EMU M-BUS Logger

Index

Introduction

The M-BUS Datalogger can readout up to 60 M-BUS Devices and save their values periodically on the internal SD-Card. All data can be readout over a TCP/IP Interface and can be visualized on a computer.

Installation
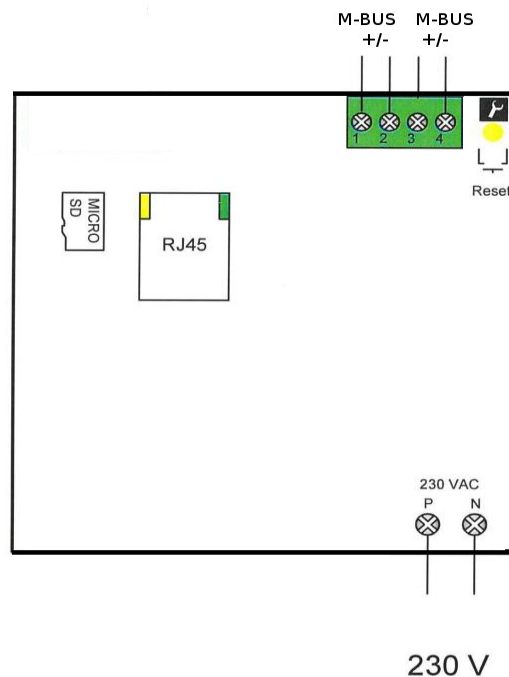
M-BUS Interface

On the M-BUS Interface you can add up to 60 M-BUS Devices (60 unit loads).

Power supply

The M-BUS Datalogger has an internal power supply (85 – 264 VAC). So it can be directly connect to the power grid.

LAN

RJ-45 Plug for the 10/100 Mbit/s connection to your Switch, Router or Network card of your computer.

Beginning of operation

You can put your Data logger to operation mode by switching on the grid voltage.

The LED's starts flashing and showing the operation state of the Data logger.

➔ The Device does at the start up an automatic self-test. (All three LED's flashing shortly). If the self-test was OK the green LED lights up.

The LED's

M-BUS Receive

Power / SD Read & Write

M-BUS Transmit

Color	Name	State	Description
Yellow	M-BUS Receive	Flashing	The M-BUS Data logger receives data from a M-BUS Device
Green	Power / SD Read & Write	On	The M-BUS Data logger is up and running
		Flashing	The M-BUS Data logger is reading data from the SD Card or he is writing data to the SD Card.
Red	M-BUS Transmit	Flashing	The M-BUS Data logger is transmitting data to the M-BUS Devices.

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Jöchlerweg 4 ǀ CH-6340 Baar ǀ Switzerland ǀ Tel. +41 (0) 41 811 02 20 ǀ Fax +41 (0) 41 811 02 21 ǀ info@emuag.ch ǀ www.emuag.ch

Establish a TCP/IP Connection to the M-BUS Datalogger

The default address of the M-BUS Datalogger is:

IP Address: 192.168.1.100

Port: 80

To get your connection working, your computer must be in the same Subnet as the M-BUS Datalogger. The computer must have an IP-Address like 192.168.1.xxx (xxx can be 1 … 254, expect 100).
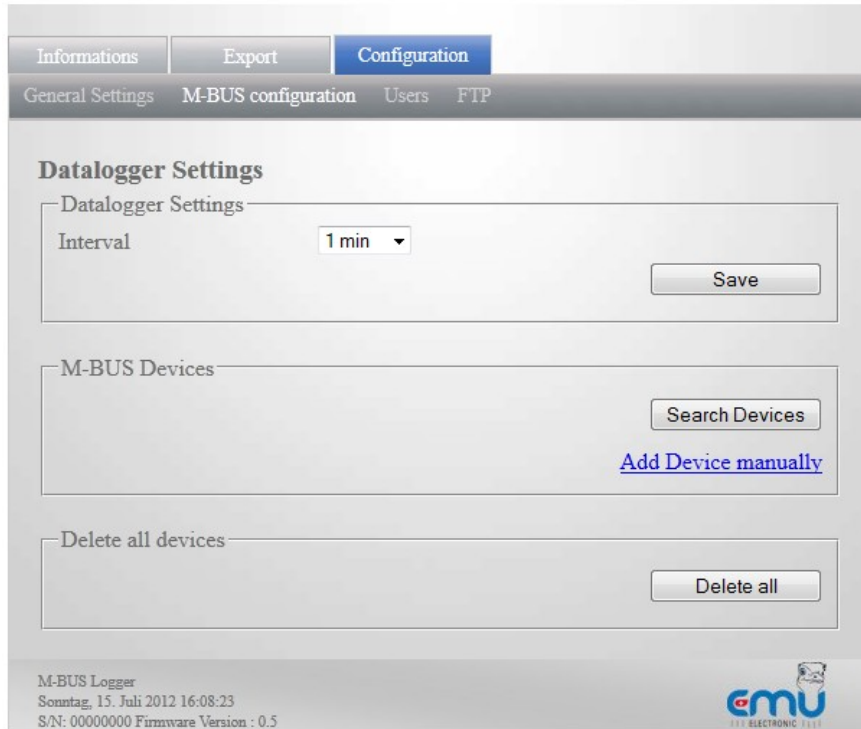
If your computer is in the same subnet as the Data logger you can start a Web Browser and enter the address http://192.168.1.100
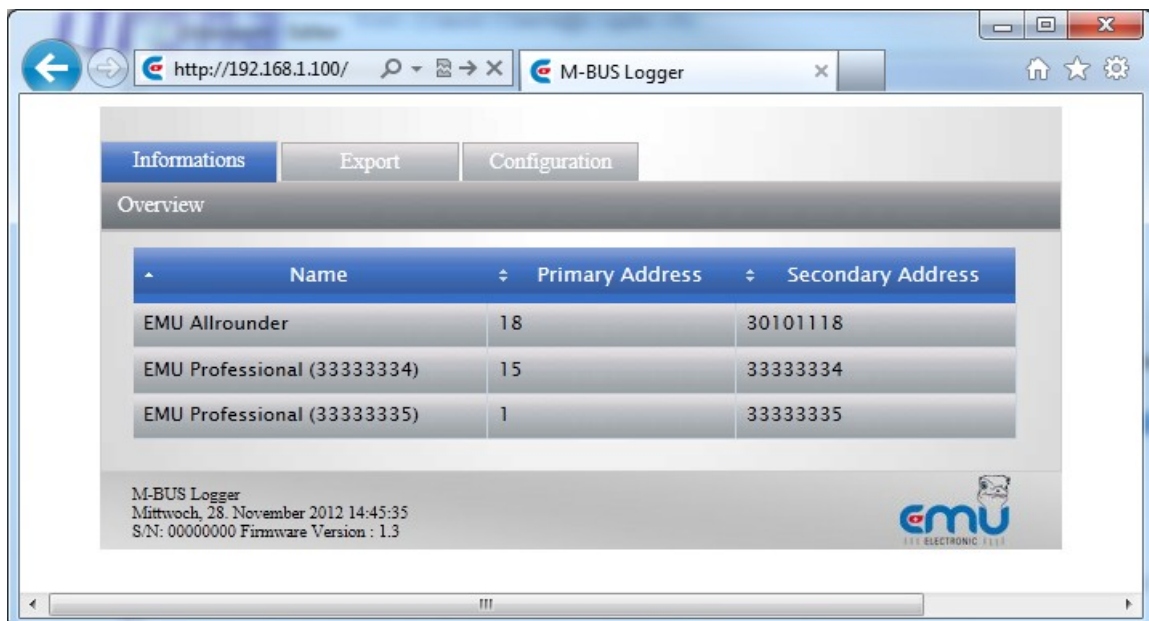
Add M-BUS Devices

To readout M-BUS devices the data logger must know the devices first. The M-BUS Datalogger can do an automatic search for devices on the M-BUS. To start the search please do:

Configuration -> M-BUS Settings -> Search M-BUS Devices

The M-BUS Datalogger search automatically for M-BUS Devices with the baud rate 300, 2400 and 9600. The duration of the search is 5 - 15 minutes (depending on the number of devices).

All found devices will be shown in the overview web page.

Configuration

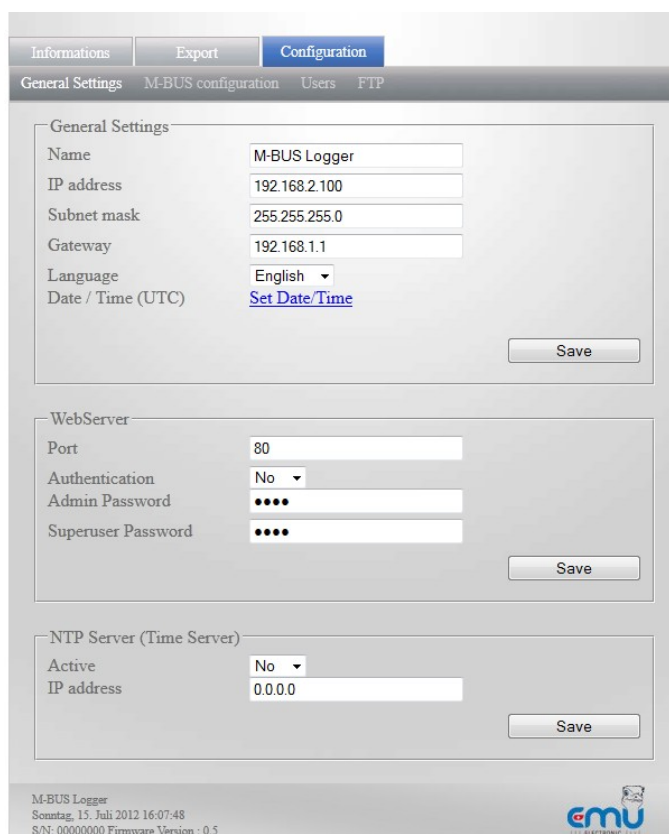To open the configuration of the M-BUS Datalogger, open your Web browser and enter the address of your Data logger. E.g. http://192.168.1.100

Select the Configuration by clicking on "Configuration" in the Menu

General Settings

General Settings

Name	Description
Name	The Name of the M-BUS Data logger
IP Address	The IP-Address of the M-BUS Data logger. Default Setting: 192.168.1.100
Subnet mask	The Subnet mask defines the size of the network. Normally you can choose 255.255.255.0 as subnet mask.
Gateway	A Gateway is a network point that acts as en entrance to another network. (E.g. to the Internet over an Internet router / gateway). The Data logger sends all TCP/IP Packets to this address, when the target-address is outside the Network of the M-BUS Data logger. Please enter here the IP-Address of your Gateway.
Language	The Language of the Web page of the M-BUS Data logger
Date / Time	The date and time of the M-BUS Data logger. You can change the date / time here.

Web Server

Name	Description
Port	The TCP Port of the Data logger. Default: 80
Authentication	**Yes**: The access to the Web page is restricted by a User name and a password. **No**: The is no access restriction. Everyone can access to the web page.
Admin Password	The password of the administrator (User name: admin). The admin has full read and write access to the Data logger. Default Password: 1234
Superuser Password	The password of the superuser. The superuser has read access to all Web pages. The superuser does not have any write permissions. (user name: superuser) Default Password: 1234

NTP Server (Time Server)

With the NTP Server Function you are able to synchronize the Time of the M-BUS Data logger with a Timer Server in the Internet or Intranet.

Name	Description
Active	**Yes**: The synchronization with the Timer server is active. **No**: The synchronization with the Time server is not active.
IP Address	The IP Address of the Time Server.

You can find a list with NTP Time Server in the Internet here:

http://support.ntp.org/bin/view/Servers/StratumTwoTimeServers
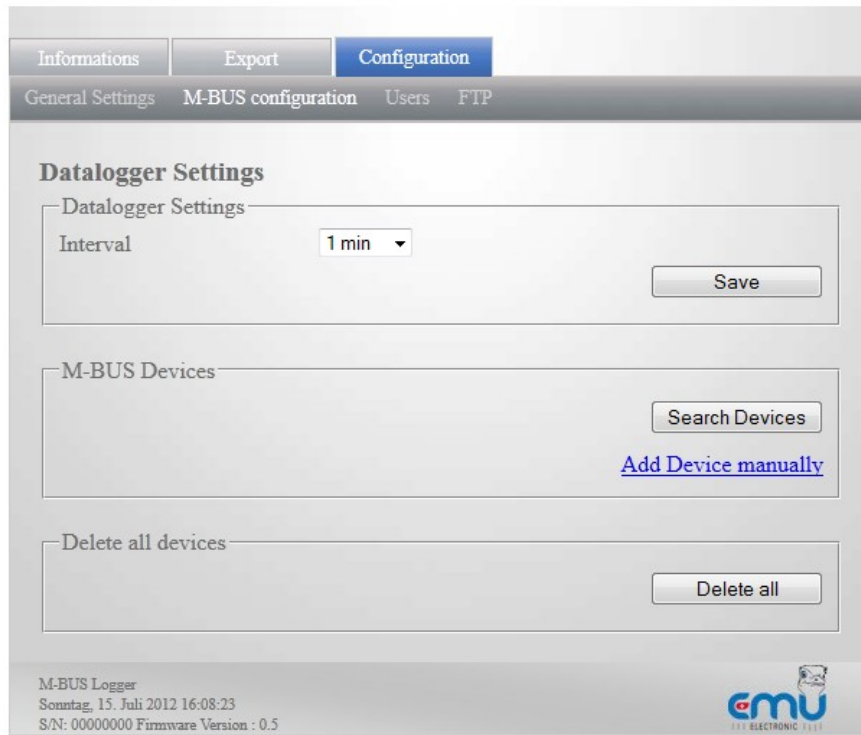
Example:

IP Address NTP Server: "Free University Berlin" 130.133.1.10

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M-BUS Configuration

Data logger Settings

Name	Description
Interval	The Interval is the time span between two readouts of all M-BUS devices. The interval time must be bigger than the time used to readout all devices.
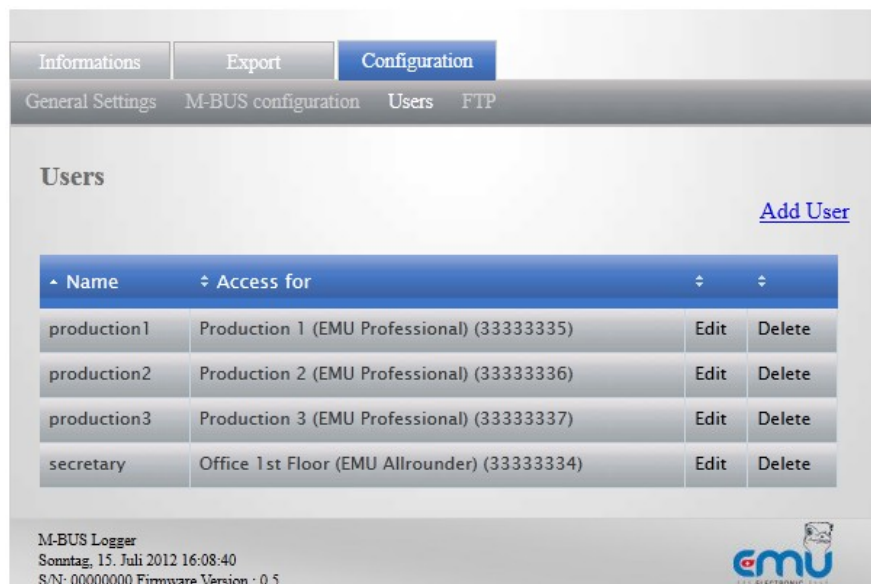
M-BUS Devices

Name	Description
Search Devices	By clicking on the „Search Devices" Button a M-BUS search with the Baud rates 2400, 300 and 9600 baud is started. The search for new Devices goes around 5 – 15 minutes.
	All found devices are listed on the Start page. (Press Refresh, to reload the site)
Add Device manually	You can also add a new M-BUS Device manually. Click on the "Add Device manually" Button and enter the Secondary address of the device. The device will be read in the next readout.

Delete all Devices

Name	Description
Delete all	With a click on the „Delete all" Button, all Devices with all data will be deleted.
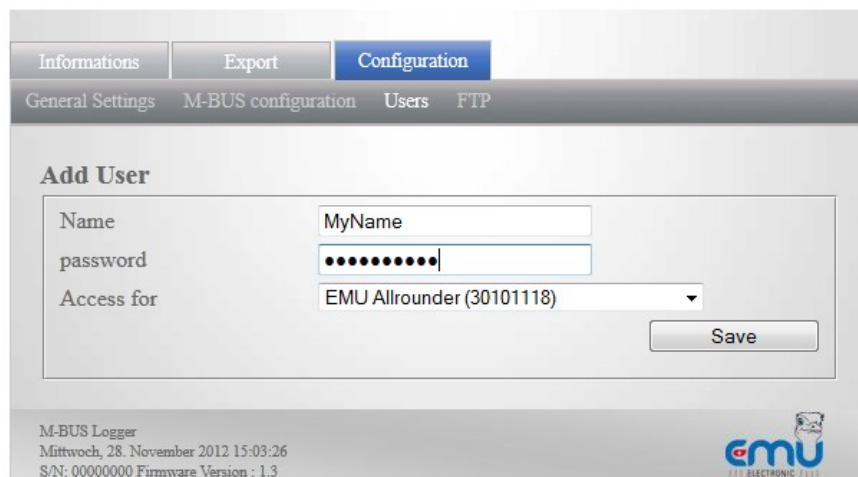
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This users have read access permissions to a single Device. A user has a User name and a Password.

➔ To Login as a user, the „Authentication" Setting on the General Settings Tab must be enabled.

Add User
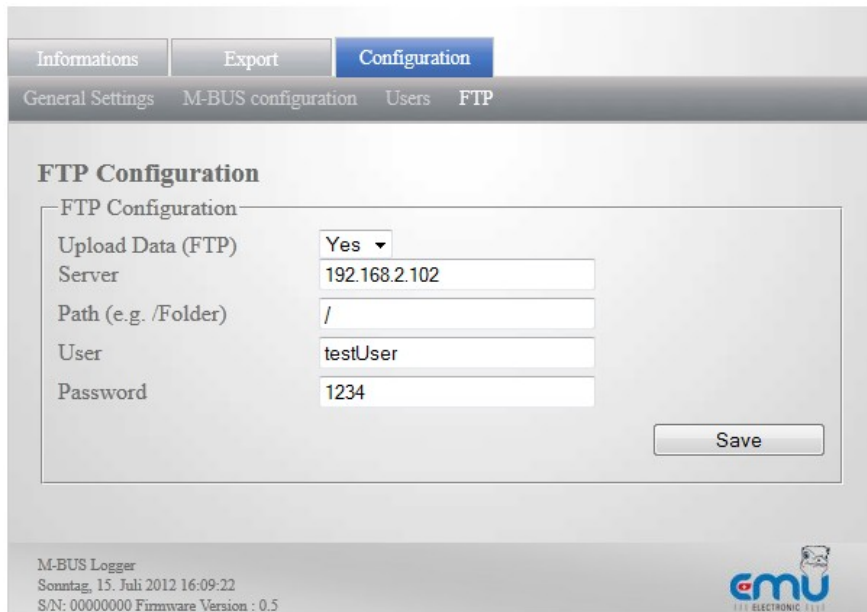
Name	Description
Name	The Name of the User. This name is used for the Login.
Password	The Password of the User.
Access for	The Device the user has access to.

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FTP

The M-BUS Data logger has the possibility to upload all read M-BUS Data directly to a FTP Server.

Name	Description
Upload Data (FTP)	**Yes**: The read Data of a Device is uploaded to the FTP Server after a successful readout. **No**: Upload to the FTP Server is disabled.
Server	The IP Address of the FTP Server
Path (e.g. /Folder)	The Path on the FTP Server where the data should be stored.
User	The FTP User name
Password	The FTP Password

Transfer mode: FTP Passive

The Data logger uploads always the last read telegram as CSV File to the FTP Server. The File name is "Secondaryaddress.csv"

Example:

Device with Secondary address 12345678: 12345678.csv

The description of the CSV File you find in the Appendix A: „CSV File Format".

Device Configuration

To configure a device, click to the device on the overview page. In the device Detail view click on "Configure".
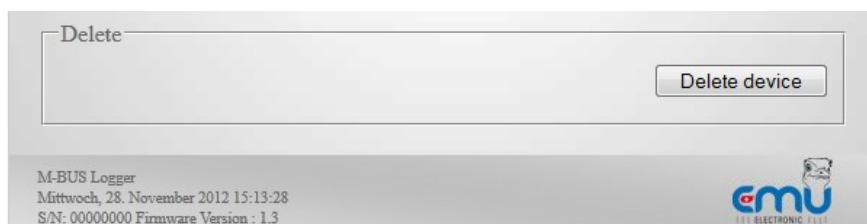
Name	Description
Name	The Name of this Device. The Name can be changed.
Primary Address	The M-BUS Primary Address of the device. Please change this address only when you are sure that the device has really this primary address.
Secondary Address	The M-BUS Secondary Address of the device. Please change this address only when you are sure that the device has really this primary address.
Baud rate	The baud rate of this device. The Data logger tries to read the device with this baud rate. Please change this baud rate only when you are sure that the device has really supports this baud rate.
Addressing	The Addressing-Mode of the M-BUS Readout. Secondary Addressing: The Device is addressed by secondary addressing (default) Primary Addressing: The Device is addressed by primary addressing.
Send SND_NKE	**Yes**: Sends a M-BUS SND_NKE (Initialization of the Slave) Command before sending a readout command. **No**: Does not send a SND_NKE Command (default) Please turn this only on, when you are sure that this is supported by the Device.
Send App. Reset	**Yes**: Sends a M-BUS "Application Reset" Command before sending a readout command. **No**: Does not send an Application Reset Command (default) Please turn this only on, when you are sure that this is supported by the Device.

M-BUS Values

The Name of each M-BUS Value can be changed.

Name	Description
M-BUS Coding	The M-BUS Telegram Coding for this Value (Hex)
Name	The Name of the M-BUS Value

Delete Device
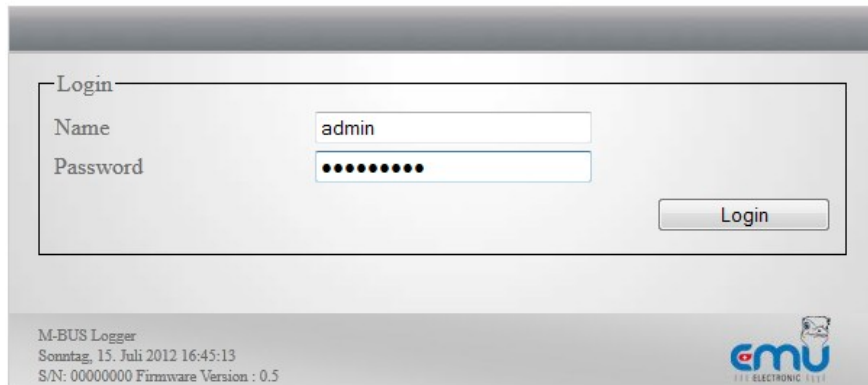
By clicking on the „Delete Device" Button (at the bottom of the page) the device will be deleted. All saved data (CSV Files and all Meter values) will be deleted.

Operation Mode

Login

If the Authentication is enabled, each user has to enter his User name and his password at the login – Web page.

This users are defined:

User name	Description	Default Password
admin	The admin (Administrator) has read and write permissions on everything. He is the only one who can change settings	1234
superuser	The superuser has read permission on everything. He can not change any settings.	1234

Additional, all other defined users can login to the Web page. For more Information see "Users".

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Jöchlerweg 4 ᥓ CH-6340 Baar ᥓ Switzerland ᥓ Tel. +41 (0) 41 811 02 20 ᥓ Fax +41 (0) 41 811 02 21 ᥓ info@emuag.ch ᥓ www.emuag.ch

Overview

On the overview page of the M-BUS Data logger, all found M-BUS devices are listed. To show the details of a device click on the name of the device.

Device Details

All values of a device are listed on the detail page of a device.

Monthly consumption

The Monthly consumption shows the Consumption over the last months. The value is calculated for all Energy values over one month.

Load profile

The Load profile shows the average Power over a time period. A Load profile is available for all Energy and Volume Values. To open a load profile click on the Load profile Symbol on the detail page of a device.
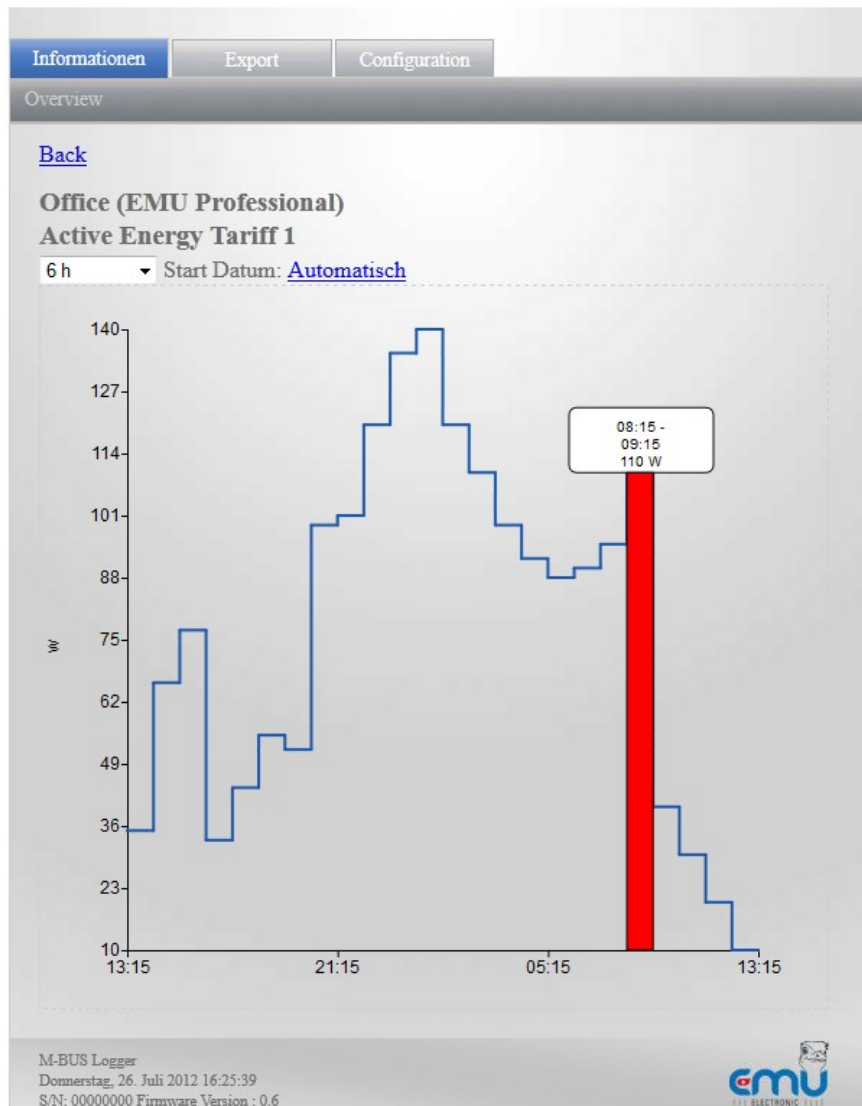
Time span

The Time span of a Load profile can be changes in the Drop Down Box. [24 h ▼]

Start date

The Start date is the Date of the first value in the Load profile.

Automatic	The Start date is set automatic. The last values from the current Date are visible on the Load profile.
Manual	You can choose the Start date.

➜ To get more information about a Load profile value, hover a value with the mouse.

All read M-BUS Data can be exported as CSV File. To Export the data of a Device, click on "Export" and choose the device to export on the device list. A List of CSV-Files is listed (one per month). To Download a file, click on the File name.

The size of the File depends on the readout interval (See M-BUS Settings).

The Description of the CSV File you find in the Appendix A: "CSV File Format".

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Reset to Factory Settings

To reset your M-BUS Data logger to factory state, press the Service-key (under the terminal cover) for more than 5s.

When you press the Key, the LED's starts flashing. Hold the key till the LED's stops flashing.

The following Settings were reset:

Name	Value after Reset
IP Address	192.168.1.100
Subnet mask	255.255.255.0
Gateway	0.0.0.0
Language	English
Web server Port	80
Authentication	Off
Admin Password	1234
Superuser Password	1234
NTP Server	Off
M-BUS Log Interval	5 min

➔ All data on the SD Card (Configured Devices, Users, CSV-Files and all load profiles) will not be deleted.

The Error Messages of the M-BUS Data logger are showed as red Text on a Web page. The following Error Message are defined:

Message: „**Name too long**"

Description: The entered Name is too long. Try a smaller name (max. 60 chars).

Message: „**IP address is wrong**"

Description: The entered IP Address is wrong. Please enter a correct IP Address (e.g. 192.168.1.100)

Message: „**Subnet address is wrong**"

Description: The entered Subnet address is wrong. Please enter a correct Subnet address (e.g. 255.255.255.0)

Message: „**Password too long**"

Description: The entered password is too long. Try a smaller password (max. 15 chars).

Message: „**Invalid Primary address**"

Description: The entered M-BUS Primary Address is invalid. Please enter a valid Primary Address (Range: 1 – 250)

Message: „**Secondary address already exists**"

Description: The entered M-BUS Secondary Address already exists. The secondary address must be unique for each all M-BUS Devices.

Message: „**User name already exists**"

Description: The entered User name already exists on the M-BUS Data logger. Please use another User name.

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Message:	„**Path too long**"
Description:	The entered path for the FTP Folder is too long. Please enter a shorter path (max. 60 chars)

Message:	„**Connection to FTP Server failed**"
Description:	The M-BUS Data logger can not connect to the FTP Server. Please check that the IP Address of the FTP is correct. If the FTP Server is in another subnet, the Gateway Address must be correct configured.

Message:	„**FTP User or Password wrong**"
Description:	The entered FTP User name of the FTP Password is wrong. The FTP-Server has responds with "Permission denied"

Message:	„**FTP Permission denied**"
Description:	The FTP-Server has responds with „Permission denied". Maybe your FTP User has no write permissions on the FTP Folder.

Message:	„**Readout interval too fast**"
Description:	The Interval Time between two M-BUS Readouts is too small. Not all devices can be read-out in this time. Please choose a bigger M-BUS Readout Interval.

Message:	„**NTP Server is not reachable**"
Description:	The M-BUS Data logger can't connect to the NTP Server (Time Server). Please check the settings.

Technical Data

Supply voltage	85 – 264 VAC, 47 – 65 Hz
Power consumption	10 W
Dimensions	90mm x 90mm x 70mm DIN Rail 5 Modules (90mm)
Interfaces	Ethernet RJ45, M-BUS (Master)
Storage	2 GB Micro SD Card (changeable) ~ 5 Mio. Telegrams
Galvanic isolation	Yes
Short circuit and overload protection	Yes
Log intervals	10s, 1 min, 5 min, 15 min, 30 min, 1 h, 6 h, 12 h
BUS Speed M-BUS	300, 1200, 2400, 4800 and 9600 baud
Protection Class	IP 20
Screw terminals	M-BUS (2 pairs), Power Supply (L,N)

SD Card

The M-BUS Data logger supports formatted SD Cards with the file system FAT16 or FAT32.

To change the SD-Card please do power off first. Otherwise the SD Card my be broken.

Appendix A: CSV File Format

All read Meter values where stored on a CSV File. Each meter has it's own CSV file (one per month). Every readout is stored on a new line. The Data fields are separated with a semicolon (;)

Every line begins with the Header.

Field Name	Description
Date / Time (UTC)	The Date and the Time of the Readout. This Data is in the UTC (World time) Format. Please note the time offset to your local time)
Primary address	The M-BUS Primary address of the Device
Secondary address	The M-BUS Secondary address of the Device
Manufacturer	The M-BUS Manufacturer Code (3 digits)
Version	The Firmware Version of the M-BUS Device
Medium	The Medium (e.g. Electricity or Water) of the Device
Access counter	The M-BUS Access Counter of the Device.
State	The M-BUS State of the Device (State 0 is OK)
M-BUS Value 1	The first M-BUS Value (e.g. Active Power)
M-BUS Unit 1	The Unit of the first M-BUS Value (e.g. kWh)
…	…
M-BUS Value n	The "n" M-BUS Value (e.g. Active Power)
M-BUS Unit n	The Unit of the n-th M-BUS Value (e.g. kWh)

Example:

```
Date / Time(UTC);Primary Address;Secondary Address;Manufacturer;Version; ->
Medium;Access counter;Status;Active Energy Import Tariff 1;Unit;         ->
Active Energy Import Tariff 2;Unit;                                      ->
11.07.12 14:46:50;3;00022987;EMU;16;Electricity;113;0;00022987;;        ->
1206;Wh;123;Wh;
```

The Device in the Example has two values:

- ➔ Active Energy Import Tariff 1: 1206 Wh

- ➔ Active Energy Import Tariff 2: 123 Wh

Ftp Upload

The FTP Upload will only upload the last CSV Line to the FTP Server.

Appendix B: Problems and Solutions

Problem

My Computer is connection directly to the M-BUS Data logger, but I can't open the web page.

Solutions

➔ Check if your M-BUS Logger is on. (Green LED must be on). Check if the Network cable is connected to the M-BUS Data logger.

➔ When you are connected directly to the M-BUS Datalogger (without a Router) you must be in the same Subnet as the Data logger. On a first time installation the computer must have a IP Address like 192.168.1.xxx

Problem

I like to backup my M-BUS Data logger Configuration

Solutions

Remove the power from the Data logger and then remove the SD Card. Connect the SD Card with a SD-Card Reader to a computer. Copy the "METERS" Folder on the SD Card to Backup Folder on the Computer.

To restore, you can copy this backup Folder to an other formatted (FAT16 or FAT32) SD-Card and put it into the Data logger.

Appendix C: API

To read the Data from the M-BUS Data logger from an other Application you can use the Application programming interface (API).

Protocol: HTTP GET

Parameter	Description
LOGGERADDRESS	The Address of the Data logger e.g. 192.168.1.100
DEVICEADDRESS	The M-BUS Secondary Address of the M-BUS Device. e.g. 12345678

➔ Attention! When the Security (authentication) is enabled on the M-BUS Data logger, you have to send a cookie with the Authentication information on each request. For more Information see Appendix D: "Calculation of the Authentication"

Request the last Meter Values

With this request you can read the last Meter Values of a M-BUS Device as CSV File.

Request: http://LOGGERADDRESS/DEVICEADDRESS/last.csv

            e.g. http://192.168.1.100/12345678/last.csv

Response: Readout data in the CSV File Format. For more Information see Appendix A.

Example:

```
10/30/12 15:40:00;3;00022987;EMU;16;Electricity;113;0;00022987;;        ->
1206;Wh;123;Wh;
```

Request the first Meter Values

With this request you can read the first Meter Values of a M-BUS Device as CSV File.

Request: http://LOGGERADDRESS/DEVICEADDRESS/first.csv

            e.g. http://192.168.1.100/12345678/first.csv

Response: Readout data in the CSV File Format. For more Information see Appendix A

Example:

```
10/20/12 15:40:00;3;00002987;EMU;16;Electricity;113;0;00022987;;        ->
1206;Wh;123;Wh;
```

Request Meter Values of a Date / Time

With this request you can read the Meter Values of specific Date / Time.

Request: http://LOGGERADDRESS/DEVICEADDRESS/dUNIXTIMESTAMP.csv

e.g. http://192.168.1.100/12345678/d1351438800.csv

UNIXTIMESTAMP: The Time as Unix time stamp.

Response:

```
10/28/12 15:40:00;3;00022987;EMU;16;Electricity;113;0;00022987;;        ->
1206;Wh;123;Wh;
```

Request the CSV File Header of a Device

With this Request you can read the CSV File Header (Descriptions of the Meter Values) of a Meter.

Request: http://LOGGERADDRESS/DEVICEADDRESS/head.csv

e.g. http://192.168.1.100/12345678/head.csv

Response: Readout data in the CSV File Format. For more Information see Appendix A.

Example:

```
Date / Time(UTC);Primary address;Secondary address;Manufacturer;Version; ->
Medium;Access counter;State;Active Energy Import Tariff 1;Unit;         ->
Active Energy Import Tariff 2;Unit;
```

Request Device List

With this request you can get a List with all Devices configured on the M-BUS Data logger.

Request: http://LOGGERADDRESS/overv.shtml

e.g. http://192.168.1.100/overv.shtml

Response: A List with Devices:

["Device name 1","Primary address", "Secondary address"],   …

["Device name n „ "Primary address", "Secondary address"]

Example:

["Meter Kitchen","11", "00000001"], ["Water meter „ "12", "00000002"] "], ["Gas meter „ "13", "00000003"]

Request a List with all CSV Files of a Device

With this request you get a List with all CSV Files for a Device.

Request: http://LOGGERADDRESS/csvd .shtml?d=SSSSSSSS

e.g. http://192.168.1.100/csvd.shtml?d=12345678

SSSSSSSS: Secondary address of the Device. (always 8 Characters)

Response: A List with all CSV File names of a Device

["CSV_FILENAME1","FILENAME2", "FILENAME3"],   …

Example:

"2012_08","2012_09","2012_10","2012_11"

Request Load Profile data

With this Request you can get the Load profile data for a Device.

Request: http://LOGGERADDRESS/lpa.shtml?NNSSSSSSSSIIIIIOOOOOO

NN: Number of the Load profile for this Device. e.g. 01 (for the Load profile of the 1. value). Always 2 characters.

SSSSSSSS: Secondary address of the Device. (always 8 Characters)

IIIII: Interval in minutes between two load profile values (Always 5 characters)

OOOOOO: Offset before the first value calculated from the actual time.

Example: http://192.168.1.100/lpa.shtml?021234567800010000000

→ Load profile of the second Value of the Device 12345678. No start offset, interval = 10min

Response: A List with the Load profile values (value and time)

"UNIXTIMESTAMP","VALUE"

Example:

"1343673594","12","1343673594","34","1343673594","50", ...

Appendix D: Calculation of the authentication

If the Security (Authentication) is enabled on the M-BUS Data logger, the correct Password Token must be send as cookie with the API call.

A Password Token is valid for 2h. The Token is send as Cookie in the HTTP Request.

The Content of the Cookie should be like this:

{USERNAMELEN}{USERNAME}{TIME}:{HASH}

Tag	Number of Chars	Description
{ USERNAMELEN}	2	Length of the User name as ASCII String (e.g. „11" for 11 Characters)
{USERNAME}	0-20	The User name as ASCII String.
{TIME}	10	The actual time of the M-BUS Datalogger Unix Time Stamp (Always in UTC)
{HASH}	40	Hex-SHA1 Hash value calculated from the Time and the Password

Calculation of the Hash Value

{HASH} = SHA1({TIME}{PASSWORT})

SHA-1 (Secure Hash Algorithm) is used as Hash Algorithm.

If the Length of the Time and the Password is shorter then 24 characters the string is padded with '0'.

Example Hash Calculation:

Time: 13. Juli 2012 11:01:20 = 1342177280

Password: Test123

sha1('1342177280Test1230000000') = 7da29d8b830c6646ca2b43335e9dbf9d15757405

Example Cookie

User: admin

Time: 7. August 2012 15:18:12 GMT = 1344352692

Password: 1234

Cookie: 05admin1344352692:3f01b5730f50c14bf971e0d76dcc3f0c96fc9e41