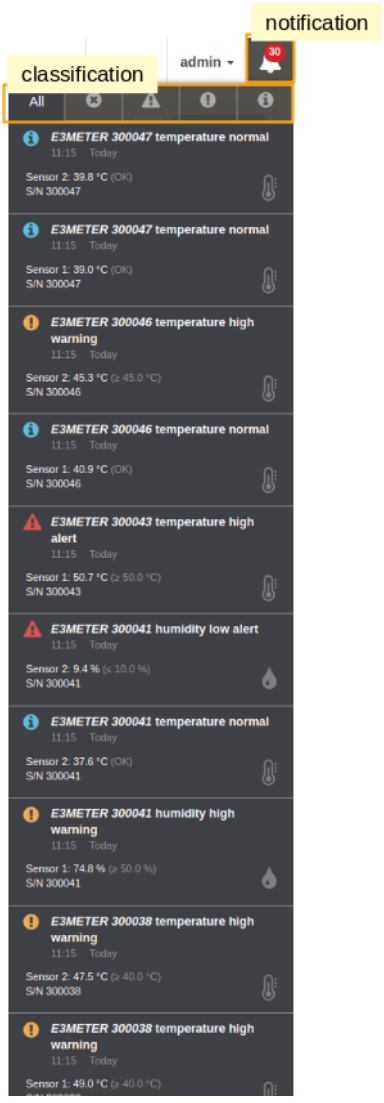


Fig. 2: Notification panel with events classification

The number in red above the notification icon is called event counter and indicates the quantity of new events. All the new events appear with a darker background color in the notification panel.

Clicking on the notification icon again closes the notification panel and clears the event

counter.

The following event types can occur and will be displayed in the notification panel:

Information (e.g. current normal)

Warning (e.g. temperature low warning)

Alert (e.g. current high alert)

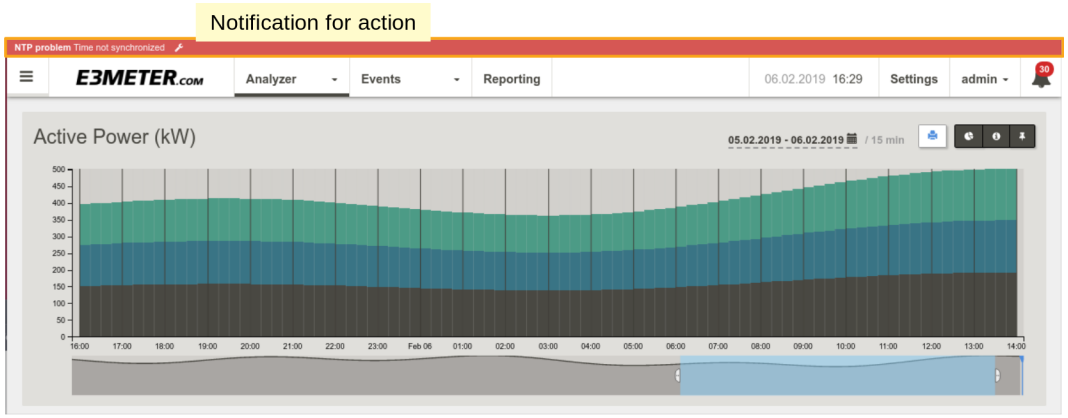


Fig. 3: Action notification explaining the actions that need to be taken.

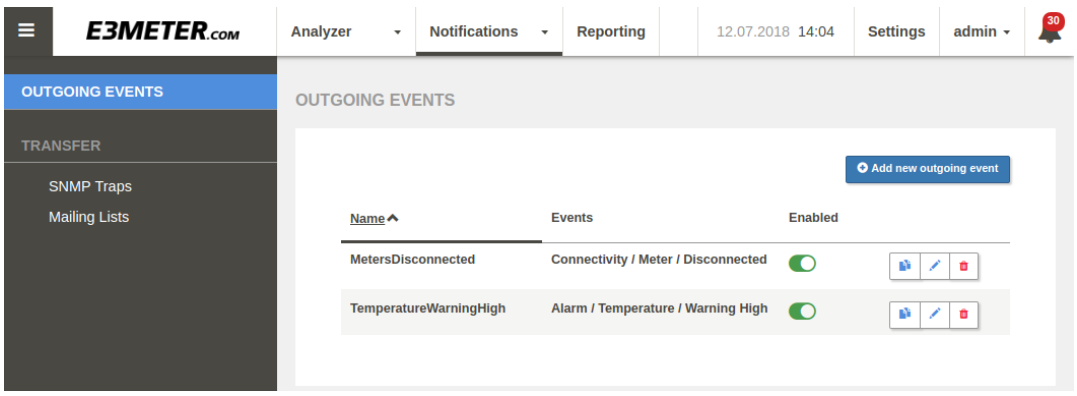
If the system detects a problem that requires an action to resume proper function, the problem is described in the top of the web-interface. It also provides direct links where the problem can be solved.

9.3 Notifications

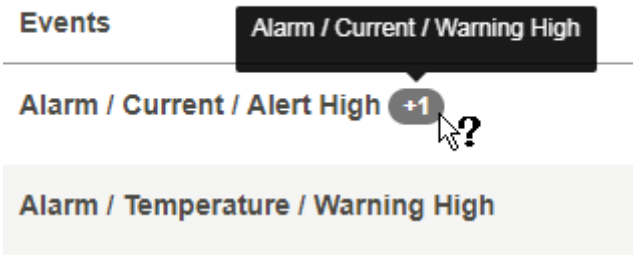
Notifications will send automatically events based on the selected type of events and method of transfer.

9.3.1 Outgoing Events

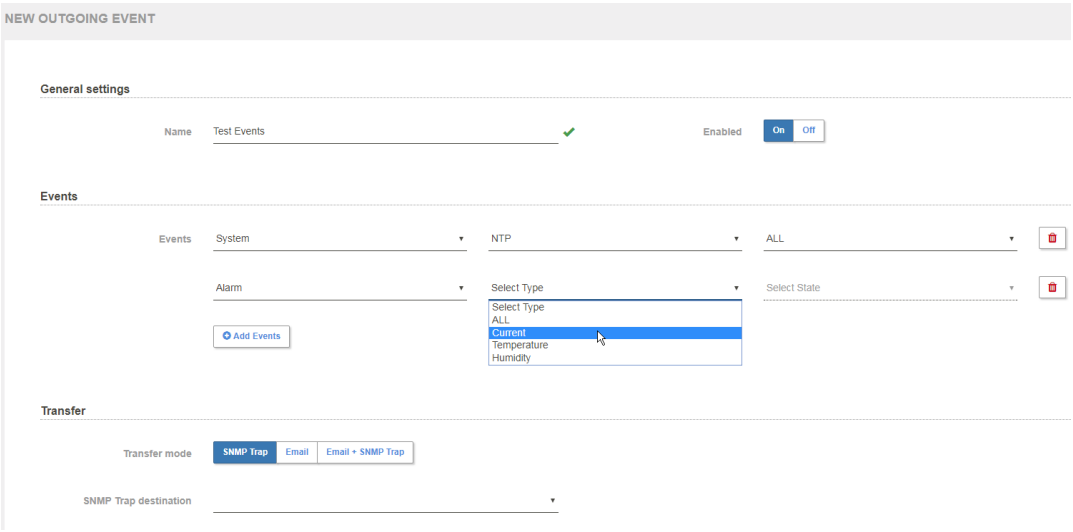
All the existing Outgoing Events are listed in the window shown below. You can copy, edit or delete templates. Also it is possible to Enable/Disable an outgoing event.



An outgoing event can contain one or several events. If it contains more than one event you can see them by placing the mouse cursor on the indication (+1) as in the example below.



A new outgoing event can be easily configured. See events configuration example below:



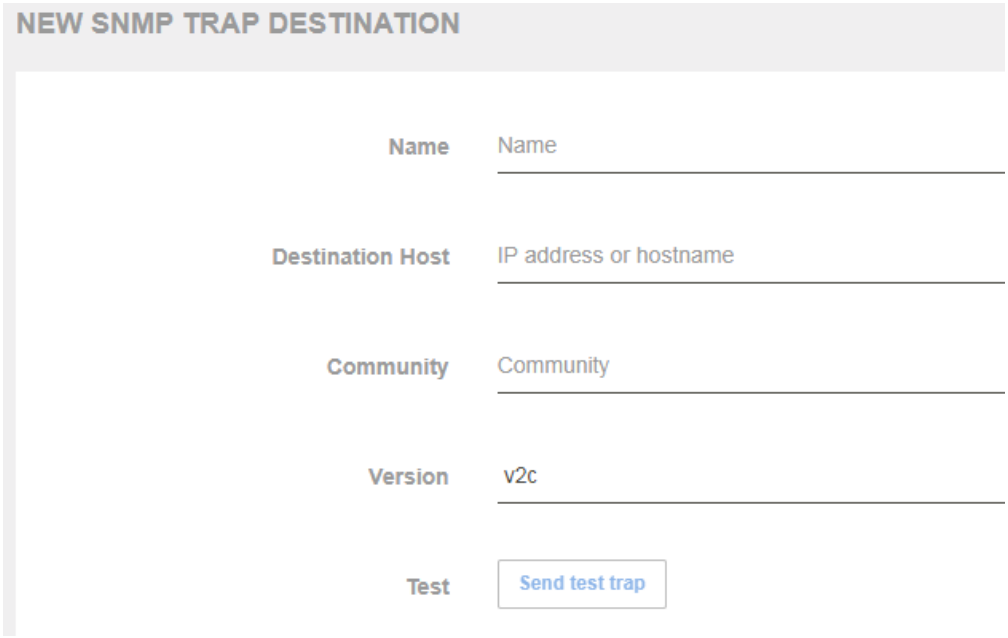
Events notification can be transferred by SNMP Traps, emails or both together.

9.3.2 Transfer

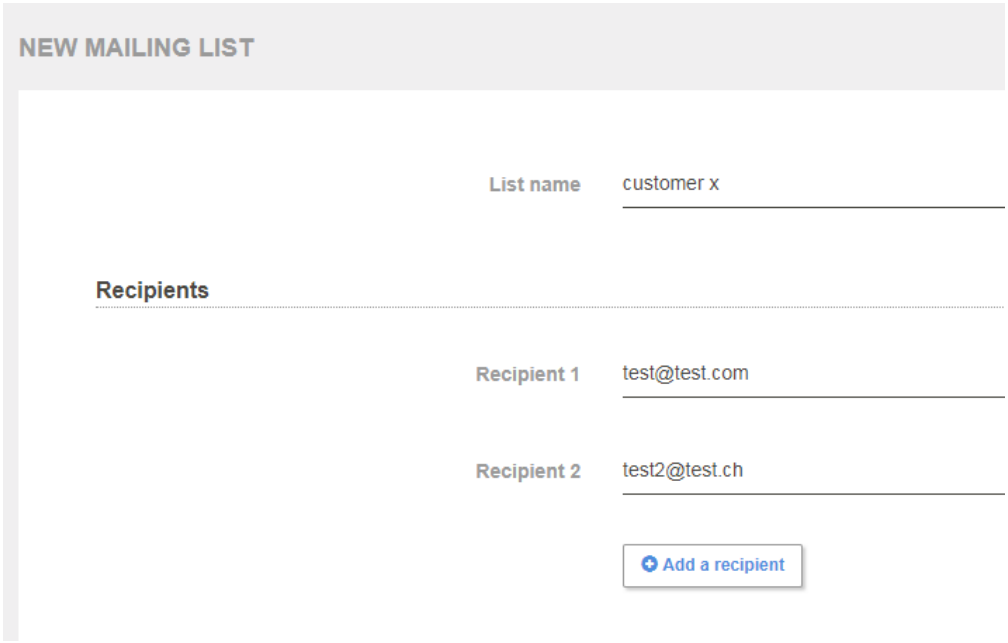
Before an event notification can be sent, the transfer needs to be configured here.

You can configure multiple SNMP Trap destinations and mailing lists. They are then all listed here. You can add edit and remove SNMP Trap destinations and mailing lists.

After configuration of a new SNMP Trap you can test it by sending a test trap.



A mailing list can contain several recipients, see example below.



9.4 Event viewer

The event viewer allows to view all events of the Data Concentrator data base. It is possible to select a portion of events based on

- Severity level
- Group
- Devices
- Time range

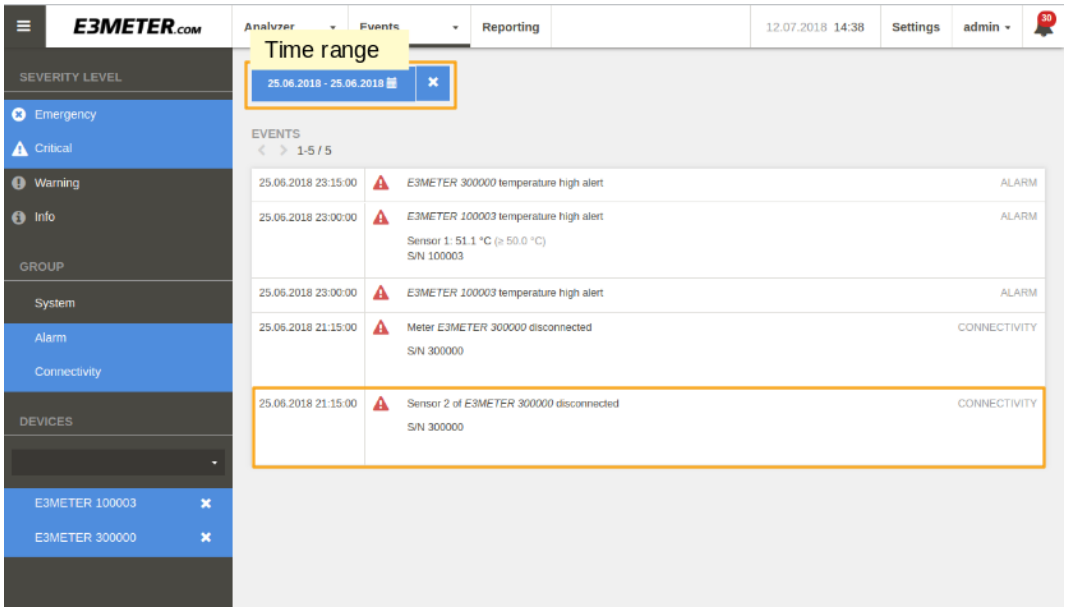


Fig. 4: Event viewer example with selection criteria applied

In the picture shown above different selection criteria is applied. Per event it is possible to click on it and see the detailed information. You find for instance the detailed temperature information as well as the temperature threshold level.

CHAPTER 10

Advanced setup

10.1 Configure SMTP (mail server)

The Data Concentrator is capable to send notifications per email hence the configuration of the mail server per SMTP is necessary.

SMTP can be enabled or disabled, Server can be configured insecure or secure.

For the detailed settings of the mail server please refer to your Internet service provider or IT administrator.

Once all parameters are set you have the possibility to test the SMTP configuration by clicking on the Test button for the Mail server test on the bottom of the SMTP (mail server) configuration page. This will open a window asking you to select an email address to which a test email will be sent. If you receive that email on the specified address this confirms that the settings are correct. Should you have trouble receiving the test mail, check first your SPAM folder and then check the mail server configuration again.

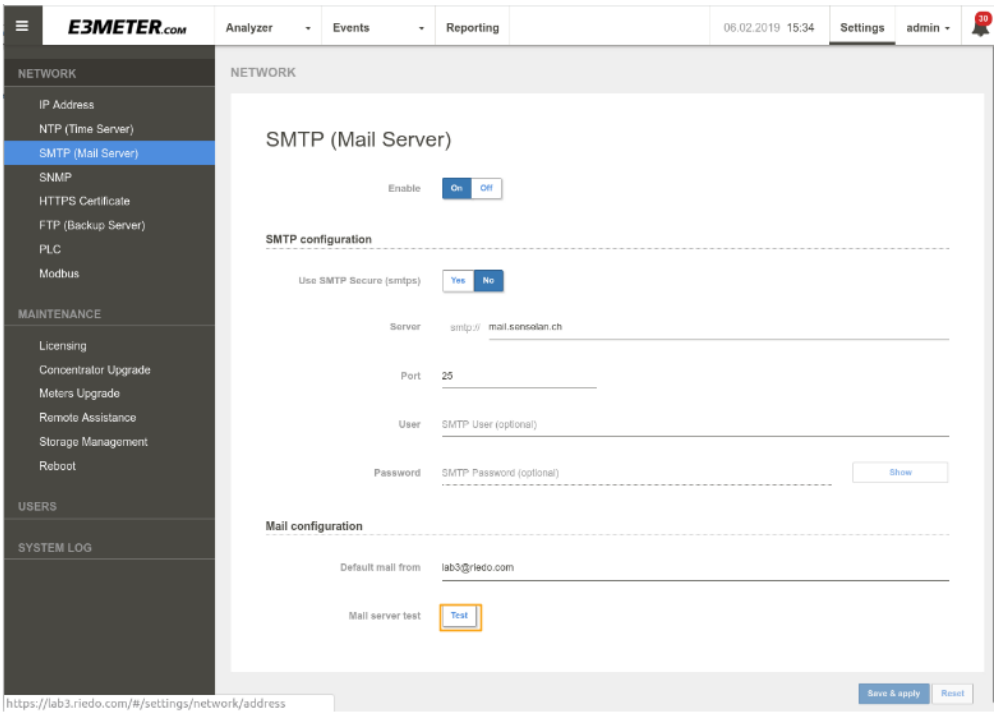


Fig. 1: SMTP setting

10.2 Configure SNMP

SNMP is used to gather data from the E3METER® Monitoring System other than over the E3METER® Monitoring Software. It is necessary to download the MIB (Management Information Base) of the Data Concentrator which is the definition of the available data for the Data Concentrator.

With ACL (Access Control List) it is possible to define access restrictions per specific IP address or range of IP addresses as indicated in the picture below:

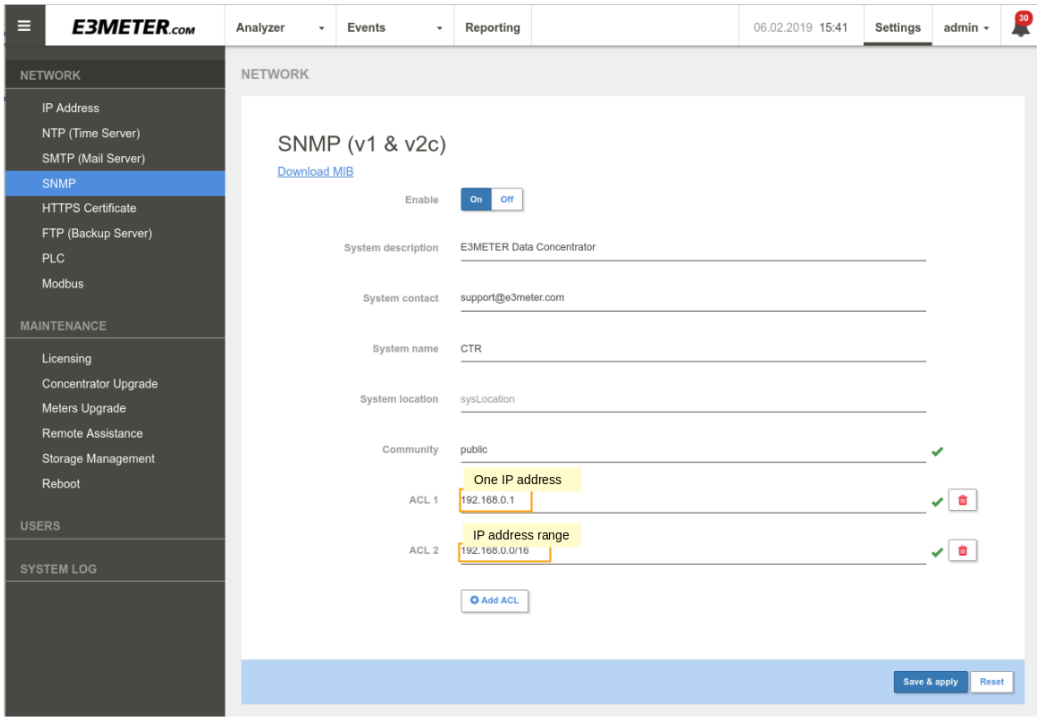


Fig. 2: SNMP setting

The first address for access control shows one single IP address, namely 192.168.0.1. The second example shows access control restriction for a range of IP addresses in the range of 192.168.0.0 to 192.168.255.255. The latter notation used is the CIDR Subnet Mask notation.

10.3 Configure FTP (Backup Server)

You have the possibility to backup data of the Data Concentrator over an FTP backup server. This has the big advantage that in case a Data Concentrator has a failure and needs to be restored or you have to restore data on a new Data Concentrator, you can restore it from a previous backup.

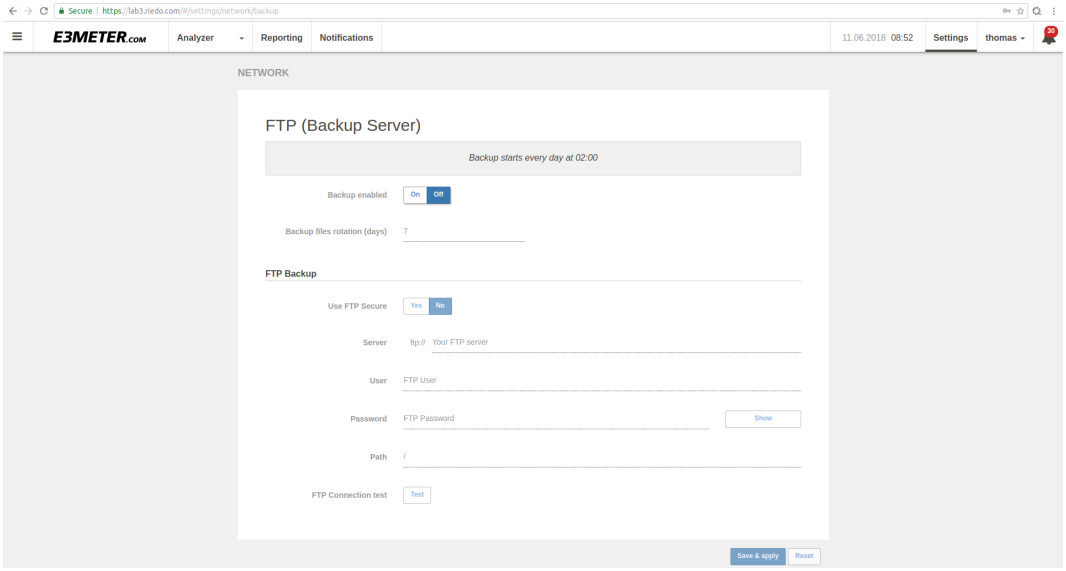


Fig. 3: FTP (Backup Server) settings

10.4 Configure PLC

The PLC allows configuring some system parameters as shown in the picture below:

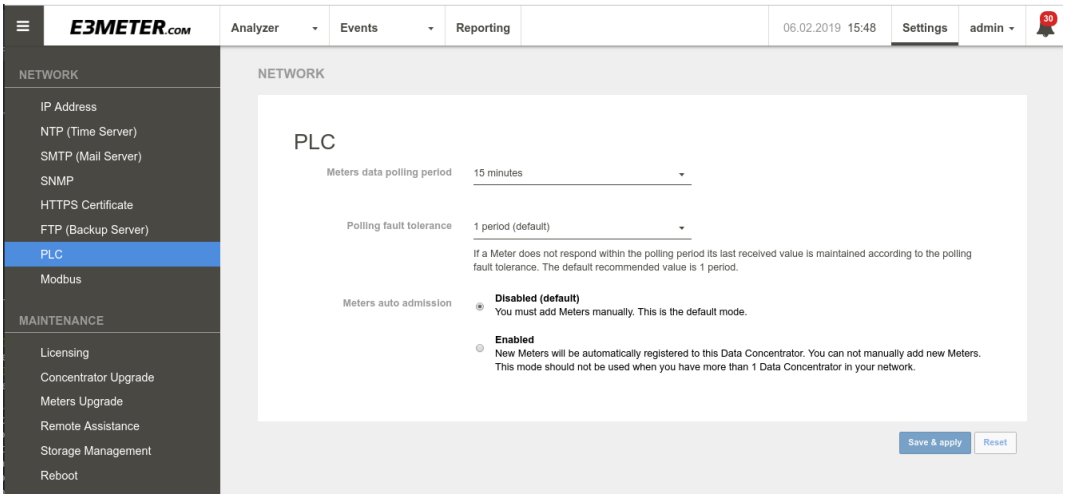


Fig. 4: PLC setting

The Meters data polling period can be configured in what time interval data is being calculated. The allowed values are 5 minutes, 15 minutes, 30 minutes or 60 minutes. Each meter calculates the power and energy consumption instantly and provides the data after the completion of the configured data polling period. That way a user can assure that all meters provide data with the same data polling period.

The data polling period has an influence on the maximum number of meters that the system can interface with as indicated in the table here below:

Table 1: Maximum node numbers

Data polling period	maximum # of meters
5 min	50
15 min	200
30 min	400

Attention: Changing the data polling period, deletes the complete history of the Data Concentrator. The concentrator warns about this fact and asks you for confirmation.

The polling fault tolerance is the number of periods the Data Concentrator tolerates not having received the data. Allowed values are 1, 2 and 3 periods. The default and suggested number for the polling fault tolerance is 1 period.

Note: Data polling period is used on all meters which defines what time period the different data is being calculated. This is basically the time tick where all of the values across different meters are based on.

Meters auto admission can be configured to be disabled or enabled. In the *Adding meters* chapter you find the different methods that exist and also how to use the Auto admission feature and why caution needs to be taken.

PLC frequency band can be configured to be either FCC or CENELEC-B

10.5 Configure Modbus

There exist multiple ways to interface PRO meters. They are explained within *Adding PRO meters manually*.

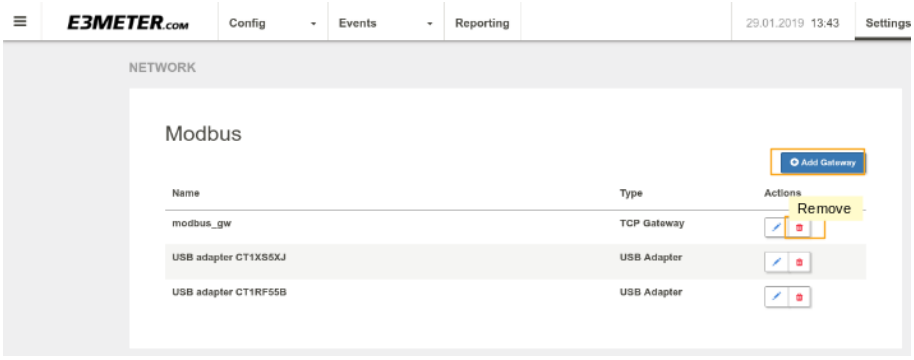


Fig. 5: Modbus settings

10.5.1 USB adapter

Direct connection is established with a RN1079 USB to RS-485 adapter. The Data Concentrator will automatically detect an adapter connected to the CTR. It is only possible to remove

a USB Adapter from the configuration, when the adapter is not physically connected anymore to the CTR. By doing so all associated meters to the selected adapter will be removed from the Data Concentrator.

10.5.2 Modbus TCP/RTU gateway

In order to use a gateway one needs to click on the Add gateway button as shown in the previous picture here above. This opens the following configuration window. Enter the IP address of the gateway and give it a name. The default port for Modbus is 502.

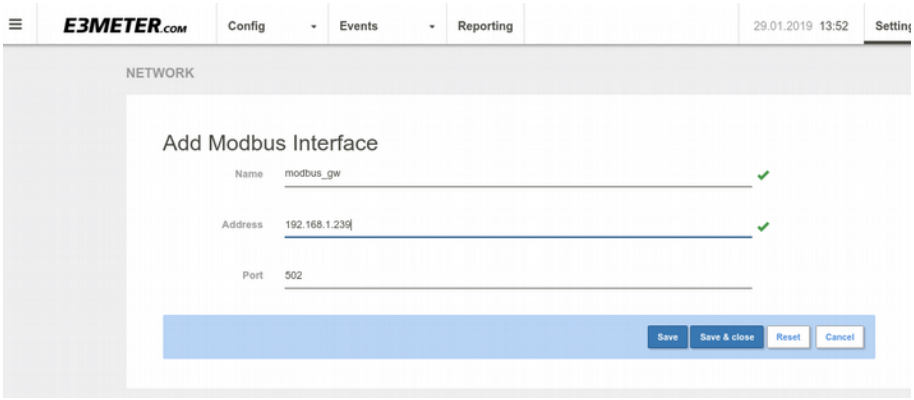


Fig. 6: Modbus Gatway Configuration window

10.5.3 Configuration parameters on the Moxa MB3180 gateway

On the gateway both the Modbus RTU and Modbus TCP parameters need to be configured. The Modbus RTU parameters need to be configured in a specific way. The Modbus TCP parameters need to reflect your network settings. The configuration can be done either by the Moxa MGate Manager or by the web interface of the MB3180 knowing it's IP address. The advantage of the MGate Manager is that it can discover any MB3180 when it is connected to the same network.

In the following section the necessary steps for configuring the Modbus TCP/RTU gateway are described.

1. Install and power gateway
2. Download reference configuration of Moxa gateway from Riedo Networks website

   The reference configuration can be downloaded from our website under the section support: www.riedonetworks.com/support.
3. Start the MGate Manager
4. Click on Off-Line-Configuration, Select the MB3000 series and MB3180 model

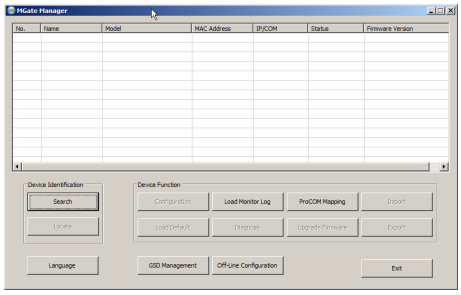


Fig. 7: Click on Off-line Configuration

5. Load the existing configuration, downloaded previously from the Riedo Networks Ltd website

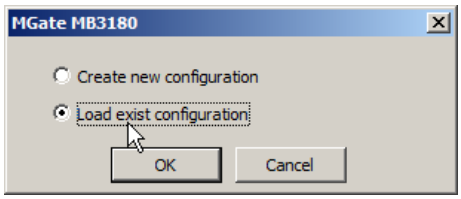


Fig. 8: Select and load the reference configuration

6. Edit the network parameters of the reference configuration and store it on your Computer.

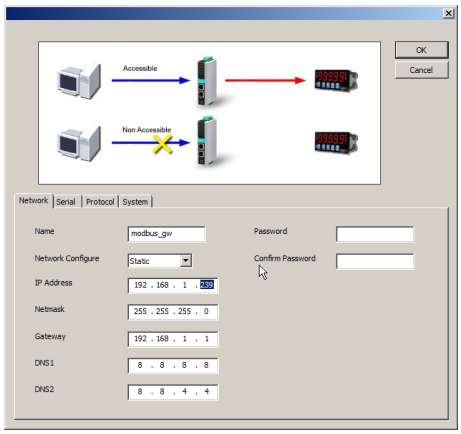


Fig. 9: Change the network parameters

7. Search for your MB3180 on the network by hitting Search, Broadcast search. Make sure you select your gateway by verifying the MAC address

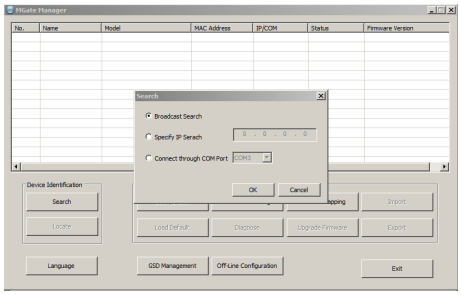


Fig. 10: Search your gateway

8. Select your gateway, previously identified

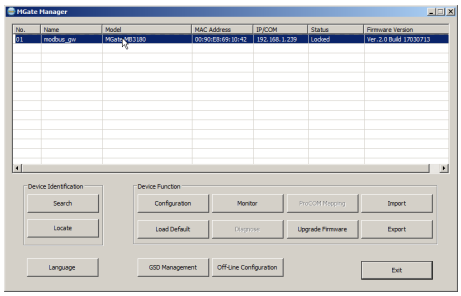


Fig. 11: Select your gateway, previously identified

9. Select import and the previously changed configuration file and confirm with OK

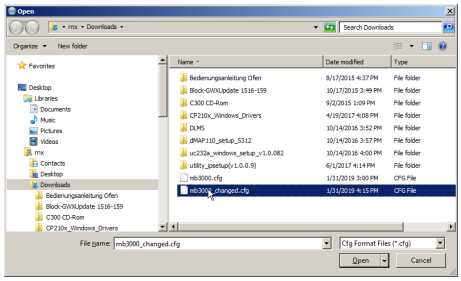


Fig. 12: Import the changed configuration on the gateway

10. Add the modbus TCP/RTU gateway in the Data Concentrator as explained in the above section *Modbus TCP/RTU gateway*.

Note: As previously mentioned, it is also possible to make the changes via the web interface. Please read the Moxa MB3180 user manual for the necessary configuration steps.

10.6 Storage Management

In the Storage Management you can have a look at the internal storage, the type, model and size as well as the status. You can format or check the storage.

Caution: If you want to check the storage, this will stop the storage of data into the internal memory (history and events) for the time of the check (about 30 seconds).

10.7 Reboot

In the Reboot menu you find the possibility to reboot the Data Concentrator.

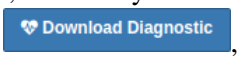
Attention: Make sure you confirm a reboot only in the case you intentionally want to reboot. Only with user rights *Administrator* you have the possibility to reboot the Data Concentrator.

10.8 Changing user rights

Within the settings menu USERS only a user with the role Administrator can change user information.

- Add a user
- Remove a user
- Change the password or other information of a user
- Change the role of a user which changes the user rights

10.9 System Log

The system log shows the latest system events. It is possible to download the logs which can then be sent to Riedo Networks Ltd in case of an issue that might need analysis. In case *Remote Assistance* over a secured connection is not possible, still the system events can be compressed and sent to Riedo Networks Ltd by clicking on 

, located on the bottom right of the SYSTEM LOG page of the settings.

CHAPTER 11

Bulk modification

Bulk modification is a useful feature to change configuration parameters of multiple meters at once.

Note: First, one needs to flag multiple meters to see the bulk modification possibility. Otherwise the bulk modification won't be shown.

Bulk modification is available for Assignment, Configuration and Alarm. In the following sections, the different possibilities are explained in detail. Bulk modification will be applied **only** on the flagged meters. It is not possible to bulk configure meters based on a category or group.

11.1 Bulk Assignment

Bulk assignment is done by clicking on Bulk assign

on top of the Assignment page. Once having clicked to Bulk assign the categories are greyed out and can't be edited individually anymore.

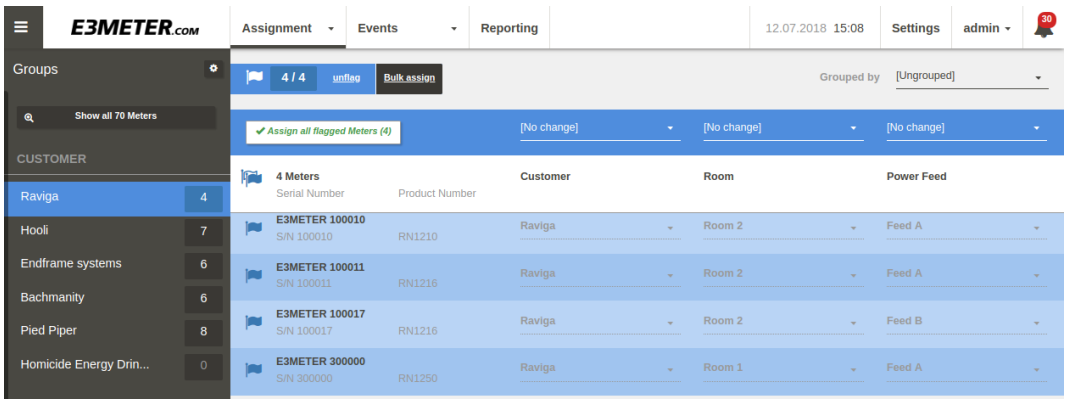


Fig. 1: Bulk assign of four flagged meters in the Assignment page.

11.2 Bulk Configuration

In the configuration window parameters like deleting a sensor or association of a phase to the meter can be done in a bulk operation. For this you need to click on Bulk configure which will then show the options of the parameters to be configured all at once.

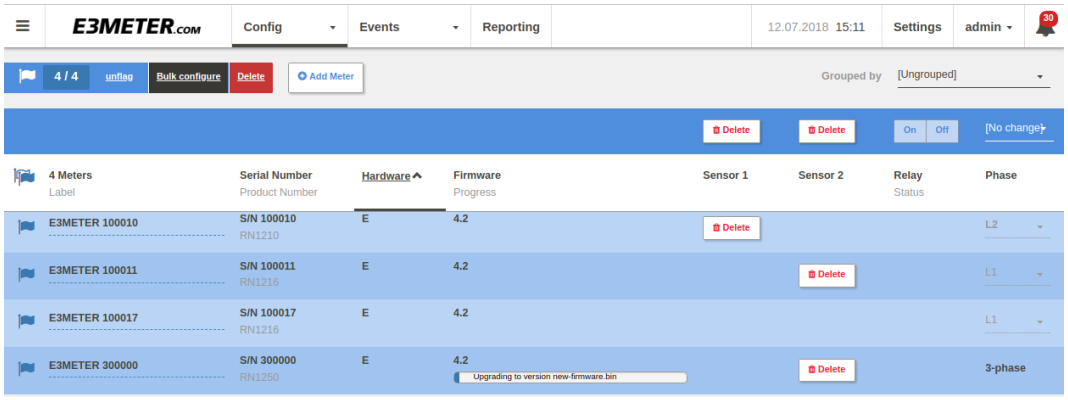


Fig. 2: Bulk configuration of four flagged meters.

11.3 Bulk alarm setting

Bulk alarm setting is done by clicking on any of the bar charts after having flagged multiple meters as shown in the picture below.

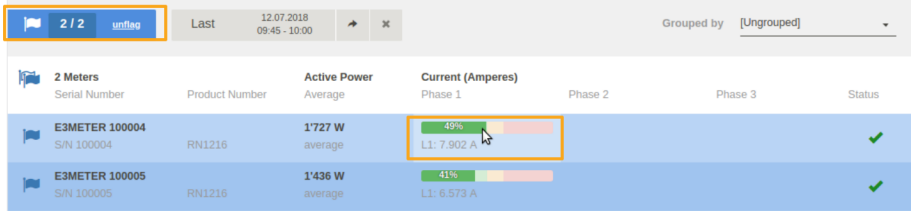


Fig. 3: Clicking on one alarm bargraph of two flagged meters in order to access bulk alarm setting

This opens the alarm configuration window which indicates that bulk alarm setting is done by stating how many meters are flagged; 2 flagged meters in the example shown below.

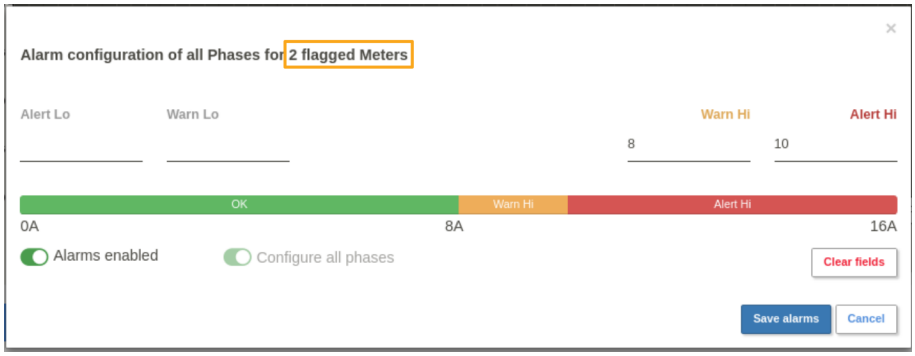


Fig. 4: Setting alarms of two flagged meters in bulk alarm setting

11.3.1 Combination of different features

When configuring meters with different features like for for instance their rated current this will be indicated. In the example below three meters are selected with two different types of rated current 10A and 16A.

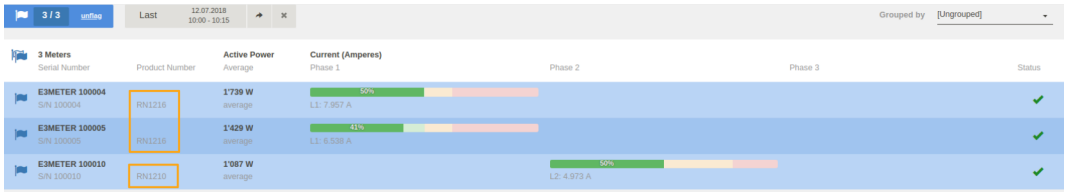


Fig. 5: Bulk alarm setting for meters with different current ratings

An example of how the bulk alarm setting looks like for two meters of type RN1216 and one meter of type RN1210 is shown in the picture below.

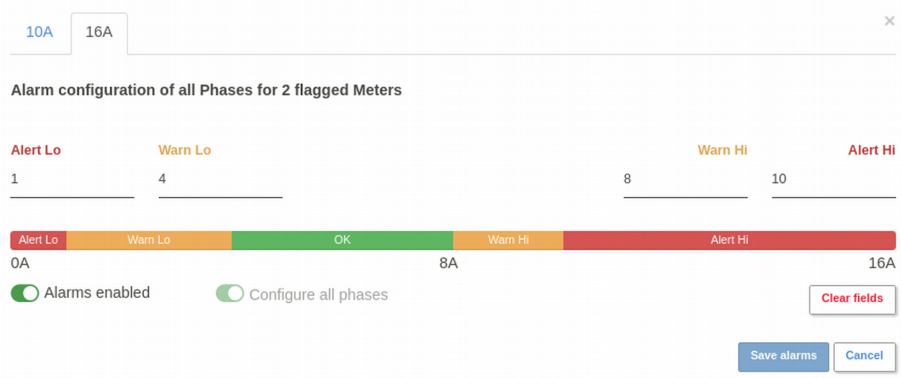


Fig. 6: Bulk alarm setting for meters with different current ratings, shown with separate windows for the different rated currents

The different parameters are shown in different windows for the configuration. You will have to configure the alarm for the two different types of meters in the separate windows and confirm with save.

CHAPTER 12

Technical support

- Visit web page www.riedonetworks.com/support
- Call +41 26 505 50 00

CHAPTER 13

Legal notice

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For the latest product updates, consult the Riedo Networks Ltd web site at www.riedonetworks.com.

CHAPTER 14

Annex

14.1 Time granularity in bar chart

The granularity of the bars shown in the bar chart corresponds to the data polling period when showing data of a short time period. When showing longer time periods it shows the following granularities 1 hour, 1 day, 1 week depending on the overall time shown.

14.2 Synchronous polling

The E3METER® system allows to interface with meters either per PLC (Power Line Communication), Ethernet or via RS485. With the communication per PLC or Ethernet the Data Concentrator (CTR) synchronizes the time base and polls data from the meters (IPS). This allows making sure that the IPS is synchronized with the CTR and to the Epoch as symbolized in the picture below with the little clock symbol and the green check mark. The advantage of the E3METER® system lies in the fact, that each IPS aggregates data within the data polling period. Once the data polling period is over, e.g. with a period of 15 minutes, the CTR polls the aggregated data of all IPS from the last polling period. In the picture below this is shown for the interval from minutes 45 to 00. Per data polling period, the aggregated data provides the average values as well as the minimum and maximum occurred during the interval. All E3METER® use the proprietary communication protocol and poll data in a timely manner. Meters other than E3METER® are not synchronized and provide only instantaneous measurement values once they are polled.

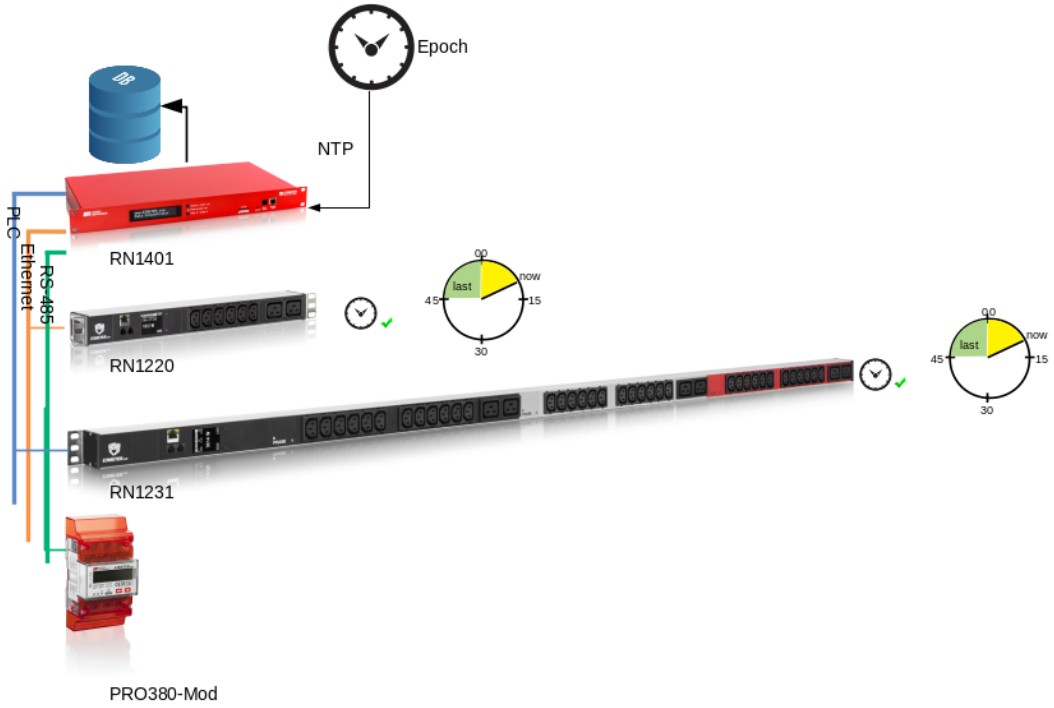

Fig. 1: Synchronous polling for E3METER® system

14.3 Accessing data per SNMP

The data provided by the Data Concentrator can be accessed either via the webpage of the Data Concentrator or access made to the Concentrator per SNMP. When accessing per SNMP the Meter data of the last polling period can be accessed. When accessing to data of the Data Concentrator via it's own web interface, the stored data is being accessed allowing to show the historic data. Within this chapter the latter option is described. This section covers how to the average power of the last data polling period of one specific Data Concentrator using SNMP.

14.3.1 Download MIB browser

Go to http://www.ireasoning.com/downloadmibbrowserfree.php and download a version of the MIB browser. There exist other tools but this user manual shows how to use the MIB browser.

The Data Concentrator Data structure is defined with MIB (Management Information Base). For more information go to https://en.wikipedia.org/wiki/Management_information_base. As a first step one needs to download the MIB information from the Data Concentrator as explained in *Configure SNMP*. The MIB shows the detailed structure of accessible data with the corresponding description.

14.3.2 Open MIB browser

After starting the MIB browser, select the MIB for the E3METER® 'e3meter-ctr.mib'.

Once the MIB for E3METER® is loaded, make sure the following basic MIB are already loaded when using iReasoning MIB Browser. For this, access Tool/Options/MIB Files and verify that you have the following MIB. Without these, the data structure won't be resolved properly.

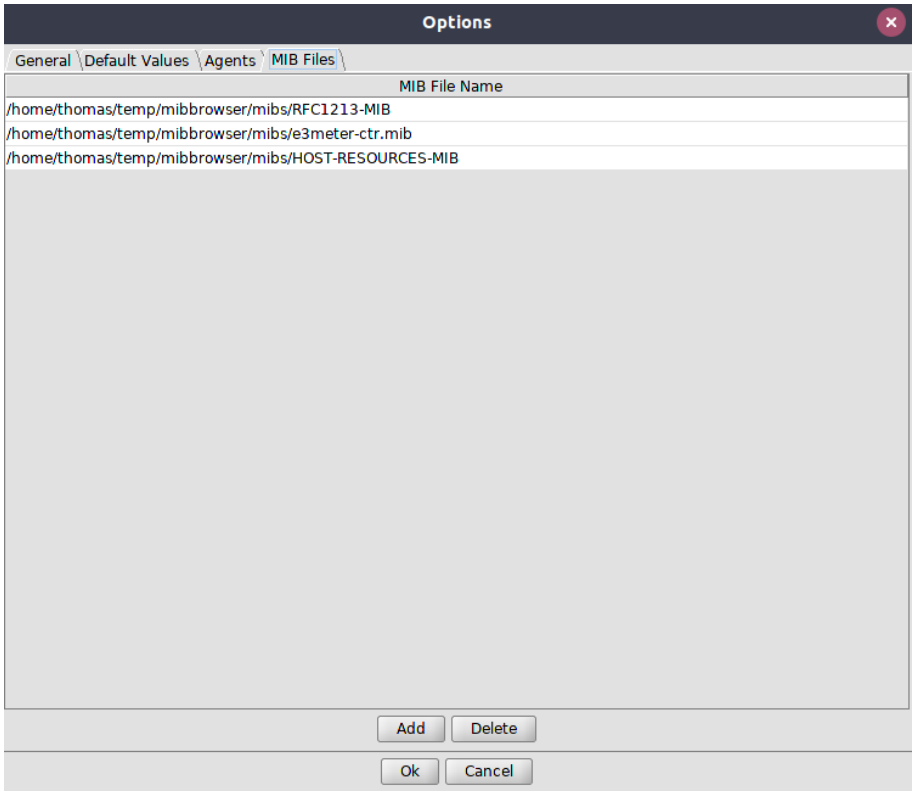

Fig. 2: List of basic MIB and e3meter-ctr.mib in MIB browser

14.3.2.1 Connect to Data Concentrator

Please make sure to connect to the correct Data Concentrator and select the correct port and SNMP version as shown in the picture below.

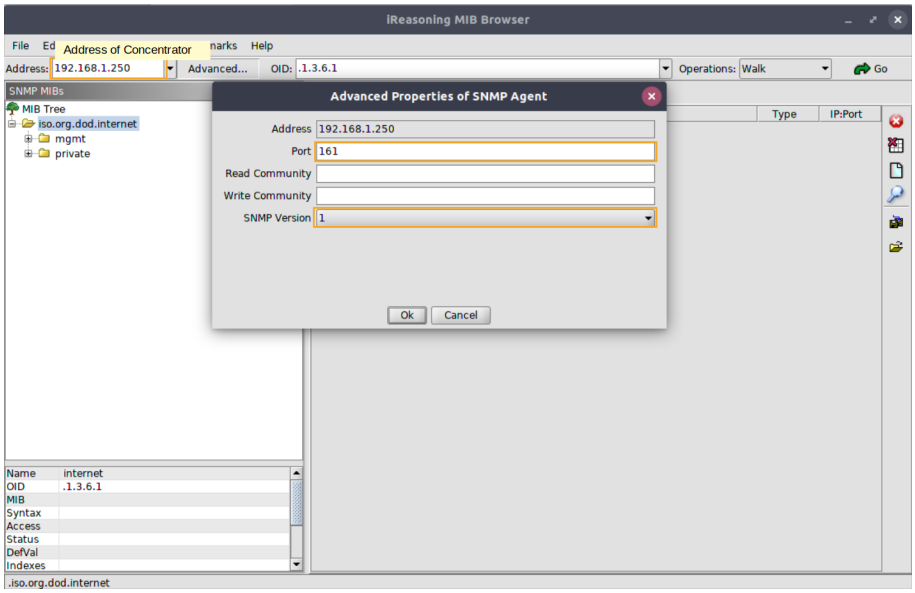

Fig. 3: MIB browser showing detailed connection parameters

Caution: Make sure that you have enabled SNMP and that the Access Control Field (ACL) grants you with access to the Data Concentrator. For instance 192.168.1.0/24 in the SNMP ACL field in the example shown throughout the chapter.

14.3.2.2 Accessing average power

In order to access the average power of the last data polling period, select the 'e3IpsPAvg' and click on the Menu 'Operations/Get Bulk'. This will have the result to show the average power of the last polling period. In order to know the polling period duration, you can access 'e3IpsPeriodDuration' and in order to know the start of the polling period, access 'e3IpsPeriodStart'. In the picture below the average power values are indicated.

The average power per meter over the last data polling period is gathered in the picture shown below.

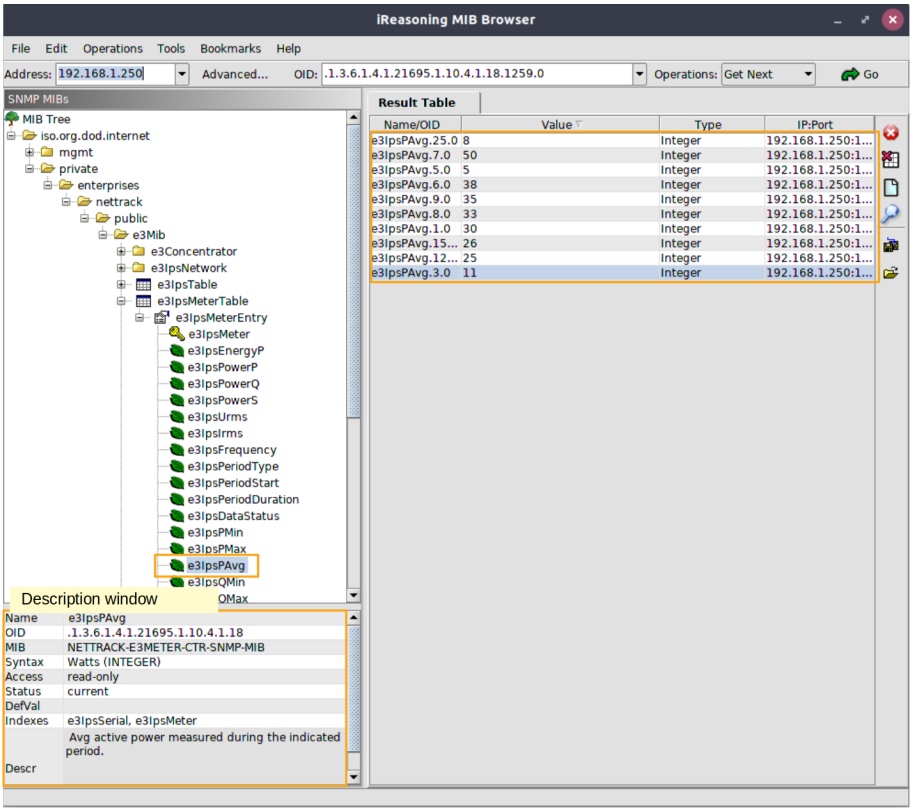

Fig. 4: Average power of all associated IPS accessed per SNMP

CHAPTER 15

Revision log

Revision	Date	Changes
A	19.01.2021	New version for software version 6.2

Index

A

add meters
    Pairing, 23
aggregated data, 81
alarm, 54
AutoIP, 3

B

bar chart, 33
Bonjour
    Zero Configuration, 4
Bulk alarm setting, 74
Bulk assignment, 73
Bulk configure, 74

C

CAL, 17
calendar, 36
CSV export, 46
current, 37

D

data polling period, 66
delete PDF templates, 47
delete specific sensors, 42
delete templates, 59
DHCP, 3, 16
DNS server, 16

E

event database, 58
event types, 59
event viewer, 61

F

FTP, 65

H

horizontal bargraph, 37

I

internal storage, 70

L

license, 17
Link Local, 2
Login, 9

M

MIB, 82
modification, 73

N

navigation, 35
navigation in time, 36
notification, 58, 60
NTP server, 16

O

outgoing event, 60

P

Pairing
    add meters, 23
phase, 33, 74
phase balance, 35
pie chart, 35
plug and play, 2
power, 37
PRO meters, 25, 43, 67

Q

quick reports, 44

R

RCM, 38
reboot, 71
relative humidity, 40
relay status
    set relay status, 42
report, 47
Residual Current Monitoring, 38

S

set relay status
    relay status, 42
settings, 15
SNMP, 64, 82
SSL, 4
synchronizes, 81

T

temperature, 40
template, 46, 47
threshold, 54
time base, 35
tooltip, 33
transfer, 50, 60

Z

Zero Configuration
    Bonjour, 4