M-BUS Center User Manual

Document Reference: 1605
Version: 2.2
Date: 01.12.2022

Inhaltsverzeichnis

Version	Revision Date	Token	Changes
V2.0	25.02.2021	met	Multiple minor updates, Updated pictures
V2.1	24.11.2022	met	new features for FW-Version 1.9.10.3/1.10.10.3: time synchronization, templates, data logger read-out
V2.2	01.12.2022	sha	Added information about MMC Error and BACNET

System

Physical interface

- **Power supply** The M-Bus Center needs a 24VDC supply voltage with a current of at least 1A.
- **Network** RJ-45 connector which allows remote access via a web browser. Supports BACNet / BACNet BBMD.
- **3x M-BUS** Three parallel M-Bus connector terminals for practical wiring.
- **4x S0-Input** Four S0-Inputs for read-out of meters with a S0-pulse output.
- **2x PT-1000** Two inputs for external temperature sensors of the type PT-1000.
- **2x Relays** In case of an Error, the relays trip.

  The following conditions lead to an Error:

  - short circuit on the M-Bus
  - Meters cannot be read
- **USB Type A** USB Host connector for specific peripheral devices.
- **USB Type B** Used for the level-converter feature.
- **MicroSD Slot** The scope of delivery includes a Micro-SD card needed for data storage.

 *Warning: Do not remove the Micro-SD card. Stored data may be lost otherwise!*

Software interface

- **Webbrowser**

  Read-out of the M-Bus Center can be monitored off-site via a web browser and conveniently exported as a .csv or .json file via the “system integration” tab on the browser interface.
- **FTP-Export**

  Export a datafile for each read-out interval and meter. Select freely between the .csv and .json format. The M-Bus Center supports the FTP, FTPS and SFTP protocols
- **Cloud-Upload**

  Interface to the “Joulio-Web” energy management system.
- **BACNet & BACNet BBMD**

  Allows the integration of measurements into the automated systems of a building.
- **DLMS**

  A DLMS option may be made available after further consultation with EMU Electronic AG.
- **OPC UA**

  A OPC UA option may be made available after further consultation with EMU Electronic AG

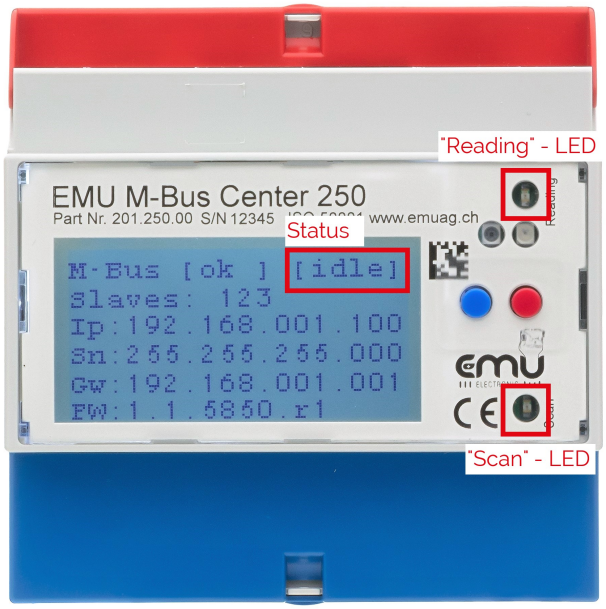
Operational buttons on the device

The M-Bus Center uses two capacitive sensing buttons which are found on the front of the device.

The following combinations are viable:

Button	Hold duration	Operation
red	>5s	Start search for devices
blue	1-5s	Network configuration
red & blue	>10s	Restart M-BUS Center

Operational states



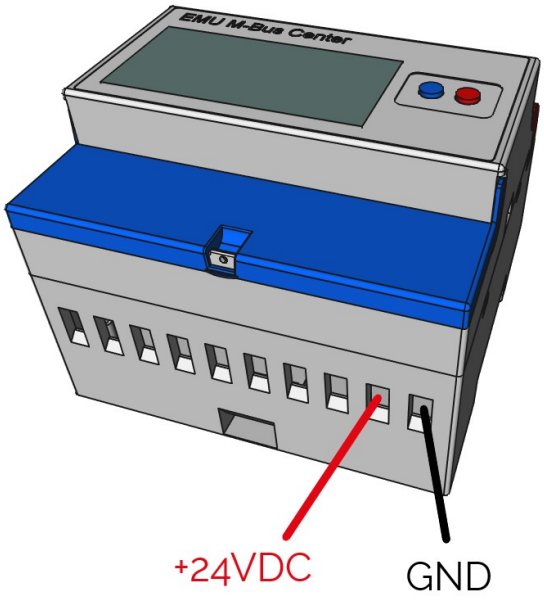
State	Display	"Reading"-LED	"Scan"-LED	Meaning
Idling	idle	blinks every second	off	The device is ready and waits for the next read out time.
Scanning	scan	constant on	constant on	The Center scans for newly added Meters.
Read out	read	constant on	off	The M-BUS Center reads out the known Meters.
Level converter	rs	off	off	Level converter mode. Access to the M-BUS Center via USB. Needs appropriate program (e.g. MB-Connect).
Error	err	-	-	Short circuit on the M-BUS.

Pins

Only the basic pins of the M-Bus Center will be described.

Further pins are to be connected according to the connection diagram.

Power Supply



The M-Bus Center needs s 24VDC supply voltage with a current of at least 1A.

Recommendation:

Power Supply MDR-20-24

Input voltage: 100-240 VAC

Output voltage: 24 VDC / 1 A

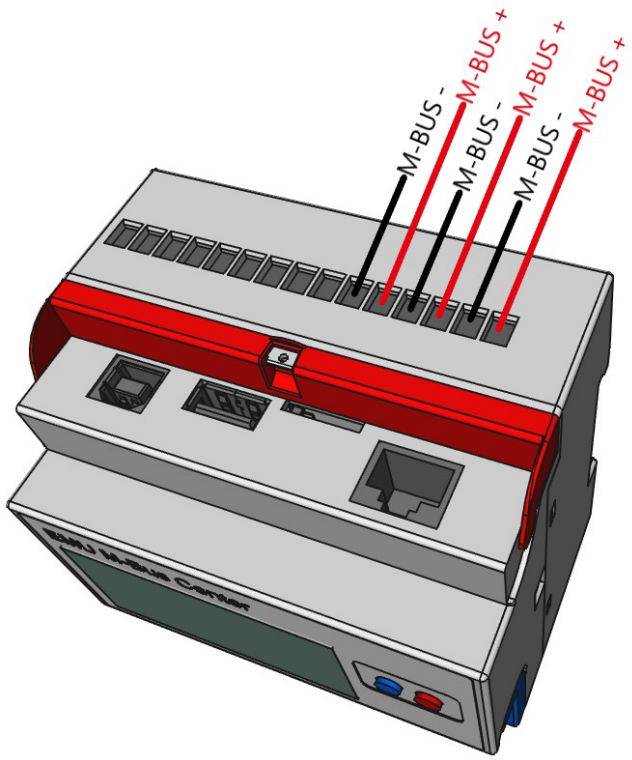
EMU Article number: 940 076

Network cable

The network cable is to be connected to the back of the device.

The network interface supports 10/100 Mbit/s duplex.

M-BUS



Cable length

The maximal Bus length is dependent on many factors. For an approximation to the maximal segment length possible between the M-Bus Center and the meter furthest to it, consult the following table.

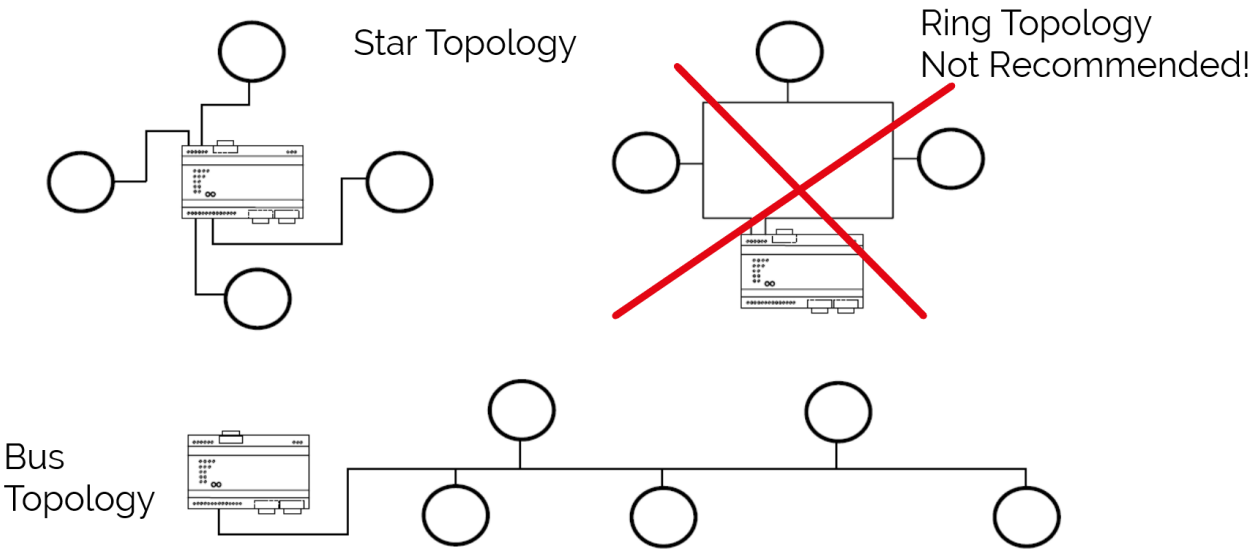
Description	Value
Cable in use	2x$0.8mm^2$
Capacity of one M-BUS device	$1nF$
Avg. current of one M-BUS device	$ 1.5 mA $

Number of connected M-Bus devices	Maximal segment length
1	142.00 km
10	14.70 km
50	2.80 km
100	1.40 km
150	0.95 km
200	0.71 km
250	0.57 km

Note: These specifications are only to be used as a reference. The actually possible segment length may vary. Generally it is recommended to keep the segment length to a minimum.

Topology

You are free to choose a network topology which suits your needs, although the ring topology is not recommended.



Start up

After successfully connecting the M-Bus Center the device may be configured.

This chapter describes the recommended steps in configure a newly installed M-Bus Center. It is always possible to configure the device further on a later time.

Network configuration

By default, the device is set to DHCP and tries to get a valid IP from a DHCP Server.

If the display shows the IP-address as 0.0.0.0 either:

- The M-Bus Center was started before the DHCP Server was online.
- There is no DHCP server available.

If the former error applies, please restart the M-Bus Center by pressing both the red and blue button on the front of the device for more than 10 seconds. After the reset, the device again tries to get a valid address.

For the latter error the device must be setup with an address manually, as is described in the next sub-chapter.

Network configuration on the device

To start the network configuration press and hold the blue button for 1 to 5 seconds.

The first Number of the IP-address will light up with a blue backdrop. Use the red button to increment the number by 1 for each button press.

Briefly press the blue button to change to the next number.

To end and save the IP configuration, press the blue button until all the numbers have been selected once.

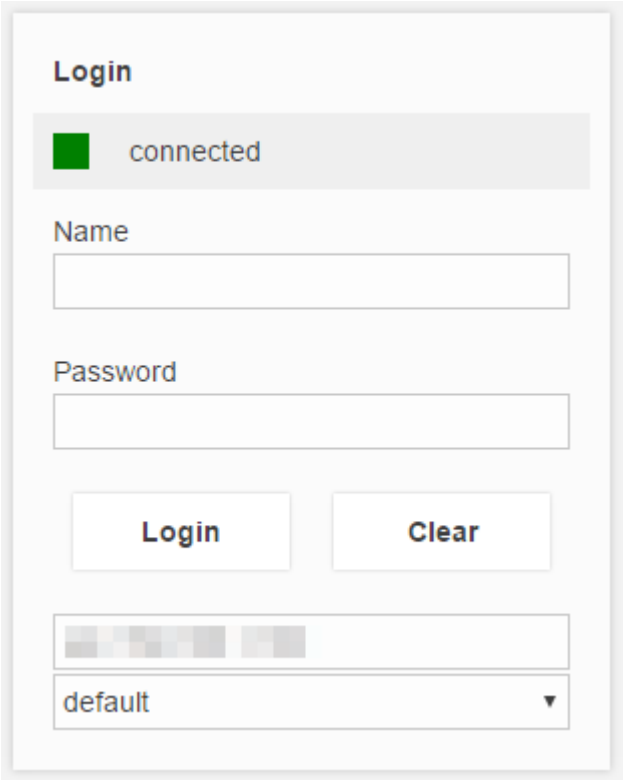
Access to the M-Bus Center through the Web interface

If the M-Bus Center has a valid IP configuration, the device can be reached via their IP-address in a web browser.

Afterwards, two buttons appear in the browser. Choose the one reading “continue without encryption / http” to get to the login.

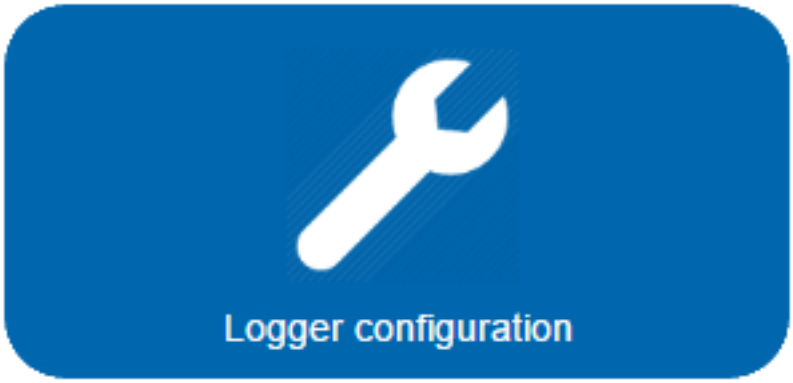
The default access data ex-factory for the M-Bus Center are as follows:

- Name: admin
- Password: 123



Note: It is recommended to change the default password.

Change M-BUS Center settings



To change the language of the web application, use the button on the bottom right. Use the Logger configuration button to reach the M-Bus Center settings. *Note: To navigate between the different sub menus please use the menu bar as shown in the picture. The return key on the browser works as a log out button.*

General

The following settings are changeable in the “General” tab:

- Name of the center
- Location of the center The name and location are from now on visible in the top blue banner.
- Timezone
- Read out cycle

Note: By default the read out cycle is 15 min.

Save the settings by pressing the save button at the end. It is possible to reboot the M-Bus Center by pressing the “Reboot” button at the end.

Network

In this sub menu, the IP address/ subnet mask and gateway of the center can be changed

If the IP configuration was performed manually, the DNS-server-address must be input here. In case they are not known, use 8.8.8.8 and 9.9.9.9.

Date/ Time

Check and change the current time and date of the M-Bus Center. - In case there is no Internet connection available, the time and date have to be set manually. - If the Center has an active Internet connection and a valid DNS-server-address a NTP-server may be input. *e.g. pool.ntp.org*

Start scan for meters

On the web application

Scanning via the web interface allows for further functionality.

To keep the scan time to a minimum, set the baud rate to 2400 Baud. This is the default for most meters.

It is possible to scan for a primary or secondary address.

The option “enable reading values from the data-logger provided by EMU Professional II?” lets you read out the data logger of a connected EMU meter. This option only applies to meters added after activating this option. (Only applicable to meters with a serial number > 2235xxxx and M-Bus Center FW 1.9.10.3/1.10.10.3)

 *Note: The data logger read-out reads the datalogger of the EMU meter. Be aware that a change in read-out interval on the M-Bus Center does not affect the data logger save interval of the EMU meter.*

Default procedure:

- Under “Meter configuration” choose the tab “Search”.
- Set Baud rate to 2400 Baud.
- Press “via Secondary address” to start the scan.
- Status (on the bottom of the web application) changes to “scanning with 2400 Baud”.
- The scan is finished once the status no longer reads “scanning”.
- To the right of the status the number of found meters is displayed in brackets.

On the device

To start the scan, press and hold the red button for at least 5 seconds. The M-Bus Center now searches via the secondary address and will run through all Baud rates. While scanning the “Read” and “Scan” LED on the device glow permanently. Once the scan is finished both LEDs turn off.

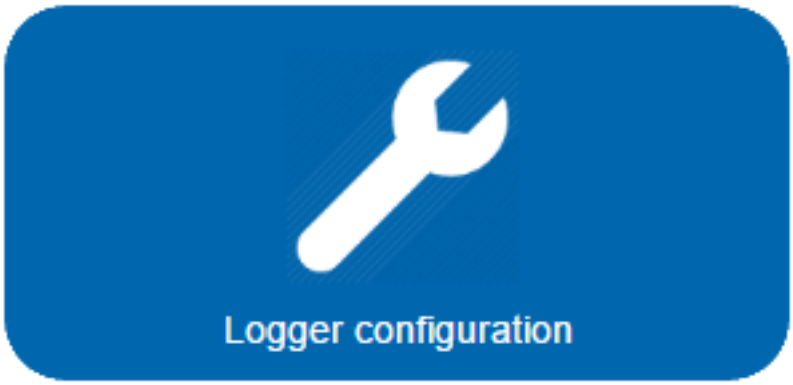
Examine found Meters

All the meters found while scanning can be found in the “Meter” tab. The four pulse inputs, as well as the two PT1000 inputs are also found in this tab. If all the found meters display a green wrench on the right side the basic configuration is finished and the M-Bus Center now records the data of the found meters based on the applied settings.

Further Settings

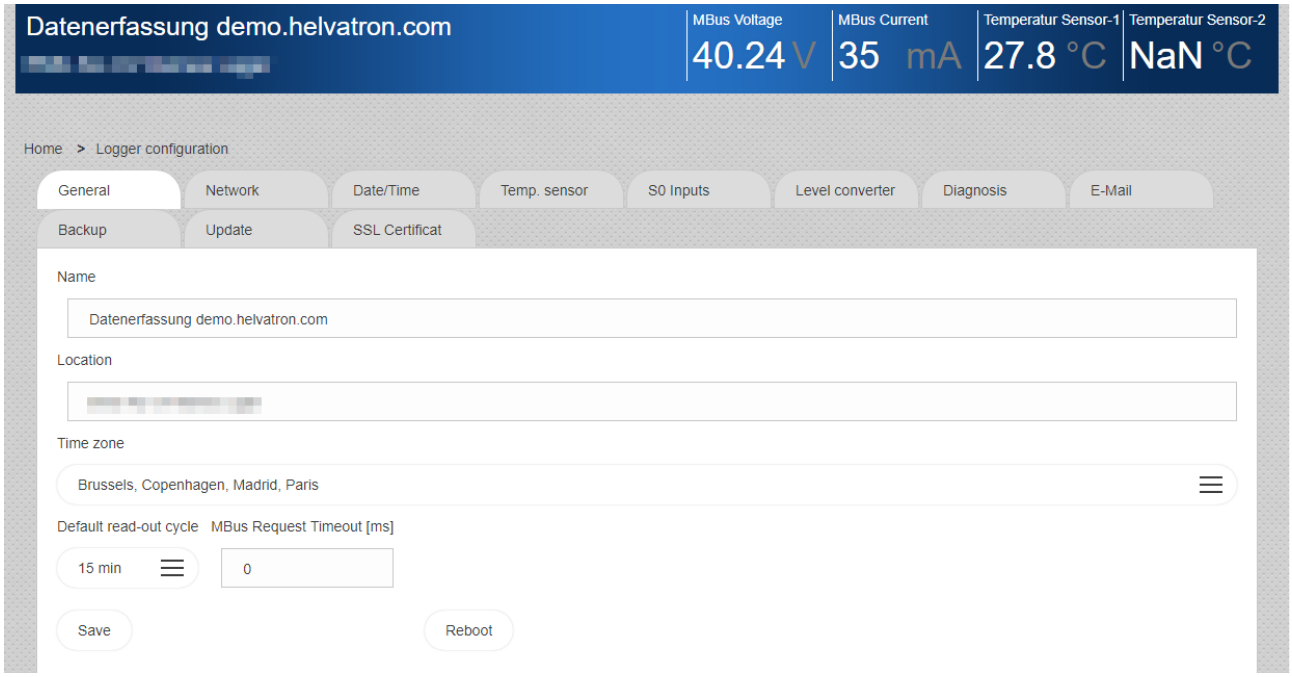
If there is need for setting further parameters refer to the following chapters which describe the web application in detail.

Logger configuration



Adjust all logger related settings in this sub menu.

General



Allows the setting of Name, location of the M-Bus Center as shown on the top left of the web application. Further allows the adjustment of time zone and read-out cycle.

The following read-out intervals are available:

10s, 30s, 1min, 2min, 3min, 4min, 5min, 10min, 15min (default), 20min, 30min, 45min, 60min, 90min, 120min, 150min, 3h, 6h, 12h, 18h, 24h, 48h, 168h (7 days), 672h (28 days)

Recommended read-out interval: 15 minutes This allows for a robust read-out with a good resolution of the data.

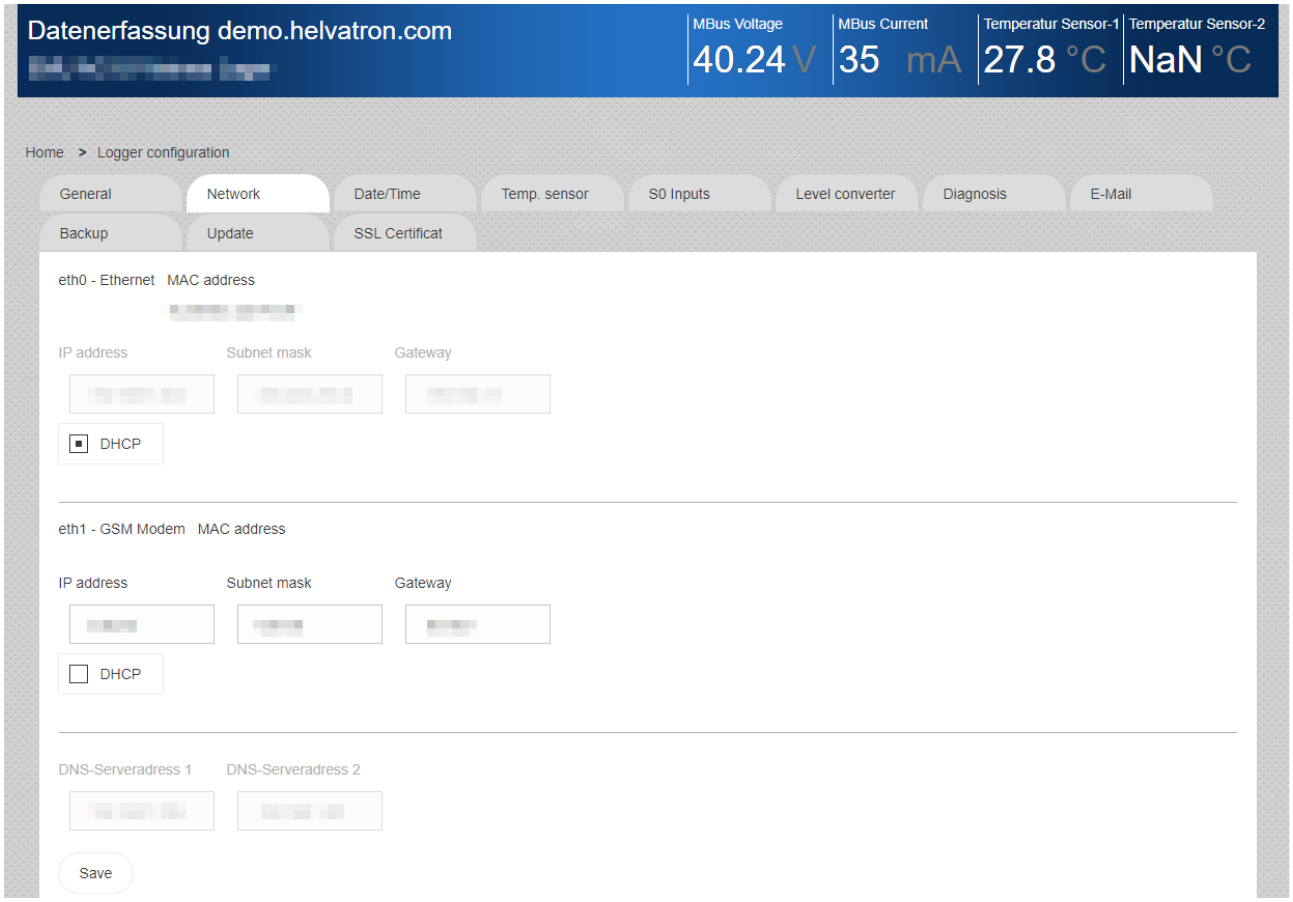
The minimally possible read-out interval is determined by the read-out duration of the connected devices. If a read-out cycle for all connected devices goes on for more than 15 minutes, a slower interval must be chosen.

The M-BUS Center supports raster read-out:

- On a chosen interval of 15 minutes the read-out starts at hh.00, hh.15, hh.30, hh.45 res

- On a chosen interval of 1 hour the read-out always starts at the full hour.

Network configuration



Allows for the configuration of the various network interfaces. This configuration can be static or dynamic.

If the network is configured dynamically, no further settings are necessary. For a static configuration the following settings are available:

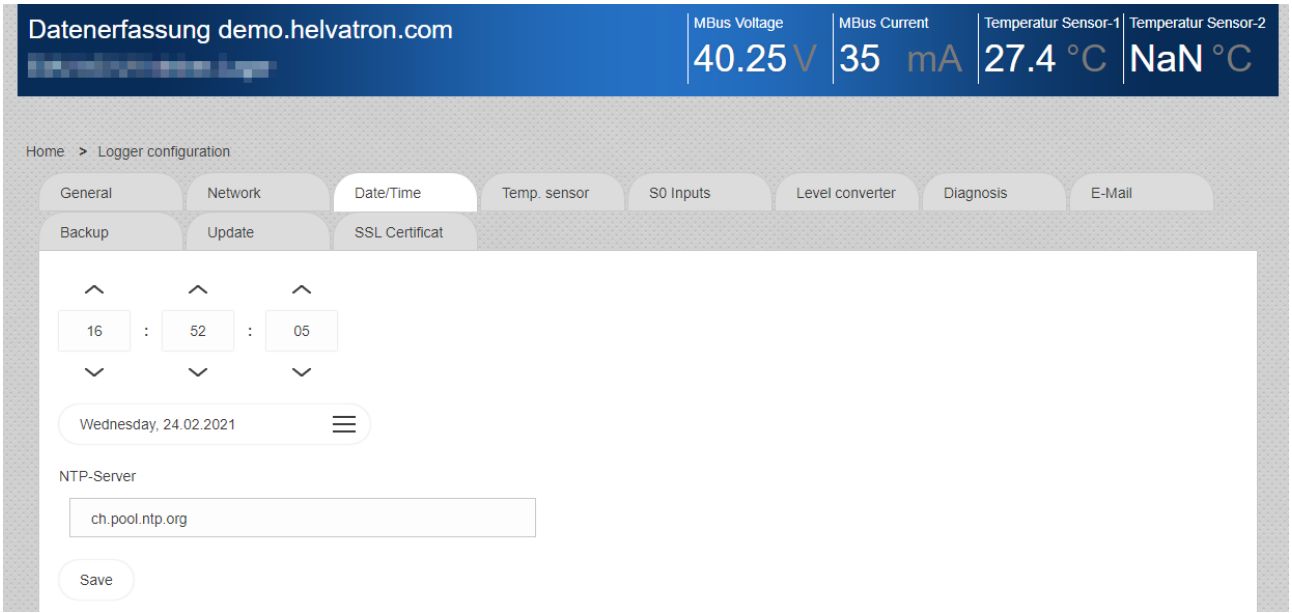
The sub menu **eth0** allows the configuration of a LAN.

The sub menu **eth1** allows the configuration of an additional UMTS-network.

The sub menu **DNS-Server-address 1 and 2** allows for registration of available DNS-Servers.

For an easy installation use the IP-address of the router for the DNS-server. Alternatively the addresses 8.8.8.8 and 9.9.9.9 can be used. *Note: If the IP-address is changed via the web application, make sure to reopen the web application anew with the new IP-address before changing any other settings.*

Date/ Time



For a correct read-out and storage of meter data, a correct date and time is a necessity.

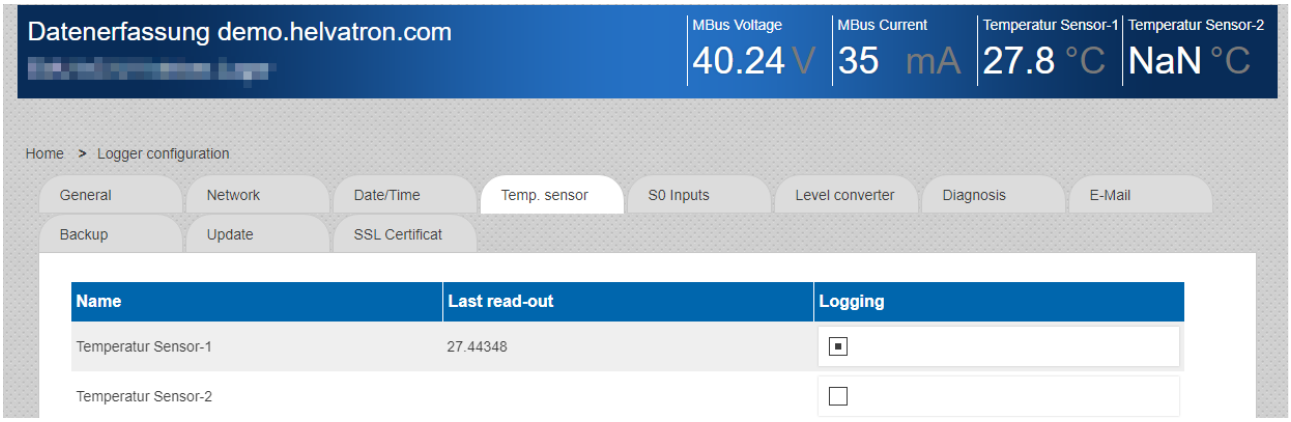
Set the date and time manually or if the M-Bus Center has a network connection set the NTP server for an automatic time synchronization.

For example: pool.ntp.org

The option “enable date/time synchronisation over M-Bus” allows for automatic hourly synchronisation of the meter time over M-Bus. (Only applicable to meters with a serial number > 2235xxxx and M-Bus Center FW 1.9.10.3/1.10.10.3)

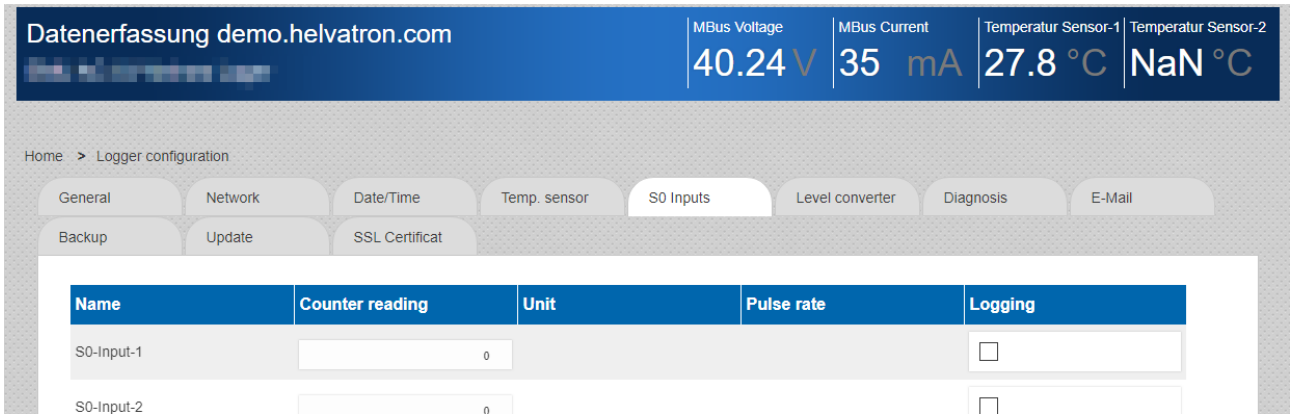
The button “Synchronize date/time over M-Bus immediately” lets you synchronize the time of all connected meters immediately. (Only applicable to meters with a serial number > 2235xxxx and M-Bus Center FW 1.9.10.3/1.10.10.3)

Temperature sensors



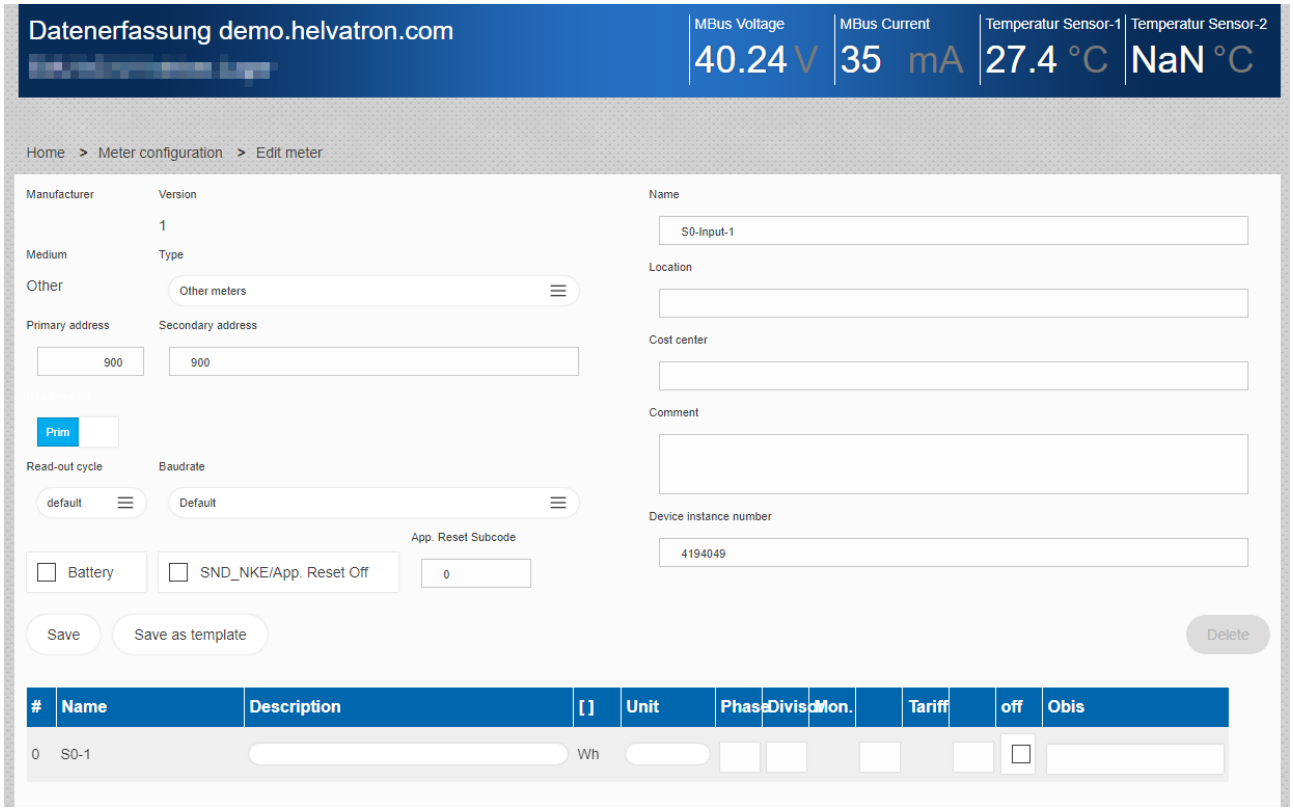
By default, the storage of temperature sensor data is turned off. Choose the option “Logging” if you want to store the data output of connected temperature sensors.

S0-Inputs



Use the option “Logging” to turn the storage of the data input of the four S0-Inputs on or off. To change the meter reading choose the corresponding option for the S0-input in question. The set unit and pulse rate for each S0-input is also visible in this tab.

To set the pulse rate of any S0-input go to the menu “Meter configuration” and choose the “Details” option.



On a set pulse rate of 1000 pulses/ kWh the unit is to be set to kWh and the divisor to 1000.

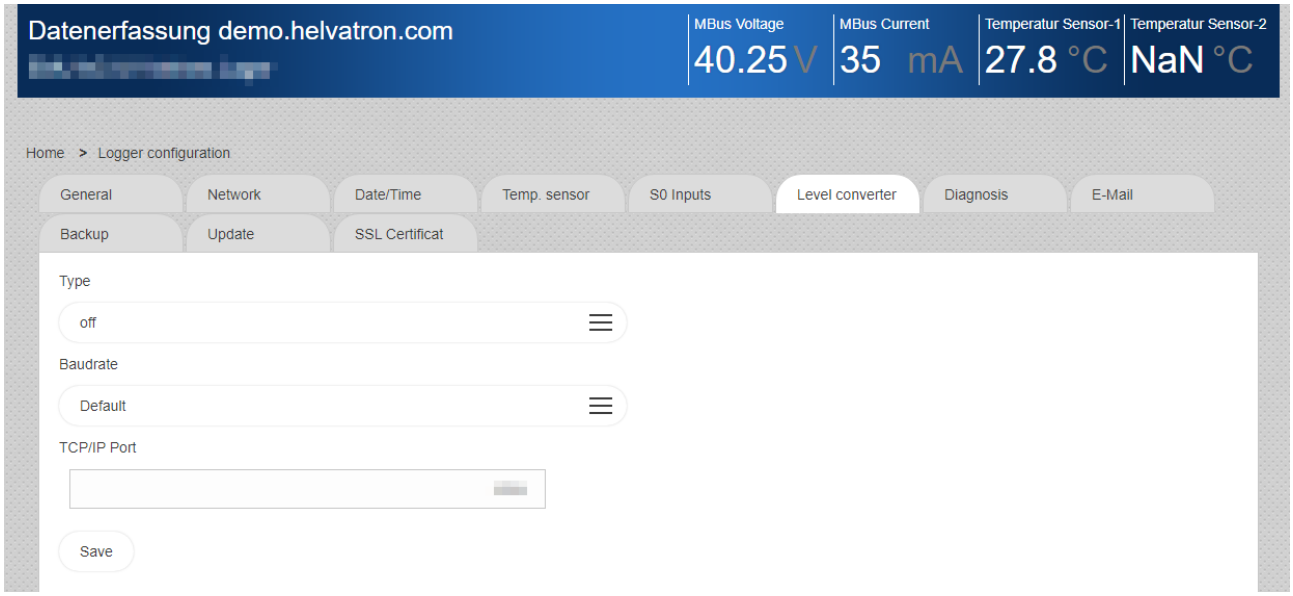
Example

A water meter specifies a pulse rate:

1 pulse = 1 hl

- The volume shall be shown in liters: 1 pulse = 100 l 1 liter has the pulse rate 0.01, the divisor therefore must be chosen at 0.01. **Check:** The current meter value reads 10241 l = 102 pulses => 102/0.01 = 10’200 l
- The volume shall be shown in m^3: 1 pulse = $0.1m^3$ $1m^3$ a pulse rate of 10, the divisor therefore must be chosen at 10. **Check:** The current meter value reads 10241 l = 102 pulses => 102/10 = $10.2m^3$

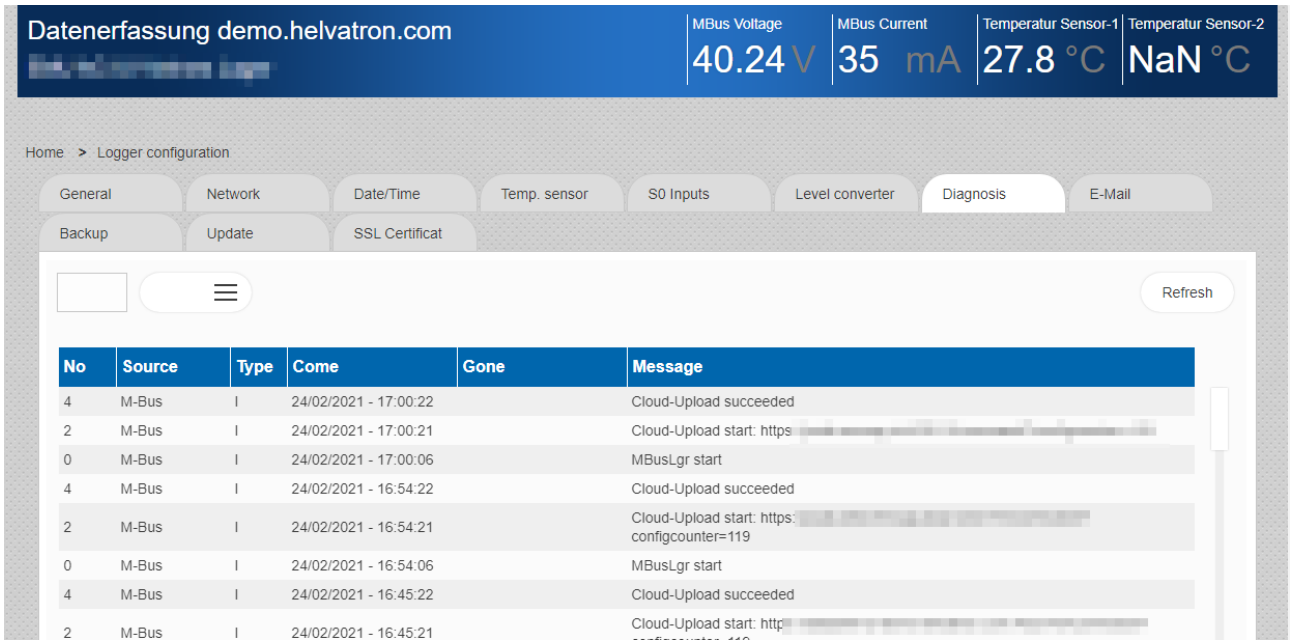
Level converter



It is possible to read out the meters by connecting via USB or TCP/ IP to the M-Bus Center.

This function is used for the first time register configuration of the EMU Allrounder/ Professional as well as for the diagnosis of M-Bus related errors in communication.

Diagnosis

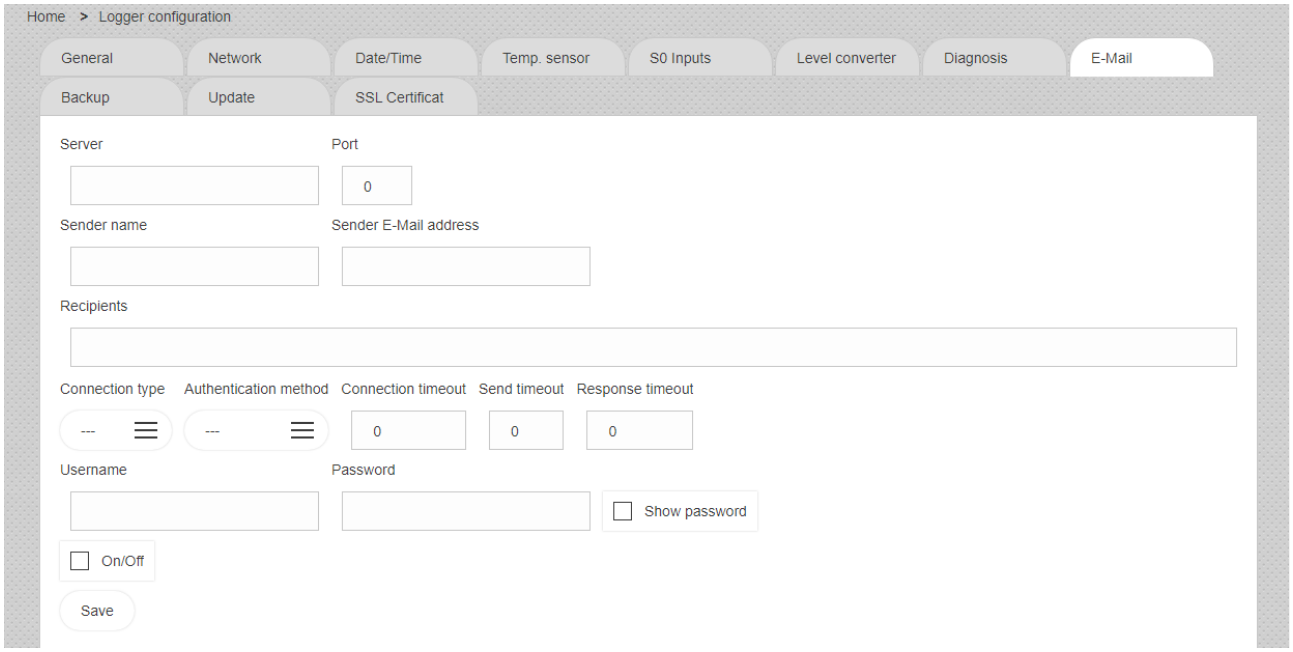


This tab lists all past events.

The following events are evident:

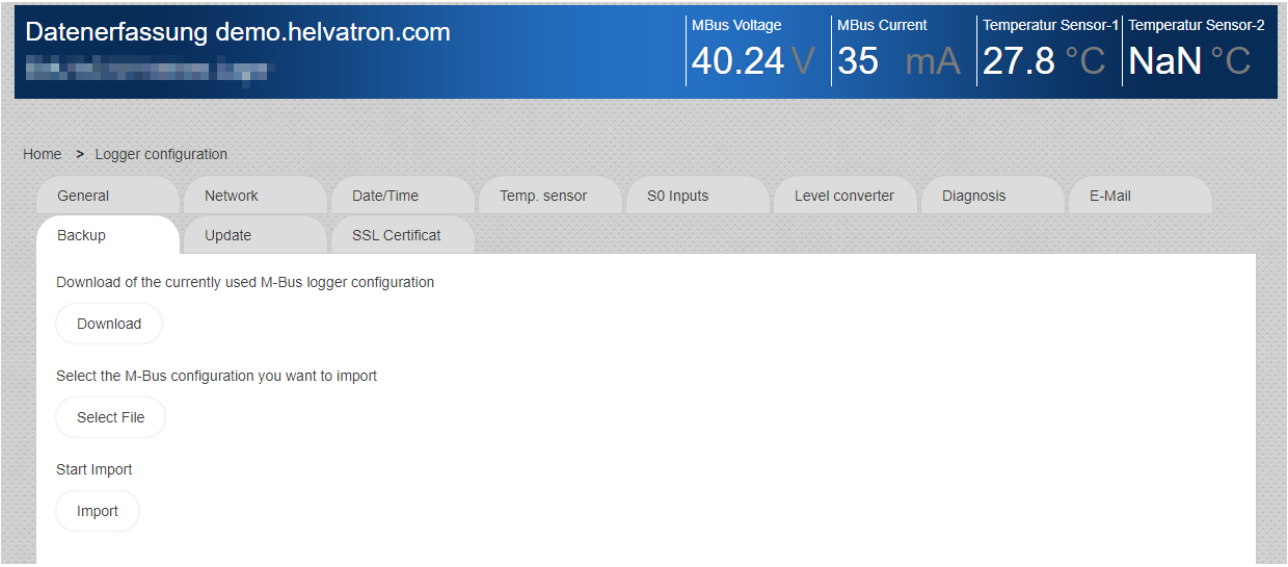
- M-BUS Center
  - “MBusLgr start”: Successful start of the M-BUS Center.
  - “M-Bus overload”: Short circuit on the M-Bus.
- Joulio-Web
  - “Cloud-Upload start:” Data upload into Joulio-Web started.
  - “Cloud-Upload finished with errors” Error in uploading data.
  - “Cloud-Upload succeeded” Success in uploading data.
- FTP-Upload
  - “Ftp-Upload start” Data upload to the FTP-Server started.
  - “Ftp-Upload failed” Data upload failed.
  - “Ftp-Upload succeeded” Successful data upload .
- Meter read-out
  - “Meter n read-out failed” Meter n could not be read.
  - “Meter n with error flags” Meter could not be read but reports an Error on one of the registers.
- E-Mail notifications
  - “EMail-Transfer failed” Sending of E-Mail failed.

E-Mail



This tab allows for e-mail notification to be configured. On a failed read-out of a meter, an e-mail is sent to the specified recipient.

Backup



Allows the export and import of M-Bus Center configuration files.

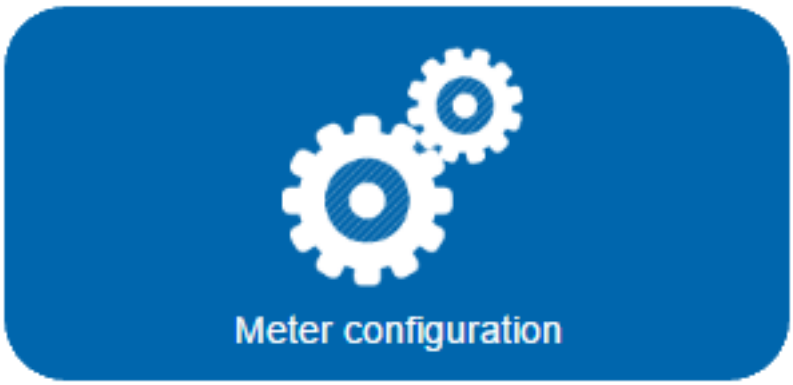
Update

This tab allows the update to the newest version as well as the review of installed packet versions. The M-Bus Center can also be updated manually.

SSL-Certificate

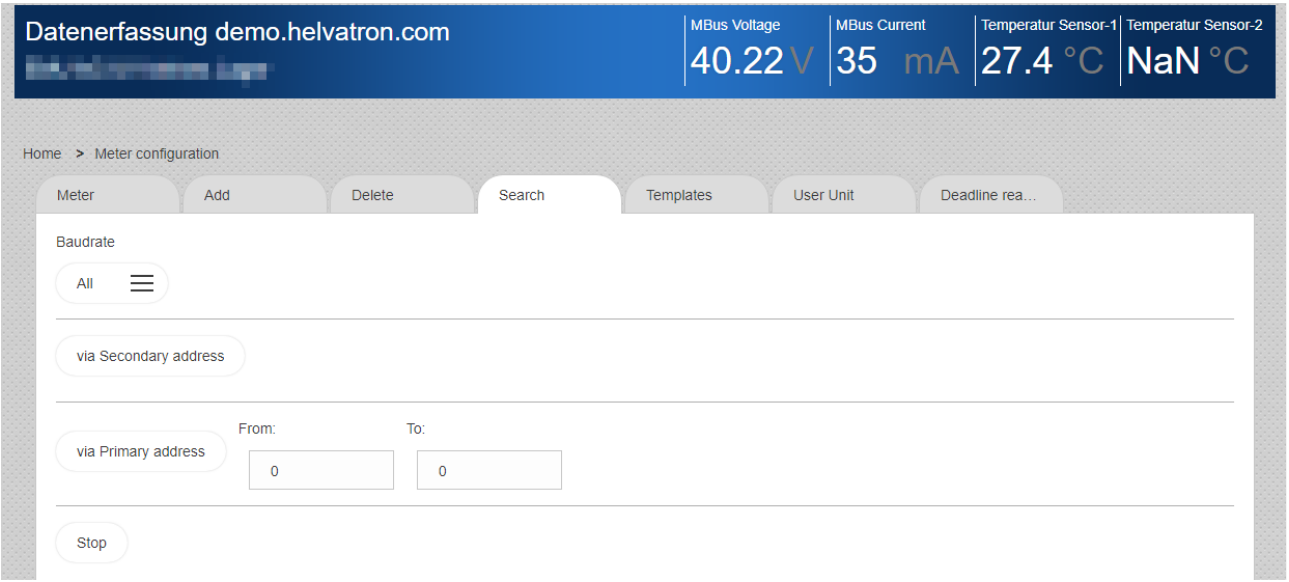
For a secure communication between the M-Bus Center and a web browser please upload a X.509 certificate.

Meter configuration



This menu allows for all meter specific settings to be applied.

Automatic Scan for connected meters



Active Scan:

- the “Scan” and “Reading” LED glow constantly.
- The status on the web browser changes to “scanning with X Baud”.

The found meters will be automatically named after the following schema:

<Manufacturer ID (3-digit)> <Medium (4-digit)> <Primary address (1-3-digit)> <Secondary address (1-8-digit)>

The scan is finished when:

- The “Scan” and “Reading” LEDs no longer glow constantly.
- The status on the web browser changes away from “scanning with X Baud”.

The option “enable reading values from the data-logger provided by EMU Professional II?” lets you read out the data logger of a connected EMU meter. This option only applies to meters added after activating this option. (Only applicable to meters with a serial number > 2235xxxx and M-Bus Center FW 1.9.10.3/1.10.10.3)

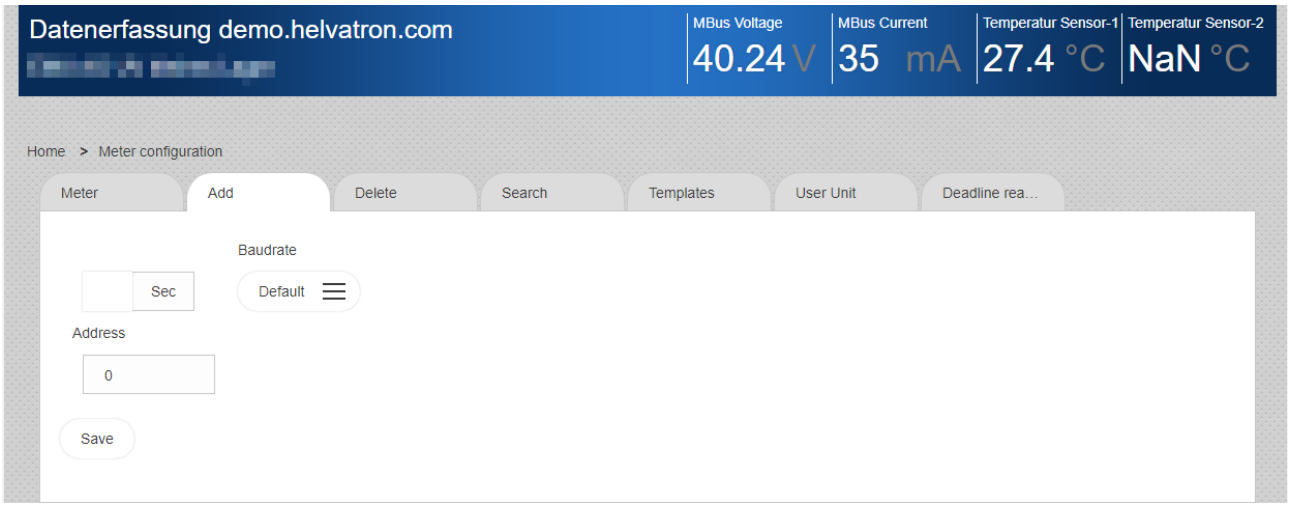
Note: The data logger read-out reads the datalogger of the EMU meter. Be aware that a change in read-out interval on the M-Bus Center does not affect the data logger save interval of the EMU meter.

Automatic registering of EMU Allrounder M-BUS and EMU Professional M-BUS Meters.

Set the Baud rate in the tab “Search” to 2400 Baud and start the scan by pressing the “via Secondary address”.

The secondary address of the EMU Allrounder and the EMU Professional translates to it’s serial number.

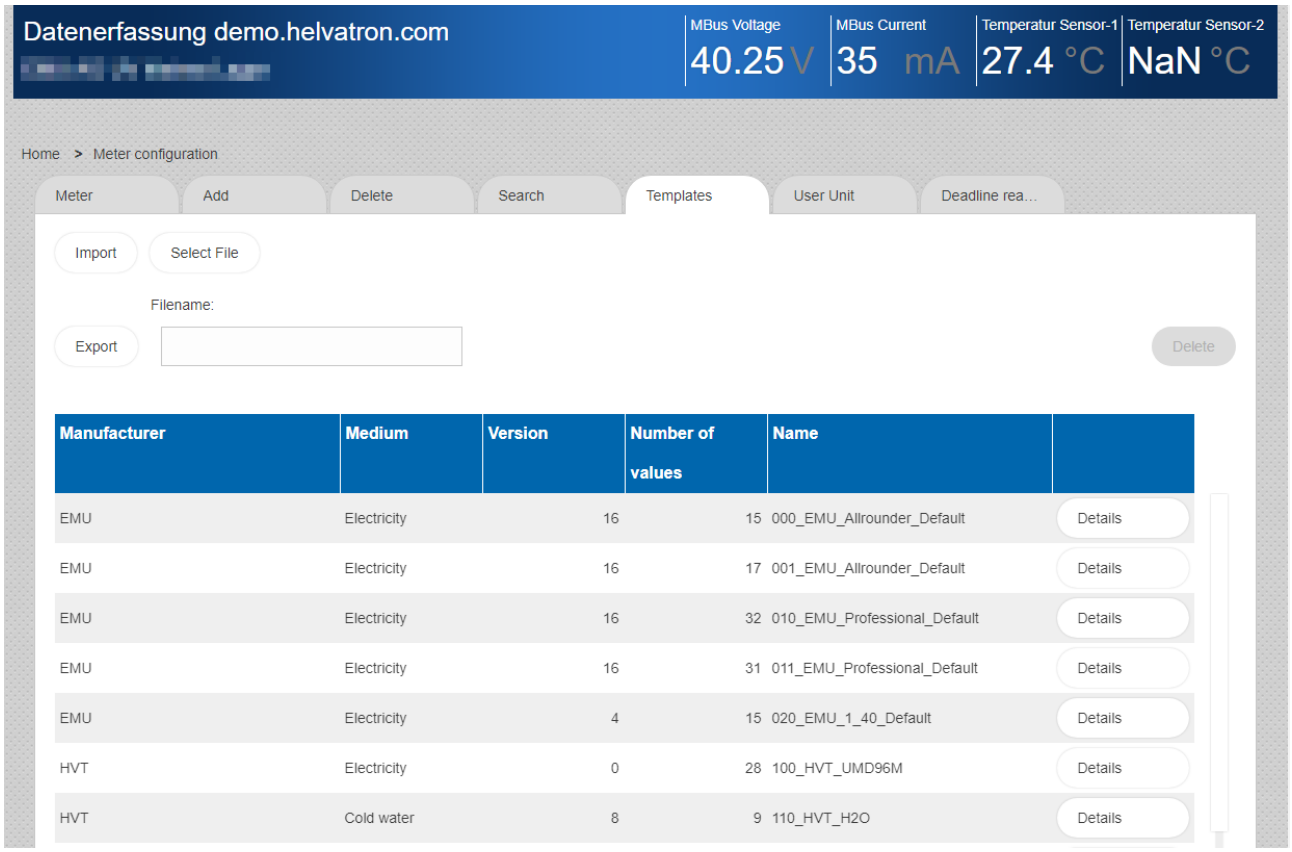
Manual meter scan



The manual scan allows to scan for a specific meter via it’s primary or secondary address (freely chosen) and Baud rate.

If no Baud rate is given, the default 2400 Baud are used.

Templates



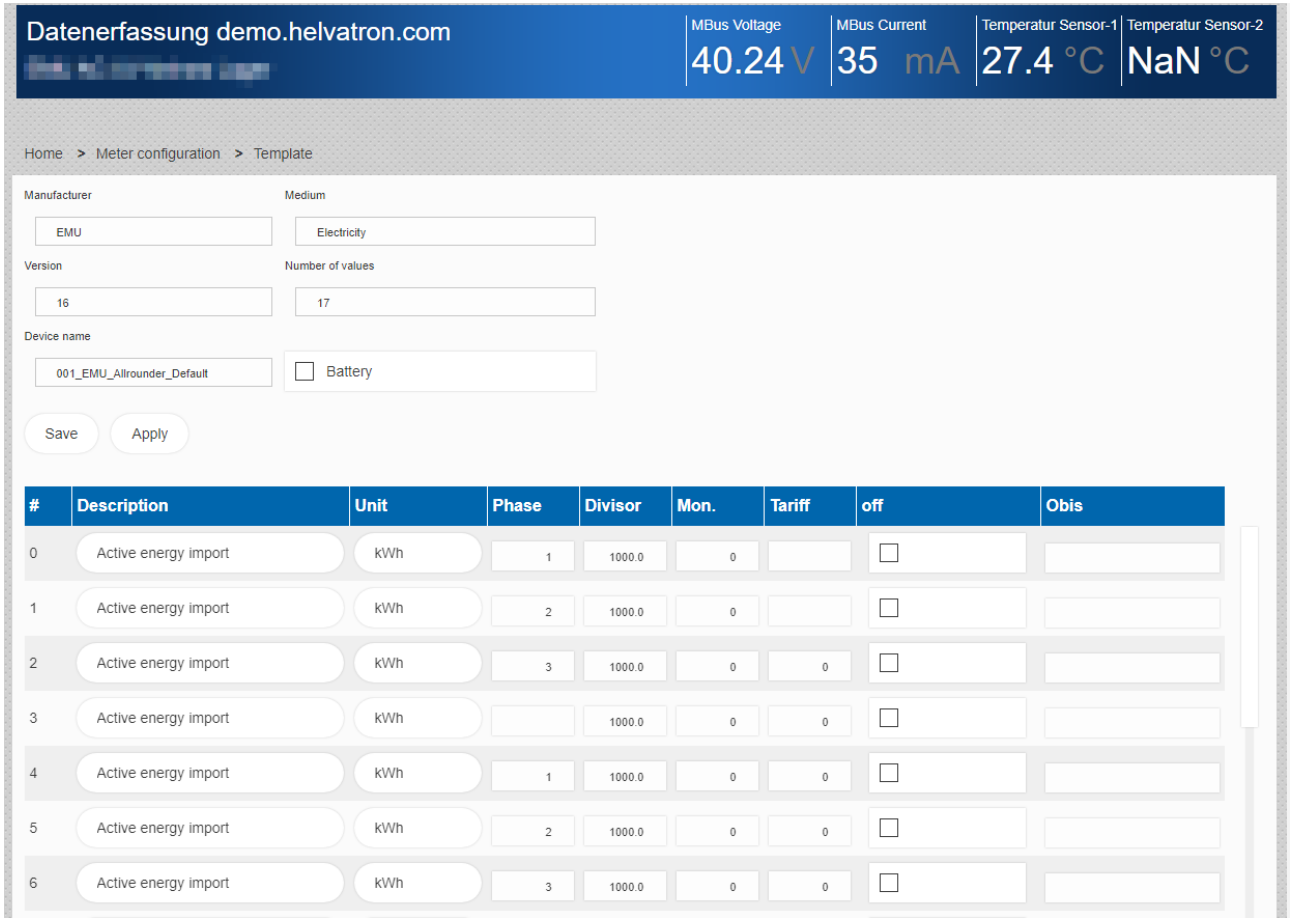
Templates are used for easier register configuration of a meter. Once created they can be used indefinitely. There can only ever be one template for each type of meter. The type of meter is characterized by the following fields:

1. Manufacturer
2. Medium
3. Version
4. Values

Condition as supplied to customer

By default one template for the standard registers of the EMU energy meters Allrounder, Professional and Professional II are available.

Apply



Choose the wanted template by clicking the “Details” button. Here the template can be adjusted, saved and directly applied to all meters with corresponding Fields as shown below.

For a template to apply the following fields must correspond with the meter:

1. Manufacturer
2. Medium
3. Version
4. Values

Once the button “Apply” is clicked, the template is applied to all meters with identical fields as the ones shown above.

Note: On a M-Bus Center with a FW-Version of 1.9.10.3/1.10.10.3 or newer the read-out interval is also applied to all meters.

Create

See meter configuration.

Import

Import templates by clicking the “Select File” button, choosing the template to upload and then clicking “Import”.

Export

To export modified versions of your templates, enter the file name of the wanted template into the “Filename:” field and click the “Export” button. The export function is also recommended for a backup of your templates.

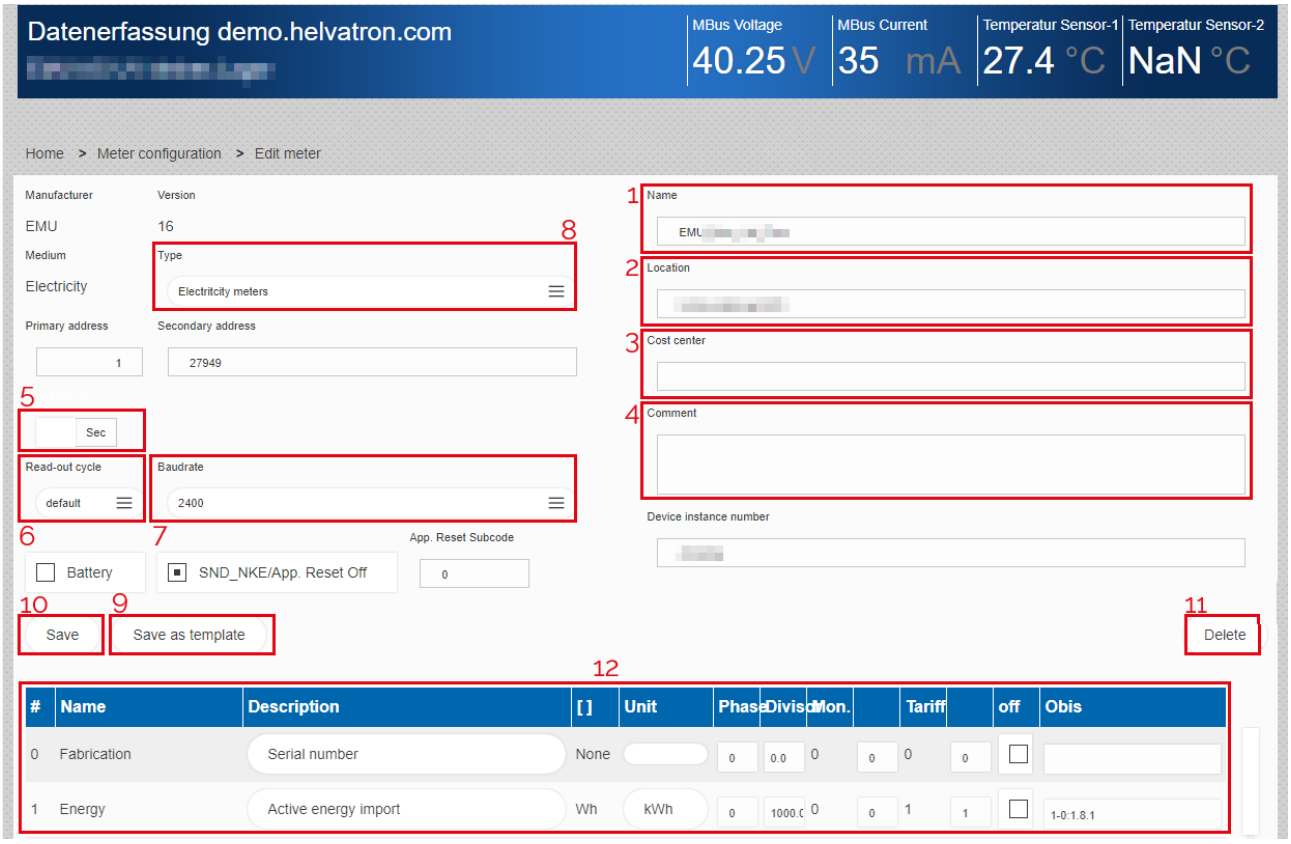
Delete

Tick the box to the left of the to be deleted meter and delete it by clicking on the “Delete” button on the top right.

Warning: If a meter gets deleted, all of it’s stored data will be deleted as well! See meter configuration.

Meter configuration

To adjust the automatically parametrized attributes of a meter, click on “Details” to the right of the meter in the tab “Meter”. The following overview appears:



1. Name

   Name of the meter that is displayed in the overview. The name is also used for the export function.

2. Location

   Location of the meter.

3. Cost Center

   Deposit a cost center for this meter.

4. Comment

   Leave a comment for this specific meter.

5. Addressing mode

   To use the primary addressing mode, a primary address must be provided beforehand.

   The default addressing mode is secondary addressing. Most installation use this mode.

6. Read-out cycle

   Set the read-out cycle for this meter. The available intervals are: 10s, 30s, 1min, 2min, 3min, 4min, 5min, 10min, 15min (default), 20min, 30min, 45min, 60min, 90min, 120min, 150min, 3h, 6h, 12h, 18h, 24h, 48h, 168h (7 days), 672h (28 days)

If nothing else was set, the meter will use the default read-out cycle of 15 mins.

7. Baud rate

   EMU Allrounder and Professional use the default 2400 Baud rate.

8. Type

   Set the type of the meter for the Overview.

9. Save as template

   Save the configured registers as a template.

10. Save

    Save all adjusted settings.

11. Delete

    Fully delete the meter from the database.  *Warning: Deleting a meter also deletes all of it's past data!*

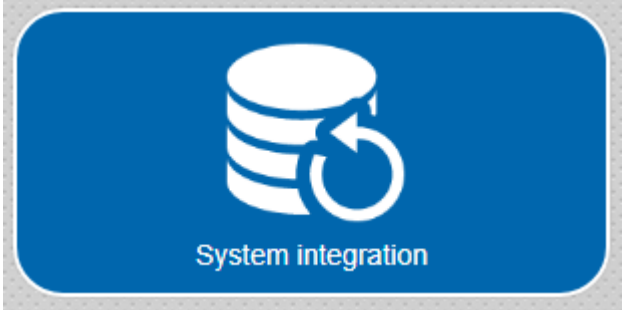
12. Register configuration

    Change the name of any register the M-Bus Center receives over M-Bus.

    Change the unit of a register. This does not automatically change the scaling factor. The scaling factor can be changed by adjusting the “Divisor”.

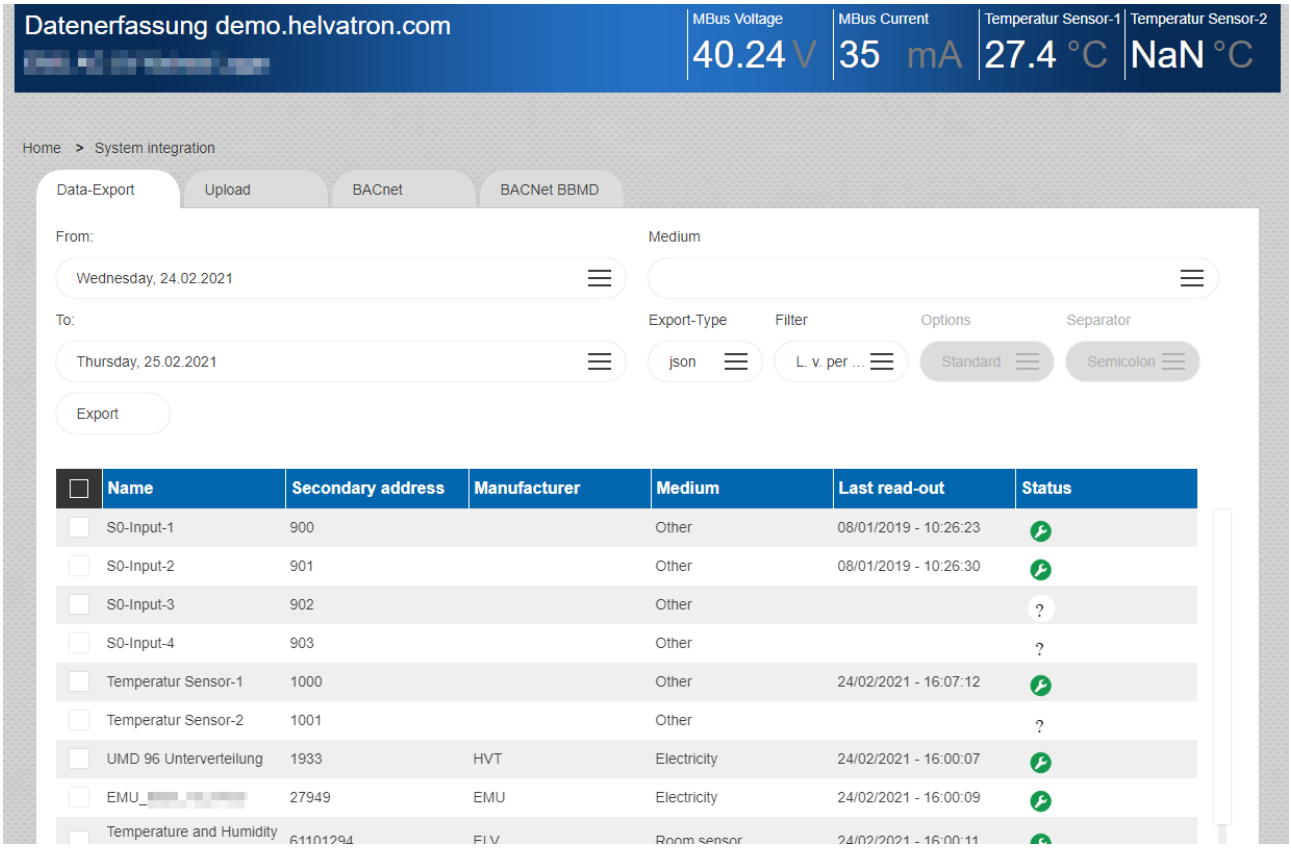
    A divisor of 1000 corresponds to a multiplication with the factor 0.001.

System integration



Configure all software interfaces in this sub menu.

Manual data export



Choose the tab “Data-Export” for a manual export of past meter data. The available formats are .csv and .json.

To start a data export choose the following attributes:

- The time frame
  - From: “Date”
  - To: “Date”
- The Export-Type
  - .csv (see below)
  - .json
- The Filter
  - Last value per hour

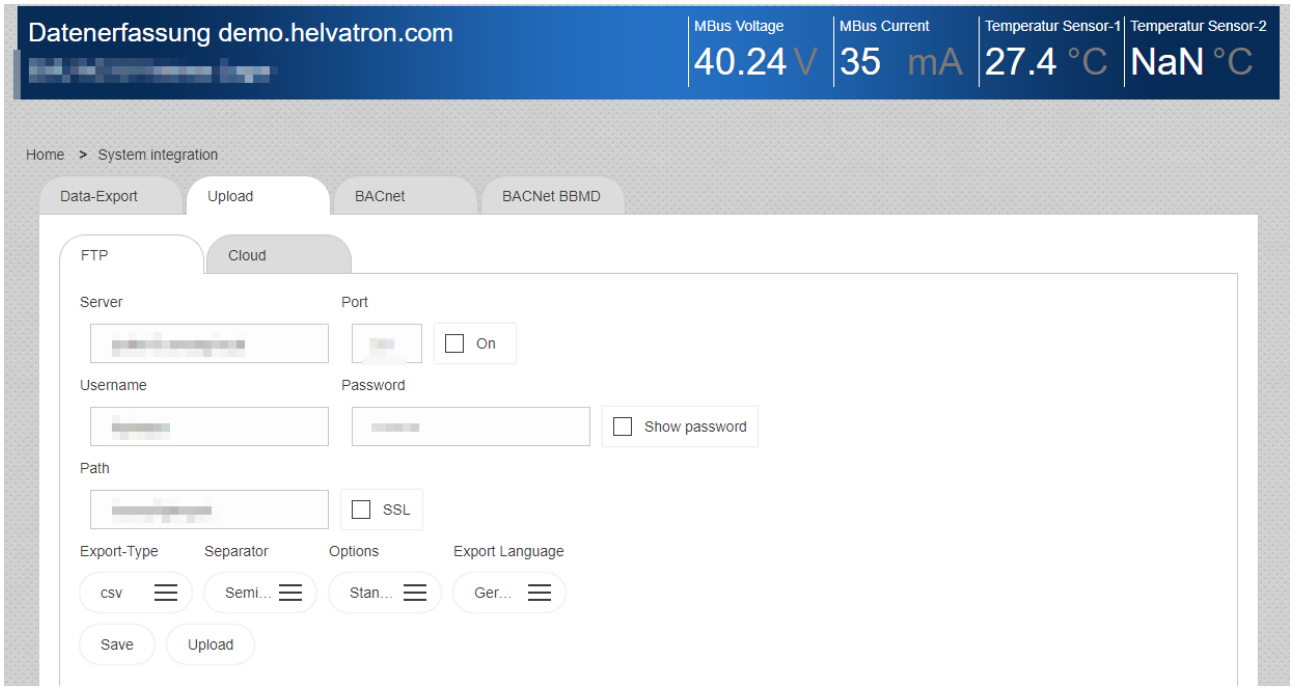
  - Last value per day
  - Last value per month
  - All Values
- the meters
  - Selective export: click the box to the left of the meter
  - Complete Export: select all meters by clicking the black box on the top left corner of the meter overview.

Note: If a meter has no data stored for the chosen time frame the meter will not show up in the export file.

- additional settings for a .csv export:
  - Options
    - Default
    - FULL DB
  - Separator
    - Comma
    - Semicolon
    - Space
    - Tab

Once the “Export” button is pressed, the web browser export starts. The export creates a file per meter with the meter data for the selected timeframe. These files output into a compressed ZIP-file. DataExport _ < Secondary address > _ < Meter name > _ < dd_MM_yyyy_hh_mm_ss > . < Format >

Automatic data export (FTP)



The “Upload” tab allows for a fully automatic export of meter data to an external server.

For each meter and time frame one file is exported.

The files are named as follows:

< Meter ID >-< Secondary address >-< yyyyMMddhhMMss >.< Format >

The “Path” field must not be empty.

FTP

The configuration of the FTP protocol can be done analogously to the figure above.

FTPS

By ticking the box next to “SSL” the FTP export can be secured.

It may be necessary to change the used port. For further questions regarding SSL export please refer to your server provider.

SFTP

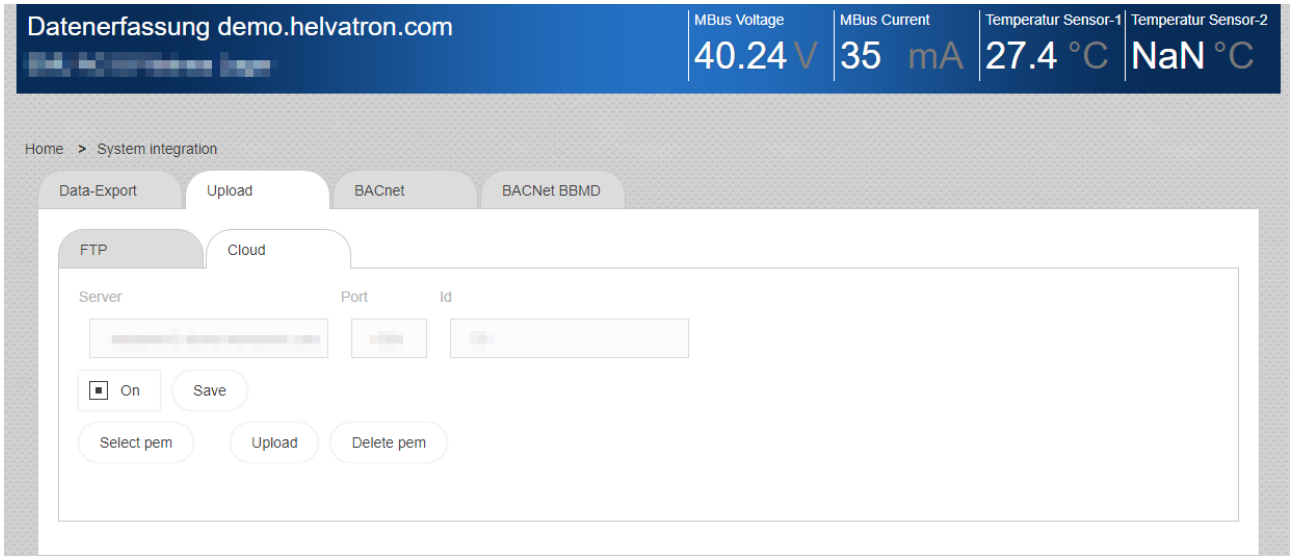
Activates the SSH file transfer protocol.

Leading the server entry the protocol must be set as follows:

sftp://[HOST]

Note: The option “SSL” cannot be selected for the SFTP to work.

Automatic data export (Cloud - Joulio-Web)



This tab allows for a Joulio-Web connection to be established.

BACNet

This tab allows for BACNet specific configurations. The device instance number is at the same time the starting address. The connected devices will be numbered continuously starting at this starting address.

If the option “Permanently read M-Bus” is selected the M-Bus Center will no longer log any data on its SD card. The current values are instead read out over M-Bus and sent to the BACnet.

BACNet BBMD

This tab allows for BACNet BBMD specific configurations.

Meter overview

Overview

For a convenient overview, all meters are categorized:

Once a category is selected, all connected meters of that category are displayed.

Status

Status	Description
	Meter has never been read
	Last Read-out successful
	Error on this meter in a register after the last read-out
	Last read-out failed

Eventual Errors of meters can be decoded using the M-Bus protocol description of this specific type of meter. In most cases error messages can be considered as an indication and don't need further action. Especially water meters have error registers.

Inspect last read-out of a meter

Press the "Details" button on the right of a meter to inspect the last read-out. It is possible to inspect past data by choosing a different date via the drop-down menu at the top of the registers.

It is possible for measurements of central relevance (Import) to be displayed as a figure by clicking on the "Chart" button.

Troubleshooting

One or more meters cannot be read

Battery operated devices oftentimes have an internal access counter. This counter prevents the read-out of meter data after a certain number of read-outs in a predefined timeframe. This functionality exists to prolong the battery life of these meters.

No meter can be read

Check for short circuits on the M-Bus:

- The M-BUS voltage should be ca. 40 VDC.
- The current on the M-BUS Strom should be in a reasonable scope. EMU meters use 1.5mA on average, while battery powered meters use up to 3 or 4 times that amount.

If the M-Bus current meter shows 0mA, no meters have been connected via M-Bus to the M-Bus Center.

Numerous meters cannot be read

- Check if all these meters are connected via the same strand and if that strand is interrupted.
- Check the M-BUS voltage on the meter (with a Multimeter). The voltage measured should be higher than 24 VDC.
- Check for a faulty addressing mode on primary or secondary addressing modes. Do multiple meters have the same address?

One meter cannot be read

- Check if the selected read-out interval is supported by the meter.
- Check the M-BUS voltage on the meter (with a Multimeter). The voltage measured should be higher than 24 VDC.

Measurement on the M-BUS Center differs from the measurement on the meter by a constant factor

Check the divisor of the affected register. If needed, set the divisor to the correct value.

FTP-Upload fails

Try and test the connection via another program. Possible cause:

- One of the parameters is incorrect.
- No DNS-server address is given.
- No Internet connection
- M-Bus Center has no access right to the specified directory.
- User may be barred from the FTP server due to repeated failed attempts.

MMC missing

The message “MMC missing!” or “Custom database query failed! Please check your mmc.” on the display points to a problem with the SD card. It was either not recognized by the M-Bus Center or missing.

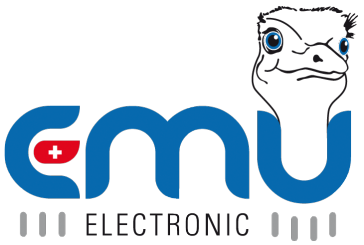
Possible cause:

- SD card is not properly/fully inserted
- SD card is faulty

Procedure:

- Shut off the M-Bus Center
- Remove SD card and reinsert correctly
- Restart the M-Bus Center

If the message still appears, the SD card should be tested with another device.



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