EWIO$_2$
User Manual

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1. Preamble

1.1. About this User Manual

This document describes the operation of the EWIO$_2$ in the following device variants.
The device designations describe the main differences.
Not all functionalities are included in all variants.

EWIO$_2$-BM	EWIO$_2$ Ethernet Web I/O Controller, for processing digital and analog signals with BACnet and Modbus functions.
EWIO$_2$-M	data logger for energy consumption monitoring and I/O controller for Energy management.
EWIO$_2$-M-BM	EWIO$_2$-M with additional BACnet and Modbus functions.

The description contains information on the use and installation of the device.
If you have any questions that cannot be answered with the help of this manual, please contact the supplier or manufacturer for further information.
The stated installation and assembly regulations and guidelines apply to the Federal Republic of Germany. If the device is used abroad, the national regulations must be observed at the sole responsibility of the system manufacturer or operator.

1.2. Safety instructions

For the installation and use of the device, the respectively valid industrial safety, accident prevention and VDE regulations must be observed.
Skilled workers or installers are advised that they must discharge themselves properly before installing or servicing the equipment.
Assembly and installation work on the devices may only be carried out by qualified subject person, see section "qualified subject person". Every person who uses the device must read the descriptions of this have read and understood this manual.

Warning of dangerous electrical voltage
Danger!



means that there is danger to life if not observed,
serious bodily injury or considerable damage to property
can occur.

1.3. Qualified subject person

Qualified subject person in the sense of this manual are persons who are familiar with the described devices and have a qualification corresponding to their activity.
This includes, for example:

- Authorization to connect the device according to the VDE regulations and the local EVU regulations, as well as authorization to switch the device on, off and disconnect it under consideration of the internal regulations.
- Knowledge of the accident prevention regulations.
- Knowledge about the application and use of the device within the plant system, etc.

1.4. Warranty terms

METZ CONNECT GmbH does not assume any liability or guarantee for consequences resulting from improper use, in particular non-observance of the instructions for use and installation. The user must ensure that the device is not operated outside the specified technical parameters. Any unauthorized alteration or manipulation of the device (including the software), as well as any repairs carried out by the user on his own authority, shall constitute "misuse" and/or "negligence" within the meaning of the warranty for the product and shall therefore exclude the warranty for the coverage of possible consequential damage.

1.5. Disclaimer of warranty

The contents of this document have been carefully compiled and checked for conformity with the product in terms of hardware and software. However, deviations cannot be completely ruled out. For this reason, the information contained in this manual does not imply any obligation or warranty of any kind. As a result, authors, companies and publishers do not assume any legal responsibility and will not assume any resulting or other liability arising in any way from the use of this information or parts thereof, including for infringement of patent rights and other rights of third parties that may result therefrom.

2. Description of the device

The EWIO$_2$ is a compact Linux-based Ethernet I/O controller that can connect digital and analog signals from the sensor and actuator level to an IP network.
Parameterization, configuration and commissioning of the device is done via a platform-independent web browser.
To expand the inputs and outputs, the Modbus RTU MR-I/O modules from METZ CONNECT can be connected to an RS485 interface of the EWIO$_2$.
Using two Ethernet ports, several Ethernet components can be connected in series as a daisy chain, one after the other and to a network.
An integrated µSD memory card extends the functional range of the EWIO$_2$ for storing settings, data and applications.

The EWIO$_2$-M variant, M for metering, focuses on energy consumption recording and energy monitoring in buildings, on machines, plants and systems. These variants have a powerful data logger based on an SQLite database and a M(eter)-Bus interface. The M-Bus and Modbus RTU interfaces allow the reading of different meters for electricity, water, gas or heat. The measured values can be sent from the database either by email (SSL) and file transfer protocol (SSL) or read out in parallel.

With the EWIO$_2$-BM variants, the communication protocols BACnet and Modbus are available in order to realize different tasks in building and industrial automation and energy management with the integrated digital and analog I/Os and the I/Os of possibly connected expansion modules.

2.1. Controller unit

Prozessor NXP i.MX7D Dual Core ARM® Cortex® - A7, frequency 1 GHz.
Internal storage:
- 512 MB RAM
- 4 GB Flash.

Operating system Linux embedded
RealTimeClock:
- with an accuracy of 1 s per day
- 10 hrs. Power failure bridging

2.2. In- and outputs

The EWIO$_2$ and EWIO$_2$-M variants are available:

- 8 digital inputs for recording and counting binary states up to 24 Volt DC
  4 of them are galvanically isolated.
- 4 switchable digital 24 Volt outputs with current carrying capacity of up to 20 mA DC per output
- 3 analogue inputs. Configurable for
  - 0-10 Volt DC voltage measurement,
  - Resistance measurement in the range from 40 Ohm to 4 Megaohm or
  - Temperature measurement. 17 different sensor types can be selected.
  - 0-20mA DC current measurement,
- 3 analog outputs with manual operation with 0-10 Volt DC with a current carrying capacity up to 5 mA per output.

Only for EWIO$_2$ variants are available:

- 6 switchable relay outputs with manual operating up to 6 A per relay
- 2 switchable TRIAC outputs with manual control with 20-250 Volt AC with a current carrying capacity of up to 0.5 A per TRIAC

Only for EWIO$_2$-M variants are available:

- 4 switchable relay outputs with manual operating with one current carrying capacity up to 6 A per relay

2.3. Housing and terminals

Dimensions (width x height x depth): 125 x 93 x 82 mm.
The width corresponds to 7 units according to DIN 43880.
The housing with 45 mm cap dimension is suitable for sub-distribution boards.

Depending on the variant, the weight is between 410 and 425 grams.
The protection class according to IEC 60529 for housing and terminals corresponds to IP20.
The impact resistance according to IEC 62262 corresponds to IK06.

The transparent upper part of the housing is made of PC polycarbonate.
The remaining housing parts are made of PA polyamide.

The terminals are suitable for wires from 0.33 to 2.5 mm² or AWG 22 to 12
Laying out.
The diameter of the cores can range from 0.3 to a maximum of 2.7 mm.

2.4. Indication

The operation indicator, which can also be seen when the flap is closed, lights up green in normal operation.
During the boot process after a device reset or after a power recovery, it lights up red.
It also glows red when a software service is not running.
The indicator flashes alternately red and green in a 1 Hz cycle in case of a detected short circuit at the transistor or analog outputs, at the M-Bus interface or in case of a software error or alarm.

When the flap is open.

The Ethernet communication indicator is green at the link,
the speed indicator 10/100 MBit is yellow.

the status indicators of the switching states of the digital inputs are yellow
The status indicators of the relays or TRIACs are yellow.
The status indicators of the analog outputs are yellow.

The indicators of the manual operation of the relays, the TRIACs or the analog outputs are green.

2.5. Communication interfaces

For the EWIO$_2$ and EWIO$_2$-M variants are available:

- 2 Ethernet interfaces LAN 10/100BaseT autosensing, Managed Switch
- 1 RS485 interfaces galvanically isolated for a maximum of 6 Modbus RTU expansion modules of the METZ CONNECT MR-family.
- 1 RS485 interface galvanically isolated for Modbus RTU field devices or meters.

- Application Programming Interface API interface for programming software applications. See chapter 12. for definition.

Only for the EWIO$_2$-M variants are available:

- 1 M(eter)-Bus interface

2.6. Communication protocols and languages

Protocols:
For the EWIO$_2$ and EWIO$_2$-M variants are available:

- Transmission Control / Internet Protocol TCP/IP Network communication
- Dynamic Host Configuration Protocol DHCP Network configuration
- Hypertext Transfer Protocol HTTP, HTTPs Data transmission
- File Transfer Protocol FTP Data transmission
- Simple Mail Transfer Protocol SMTP Email
- Network Time Protocol NTP Time control

Only for the EWIO$_2$-BM variants are available:

- BACnet IP
- Modbus TCP
- Modbus TCP <-> Modbus RTU Gateway-function

Script languages:

- JS Java Script
- HTML Hypertext Markup Language
- CSS Cascading Style Sheets
- PHP Hypertext Preprocessor
- JSON JavaScript Object Notation
- Python Programming language
- Shell Script Command Line Interpreter

3. Scope of delivery and incoming inspection

3.1. Scope of delivery basic unit

EWIO$_2$ Ethernet Web I/O je nach Ausführung depending on variant:
Web-I/O-variants:
110904 EWIO$_2$-BM
110909 EWIO$_2$-W-BM
Data logger -variants:
110930 EWIO$_2$-M
110935 EWIO$_2$-M-BM
110931 EWIO$_2$-MW
110934 EWIO$_2$-MW-BM
Jumper plug for I/O-components
Terminal block for I/O-components
Mounting instruction

3.2. Available accessories

Power supply:
110561 Power supply NG4

Expansion modules:
11083013 MR-TO4 Modbus RTU
1108311319 MR-DI10 Modbus RTU
11083213 MR-AI8 Modbus RTU
1108331326 MR-DIO4/2 Modbus RTU
1108341319 MR-DI4 Modbus RTU
1108351302 MR-AO4 Modbus RTU
1108361321 MR-DO4 Modbus RTU
1108371302 MR-AOP4 Modbus RTU
11083813 MR-TP Modbus RTU
11083913 MR-SI4 Modbus RTU
1108401332 MR-CI4 Modbus RTU
11084113 MR-SM3 Modbus RTU

3.3. Incoming inspection

Proper and safe operation of this device requires proper transport, storage, installation and assembly as well as careful operation and, if necessary, maintenance.
If it can be assumed that safe operation of the device is no longer possible, the device must be taken out of operation immediately and secured against unintentional start-up.
Unpacking and packing must be carried out with the usual care without the use of force and only using suitable tools.

The device must be visually inspected for the following before installation:

- Damage to packaging
- Completeness of the package contents
- Visible external damage to the device

If one or more of the above-mentioned cases should occur, please contact your METZ CONNECT sales partner

Warning!



Damaged devices may neither be installed nor put into operation. They can lead to death, serious physical injury or damage to property.

It is to be assumed that safe operation is no longer possible if the device is also, e.g.

- no longer works despite intact mains supply
- was exposed to unfavourable conditions for a longer period of time (e.g. storage outside the permissible climatic limits without adaptation to the room climate, condensation, etc.) or transport stresses (e.g. fall from a great height even without visible external damage, etc.).

Attention!
Prevent condensation.
Sudden changes in temperature can cause condensation.
Condensation can impair the function of the unit.
Store the device at the installation site for at least 2 hours before starting to install it

4. Installation

4.1. Installation location and state

The electrical installation and device connection may only be carried out by qualified personnel in compliance with VDE regulations and local regulations.

Before working on the system, it must be disconnected from the power supply.

The EWIO$_2$ is intended for fixed installation and operation inside enclosed rooms in electrical distribution boards and suitable control panels.

The EWIO$_2$ is designed for mounting on TH35 mounting rails in accordance with IEC 60715.

It can be installed in any position. Horizontal installation is recommended.

It is possible to add them to other control cabinet components without spacing.

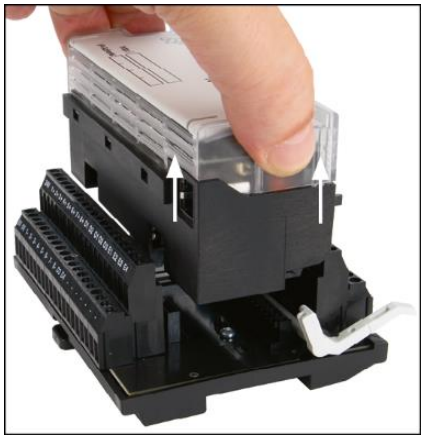
4.2. Elektronic block

In case of service the EWIO$_2$ may have to be replaced or the MicroSD card may have to be removed in order to read out data saved on it.
In this case, the electronic block can be disconnected from the terminal module without having to remove the connected cables.

The eject lever at the top right must be pushed back strongly. The electronic block can then be easily removed.







When reinserting the electronic block, the eject lever must first be moved to the rear so that it can engage in the correct position above the mounting lugs..





Note!

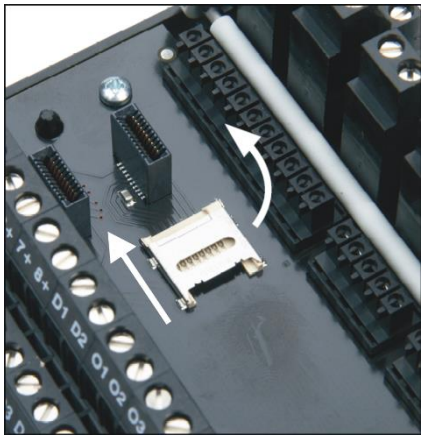
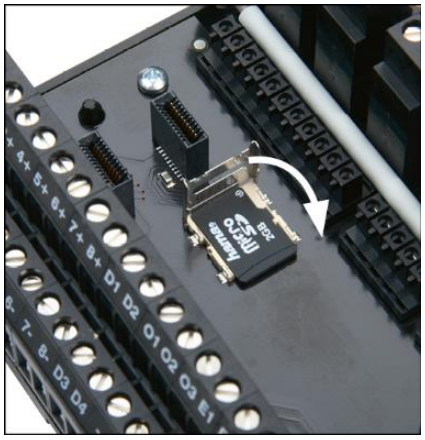
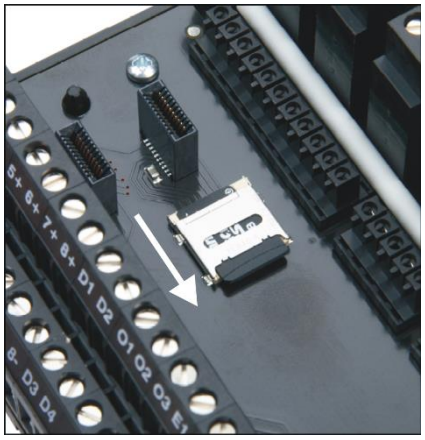


EWIO$_2$, to which a fixed IP address has been assigned via DHCP and which are exchanged, can only be addressed again with this IP address if the MAC address is exchanged in the DHCP server.

4.3. MicroSD card

The EWIO$_2$ has an integrated MicroSD memory card that can be expanded up to a maximum of 32 GB. It is used to store device configurations, data and applications. After the electronic block has been replaced, it can be made available again in the new device.

Access to the MicroSD card is only possible after removing the electronic block.
See chapter 4.2.
The card holder is opened by pushing up and opening the holder flap.
The MicroSD card is positioned according to the contour in the holder with the contacts pointing downwards.
The card holder is closed by closing and pushing back the holder flap.

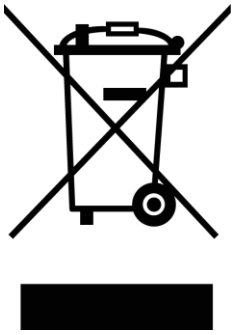




4.4. Disassembly and disposal

Before disassembling, it must be ensured that the EWIO$_2$ has been taken out of operation and that all supply lines are de-energised.

Once all supply lines have been removed, use a slotted screwdriver to move the bolt on the EWIO$_2$ outwards and remove the device from the mounting rail.

After use, the EWIO$_2$ must be disposed of as electronic scrap in accordance with the WEEE Directive and the laws in force in the respective country.
Further information is available from METZ CONNECT GmbH.



5. Connection

Warning of dangerous electrical voltage
Danger!



Incorrect connection may result in fatal injury.
Serious bodily injury or considerable damage to property can occur.
Before working on the system, it must be disconnected from the power supply.

The electrical installation and device connection may only be carried out by qualified personnel in compliance with VDE regulations and local regulations.

The correct connection must be checked before commissioning.
Incorrect connection can destroy the EWIO$_2$.

5.1. Power supply

The operating voltage of the EWIO$_2$ is 24 Volt DC ± 10% (SELV).
The current consumption is
for EWIO$_2$ at maximum 350 mA,
for EWIO$_2$-M at maximum 500 mA.

The easiest way to supply voltage ist o use the power supply
NG4 from METZ CONNECT, order number 110561
via a jumper plug on the left side of the EWIO$_2$.



Danger!



The mains voltage oft he supply lines tot he power supply NG4 is 230 V AC.
Serious bodily injury or considerable damage to property can occur.
Before working on the system, it must be disconnected from the power supply.

Power can also be supplied directly via the power supply terminals (24V / 0V).



5.2. Ethernet interface

The EWIO$_2$ has a switch module with two Ethernet ports. This makes it possible to build a network in daisy chain topology. The EWIO$_2$ is connected to the network via standard patch cables.

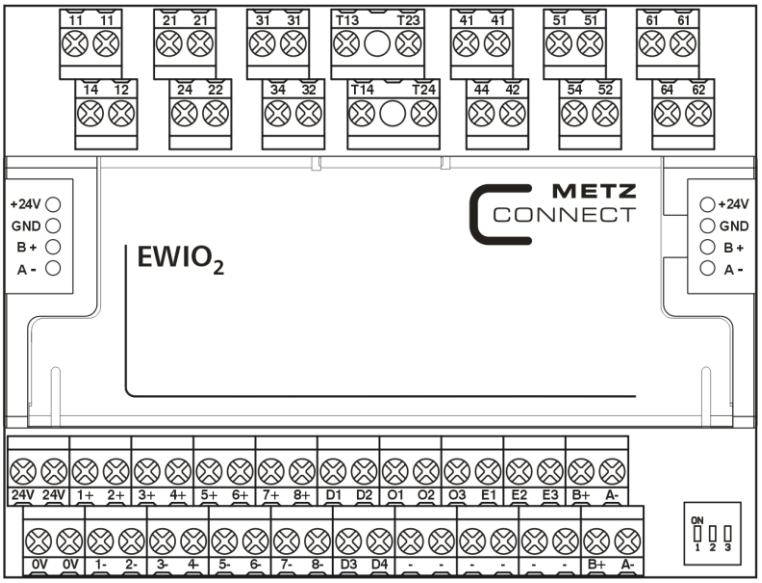


5.3. In- and outputs (I/Os)

Various sensors and actuators can be connected to the dedicated I/Os.

Note!

Sensor cables, including shielded ones, must be laid at a sufficient distance from live cables so that the measured values are not affected.



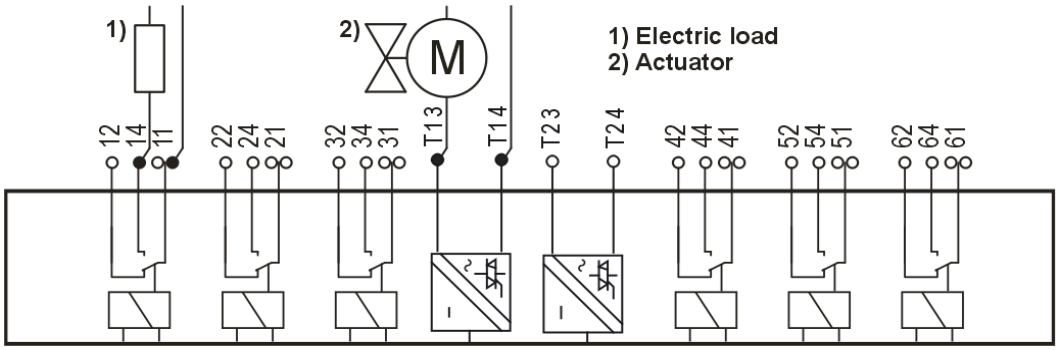
5.3.1. Relay

The terminals of the respective relay outputs have the following meanings
the common connections (COM) with 11, 21, 31, 41, 51, 61,
the normally closed contacts (NC) 12, 22, 32, 42, 52, 62 and
the normally open contacts (NO) 14, 24, 34, 44, 54, 64.
They can be switched individually and can carry up to 6 A resistive load.

5.3.2. TRIAC

(Only for the Ethernet I/O variants.)
The terminals of the respective TRIAC outputs (semiconductor outputs) are T13..T14 and T23..T24. They can be switched individually and can be loaded up to 0.5 A.

Wiring Example 5.3.1. and 5.3.2.:



5.3.3. Digital inputs

The terminals oft the respective digital inputs are called 1+..1- to 8+..8-.
The inputs 1 to 4 are internally supplied with 15 volts. The respective minus terminals are electrically connected to the terminals 0V and GND. Inputs 5 to 8 are electrically isolated from the device and require external voltage.

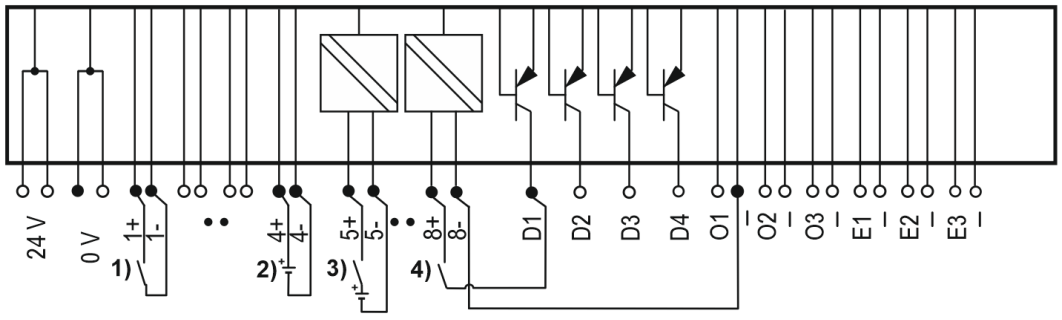
A 24 V DC voltage source with the same GND potential can also be connected to inputs 1 to 4. Here, however, it must be noted that, unlike a digital signal, the HIGH state is assumed at a voltage of 0 V up to a threshold of about 9 V and from there the LOW state.

Each digital input is internally connected to a pulse counter register that allows for counting pulses with a duration (length of HIGH phase) of at least 8 ms, pause (length of LOW phase) of at least 8 ms and a maximum frequency of 50 Hz. The pulse counting can be enabled or disabled individually for each digital input using the web-interface (see chapter 10.5.3.1).

5.3.4. Digital outputs

The terminals of the respective digital outputs are called D1 to D4. The outputs are internally supplied with 24 volts. They are individually switchable and can be loaded up to 20 mA.

Wiring example 5.3.3. and 5.3.4.:



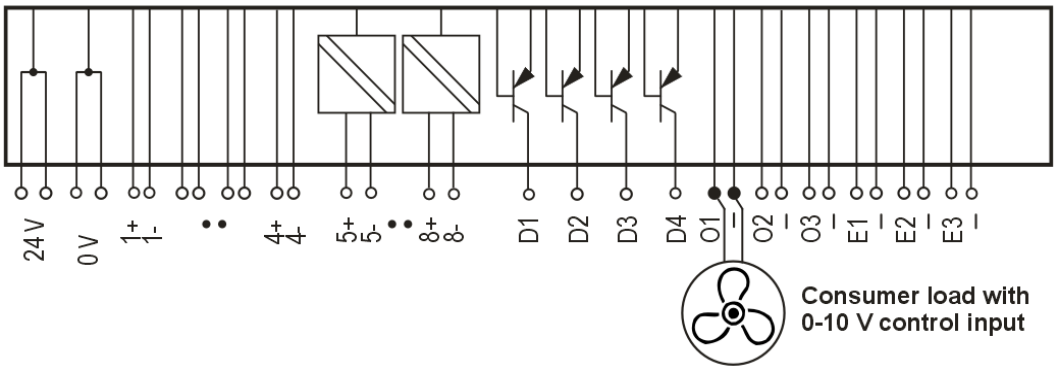
1) Dry contact or S0 - pulse from Counter
2) 24V DC separate source voltage 0V - HIGH - ~9V - LOW - 24V
3) Switch contact with 24V DC separate source voltage
4) Switch contact with 24V DC from digital Output

5.3.5. Analog outputs

The terminals of the respective analog outputs are called O1 to O3.

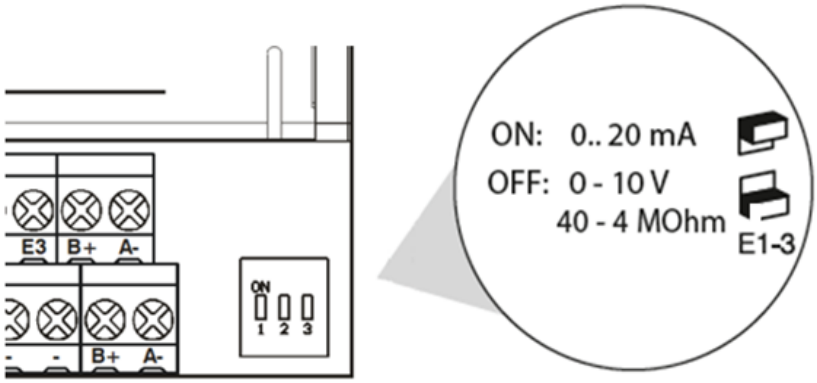
The outputs are adjustable from 0-10 Volt DC. They are individually loadable up to 5 mA.

Wiring examples:

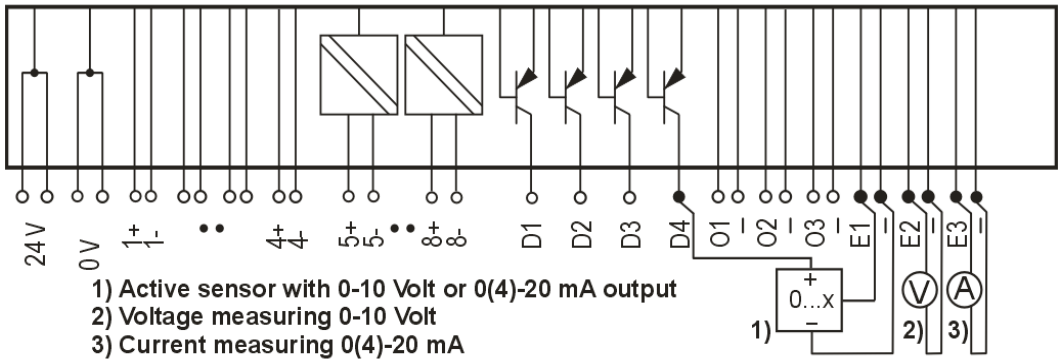


5.3.6. Analog inputs

The terminals of the respective analog inputs are called E1 to E3. Depending on the configuration, active sensors with 0-10 Volt, 0-20 mA or resistance sensors in the range of 40 Ohm to 4 Megaohm can be measured. The changeover of voltage/resistance measurement and current measurement is done Hardware side by means of the red dip switches on the bottom right.



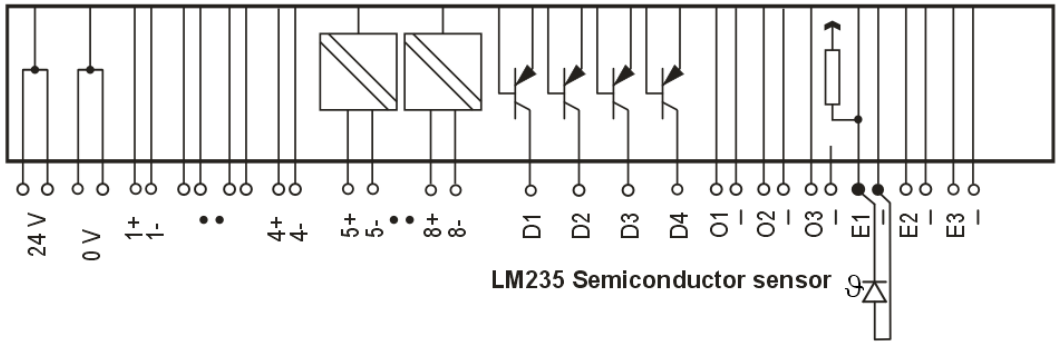
Wiring examples:

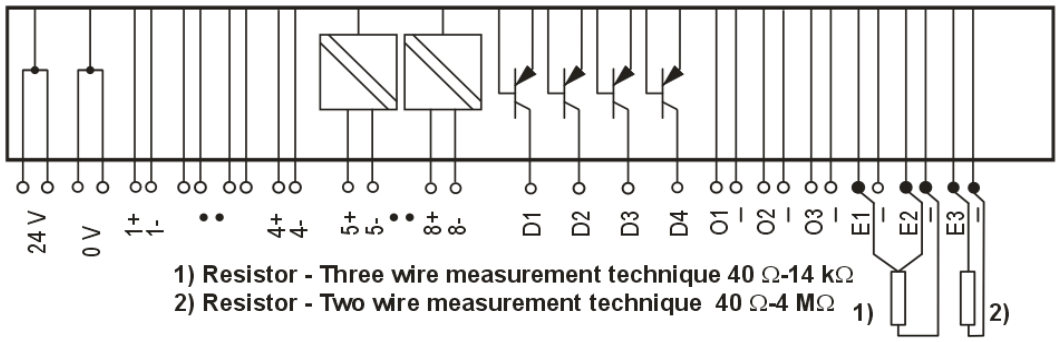


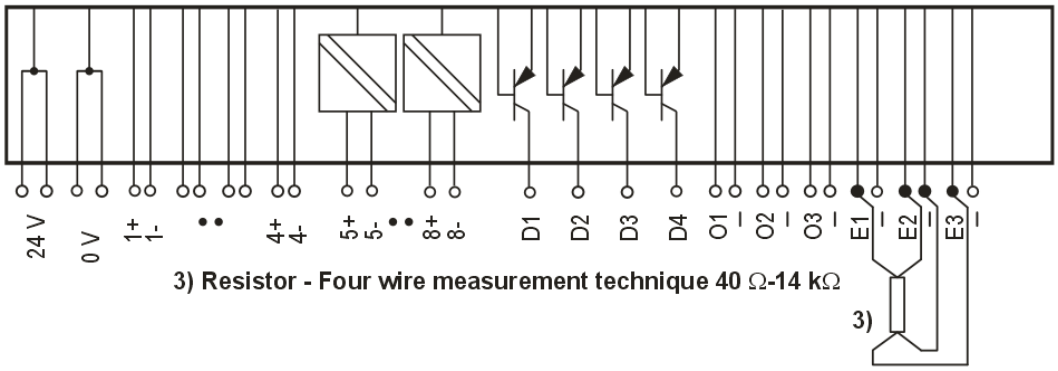
On the software side, each input can be individually configured to measure voltage, current, two-wire resistance or semiconductor temperature sensors based on the LM235.

The configuration for resistance measurements for three or four wire measurement uses several analog inputs. See chapter 10.5.3.2.

Wiring Examples:







5.4. RS485-Fieldbus-Interface

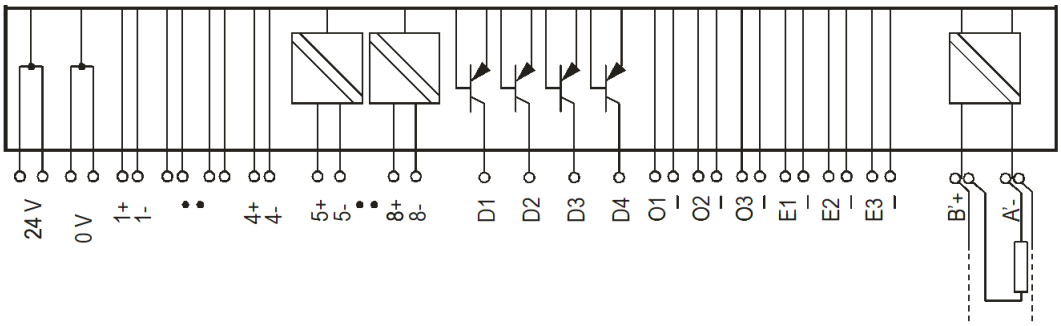
The terminals of the RS485 fieldbus interface are called B'+ and A'-.
B'+ indicates the non-inverted bus line and
A'- indicates the inverted bus line.
The interface is electrically isolated.
The interface is equipped with "failsafe bias" resistors.

Note!

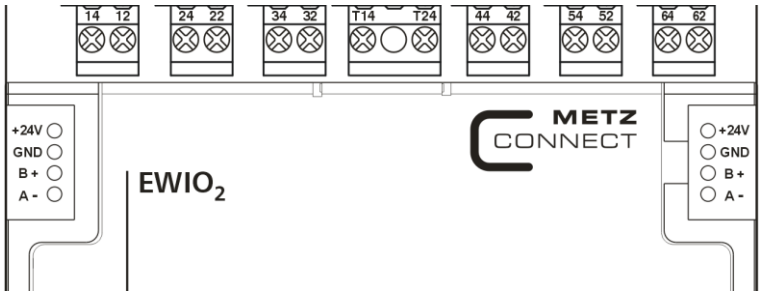
Bus cables, including shielded ones, must be laid at a sufficient distance from live cables so that the signals are not affected.

To reduce the influence of interference on the bus signals, a shielded cable with twisted pairs of wires should be used.
The bus cable must be laid in series or line topology. Star topology is not permitted.
A terminating resistor of 120 Ohm must be connected in parallel with the bus lines at each end of the cable.
Do not connect the shield of the bus line to a minus terminal of the EWIO$_2$.

Wiring examples:



5.5. Expansion bus interface



The connections of the extension bus interface are called B+ and A- and are located to the left and right of the flap.
B+ indicates the non-inverted bus line and
A- indicates the inverted bus line.
The interface is electrically isolated.
The interface is equipped with failsafe bias resistors.
A maximum of 6 expansion modules of the MR-xxx series can be connected to the EWIO$_2$ via jumper plug. The jumper plug connects supply voltage and bus to the expansion modules.
Each expansion module connected to the EWIO$_2$ must be set to an individual address in the range 1 to 6. If an address is assigned twice, the operation of the expansion modules is not guaranteed.

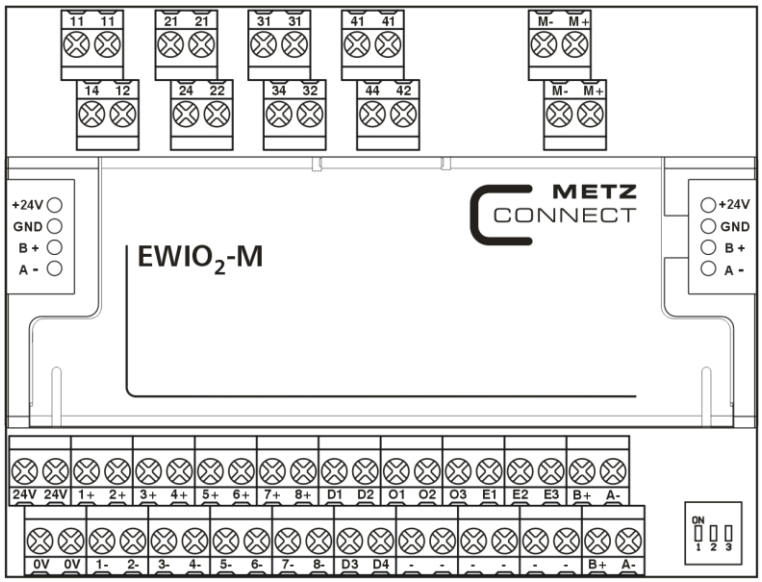
Note!

When using an NG4 power supply unit for the supply voltage, the total power requirement of the EWIO$_2$ and the expansion modules must be taken into account. If it exceeds the maximum output current of NG4, it is possible to use a second power supply unit as shown in the picture.



5.6. M-Bus interface

(Only with the data logger variants.)
The terminals of the M-Bus interface are called M+ and M- and are located at the top right.
The interface is electrically isolated.
The bus topology and the polarity of the bus lines are arbitrary.

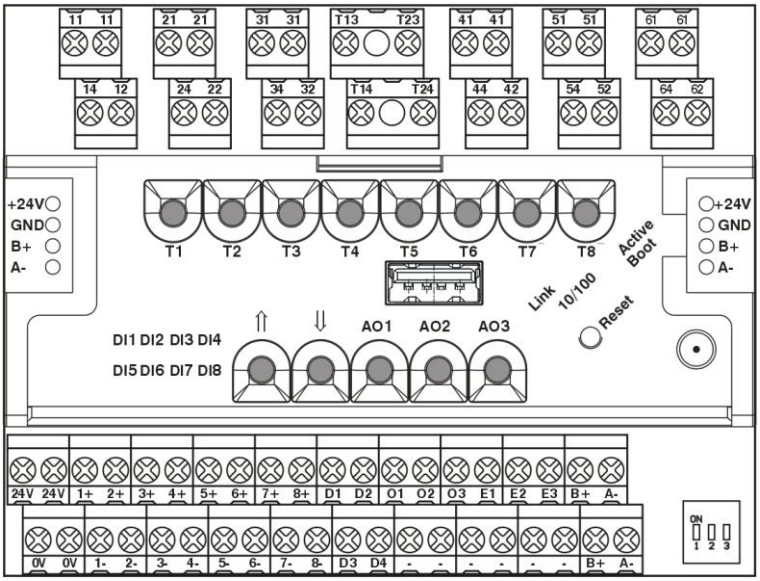


The EWIO$_2$-M supplies the M-Bus with power. The power of the integrated level converter is designed for 80 bus loads of 1.5 mA each.

5.7. USB-interface

The EWIO$_2$ has a USB-A socket. It is located under the flap.

It is used to copy or upload configuration data to or from a memory stick.



6. Display and operating elements

6.1. Manual operating

The EWIO$_2$ has manual operation of the I/O outputs.
This is done by the keys T1 to T8, which can be configured for various functions, and the keys AO1 to AO3 for manual operation of the analog outputs. These are not configurable.
When delivered (factory settings), the push-buttons are assigned to the relay and TRIAC outputs in the Web I/O variants. T1 to T3 are assigned to relays 1 to 3, T4 and T5 to TRIAC 1 and 2, and T6 to T8 to relays 4 to 6. In the data logger versions, the buttons T1 to T4 are assigned to relays 1 to 4 and the buttons T5 to T8 are assigned to digital outputs D1 to D4.

Long keystroke, greater than 1 second, switches between manual and automatic operation of the corresponding output. Manual operation is indicated by a green LED.
A short keystroke, less than 1 second, changes the state of the binary outputs.
Thereby, the analog output to be changed is selected with the keys AO1 to AO3. This is indicated by flashing of the corresponding green LED.
The keys ↑ and ↓ then change the output voltages. The longer the button is pressed here, the faster the voltages change. The blinking frequency of the green LED also changes.

7. Availability of the EWIO$_2$ via LAN

7.1. MAC address and Device-/Host name

The MAC address can be found on the nameplate located on the side of the machine.
The preset device/host name is composed of the characters "EWIO2-" and the last 3 bytes of the MAC address. For example: EWIO2-a58176
This name can be changed in the network settings on the Web page.



7.2. LAN connection

The EWIO$_2$ has DHCP enabled by default.
The default network configuration is automatically set if no active DHCP server is found.

When resetting the IP configuration to factory default, chapter 9. and 10.5.2.12.

IP-adddress: 192.168.0.111
Subnetmask: 255.255.255.0
Standard-Gateway: 192.168.0.1
DNS-Server: 192.168.0.2

This configuration can be changed in the Network Settings on the Web page.

If the PC client network is in the same IP address range, http://192.168.0.111 will take you to the EWIO$_2$ home page.
Otherwise, the route must first be entered using the PC console command:
route add 192.168.0.111 netmask 255.255.255.255 xxx.xxx.xxx.xxx (IP address of the client)

7.3. BACnet-Server

The EWIO$_2$ variants -BM have a BACnet server. The integrated digital and analogue I/Os and the I/Os of any connected expansion modules can be queried and controlled via BACnet IP. In addition, values can be read from the database via BACnet TrendLog objects.

Details can be found in the separate document "EWIO$_2$ BACnet Server PICS.pdf", available at www.metz-connect.com.

7.4. Modbus-Server

The EWIO$_2$ variants -BM have a Modbus server that uses the network protocol Modbus TCP, which is based on TCP/IP. The integrated digital and analogue I/Os and the I/Os of possibly connected expansion modules can be queried and controlled via Modbus TCP.

The Modbus server is addressed with port number 502 when a new connection is established.

Details can be found in the separate document "EWIO2 Modbus Server.pdf", available at www.metz-connect.com.

7.5. Modbus-Router

The EWIO$_2$ variants -BM have a Modbus router that uses the network protocol Modbus TCP, which is based on TCP/IP. The router contains a Modbus/RTU master for the RS485 interfaces. Several Modbus/RTU slaves can be controlled and polled by it.

The EWIO$_2$ has two RS485 interfaces. 1:

1. on the 4-pole terminals A- and B+ at the top of the unit, specially used for expansion modules. (TCP port 5021)

2. At the terminals A'- and B'+ of the wide terminal strip for general use. (TCP port 5022)

Each interface requires its own Modbus/RTU master, so the Modbus router has to run twice.

Details can be taken from the separate document "EWIO$_2$ Modbus Router.pdf", which can be found at www.metz-connect.com.

7.6. MBus-Server

The EWIO$_2$ variants -BM have an MBus server that makes the MBus accessible via TCP connections in the network. The transmission of MBus data via a TCP connection uses MBus data format directly without an additional transport protocol. The MBus server can serve multiple TCP connections at the same time. Multiple simultaneously active TCP connections are processed in a round-robin approach, with each TCP connection receiving the response data of the MBus commands it initiated.

The MBus server accepts TCP connections at port 5023 and can be activated or deactivated via the web-interface (see chapter 10.5.2.12).

The baud rate used by the MBus server for MBus transactions is configured in the web-interface as well.

7.7. OpenVPN

OpenVPN is installed and can be configured by the user by creating a configuration file in the /etc/openvpn directory of the EWIO$_2$. The OpenVPN service starts automatically during the boot process if there is a valid OpenVPN configuration in this directory.

8. Browser

The EWIO$_2$ was tested with the following browsers:

- Google Chrome Version 84.0
- Firefox Version 79.0
- Microsoft Edge Version 44.17763.831.0
- Apple Safari Version 13.6

It is recommended to use one of the browsers in a current version.
With other, especially older browsers, the functionality cannot be guaranteed.

As the page content is dynamically changed by the EWIO$_2$, they must not be kept in the browser cache.
Otherwise, updates to the web pages may not be displayed.

9. Reset to factory settings

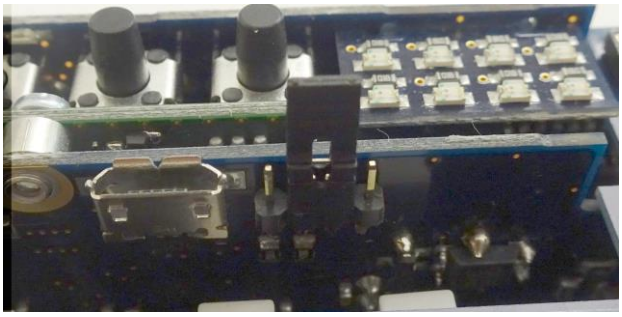
Warning of dangerous electrical voltage
Danger!



Before working on live electrical lines, the following must be observed disconnect them from the power supply. The safety measures described in chapter 1.2. to 1.4. must be observed.

Resetting the IP configuration to factory settings

1. Power off the unit or disconnect it from the power supply.
2. Remove the transparent upper part of the housing including the flap.
3. Place the jumper on the middle pins 2 and 3 of the pin strip on the electronic unit.

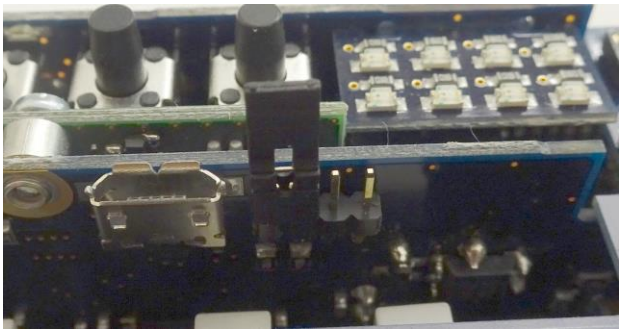


4. Power on the device, the status LED flashes slowly (at about 2 Hz).
5. Remove the jumper from the pins on the pin header and plug it back into the individual other pins. The status LED turns green.
6. Wait until the status LED turns red, then the IP configuration is reset to factory settings.
7. Remount the transparent upper part of the housing.

The IP configuration is then reset (see chapter 7.2.).

Resetting the whole unit to factory settings

1. Power off the unit or disconnect it from the power supply.
2. Remove the transparent upper part of the housing including the flap.
3. Place the jumper on pins 3 and 4 of the pin header (next tot he USB socket) on the middle electronic unit.



4. Power on the device. The status LED flashes rapidly (at approx. 4 Hz).
5. Remove the jumper from the pins on the pin header and reinsert it on the outer pin. The status LED turns green.
6. Wait until the status LED turns red. The the unit has been reset to factory settings.
7. Remount the transparent upper part of the housing.

In both cases, an accidentally initiated reset process can still be aborted if the device is switched off or disconnected from the power supply again before removing the jumper in step 4 and the jumper is only removed again afterwards (in the de-energised state). The next time the unit is switched on (without the jumper), it will start normally.

10. Web-Interface

10.1. Responsive Web design

The EWIO$_2$ websites have been developed in a responsive design. These are pages that can be adjusted to the characteristics, such as size and resolution, of the display device used, such as PC monitors, smartphones or tablet.

Hint!



The websocket technology used for the EWIO$_2$ web pages can lead to problems when using some older or faulty Windows programs that interfere with network communication (e.g. virus scanners, firewalls, proxies), where the EWIO$_2$ web page seems to hang or freeze. In many cases it helps to operate the web interface via an encrypted HTTPS connection instead of a simple HTTP connection, as this also encrypts the websocket communication and it can no longer be manipulated by other programs. To do this, write https:// in front of the IP address or the host name in the address line of your browser (HTTPS must not be deactivated for this in the security settings, see Chapter 10.5.2.6. Security). If you have uploaded a certificate signed by a valid certification authority to your EWIO$_2$ in the security settings, a security warning will be displayed during the first connection attempt via HTTPS, which must be confirmed. To suppress this security warning permanently, either upload a certificate signed by a valid certification authority to your EWIO$_2$ or import the existing certificate into your browser's trusted certificate collection.

10.2. Operation

The EWIO$_2$ web pages have the following display and control elements:



Indicates the status of the yellow LED on the device. "OFF"



Indicates the status of the yellow LED on the device. "ON"



Indicates the status of the green LED on the device. "OFF"



Indicates the status of the green LED on the device. "ON"



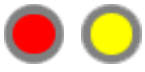
Slide switch for "OFF" function



Slide switch for "ON" function



Marking field "OFF“



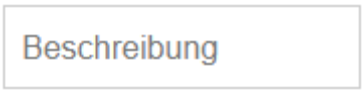
Marking field "ON“



Checkbox „ON“ – „OFF“



Radio-Button „ON“ – „OFF“



Entry field



Drop-down menu for predefined configuration parameters



Activity button



Menu button on small displays



System status „System is OK“

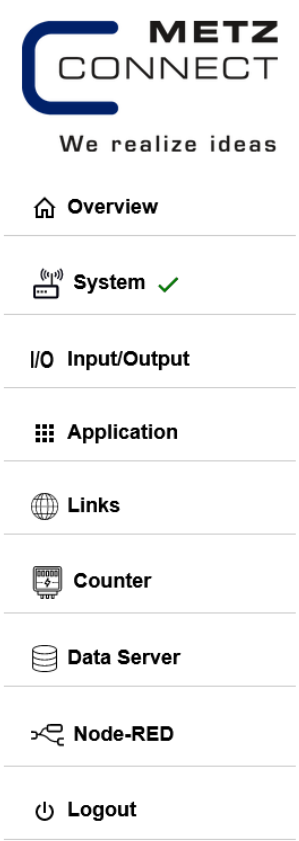
System status „Invalid system time“



System status „Error was detected“or „Alarm“



Help text appears on mouse hover



The menu bar is located on the left side of the screen. Pressing the individual menu item open the corresponding page or, if available, the sub-menus appear.

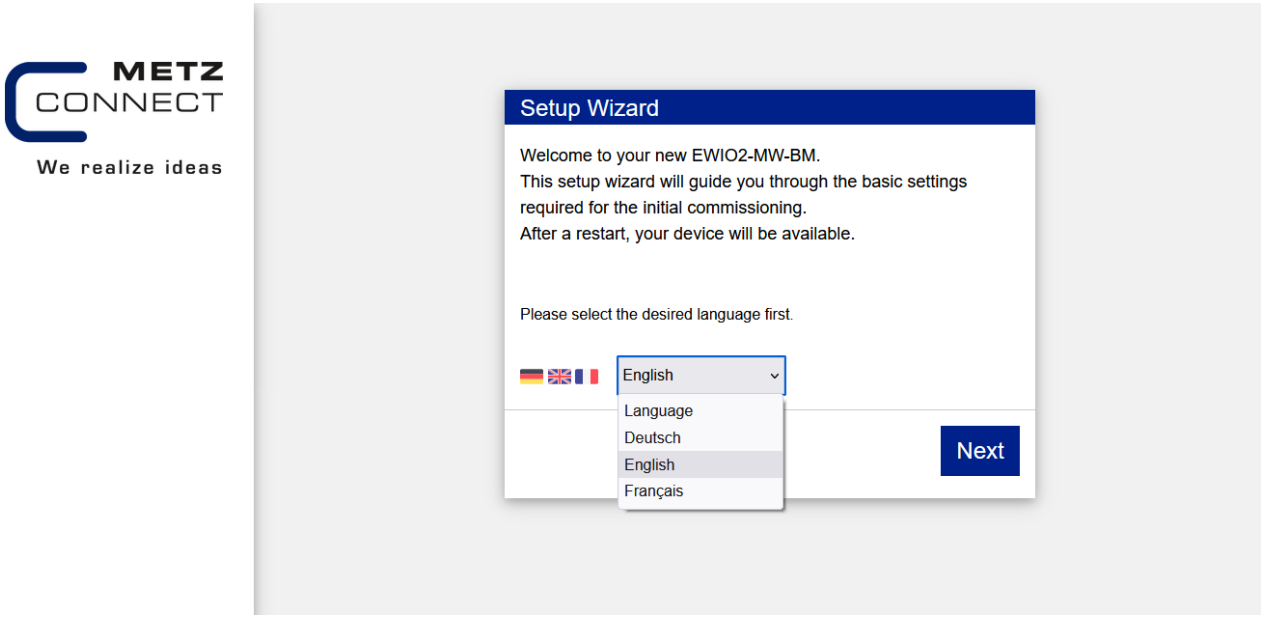
The browser arrows for page forward and page backward can be used to switch to the previous or next window if necessary.

10.3. Wizard setup

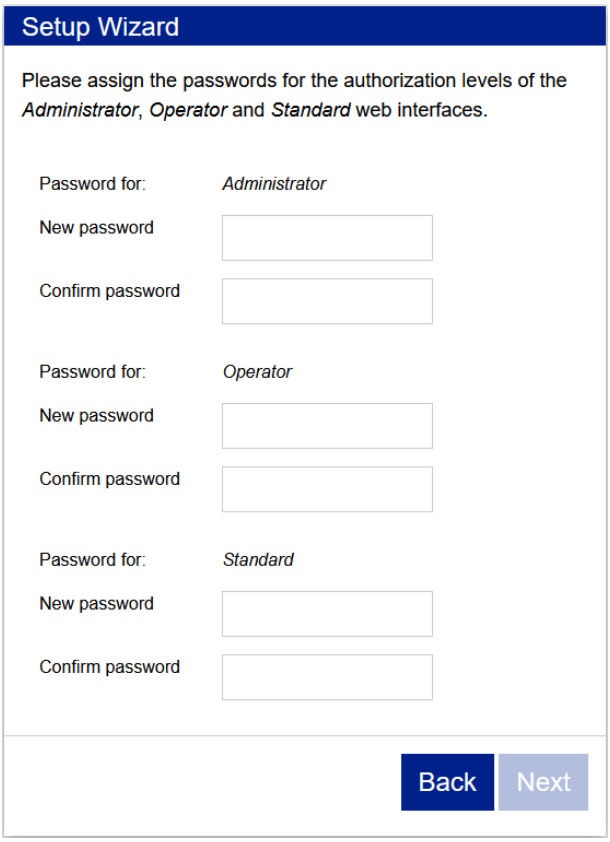
The first time the IP address or host name is called up, a setup wizard guides you through the basic settings of the EWIO$_2$.

The settings are only applied when the "Next" action field is activated.

The language can be selected in the welcome window. The default language is German.

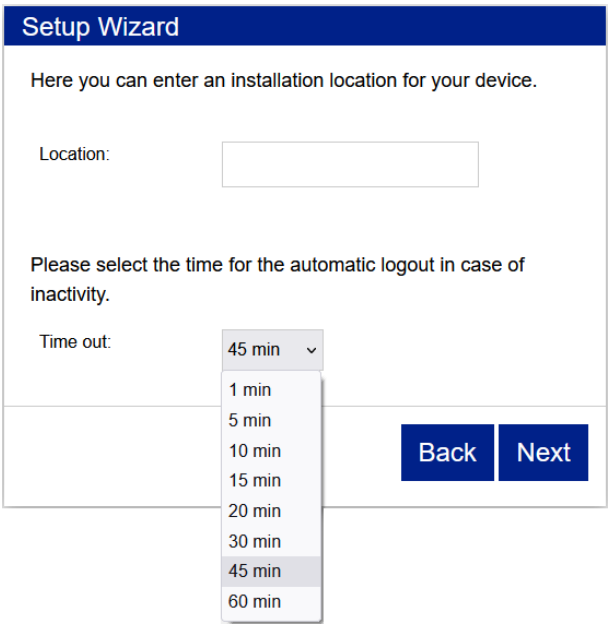


In the next window the passwords for the authorisation levels must be assigned.
See chapter 10.4. The administrator password is also the password for the root access in Linux, which can be changed separately in the menu window "Password" chapter 10.5.2.8.



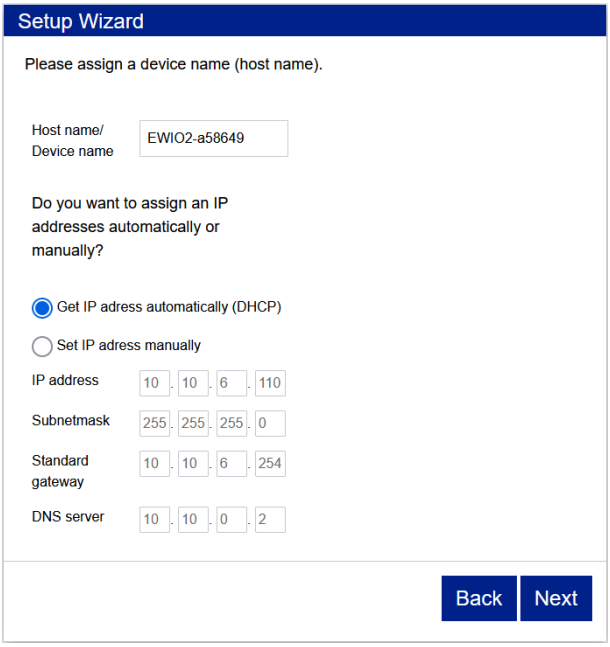
Permitted are the characters: A…Z a…z 0-9 _ . ! @ - ^ $ % / ( ) { } [ ] = ? ~ # + * | , ; :

In the next window you can enter the installation location and the time until automatic logout.
The times 1, 5, 10, 15, 20, 30, 45 and 60 minutes can be selected.
The default time is 45 minutes.

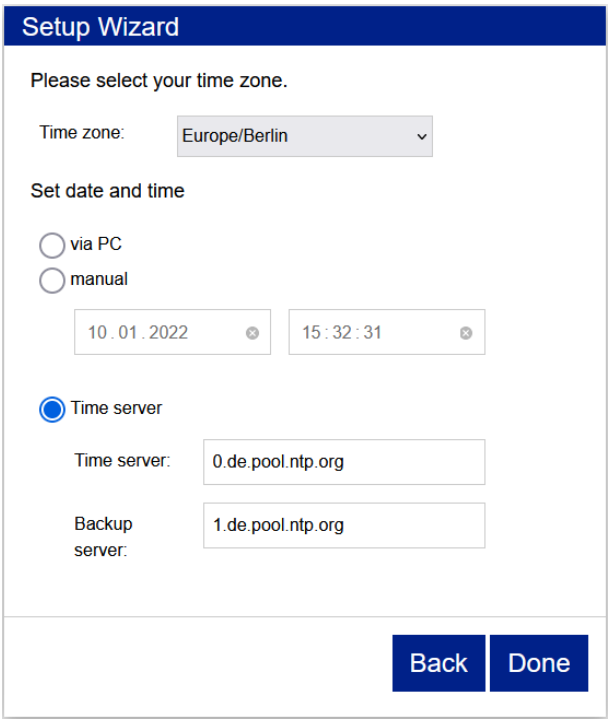


In the next window the network settings must be configured.

The device/host name is freely selectable (max. 255 characters, a-z, A-Z, 0-9, dot and hyphen). Default is the name composed of "EWIO2-" and the last 6 digits of the MAC address.
Here you can also define if the EWIO$_2$ gets an IP address from a DHCP server or by manual input.
In case of manual entry, the IP address, subnet mask, default gateway and DNS server must be specified.



In the next window the time zone, date and time must be set.
Use the pop-up menu to select the time zone via the cities specified.
The date and time can be set in three different ways:
- by taking over the PC time,
- by manual input or
- through a time server. In case the time server is not available, a second (backup) server can be entered.

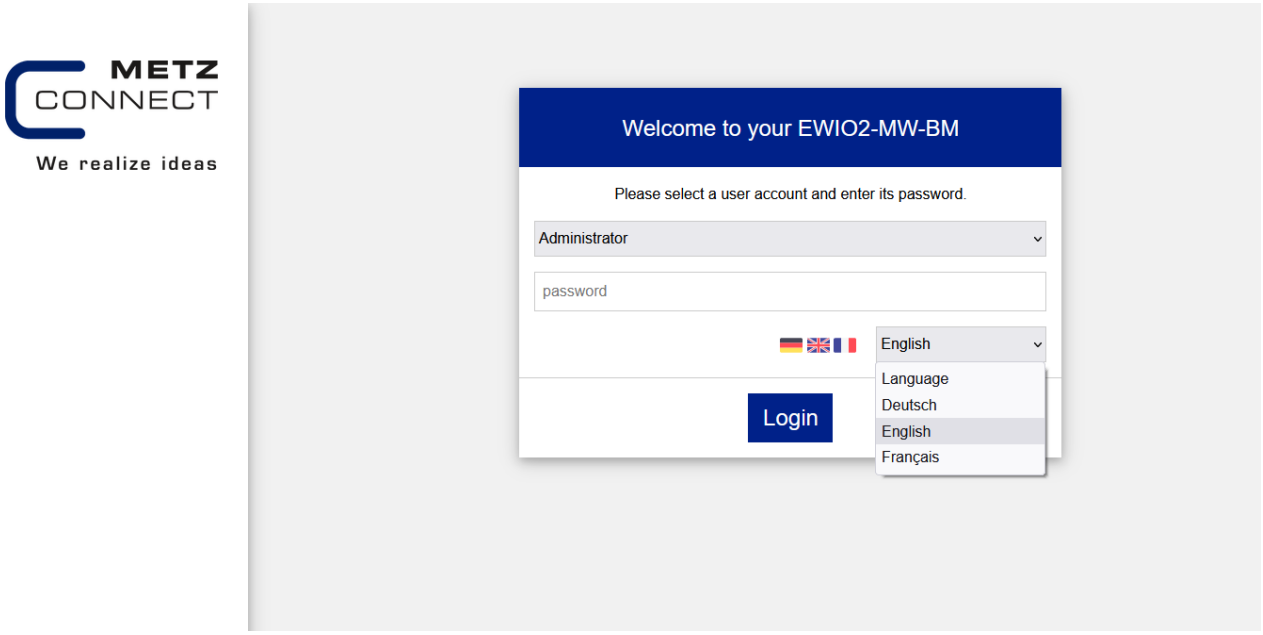


By activating the "Done" field, the settings are accepted and a device restart is performed.

Afterwards you have to log in with the new network settings.

10.4. Authorization levels and login

After entering the IP address or the device/host name in the browser, the start window of the EWIO$_2$.



In addition to the language selection, the access to the web content for the corresponding authorization level with the corresponding password is entered here.
If no password or an incorrect password is entered, access is denied.
The passwords were set in the setup wizard during initial commissioning.
Depending on the authorization level, there may be menu items that are not displayed.

EWIO$_2$ has three authorization levels for access to the device functions.

Administrator: Unrestricted reading and writing in all menus and submenus.

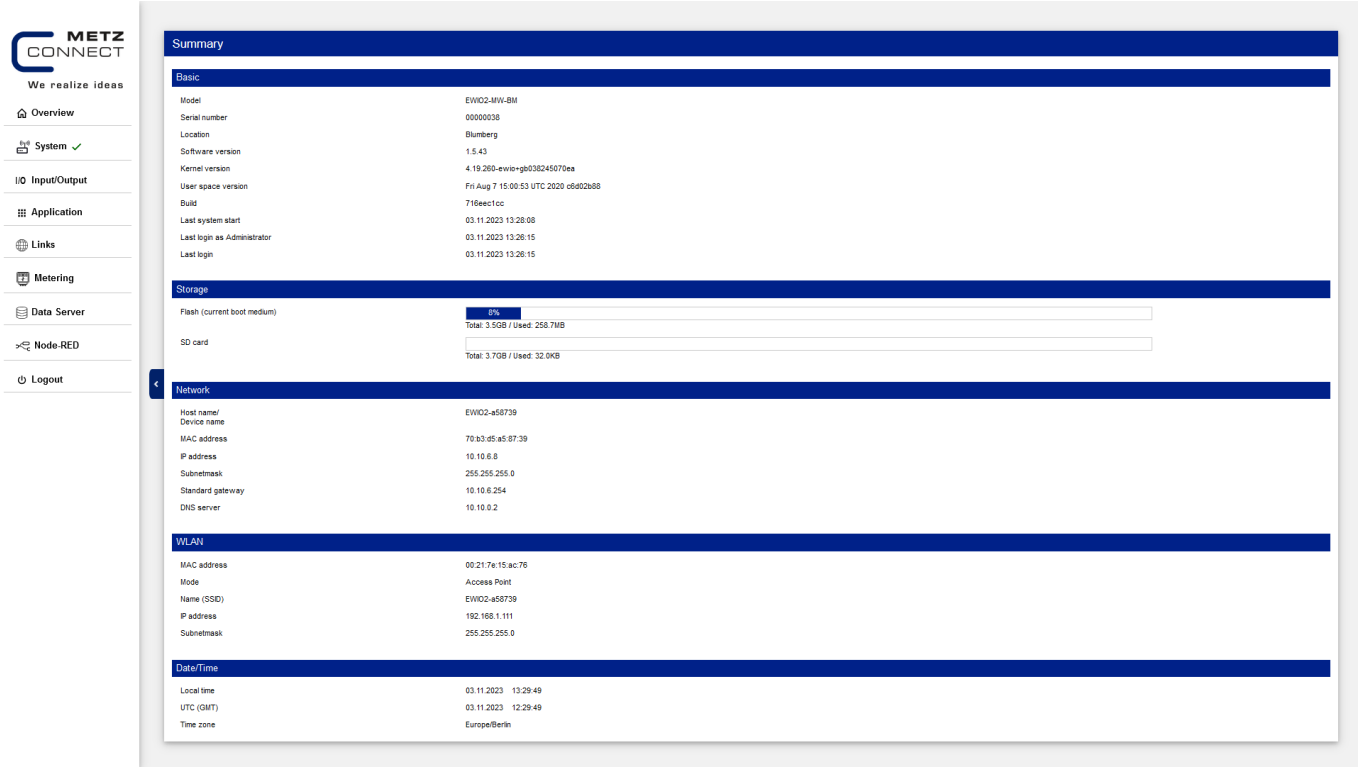
Operator: Read authorization in all menus and submenus except password.
Write in all menus and submenus except password, network and security.

Standard: Language selection and read permission in all menus and submenus except password.

10.5. Menu

10.5.1. Overview

After successfully logging in, the system overview appears with the most important current device statuses and settings in the following areas
General, Memory, Network, Date and Time.



10.5.2. System

Next to the menu item „System“


shows a green checkmark, if no error or alarm has occurred.


shows a yellow exclamation mark, if the system time is invalid.


shows a red cross if an error or alarm has occurred.

See also in the submenu item „Status“chapter 10.5.2.2.

10.5.2.1. Basic

The "Basic" menu window displays the model name, serial number and software version.

The installation location can be entered in the Location input field.

In the pop-up menu the time until automatic logoff can be selected.
The times 1, 5, 10, 15, 20, 30, 45 and 60 minutes can be selected.
The default time is 45 minutes.

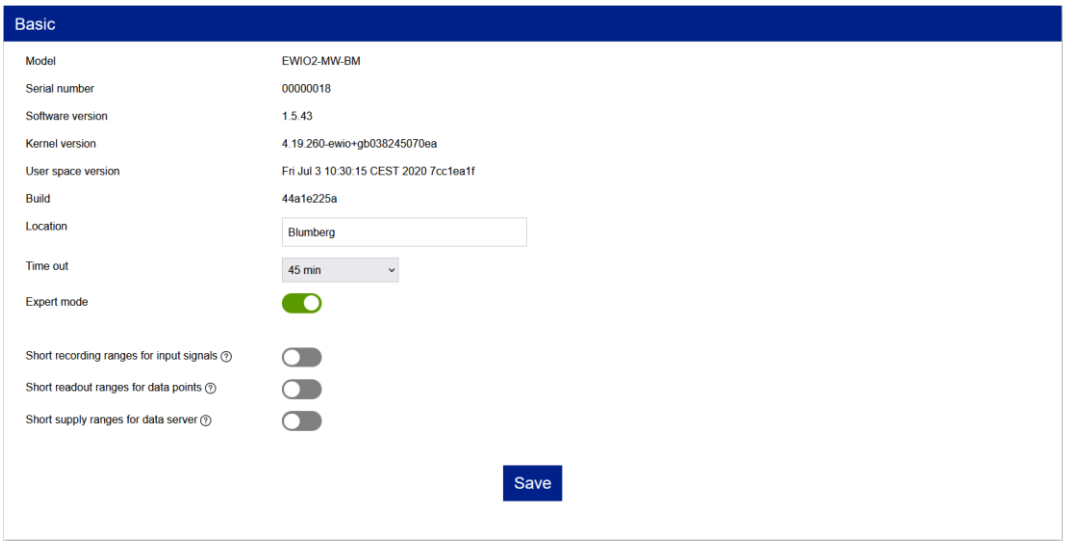
With the slide switch Expert view additional configuration parameters can be switched on in the following submenus:

- Basic: Short input signal recording, data point readout and data server supply ranges. These slide switches allow for the selection of additional input signal recording ranges (see chapter 10.5.3.2), datapoint readout intervals (see chapter 10.5.7.1) and data server supply ranges (see chapter 10.5.8.2) in their respective configurations if enabled.

- Security, Chapter 10.5.2.6.: The option "Force SSL".

- Password, chapter 10.5.2.8.: The assignment of passwords for Linux system and FTP users.

- Modbus settings, chapters 10.5.2.11, 10.5.3.5. and 10.5.7.4.: The input fields for the communication "Repeats" and "Timeout Frame".



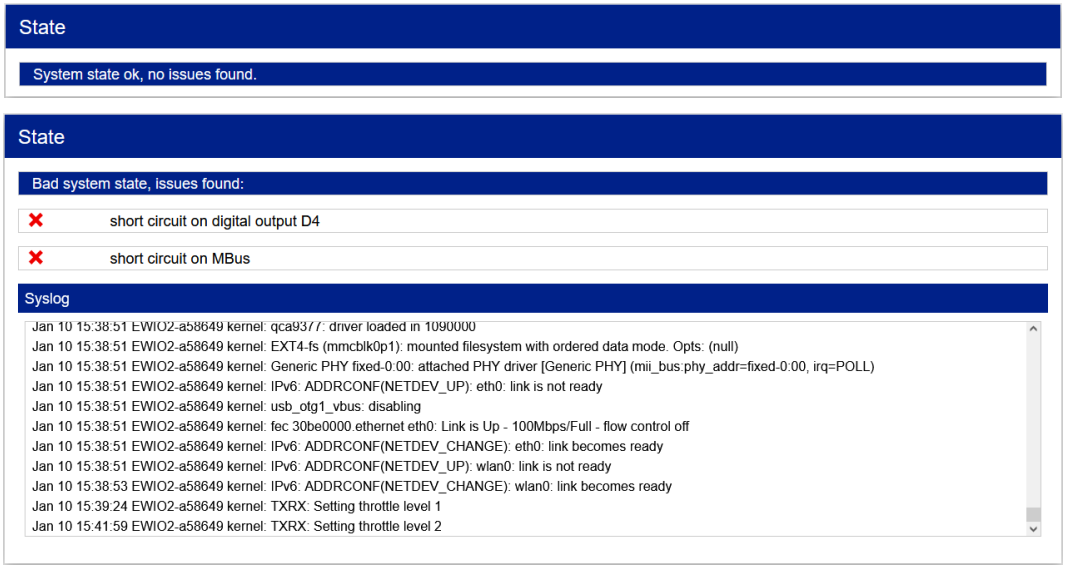
Only after activating the action field "Save" the settings are applied.

The slide switch "Short recording ranges for input signals" allows to configure additional recording ranges shorter than 1 minute for analog input signals (see chapter 10.5.3.2) if enabled.

The slide switch "Short readout ranges for data points" allows to configure additional data point readout ranges shorter than 1 minute (see chapter 10.5.7.1) if enabled.

10.5.2.2. Status

The "Status" menu window displays the system status.
If there are several errors or alarms, they are listed one below the other.



The logged system messages are displayed below. These messages can contribute to error detection in case of service.

10.5.2.3. Sessions

The menu window "Sessions" displays the permission level, IP address and period of inactivity of the participants who are currently logged in on the device.

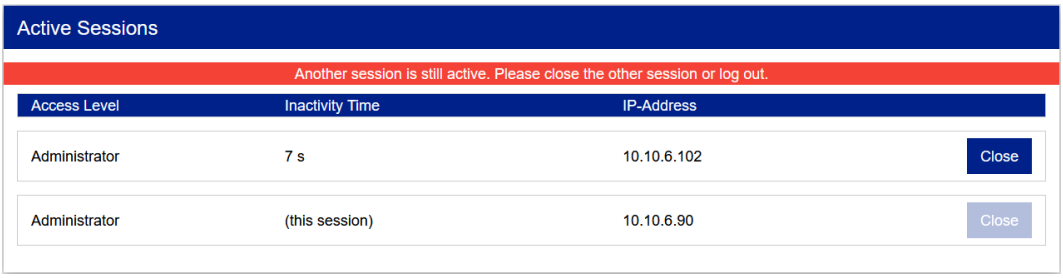
Here it is also possible to close the sessions of participants with lower authorization level.



Attention!



Only one administrator and one operator may be active at the same time. A second login will prompt you to close one of the sessions again.
Setting up a new meter can only be done by one user (administrator and operator cannot be active at the same time).



10.5.2.4. Network

In the menu window "Network" the network configurations are set.

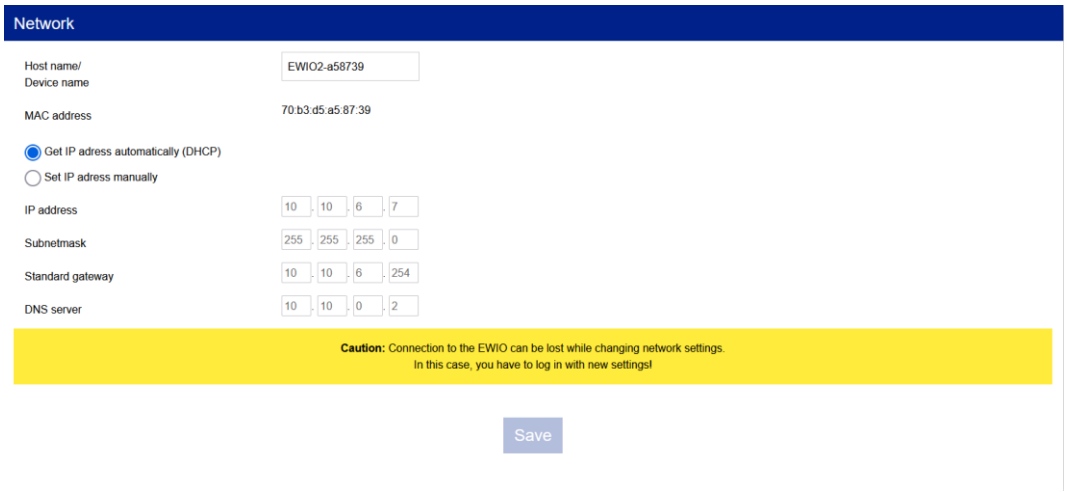
In the input field Device name/Host name the mounting location can be changed.
It is freely selectable (max. 255 characters, a-z, A-Z, 0-9, dot and hyphen).
Default is the name composed of "EWIO2-" and the last 6 digits of the MAC address displayed below.

The respective radio button is used to select if the EWIO$_2$ gets an IP address from a DHCP server or by manual input.
If manual input is used, the IP address, the subnet mask, the default gateway and if necessary the DNS server must be entered.

Attention!



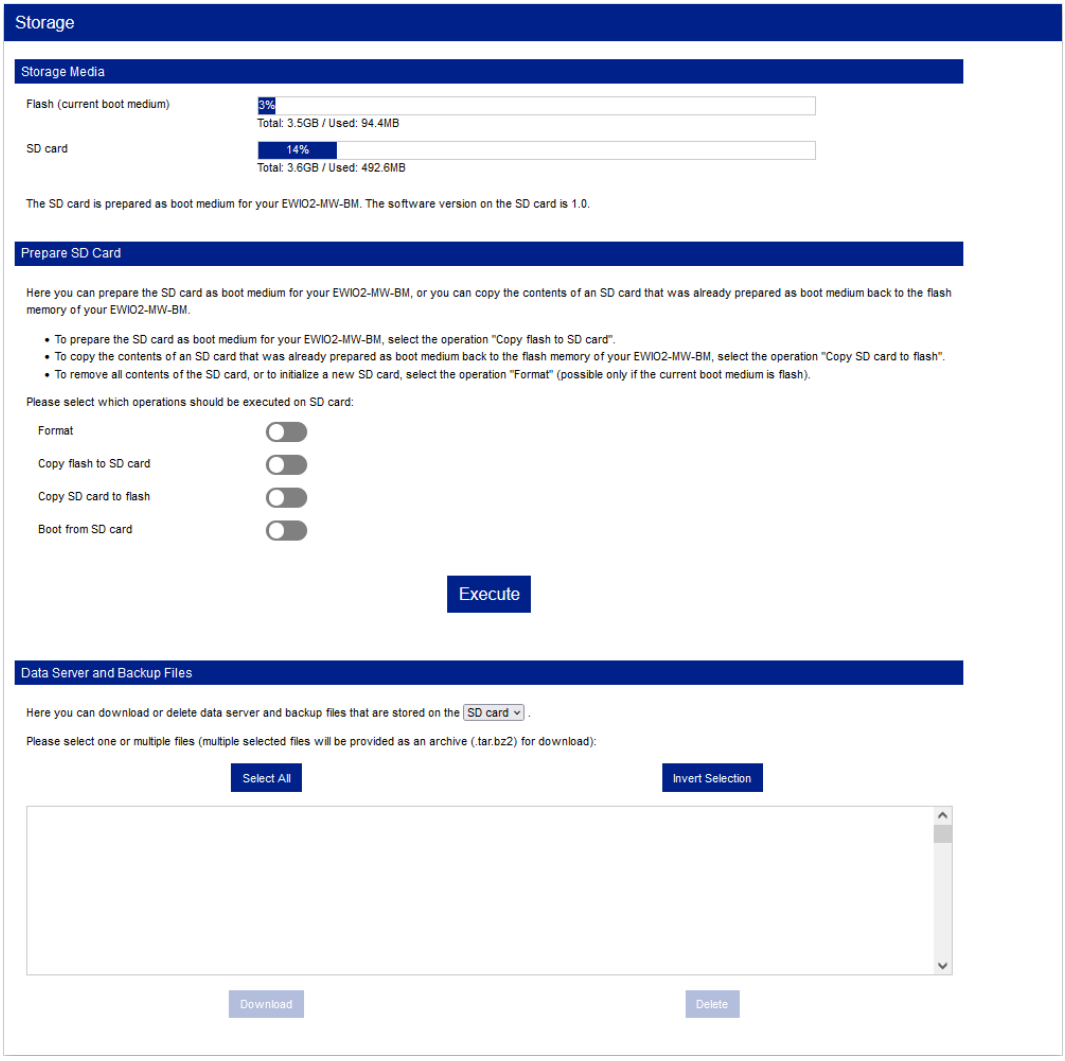
If the network settings are changed, the connection to the EWIO$_2$ may be lost. In this case you must log in again with the new settings!



Only after activating the action field "Save" the settings are applied.

10.5.2.5. Storage

In the menu window "Storage" the storage media are displayed, the use of the SD card and the storage of data server and backup files may be defined.



The upper area shows the available storage media, how much storage space is used and from which medium you are booting.
The additional information about the SD card shows whether it is set up as a boot medium and which software version is on it.
In the area "Prepare SD card" the following actions can be selected by slide switch and executed by pressing the action button.

- Format: Is used to delete the contents of the SD card or to initialize a new one. This is only possible when booting from flash memory.
- Copy Flash to SD card: Used to set up the SD card as a boot medium.
- Copy SD card to flash memory: Used to copy the contents of a setted up SD card as boot media to flash memory.

- Boot from SD card: Is used to boot from this media in the future.
When using the SD card as the boot medium, the actions offered affect the entire storage medium. When copying from Flash to SD card and vice versa, from SD card to Flash, the device software, all device settings, stored measured values and I/O events and, if available, also the user data are copied. The original content of the target memory is lost. Only the files stored in the /data directory on the SD card are retained when copying from Flash to SD card and are not copied when copying from SD card to Flash. Files in this directory are created by the CSV data server in the operating mode "Save to SD card" and when saving to SD card, see Chapter 10.5.2.12.

If an SD card is available, it is always available for applications and other use under /media/sd-card. This is independent of whether the system was booted from SD card or flash memory. Other mount points where the SD card may also be available depend on the boot medium and should not be used for user applications.

The files can be downloaded or deleted in the "Data Server and Backup Files" area. Here one or more files can be selected, whereby several files are packed into an archive (.tar.bz2). This is done by clicking on the files or the action fields "Select all" and "Invert selection".
When using the SD card as a staging method for the CSV data server, the selected data is stored in the /data directory of the SD card at the selected staging interval. Unlike the other deployment types, saving to the SD card does not delete the data from the previous deployment. The data provided on the SD card accumulates over time and can be evaluated in its entirety.

Note!

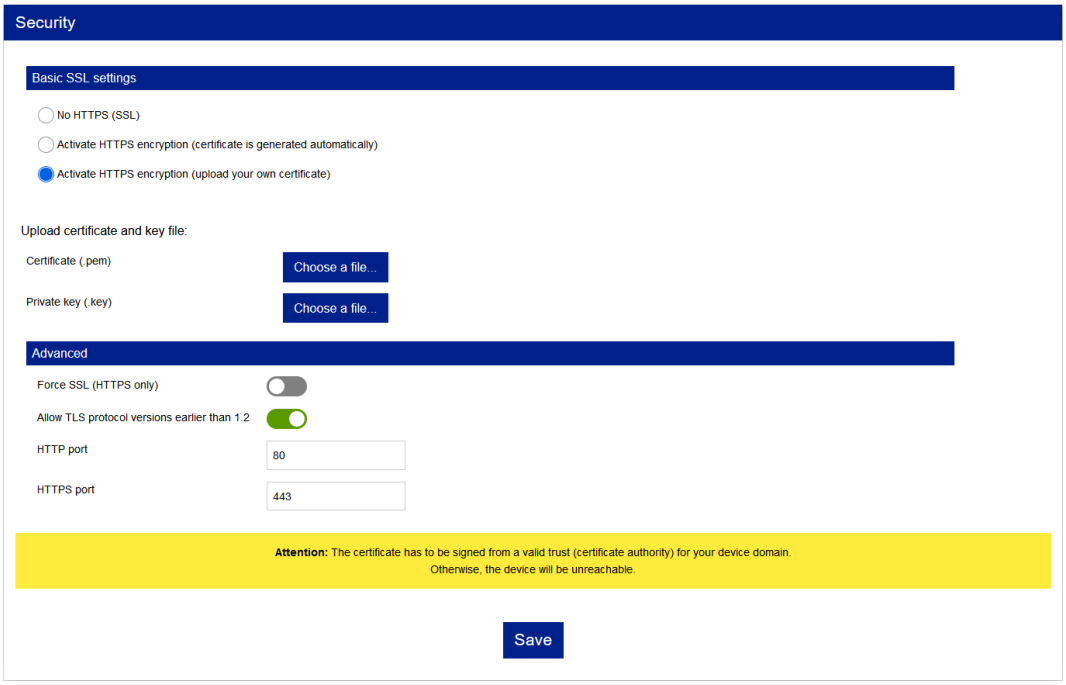


USB storage devices can also be used as backup or data server media. Here the same basic conditions apply as for the SD card. All files are stored in the /data directory on the USB memory.
If a USB memory is available, it is always available under /media/usb for applications and other use. Other mount points, where the USB memory may also be available, should not be used for user applications.

Using the USB memory as a boot medium is not possible for safety reasons.

10.5.2.6. Security

In the menu window "Security" the communication encryption is defined.



If "No HTTPS (SSL)" is selected, the communication is carried out without encryption.

If you select "Enable (certificate is generated automatically)", the communication is encrypted.

With the selection "Activate HTTPS (Upload own certificate)" the menu window is extended by the possibility to upload an own certificate file and a private key.

If the expert mode is activated, see chapter 10.5.2.1, the menu window is extended by the configuration parameters "Force SSL" and "Allow TLS protocol versions earlier than 1.2", as well as HTTP and HTTPS ports. If "Allow TLS protocol versions earlier than 1.2" is disabled, HTTPS security is improved but older clients may not be able to connect using HTTPS. This functionality is only available if "HTTPS" is activated.

Attention!

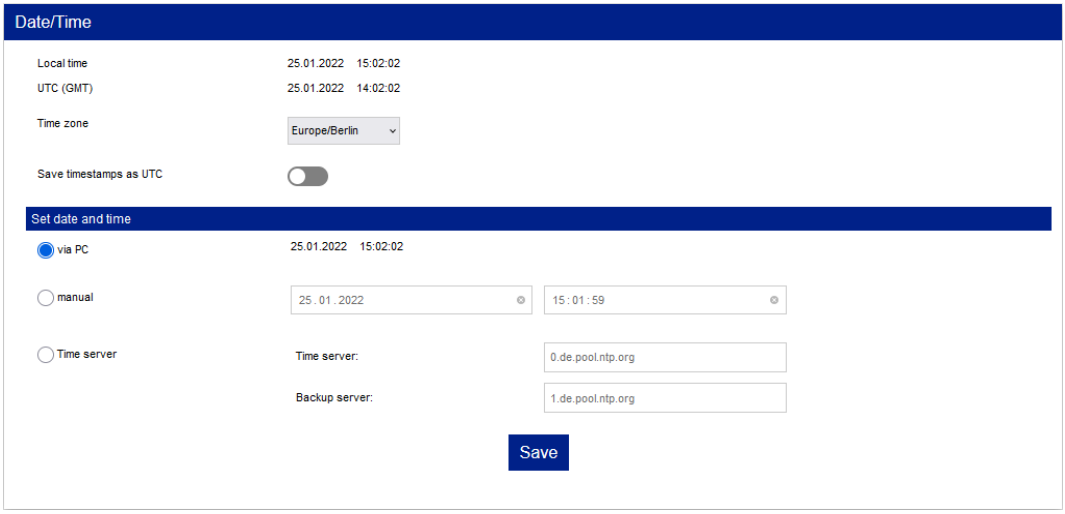


The certificate must be signed by a valid certification authority and be issued to the domain of the device.
Otherwise, the device may not be accessible.

Only after activating the action field "Save" the settings are applied.

10.5.2.7. Date/Time

In the menu window "Date/Time" the time zone, date and time are set.



The time zone is selected via the drop-down menu using the specified cities.
Saving the time stamp in UTC can be activated globally via a slide switch.
The time stamp processing then changes as follows:

- All timestamps are no longer saved as local time, but as UTC time (for measured values and I/O events).
- The first measured value flag is set to "T" to indicate that the timestamp contains a UTC time.
- If an application is involved in the readout process, it also receives the time stamp as UTC time and the time stamp return value of the application is interpreted as UTC time.

Hint!



It should be noted that information on time restrictions in the web interface, e.g. "Measured data from... to..." in the measured value display, always refer to the saved time stamps. This means that time stamps stored in local time refer to local time and time stamps stored in UTC refer to UTC time.

The time zone set on the date/time configuration page is used to convert between local and UTC time. Summer and winter time are automatically taken into account based on the rules for the summer/winter time changeover stored in the system.

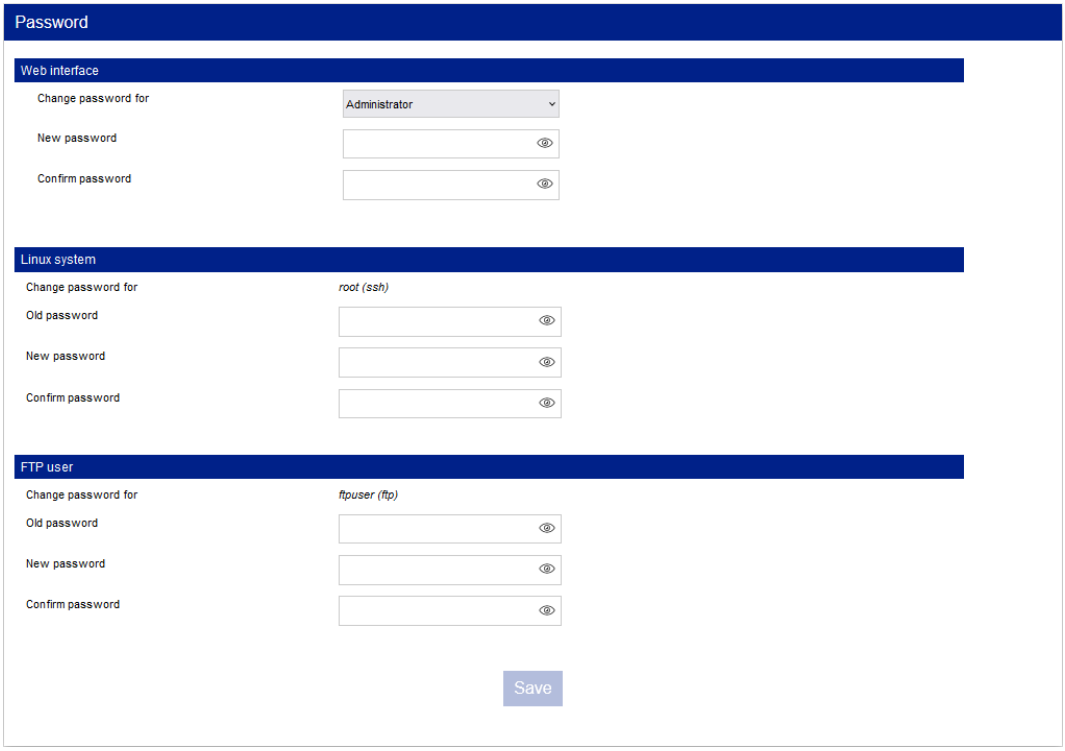
The date and time can be set in three different ways:

- by adopting the PC time,
- by manual input or
- by a time server. In case the time server is not available, a second (backup) server can be entered.

The settings are not applied until the action field "Save" is activated.

10.5.2.8. Password

In the menu window "Password" the passwords of the authorization levels, see chapter 10.4. The level is selected in the pop-up menu.



The "Password" menu window is only visible for the "Administrator" authorization level.

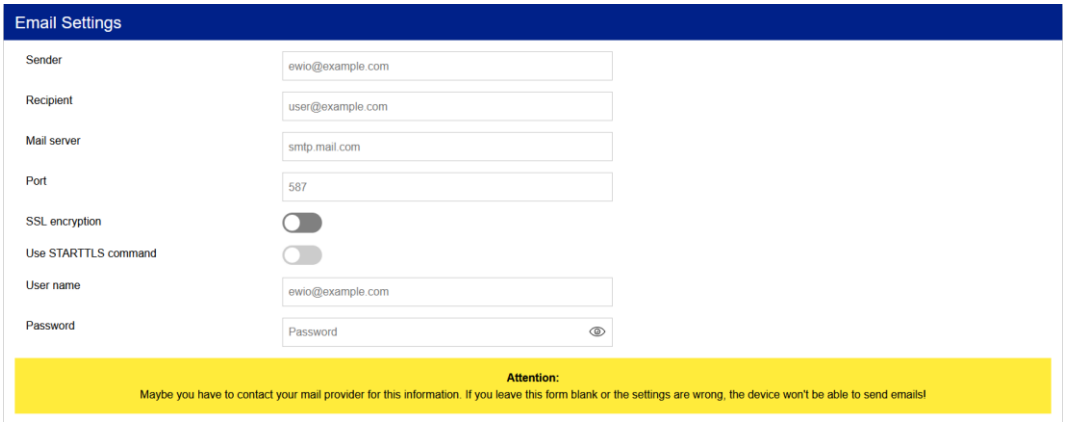
When the expert mode is switched on, see Chapter 10.5.2.1. General, the menu window is extended by the password changes for accessing the Linux system on the developer console and the FTP user for data transfer, Chapter 0.

Permitted are the characters: A…Z a…z 0-9 _ . ! @ - ^ $ % / ( ) { } [ ] = ? ~ # + * | , ; : &

Only with the activation of the action field "Save" the settings are taken over.

10.5.2.9. E-Mail

In the menu window "E-Mail" the necessary information for sending messages is entered.



The sender, the recipient address, the URL of the desired mail server and its communication port are entered here. The slide switch “SSL encryption” allows you to select whether the messages are encrypted by SSL.

If the sliding switch “SSL encryption” is enabled, the sliding switch “Use STARTTLS command” selects whether to use a STARTTLS command to the mail server to enable SSL encryption (if sliding switch is enabled), or SSL encryption is already active at connection establishment (if sliding switch is disabled). This is a mail server property. If SSL encryption does not work with disabled “Use STARTTLS command” sliding switch, please try again with the sliding switch enabled.

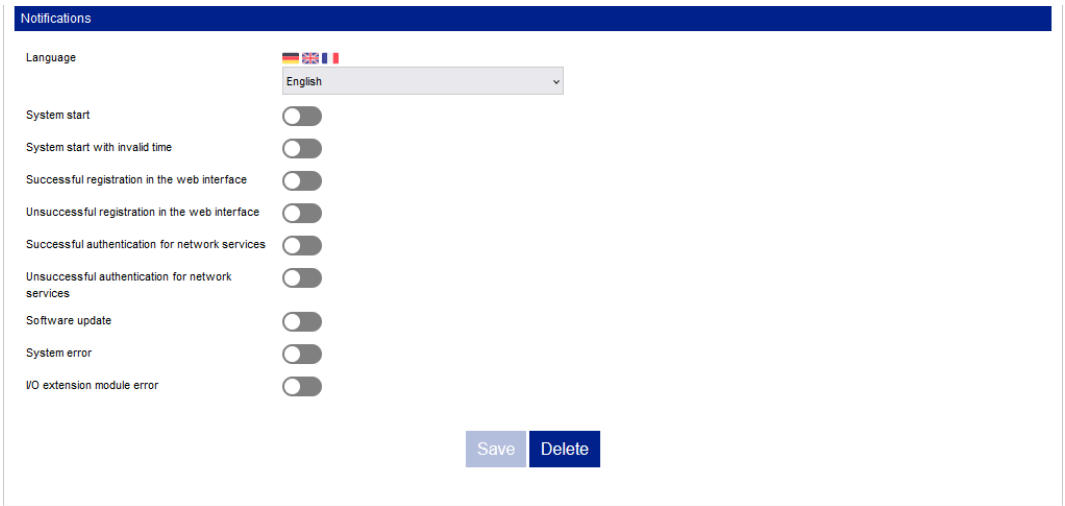
Use the input fields “User name” and “Password” to specify user name and password to be used for authentication with the mail server.

Attention!



The specific data may have to be requested from your e-mail provider. If these settings are not set or are incorrect, no E-Mail dispatch possible!

Additional email notifications can be created in the lower part of the window.



These can be sent in different languages to the email address set above. This can be selected in the pop-up menu.

The additional notifications
- System start
- Successful and unsuccessful registration in the web interface
- Successful and unsuccessful authentication for network services
- Software update and
- System error

Can be selected by slide switch.

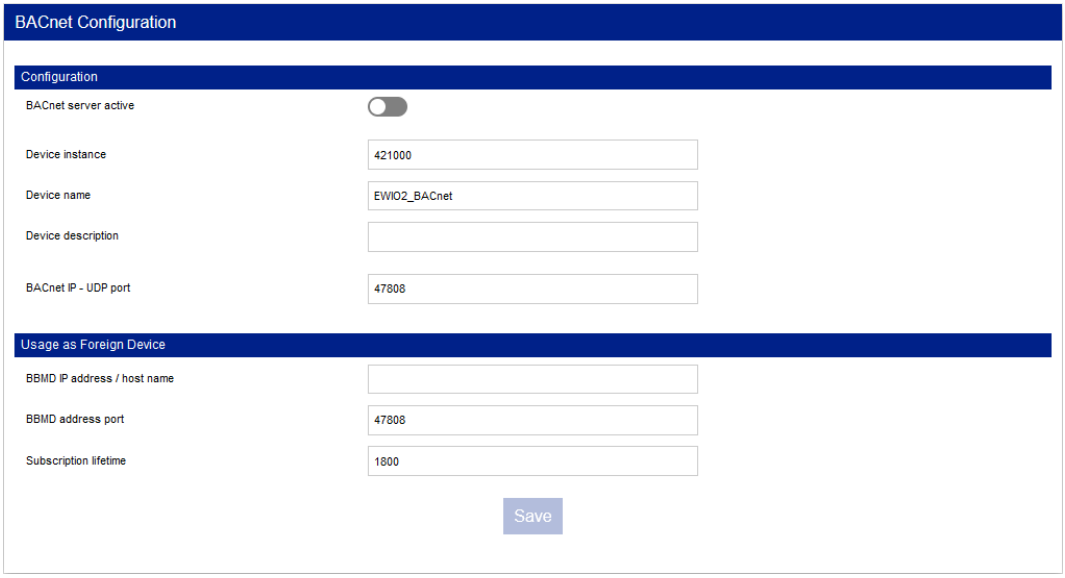
Only after activating the action field "Save" the settings are applied. All email settings can be reset with the "Delete" action field.

10.5.2.10. BACnet

In the menu window "BACnet" the required information about the BACnet server is entered. With the slide switch the BACnet server is activated.
The configuration parameters can be changed in the input fields Device Instance, Device Name, Device Description and the UDP Port for BACnet IP.

Factory settings are:

For the devices instance : 421000
For the device name : EWIO2_BACnet.
BACnet IP - UDP Port : 47808 (BAC0hex)



For the BACnet Broadcast Management the necessary input fields are
BBMD IP address / host name, BBMD address port and the subscription period.

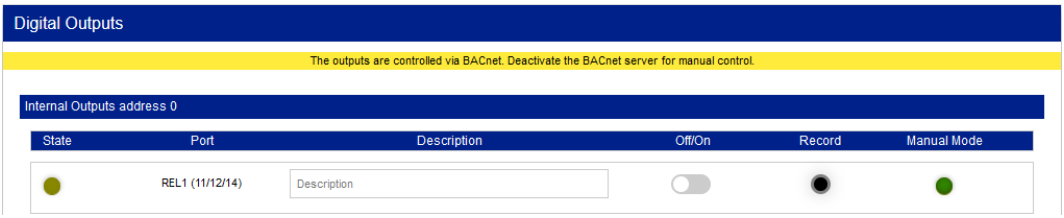
Factory settings are:

For the BBMD address port : 47808
For the subscription runtime : 1800 s

Attention!



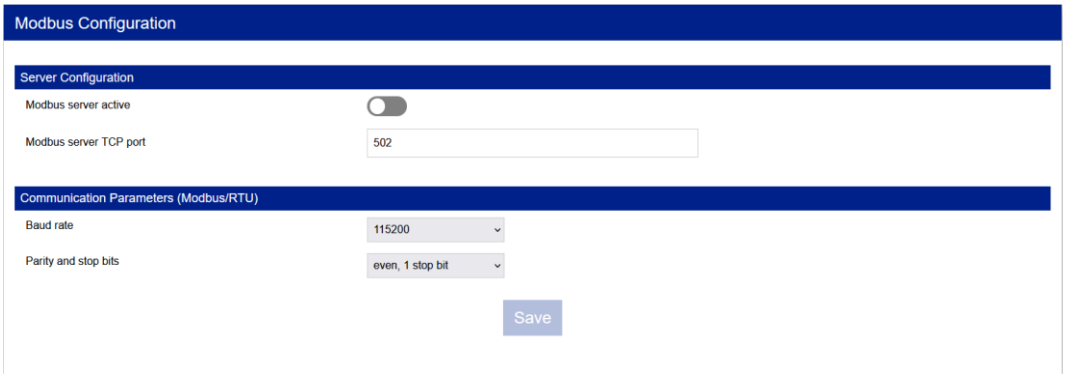
If the BACnet server is activated, manual control of the analog and digital outputs via the menu windows "Digital Outputs" and "Analog Outputs" is disabled. A note is displayed in the corresponding windows.



Only after activating the action field "Save" the settings are applied.

10.5.2.11. Modbus

In the menu window "Modbus" the required information about the Modbus server is entered and the communication parameters baud rate and parity for the fieldbus interface are set (this is the same setting as in chapter 10.5.7.4, which is only available in data logger device variants).
With the slide switch the Modbus server is activated.

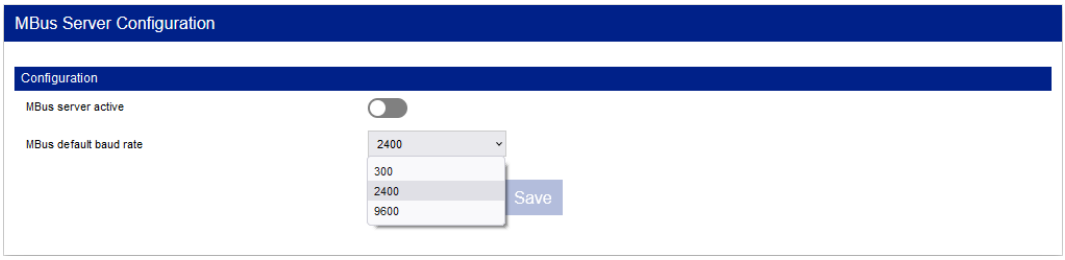


The parameter can be changed in the Modbus Server TCP Port input field.

Factory setting for the TCP port is: 502

10.5.2.12. MBus

In the menu window "MBus" the required information about the MBus server is entered.
With the slide switch the MBus server is activated.

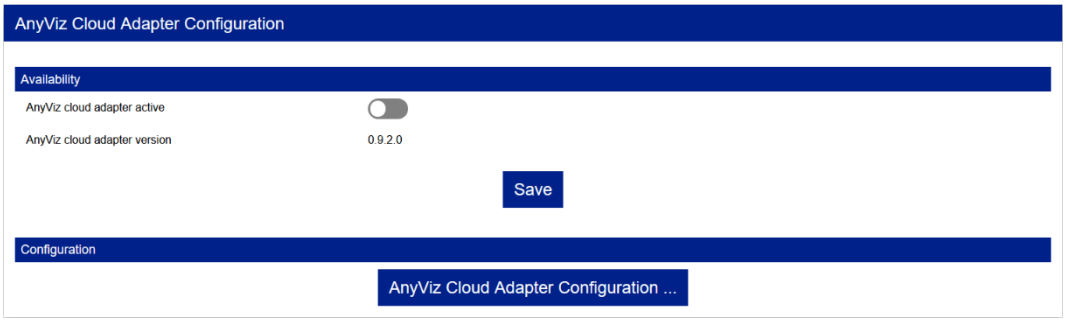


The MBus server transparently forwards data between the MBus and a TCP connection. The default baud rate to be used for MBus operations by the MBus server can be changed in the MBus default baud rate drop-down menu.

If enabled, the MBus server listens at TCP port 5023 (this port cannot be changed). MBus telegrams are expected on such a TCP connection, which are forwarded to the MBus with the set baud rate. The response telegrams are returned to the respective TCP connection.

10.5.2.13. AnyViz

In the menu window "AnyViz" the AnyViz cloud adapter can be enabled or disabled with the slide switch. The installed version of the cloud adapter component is displayed below. A change of the enable state is activated only after the action field "Save" was activated.



The AnyViz cloud adapter enables the connection of an EWIO$_2$ to the AnyViz cloud. The action field "AnyViz Cloud Adapter Configuration" opens the configuration interface of the AnyViz cloud adapter, which can be used to configure the connection to the AnyViz cloud.

10.5.2.14. Node-RED

In the menu window “Node-RED” the Node-RED server, which is running on EWIO$_2$, can be configured.

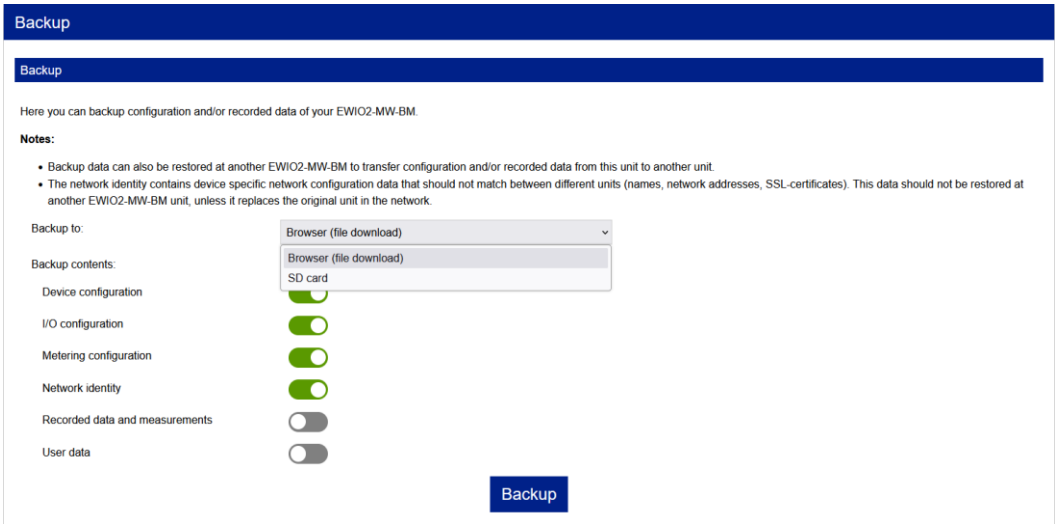


As default value, Node-RED server is disabled. It can be enabled with the switch “Node-RED server active”.

Normally user authentication is necessary to access Node-RED editor and dashboard. With enabling switch “Allow access to dashboard without user authentication” it is possible to access Node-RED dashboard at address “<IP-address or hostname>/nodered/dashboard/” without user authentication.

10.5.2.15. Backup

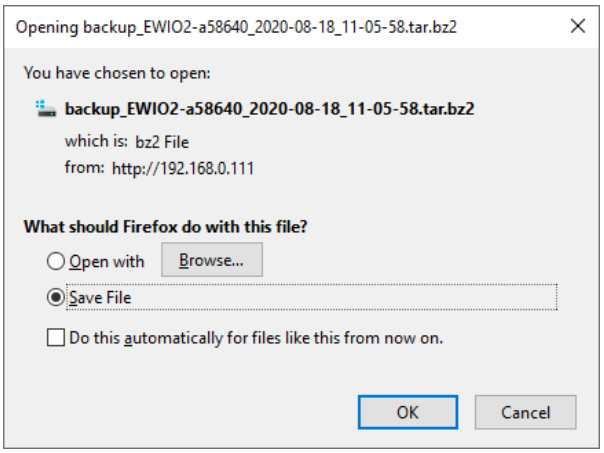
The menu window "Backup" offers the functions Backup Data, Restore Data, Device Restart, Device Reset to Factory Settings and Firmware Update.

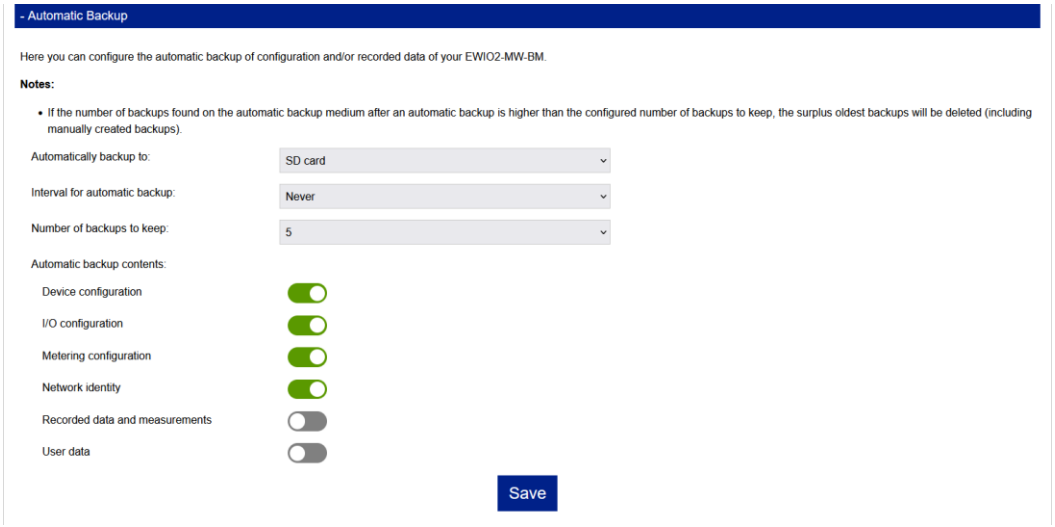


With the "Save" function using the slide switch, you can select which data or configurations are to be saved in the browser or on the SD card. These can also be used to transfer configurations from one EWIO$_2$ to another.

- General device configurations, security settings, time source, password
- I/O configurations, their recording intervals and those of the expansion modules
- Metering configurations, their data point selection and their recording intervals
- Network configurations
- Recorded data and measured values from databases
- User data: Installation location, Time-Out, Email

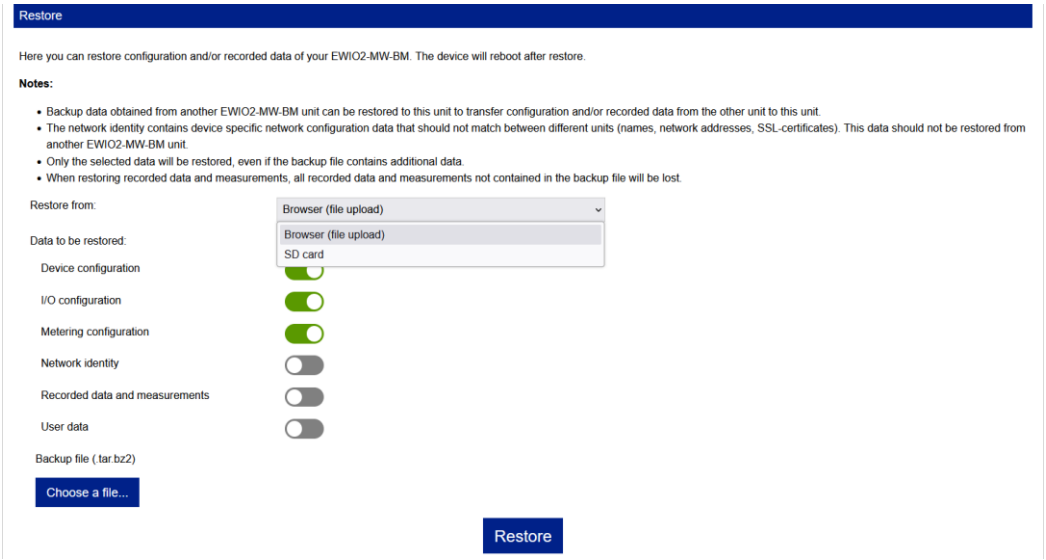
Clicking the "Save" action field opens a browser-dependent window that shows how to proceed with the backup file.



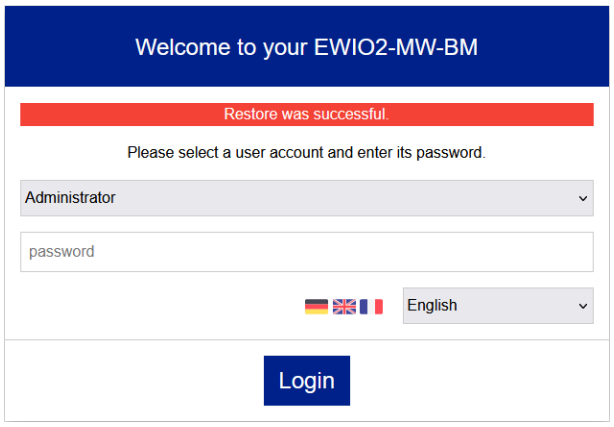


Press the blue bar to open and close the parameters for the "Automatic Backup". In the pop-up menus, you can specify where, at what interval and how many backups are to be stored and how many are to be kept. If the interval is set to "Never", no automatic backup is performed.

With the "Restore" function, you can select which data or configurations are to be uploaded to the device via the browser or from the SD card.

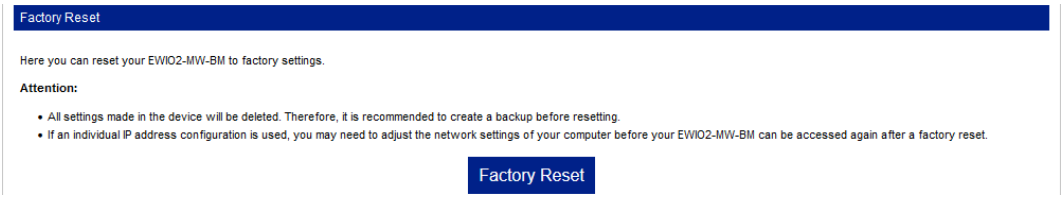


Clicking the action field "Choose a file" opens an explorer window to select the desired tar.bz2 file. Only then the action field "Restore" can be activated. Here only the data can be restored that were saved before under the function "Save".
Afterwards the device is restarted with the new settings. The hardware is not reset.
In the login window it is indicated that a recovery of the data and configurations was the cause of the restart.

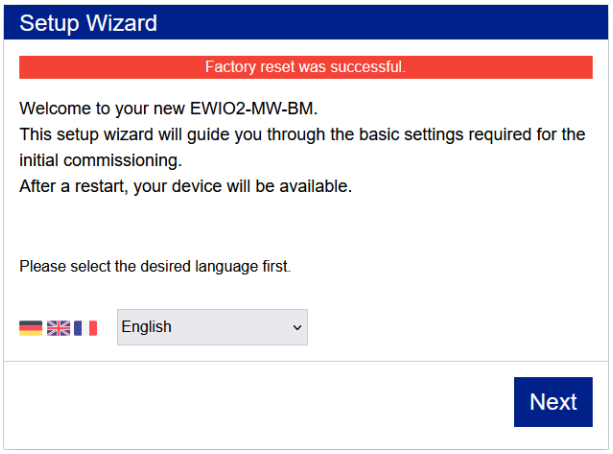




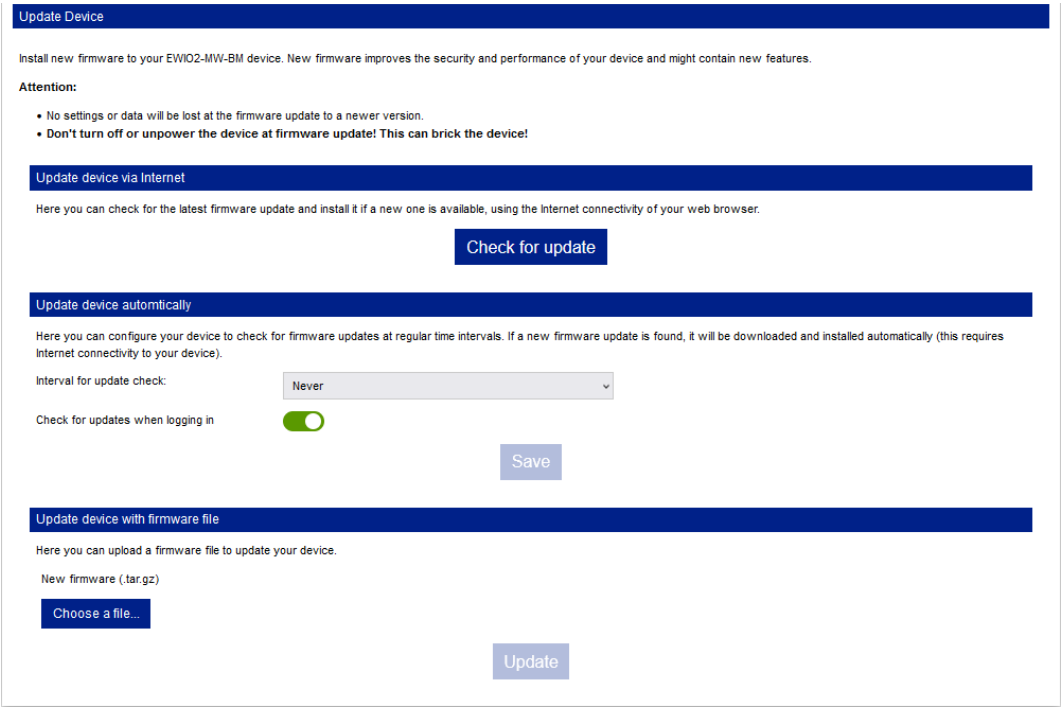
With the function "Reboot" the device is restarted.



With the "Factory settings" function, the device is reset to its delivery status by activating the "Load factory settings" action field. All settings and configurations will be lost.



Afterwards the device is restarted with the new settings. The hardware is not reset. The setup wizard, chapter 10.3. is executed. After a new restart the login window is displayed again.



The firmware of the device can be updated with the "Update Device" function. This can be done either by the device itself checking the Internet for a firmware update, or by the user uploading a firmware file.

An Internet connection is required for the device to check for a firmware update itself. This can be done either via the network connection of the device or via the network connection of the user's web browser.

Clicking the "Check for update" action field in the "Update device via the Internet" section searches for a firmware update once using the user's web browser's Internet connection. The result of this search is displayed in the "Update device via Internet" section and if there is a firmware update, the device can then be updated.

In the "Update device automatically" section, the device can be configured to automatically check for firmware updates on the Internet via its own network connection at specific intervals that can be set in the "Interval for update check" drop-down menu. If a firmware update is found, it will be installed automatically and then the device will restart with the updated firmware (during an ongoing update process, the status LED flashes red and green alternatingly). This feature can keep the device always up to date with the latest firmware even without user interaction.

If the slide switch "Check for updates when logging in" is activated, the device also searches for a firmware update each time the user logs into the web-interface. The Internet connection of the user's web browser is used for this. If a new firmware update is found, the user is informed of this by a notice in the system overview.



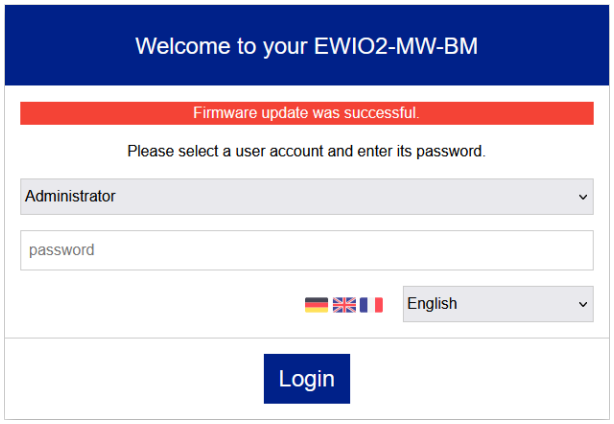
To update the firmware by uploading a firmware file, the action field "Choose a file" in the section "Update device with firmware file" can be used. Clicking the action field opens an Explorer window to select the desired tar.gz file. Then the "Start update" action field be activated to initiate the update process.

Attention!



Don't turn off or unpower the device at firmware update! This can brick the device!

Afterwards the device is restarted with the new firmware. The hardware will not be reset. The login window show a note that a firmware update was the cause of the restart. This note is also shown after an automatic firmware update.



Attention!



Updating to an older firmware is possible only in combination with a reset of the configuration to factory settings, which means that all of your own data and settings saved in the device are lost.

On the attempt to update the device to an older firmware by uploading a firmware file, a warning is displayed. If this is confirmed, the update to the older firmware is carried out in combination with a reset of the configuration to factory settings and the device is then restarted.

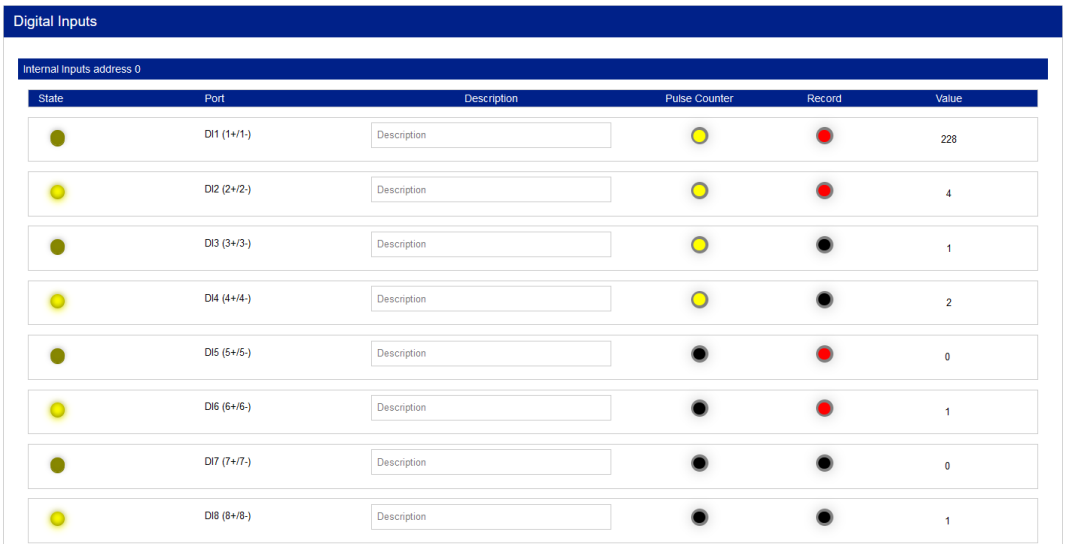
10.5.2.16. Info

The menu window “Info” shows information about the used software components and their licenses.

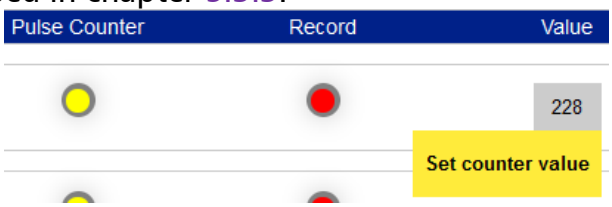
10.5.3. Inputs/outputs

Under the menu item "Inputs/Outputs", configurations and states of the internal I/Os and those of the external expansion modules are displayed and changed.

10.5.3.1. Digital inputs

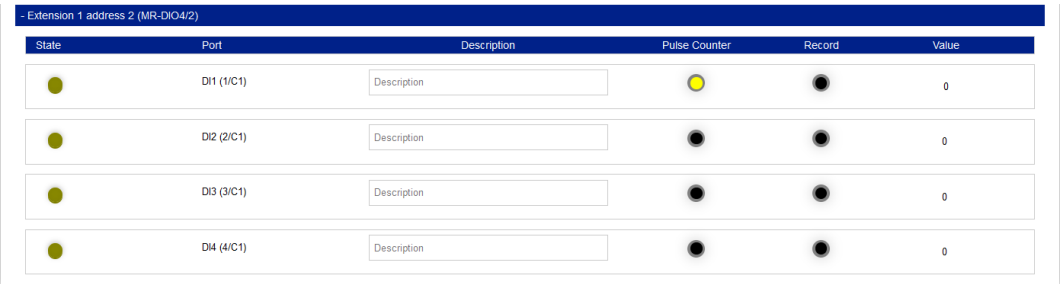


The menu window "Digital Inputs" lists the available digital inputs.
The status display on the left corresponds to the LED on the EWIO$_2$.
The port name displayed indicates the input channel. The designation in brackets corresponds to the terminals on the EWIO$_2$.
The text field is intended for a user-defined description of the signal connected to the input.
If the "Pulse counter" checkbox is black, the value corresponds to the binary state of the input.
If the "Pulse counter" checkbox is yellow, the value is incremented on the rising edge at the input. Additionally, the counter value can be changed by clicking on it. The timing limits of pulse counting are described in chapter 5.3.3.



If the "Recording" checkbox is red, the input states are written to the database under event control with a time stamp and can be viewed in the "Recording" menu window Chapter 10.5.3.7. can be selected and displayed.

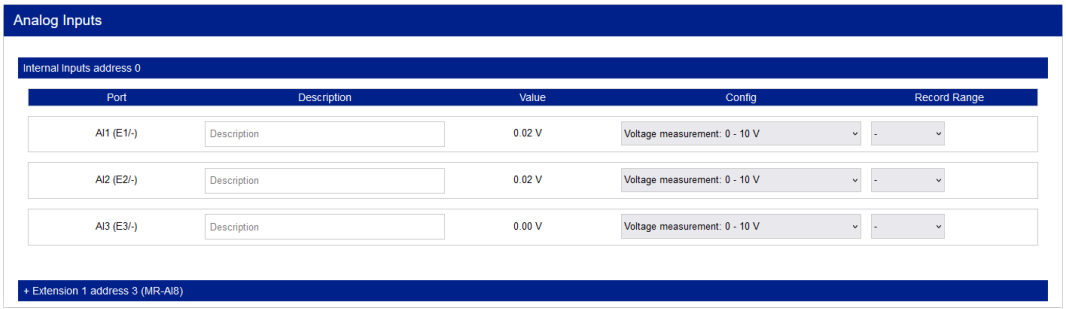
If the search for expansion modules as described in chapter 10.5.3.5. was performed, they are listed below.



By pressing the blue bar with the name and the set address of the expansion module, the display can be opened and closed with the other IOs.

The digital inputs of extension modules can also be used as pulse counters and as system meter data points. The pulse counters of extension modules can also be accessed via the Modbus server, see chapter 7.4.

10.5.3.2. Analog Inputs



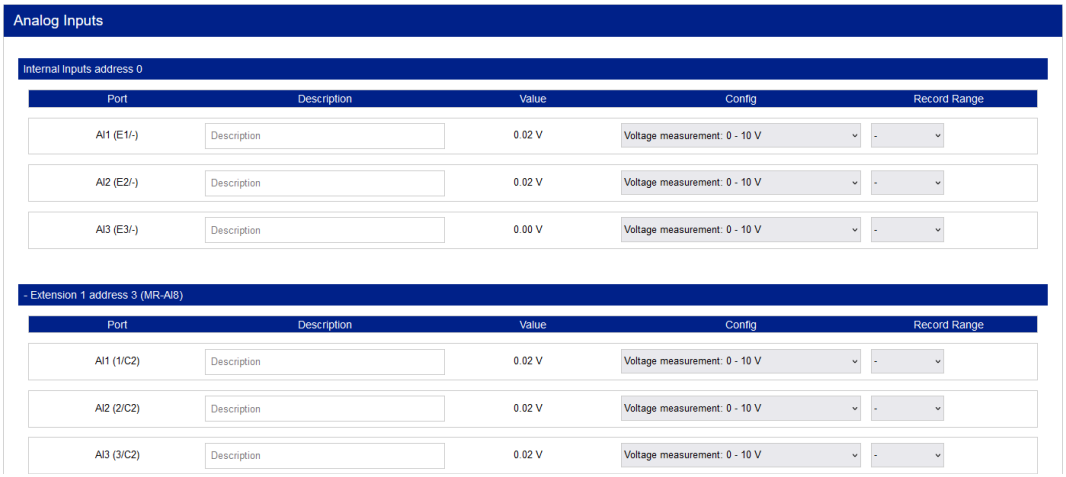
The menu window "Analog inputs" lists the available analog inputs.
The port name shown indicates the input channel. The designation in brackets corresponds to the terminals on the EWIO$_2$.
The text field is intended for a user-defined description of the signal connected to the input.
The configuration-dependent process value at the input is displayed live.
The input configuration can be changed in the pop-up menu.

Configurations are available for
- Voltage measurement for 0 - 10 Volt with unit Volt or percent
- Voltage measurement for 0 - 5 Volt and switched on PullUp resistor for Semiconductor sensor with unit Volt or percent
- Resistance measurement in the range 40 Ohm to 4 MegaOhm with unit Ohm.
- Current measurement for 0 or 4 - 20 mA with unit milliAmpere or percent
- 18 different temperature probes with unit °C
- Measurement with three- or four-wire sensor in the range 0 - 14 kOhm with unit Ohm.

In the pop-up menu, you can select the recording interval with which the measured values are written to the database with a time stamp. These can be selected and displayed in the menu window "Record", Chapter 10.5.3.7.

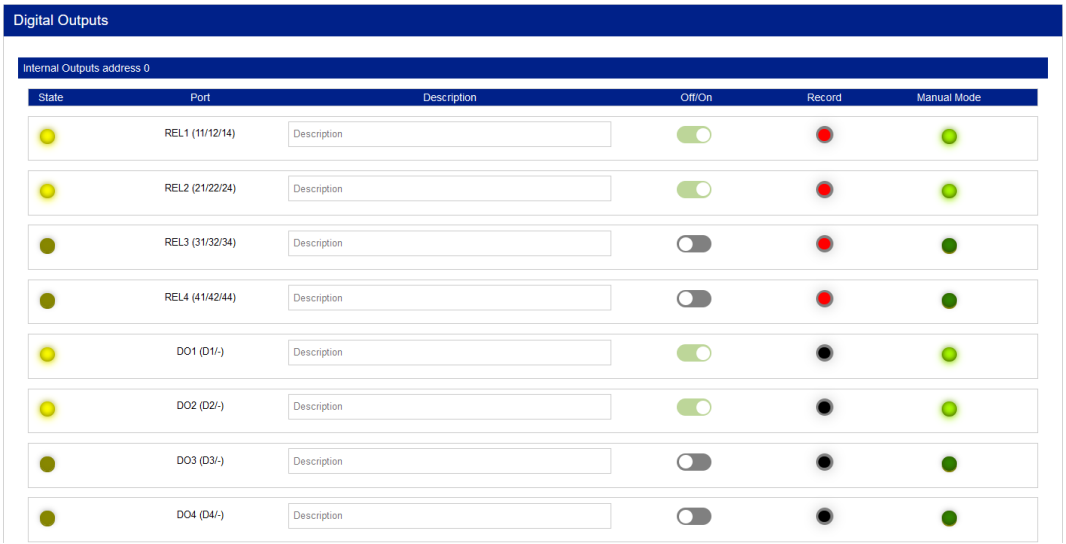
Intervals of 1, 5, 10, 15 and 30 minutes, 1, 2, 4, 6 and 12 hours, daily, weekly and monthly are available.

If the search for extension modules described in chapter 10.5.3.5. was carried out, they are listed below.



By pressing the blue bar with the name and the set address of the expansion module, the display can be opened and closed with the other IOs.

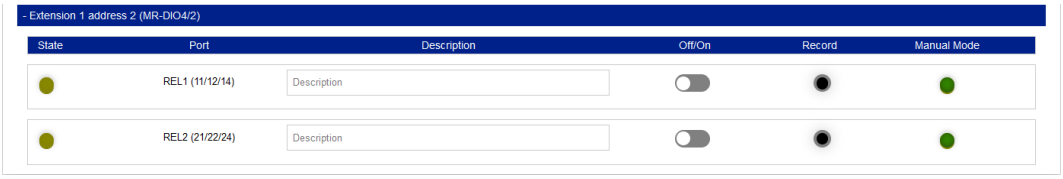
10.5.3.3. Digital outputs



The menu window "Digital Outputs" lists the available digital outputs.
The status display on the left corresponds to the LED on the EWIO$_2$.
The port name displayed indicates the output channel. The designation in brackets corresponds to the terminals on the EWIO$_2$.
The text field is intended for a user-defined description of the actuator connected to the output.
With the slide switch the output can be switched manually. It is locked when the BACnet

server is activated.
If the checkbox is red, the output states Event controlled are written with timestamp to the database and can be displayed under the menu window "Recording". Chapter 10.5.3.7. can be selected and displayed.

If the search for expansion modules as described in chapter 10.5.3.5. was performed, they are listed below.



By pressing the blue bar with the name and the set address of the expansion module, the display can be opened and closed with the other IOs.

10.5.3.4. Analog outputs



The menu window "Analog Outputs" lists the available analog outputs.
The displayed connection name refers to the output channel. The designation in brackets corresponds to the terminals on the EWIO$_2$.
The text field is intended for a user-defined description of the actuator connected to the output.
The configuration dependent actual value at the input is displayed live.
The setpoint input field is for setting a voltage at the output.
In the pop-up menu the recording interval can be selected, with which the actual values are written to the database with time stamp. These can be selected and displayed in the menu window "Record", Chapter 10.5.3.7.
Intervals of 1, 5, 10, 15 and 30 minutes, 1, 2, 4, 6 and 12 hours, daily, weekly and monthly are available.

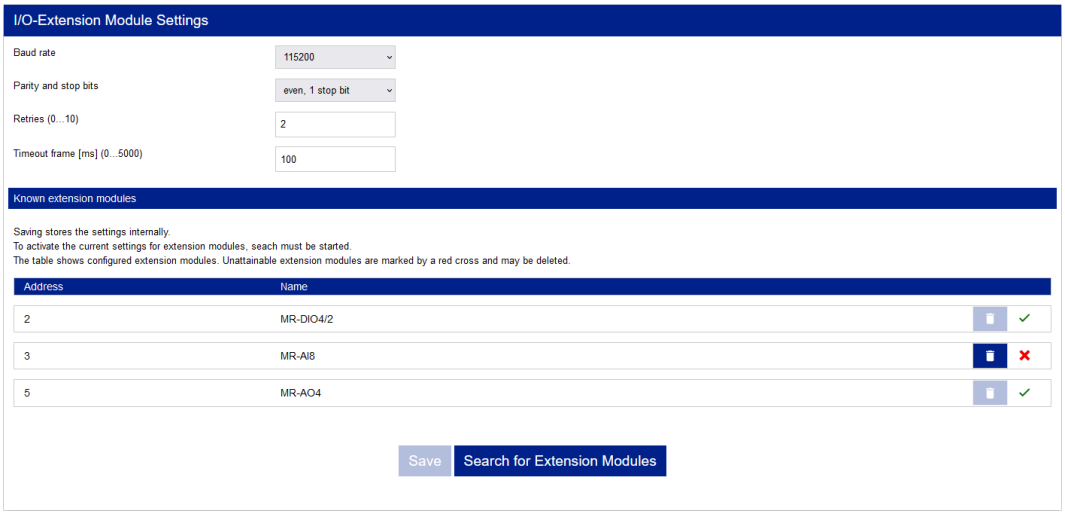
If the search for extension modules described in chapter 10.5.3.5. was carried out, they are listed below.



By pressing the blue bar with the name and the set address of the expansion module, the display can be opened and closed with the other IOs.

10.5.3.5. Extension Settings

In the menu window "Extension Settings" connected extension modules can be searched for and their communication parameters adjusted.



In order to achieve the best possible communication and a short reaction time to the expansion modules, it is best to connect them directly via jumper plugs. Here a baud rate of 115200 bit/s is useful. If the devices are installed further away from the EWIO$_2$, a lower baud rate should be selected. In the pop-up menu the baud rates of 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bit/s and the parity none with 1 stop bit, none with 2 stop bits, even and odd parity can be selected. The found expansion modules are set to these communication parameters after the search.

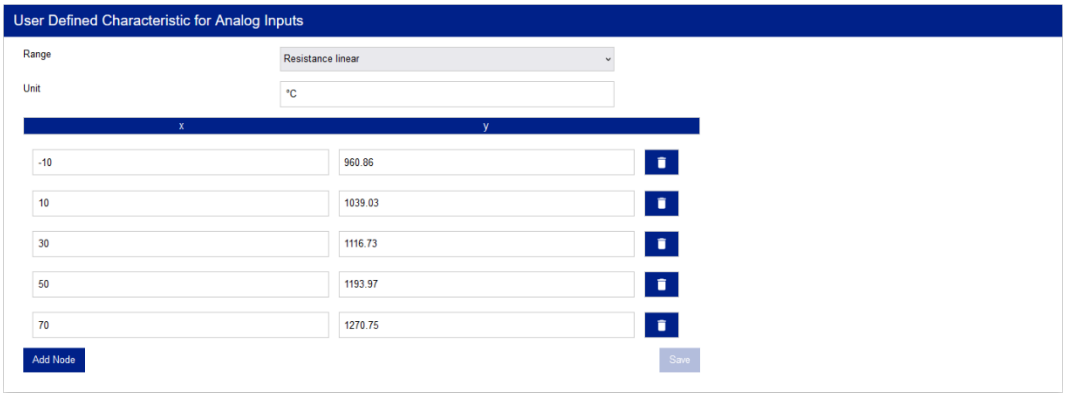
When the Expert Mode is switched on, see Chapter 10.5.2.1. "General", the menu window is expanded.
In the input fields "Repetitions (0...10)" and "Timeout Frame [ms] (0...5000)" you can select how often a Modbus request should be sent and how long to wait for a response from a meter.

By activating the action field "Search extension modules" a request is sent with every baud rate and parity and waited for a response from an extension module.
The search can therefore take up to 60 seconds and cannot be interrupted. The table shows the extension modules.

By activating the action field "Save" the settings are set internally.
With each update of the menu window the communication to the modules is checked. Reachable expansion modules are marked with a green hook, unreachable ones with a red cross. They can be deleted by clicking the action field with the trashcan symbol.

10.5.3.6. Characteristics

In the menu window "Characteristic" a user-defined sensor characteristic curve can be defined. It can be selected as "User defined" in the menu item "Analog inputs", see chapter 10.5.3.2. in the pop-up table "Config". The actual value shown there is then interpolated using this table.



In the pop-up menu "Range" the physical quantities voltage, voltage with connected pull-up resistor, current and resistance linear or exponential are available.

In the input field "Unit" a unit can be entered.

In the input fields "x" and "y" the given value pairs can be edited. Here in the example, the X-value as a support point for the temperature and the Y-value for the corresponding resistance value.

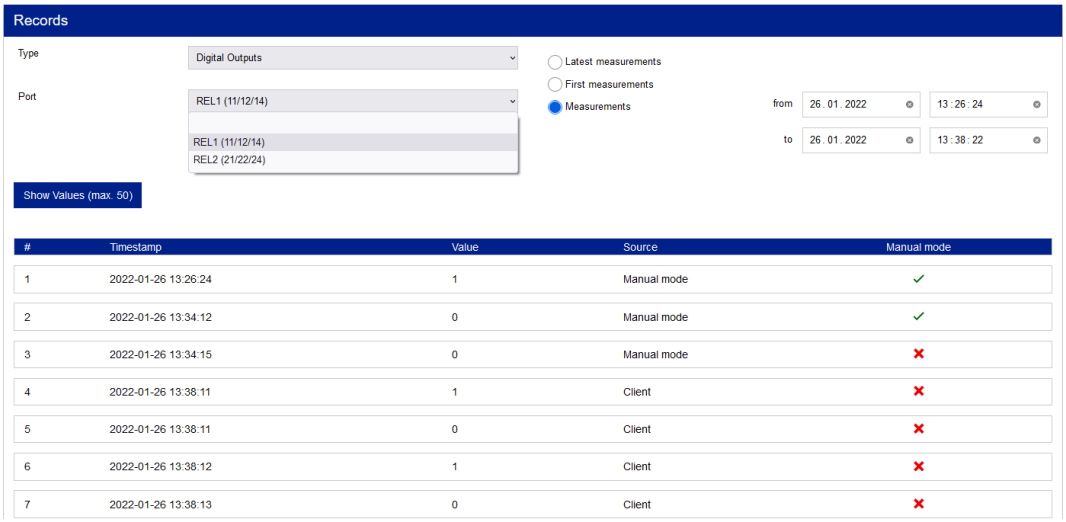
Up to 10 value pairs can be defined by activating the action field "Add Node".

By activating the action field with the trashcan symbol, interpolation points can be removed.

The value pairs are only accepted when the action field "Save" is pressed.

10.5.3.7. Record

In the menu window "Record" stored data of inputs and outputs can be displayed, which have been configured for an acquisition as described in chapters 10.5.3.1. to 10.5.3.4.



A digital or analog input or output can be selected in the "Type" pop-up menu.
The channel is selected in the "Connection" pop-up menu.
To define the time range for the display of measurement data, one of the selection fields "Newest measurement data", "Oldest measurement data" or "Measurement data" is activated. When the "Measurement data" selection field is clicked, the input fields for date and time for the range start and range end appear.

When the "Show values (max 50)" action field is activated, a list with time stamp, value, source and, in the case of the outputs, whether automatic or manual operation was active at the time of recording, appears. Up to 50 entries can be displayed in the browser. When exporting the values, in a CSV file, all stored values are used.

10.5.4. Functional Modules

Via the "Functional modules" menu item, the EWIO2 offers the option to find METZ CONNECT internal modules and integrate them into the system, for example as meter. Functional modules must be connected via the upper bridge connector.

Supported modules:

Energy meters:

11084114 MR-SM4i Modbus RTU
11084115 MR-SM4u Modbus RTU

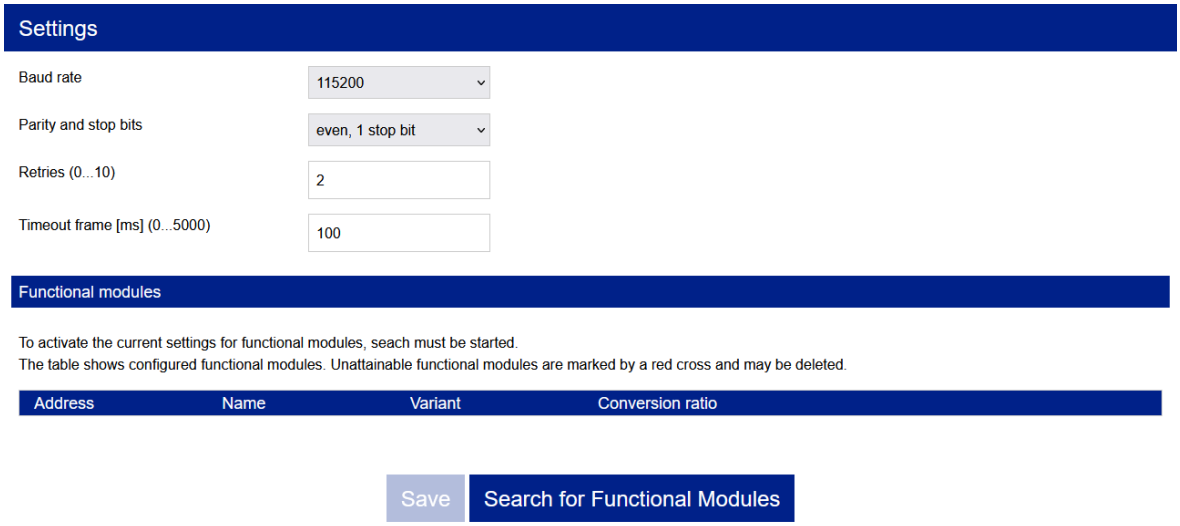
Note!



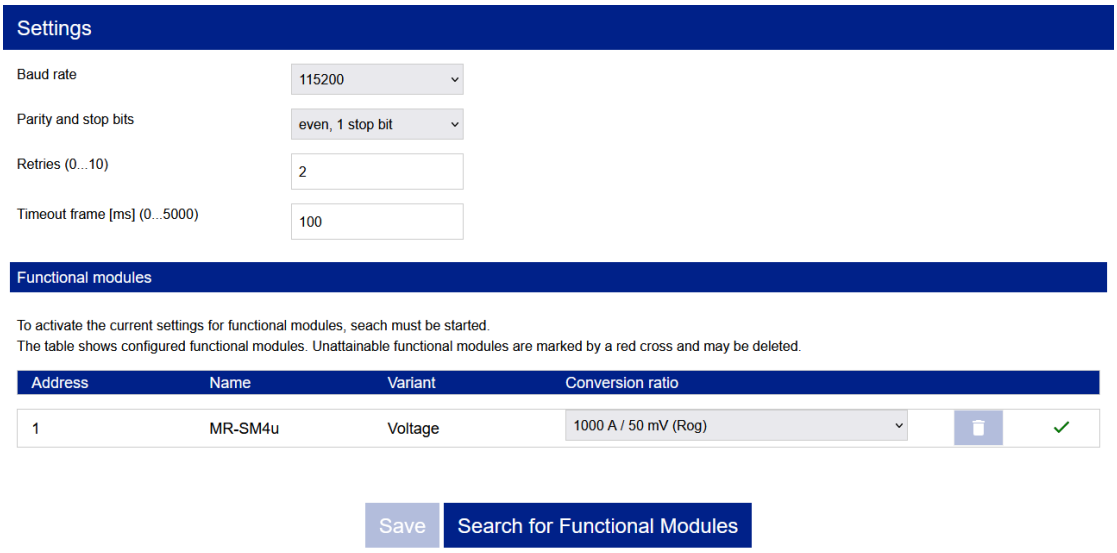
The corresponding address must be set using the rotary switch. A maximum of 6 functional modules is allowed.
A baud rate of 115200 bit/s is useful to achieve the best possible communication and a short reaction time.

10.5.4.1. Settings

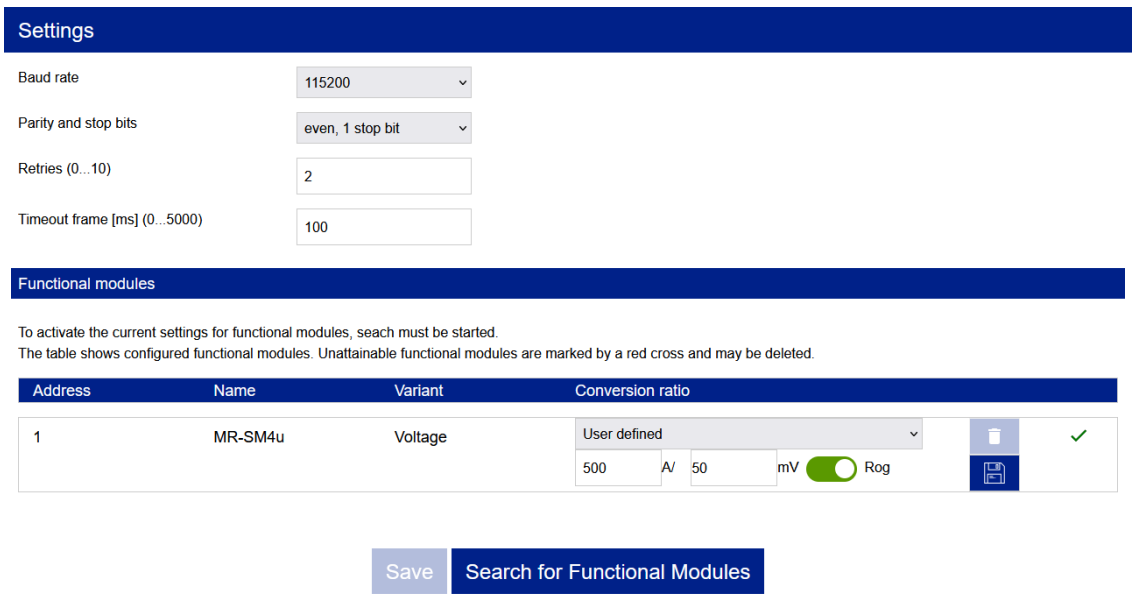
The selected baud rate settings are identical for all connected modules, also for extension modules (see chapter 10.5.3.5).



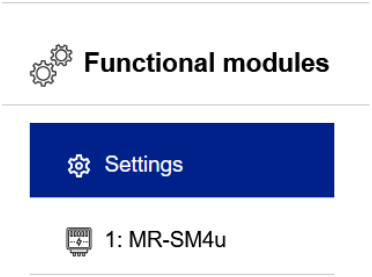
By activating the action field "Save" the settings are set internally.
Clicking "Search for functional modules" automatically configures communication parameter with the connected modules, and the found functional modules are displayed:



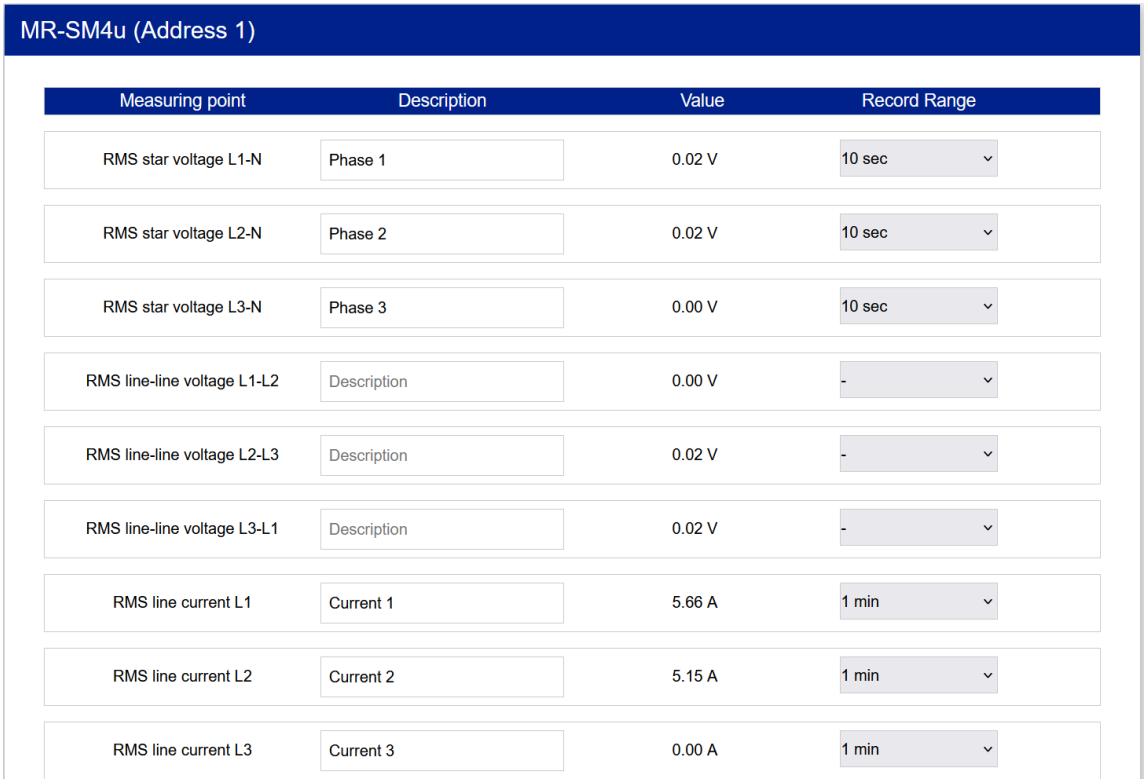
In the drop-down menu for conversion ratio, you can choose the primary current of the transformer and the secondary current (current variant MR-SM4i) or secondary voltage (voltage variant MR-SM4u) of the transformer. For voltage variant MR-SM4u you can additionally activate Rogowski coil mode. The changes take effect immediately



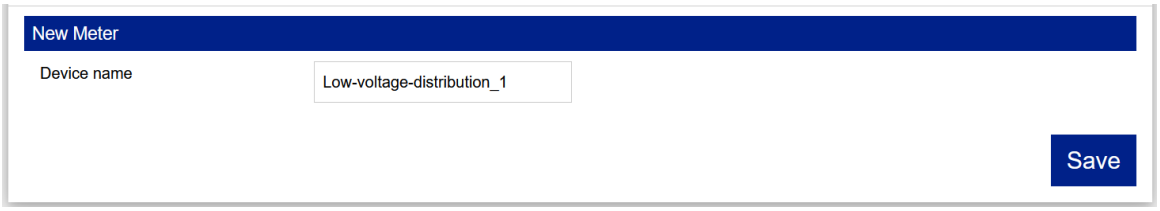
With conversion ratio “User defined” you can manually edit primary current and secondary current (current variant MR-SM4i) or secondary voltage (voltage variant MR-SM4u) of the transformer. For voltage variant MR-SM4u you can additionally activate Rogowski coil mode. The changes take effect when clicking the Save button.
The device then appears under the "Functional modules" menu item:



And can be configured for data logging from there.



After configuring the measurement points, the measuring point is assigned a name. Clicking "Save" creates a meter:



The available measurement data can now be further used via the "Meters" menu item; see Chapter 10.5.7.

10.5.5. Applications

Under the menu item "Applications" the EWIO$_2$ offers the possibility to create and execute applications.
Applications are small programs, with which e.g. links between the I/Os can be switched. This allows to realize simple assignments between outputs and inputs up to controllers. But apart from that, any programs can be started and evaluated. Thus, measured values can also be processed by an application after they have been queried by the meter.
Events can be triggered by evaluating the measured values. These events in turn can initiate the sending of an e-mail or the switching of a relay.

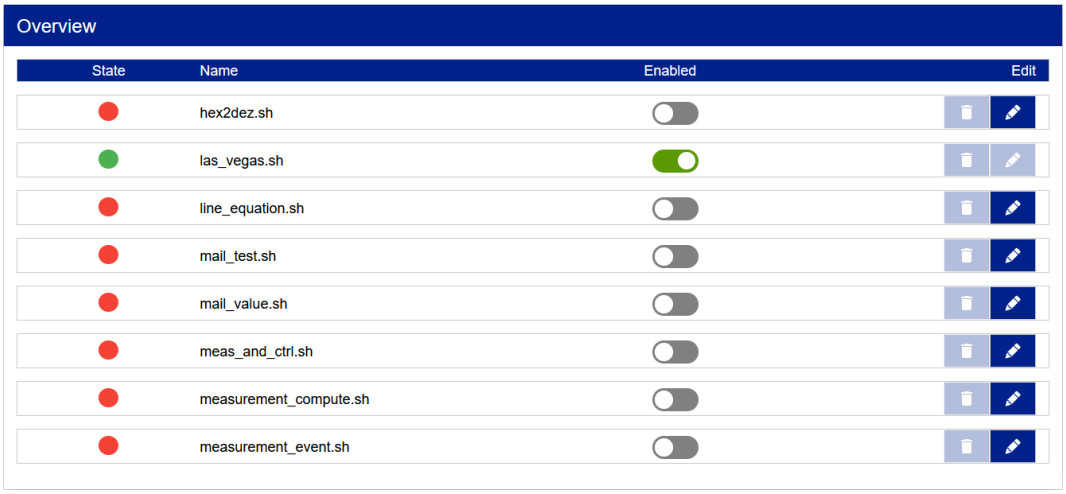
Note!



Chapter 11. describes the access to the IOs via application in more detail.

10.5.5.1. Overview

The menu window "Overview" lists the saved applications.

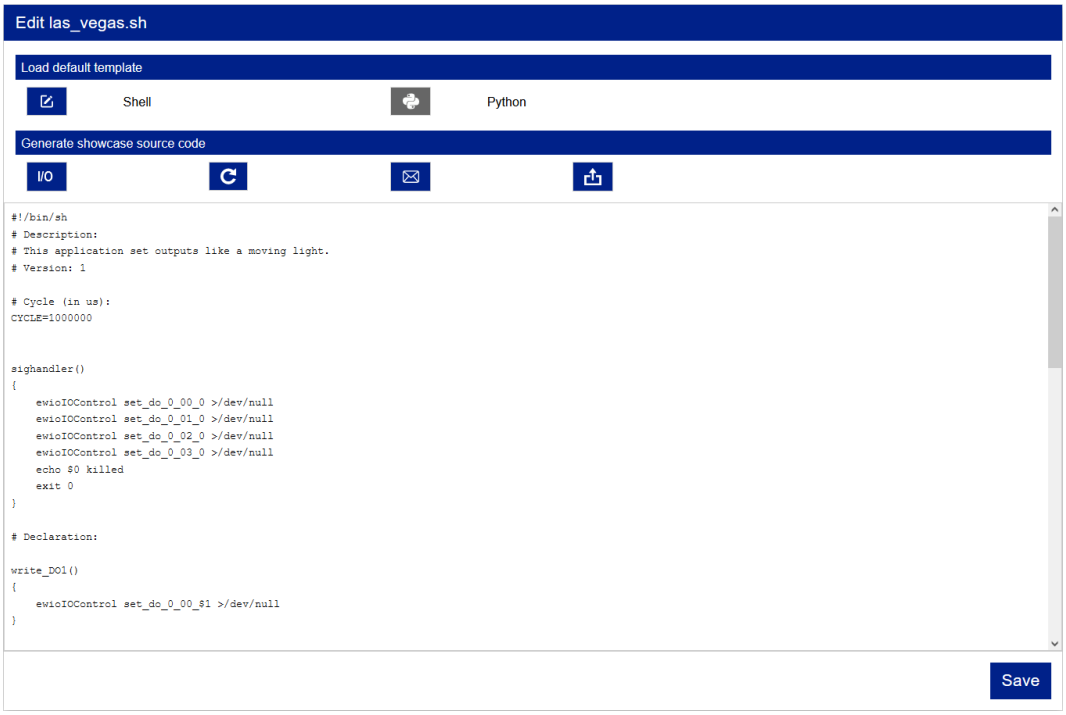


Note!



The application las_vegas.sh serves only as an example code for the control of relays 1 to 4.
When the application is started, the relays switch!!!

To the right of the application name, use the slide switch to activate the application, the status display is green, and deactivated, the status display is red.
Clicking the action field "Trashcan" deletes the application.
Clicking the "Pen" action field opens the editing window with the script program.

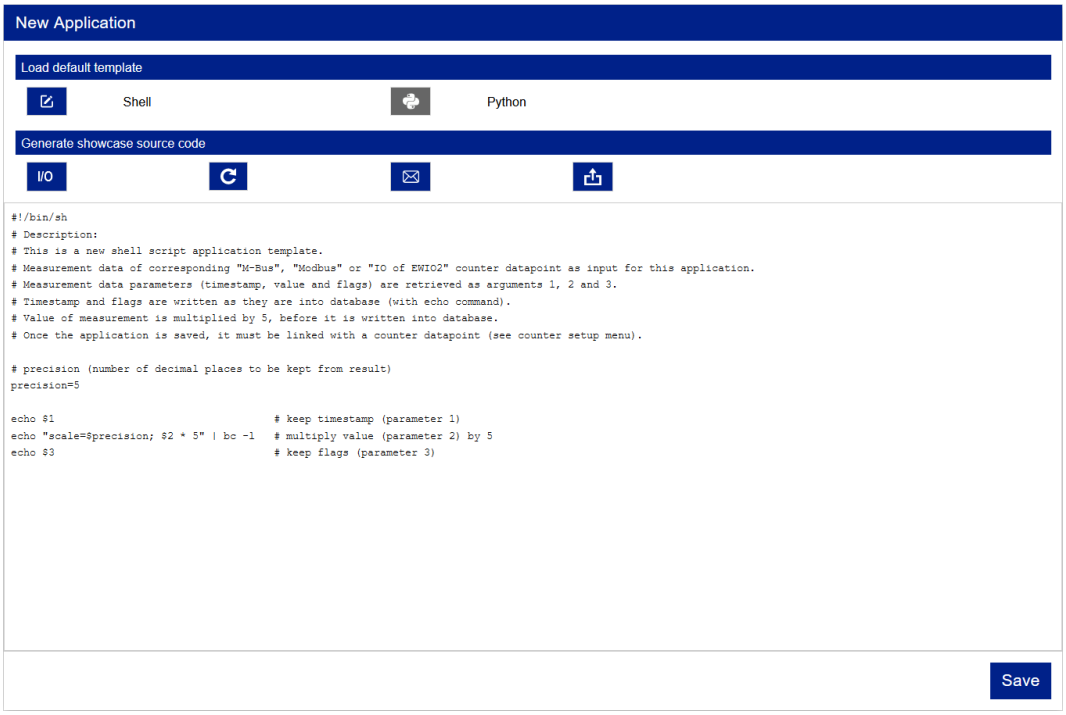


Only after activating the action field "Save" the changes are accepted.

10.5.5.2. New application

The menu window "New Application" opens a new editing window.

By pressing the action fields "Shell" or "Python" standard templates for the desired script language are selected.
The already existing lines are intended as a starting point for your own applications, such as for the manipulation of measured values.
But also existing applications, like the example applications, can be modified by assigning a new name and making changes in the script.



Changes can now be made in this template.

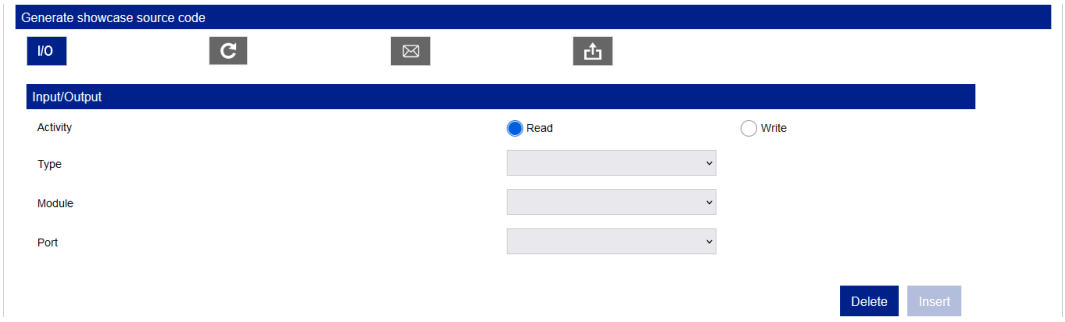
By activating the action field "Save", the changes are accepted.
Afterwards, a name of your own must be assigned. The name may contain the characters A-Z, a-z, 0-9 and "_".

For writing the script, tools are offered which can be helpful during the script creation. After selecting a tool and the subsequent configuration, the corresponding code for the script is generated.

By pressing the action field "Insert" the program code is inserted at the position where the cursor is located.

Clicking the action field "Delete" resets the entries.

The action field "Input/Output" is used to generate the program code for reading or writing an I/O.

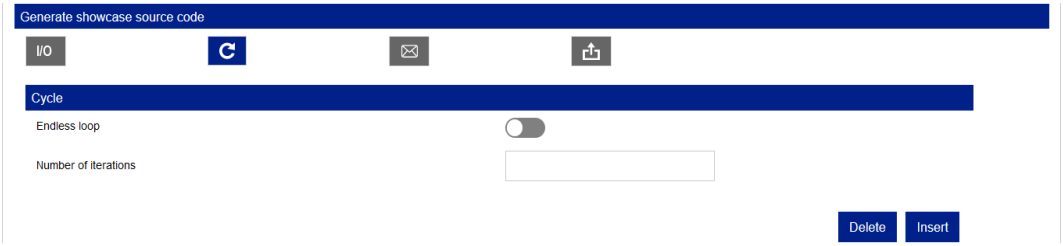


The type of I/O is selected in the "Type" pop-up menu.
When selecting a digital input, the radio buttons for the Level and Pulse Counter Value

functions appear additionally. The pulse counter value can be overwritten by the script.
When an analog input is selected, the radio buttons for the functions Actual Value and Configuration appear additionally. The configuration can be changed by the script.
In the pop-up menu "Module" the device where the I/O is located is selected. If extension modules are connected and known to the EWIO$_2$, they will be listed as well.

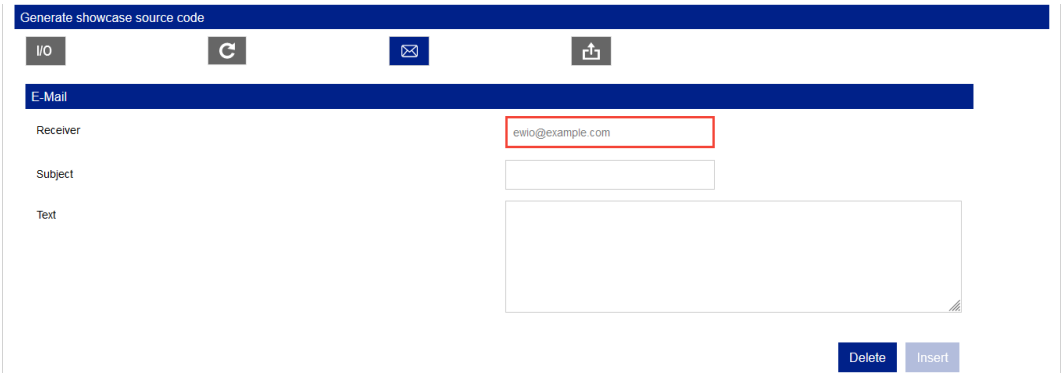
In the "Port" pop-up menu, the desired I/O is then selected.

The "Cycle" action field is used to generate program code for program loops.



The slide switch is used to generate program code for an endless loop, the input field "Number of iterations" is used to generate program code for a certain number of program loops.

The action field "E-Mail" is used to generate program code for e-mail notification. This tool can only be used after the system settings for e-mail have been made as described in Chapter 10.5.2.9.



Events can be defined during the script creation itself.
This can be, for example, the exceeding of a certain threshold value or the result of the evaluation of a digital input. System events that can be evaluated via the shell can also be used as triggers.
An entry in the input field "Receiver" is mandatory. Additional information can be entered in the fields "Subject" and "Text".

Clicking the action field "Upload file" opens a file system window to upload script files created by other text editors.

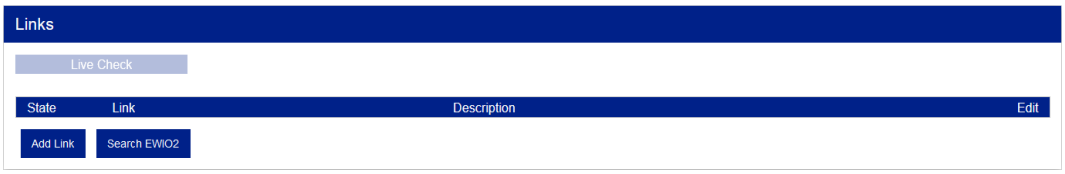
During saving the script syntax is checked.
Once the script has been saved, it can be found in the Application Overview, Chapter 10.5.5.1.

To start it, it must be activated there with the slide switch.

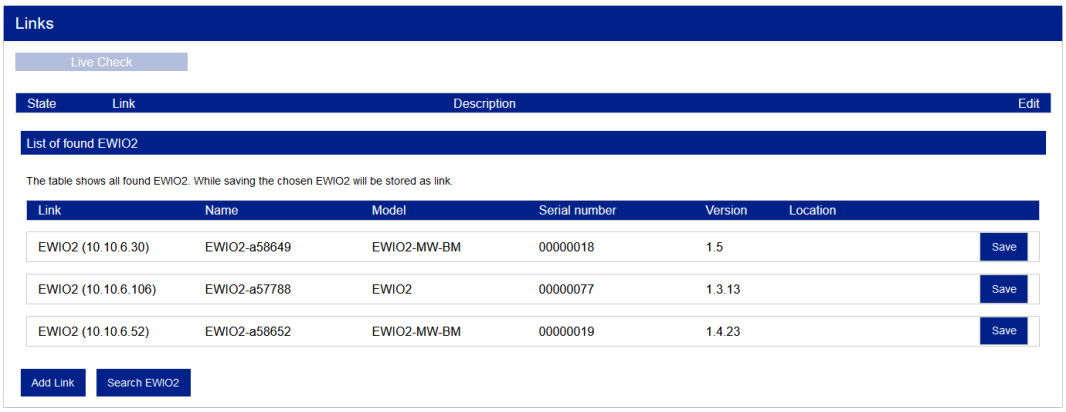
Created scripts can be found in the EWIO$_2$ directory structure:
/var/www/html/resources/upload/

10.5.6. Links

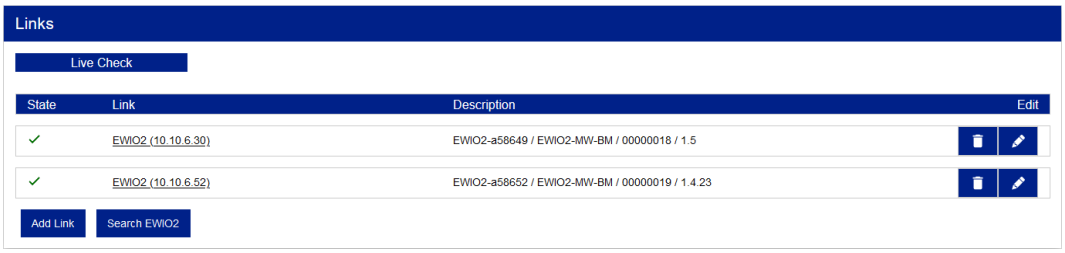
Under the menu item "Links" the user can manually enter links or automatically search and enter EWIO$_2$ located in the same subnetwork.



After activating the action field "Search EWIO2" all EWIO$_2$ found in the current subnet are listed.

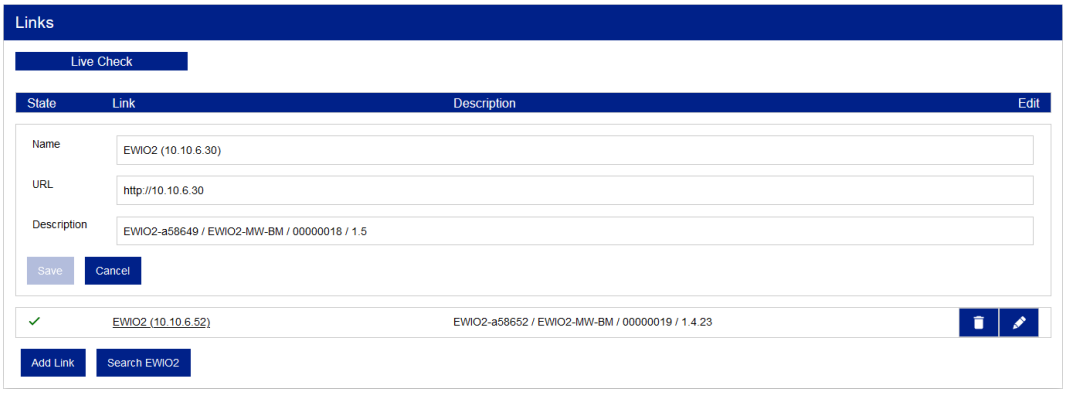


By activating the action field "Save" the link of the respective EWIO$_2$ is entered into the list.



By activating the action field "Live Check" the availability of the link targets can be checked. This is indicated by a green tick or a red cross in the status.

Clicking the action field with the pencil symbol opens the window for the selected EWIO$_2$ and in the input fields name, URL and description can be edited.



By clicking the action field "Add link" these entries can also be made manually.

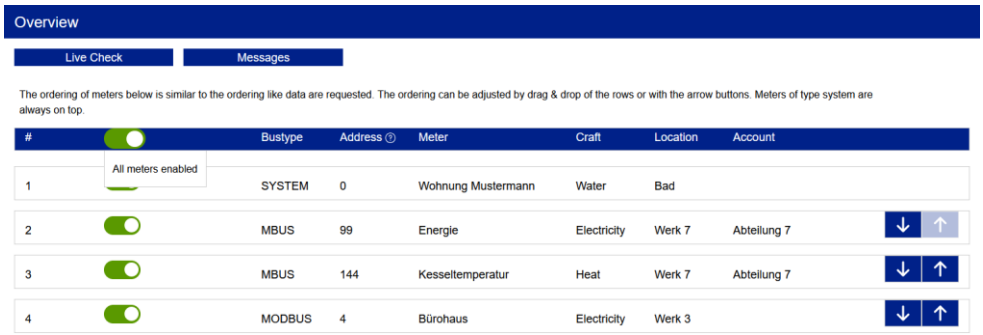
By clicking on the action field with the trashcan symbol the link can be removed from the list.

10.5.7. Metering

Under the menu item "Metering" are all menu windows that are necessary for data logger operation.
It is recommended to check the time set in the EWIO$_2$-M before starting the meter setup and to set it if necessary. This is important so that the time stamps given to each measured value are correct. The setup date is, if not entered otherwise, also the scan start of the meters.
The EWIO$_2$-M also offers a comfortable way to identify and set up connected M-Bus devices.

10.5.7.1. Overview

The configured meters are listed in the "Overview" menu window.



The sequence corresponds to the query sequence of the meters. The query order can be influenced by moving the lines with the computers input device or with the arrow keys.
Note!



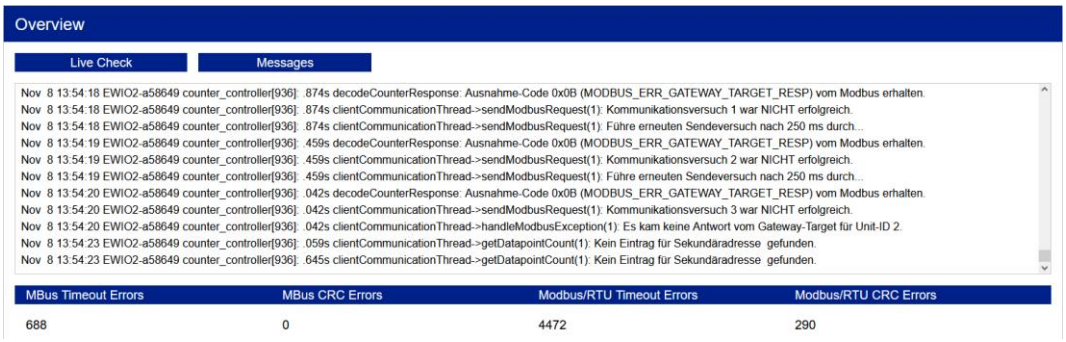
System meters are always queried first because it takes almost no time to query them.

Retrieving measurement values from the meters can be activated or deactivated by the slide switches. Meters that are not used or not connected, can be deactivated, to not stress the bus unnecessarily. The slide switch in the header shows if all meters are activated. Additionally, this slide switch can be used to activate or deactivate all meters.

For MBus meters the primary address is displayed, for Modbus meters the node address. Or it is an input connected to the internal system bus. In the following document, this input will be called system meter.

To identify a meter, the information: meter, trade, installation location and cost center is displayed. These were entered in the "New Meter" menu window when setting up the meter.

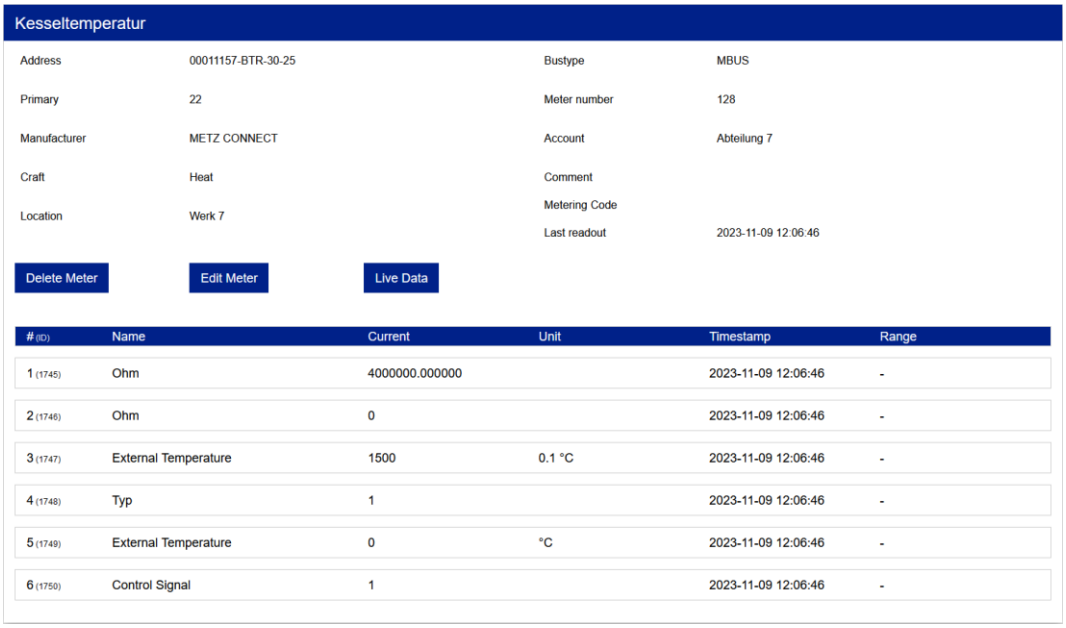
By clicking the "Live Check" action field, you can check whether the meters are still responsive. A green tick (counter accessible), a red cross (counter not accessible) or a yellow exclamation mark (counter deactivated) then appears next to the activation slide switch.



By activating the action field "Messages" the logged messages can be opened and closed by the counter controller. This software part is responsible for the communication with the meters. These messages can contribute to error detection in case of service.

Timeout and CRC error counters for MBus and Modbus communication are displayed below the opened messages area. In error-free operation, all counters should have the value 0. Larger values indicate wiring problems or interference pulses on the respective bus, which can interfere with the reading of meters.

If you press within the display field of a meter, its overview with the most important configurations and its data points opens.

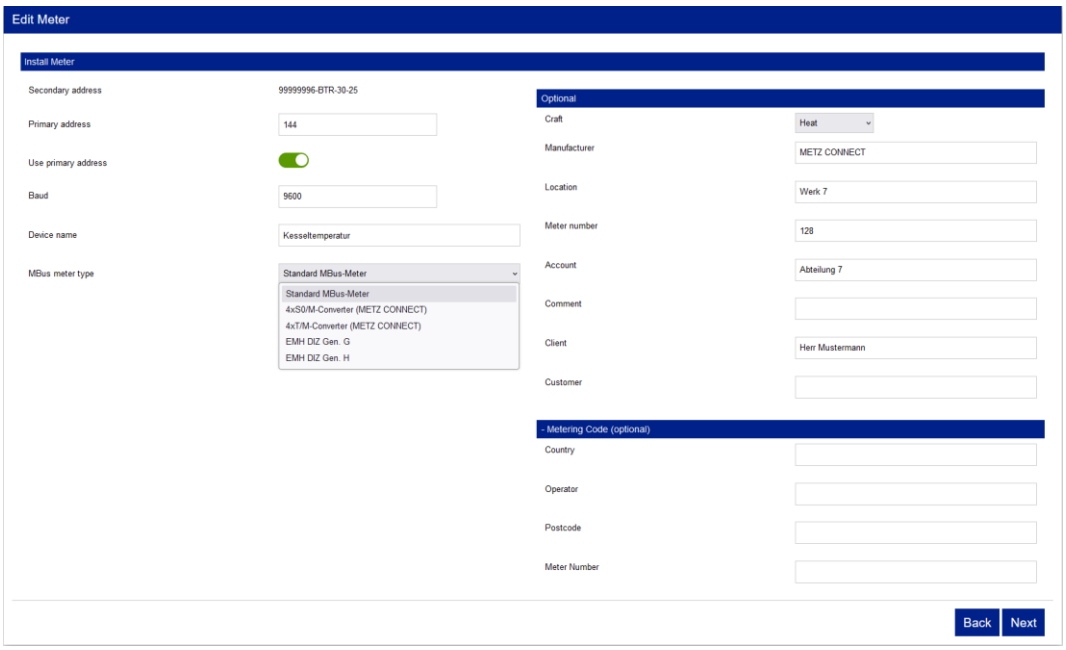


The meter can be deleted from the database by clicking on the "Delete Meter" action field.

Pressing within the display field of a data point opens the "Measured values" menu window described in Chapter 10.5.7.3.

Clicking the "Live Data" action field triggers a single readout of all data points of the meter and the read measurement values are displayed without storing them in the database. This allows to check functionality and electrical connections of a meter.

Clicking the "Edit Meter" action field opens the window for setting up the meter.



For the MBus meter the secondary address and the MBus ID are displayed. With the help of the slide switch "Use primary address" you can choose between the use of primary and

secondary addressing. If the slide switch is deactivated, only secondary addressing is used when communicating with the meter. This setting is not recommended as it slows down communication with the meter. However, it can be useful for troubleshooting communication problems with some meters where primary addressing is not working properly.

In the pop-up menu "MBus meter type" you can choose between standard MBus meters, two METZ CONNECT meter types and two EMH meter types. Additional functions are offered for the types "4xS0/M Converter", "4xT/M Converter", "EMH DIZ Gen. G" and "EMH DIZ Gen. H":

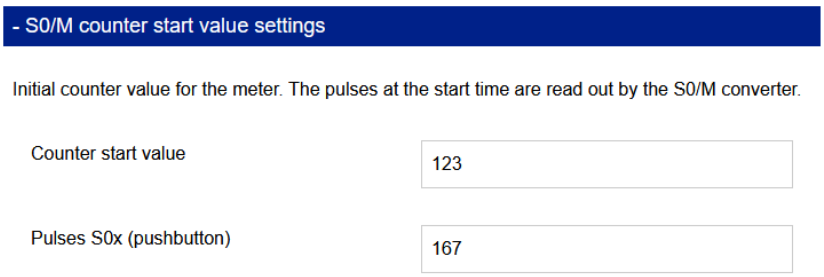
4xS0/M converter:
With this selection a slide switch for "Use FREEZE command" appears.



This allows the exact time of the measurement request of all meters of this type by using the BTR-Freeze command. A freeze command is sent by broadcast to all connected meters at the beginning of the measurement value query, whereby the measurement values of the meters concerned are frozen at an exact time so that they can be read out later in the readout cycle.

If a set installation or start flag is found during a readout cycle, it will be reset automatically. Additionally, a set start flag will lead to measurement value flag 5 being set to H to indicate that the 4xS0/M Converter was restarted.

You can also enter the counter start value - click on ‘S0/M counter start value setting’ to open the following input screen:



The initial meter value is read directly from the meter and entered. At the time of reading, the corresponding button on the S0/M converter is pressed and the pulses at the time of reading (reading pulses) are saved. These are displayed legibly for information purposes. The meter value is calculated according to the following formula:

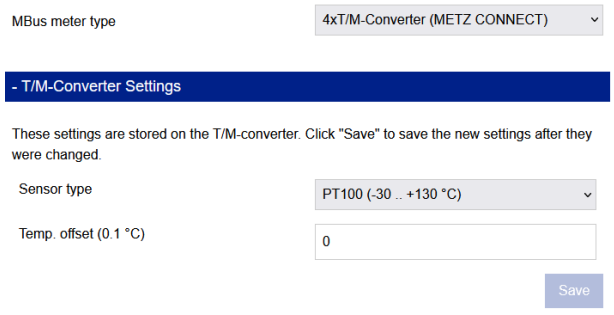
$$\text{Countervalue} = [(\text{Overfallpulses} - \text{Readoutpulses}) * \text{Factor} + \text{Counterstartvalue}] - [\text{Readoutpulses} * \text{Factor}]$$

4xT/M converter:
When this selection is made, the blue bar appears, which, when pressed, shows the further settings Temperature Sensor and Temperature Offset. These can be configured directly on the T/M converter.

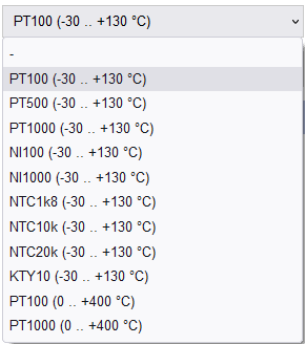
Note!



However, the configuration only affects the addressed one of the four T/M converters in the device, not all of them.

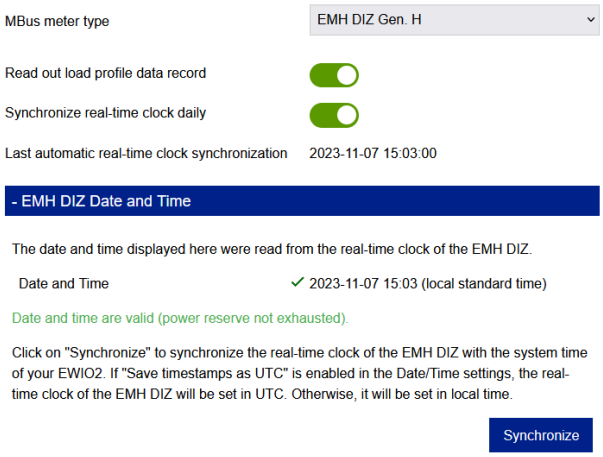


Various common temperature sensors are available in the "Sensor type" pop-up menu.



In the "Temp. offset" input field, the temperature value can be compared in 0.1 °C steps with a value measured on site.

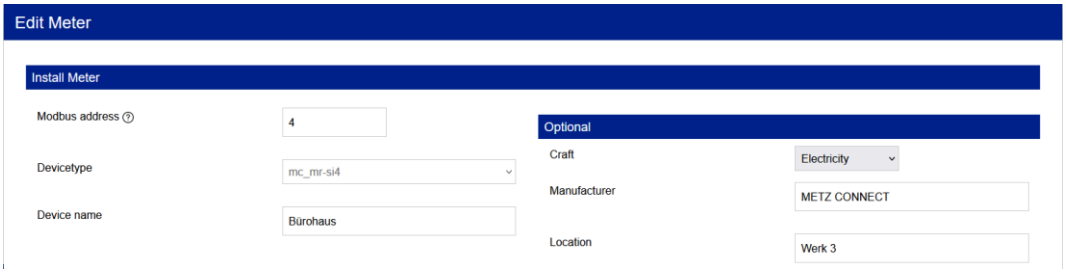
EMH DIZ Gen. G and EMH DIZ Gen. H:
When this selection is made, a slide switch for "Read out load profile data record" and for real-time clock synchronization appears.



When this slide switch "Read out load profile data record" is enabled, additional data points of the load profile data record of EMH DIZ meters can be configured for read out in the data points configuration. In contrast to ordinary data points, data points of the load profile record contain time stamp information delivered by the meter.

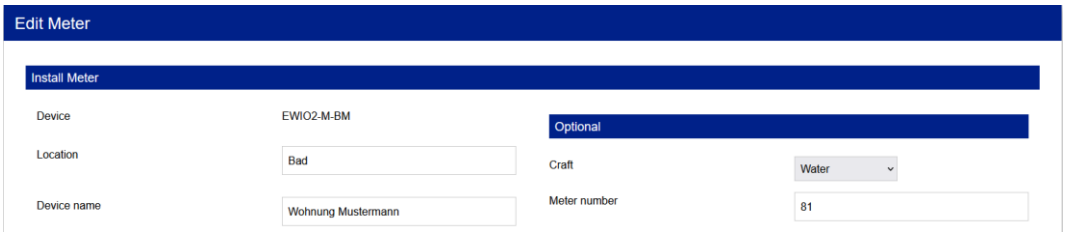
The real-time clock of the meter can be synchronized automatically with the EWIO2 real-time clock in a daily interval by enabling the slide switch "Synchronize real-time clock daily". Further information about the meters real-time clock status is shown below that slide switch. The action field "Synchronize" allows for manual synchronization of the meters real-time clock.

The Modbus address and the device type are displayed for the Modbus meter.



The device type is selected in the menu window "New Meter" in the drop-down menu during meter setup.

For the system meter, the device variant is displayed.



The name of the measuring point must be entered in the input field. This name will later be used in the overviews to identify the meters.

Additional information can be entered optionally:

The trade electrical, water or heat can be selected in the pop-up menu.

In the other input fields you can enter the following information: meter manufacturer, installation location, meter number, cost center, comment, client and customer number.

Clicking the "Metering Code (optional)" action field opens and closes the entries required for the code.
The Metering Code is a worldwide unique identification of a measuring point. It is used for unique identification in large networks and is composed of different components:

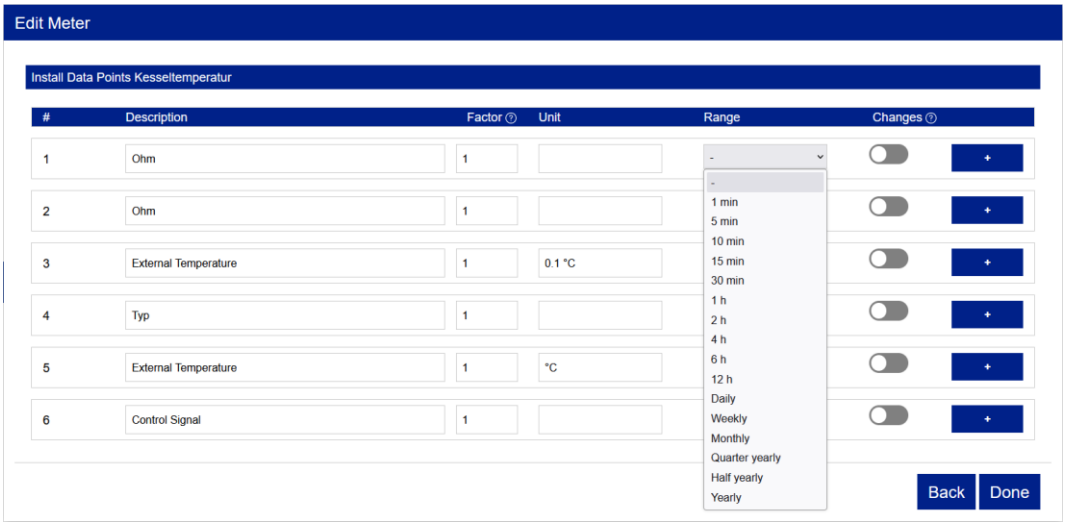
Country - e.g. DE for Germany (2 letters)

Operator - Network operator identification (6 digits)

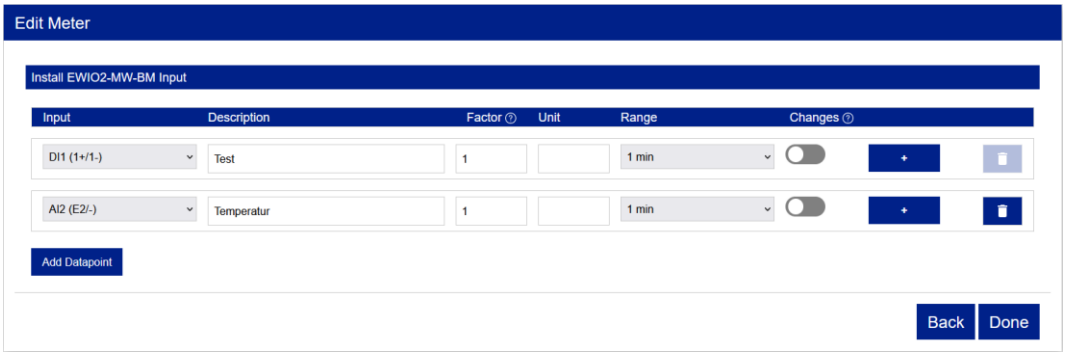
Postal code - Zip code (5 digits)

Measuring point ID - Counting point number (20 alphanumeric characters)

Clicking the "Next" action field opens the window for the MBus and Modbus meters to select and configure the data points of the meter.

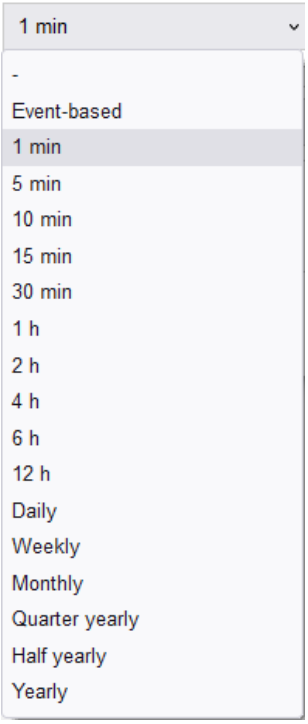


For system meters, an analog or digital input must first be selected as a data point in the pop-up menu by clicking on the "Add data point" action field.



In the input fields of the data points a description, a factor and the unit can be entered. The measured value will be multiplied by the factor and written to the database.
A dot is generally to be used as decimal separator!

In the pop-up menu for the interval the time is selected in which the measured values are written into the database.



With the setting "-" the value is not written. If the slide switch "Short readout ranges for data points" in the basic system configuration (visible only in expert mode, see chapter 10.5.2.1) is enabled, additional intervals between 1 second and 30 seconds can be selected.

For digital inputs of system meters that are configured as pulse counters (see chapter 10.5.3.1), the pulse counter value is stored as measurement value, otherwise the binary state of the input.

Only for the digital inputs of the system meters there is the additional polling interval "Event-based". Here, each change of the data point value immediately leads to the saving of the new data point value with the time of change as time stamp. To identify the non-periodic data point query, flag 3 of this query interval is set to 'N' for non-periodic. See chapter 10.5.7.3.

Note!



Since the meters are read one after the other, it is important to know when selecting an interval whether it was not selected too short. Depending on the number and type of meters, the number of data points per meter and the baud rate at which the data is exchanged, the total time required may exceed the set interval. Then it is no longer possible to keep the polling cycle. With MBus meters, all data points are sent during the polling, even if only a few have been set up. Differently with Modbus or system meters it is only the data points that have been set up.

Approximately can be assumed for MBus meters:

At 300 bit/s, 10 meters per minute can be queried.
At 2400 bit/s: 48 meters per minute can be queried.
At 9600 bit/s: 60 meters per minute can be polled.

An approximate value can be assumed for Modbus meters:

At 300 bit/s: 60 meters per minute can be polled.
At 2400 bit/s: the maximum number of 247 meters per minute can be polled.

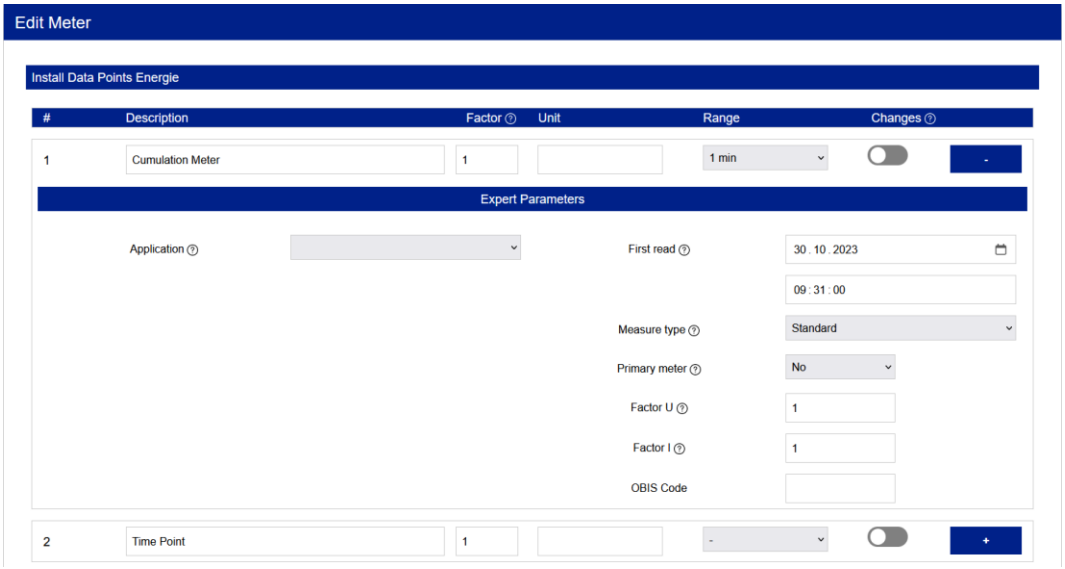
The time required for system meters can be neglected.

For meters with large data packets with multi-response, each data packet must be evaluated as one meter for the time calculation.

With the MBus a mixture of different baud rates is permissible. Accordingly, the individual times add up to the total time.

If the slide switch "Changes" is enabled, measurement values are saved only if they changed since the previous reading.

Press the "+" or "-" action field to open and close the meter field by the expert parameters.



In the pop-up menu "Application" all applications stored in the EWIO$_2$ are listed, which are to be applied to the read out data before they are saved.
In order for an application to be executed, it must have been started in the menu item "Applications" in the menu window "Overview".

A time before which the meter is not read out can be entered in the input fields for date and time. The first actual reading date then still depends on the selection of the "Interval" parameter.

In the "Measurement type" pop-up menu, you can select whether the data, its average value or the minimum or maximum value should be written to the database. The average and the extreme values are determined by querying the measured value every minute.

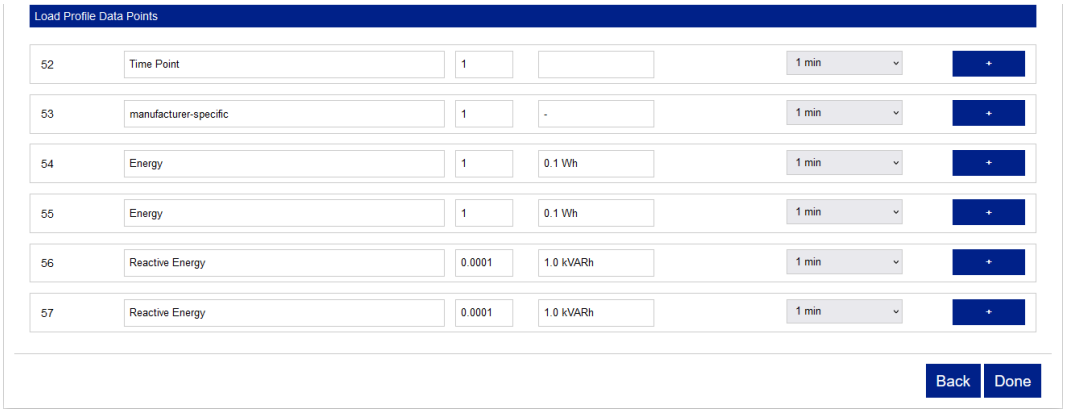
In the pop-up menu "Primary meter" you can select whether the meter in question is a primary meter. Primary meters are electronic meters that include transformer factors when displaying

the meter reading.
This pop-up menu is only available for MBus meters!

The input fields "Factor U" and "Factor I" are changed if a voltage or current transformer is connected upstream of the meter. The measured value is multiplied by the factors before being saved.
These input fields are only available for MBus meters and the electrical trade!

In the input field "OBIS code" a code matching the measured value can be entered. OBIS indices are internationally standardized and are used in electronic data communication in the energy market to uniquely identify measured values (energy quantities, meter readings) and abstract data.

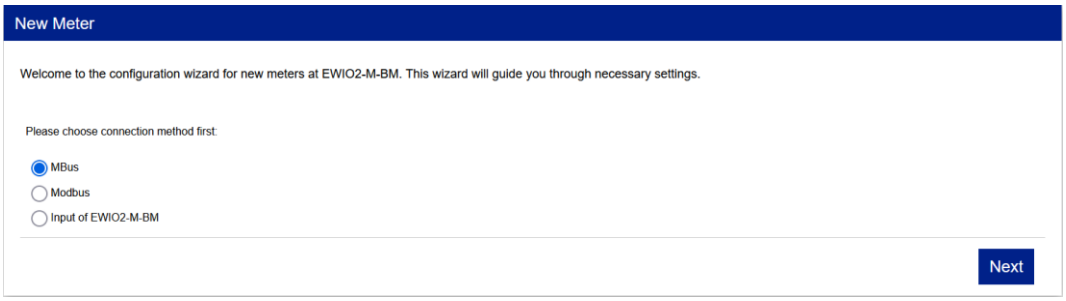
If the meter is an EMH DIZ Gen. G or EMH DIZ Gen. H MBus meter, and if this meter type was set accordingly in the "MBus meter type" drop-down menu on the "Install Meter" page, then at the end of the data point list, there appears an additional “Load Profile Data Points” section that displays the data points included in the load profile records of these meters and makes them configurable.



In contrast to ordinary data points, the data points contained in the load profile data records are stored by the meter itself at specific time intervals. Therefore these data points contain timestamp information supplied by the meter. When reading out load profile data points, always the last load profile record saved in the meter is evaluated. If the same time stamp is found when reading out a load profile data record as in the previous readout process, then the meter has not yet saved a new load profile record. The measured values read out last are therefore duplicates of the measured values read out in the previous readout process and are discarded.

10.5.7.2. New Meter

The meters are set up in the "New Meter" menu window.



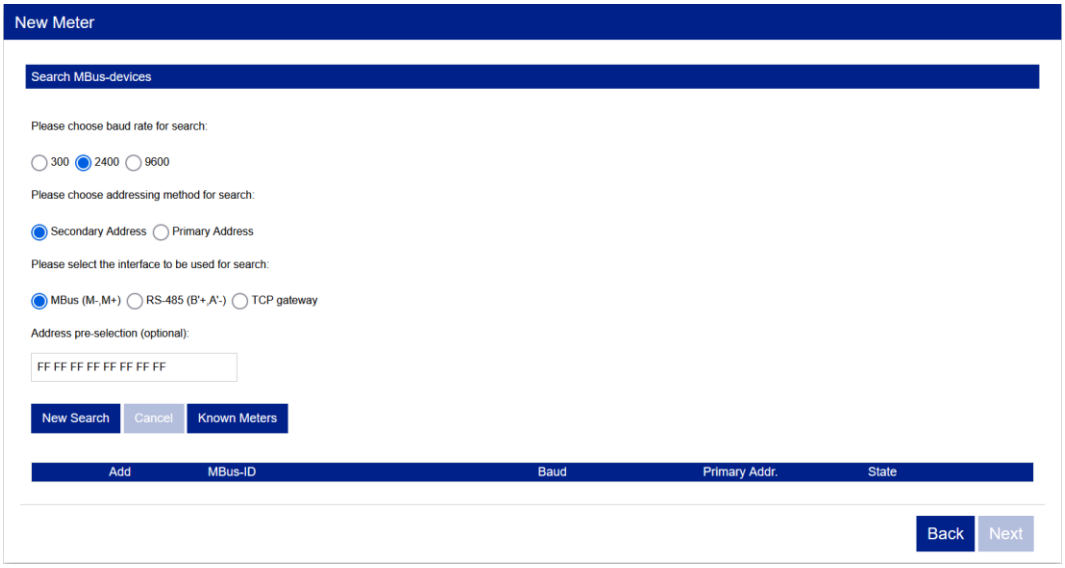
MBus meters are connected to the terminals M+ and M-. Some manufacturers offer meters that transmit the MBus protocol via an RS485 interface. Such meters are to be connected to terminals B'+ and A'-.

Modbus meters are connected to terminals B'+ and A'-. The communication parameters are set in the menu window "Modbus settings (meter)", chapter 10.5.7.4.

System meters are the analog and digital inputs available in EWIO$_2$. They can be set up as meters, regardless of the settings made under the menu item "Inputs/Outputs", chapter 10.5.3.

MBus:

By selecting "MBus" and pressing the "Next" action field, the window for searching the connected meters opens.

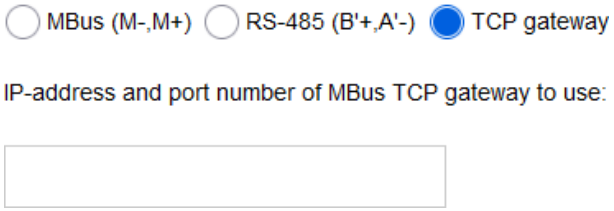


Only the baud rates 300, 2400 and 9600 bit/s recommended by the M-Bus protocol are supported.
If it is known on which baudrate the connected devices respond, you can set this and start the search. Otherwise you should repeat the search with all baud rates.
It is recommended to start with the lowest one and then use the next higher baud rate.

The meter search can be done by primary or secondary address. When searching for secondary addresses, it is limited to the first specified max. 8 (from left) digits.

The port to be used for the search must be selected according to the newly connected MBus meter. MBus meters are normally connected to terminals M+ and M-, corresponding to the "MBus (M-,M+)" selection. For meters that transmit the MBus protocol via an RS485 interface, "RS-485 (B'+,A'-)" should be selected.

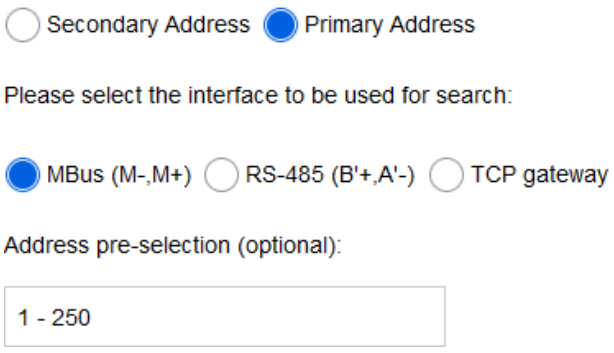
The connection type "TCP gateway" enables the connection of MBus meters via a network connection and an MBus TCP gateway. For this type of connection, the IP address and port number of the TCP gateway to be used must also be specified.



When using a TCP gateway, make sure that the baud rate used for the search matches the baud rate setting in the TCP gateway.

In the input field "Preselection for search addresses", various criteria can be entered to shorten a search.

The syntax for searching with the secondary address is:
NNNNNNNNNN for the search for exactly one address,
NNNN to search for the first four significant digits of adresses, thus NNNNFFFF,
by default, FF FF FF FF FF FF FF FF FF FF is in the input field. This means that all addresses are searched.

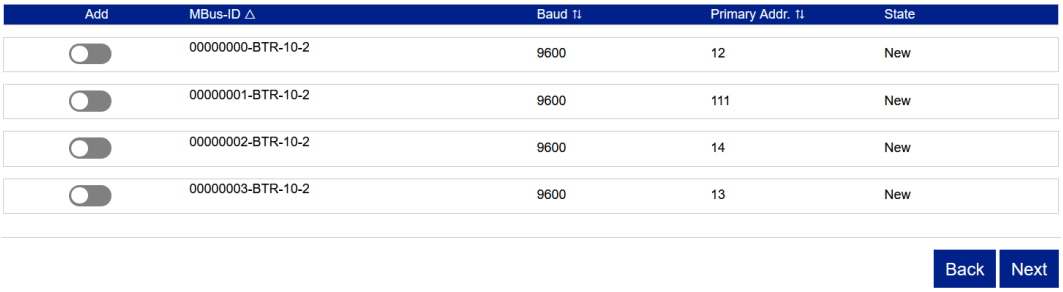


The syntax for searching with the primary address is:
NNN for the search for exactly one address,
NNN- for the search from NNN
-NNN for the search until NNN,
NNN-NNN to search from NNN to NNN (to define an exact range).
The default is 1 - 250 in the input field. This means that all valid addresses are searched.

After clicking the action field "New search" the search is started. A display field will appear that shows the progress.

By clicking the action field "Cancel" a search can be terminated.

In the display field of the search address the search progress can be followed.



When the search is complete, all meters found are listed.
The table shows MBus-ID, baudrate and status, indicating whether it is a newly found or already known meter. The order of the table rows can be changed by clicking the triangle and arrow symbols in the table header.

By clicking the action field "Known meters" the meters are listed, which were found during the last search.

Use the slide switch to add a new meter to the list in the "Overview" menu window if the entries in the next "Edit Meter" menu window have been completed with the "Done" action field.

In the input field the primary address can be entered or changed. Valid primary addresses range from 10 to 250.

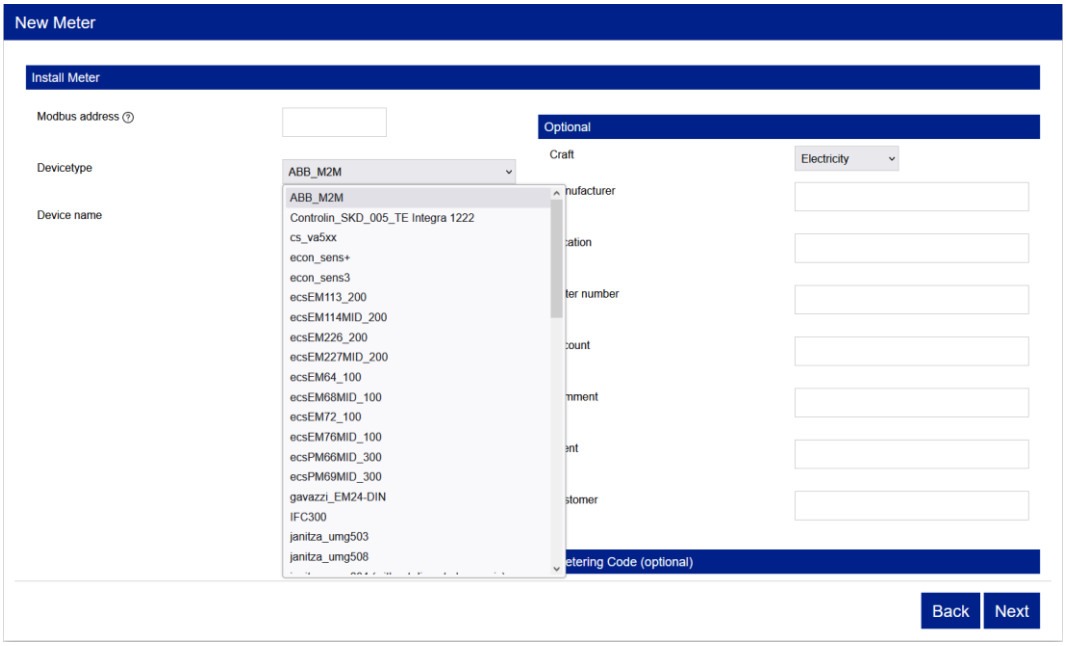
Clicking the "Next" action field opens the "Edit Meter" menu window, which is described in Chapter 10.5.7.1.

Modbus:

Select "Modbus" and click on the "Next" action field to open the window for setting up the meter.

It can either be the node address of a device connected to the RS485 interface or an IPv4 address with optional TCP port and Modbus unit number (each separated by a colon). If no port number is specified after the IPv4 address, port 502 is used. If no unit number is specified, unit number 255 is used. A Modbus meter with an IPv4 address is queried via Ethernet and Modbus/TCP. The IPv4 address of the Modbus meter must match the network configuration of the EWIO$_2$. This means, that it must be in the same IPv4 subnet as the EWIO$_2$, when connected directly to an Ethernet port.

To use a MR-SM3 expansion module, which is connected via jumper plugs to the EWIO$_2$, a setup of Modbus/TCP meter must be used. The Modbus address is then localhost address (127.0.0.1), followed by port 5021 and Modbus unit number. Example for a MR-SM3 with Modbus unit number 3: *127.0.0.1:5021:3*



The Modbus address must be entered in the input field.

The device type is selected in the pop-up menu. Only meters for which a device template has been defined can. Only with the data registers defined here the EWIO$_2$ can poll the meters.

How to create a new template for Modbus meters is described in Chapter 13.

The other input fields are explained in the menu window "Edit meter", which is described in chapter 10.5.7.1.

System meters:

Select "Input of EWIO$_2$-M..." and click on "Next" to open the window for setting up the meter.

The other input fields are explained in the menu window "Edit meter", which is described in chapter 10.5.7.1.

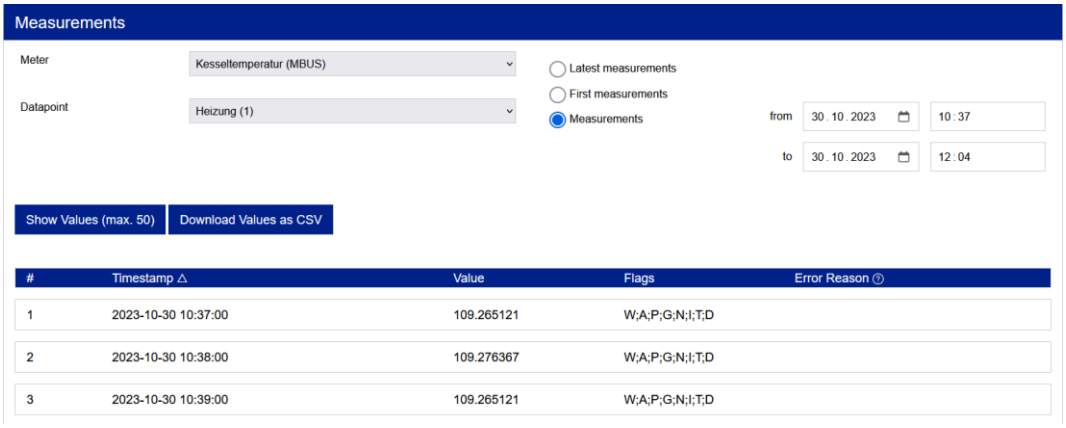
10.5.7.3. Measurements

In the "Measurements" menu window, the stored meter data can be viewed and saved as a file for evaluation programs in the manual CSV download.

Note!



If a lot of meter data is read out or the meter reading is extended by user applications, the web interface can react tough or the display for background activities is often shown.



The meter must be selected in the "Meter" pop-up menu before its data points can be selected in the "Data point" pop-up menu. Only the stored data points are displayed.

Use the radio buttons "Newest measurement data", "Oldest measurement data" or "Measurement data" to select which data should be shown. With the selection "Measurement data" input fields are displayed to define a time range.

Clicking the "Show values (max. 50)" action field lists the logged measurement data, starting with the most recent entry. A maximum of 50 entries are displayed. The timestamp based sorting of the displayed data can be reversed by clicking the triangle symbol in the header of the timestamp column.

Clicking the action field "Download values as CSV" initiates the manual CSV download. A browser dependent window opens, how to proceed with the file.

The records consist of the sequence number, the timestamp, the value and the flags.

The flags indicate the status of the measured value. The meaning is listed below.

Flag 1: Time zone designation.
W = local winter time (correct: local normal time)
S = local summer time
T = UTC time
U = Invalid time

Flag 2: Sequence and meaning of the data record in the M-Bus response.
G = Exact (freeze value)
A = Deviating (not freed value)

Flag 3: Source of the measured value query.
P = periodic value
N = Non-periodic value

Flag 4: If no value was determined by the meter, it is entered as value 0 and this flag is set to invalid.
U = Invalid
G = Valid

Flag 5: After a reboot the flag is set once during the following periodic readout.
H = EWIO$_2$-M has booted
N = EWIO$_2$-M has not booted (normal state)

Flag 6: Evaluation of the status in the meter response. If there are no errors, the Flags is set to I.
I = response telegram from MBus „All right"
E = Response telegram from MBus contains error status

Flag 7: The timer or the synchronous pulse triggers the reading of the measured value, or it is a load profile record with the meter´s timestamp.
S = synchronization pulse
T = internal timer of the EWIO$_2$-M
L = load profile record with meter's timestamp

Flag 8: Effect of an application on the measured value.
A = an application was involved in the determination of the value
D = no application was involved in the determination of the value

For measured values of data points of load profile records, the value of Flag 1 for the time zone designation refers to the setting of the EMH DIZ meter's clock. If the EWIO$_2$-M was configured to save time stamps in UTC (see chapter 10.5.2.7), it is assumed that the clock of the EMH DIZ meter is also set to UTC and flag 1 is set to the value "T" (unless an invalid timestamp was found).

10.5.7.4. Modbus settings (metering)

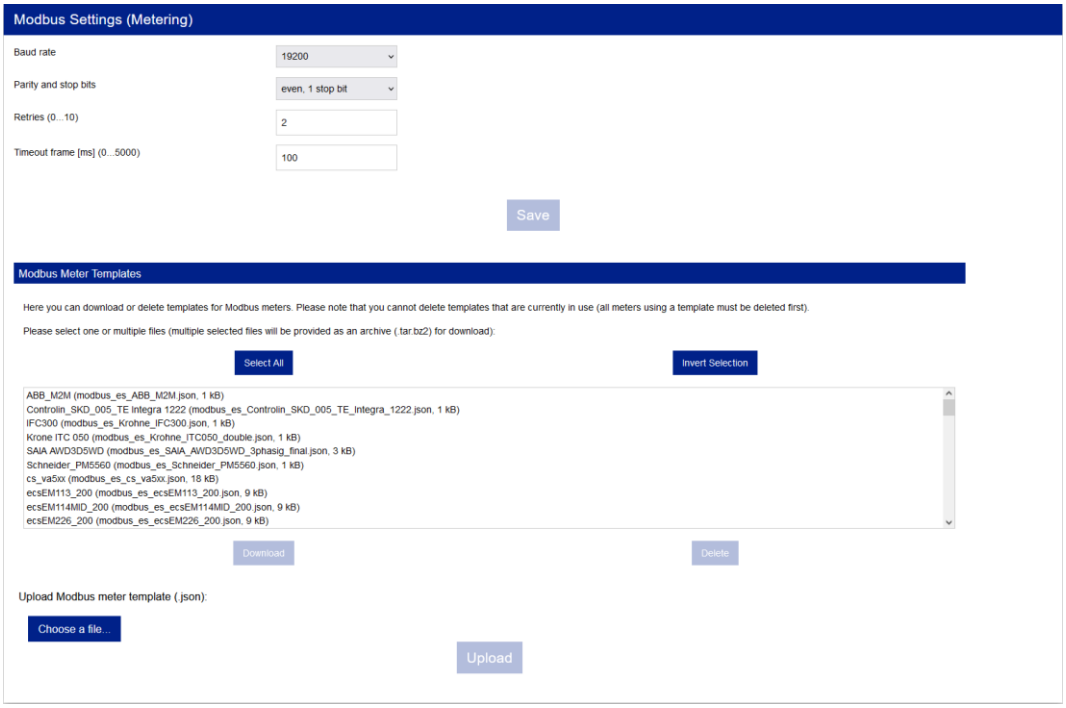
In the menu window "Modbus settings (metering)" the communication parameters baud rate and parity for the fieldbus interface are set.
In addition, the templates for the Modbus meters can be managed in this window.



In the pop-up menus the baud rates of 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bps and the parity none with 1 stop bit, none with 2 stop bits, even and odd parity can be selected.

When Expert Mode is activated, see Chapter 10.5.2.1. General, the menu window is extended.

In the input fields "Retries (0...10)" and "Timeout Frame [ms] (0...5000)" you can select how often a Modbus request should be sent and how long to wait for a response from a meter.

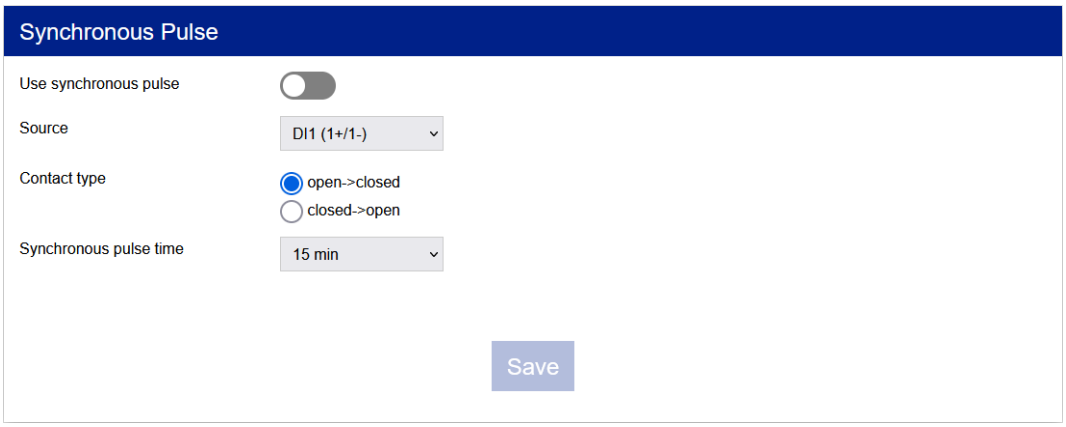


Here, you can download or delete templates for Modbus meters, see chapter 10.5.7.2. and chapter 13. Templates that are used by meters that have been set up cannot be deleted until they have been deleted.
For downloading, one or more files are selected. Several selected files are packed into an archive (.tar.bz2) for downloading).
With the action field "Browse" and "Upload", externally created templates can be added to the list and used immediately when setting up new Modbus meters.

10.5.7.5. Synchronous pulse

The synchronous pulse is an external signal that is applied to a digital input.

This deactivates the time-controlled measured value query (factory setting) and the measured value query is directed to the synchronous pulse instead.



By activating the slide switch "Use synchronous pulse", the following settings become effective.

In the drop-down menu, one of the 8 digital inputs on the EWIO$_2$ can be selected for the external synchronous pulse.

With the radio button for the contact type, the signal edge that is to trigger the synchronous pulse can be selected.

In the drop-down menu for the time grid, you can set the interval, 15, 30 or 60 minutes, after which the measured value query is synchronised.

With the first detected synchronous pulse, the measured value request is synchronised to the set time grid. After the grid time has elapsed, another synchronisation pulse is expected with a time accuracy of +/- 5 seconds, to which the measured value request is then synchronised again. If no synchronisation pulse is detected within the time window of +/- 5 seconds to the next time grid interval, the measured value query continues on the basis of the last synchronisation. Synchronisation pulses detected outside the time window of +/- 5 seconds to the next time grid interval are ignored.

The clock for the time stamp of the measured value query is set with each synchronisation to the system time rounded to the next whole synchronisation pulse raster. From then on, it continues to run with a fixed difference to the system time. This difference corresponds exactly to the difference between the system time and the next whole synchronous pulse raster time at the time of the last synchronisation.

Example: A sync pulse raster of 15 minutes is set. The first synchronous pulse is detected at 11:43:40. At this moment, a new measured value query with time stamp time 11:45:00 is started. For the measuring interval "1 minute", the next measured value requests are started at system time 11:44:40 with time stamp time 11:46:00, at system time 11:45:40 with time stamp time 11:47:00, and so on. The next synchronisation pulse is expected between system time 11:58:35 and 11:58:45. If this is detected during this period, a new synchronisation takes place and the measured value query is continued with the difference between the current system time and the synchronous pulse time 12:00:00. If no synchronisation pulse is detected during this period, the measured value enquiry is continued with the current difference between system time and synchronisation pulse grid time, i.e. measured value enquiry at system time 11:58:40 with time stamp time 12:00:00, measured value enquiry at system time 11:59:40 with time stamp time 12:01:00, and so on. The next synchronous pulse is then expected between system time 12:13:35 and 12:13:45.

Hint!

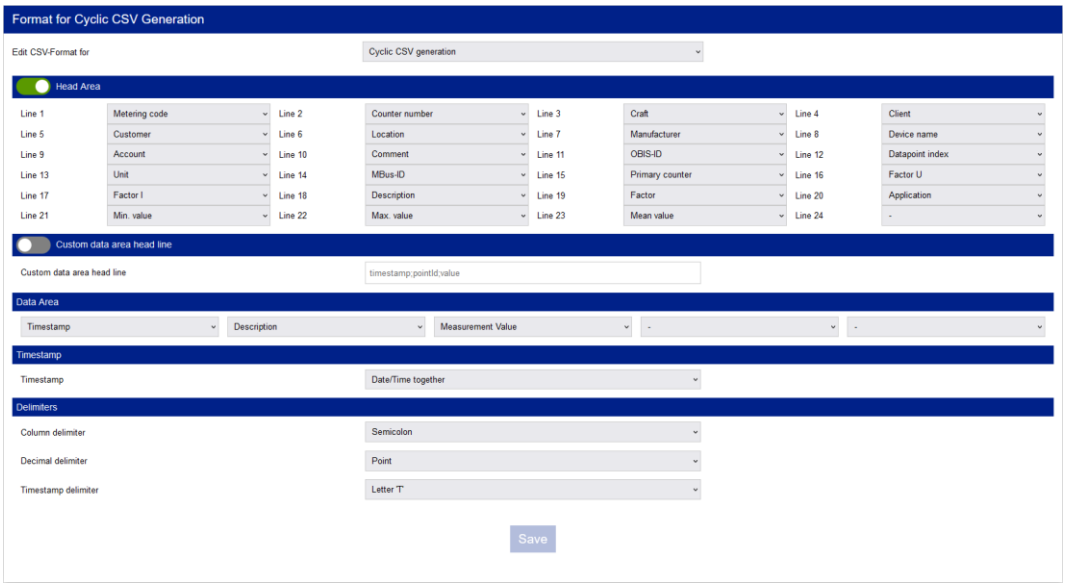


When activating / deactivating the synchronous pulse setting, there may be "jumps" in the measured value table because a different time base is used!

10.5.8. Data server

Under the menu item "Data server" the measured values stored in the database are prepared for external evaluation. The dispatch can be done in different ways: via FTP or e-mail, as push or poll server and can be done cyclically.

10.5.8.1. CSV-Format



In the menu window "CSV format" you can define how the measured value file to be transferred should be structured. By the configuration possibilities a maximum flexibility for the adjustment to existing evaluation systems is reached here.

In the pop-up menu "Edit CSV format for" the file structure for Cyclic CSV generation or Manual CSV download can be saved separately.

The manual CSV download is generated under the "Metering" menu item in the "Measured Values" menu window.

The CSV file is generated in Unicode/ UTF-8 format.

The header contains up to 24 lines. It can be enabled or disabled entirely using the slide switch left of the words ‘‘Head Area’’. For the head area, you can select which configuration setting is to be assigned to which line. If nothing is selected for a line, the following lines will move up and the page will be updated after clicking the "Save" action field.
This way, you only select the configuration settings that you need. The settings are entered under the menu item "Metering" in the "New Meter" menu window or via the menu item "Metering" in the "Overview" menu window ->"Edit meter" changed.

A user-defined header for the data area can be activated with the help of the slide switch "User-defined header for data area", which is generated as the start line of the data area instead of the otherwise specified column designations.

In the data area, the columns for timestamps, measured values and flags can be arranged as desired. The timestamp can be configured either as a one-column value in database format or

as a two-column value divided into date and time. Optionally, timestamps can be specified with timezone offset.

The column delimiter separates the individual data from each other. The characters semicolon, comma, a space, a tab or the concatenation character are allowed.

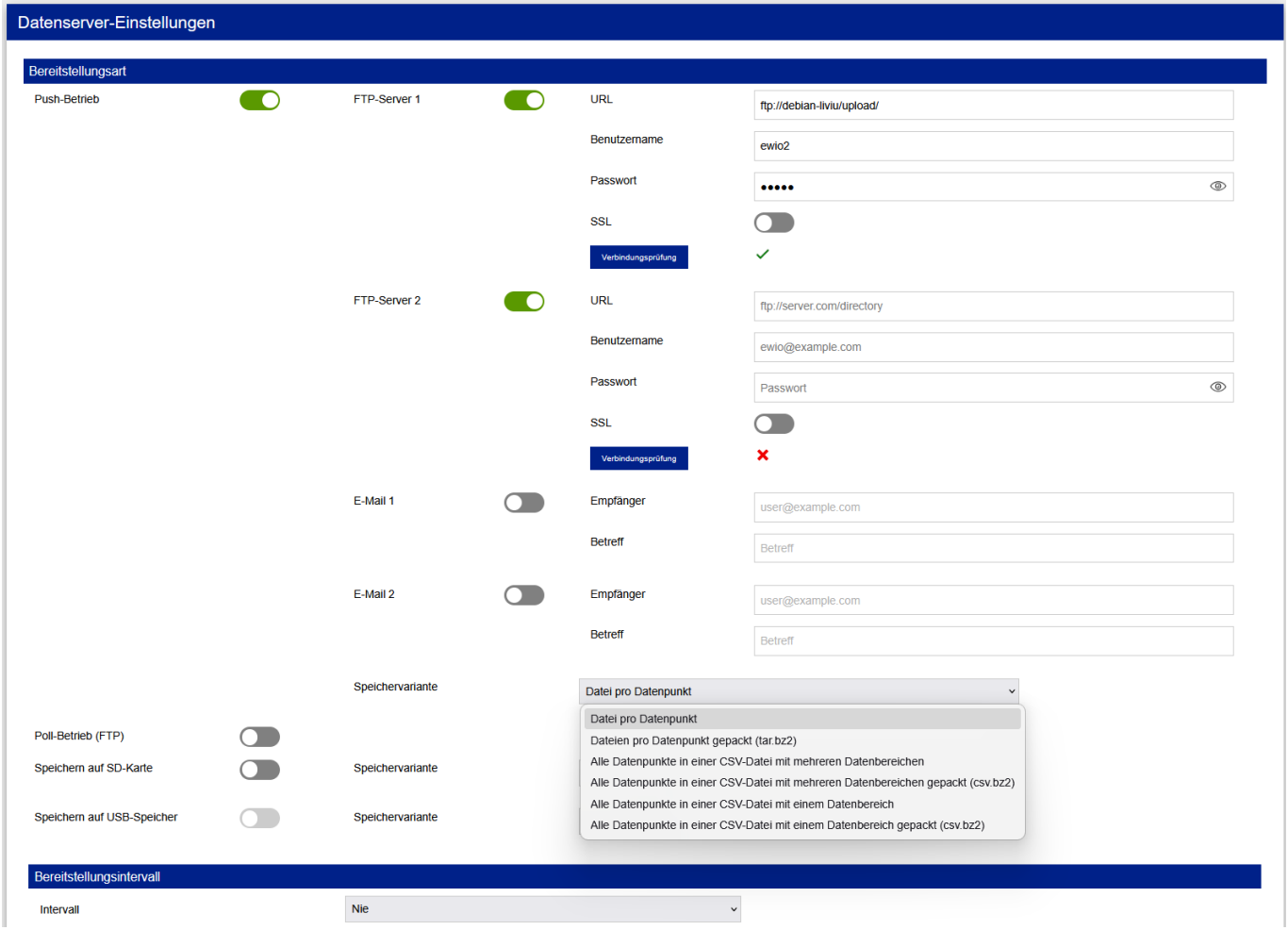
The decimal delimiter point or comma is used to separate "places before decimal point" and "places after decimal point" in the measured values.

The timestamp delimiter separates date and time within the timestamp. Here you can choose between a space and the letter "T".

The meaning of the configuration settings and data is explained in chapter 10.5.7.2.

10.5.8.2. Settings

In the menu window "Data server settings" the mode of sending the stored measured values is selected.



The two slide switches "Push operation" and "Poll operation (FTP)" are used to select whether the data is sent by EWIO$_2$ or retrieved by an FTP client.
In push mode, the EWIO$_2$ sends measurement files to one or two FTP servers or to one or two e-mail addresses.

When activating the slide switches for sending via FTP server, the URL, user name and password must be specified and whether the data should be encrypted via SSL.

The 'Connection check' button can be used to verify the accuracy of the login data. A connection to the FTP server is established and the user is given feedback on the accuracy of their login data. This function is also available when the slide switch is deactivated.

When activating the slide switches for sending by email, the email address and subject must be specified. The settings made in the menu item "System" in the menu window "Email" are relevant here.

The slide switches "SD card storage" and "USB memory storage" enable data storage on an SD card or USB memory stick connected to the EWIO$_2$.

In the pop-up menu you can select whether individual files are created and sent per data point or whether they are sent as a packed file (.tar.bz2), which contains and compresses the individual CSV files.
The data of all data points can also be collected in a single CSV file. The format with multiple data areas locates the data of individual data points underneath each other, with separate and independent timestamp columns. The format with a single data area locates the data of individual data points besides each other, with a single common timestamp column. For this format, all data points should be sampled in the same interval.
The tar.bz2 format can be unpacked with a standard program such as "7-Zip". After unpacking, the measured value files are again available in CSV format.

For the push operation different times for the provision interval can be selected.



If the slide switch "Short supply ranges for data server" in the basic system configuration (visible only in expert mode, see chapter 10.5.2.1) is enabled, additional intervals between 1 minute and 10 minutes can be selected.

In poll mode, measurement files can be retrieved from the EWIO$_2$ via FTP client.
As client a special program, e.g. "Filezilla" or a web-browser can be used

FTP-URL: ftp://ftpuser@(ip-adr)/data

When logging in, the password for the FTP user specified in the Setup Wizard, Chapter 10.3. or in Expert Mode, Chapter 10.5.2.1. under the menu window "Password", Chapter 10.5.2.8. must be used.

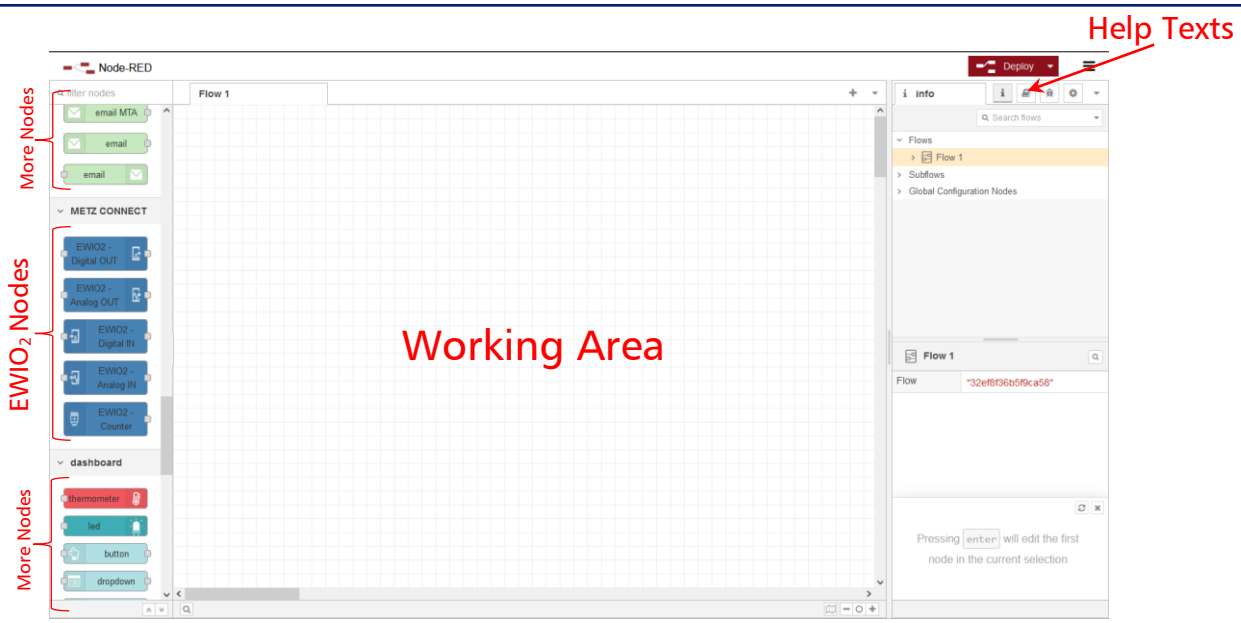
The user name is ftpuser.

10.5.9. Node-RED

Under the menu item "Node-RED" is the Node-RED editor and Node-RED dashboard located.

10.5.9.1. Editor

The menu window "Editor" shows the Node-RED editor.

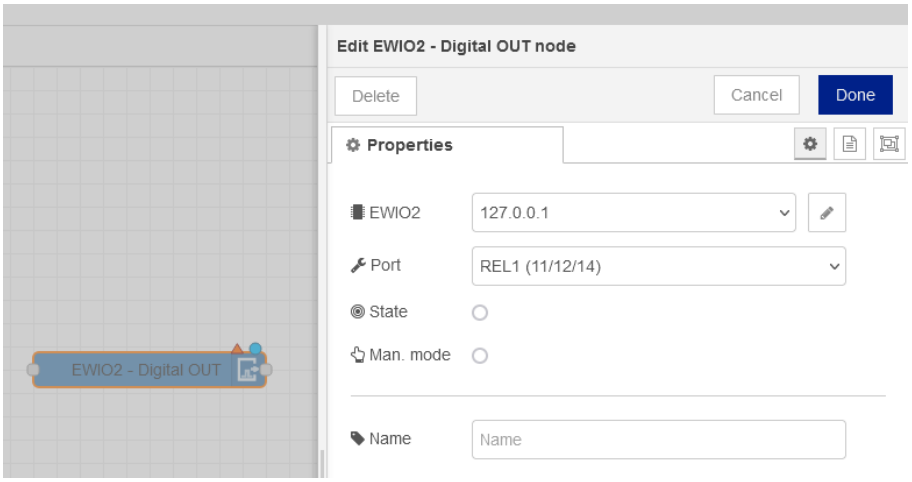


Additionally, to the Node-RED default configuration, there are several nodes already pre-installed. These are especially the dashboard nodes and nodes to connect to EWIO$_2$. The nodes can be found in the column on the left-hand side. Within the "METZ CONNECT" section, there are the EWIO$_2$ nodes.

If connection to the internet is established, further nodes can be installed via palette. How to install nodes without internet connection is described in chapter 10.5.9.1.1.

Clicking the action field showing a book symbol close to the upper right corner shows help texts for all nodes.

With drag & drop the nodes can be places in the working area. The outputs of nodes can be connected to inputs of other nodes, this is known as as flow. By double clicking a node, the configuration menu opens.



To connect to an EWIO$_2$, always a EWIO$_2$ configuration node is necessary. This node knows the address and access details of EWIO$_2$ and handles the communication.

Further information about Node-RED and handling of Node-RED can be found online.

The documentation of a node can be found within help menu , below the "deploy" button.

10.5.9.1.1. Install nodes (without connection to internet)

If EWIO$_2$ is not connected to internet, nodes can be installed via browser of PC.

First the node must be downloaded via browser to PC. Therefore, the following address (template) must be entered into address bar of the browser:

https://registry.npmjs.org/x/-/x-y.tgz

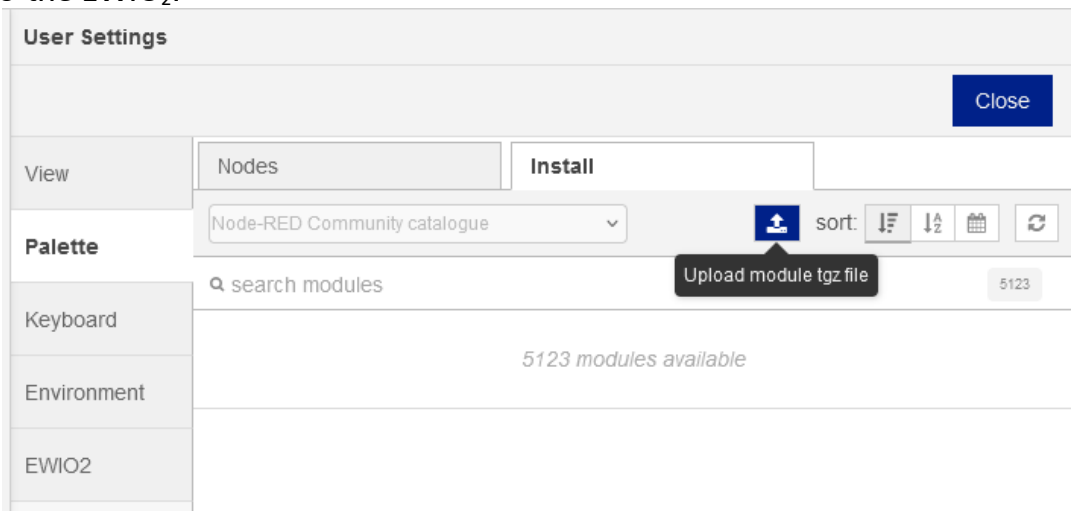
Both "x" must be replaced with the name of the node and the "y" must be replaced with the version number of the node.

As example could the EWIO$_2$ node (node-red-ewio2) be downloaded with the following address:

https://registry.npmjs.org/@metz-connect/node-red-ewio2/-/node-red-ewio2-1.0.1.tgz

Attention: only an example, this node is already preinstalled on the EWIO$_2$.

With the "Upload module tgz-file" button of the palette, the node can be loaded and installed to the EWIO$_2$.



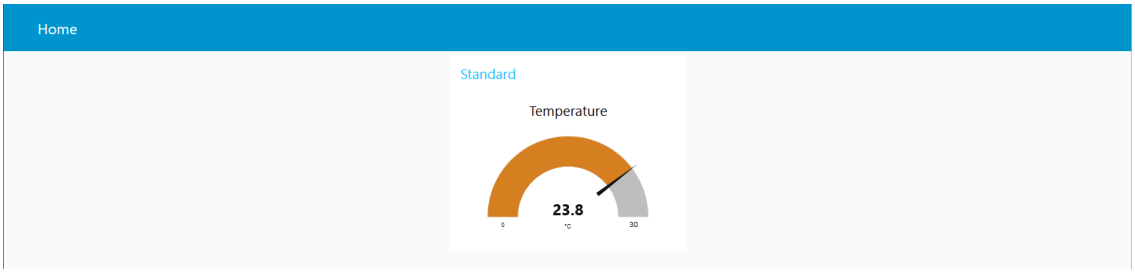
Maybe restart of Node-RED is required after installation of node.

Hint!

There are nodes that access other nodes.
These must be loaded beforehand.

10.5.9.2. Dashboard

The menu window "Dashboard" shows the Node-RED dashboard. Dashboard nodes can be added to a flow in the Node-RED editor. Depending on the nodes and their configuration, the dashboard elements are represented visually in the dashboard.



10.5.10. Logout

With the menu item "Logout" the session is terminated and the start window of the EWIO$_2$ is displayed.

11. Access the IOs from the command line or via script application

This chapter provides information about query and control of the digital and analog inputs and outputs of an EWIO$_2$ from the command line or per scripts application.

For this purpose, a command line tool named „ewioIOControl“ is installed on the EWIO$_2$. This tool can be used to send a single command to the ewio2Server, the central software control unit, in order to query or control an I/O pin at a time.

11.1. Calling conventions

The general syntax of the CLI Tool is:

ewioIOControl <command>

where <command> has the following structure:

<base_command>_<io-category>_<module-addr>_<pin-addr>[_value]

The <base-command> possible values are „set“ or „get“.

The <io-category> may be one of „ai“, „ao“, „di“, „do“, „aisensor“ or „dicount“

Each individual pin (digital or analog In-/Output) is identified by it’s address.
The address consists of two parts: module address and pin address.

The module address <module-addr> ever has the value 0 for the EWIO$_2$ base device and the values 1-6 for the extention modules.

The <pin-addr> is the address of the pin of a certain category for a module at address <module-addr>. The pin address must be entered with two digits with leading zeroes and begins always with „00“.

The [_value] part is optional (only for “set” commands) and represents the value to be set (for digital outputs 0 or 1, for analog outputs the float value with decimal point, for ai the sensor id : integer according definition table, di counter : positive integer value).

More detailed, the <command> parameter looks like:

set|get_ai|ao|di|do|aisensor|dicount _<moduladdr>_<pinaddr>[_value]

11.2. Return values

The „ewioIOControl“ tool will generally return a keyword or a value on each call.

If the ewio2Server is not reachable the return value will be „no_server“.

For „set“ commands the return value will be one of the keywords:

„ok“: issued when the set command successfuly executed.
„err“: issued when an error occurred. No further details will be shown.
„man“: issued when the output to be controlled is in the manual operating mode.
„range“: issued when the value to be set is not in the allowed range.

For „get“ commands the return value will be a digital or analog value in floating point format, or the keyword „err“ in case of errors.

11.3. Examples

11.3.1. Set an analog value for an analog output

ewioIOControl set_ao_0_01_3.73

The command above, will set 3.73 V to the analog output AO2 (O2/-)
the return value is „ok“

ewioIOControl set_ao_0_02_25.5

The command above will try to set a value out of range for the analog output AO3 (O3/-).
The return value is „range“ and the output value will be set to the maximum value of the AO (10.24 V).

11.3.2. Set a digital value for a digital output

ewioIOControl set_do_0_00_1

The command above, will set „1“ to the first digital output REL1 (11/12/14)
The return value is „ok“

ewioIOControl set_do_0_01_32

The command above will try to set a value out of range for the second digital output REL2 (21/22/24).
The return value is „range“ and the output value will be set to 1 (on).

11.3.3. Set the sensor ID of an analog input

ewioIOControl set_aisensor_0_00_3

The command above, will set the sensor ID of the first analog input AI1 (E1/-) to 3 ("0-10 Volt"). The number corresponds to the entries in the pop-up menu as described in chapter 10.5.3.2.
The return value is „ok“

ewioIOControl set_aisensor_0_01_184

The command above will try to set the sensor ID of the second analog input AI2 (E2/-) to a value out of allowed range (see chapter 11.7.)
The return value is „err“ and the sensor ID of the AI remains unchanged.

11.3.4. Set the counter value of a digital input

ewioIOControl set_dicount_0_00_366

The command above, will set the counter initial value of the first digital input DI1 (1+/-) to 366.
The return value is „ok“

ewioIOControl set_dicount_0_57_134

The command above will try to set the counter value of a not axisting digital input.
The return value is „err“.

11.3.5. Get the analog value of an analog input

ewioIOControl get_ai_0_01

The command above, will return the analog value of the second analog input AI2 (E2/-).
The return value is a float value with decimal point (like „2.46“).

ewioIOControl get_ai_0_08

The command above will try to get the value of a not existing analog input
The return value is „err“.

11.3.6. Get the digital value of a digital input

ewioIOControl get_di_0_00

The command above, will return the digital value of the first digital input REL1 (11/12/14)
The return value may be „0“ or „1“

ewioIOControl get_di_1_03

The command above will try to get the value of a not existing digital input
The return value is „err“.

11.3.7. Get the sensor ID of an analog input

ewioIOControl get_aisensor_0_01

The command above, will get the sensor ID of the second analog input AI2 (E2/-).
The return value is a valid sensor Id (see chapter 11.7.).

ewioIOControl get_aisensor_0_07

The command above will try to get the sensor ID of a not existing analog input.
The return value is „err“

11.3.8. Get the counter value of a digital input

ewioIOControl get_dicount_0_00

The command above, will return the current counter value of the first digital input DI1 (1+/-).
The return value is an integer.

ewioIOControl get_dicount_0_24

The command above will try to get the counter value of a not axisting digital input.
The return value is „err“.

11.4. Remotely query/control IOs of an EWIO$_2$

For the sake of security, the „ewioIOControl“ tool can only be executed locally on EWIO$_2$.

In order to remotely access the IOs of another EWIO$_2$ device, you must call the tool via SSH on this one. This can be only useful if an implicit authentification method is used (i.e. without user input of credentials).

Attention!



The following instructions require Linux knowledge and are performed on a Linux console.

11.4.1. Configure a SSH key-based authentication

To allow the remotely execution of the „ewioIOControl“ tool from another EWIO$_2$ (or generally a linux system) you need to setup the SSH key-based authentification for on the controlled EWIO$_2$.

11.4.1.1. Generate the SSH keys

To configure the SSH key authentication to the controlled EWIO$_2$ device we need first to generate an SSH key pair on the local linux system used for remote control.

To do this, enter:

ssh-keygen

You will get in the terminal the following messages issued:

```
Generating public/private rsa key pair.
Enter file in which to save the key (/home/root/.ssh/id_rsa):
```

Press <ENTER>

```
/home/root/.ssh/id_rsa already exists.
Overwrite (y/n)?
```

Input <y>

```
Enter passphrase (empty for no passphrase):
```

Press <ENTER>

Hint!



Always let the passphrase empty otherwise the user will be asked on every login for it!

```
Enter same passphrase again:
```

Press <ENTER>

If the keys were successful generated you'll get the following output:

```
Your identification has been saved in /home/root/.ssh/id_rsa.
Your public key has been saved in /home/root/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:jYgP6ipdp9OrPzf1KaM7Gacnfh7g88gdbqeceD9jWKg root@EWIO2-7e956e
The key's randomart image is:
+---[RSA 2048]----+
|                 |
|                 |
|                 |
|     . . o       |
|    o . S ..     |
|   ..o....+ .    |
| ... +. oBo+ .   |
|... o o.EOO+B    |
|o.. .+o=B%OB.o   |
+----[SHA256]-----+
```

11.4.1.2. Deploy the public key

You need to deploy the public-key on the EWIO$_2$ device you intend to remotely control:

```
cat ~/.ssh/id_rsa.pub | ssh root@<ewio2-remote-IP> "mkdir -p ~/.ssh && cat >>
~/.ssh/authorized_keys"
```

You'll be asked for root password:

root@<ewio2-remote-IP>'s password: <password><ENTER>

11.4.1.3. Test the ssh connection

You can test now the ssh-login on the remote EWIO$_2$:

ssh root@<ewio2-remote-IP>

You are able to log in as root on the EWIO$_2$ with no need of credentials input.

11.4.2. Remote call

Once you have set the key-based ssh authentification for the remote EWIO$_2$, you can call the tool using following command:

ssh -n <remote-ewio2-host> /usr/bin/ewioIOControl <command>

The <remote-ewio2-host> parameter is the hostname (if an entry in the /etc/hosts file exists) or the IP-Address of the remote EWIO$_2$.

11.5. Usage of aliases

On the command line you can use the alias:

ewiolc <command>

for local control, or:

ewiorc <hostname/IP> <command>

for remote control.

If you intend to use those aliases also in shell scripts (non-login shell), you need to create the ~/.bashrc file on the EWIO$_2$ device with following content:

```
# Set alias for io local control tool
alias ewiolc='function _(){ /usr/bin/ewioIOControl $1; }; _'

# Set alias for io remote control tool
alias ewiorc='function _(){ ssh -n $1 /usr/bin/ewioIOControl $2; }; _'
```

11.6. Shell Script example (measuring and control)

The following example shell script illustrates the usage of the „ewioIOControl" tool for measuring and control purposes.

The analog input 1 (at address „0_00") will be queried in a loop every second.
If the value of the input falls below the defined lower limit (here 3.5 Volt), the digital output 1 (at „0_00") will be set to 1, otherwise to 0.

If the value of AI1 rises over the defined upper limit (here 7.5 Volt) the second digital output („0_01") will be set to 1, otherwise to 0.

```
#!/bin/sh

ai_monitor_addr="0_00"
do_under_range_sig_addr="0_00"
do_over_range_sig_addr="0_01"

lower_voltage_limit="3.5"
upper_voltage_limit="7.5"

while true; do

current_in_voltage=$(ewioIOControl get_ai_$ai_monitor_addr)

cmp_lower=`echo "$current_in_voltage >= $lower_voltage_limit" | bc`

if [ $cmp_lower == 1 ]; then
  #over the lower limit, turn do 0 off
  ewioIOControl set_do_${do_under_range_sig_addr}_0 >/dev/null
else
  #under the lower limit, turn do 0 on
  ewioIOControl set_do_${do_under_range_sig_addr}_1 >/dev/null
fi


cmp_upper=`echo "$current_in_voltage <= $upper_voltage_limit" | bc`

if [ $cmp_upper == 1 ]; then
  #under the upper limit, turn do 1 off
  ewioIOControl set_do_${do_over_range_sig_addr}_0 >/dev/null
else
  #over the upper limit, turn do 1 on
  ewioIOControl set_do_${do_over_range_sig_addr}_1 >/dev/null
fi

sleep 1
done
```

To test this script, log in to the EWIO$_2$ and put the content from above into a file named for example „meas_and ctrl.sh“ in „/usr/bin“ using the vi editor.
Change the permission of the file to 755.
Make sure the digital outputs 1 and 2 are not in manual mode. Set the range of the AI1 to 0-10 Volt using a GUI client.

Activate the script, how is described in chapter 10.5.5.1., and apply different voltages to AI1.

If the applied voltage is lower than 3.5 Volt, the DO1 will be turned on, otherwise turned off.

Increase the voltage over 7.5 Volt; the DO2 will be turned on. If the input voltage falls under 7.5 Volt, the DO2 will be turned off.

11.7. Sensor IDs for the analog inputs and their meaning

Sensor	string Name enum Unit	Minimum Maximum	enum Sensor enum Range
1	"0-10V %" UNITS_PERCENT	0.0 100.0	ewioSensor_0_10V_Percent ewioRange_Volt
2	"0-5V % Pullup" UNITS_PERCENT	0.0 100.0	ewioSensor_0_5V_Percent_PU ewioRange_Volt_PU
3	"0-10 Volt" UNITS_VOLTS	0.0 10.0	ewioSensor_0_10V ewioRange_Volt
4	"0-5 Volt Pullup" UNITS_VOLTS	0.0 5.0	ewioSensor_0_5V_PU ewioRange_Volt_PU
5	"Ohm" UNITS_OHMS	40.0 4E6	ewioSensor_Ohm_2Wire ewioRange_Ohm_2Wire
6	"User Defined" UNITS_NO_UNITS	0.0 0.0	ewioSensor_UserDef ewioRange_Modes ???
7	"PT100" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_PT100 ewioRange_Ohm_2Wire
8	"PT500" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_PT500 ewioRange_Ohm_2Wire
9	"PT1000" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_PT1000 ewioRange_Ohm_2Wire
10	"NI1000-TC5000" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_NI1000_TC5000 ewioRange_Ohm_2Wire
11	"NI1000-TC6180" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_NI1000_TC6180 ewioRange_Ohm_2Wire
12	"BALCO500" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_BALCO500 ewioRange_Ohm_2Wire
13	"KTY81_110" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_KTY81_110 ewioRange_Ohm_2Wire
14	"KTY81_210" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_KTY81_210 ewioRange_Ohm_2Wire

Sensor	string Name enum Unit	Minimum Maximum	enum Sensor enum Range
15	"NTC1k8 Thermokon" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_NTC1k8_Thermokon ewioRange_Ohm_2Wire
16	"NTC5k Thermokon" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_NTC5k_Thermokon ewioRange_Ohm_2Wire
17	"NTC10k Thermokon" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_NTC10k_Thermokon ewioRange_Ohm_2Wire
18	"NTC20k Thermokon" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_NTC20k_Thermokon ewioRange_Ohm_2Wire
19	"LM235Z" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_LM235Z ewioRange_Volt_PU
20	"NTC10k Carel" UNITS_DEGREES_CELSIUS	-50.0 110.0	ewioSensor_NTC10k_Carel ewioRange_Ohm_2Wire
21	"NTC5k Schneider" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_NTC5k_Schneider ewioRange_Ohm_2Wire
22	"NTC30k Schneider" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_NTC30k_Schneider ewioRange_Ohm_2Wire
23	"KP250" UNITS_DEGREES_CELSIUS	-50.0 150.0	ewioSensor_KP250 ewioRange_Ohm_2Wire
24	"Poti 10k %" UNITS_PERCENT	0.0 100.0	ewioSensor_Poti_10k_Percent ewioRange_Ohm_2Wire
25	"Inactive" UNITS_NO_UNITS	0.0 0.0	ewioSensor_Inactive ewioRange_Inactive
26	"0-20mA %" UNITS_PERCENT	0.0 100.0	ewioSensor_0_20mA_Percent ewioRange_mAmpere
27	"0-20mA" UNITS_MILLIAMPERES	0.0 20.0	ewioSensor_0_20mA ewioRange_mAmpere
28	"4-20mA %" UNITS_PERCENT	0.0 100.0	ewioSensor_4_20mA_Percent ewioRange_mAmpere
29	4-20mA UNITS_MILLIAMPERES	4.0 20.0	ewioSensor_4_20mA ewioRange_mAmpere
30	"3-wire sensing" UNITS_OHMS	0.0 14E3	ewioSensor_Ohm_3Wire ewioRange_Ohm_3Wire
31	"4-wire sensing" UNITS_OHMS	0.0 14E3	ewioSensor_Ohm_4Wire ewioRange_Ohm_4Wire
32	"40 Ohm - 14 kOhm" UNITS_OHMS	40.0 14E3	ewioSensor_Ohm_Test1 ewioRange_Ohm_Test1
33	"12 kOhm - 4 MOhm" UNITS_OHMS	12E3 4E6	ewioSensor_Ohm_Test2 ewioRange_Ohm_Test2
34	"40 Ohm - 650 Ohm" UNITS_OHMS	40.0 650.0	ewioSensor_Ohm_Test3 ewioRange_Ohm_Test3

Sensor	string Name enum Unit	Minimum Maximum	enum Sensor enum Range
35	"500 Ohm - 14 kOhm" UNITS_OHMS	500.0 14E3	ewioSensor_Ohm_Test4 ewioRange_Ohm_Test4
36	"12 kOhm - 180 kOhm" UNITS_OHMS	12E3 180E3	ewioSensor_Ohm_Test5 ewioRange_Ohm_Test5
37	"140 kOhm - 4 MOhm" UNITS_OHMS	140E3 4E6	ewioSensor_Ohm_Test6 ewioRange_Ohm_Test6

12. API – Programming interface

Communication between the EWIO2 and the web interface takes place via HTTP over TCP/IP by default. Alternatively, secure access via TLS-encrypted connections (HTTPS) is possible.

The application-layer data transmitted in this way can be accessed not only by a web browser, but also by other applications. In addition, generic functions (e.g. for SQL statements) are available, enabling the implementation of additional functionality.

Detailed information about the programming interface can be found in the separate document "EWIO2 API.pdf", which is available at www.metz-connect.com.

13. Creating a template for Modbus meters

A template for a Modbus meter can be created with all common text editors.
The template is a JSON file which can be interpreted by the EWIO$_2$.

The required Modbus registers can be found in the manufacturer documentation of the new meter.

The basic format of the template looks like this:

```
{
	"device":
	{
		"Address": 0,
		"AddressBase": 0,
		"Type": "manufacturer_type",
		"TX":
		[
			{"function": 3, "start": 0, "length": 10}
		],
		"RX":
		[
			{"register": 0, "format": "HEX8", "unit": "unit",
			"description": "description", "factor": 1.0, "select":""}
		],
		"LC":
		[
			{"function": 3, "start": 0, "length": 1}
		]
	}
}
```

The individual items are:

Address	Placeholder for slave address of the device, leave at 0	
AddressBase	Start address of the address range (0 or 1)	
Type	Name of the device (any text string)	
TX [ ]	Array with send elements. Each element contains the elements to determine a send frame.	
	function	Modbus function (e.g. 3 for "Read Holding Register"), the following Modbus functions are supported: 1 ("Read Coils"),

		2 ("Read Discrete Inputs"), 3 ("Read Holding Register"), 4 ("Read Input Register")
	start	Start address (decimal)
	length	Number of bytes (decimal)
RX [ ]		Array with receiving elements. Each element contains the components to determine a data point. The data appear on the web interface as data points to be selected.
	register	Start address of values
		format Type of the value, possible are: (HL: High-Byte - Low-Byte; LH: Low-Byte - High-Byte; B… (arbitrary byte order with specification of byte positions), here 0 represents the least significant byte, the notation INT32 B0123 is equivalent to INT32 LH, INT32 B3210 is equivalent to INT32 HL)
		INT8, UINT8, INT16 HL, INT16 LH, UINT16 HL, UINT16 LH, INT32 HL, INT32 LH, UINT32 HL, UINT32 LH, INT32 B0123 (arbitrary byte order), UINT32 B0123 (arbitrary byte order), INT48 HL, INT48 LH, UINT48 HL, UINT48 LH, INT48 B012345 (arbitrary byte order), UINT48 B012345 (arbitrary byte order), INT64 HL, INT64 LH, UINT64 HL, UINT64 LH, INT64 B01234567 (arbitrary byte order), UINT64 B01234567 (arbitrary byte order), FLOAT32 HL, FLOAT32 LH, FLOAT32 B0123 (arbitrary byte order), FLOAT64 HL, FLOAT64 LH, FLOAT64 B01234567 (arbitrary byte order), HEX8, HEX16 HL, HEX16 LH, HEX32 HL, HEX32 LH HEX48 HL, HEX48 LH, HEX64 HL, HEX64 LH, MOD10 32 I, MOD10 48 I, MOD10 64 I
	unit	Unit as text string
	description	Description of the data point as text string
	factor	Optional default value for the factor attribute of the data point (decimal)
	obis_id	Optional default value for the OBIS code attribute of the data point as string

	select	Placeholder for the Select button, do not change!
LC [ ]	Optional single-element array with send elements for live check. The array element describes the send frame to be used for live check.	
	function	Modbus function (e.g. 3 for "Read Holding Register")
	start	Start address (decimal)
	length	Number of bytes (decimal)

Example:

```
{
	"device":
	{
		"Address": 0,
		"AddressBase": 1,
		"Type": "econ unit + V2",
		"TX":
		[
			{"function": 3, "start": 2, "length": 50}
			// Modbus-command „Read Holding Registers“, 50 registers beginning
			with register 2
			{"function": 3, "start": 52, "length": 50}
			// Modbus-command „Read Holding Registers“, 50 registers beginning
			with register 52
					:
					:
		],
		"RX":
		[
			{"register": 2, "format": "FLOAT32 HL", "unit": "kWh","description": "Real
			Energy L1, L2, L3", "factor": 1.0, "obis_id": "1.8.1", "select":""},
			{"register": 2, "format": "FLOAT32 HL", "unit": "kWh","description": "Real
			Energy L1, L2, L3", "factor": 1.0, "obis_id": "1.8.2", "select":""},
					:
					:

		],
		"LC":
		[
			{"function": 3, "start": 2, "length": 1}
			// Modbus-command „Read Holding Registers“, 1 register beginning with
			register 2
		]
	}
}
```

14. Version History

Changes in Software-Version 2.2.2
- Security-fix: Patched php Version to version 8.5.12

Changes in Software-Version 2.2.2
- fixed problem with firmware update via API endpoint
- Anyviz cloud adapter update to version 2.1.2.2
- BACnet server supports fallback IP address 192.168.0.111

Changes in Software-Version 2.2.1
- Support for Schneider Electric data types "Mod10"
- Web server "nginx" security update to version 1.28.1
- The backup time server is optional (NTP settings)
- When creating a new meter, the "Craft" field is optional

Changes in Software-Version 2.2.0
Several security patches:
- Improved commissioning wizard – no longer possible to execute if device is already initialized.
- Updated php version to 8.1.33.
- Restricted file upload – only whitelisted file patterns like *.json are allowed to upload.

Changes in Software-Version 2.1.0
- Official BACnet certificate.
- Formula correction "Counterstartvalue" S0/M converter.
- Connection check to FTP server possible.
- Bugfix: The char '#' is allowed to be used everywhere.
- Security Improvement: Closed port 21 if FTP server is disabled.
- Security Improvement: Disabled ChaCha20-Poly1305 by default for ssh connection.

Changes in Software-Version 2.0.13
- Retrieving measurement data of meters can be deactivated.
- It is now possible to enter the start value for meters behind a S/0M converter.
- Bug-fixing: The status of the external digital inputs is displayed correctly after reloading the web page (F5).
- Bug-fixing: User Standard must not see passwords in plain text.
- Updated openssh to 9.8p1.
- Node-RED metering node can load measurement data from database.
- Added REST API endpoint Load extended counter type list
- Data Server: filename of csv contains UTC timestamp, if "Save timestamp as UTC" is active.
- Date Server: Avoid duplicates of measurement data. Measured values at the time of csv generation are considered in the following data server interval.
- Added OBIS code to Modbus templates.

- Increased number of supported Modbus registers to 1024 per meter.
- Added REST API endpoint Live Check.

Changes in Software-Version 2.0.9

- Added support of EMU meters.
- Improved REST API endpoint to retrieve measurement data from database, to define amount of retrieved measurement data.
- Added error output for not readable system meters.
- Added NTP-Server monitoring and error output.
- Added configuration of port numbers for HTTP and HTTPS access of web-interface.
- Added timestamp formats with timezone offset for CSV files.

Changes in Software-Version 2.0

- Added Node-RED.
- Sorting order of measurement value and MBus search results displays can be changed by user.
- Added additional input recording, data point readout and data server supply intervals.
- Added data point configuration sliding switch "Changes" that allows to save measurement values only if changed since the previous reading.
- Added error counters for MBus and Modbus to the metering overview page.
- System meter data points based on digital inputs can store pulse counter values.
- Added data server send variants with all data contained in a single CSV file.
- Added real-time clock synchronization for EMH-DIZ load profile meters.
- Added automatic reset of installation and start flag of 4xS0/M-converters.
- Added Modbus template element device.LC to configure live check send frame.
- Added "Use STARTTLS command" sliding switch to E-mail configuration.

Changes in Software-Version 1.5

- Connect MBus meter via RS-485 or TCP gateway.
- Added MBus server.
- Support MBus meters without secondary addressing.
- Read out load profile data records of load profile meters EMH-DIZ Gen. G and H.
- Added AnyViz cloud adapter.
- Added Node.js runtime environment.
- Data forwarding between WLAN- and Ethernet interfaces.
- Added firmware update via internet.
- Extended data server configuration options.

Changes in Software-Version 1.4

- Save timestamp in UTC.
- OpenVPN feature is added.
- Use extension modules as pulse counters or system meter data points.
- Download, upload and delete Modbus templates in the web interface.
- More characters for passwords.
- French language support.

- Data logging for Modbus meters via IP addresses.
- Free SSID input for WLAN client mode.

Changes in Software-Version 1.3

- Fixed power-down-loss of counter values of digital inputs configured as pulse counters
- Improved stability of measurement value retrieval with multiple MBus meters

Changes in Software-Version 1.2

- Fixed primary address assignment after repeated MBus search

Changes in Software-Version 1.1

- Pulse counter values of digital inputs can be set through web-interface
- Added user defined characteristic curve for analog inputs
- Fixed percentage based measurement values of analog inputs
- Added user defined links to other devices
- Meter order for measurement value retrieval can be changed by user
- Added query interval „event based“ for system meter data points connected to digital inputs
- Added new action fields to application editor
- Resetting IP-configuration to factory settings resets device access passwords as well
- Completed support of operating modes of extension module MR-CI4
- Completed support of operating modes of extension module MR-AI8
- Added support for FREEZE command of 4xS0/M-converter
- Added configuration of sensor type and temperature offset of 4xT/M-converter