Manual EMU Professional II TCP/IP

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Version	Revision Date	Token	Changes
V1.0	01.07.2021	fbo, met	Creation of document
V1.1	13.10.2021	met	Further specification of time synchronization
V1.2	14.03.2022	fbo	Added requirements for updating
V1.3	07.04.2022	met	Update HTTP access. Update data logger and logbook read-out
V1.4	13.04.2022	met	Update HTTP GUI description
V1.5	11.05.2022	met	Rework of Doc.Ref numbers. Same document in different language no longer has a different Doc.Ref number
V1.6	27.05.2022	fbo	Remark about firmware-update
V1.6.1	14.06.2022	fbo	Remark about update frequency
V2.0	30.11.2022	met	Rework of document structure
V2.1	24.04.2023	met	Read out configuration and meter values via HTTP-GET
V2.2	02.06.2023	met	Correction of web-link examples
V2.3	15.06.2023	met	Updated Access Protection
V2.4	23.10.2023	met	Languages added to web interface
V2.5	20.03.2024	met	TCP Timeout added on web interface
V2.6	30.04.2024	met	Info and Examples for data logger readout added
V2.7	20.06.2024	met	Added EMU TCP Update Tool manual
V2.8	20.05.2026	met	MQTT Update

General

The EMU Professional II TCP/IP is equipped with a 100 MBit Ethernet-Interface and an RJ-45 connector.

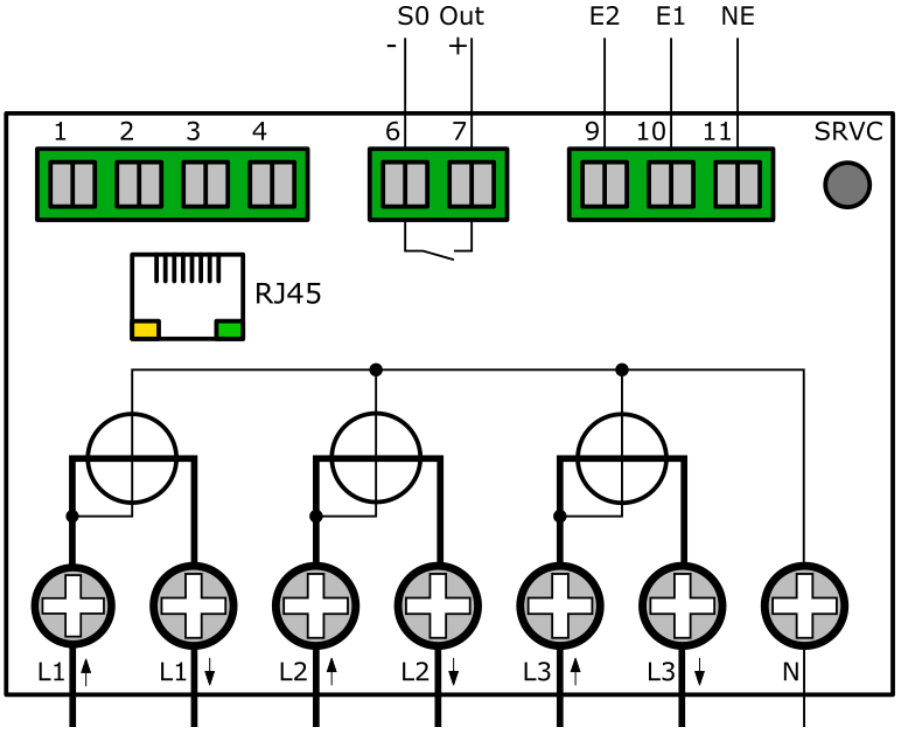
Ex-Factory the EMU Professional II obtains its IP-Address via a DHCP-request. The assigned IP-Address can be read out on the display of the meter under “Settings” -> “IP-Address”. Navigate to “Settings” by pressing the “Arrow right” button and then use the “Arrow down” button to reach “IP-Address”.

This document explains the method of accessing and configuring the EMU Professional II TCP/IP via TCP/IP. Furthermore, this document describes the read out of historical data. The output of such read outs is a CSV file, the structure of which is subsequently described. At the end of this document, you will find a step-by-step guide to update the firmware via TCP/IP.

Note: We recommend checking regularly (monthly) for available updates and performing at least one update per year. Further information about the updates can be found on our website or will be provided by e-mail upon request.

Connection Diagram TCP/IP

Note: The TCP/IP interface is the same for both the EMU Professional II 3/100 TCP/IP and the EMU Professional II 3/5 TCP/IP.



LED on the LAN port

The LED on the LAN port on the EMU Professional II are programmed as follows. Only the Link LED (green) is used. It is lit green permanently if the meter is connected and will blink if any communication is happening on the port.

Accessing the User-interface

The user interface depends on the hardware version of the installed TCP module. You can find the hardware version of your meter module in the status.json file. You can access the status.json file with http://[IP-addresse of meter]/status.json.

Hardware Revision A

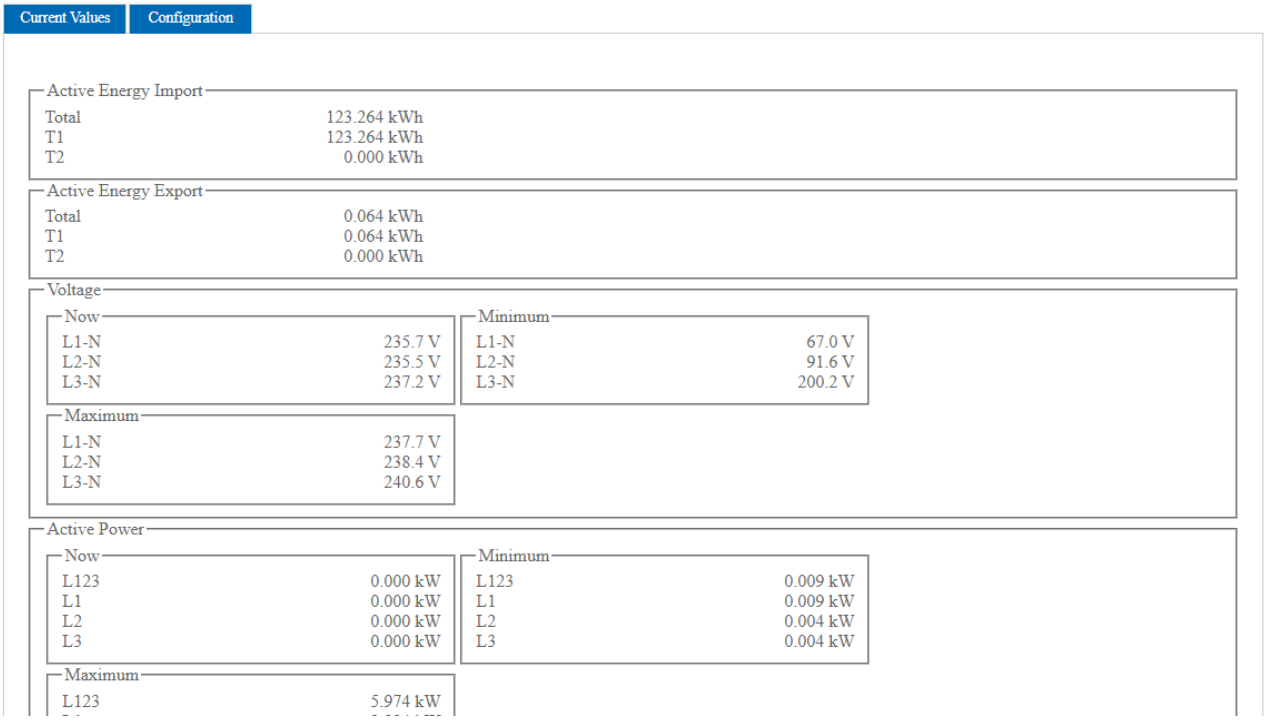
Once the EMU Professional II TCP/IP is connected to your network via an Ethernet cable you can reach it on a web browser. Access your meter with the following address:

http://[IP-Address of the meter]/

The IP-Address can be found under “Settings” -> “IP-Address”

The web interface is set to English by default and the language package for the German language is already on the module. The interface will check your language setting in your browser and choose the fitting language package automatically.

The following interface appears once the above link is entered. At the very top you can switch between “Current Readings” and “Configuration”.



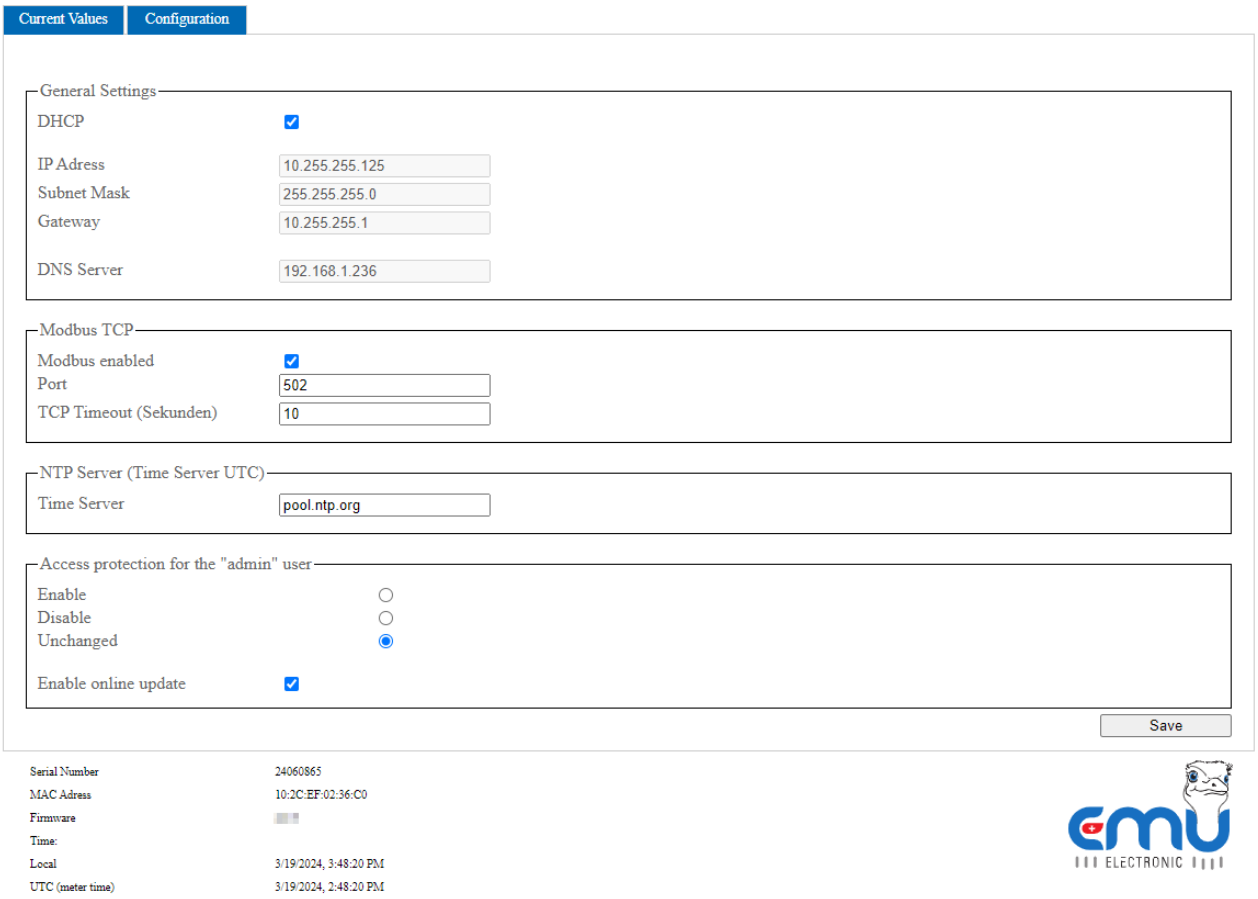
Current Readings

This page shows the register values for Active Energy Import/Export as well as the momentary values of the Voltage, Active Power, Reactive Power, Current, Power Factor and Frequency of the meter. These values are updated once every 5 seconds.

Note: All meters with serial numbers higher than 22350000 will also show the minimal and maximal values of the corresponding momentary values in this tab.

Configuration

The configuration page has the following configurations available:



- General Settings
  - DHCP: Choose between letting the meter request its own IP-Address or entering one manually.
  - If DHCP is not selected, you are required to enter the network parameters (IP-Address, subnet mask, gateway and DNS server) manually.
- Modbus TCP
  - Modbus active: Choose whether the Modbus TCP server is turned on or not.
  - Port: Choose a TCP-Port over which the Modbus server accepts requests.
  - TCP Timeout: Set the timeout, in seconds, after which the EMU Professional II closes a connection again. The default time is 10 seconds. The time can be chosen within a range of 10 to 600 seconds.

The Modbus registers such as power, current, voltage, frequency and power factor are updated approx. every 500-900ms.

Note: Up to 4 simultaneous queries can be carried out via Modbus TCP.

- NTP-Server
  - Time server: Enter the IP-Address or the DNS-name of an NTP-server from which the EMU Professional II TCP/IP gets its time and date synchronization.

If an NTP-server is set the communication module will try to get its synchronization every 1-2 minutes. After the first successful synchronization the communication module requests interval changes once per hour.

If access to an NTP-server is not possible, this may lead to short interruptions in the response to requests on the communication module.

Note: The entered NTP-server must use a calibration valid time reference source.

- Access Protection:
  - Activate: If you wish to secure your meter against unauthorized third parties you can choose the option “Activate”. Make sure to enter your chosen password (max. 20 characters) in the intended field and save the settings. Access to the EMU Professional II TCP/IP is now only possible via HTTP-Basic-Auth with the user “admin”.
  - Deactivate: Should you want to deactivate the password protection on your meter choose this option and save the change.
  - Keep: If you want to change another setting but keep the password protection, choose this option before saving the settings.
  - Allow Online-Updates: If you want to allow signed firmware updates over network from EMU Electronic AG please choose this option.

Save your settings by clicking on the “Save” button on the lower right-hand side.

Note: If you select the option “Activate Password” but do not set a password, the meter will deactivate the password protection automatically.

Hardware Revision B

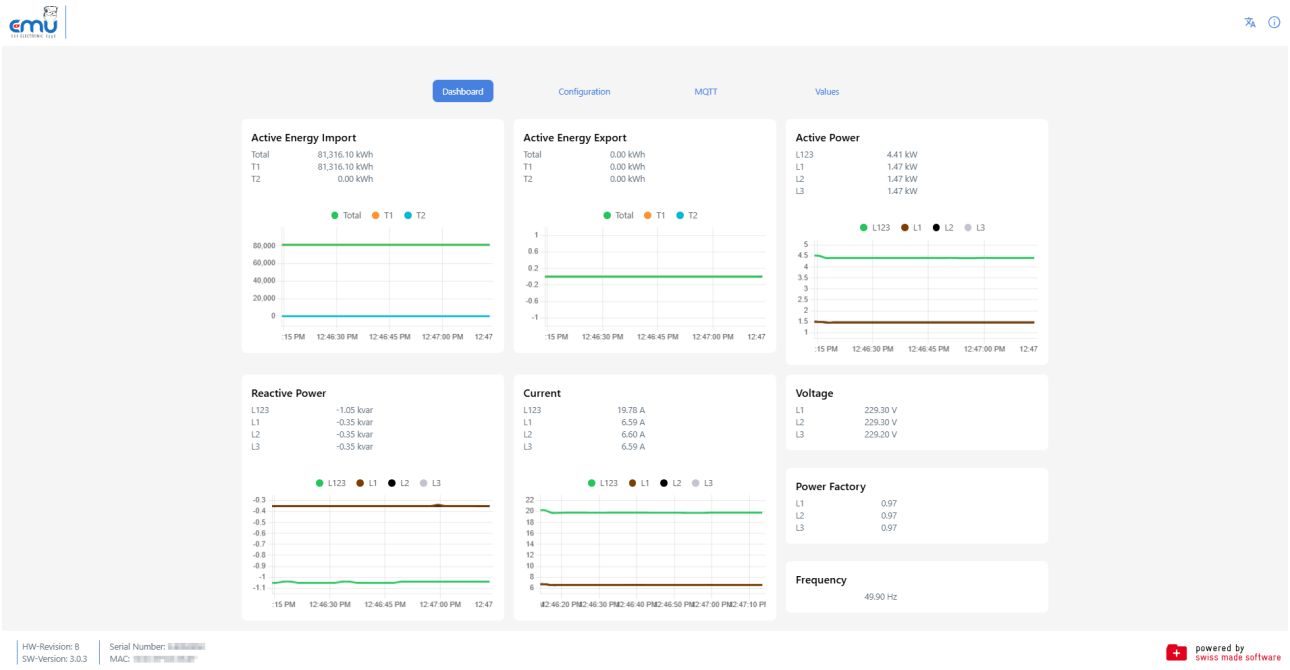
Once the EMU Professional II TCP/IP is connected to your network via an Ethernet cable you can reach it on a web browser. Access your meter with the following address:

http://[IP-Address of the meter]/

The IP-Address can be found under “Settings” -> “IP-Address”

The web interface is set to English by default and the language package for the German language is already on the module. The interface will check your language setting in your browser and choose the fitting language package automatically.

The following interface appears once the above link is entered. At the very top you can switch between “Dashboard”, “Configuration”, “MQTT” and “Values”.

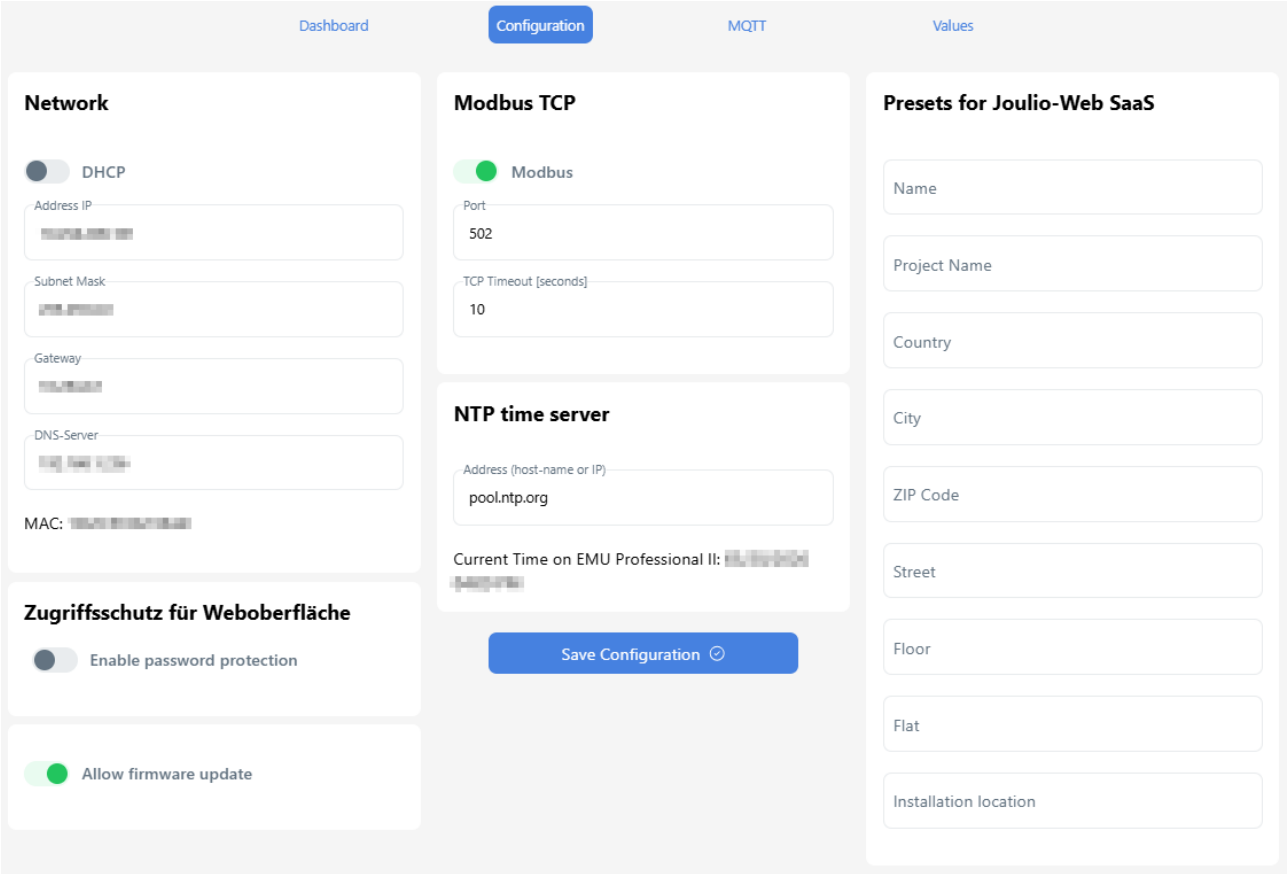


Dashboard

The dashboard lets you inspect the important measurement in graph form. With a click on the legend on a graph you can show/hide the corresponding measurement. A hidden measurement is greyed out and crossed out.

Configuration

The configuration page has the following configurations available:



- General Settings
  - DHCP: Choose between letting the meter request its own IP-Address or entering one manually.
  - If DHCP is not selected, you are required to enter the network parameters (IP-Address, subnet mask, gateway and DNS server) manually.
- Modbus TCP
  - Modbus active: Choose whether the Modbus TCP server is turned on or not.
  - Port: Choose a TCP-Port over which the Modbus server accepts requests.
  - TCP Timeout: Set the timeout, in seconds, after which the EMU Professional II closes a connection again. The default time is 10 seconds. The time can be chosen within a range of 10 to 600 seconds.

The Modbus registers such as power, current, voltage, frequency and power factor are updated approx. every 500-900ms.

Note: Up to 4 simultaneous queries can be carried out via Modbus TCP.

- NTP-Server
  - Time server: Enter the IP-Address or the DNS-name of an NTP-server from which the EMU Professional II TCP/IP gets its time and date synchronization.

If an NTP-server is set the communication module will try to get its synchronization every 1-2 minutes. After the first successful synchronization the communication module requests interval changes once per hour.

If access to an NTP-server is not possible, this may lead to short interruptions in the response to requests on the communication module.

Note: The entered NTP-server must use a calibration valid time reference source.

- Access Protection:

- Activate: If you wish to secure your meter against unauthorized third parties you can choose the option “Activate”. Make sure to enter your chosen password in the fields “Provide new Password” and “Confirm Password” and save the setting. Access to the EMU Professional II TCP/IP is now only possible via HTTP-Basic-Auth with the user “admin”.
- Deactivate: Should you want to deactivate the password protection on your meter choose this option and save the change.
- Allow firmware update: If you want to allow signed firmware updates over network from EMU Electronic AG please choose this option.

Save your settings by clicking on the blue “Save Configuration” button on the lower right-hand side.

Information for Joulio-Web SaaS

These Fields are pushed automatically to your Joulio-Web SaaS if you activated this option.

MQTT

A EMU Professional II TCP/IP with a TCP-Module Firmware of 3.0.3 or newer and Hardware Index B can upload data via the MQTT protocol to a broker. On this broker you can subscribe to the data from the meter. Go to the “MQTT” tab on the web interface of the meter and add your MQTT-Server.

By enabling the “Enabled MQTT” option, you allow the meter to send data via MQTT.

The “Manual” option gives you two choices:

- Manual disabled: Here you can enter a Joulio-Web SaaS access code. Once you have done this, the meter will automatically send its data to your Joulio-Web SaaS. Your Joulio-Web SaaS will generate the access code for you when you create a TCP meter.
- Manually enabled: Specify your own MQTT server. Here, on the left, you can set your desired **Prefix**, **Quality of Service**, and **Publish interval**. In the middle, please enter the **Hostname** of your server, as well as the **port**, the **user**, and the **password** through which the meter should push the data to the server. If you enable the “Use TLS (SSL)” option, you can also enter your **TLS certificate**, the **TLS private key**, and the **CA chain**.

Note: The automatic setup for Joulio-Web SaaS is not compatible with the old Joulio Software.

TLS (Transport Layer Security) protects data transmission over the network through encryption and ensures that the communication partner is authentic.

Certificates are used to verify the identity of the communication partners. These are issued by trusted authorities and verified by the client (e.g., validity and consistency with the domain) and the server (e.g., validity and trust in the trusted authority).

MQTT json File Structure

A .json file blueprint can be downloaded here.

An example payload of a published message can be downloaded here.

Position	Description	Unit
id	MQTT-Client ID	-
sn	Meter Serial Number	-
ts	Current Timestamp of the Meter	-
t	Current Tariff	-
1	Active Energy Import Phase 1 Tariff 1	Wh
2	Active Energy Import Phase 1 Tariff 2	Wh
3	Active Energy Import Phase 1 Tariff 3	Wh
4	Active Energy Import Phase 1 Tariff 4	Wh
5	Active Energy Import Phase 1	Wh
6	Active Energy Import Phase 2 Tariff 1	Wh
7	Active Energy Import Phase 2 Tariff 2	Wh
8	Active Energy Import Phase 2 Tariff 3	Wh
9	Active Energy Import Phase 2 Tariff 4	Wh
10	Active Energy Import Phase 2	Wh

Position	Description	Unit
11	Active Energy Import Phase 3 Tariff 1	Wh
12	Active Energy Import Phase 3 Tariff 2	Wh
13	Active Energy Import Phase 3 Tariff 3	Wh
14	Active Energy Import Phase 3 Tariff 4	Wh
15	Active Energy Import Phase 3	Wh
16	Active Energy Import Phase 123 Tariff 1	Wh
17	Active Energy Import Phase 123 Tariff 2	Wh
18	Active Energy Import Phase 123 Tariff 3	Wh
19	Active Energy Import Phase 123 Tariff 4	Wh
20	Active Energy Import Phase 123	Wh
21	Active Energy Export Phase 1 Tariff 1	Wh
22	Active Energy Export Phase 1 Tariff 2	Wh
23	Active Energy Export Phase 1 Tariff 3	Wh
24	Active Energy Export Phase 1 Tariff 4	Wh
25	Active Energy Export Phase 1	Wh
26	Active Energy Export Phase 2 Tariff 1	Wh
27	Active Energy Export Phase 2 Tariff 2	Wh
28	Active Energy Export Phase 2 Tariff 3	Wh
29	Active Energy Export Phase 2 Tariff 4	Wh
30	Active Energy Export Phase 2	Wh
31	Active Energy Export Phase 3 Tariff 1	Wh
32	Active Energy Export Phase 3 Tariff 2	Wh
33	Active Energy Export Phase 3 Tariff 3	Wh
34	Active Energy Export Phase 3 Tariff 4	Wh
35	Active Energy Export Phase 3	Wh
36	Active Energy Export Phase 123 Tariff 1	Wh
37	Active Energy Export Phase 123 Tariff 2	Wh
38	Active Energy Export Phase 123 Tariff 3	Wh
39	Active Energy Export Phase 123 Tariff 4	Wh
40	Active Energy Export Phase 123	Wh
41	Reactive Energy Import Phase 1 Tariff 1	varh
42	Reactive Energy Import Phase 1 Tariff 2	varh
43	Reactive Energy Import Phase 1 Tariff 3	varh
44	Reactive Energy Import Phase 1 Tariff 4	varh
45	Reactive Energy Import Phase 1	varh
46	Reactive Energy Import Phase 2 Tariff 1	varh
47	Reactive Energy Import Phase 2 Tariff 2	varh
48	Reactive Energy Import Phase 2 Tariff 3	varh
49	Reactive Energy Import Phase 2 Tariff 4	varh
50	Reactive Energy Import Phase 2	varh
51	Reactive Energy Import Phase 3 Tariff 1	varh
52	Reactive Energy Import Phase 3 Tariff 2	varh
53	Reactive Energy Import Phase 3 Tariff 3	varh
54	Reactive Energy Import Phase 3 Tariff 4	varh
55	Reactive Energy Import Phase 3	varh
56	Reactive Energy Import Phase 123 Tariff 1	varh
57	Reactive Energy Import Phase 123 Tariff 2	varh
58	Reactive Energy Import Phase 123 Tariff 3	varh
59	Reactive Energy Import Phase 123 Tariff 4	varh
60	Reactive Energy Import Phase 123	varh
61	Reactive Energy Export Phase 1 Tariff 1	varh
62	Reactive Energy Export Phase 1 Tariff 2	varh
63	Reactive Energy Export Phase 1 Tariff 3	varh
64	Reactive Energy Export Phase 1 Tariff 4	varh
65	Reactive Energy Export Phase 1	varh
66	Reactive Energy Export Phase 2 Tariff 1	varh
67	Reactive Energy Export Phase 2 Tariff 2	varh
68	Reactive Energy Export Phase 2 Tariff 3	varh

Position	Description	Unit
69	Reactive Energy Export Phase 2 Tariff 4	varh
70	Reactive Energy Export Phase 2	varh
71	Reactive Energy Export Phase 3 Tariff 1	varh
72	Reactive Energy Export Phase 3 Tariff 2	varh
73	Reactive Energy Export Phase 3 Tariff 3	varh
74	Reactive Energy Export Phase 3 Tariff 4	varh
75	Reactive Energy Export Phase 3	varh
76	Reactive Energy Export Phase 123 Tariff 1	varh
77	Reactive Energy Export Phase 123 Tariff 2	varh
78	Reactive Energy Export Phase 123 Tariff 3	varh
79	Reactive Energy Export Phase 123 Tariff 4	varh
80	Reactive Energy Export Phase 123	varh
81	Active Power Phase 1	W
82	Active Power Phase 2	W
83	Active Power Phase 3	W
84	Active Power	W
85	Reactive Power Phase 1	var
86	Reactive Power Phase 2	var
87	Reactive Power Phase 3	var
88	Reactive Power	var
89	Apparent Power Phase 1	VA
90	Apparent Power Phase 2	VA
91	Apparent Power Phase 3	VA
92	Apparent Power	VA
93	Current Phase 1	mA
94	Current Phase 2	mA
95	Current Phase 3	mA
96	Current	mA
97	Voltage Phase L1-N	0.1 V
98	Voltage Phase L2-N	0.1 V
99	Voltage Phase L3-N	0.1 V
100	Voltage Phase L1-L2	0.1 V
101	Voltage Phase L2-L3	0.1 V
102	Voltage Phase L3-L1	0.1 V
103	Power Factor Phase 1	0.1 cosPhi
104	Power Factor Phase 2	0.1 cosPhi
105	Power Factor Phase 3	0.1 cosPhi
106	Frequency	0.1 Hz

Values

This page shows the momentary values for Voltage, Active Power, Reactive Power, Current, Power Factor and Frequency of the meter. These values are updated once every 5 seconds.

Note: All meters with serial numbers higher than 22350000 will also show the minimal and maximal values of the corresponding momentary values in this tab.

Read out Configuration | Values

The configuration and Values displayed on the web interface can be downloaded as a .json file.

Note: These readouts are the same on both hardware versions.

http://[ip-address]/status.json lists the meter configurations that are displayed on the web interface.

{
”networkdhcpactive”: false,

```
  ”networkip”: ”**.***.***.*”,
  ”networknm”: ”**.***.***.*”,
  ”networkgw”: ”**.***.***.*”,
  ”networkdns1”: ”**.***.***.*”,
  ”mbactive”: true,
  ”mbport”: 502,
  ”ntpactive”: true,
  ”ntp1”: ”pool.ntp.org”,
  ”meterserial”: ”22350000”,
  ”meterfactorynr”: 0,
  ”meterdatetime”: 0,
  ”networkmac”: ”10:2C:EF:**:**:**”,
  ”softwareversion”: ”1.0.14”,
  ”updateractive”: true
  ”hw”: ”*”
}
```


http://[ip-address]/meterdata.json lists the current energy and momentary values of the meter.


```
{
”meterdatetime”: 1681808392,
”wpulse_cnt_L123_e”: ”306.722”,
”wpulse_cnt_L123_T1_e”: ”306.722”,
”wpulse_cnt_L123_T2_e”: ”0.000”,
”wpulse_cnt_ex_L123_e”: ”0.000”,
”wpulse_cnt_ex_L123_T1_e”: ”0.000”,
”wpulse_cnt_ex_L123_T2_e”: ”0.000”,
”p_L123_act_e”: ”6.973”,
”p_L1_act_e”: ”2.326”,
”p_L2_act_e”: ”2.323”,
”p_L3_act_e”: ”2.323”,
”q_L123_act_e”: ”3.687”,
”q_L1_act_e”: ”1.229”,
”q_L2_act_e”: ”1.232”,
”q_L3_act_e”: ”1.225”,
”i_L123_act_e”: ”34.180”,
”i_L1_act_e”: ”11.397”,
”i_L2_act_e”: ”11.409”,
”i_L3_act_e”: ”11.374”,
”u_L1_act_e”: ”230.9”,
”u_L2_act_e”: ”230.4”,
”u_L3_act_e”: ”230.9”,
”pf_L1_act_e”: ”0.88”,
”pf_L2_act_e”: ”0.88”,
”pf_L3_act_e”: ”0.88”,
”f_L123_act_e”: ”50.0”,
”showMinMax”:true,
”p_max_L1_e”: ”4.192”,
”p_max_L2_e”: ”4.150”,
”p_max_L3_e”: ”4.036”,
”p_max_L123_e”: ”12.379”,
”p_min_L1_e”: ”-4.049”,
”p_min_L2_e”: ”-3.795”,
”p_min_L3_e”: ”-3.989”,
”p_min_L123_e”: ”-11.834”,
”q_max_L1_e”: ”1.311”,
”q_max_L2_e”: ”1.310”,
”q_max_L3_e”: ”1.304”,
”q_max_L123_e”: ”3.926”,
”q_min_L1_e”: ”0.001”,
```

”q_min_L2_e”: ”0.001”,
”q_min_L3_e”: ”0.001”,
”q_min_L123_e”: ”0.005”,
”i_max_L1_e”: ”18.521”,
”i_max_L2_e”: ”18.373”,
”i_max_L3_e”: ”17.835”,
”i_max_L123_e”: ”54.729”,
”i_min_L1_e”: ”-17.648”,
”i_min_L2_e”: ”-16.576”,
”i_min_L3_e”: ”-17.386”,
”i_min_L123_e”: ”-51.610”,
”u_min_L1_e”: ”223.2”,
”u_min_L2_e”: ”222.8”,
”u_min_L3_e”: ”223.2”,
”u_max_L1_e”: ”234.3”,
”u_max_L2_e”: ”233.9”,
”u_max_L3_e”: ”234.4”,
”pf_max_L1_e”: ”1.00”,
”pf_max_L2_e”: ”1.00”,
”pf_max_L3_e”: ”1.00”,
”pf_min_L1_e”: ”-1.00”,
”pf_min_L2_e”: ”-1.00”,
”pf_min_L3_e”: ”-1.00”,
”f_min_L123_e”: ”49.8”,
”f_max_L123_e”: ”51.9”,
”ts_p_max_L1_e”: 1680457945,
”ts_p_max_L2_e”: 1680457945,
”ts_p_max_L3_e”: 1680457945,
”ts_p_max_L123_e”: 1680457945,
”ts_p_min_L1_e”: 1680628117,
”ts_p_min_L2_e”: 1680628117,
”ts_p_min_L3_e”: 1680628117,
”ts_p_min_L123_e”: 1680628117,
”ts_q_max_L1_e”: 1679908541,
”ts_q_max_L2_e”: 1679908541,
”ts_q_max_L3_e”: 1679896832,
”ts_q_max_L123_e”: 1679908541,
”ts_q_min_L1_e”: 1679673392,
”ts_q_min_L2_e”: 1679673392,
”ts_q_min_L3_e”: 1679673392,
”ts_q_min_L123_e”: 1679673392,
”ts_i_max_L1_e”: 1680457945,
”ts_i_max_L2_e”: 1680457945,
”ts_i_max_L3_e”: 1680457945,
”ts_i_max_L123_e”: 1680457945,
”ts_i_min_L1_e”: 1680628117,
”ts_i_min_L2_e”: 1680628117,
”ts_i_min_L3_e”: 1680628117,
”ts_i_min_L123_e”: 1680628117,
”ts_u_min_L1_e”: 1681731345,
”ts_u_min_L2_e”: 1681731345,
”ts_u_min_L3_e”: 1681731345,
”ts_u_max_L1_e”: 1681400950,
”ts_u_max_L2_e”: 1681400952,
”ts_u_max_L3_e”: 1681400952,
”ts_pf_max_L1_e”: 1679933033,
”ts_pf_max_L2_e”: 1679933033,
”ts_pf_max_L3_e”: 1679933033,
”ts_pf_min_L1_e”: 1679753738,

”ts_pf_min_L2_e”: 1679753738,
”ts_pf_min_L3_e”: 1679753738,
”ts_f_min_L123_e”: 1679742136,
”ts_f_max_L123_e”: 1681806387
}

The following abbreviations are used:

Description	Abbreviation
Active Energy Import Total	wpulse_cnt_L123_e [kWh]
Active Energy Import T1	wpulse_cnt_L123_T1_e [kWh]
Active Energy Import T2	wpulse_cnt_L123_T2_e [kWh]
Active Energy Export Total	wpulse_cnt_ex_L123_e [kWh]
Active Energy Export T1	wpulse_cnt_ex_L123_T1_e [kWh]
Active Energy Export T2	wpulse_cnt_ex_L123_T2_e [kWh]
Voltage Momentary L1-N	u_L1_act_e [V]
Voltage Momentary L2-N	u_L2_act_e [V]
Voltage Momentary L3-N	u_L3_act_e [V]
Voltage Minimum L1-N	u_min_L1_e [V]
Voltage Minimum L2-N	u_min_L2_e [V]
Voltage Minimum L3-N	u_min_L3_e [V]
Voltage Maximum L1-N	u_max_L1_e [V]
Voltage Maximum L2-N	u_max_L2_e [V]
Voltage Maximum L3-N	u_max_L3_e [V]
Active Power Momentary L123	p_L123_act_e [kW]
Active Power Momentary L1	p_L1_act_e [kW]
Active Power Momentary L2	p_L2_act_e [kW]
Active Power Momentary L3	p_L3_act_e [kW]
Active Power Minimum L123	p_min_L123_e [kW]
Active Power Minimum L1	p_min_L1_e [kW]
Active Power Minimum L2	p_min_L2_e [kW]
Active Power Minimum L3	p_min_L3_e [kW]
Active Power Maximum L123	p_max_L123_e [kW]
Active Power Maximum L1	p_max_L1_e [kW]
Active Power Maximum L2	p_max_L2_e [kW]
Active Power Maximum L3	p_max_L3_e [kW]
Reactive Power Momentary L123	q_L123_act_e [kvar]
Reactive Power Momentary L1	q_L1_act_e [kvar]
Reactive Power Momentary L2	q_L2_act_e [kvar]
Reactive Power Momentary L3	q_L3_act_e [kvar]
Reactive Power Minimum L123	q_min_L123_e [kvar]
Reactive Power Minimum L1	q_min_L1_e [kvar]
Reactive Power Minimum L2	q_min_L2_e [kvar]
Reactive Power Minimum L3	q_min_L3_e [kvar]
Reactive Power Maximum L123	q_max_L123_e [kvar]
Reactive Power Maximum L1	q_max_L1_e [kvar]
Reactive Power Maximum L2	q_max_L2_e [kvar]
Reactive Power Maximum L3	q_max_L3_e [kvar]
Current Momentary L123	i_L123_act_e [A]
Current Momentary L1	i_L1_act_e [A]
Current Momentary L2	i_L2_act_e [A]
Current Momentary L3	i_L3_act_e [A]
Current Minimum L123	i_min_L123_e [A]
Current Minimum L1	i_min_L1_e [A]
Current Minimum L2	i_min_L2_e [A]
Current Minimum L3	i_min_L3_e [A]
Current Maximum L123	i_max_L123_e [A]
Current Maximum L1	i_max_L1_e [A]
Current Maximum L2	i_max_L2_e [A]

Description	Abbreviation
Current Maximum L3	i_max_L3_e [A]
Power Factor Momentary L1	pf_L1_act_e []
Power Factor Momentary L2	pf_L2_act_e []
Power Factor Momentary L3	pf_L3_act_e []
Power Factor Minimum L1	pf_min_L1_e []
Power Factor Minimum L2	pf_min_L2_e []
Power Factor Minimum L3	pf_min_L3_e []
Power Factor Maximum L1	pf_max_L1_e []
Power Factor Maximum L2	pf_max_L2_e []
Power Factor Maximum L3	pf_max_L3_e []
Frequency Momentary All Phases	f_L123_act_e [Hz]
Frequency Minimum All Phases	f_min_L123_e [Hz]
Frequency Maximum All Phases	f_max_L123_e [Hz]

ts_ values are the epoch timestamps of the specific minimal and maximal values and therefore show the time of occurrence.

RESET

In case of maloperation (wrong IP address, forgotten password, etc.) you can RESET the TCP configuration.

- “Arrow right” to settings
- “Arrow down” to TCP/IP Interface
- Press “SRVC” button (<2 seconds)
- “Arrow right” chooses between Factory RESET, Soft RESET and No RESET
- Save: Press “SRVC” button (>2 seconds) until the LCD flashes

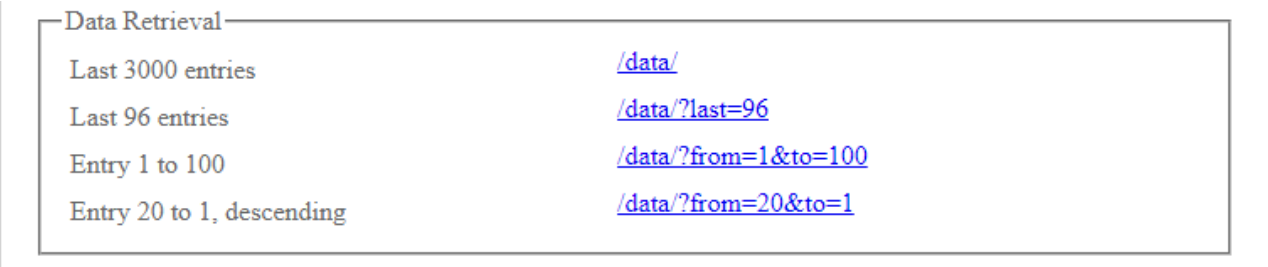
A factory RESET may take up to 5 minutes before the meter is reachable again. This RESET resets the TCP interface to its factory settings.

A Soft RESET only restarts the TCP module of the EMU Professional II . The TCP configuration is not affected by this reset.

Note: Whichever RESET is done, no meter reading, measurements, ongoing measurements or other processes relevant to metering are changed.

Data Logger

The EMU Professional II TCP/IP has a load profile memory that can store 105378 entries. This corresponds to a load profile interval of about 3 years with a load profile interval of 15 minutes. Each load profile entry is assigned a unique index in ascending order.



You can get the historical data of your EMU Professional II TCP/IP via the links at the bottom of the “Current Measurements” tab or by entering the following URL in your browser:

http://[IP-Address of the meter]/data/

If you specify no further parameters, the last 3000 entries are printed in descending order.

Note: Read-Out provides a maximum of 3000 entries per request, if more entries are required, the queries can be transmitted in staggered order.

Query of staggered entries

To specify further which data points you want, you can add the following parameters to the URL (HTTP-GET).

Parameter	Description
last=x	Read-Out of the last x entries of the data logger, max. 3000 entries
from=a	Start your read-out at index a
to=b	Stop your read-out at index b

Examples

Query of the last **1250** entries in the data logger:

http://[IP-Address]/data/?last=1250

Query the entries from index 50 to index 500, in **ascending** order:

http://[IP-Address]/data/?from=50&to=500

Query of entries from index 3000 to index 2500, in **descending** order:

http://[IP-Address]/data/?from=3000&to=2500

Note: If index a is less than index b, the data is read-out chronologically ascending. To receive a descending read-out, enter the bigger index first (a>b).

Query the last 5000 entries:

In this example the current data logger index is 8433. If you would like to receive the last 5000 entries, first request the last 3000 entries with

http://[IP-Address]/data/

Then determine the index of the oldest entry of this request and use this to retrieve the next 2000 entries.

Example: The index with the oldest entry in this case is 5434. The second query is therefore

http://[IP-Address]/data/?from=5433&to=3434

to get the next 2000 entries.

Retrieval of entries from a defined period:

Note: 96 entries are created per day with a load profile interval of 15 minutes

The load profile interval of 15 minutes applies to this example.

Calculate the difference to the desired end target date in days. Multiply this by 96. Subtract the result from the index of the most recent entry. Use this result as the value for the “to” parameter.

Then calculate the difference to the desired start-destination date in days. Multiply this by 96. Subtract the result from the index of the most recent entry. Use this result as the value for the “from” parameter.

Most recent data logger entry: 64536

Today’s date: March 22, 2024, 10:30

Requested query range:

From: December 31, 2023, 22:00 To: January 01, 2024, 06:00

Time elapsed since December 31, 2023, 22:00 = 81 days, 12 hours, 30 minutes

Time elapsed since January 01, 2024, 06:00 = 81 days, 4 hours, 30 minutes

$$(81 * 24 * 4) + (12 * 4) + (30/15) = 7826 \rightarrow 64536 - 7826 = 56710$$

$$(81 * 24 * 4) + (4 * 4) + (30/15) = 7794 \rightarrow 64536 - 7794 = 56742$$

To get the data logger entries for the time span you need to enter the following query.

http://[IP-Address]/data/?from=56710&to=56742

CSV-File Structure of the data logger

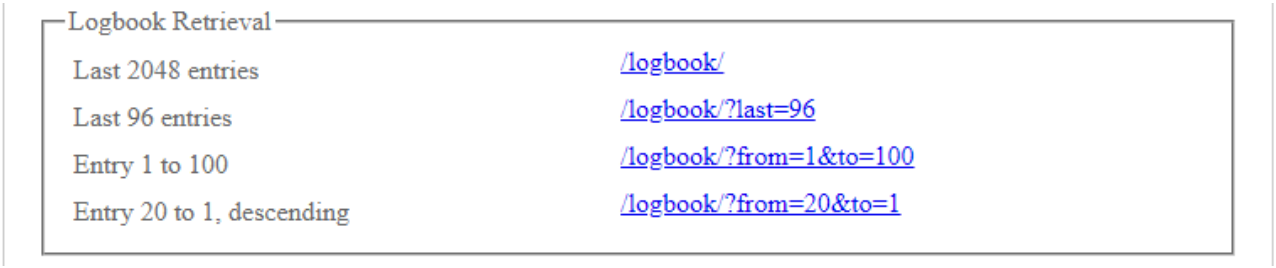
Column	Description	Unit	Resolution	Example Value
1	Time stamp	UTC		2022-09-28T10:30:00Z
2	Index			2
3	Status			2
4	Serial number			22350000
5	Active Energy Import L123 T1	Wh	1 Wh	0
6	Active Energy Import L123 T2	Wh	1 Wh	0
7	Active Energy Export L123 T1	Wh	1 Wh	0
8	Active Energy Export L123 T2	Wh	1 Wh	0
9	Reactive Energy Import L123 T1	varh	1 varh	0
10	Reactive Energy Import L123 T2	varh	1 varh	0
11	Reactive Energy Export L123 T1	varh	1 varh	0
12	Reactive Energy Export L123 T2	varh	1 varh	0
13	Active Power L123	W	1 W	4252
14	Active Power L1	W	1 W	2010
15	Active Power L2	W	1 W	992
16	Active Power L3	W	1 W	1250
17	Current L123	mA	1 mA	15680
18	Current L1	mA	1 mA	8682
19	Current L2	mA	1 mA	4300
20	Current L3	mA	1 mA	2698
21	Current N	mA	1 mA	0
22	Voltage L1-N	V	0.1V	2326
23	Voltage L2-N	V	0.1V	2320
24	Voltage L3-N	V	0.1V	2304
25	Power factor L1		0.01	99
26	Power factor L2		0.01	99
27	Power factor L3		0.01	99
28	Frequency	Hz	0.1 Hz	500

Definition of the Status-Codes

The status code is bit coded. The following table describes the status byte for binary, hex, and decimal read out.

Bit-Position	Bin	Hex	Dec	Description
0-7	0b00000000	0x0	0	No Change
0	0b00000001	0x1	1	Time changed
1	0b00000010	0x2	2	Current transformer ratio changed
2	0b00000100	0x4	4	Voltage transformer ratio changed
3	0b00001000	0x8	8	Impulse length changed
4	0b00010000	0x10	16	Impulse ratio changed
5	0b00100000	0x20	32	Power Failure
6	0b01000000	0x40	64	No time synchronization occurred
7	0b10000000	0x80	128	Logbook is full

Read-Out Logbook



Note: The logbook is only available on the LP version of the meter.

You can get the Logbook of your EMU Professional II TCP/IP via the following URL:

http://[IP-Address]/logbook/

If you specify no further parameters, the last 2048 entries are printed in descending order.

Note: Read-Out provides a maximum of 2048 entries per request.

Possible Parameters

To specify further which data points of the logbook you want, you can add the following parameters to the URL (HTTP-GET).

Parameter	Description
last=x	Read-Out of the last x entries of the logbook
from=a	Start your read-out at index a
to=b	Stop your read-out at index b

If index a is less than index b, the data is read-out chronologically ascending. To receive a descending read-out, enter the bigger index first (a>b).

Examples

The last 30 entries of the logbook: http://[IP-Address]/data/?last=30

Entries 55 to 65 of the logbook: http://[IP-Address]/data/?from=55&to=65

CSV-File Structure of the Logbook

Column	Description	Unit	Resolution	Example Value
1	Time stamp	UTC	1 s	2022-09-28T10:35:00Z
2	Time stamp after change	UTC	1 s	2022-09-28T10:37:30Z
3	Index			3
4	Serial Number			22350000
5	Active Energy Import L123 T1	Wh	1 Wh	2568
6	Active Energy Import L123 T2	Wh	1 Wh	120
7	Active Energy Export L123 T1	Wh	1 Wh	487
8	Active Energy Export L123 T2	Wh	1 Wh	3615
9	Index of corresponding load profile entry			35
10	CT setting primary actual			500
11	CT setting primary pre change(if)			5
12	CT setting secondary actual			5
13	CT setting secondary pre change(if)			5
14	VT setting primary actual			200
15	VT setting primary pre change(if)			100
16	VT setting secondary actual			100
17	VT setting secondary pre change(if)			100
18	S0 pulse value actual	P/kWh		1000
19	S0 pulse value pre change(if)	P/kWh		10
20	S0 pulse width actual	ms		2
21	S0 pulse width pre change(if)	ms		40

Firmware-Update

The EMU Professional II TCP/IP allows for firmware updates of its communication module via its built in “mcumgr-server”. The update can be done automatically with the EMU Professional II TCP Update Tool or manually.

Requirements

- Please make sure that the meter you want to update is in your local network and that the firewall and all other programs that prohibit or prevent access are deactivated.
- TCP-port 1337 is a requirement for the update.
- The update is only possible if the setting “online update allowed” is activated on the web server of the meter.
- The current firmware version is provided on the EMU AG update server and automatically downloaded by the update tool.
- Updating is only possible for meters with a TCP firmware version 1.0.6 or newer.
- Updating the firmware of the communication module doesn’t affect the firmware of the meter (FW-MID, FW-APP), also no meter reading, measurements, ongoing measurements or other processes relevant to calibration are changed.
- When you install the update tool, a message from Microsoft Defender may appear. Click on More information and then on Run anyway.

Note: Only signed update files from EMU Electronic AG are allowed.

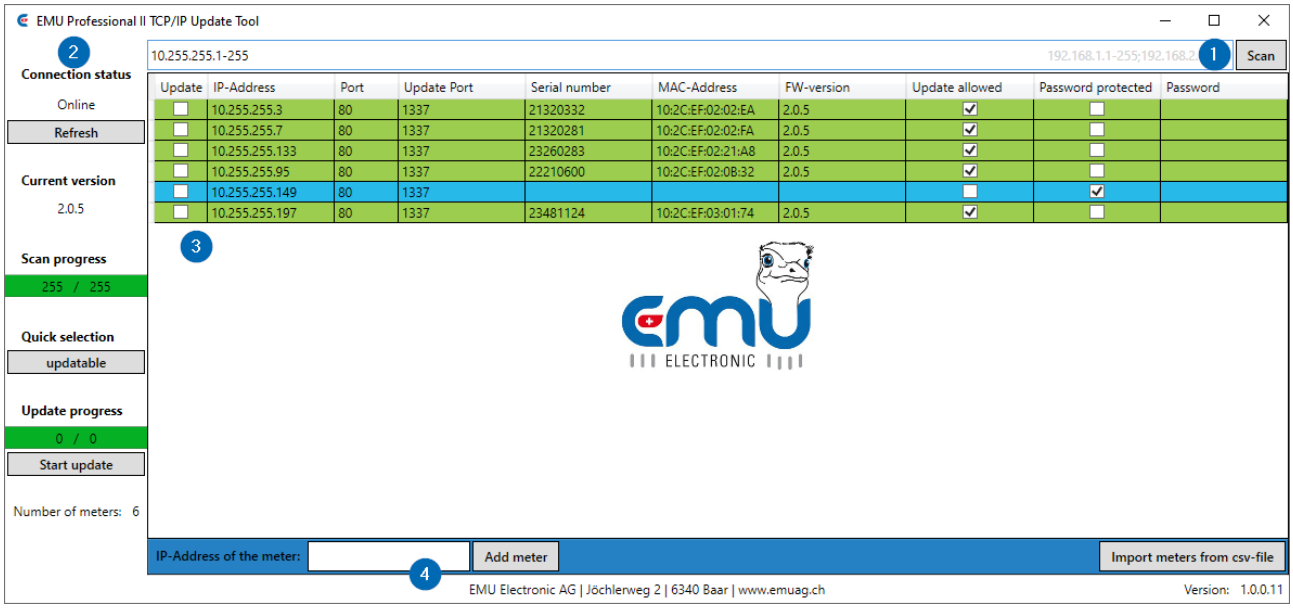
Danger: Improper use or interrupting the firmware update can lead to damage to the EMU Professional II TCP/IP!

Automatically execute the Firmware Update

EMU Electronic AG offers a free EMU Professional II TCP Update Tool on our website. With this tool you can update entire subnets of meters simultaneously. You can download and install the tool via the following link:

https://www.emuag.ch/files/software/EMU_Prof2_TCPIP_Update_Tool.zip

Note: If your system language is German, the tool language is also in German. In all other cases, the tool language is English.



1. Scan

Enter one or multiple IP-ranges into the search field. Once you press “Scan” the tool will scan the given ranges for EMU Professional II . All found devices are then shown in the list of devices.

You can specify the IP-range as follows:

- 10.255.255.1-255 or 10.255.255.1 - 10.255.255.255 Checks all IP-Addresses from 10.255.255.1 to 10.255.255.255.
- 10.255.255.1-10;10.255.255.56-156 Checks all IP-Addresses from 10.255.255.1 to 10.255.255.10 and from 10.255.255.56 to 10.255.255.156.

2. Progress bar and info

The connection status shows whether your computer can connect to the update server (online) or not (offline). If your computer is connected “Current version” shows the most up to date version of the TCP module for the EMU Professional II on the update server.

The progress bar under starts as soon as you have entered a valid range of IP-Addresses and click on “Scan”.

*Note: A second scan **doesn’t** delete any previously found devices.*

With the “Update possible” button you can quickly select all meters on the list that are set to “update allowed” and are not on the current version of the TCP firmware.

Start the update of all selected meters with the button “Start Update”. The progress bar above the button shows the progress of the update.

“Number of meters” at the bottom shows the total number of found meters via the scan.

3. Meter list

In this list you can find all found EMU Professional II meters. The columns are as follows:

- Update: This checkbox lets you select all the meters you want to update.
- IP-Address, Serial Number, MAC-Address and FW-Version: These Columns provide information on the meter and cannot be edited.
- Port and Update Port: These columns can be edited if necessary.
- Update allowed and password protected: The settings in these columns can only be edited on the configuration website of the meter. In this tool the column is purely informative.
- Password: Meters with password protection enabled need the password to be entered in this column for the update to work.

Right-click on any meter to receive the following further options:

- Update meter: Click on this option to update this specific meter.
- Show in browser: Switch to the website of this meter by clicking on this option.
- Update meter info: Click on this option to update the columns for this meter. A meter with password protection enabled requires the password in the last column to update the info properly.
- Delete meter: This option lets you delete this meter from the list.

The list of meters has the following color coding:

- Red: The meter has old TCP firmware.
- Blue: The meter has password protection, or meter info cannot be retrieved. A manually added, nonexistent meter will also show as blue.
- Green: The meter is up to date.

4. Manual IP-Address Import

These two options let you manually add meters via their IP-Address. The .CSV file mustn't have a header, and the IP-Addresses are listed in the first column.

Note: Opening a .CSV file in this tool will delete all previously added meters from the list.

Manually execute the Firmware Update

The update is done via the command line tool mcumgr. For the installation go must be installed in advance.

After successful installation of "go", the latest version of mcumgr can be installed via the command prompt:

```
go get -v github.com/apache/mynewt-mcumgr-cli/mcumgr
```

Note: In the following example the EMU Professional II TCP/IP has the IP-Address 192.168.0.131 assigned.

1. Download the new firmware and validate the checksum.
2. Read out the current firmware version of your EMU Professional II TCP/IP with the following command line argument:

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image list
```

The meter answers the following way. Version number and hash code may vary:

```
Images:
  image=0 slot=0
     version: 1.0.12
     bootable: true
     flags: active confirmed
     hash: oldHash
Split status: N/A (0)
```

3. Upload the new firmware version with the following command line argument:

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image upload [UpdateFilePath.bin]
```

The meter will send the following loading bar as answer:

```
200.11 KiB / 200.11 KiB [=====...===] 100.00% 34.99 KiB/s 5s
Done
```

4. The following command lets you review the status of the uploaded images. You can review the old, as well as the new firmware.

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image list
```

"Slot=0" contains the data of the old FW version and "Slot=1" contains the data of the newly uploaded FW version:

```
Images:
 image=0 slot=0
    version: 1.0.12
    bootable: true
    flags: active confirmed
    hash: oldHash
 image=0 slot=1
    version: 1.0.13
    bootable: true
    flags:
    hash: newHash
Split status: N/A (0)
```

5. Confirm the new firmware. The identification of the firmware is done via its checksum/Hash code. Use the following command line argument:

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image test
```

The meter answers with the following data:

```
Images:
 image=0 slot=0
    version: 1.0.12
    bootable: true
    flags: active confirmed
    hash: oldHash
 image=0 slot=1
    version: 1.0.13
    bootable: true
    flags: pending
    hash: newHash
Split status: N/A (0)
```

The new firmware has the flag “pending”.

6. Restart the TCP/IP module of the EMU Professional II TCP/IP with the following command line argument. After the successful restart of the TCP module the meter switches the old for the new firmware and starts up with the new firmware. Wait until the meter has received an IP-Address again before continuing with step 7.

```
mcumgr --conntype udp --connstring=192.168.0.131:1337  reset
```

7. Confirm the permanent change to the new firmware with the following command line argument:

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image confirm newHash
```

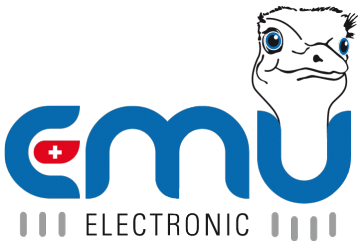
8. Delete the old firmware.

Note: Deleting the old firmware is not mandatory. The firmware update is finished with step 7. This allows for switching between the two versions at any time.

Note: Please be advised that the EMU Professional II TCP/IP can only store 2 firmware images at any time. If both slots are full, you will not be able to upload a new firmware update until you deleted one of the existing images!

```
mcumgr --conntype udp --connstring=192.168.0.131:1337 image erase
```

The firmware update is finished successfully.



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