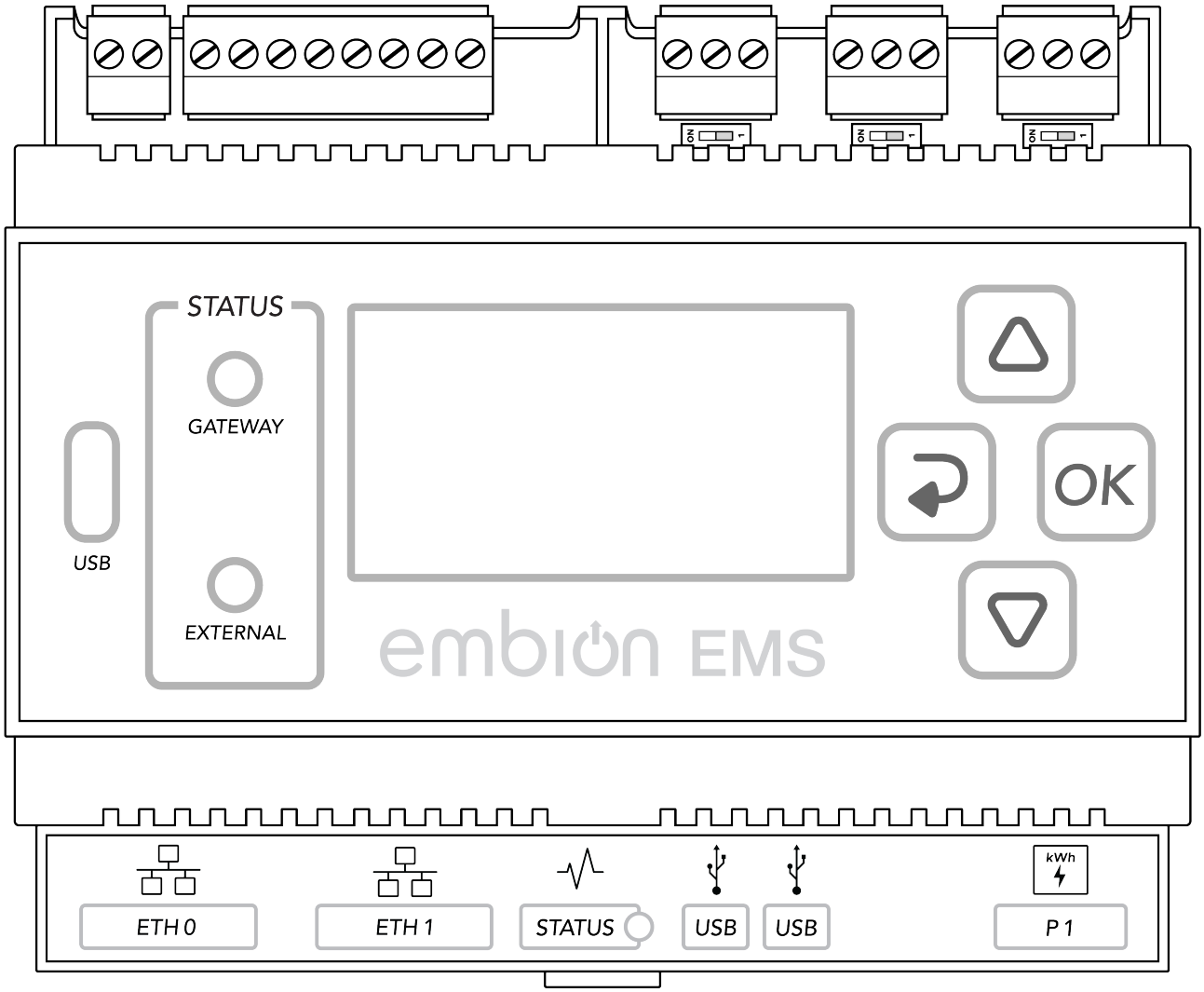
embion EMS

User Manual - Embion EMS Controller



embion

6.1 rev. 1

User Manual - Embion EMS Controller

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Introduction

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Disclaimer

By using this product, the user acknowledges and accepts this disclaimer.

The Embion EMS Controller is designed for use in electrical systems, but it is not a safety device. It is the responsibility of the user to ensure that the system is properly equipped with the necessary safety measures to protect against any potential hazards. If the user is unsure about the safety requirements of their electrical system, they should consult with a qualified installer or distributor to determine what additional components or redundancy measures may be necessary. Embion B.V. cannot be held liable for any damages or injuries resulting from the use of the Embion EMS Controller without proper safety measures in place.

Exclusions/Limitations of Liability

1. In the event of attributable non-performance, Embion remains obliged to fulfil its contractual obligations. Any liability of Embion is limited to what is set out in this provision.
2. The potential liability of Embion, based on any legal ground whatsoever, cannot result in it having to pay an amount to its customer that exceeds the amount paid out in any given case under an insurance policy concluded by Embion.
3. If, for whatever reason, Embion is unable to invoke clause 2 of this article, the obligation to pay any amount, for whatever reason, is limited to a maximum of the purchase price (exclusive of VAT), plus 15%. If the agreement between Embion and its customer consists of parts or partial deliveries, this obligation is limited to the purchase price of that part or partial delivery (exclusive of VAT), plus 15%.
4. The potential obligation of Embion to compensate for damage is further limited as set out below in this provision.
5. Embion shall only be liable for direct damage. Liability for indirect damage and for non-pecuniary loss is expressly excluded.
6. Direct damage solely refers to the reasonable costs incurred in determining the cause and extent of the damage, insofar as the determination concerns damage within the meaning of these terms, any reasonable costs incurred to make the product supplied by Embion comply with the agreement, insofar as these can be attributed to Embion, and reasonable costs incurred to prevent or limit direct damage as referred to in these general terms and conditions.
7. Indirect damage includes, but is not limited to: consequential damages, loss of (production) profit, energy costs, feed-in costs, network costs or fees, missed net metering, missed savings, lost profits, fines, taxes, levies, missed tax benefits, and missed subsidies.
8. The total liability of Embion is limited to what is determined above.
9. The customer indemnifies Embion against claims from third parties, on any grounds whatsoever, who suffer damage in connection with the performance of the agreement between Embion and its customer and where the cause is attributable to anyone other than Embion.

Warranty for the Embion EMS Controller

Embion B.V. provides a limited warranty for the Embion EMS Controller (the “Product”) to the original purchaser (“Purchaser”) for a period of two (2) years from the date of purchase.

Embion B.V. warrants that the Product shall be free from defects in materials and workmanship under normal use and service during the applicable warranty period. In the event that a defect arises within the warranty period, Embion B.V. shall, at its sole discretion and expense, either repair or replace the defective Product, or refund the purchase price paid by the Purchaser.

This warranty does not cover any damage caused by misuse, abuse, accident, neglect, or unauthorised modification of the Product. The warranty also does not cover any damage caused by natural disasters.

To make a warranty claim, the Purchaser must provide proof of purchase and contact the reseller of the Embion EMS Controller. The reseller will provide instructions on how to return the defective Product and receive a replacement or refund.

THIS WARRANTY IS THE ONLY EXPRESS WARRANTY MADE BY Embion B.V. WITH RESPECT TO THE PRODUCT. Embion B.V. EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL Embion B.V. BE LIABLE FOR ANY INCIDENTAL, SPECIAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE PRODUCT OR THIS WARRANTY.

Some jurisdictions do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations may not apply to the Purchaser. This warranty gives the Purchaser specific legal rights, and the Purchaser may also have other rights which vary from jurisdiction to jurisdiction.

This warranty is governed by and shall be construed in accordance with the laws of the Netherlands without giving effect to any choice of law or conflict of law provisions. Any dispute arising out of or in connection with this warranty shall be resolved by the courts of the Netherlands.

About this document

Purpose

This document introduces the Embion EMS Controller in terms of installation, electrical connections, system operation and maintenance and troubleshooting. Understand the Embion EMS Controller features, functions and safety precautions provided in this document before installing and operating the Embion EMS Controller.

To ensure an identical menu layout, please make sure that the version number of this document corresponds to the software release of the Embion EMS Controller.

> **Note**
>
> This product has been renamed. Information in this document related to firmware versions below v5.0.0 also applies to the SolarGateway. Despite the name change, installation, configuration, and operating procedures remain unchanged. Features and integrations introduced in version 5.0.0 and later are not supported on the SolarGateway. To benefit from the latest features and integrations, upgrade your device to Embion EMS.

Intended audience

This document is intended for operating personnel, system engineers adopting the Embion EMS Controller in their system design.

Callout conventions

This document uses the following note types as callouts:

> **Note**
>
> Used for general notes in this documentation

> **Warning**
>
> Used for expressing warnings in this documentation

> **Important**
>
> Used for important notes in this documentation

> **Tip**
>
> Used for general tips in this documentation

Caution

Used for caution notes in this documentation

Safety information

General safety

Statement

Before installing, operating or maintaining the equipment, read this document and observe all safety instructions on the equipment and in this document.

The “Warning”, and “Caution” statements in this document do not cover all the safety instructions. They are only supplements to the safety instructions. Embion B.V. will not be liable for any consequence caused by the violation of general safety requirements.

Ensure that the equipment is used only in environments that meet its design specifications. Failure to do so may result in equipment malfunction, component damage, personal injury, or property damage, which are not covered under the product warranty.

Follow local laws and regulations when installing, operating, or maintaining the equipment. The safety instructions in this document are only supplements to local laws and regulations.

Embion B.V. will not be liable for any consequences of the following circumstances:

- Operation beyond the conditions specified in this document.
- Installation or use in environments which are not specified in relevant international or national standards.
- Unauthorised modifications to the product, software or removal of the product warranty sticker.
- Failure to follow the operation instructions and safety precautions on the product and in this document.
- Equipment damage due to force majeure, such as earthquakes, fire, and storms.
- Damage caused during transportation by the customer.
- Storage conditions that do not meet the requirements specified in this document.

General requirements

> ⚠ **Warning**
>
> Do not perform installation while the system power is turned on.

- After installing the equipment, remove all unused packing materials, such as cartons, foam, plastics, and cable ties, from the equipment area.
- In the event of a fire, immediately evacuate the building or equipment area and activate the fire alarm or contact emergency services. Do not re-enter the building under any circumstances.
- Do not deface, damage, obscure, or remove any warning labels on the equipment.
- Use appropriate tools to properly tighten all screws during installation.
- Ensure you understand the system components, the operation of the Embion EMS Controller, and all applicable local standards before use.
- You shall not reverse engineer, decompile, disassemble, adapt, modify, or otherwise alter the device software; attempt to discover its internal implementation; obtain or attempt to obtain its source code; infringe upon Embion B.V.’s intellectual property rights; or disclose any performance or benchmark test results related to the device software.

Personal safety

- If there is a risk of personal injury or equipment damage during operation, immediately stop work, report the situation to your supervisor, and take appropriate protective measures.
- Use tools properly and for their intended purpose to prevent personal injury and equipment damage.

Personnel requirements

- Personnel installing or maintaining Embion B.V. equipment must be adequately trained, understand all relevant safety precautions, and be capable of performing all required tasks correctly.
- Personnel working with the Embion EMS Controller must have knowledge of IP-based networks, RS485 bus systems, Modbus protocols and addressing, validation of energy measurements, and the connected devices. The exact knowledge required may vary depending on the specific installation and application.
- Only qualified or properly trained personnel are permitted to install, operate, and maintain the equipment.
- Only qualified professionals are permitted to remove or acknowledge any safety lock or notification on the device.
- Only qualified or authorised personnel are permitted to replace the equipment or its components.

> ⓘ **Note**
>
> - **Professionals**: Personnel who are trained and experienced in equipment operation and who understand the sources and severity of potential hazards associated with installation, operation, and maintenance. Professionals are responsible for understanding the overall system architecture and working principles, including the correct configuration of the Embion EMS Controller.
> - **Trained personnel**: Personnel who have received technical training, possess relevant experience, and are aware of potential hazards associated with specific tasks. They are capable of taking appropriate protective measures to minimise risks to themselves and others.
> - **Operators**: Personnel who may interact with or operate the equipment but are neither classified as trained personnel nor professionals.

Electrical safety

General

> ⚠ **Warning**
>
> Before connecting any cables, ensure that the equipment is intact and undamaged. Failure to do so may result in electric shock or fire.

- Ensure that all electrical connections comply with applicable local electrical standards.
- Verify that all cables used meet the relevant local regulations.

Product power supply

> ⚠ **Warning**
>
> Do not connect or disconnect power cables while the system is powered on.

- Before making any electrical connections, switch off the upstream disconnector.
- Before connecting a power cable, verify that the label on the cable matches the intended connection.
- If the equipment has multiple energised inputs, ensure that all inputs are disconnected before operating the equipment.

Installation environment requirements

- Ensure the equipment is installed in a well-ventilated environment.
- Ensure that the environment temperature does not exceed the maximum allowed operating temperature.
- Do not expose the equipment to flammable or explosive gases or smoke, and do not perform any operations in such environments.

Commissioning

When powering on the equipment for the first time, ensure that a qualified professional sets all parameters correctly. Incorrect settings may cause damage to subsystems connected to the Embion EMS Controller.

Maintenance and replacement

- Perform maintenance only with sufficient knowledge of this document and using appropriate tools and testing equipment.
- If the equipment is faulty, contact your authorised dealer.
- The equipment must not be powered on until all faults are rectified. Failure to comply may worsen existing faults or cause damage to the equipment.

Internet and offline Storage

If the EMS Controller loses connection with the HUB, it will store data locally for up to one month. Once the connection is restored, the stored data will be uploaded to the HUB, which may take up to 24 hours. If the connection is lost for longer than one month, any data older than one month will not be retained.

Product overview

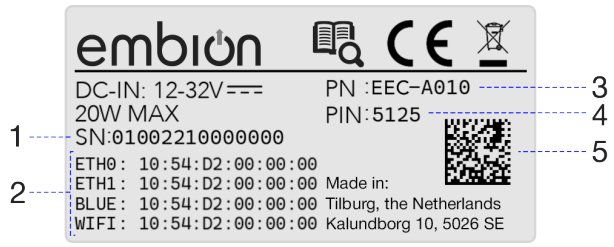
Model description

This document covers the EEC-A010 Embion EMS Controller model.

Model identification

The model number of the Embion EMS Controller can be found on the label on the side of the device. The model number is listed on the label under PN (Product Name).

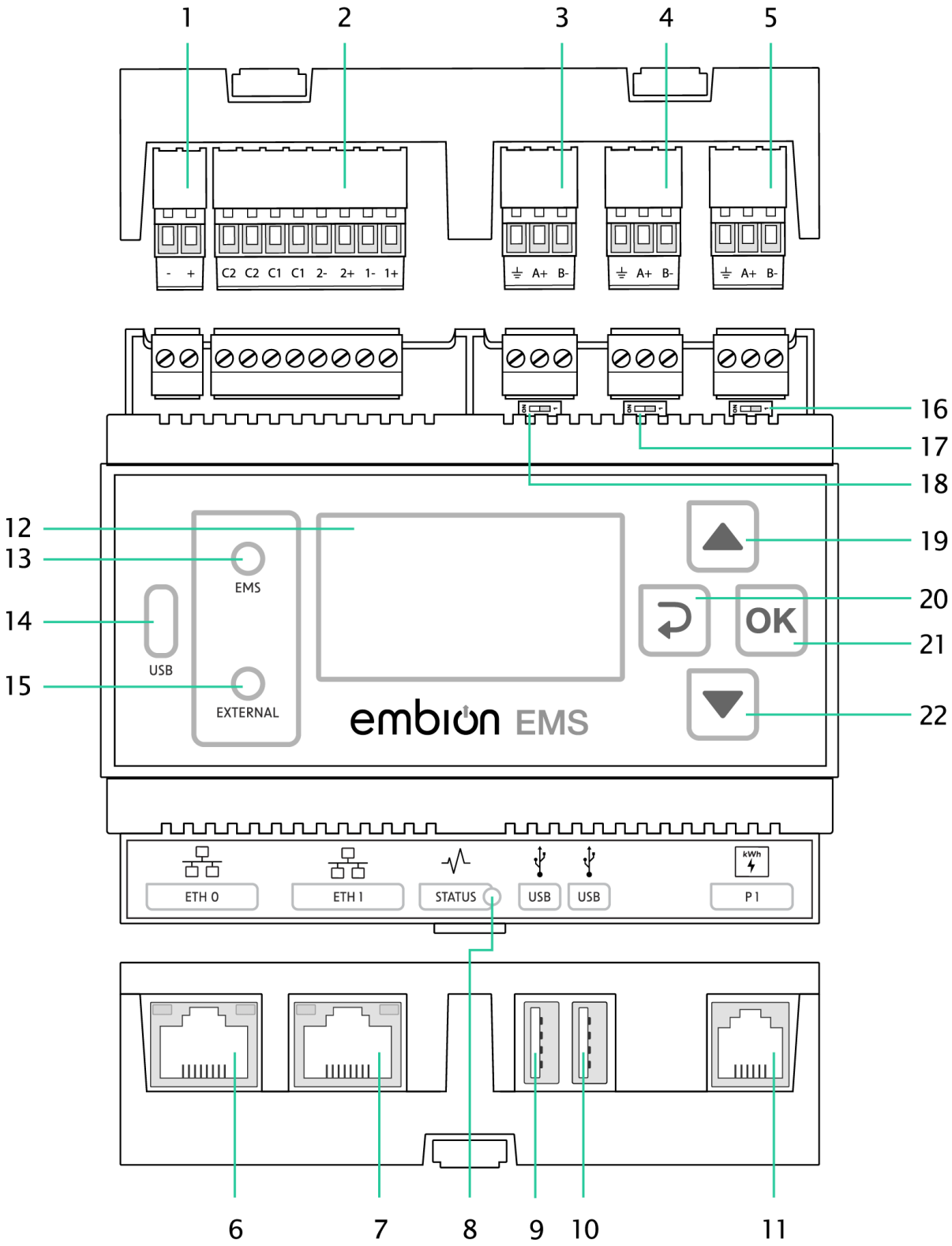
Label



Embion EMS label

1. Serial Number
2. MAC Addresses
3. Product Name
4. PIN Code
5. Datamatrix

Product appearance

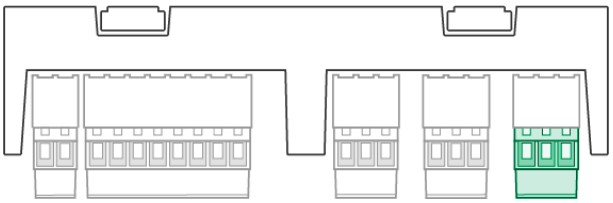


Embion EMS layout

1. X14 DC Input Port
2. X13 GPIO Port
3. X12 RS485 Port C
4. X11 RS485 Port B
5. X10 RS485 Port A
6. ETH Port 0 / POE
7. ETH Port 1
8. Status LED
9. USB Port 0
10. USB Port 1
11. P1 Port
12. LCD Screen
13. EMS status LED
14. USB-C Port
15. Service status LED
16. X10 termination switch
17. X11 termination switch
18. X12 termination switch
19. Arrow up button
20. Back button
21. OK button
22. Arrow down button

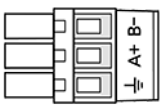
Communication ports

X10 RS485 Default inverter port



X10 RS485 port

The X10 RS485 port is the default inverter port. It is possible to deviate from the default and use the port for something different then inverters.

X10 RS485 Connector			
Image	**PIN**	**Name**	**Description**
	1	B-	RS485 Negative signal
	2	A+	RS485 Positive signal
	3	⏚	RS485 SHIELD (ISOGND)

X10 120 ohm termination switch	
Position	**Description**
	Termination ON

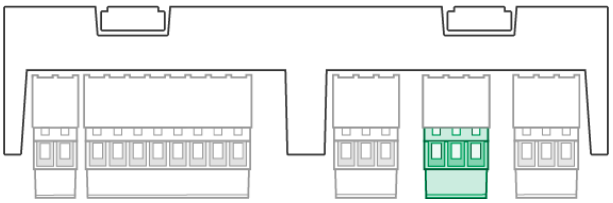
Position	Description
	Termination OFF

The X10 120 ohm termination switch is used to terminate the X10 RS485 bus.

Important

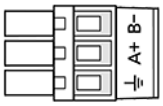
The protocol and port settings (including baud rate, parity, data bits, and stop bits) must be identical for all devices connected to the X10 port. Additionally, each (Modbus) secondary address must be unique on the same port.

X11 RS485 Default meter port



X11 RS485 port

The X11 RS485 port is the default meter port. It is possible to deviate from the default and use the port for something different then meters.

X11 RS485 Connector			
Image	PIN	Name	Description
	1	B-	RS485 Negative signal
	2	A+	RS485 Positive signal
	3	⏚	RS485 SHIELD (ISOGND)

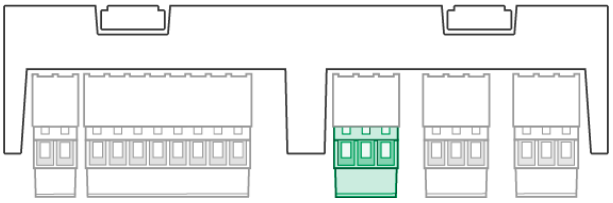
X11 120 ohm termination switch	
Position	Description
	Termination ON
	Termination OFF

The X11 120 ohm termination switch is used to terminate the X11 RS485 bus.

Important

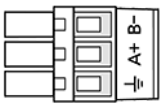
The protocol and port settings (including baud rate, parity, data bits, and stop bits) must be identical for all devices connected to the X11 port. Additionally, each (Modbus) secondary address must be unique on the same port.

X12 RS485 Default auxiliaries port



X12 RS485 port

The X12 RS485 port is the default auxiliary device port. It is possible to deviate from the default and use the port for something different then auxiliary devices.

X12 RS485 Connector			
Image	PIN	Name	Description
	1	B-	RS485 Negative signal
	2	A+	RS485 Positive signal
	3	⏚	RS485 SHIELD (ISOGND)

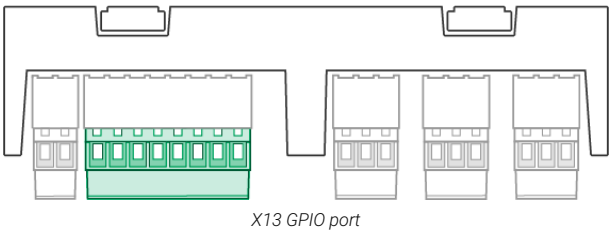
X12 120 ohm termination switch	
Position	Description
	Termination ON
	Termination OFF

The X12 120 ohm termination switch is used to terminate the X12 RS485 bus.

Important

The protocol and port settings (including baud rate, parity, data bits, and stop bits) must be identical for all devices connected to the X12 port. Additionally, each (Modbus) secondary address must be unique on the same port.

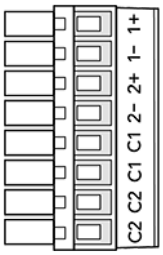
X13 GPIO port



X13 GPIO port

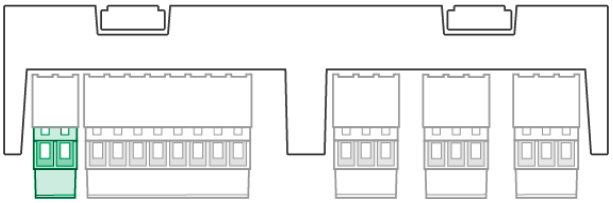
The X13 GPIO port can be used for general input/output control.

X13 GPIO connector			
Image	PIN	Name	Description

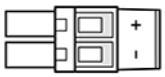
	1	1+	Potential free input #1 (+)
	2	1-	Potential free input #1 (-)
	3	2+	Potential free input #2 (+)
	4	2-	Potential free input #2 (-)
	5	C1	Potential free output contact #1
	6	C1	Potential free output contact #1
	7	C2	Potential free output contact #2
	8	C2	Potential free output contact #2

GPIO electrical specifications			
Item	**Min**	**Max**	**Unit**
Input 'low' voltage	-32.0	2.0	V
Input 'high' voltage	5.0	32.0	V
Input forward current	1.0	6.0	mA
Contact (C) switch voltage	-	32.0	V
Contact (C) switch current	-	2.0	A
GPIO isolation voltage	-	48.0	V

X14 DC Input Port

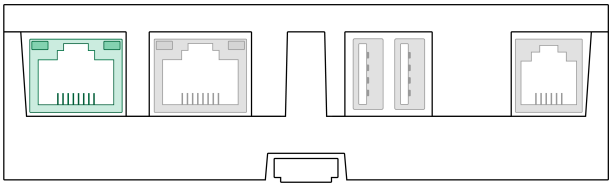


X14 DC Input port

X14 DC Port			
Image	**PIN**	**Name**	**Description**
	1	+	External DC power supply (+)
	2	-	External DC power supply (-)

DC input supply specifications			
Item	**Min**	**Max**	**Unit**
DC input voltage	12.0	32.0	V
DC input current	-	2.0	A
DC input power	-	20.0	W

ETH0 Port

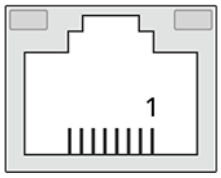


ETH0 Port

The ETH0 port can be used for ethernet connections on the Embion EMS Controller.

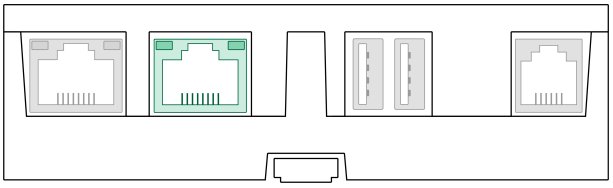
Port specifications

- 10/100

ETH0 Port		
Image	**PIN**	**Description**
	1	BI_DA+ Transmit/Receive Pair A (positive)
	2	BI_DA- Transmit/Receive Pair A (negative)
	3	BI_DB+Transmit/Receive Pair B (positive)
	4	BI_DC+Transmit/Receive Pair C (positive)
	5	BI_DC- Transmit/Receive Pair C (negative)
	6	BI_DB- Transmit/Receive Pair B (negative)
	7	BI_DD+Transmit/Receive Pair D (positive)
	8	BI_DD- Transmit/Receive Pair D (negative)

ETH0 Indicators	
Indicator	**Description**
Green	Blinks when data is transmitted/received
Yellow	Reserved

ETH1 Port

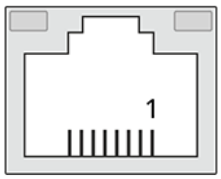


ETH1 Port

The ETH1 port can be used for ethernet connections on the Embion EMS Controller.

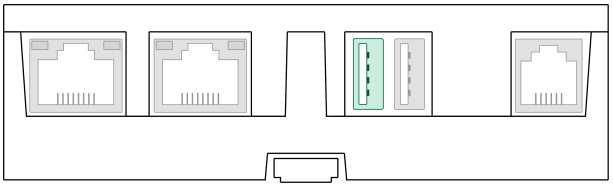
Port specifications

- 10/100/1000 Mbps

ETH1 Port		
Image	PIN	Description
	1	Transmit + (TX+)
	2	Transmit - (TX-)
	3	Receive + (RX+)
	4	Unused
	5	Unused
	6	Receive - (RX-)
	7	Unused
	8	Unused

ETH1 Indicators	
Indicator	Description
Green	Blinks when data is transmitted/received
Yellow	Reserved

USB0 Port



USB0

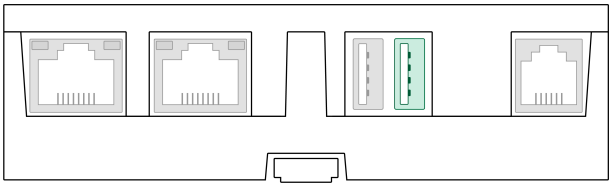
The USB0 port can be used to connect external storage devices to the Embion EMS Controller.

Port specifications

The port can deliver a maximum current of 500 mA.

USB0 Port		
Image	PIN	Description
	1	+5V
	2	D-
	3	D+
	4	GND

USB1 Port



USB1

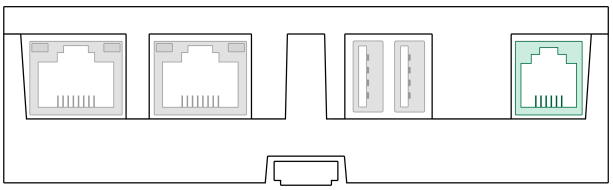
The USB1 port can be used to connect external storage devices to the Embion EMS Controller.

Port specifications

- Up to 500mA current delivery

USB1 Port		
Image	**PIN**	**Description**
	1	+5V
	2	D-
	3	D+
	4	GND

P1 Port



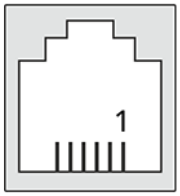
P1 port

The P1 port is used to directly connect to a compatible smart meter.

Port specifications

- Reads meter directly from P1 connection to smart meter
- Support for DSMR 4.0-5.0
- Fixed baudrate of 115200 Baud
- Only usable for unencrypted meter data

> ⚠ **Warning**
>
> Please make sure the meter connected to P1 is a DSMR 4 or DSMR 5 meter. Older DSMR versions are not supported at the moment.

P1 Port		
Image	PIN	Description
	1	Unused
	2	Data request
	3	ISOGND
	4	Unused
	5	Data
	6	ISOGND

Status Indicators

Status LED

Status LED		
Image	Status	Description
	Green	Device operational
	Red	System busy
	Blue	Reserved

EMS LED

EMS LED		
Image	Status	Description
	Green	Services are running
	Yellow	Problem with a service
	Red	Not operating

External LED

External LED		
Image	Status	Description
	Green	HUB control rules (energy pricing) active
	Cyan	Scheduled API control active
	Blue	Instantaneous API control active
	Purple	External plant control active

When multiple External LED statuses are active, they take precedence in the order shown above.

Buttons

Up Button



Up Button

The Up button on your Embion EMS Controller can be used in two ways. A short press is the most common way to use it but there are some instances in which a long press is requested. In that case press and hold the Up button for at least two seconds before releasing, this is used for example for switching between uppercase and lowercase when providing text input. The use of this and other buttons are depending on context but most commonly the Up button is used for navigation.

Down Button



Down Button

The Down button on your Embion EMS Controller can be used in two ways. A short press is the most common way to use it but there are some instances in which a long press is requested. In that case press and hold the Down button for at least two seconds before releasing. The use of this and other buttons are depending on context but most commonly the Down button is used for navigation.

Back Button



Back Button

The Back button on your Embion EMS Controller can be used in two ways. A short press is the most common way to use it but there are some instances in which a long press is requested. In that case press and hold the Back button for at least two seconds before releasing. The use of this and other buttons are depending on context but most commonly the Back button is used for removing the

last character of input.

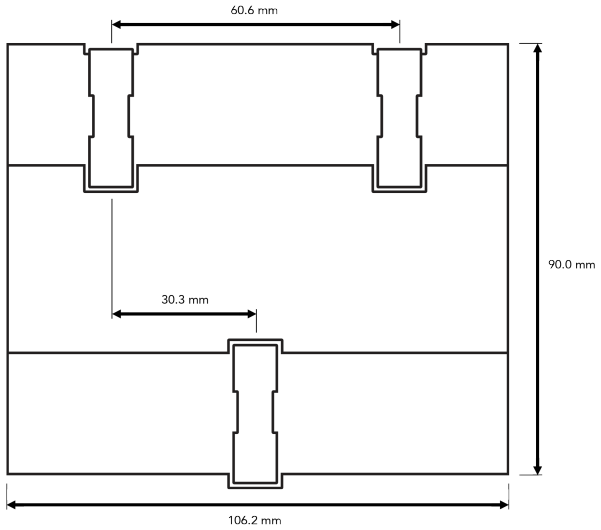
Ok Button



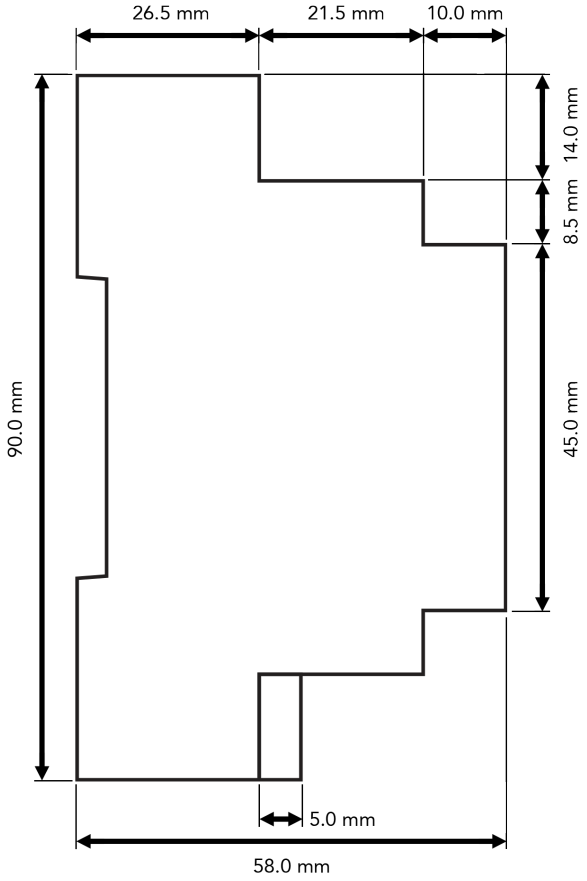
OK Button

The Ok button on your Embion EMS Controller can be used in two ways. A short press is the most common way to use it but there are some instances in which a long press is requested. In that case, press and hold the Ok button for at least two seconds before releasing it. This can be used, for example, to clear all characters from a given text input field. The use of this and other buttons are depending on context but most commonly the Ok button is used for confirming input or a selected option.

Dimensions



Embion EMS Controller Dimensions



Embion EMS Controller Dimensions

Weight

The Embion EMS Controller unit weighs 335 grams in total.

Device installation

Box check

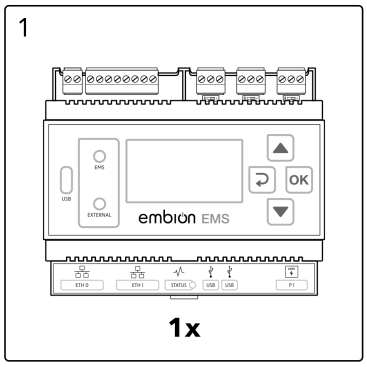
Outer packaging

Check if outer packaging is undamaged before opening it. If there are any signs of damage or abnormality, do not open the package and contact your dealer immediately.

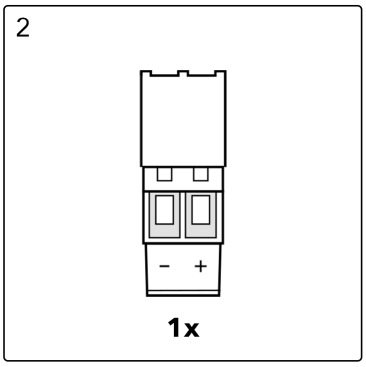
Deliverables

Check if the listed number of items for each component is in the packing case. If any component is missing or damaged, contact your dealer.

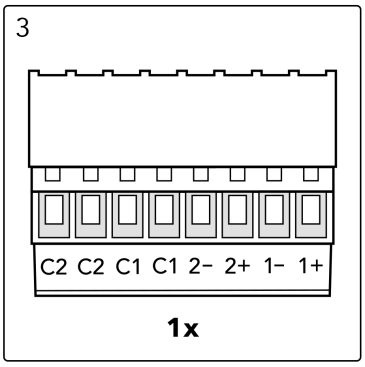
1. Embion EMS Controller
2. DC input connector
3. GPIO connector
4. RS485 connector (3x)
5. Quick installation guide



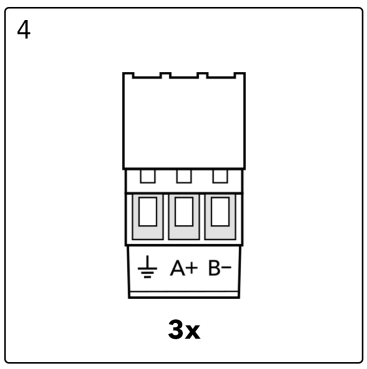
Embion EMS Controller



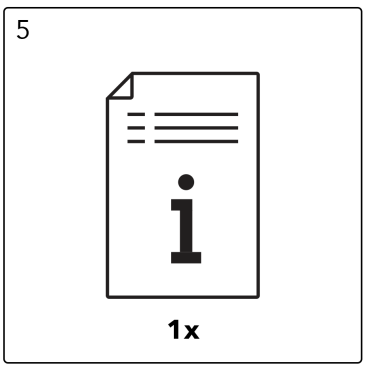
DC Input Connector



GPIO connector



RS485 connector

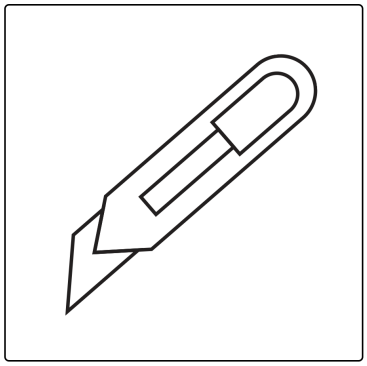


Quick installation guide

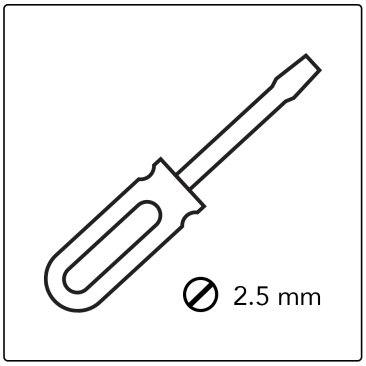
Note

All provided connectors are already plugged into the device

Required tools



Cutting knife



Screwdriver

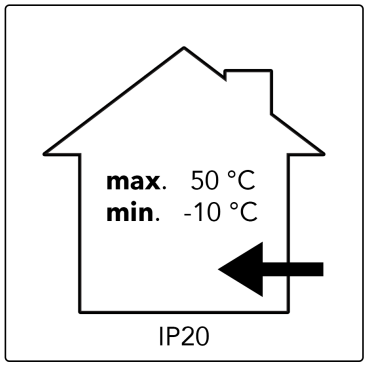
Note

Depending on the specific type of installation and type of environment, extra tools may be required.

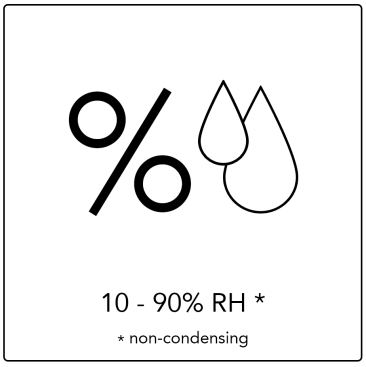
Installation Requirements

Note

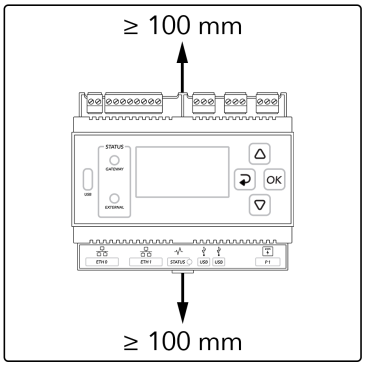
Proper installation of the Embion EMS Controller is essential for achieving optimum performance and ensuring easy maintenance. It is crucial to adhere to the recommended height to ensure optimal functionality. Additionally, it is important to meet the minimum object distance, ambient temperature, and humidity requirements to maintain the validity of the warranty. Failure to comply with these guidelines may result in voiding the warranty.



Temperature



Humidity



Space

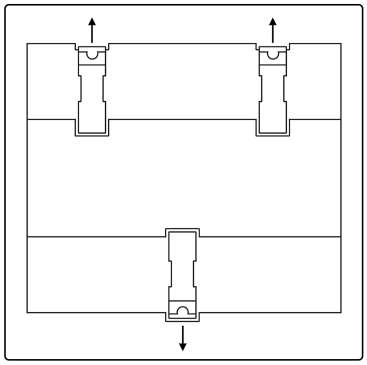
- The ambient temperature at the installation location of the Embion EMS Controller must be between 10°C and 50°C.
- The controller has an IP20 rating, meaning it is protected against solid objects larger than 12.5 mm (e.g., fingers) and is intended for indoor use in dry environments only.
- The ambient relative humidity must be between 10% and 90%, non-condensing.
- Ensure a minimum clearance of 100 mm above and below the controller to allow adequate ventilation.

Mounting the Embion EMS Controller

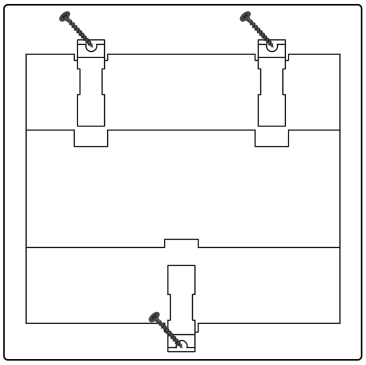
The Embion EMS Controller can be wall-mounted or DIN rail-mounted (preferred).

Wall-mounted installation

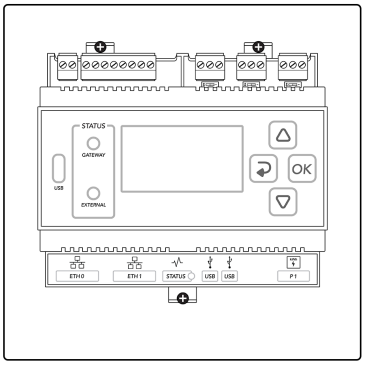
> ⚠ **Warning**
>
> The Embion EMS Controller should be installed at a proper height to facilitate operation and maintenance



Pull out latches



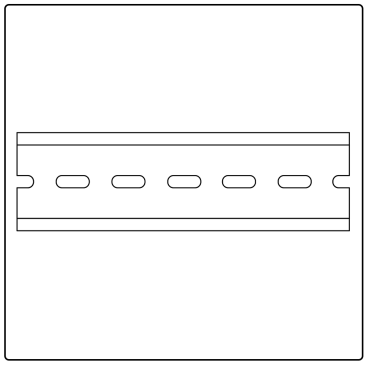
Fasten with screws



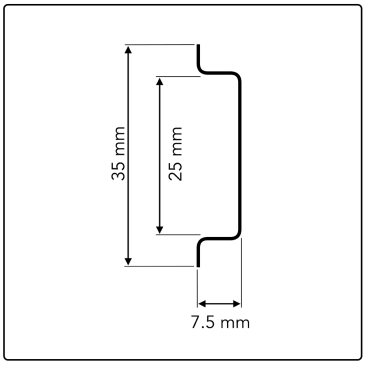
Steady in place

DIN rail mounted

Prepare a 35mm standard DIN rail (not included).



DIN rail

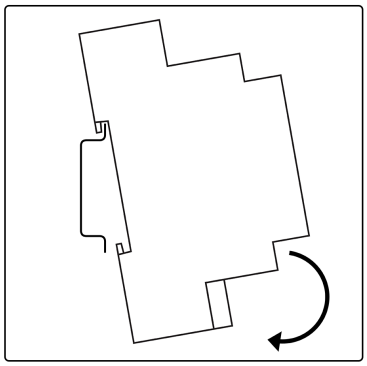


Rail measurements

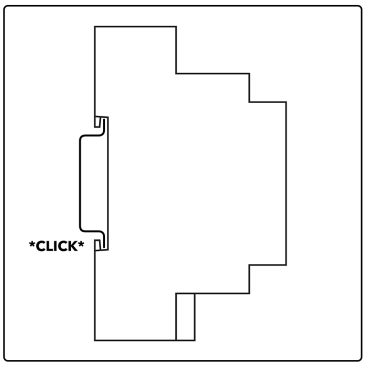
Ensure that the DIN rail:

- Has sufficient length to securely mount the Embion EMS Controller (recommended minimum effective length: 120 mm).
- Is firmly secured before installing the controller.
- Is properly terminated (e.g., with end stops) to prevent the controller from sliding.

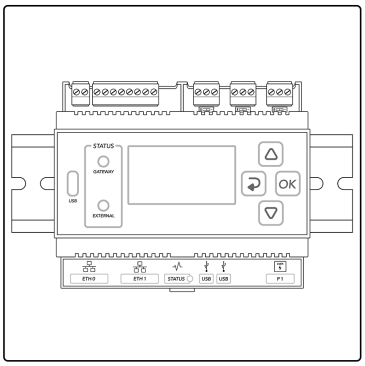
Attach to DIN rail



Rotate inwards

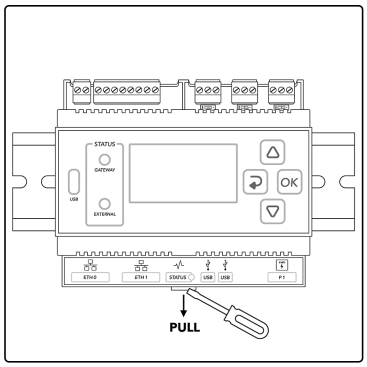


Snap onto rail

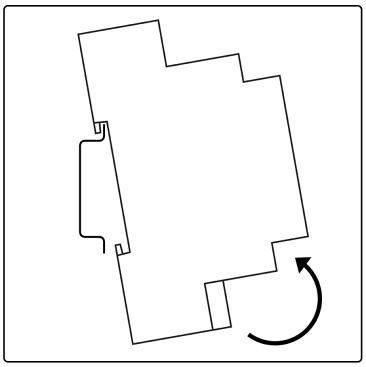


Controller on rail

Remove from DIN rail



Pull out latch



Rotate outwards

Brand-specific instructions

Some third-party meters, EV chargers and inverters need extra settings or a workaround to work correctly with the Embion EMS Controller. This chapter lists them by type, then alphabetically by brand. For installing and commissioning the equipment itself, always follow the manufacturer's documentation.

Meters

Chint DTSU666 setup

Two versions of the Chint DTSU666 with CT clamps are in use. One takes the CT ratio into account and the other doesn't.

- Select the meter type Chint DTSU666 by default. This fits the most common version.
- If the current and power are lower than the values on the meter's own display, select Chint DTSU666 (Gain) instead.

Inverters

Aiswei configuration

By default, the inverter changes its output power only slowly, so it responds late to power setpoints from the Embion EMS Controller. To make it respond as fast as possible, set the power ramp to its maximum:

- Open the Solplanet app.
- Go to Inverter configuration → Active power settings → Active power increase/decrease gradient.
- Set the gradient to the maximum value.

Solax X3 Ultra Hybrid - Firmware update

This inverter needs a special firmware version to work with the Embion EMS Controller. To get it, contact Solax service at service.bnl@solaxpower.com

EV Chargers

ABL eM4

See the ABL installation manual for how to install the eM4.

Add only the eM4 Controller to the Embion EMS Controller, as one EV charger. Do not add the Extenders as separate chargers. The Embion EMS Controller reads the sockets of all Extenders through the eM4 Controller.
First connect all Extenders to the eM4 Controller as described in the ABL manual. Then, in the Embion EMS Controller, set the number of sockets to the total for the Controller and all Extenders together, up to 32. For a single-socket eM4, enter 1.

The eM4 Controller needs software version 2.2 or higher.

Amtron 4you RTU (300 series)

Settings on the Embion EMS Controller:

- RS485: 57600 baud, 8 data bits, no parity, 2 stop bits
- Device ID: 50 (the Amtron default)

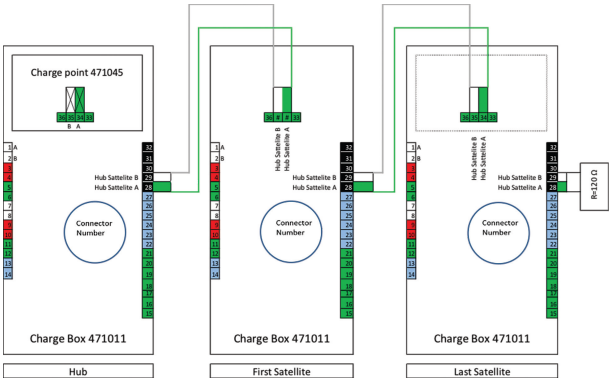
Settings on the Amtron:

- DIP switch bank S1: set at least switches 4 and 5 to ON

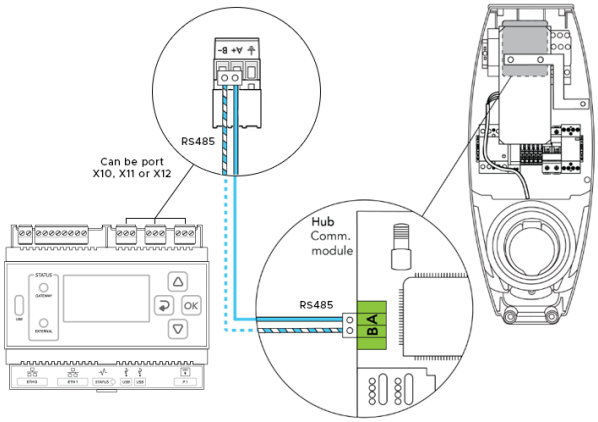
EVBox G3

> **Note**
>
> To install and commission the EVBox G3, follow the official EVBox documentation.

- Connect an RS485 cable from the Embion EMS Controller to the RS485 port of each EVBox G3 Hub (master charger).
- Connect the G3 Satellites to their Hub as EVBox describes. The EMS Controller doesn't connect to the Satellites directly.



EVBox G3 Hub / Satellite setup. Source: EVBox manual

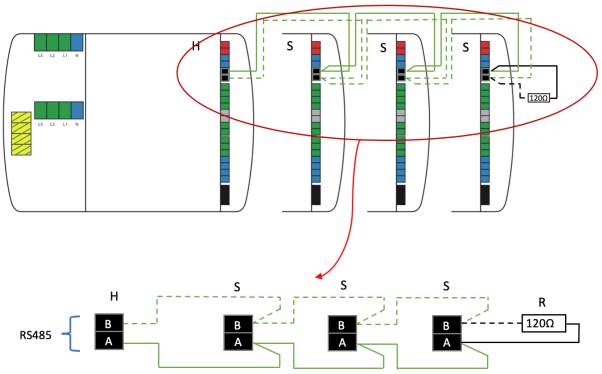


EVBox G3 RS485 connector

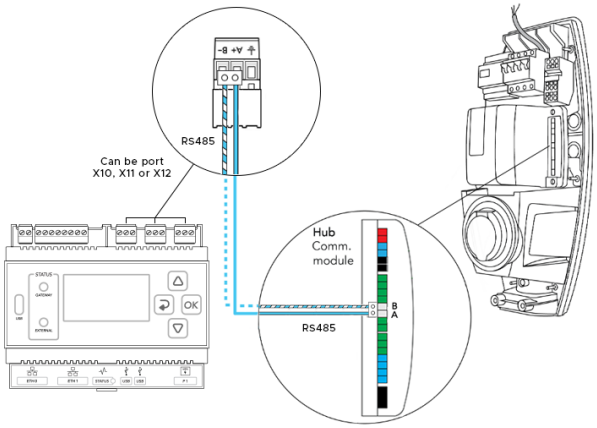
EVBox G4

> **Note**
>
> To install and commission the EVBox G4, follow the official EVBox documentation.

- Connect an RS485 cable from the Embion EMS Controller to the RS485 port of each EVBox G4 Hub (master charger).
- Connect the G4 Satellites to their Hub as EVBox describes. The EMS Controller doesn't connect to the Satellites directly.



EVBox G4 Hub / Satellite setup. Source: EVBox manual



EVBox G4 RS485 connector

Flexicharge AC

A dual-socket Flexicharge AC charger has one IP address and a separate Modbus TCP port per socket. Socket 1 uses port 502 and socket 2 uses port 503. Add each socket as its own EV charger, with the same IP address and the port of that socket. For a single-socket charger, add one charger on port 502.

Leave the Modbus TCP port in the Flexicharge's own settings at 502. If you change it, socket 2 is no longer available.

If socket 2 does not respond on port 503, contact Flexicharge.

Using the device

This section explains how to operate the device locally. Although most configuration and settings can be performed via the HUB Portal, a selection of settings can also be viewed and configured directly on the hardware.

When the Embion EMS Controller is installed for the first time, local configuration is required to complete the initial setup and establish an internet connection. Once the connection has been successfully configured, all remaining settings can be managed through the HUB Portal.

EMS Controller Display

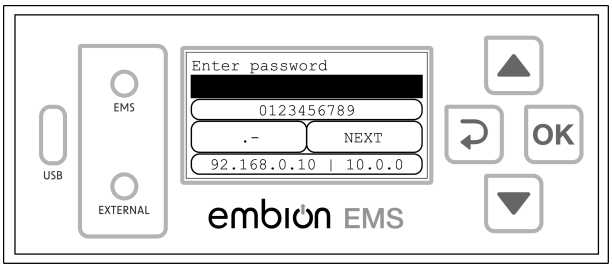
The central display presents installation information to the user. When there is no user interaction, the display shows the main screen, which includes plant information and a status bar.

Using the controls located to the right of the display, the user can navigate through the various screens described later in this section.

Controls

The buttons on the Embion EMS Controller are used foremost for navigation. However, on the Embion EMS Controller there are multiple inputs required like IP addresses, names and passwords. The steps below will explain how to use the buttons to insert characters.

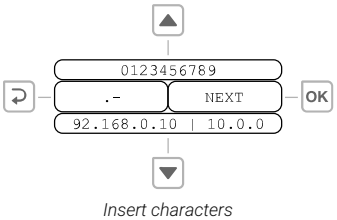
When input fields require you to insert characters the screen will look like this:



Insert characters

Use the buttons on the Embion EMS Controller to select one of the four input options related to the position of the pressed button.

For example: the UP button selects and highlight the numeric input.

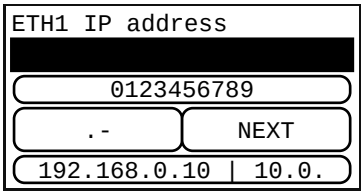


Insert characters

Select character

When an input option is selected, use the UP and DOWN buttons to navigate and select a character or pre-defined value like and IP-address. Press the Ok button or wait 3 seconds to confirm the selected character or value. Characters now appear in the input field

as shown below.



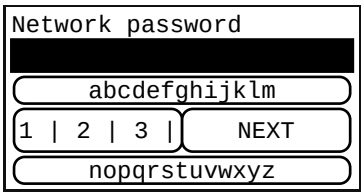
Select a character

Remove character

While one of the input option is selected, press the BACK button to remove the last character or hold the Ok button to clear all input.

Uppercase

It is possible to use uppercase characters. Hold the UP button to activate uppercase characters, and hold it again to switch back.



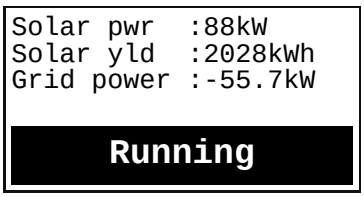
Switch between lowercase and uppercase

Screens on display

Main screen

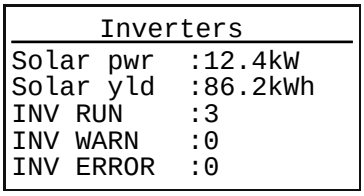
The main screen, displayed when the system is in standby mode, provides general information about the installation. This screen is shown automatically after a period of user inactivity.

The information displayed may vary depending on the system configuration. The dark status bar indicates the current system state (e.g., Running).



Standby screen

Inverters

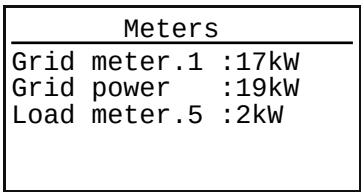


Inverters overview

If any inverters are configured, this screen shows the current status for all inverter(s) combined. The AC power per inverter is also listed. Depending on the number of inverters configured, multiple pages are used. The displayed name for each inverter is the name of the group where it's in, combined with the inverter address. For example the inverter "New 1.10" is an inverter from the inverter group "New 1" with the inverter address "10".

Inverters can be configured using the HUB Portal.

Meters



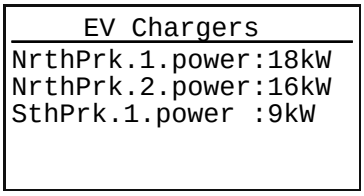
Meter overview

If any meters configured, this screen displays the current grid power and current status for each meter. The displayed name of the meter is the name of the group where it's in, combined with the meter address. For example the meter "New 1.10" is a meter from the meter group "New 1" with the meter address "10".

If a P1 meter has been configured, this page also displays the P1 smart meter status. No metering values are shown here, only connection related information.

Meters can be configured using the HUB Portal.

EV-chargers

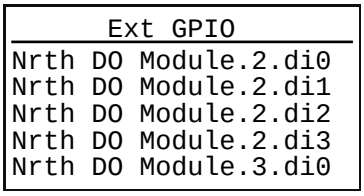


EV-chargers overview

If any EV-chargers are configured, this screen shows the current EV-charger groups as well as the charge rate for each group. Depending on the number of EV-chargers configured, multiple pages are used.

EV-chargers can be configured using the HUB Portal

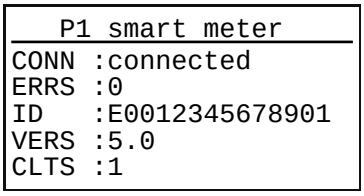
EXT GPIO



Ext GPIO

The Ext GPIO screen shows the actual status of each of the GPIO ports. They can be configured in the HUB Portal.

P1 Smart meter



P1 Smart meter status

This screen displays the P1 smart meter status. No metering values are shown here, only connection related information.

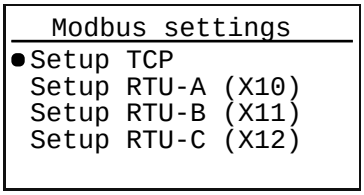
Meters can be configured using the HUB Portal.

Modbus

This screen displays the current Modbus status for all the RTU and TCP ports. We recommend setting up the individual RTU ports using the HUB Portal but its also possible to use the controller itself to do this.

To configure the Modbus settings using the controller use the Ok button while the Modbus screen is displayed to begin.
First you need to select which Modbus port you want to configure:

- TCP
- RTU-A (X10)
- RTU-B (X11)
- RTU-C (X12)



Modbus settings

TCP configuration

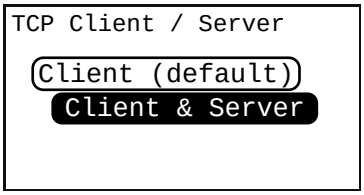
Client / Server settings

To enable / disable Modbus TCP server on the Embion EMS Controller, select the desired setting:

- Client (default)
- Client & Server

> **Note**
>
> Only one Modbus server can be active at a time. To use the Modbus server on an RTU port instead, set TCP Client / Server to Client.

The Modbus client is used to communicate with the configured assets. The Modbus TCP server is used to readout or control to the Embion EMS Controller from an external controller with Modbus client support.



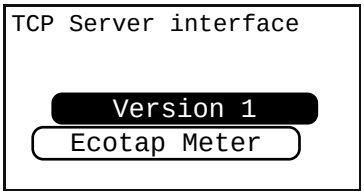
TCP Client / Server

> **Note**
>
> When 'Client' is selected as setting, no other settings are needed for the Modbus TCP configuration. If 'Client & Server' is selected, other settings below are needed.

Interface

Select the desired Modbus interface. The options are described in the HUB Portal manual.

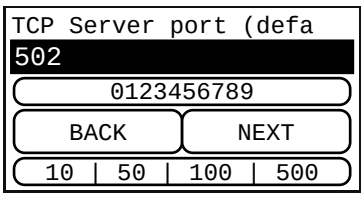
> **Note**
>
> The Modbus register list of the Embion Modbus interface is not publicly available. To request it, contact Embion support.



TCP Server interface

TCP Port

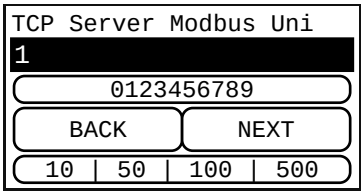
Enter the TCP port for the Modbus Server TCP connection. The port is used to host the Modbus server on the ip address of the Embion EMS Controller. It is recommended to use port '502'.



TCP Server port

Unit ID

Enter the Modbus unit id for the Modbus Server TCP connection. The unit ID is used to identify the Embion EMS Controller in the Modbus network. Valid range is 1-247, as defined in the Modbus protocol.



TCP Server Unit ID

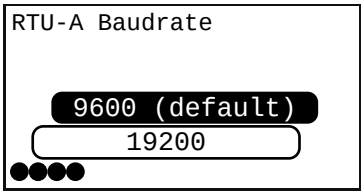
RTU configuration

The following input parameters are required to complete the RTU configuration:

- RTU Client / Server
- Server interface and Modbus Unit ID (only when the port is set to Server)
- Baudrate
- Parity
- Databits
- Stopbits

The default port configuration is 9600 8N1.

Baudrate

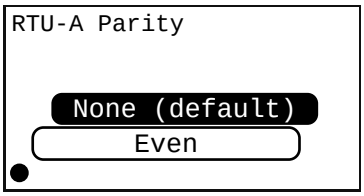


RTU-A Baudrate

Select the baudrate for the RTU connector, options are:

- 9600
- 19200
- 38400
- 57600
- 115200
- 230400

Parity

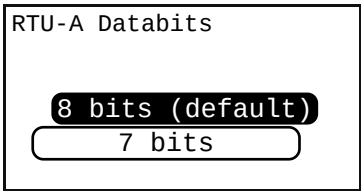


RTU Parity

Select the parity for the RTU connector, options are:

- None
- Even
- Odd

Databits

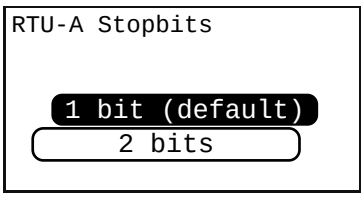


RTU Databits

Select the databits for the RTU connector, options are:

- 8 bits (default)
- 7 bits

Stopbits



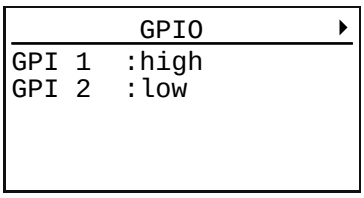
RTU Stopbits

Select the stopbits for the RTU connector, options are:

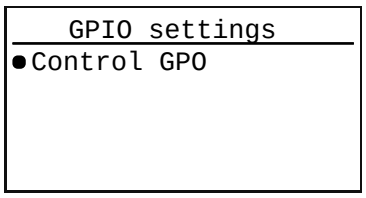
- 1 bit (default)
- 2 bits

GPIO

The GPIO screen shows the actual status of each of the GPIO ports. They can be configured in the HUB Portal or directly on the EMS Controller itself.



GPIO menu



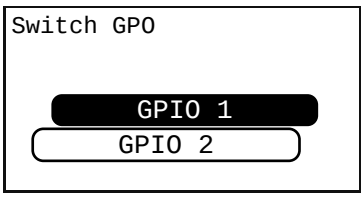
GPIO settings

Control GPO

This setting allows the user to directly control the two output ports on the Embion EMS Controller.

OUT1 and OUT2 can also be switched by a control rule in the HUB Portal. While that control rule is active, the output follows the rule

and the setting on this screen is overruled.



Switch GPO

> ⚠ **Warning**
>
> Forcing the GPO state can counteract the intended function!

Local Web Interface

The **Local Web Interface** is a small web page served directly by the Embion EMS Controller, on the same network. An installer or operator opens it in a browser to see the site's live energy flow and the state of every connected device without needing the portal or an internet connection.

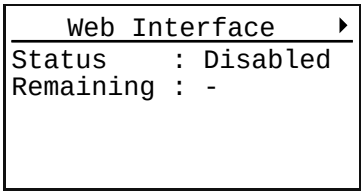
It is **read-only**: the interface shows what the controller is doing, it does not change settings. It is served over HTTPS and protected by a password, and it is **off by default**. To switch it on, a user navigates to the Local Web Interface screen on the Embion EMS Controller display and opens the settings.

The Local Web Interface also works on a controller that has not been configured yet, or that was reset to factory settings.

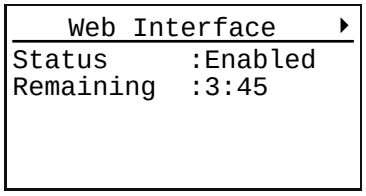
> ⓘ **Note**
>
> The interface is only reachable from the local network (LAN). It is not exposed to the internet.

Settings

The web interface is disabled by default. Enable it from the menu on the controller's front display, as shown below. Once enabled, it remains available for a limited time (4 hours by default) and then automatically switches off again. You can re-enable it in the same way at any time, or extend the timer by selecting Enable again.



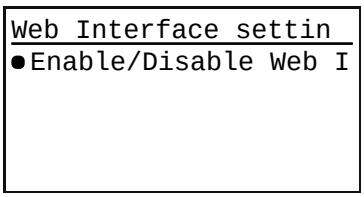
Local Web Interface overview, disabled



Local Web Interface overview, enabled

Local Web Interface overview

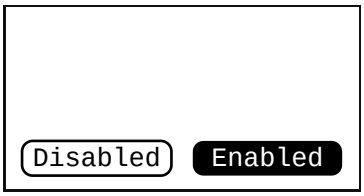
From the home screen, navigate the screens until you see the Local Web Interface page. When the Local Web Interface is switched off, Status reads Disabled and Remaining shows a dash. When the Local Web Interface is switched on, Status reads Enabled, and Remaining shows how long the Web Interface will remain active. The ▶ marker indicates that a settings screen can be opened here.



Local Web Interface settings

Local Web Interface settings

If you want to enable the Local Web Interface, press **OK** to open the Web Interface settings, then select **Enable / Disable Web Interface**.



Enable / Disable Web Interface

Choose Enabled and confirm. The Web Interface page now shows Status: Enabled, with Remaining displaying a countdown of the time left. The interface is now reachable in a browser.

Local Web page

On a device connected to the same network, browse to the controller's IP address: `https://<controller-ip>/`

> **Caution**
>
> The controller uses a **self-signed certificate**, so the browser will show a security warning the first time ("Your connection is not private"). This is expected for a local device. Choose **Advanced → Continue** to proceed.

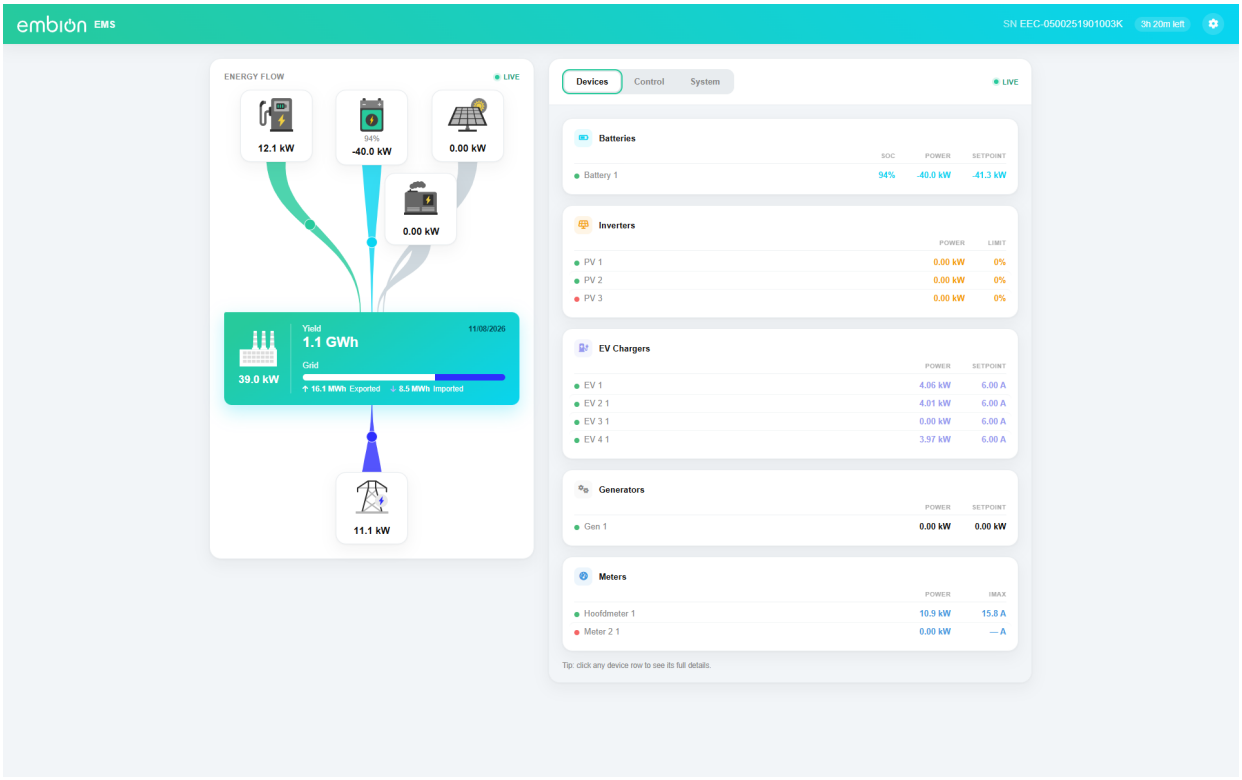
Sign in

Enter the device password and select **Sign in**.

- The **default password** is printed on a label on the side of the device (it consists of serial number + PIN).
- On your first login, you will be asked to set a new password. It must be at least 6 characters long and contain at least one capital letter or one special character.

> **Note**
>
> If the label on the EMS Controller is obscured or damaged, the controller's serial number and PIN can also be found in the front display menu, on the Device info page.

The overview page



Local Web Page - overview

After signing in, you land on the overview. It has two parts: the **energy flow** on the left and an **inspector** with tabs on the right. Everything updates live: a green Live dot marks the panels that refresh continuously (approximately every 2 seconds).

> **Note**
>
> On smaller screens, the layout stacks: the energy flow fills the first screen, followed by the Devices, Control and System panels.

Energy flow

The Energy flow is a top-down diagram of the site:

Sources and assets sit as tiles across the top: EV chargers, battery (with its state of charge), solar, generator and wind. Each tile shows its live power.

Coloured lines converge on the **central plant** card, which shows the headline **site power**, the cumulative **Yield** for the day, and a **Grid** bar splitting energy into exported and imported.

A single line continues down to the **Grid** at the bottom.

A tile is only shown when the site actually has that type of device. Selecting any tile opens its details.

Inspector: Devices tab

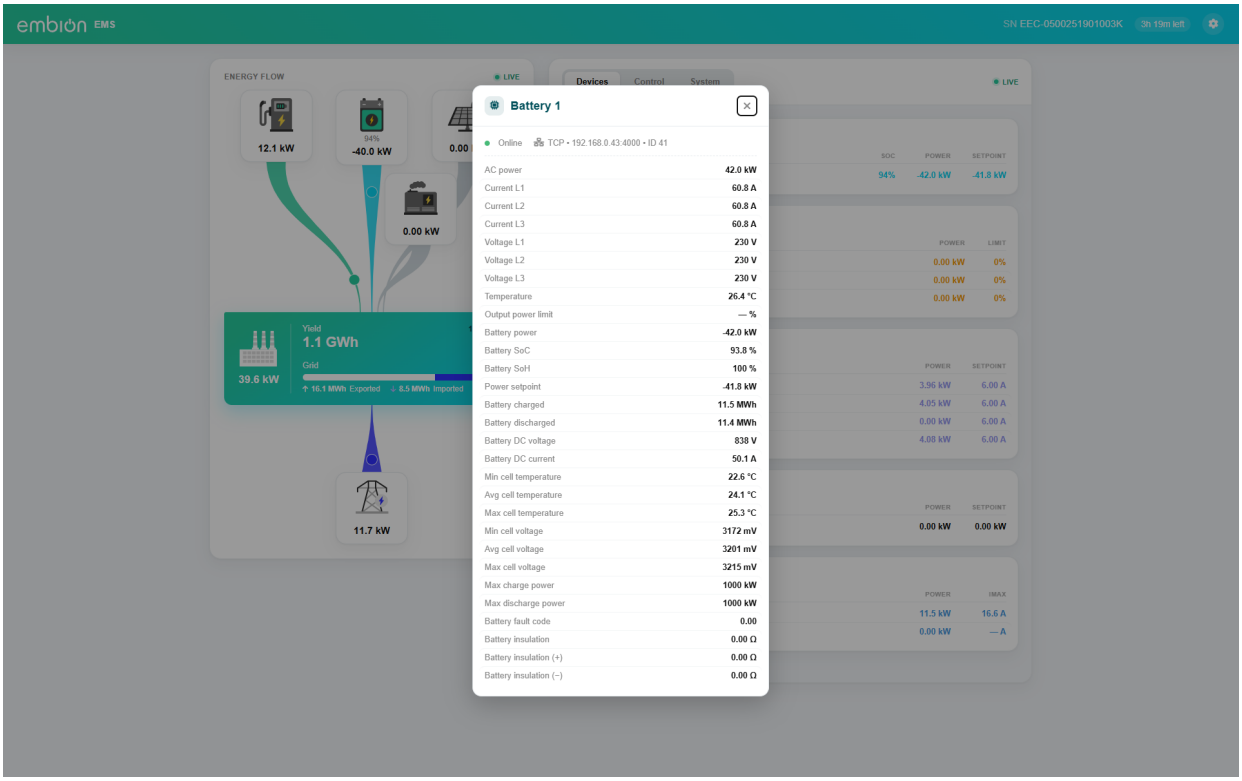
The Devices tab lists every connected device, grouped by type, with its key live values:

Devices tab	
Device Type	**Values**
Batteries	State of charge, power, setpoint
Inverters	Power, limit
EV Chargers	Power, setpoint

Device Type	Values
Generators	Power, setpoint
Meters	Power, max current

A coloured dot next to each device shows whether it is online (green) or not reachable (red).

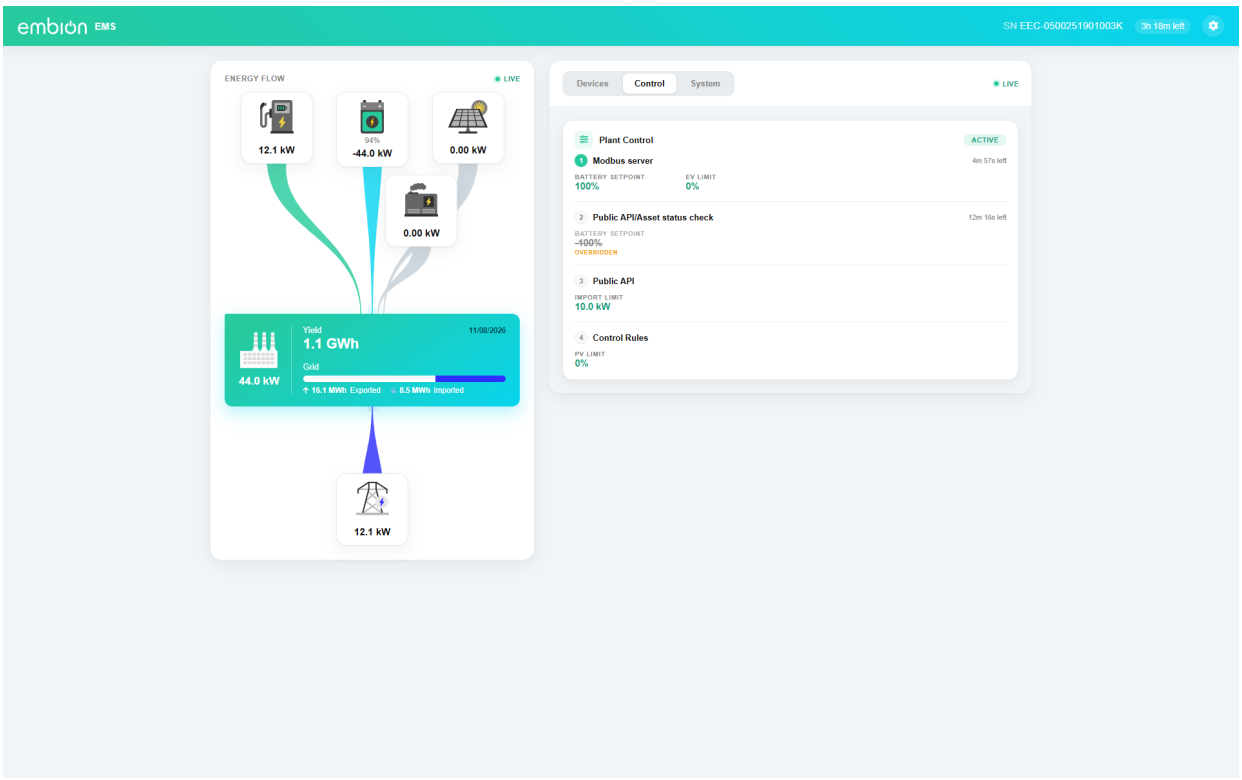
Device details



Device details

Selecting any device row opens a panel with its **full list of registers** and connection details (protocol, address and Modbus ID). This is the same data that the device reports to the portal.

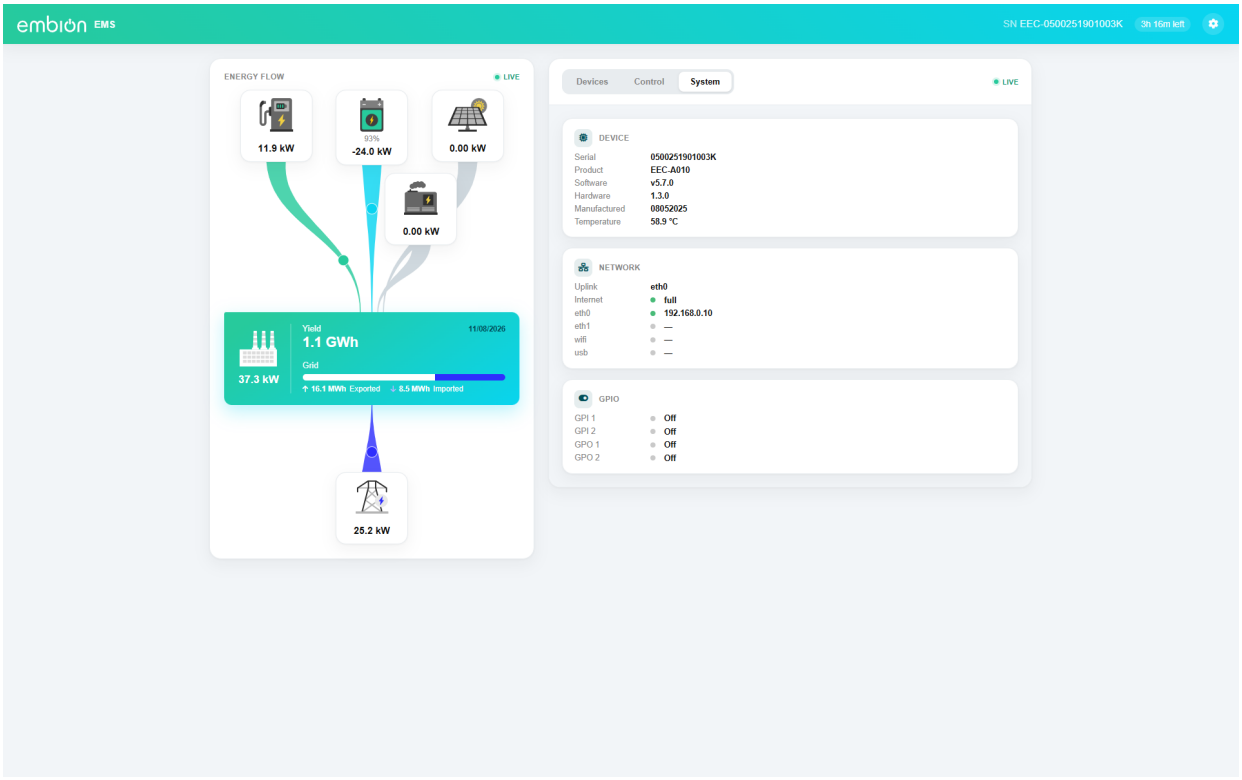
Inspector: Control tab



Control tab

The **Control** tab shows how the plant is being commanded. Every active command source is listed, numbered by priority, with the value it is requesting. For example, a battery setpoint, a grid import limit or a PV limit and where relevant, the time left before that command expires. A higher-priority source overrides a lower-priority one: an overridden value is struck through and marked **Overridden**. When nothing is commanding the plant, the tab shows an **Idle** state instead.

Inspector: System tab



System tab

The System tab mirrors the information on the controller's front display:

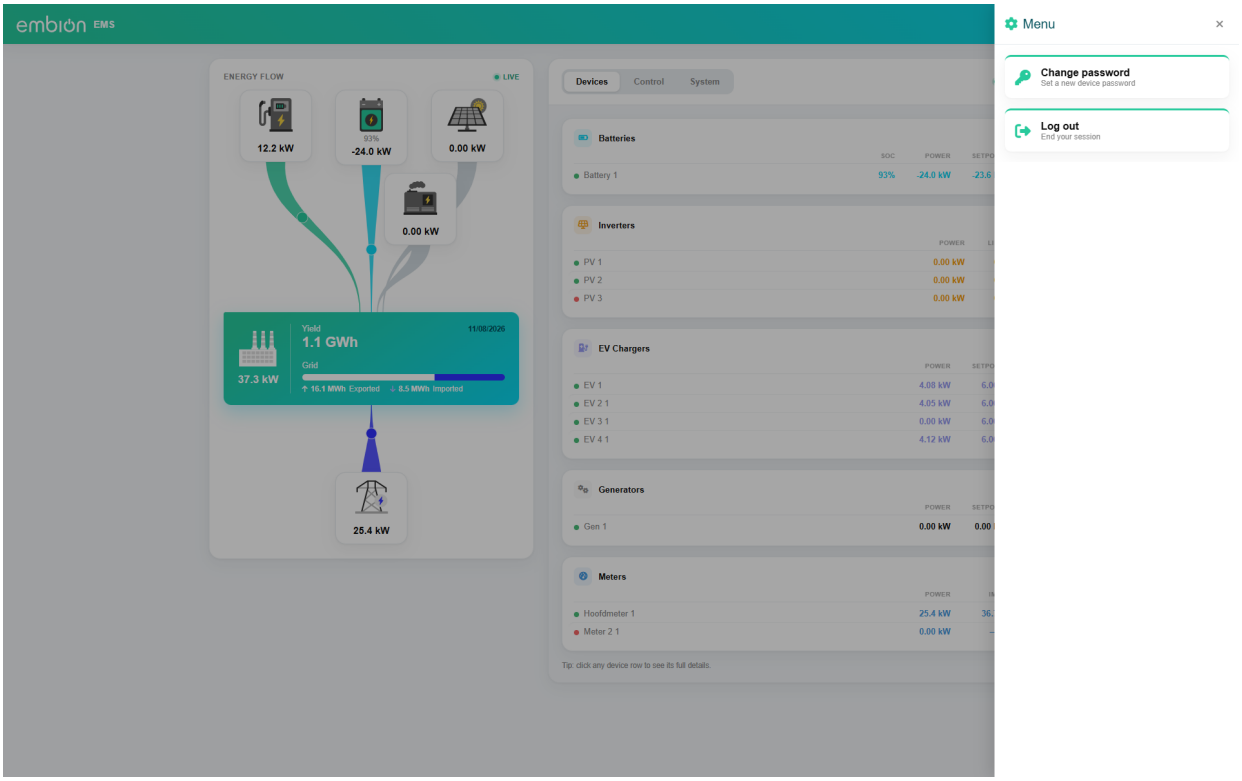
Device: serial number, product, software and hardware versions, manufacture date and temperature.

Network: the active uplink, internet status and each network interface with its link status, IP address, subnet mask, gateway and DNS server.

GPIO: the state of the digital inputs and outputs.

> **Note**
>
> On controllers that are part of a cascade, an extra Cascade tab appears, showing the upstream and downstream controllers. It is hidden on standalone controllers.

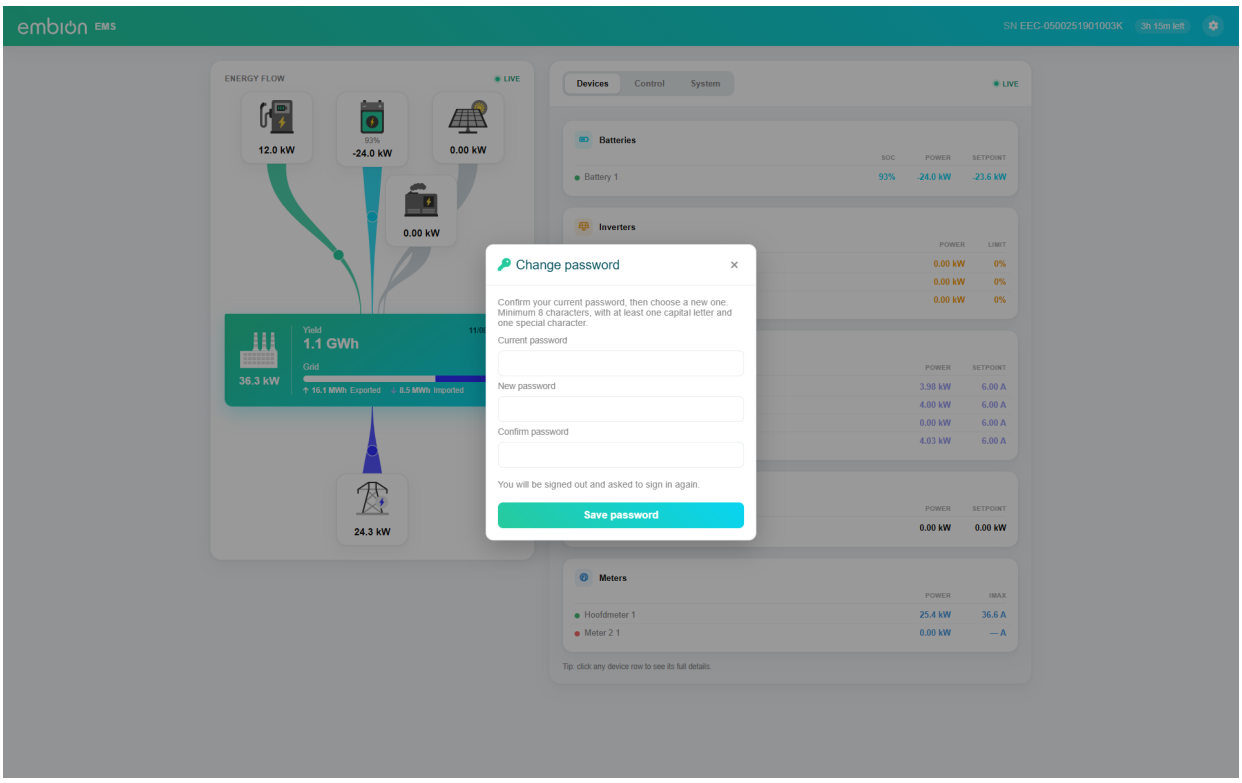
Account and session



Account information

The gear icon in the top-right corner opens the menu, which contains options to change the password or sign out.

Changing the password

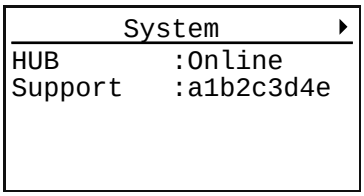


Change password

Select **Change password**, enter your current password and choose a new one (using the same rules as above: at least 6 characters, including one capital letter or special character). After changing the password, you are signed out and asked to sign in again.

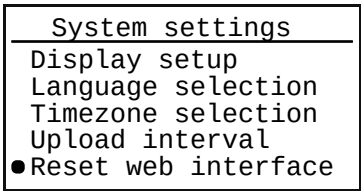
Resetting the password from the controller display

If ever your Web Interface password is lost, it can be reset to the default (consisting of the controller serial number + PIN) from the front display. You will be asked to set a new password the next time you sign in (at least 6 characters, including at least one capital letter or special character). The serial number and PIN can be found on the label on the side of the controller or on the **Device info** page in the front display menu.



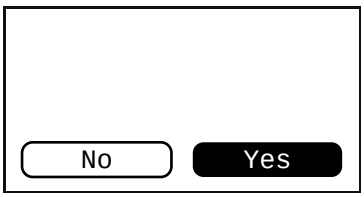
System page

Open the menu and scroll to the System page, then open it.



Select Reset Web Interface

In System settings, select Reset Web Interface.



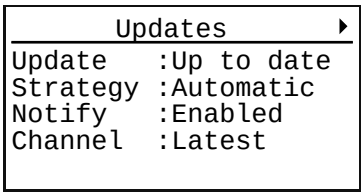
Confirm reset

Confirm with **Yes**. The password returns to the default.

> **Caution**
>
> A factory reset also clears the Web Interface password, restoring the default (device serial number + PIN).

Updates

This screen shows the current update settings for the device.



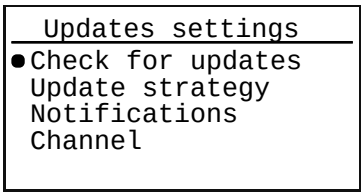
Update settings overview

To configure the update settings use the HUB Portal or alternatively you can configure the settings on the device itself.

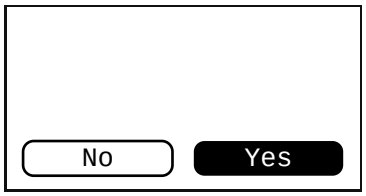
After an update, the controller checks that it starts correctly and connects to the HUB Portal. If this check fails, the controller automatically rolls back to the previous firmware version.

Check for updates

Manually verify if any software updates are available. The Embion EMS Controller should be connected to the internet to check for new updates.



Check for updates

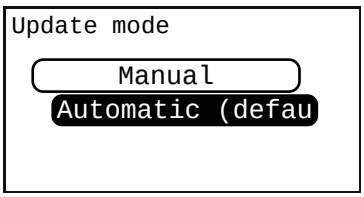


Confirm checking for updates

Update strategy

Select the update mode. Two options are available:

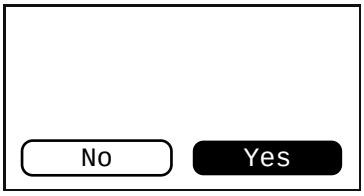
- Automatic (default): Embion EMS Controller will automatically download and install available updates at night.
- Manual: If enabled a notification is shown when an update is available. The device will not automatically install updates.



Update strategy

Notifications

Turn on or turn off update notifications on the Embion EMS Controller. This will tell you when an update is available for downloading.



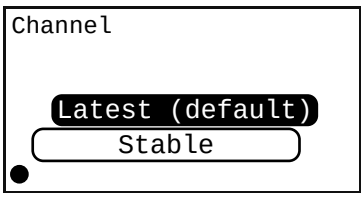
Update availability notification

Update channel

Select the active update channel.

- Latest (default): get the latest official releases
- Stable: Only receive stable updates (version have already been tested for multiple weeks till months in a production environment)
- Beta: Receive Beta versions (no official release!)

> ⚠ **Warning**
>
> The Beta channel is not recommended for devices in a production environment. Releases in the Beta channel are still in the testing phase. There is no warranty for the functionality of the software.

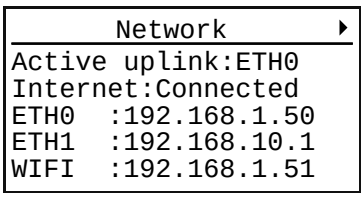


Choose update channel

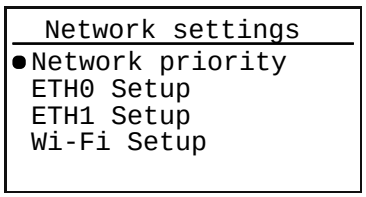
Network

The Network screen gives an overview of the network connections of the Embion EMS Controller:

- Active uplink: the connection that is currently used for the internet connection
- Internet: whether the controller is connected to the internet
- ETH0, ETH1 and WIFI: the IP address of each connection



Network overview



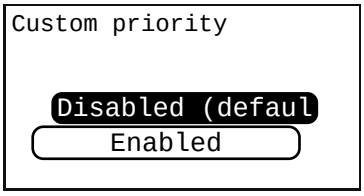
Network settings

The ▶ marker indicates that a settings screen can be opened here. Press Ok to open the Network settings menu, which contains:

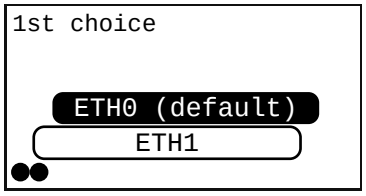
- Network priority
- ETH0 Setup
- ETH1 Setup
- Wi-Fi Setup

Network priority

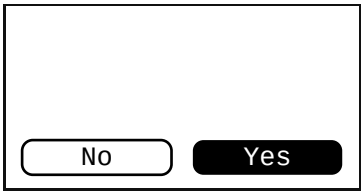
Network priority sets the order in which the Embion EMS Controller uses its connections for the internet connection. The controller uses the 1st choice; when that connection has no internet, it uses the next one.



Custom priority



1st choice



Apply network priority

Custom priority

- Disabled (default): the default order is used: ETH0, ETH1, Wi-Fi, USB.
- Enabled: set the order yourself with 1st choice to 4th choice.

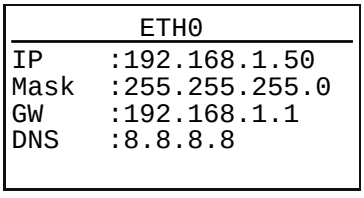
1st choice to 4th choice

Select a connection for each position: ETH0, ETH1, Wi-Fi or USB. USB is an internet connection through a dongle connected to a USB port of the controller. Confirm with Yes to apply the network priority.

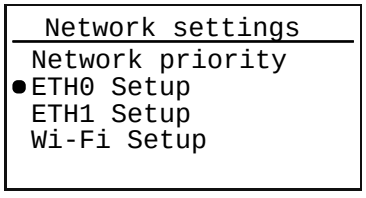
ETH0

This screen shows the network settings of the ETH0 connection: IP address, netmask, gateway and DNS server.

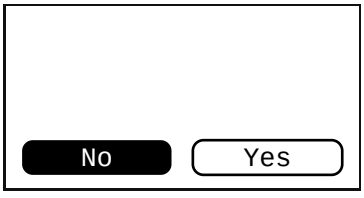
The configuration for the ETH0 port can be done in the HUB Portal. If necessary, the setup can be done on the device itself as well. To make any changes, open the Network settings menu, select ETH0 Setup and press Ok to start (re-)configuring the ETH0 port.



ETH0 Overview



ETH0 Setup

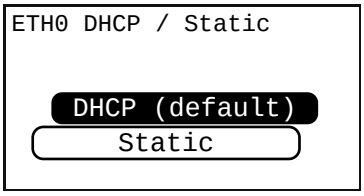


ETH0 Save settings

ETH0 Type

Select the type of ETH0 connection, options are:

- DHCP (default)
- Static

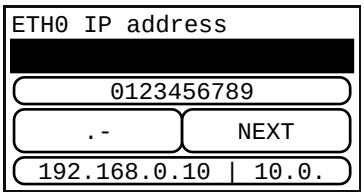


ETH0 Connection type

> **Note**
>
> When DHCP is selected as network type for ETH0, no other settings are needed for configuration. If Static is selected as ETH0 network type, other settings below are needed.

ETH0 IP Address

Enter the IP address of the ETH0 network, for example: “192.168.0.10”.
For help with character input on the device see the Controls section of this manual.

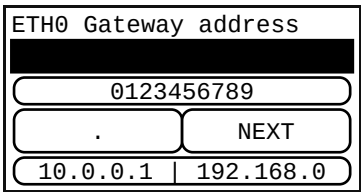


ETH0 IP Settings

ETH0 Gateway IP address

Enter the IP address of the network default gateway, for example: “192.168.0.1”.

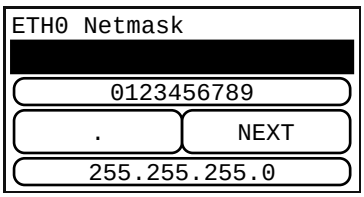
This field can be left empty when there is no default gateway for this connection (and therefore no internet connection through this port).



ETH0 Gateway IP address

ETH0 Netmask

Enter the network Netmask, for example: “255.255.255.0”.

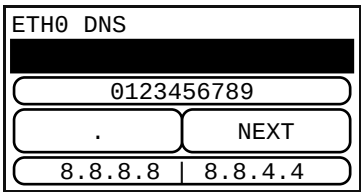


ETH0 Netmask

ETH0 DNS

Enter the DNS setting for ETH0, for example: “8.8.8.8”.

This field can be left empty when there is no DNS required.

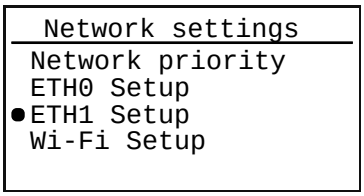


ETH0 DNS configuration

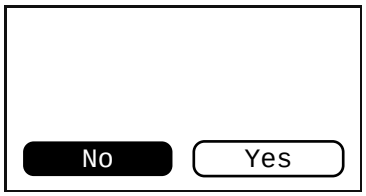
ETH1

The IP address of the ETH1 connection is shown on the Network overview screen.

The configuration for the ETH1 port can be done in the HUB Portal. If necessary, the setup can be done on the device itself as well. To make any changes, open the Network settings menu, select ETH1 Setup and press Ok to start (re-)configuring the ETH1 port.



ETH1 Setup

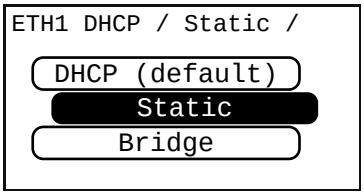


ETH1 Save settings

ETH1 Type

Select the type of ETH1 connection, options are:

- DHCP (default)
- Static
- Bridge



ETH1 Connection type

Note

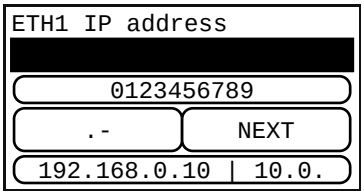
When DHCP is selected as network type for ETH1, no other settings are needed for configuration. If Static is selected as ETH1 network type, other settings below are needed.

Note

Bridge joins ETH1 with ETH0: both act as one port, and all data received / sent on one port is forwarded to the other, so a device connected to ETH1 is on the same network as ETH0. The controller keeps using the network settings of ETH0; the IP settings of ETH1 are not used.

ETH1 IP Address

Enter the IP address of the ETH1 network, for example: “192.168.0.10”
For help with character input on the device see the Controls section of this manual.

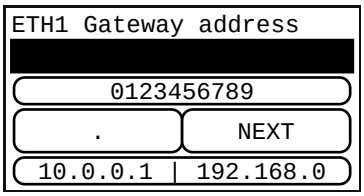


ETH1 IP address

ETH1 Gateway IP address

Enter the IP address of the network default gateway, for example: “192.168.0.1”.

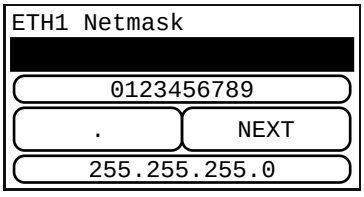
This field can be left empty when there is no default gateway for this connection (and therefore no internet connection through this port).



ETH1 Gateway IP address

ETH1 Netmask

Enter the network Netmask, for example: “255.255.255.0”.

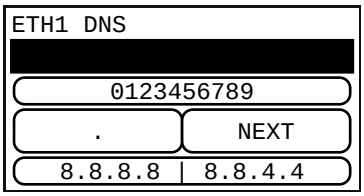


ETH1 Netmask

ETH1 DNS

Enter the DNS setting for ETH1, for example: “8.8.8.8”.

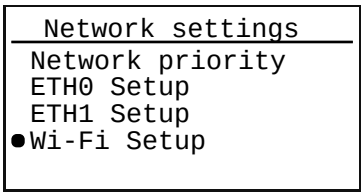
This field can be left empty when there is no DNS required.



ETH1 DNS configuration

Network WiFi

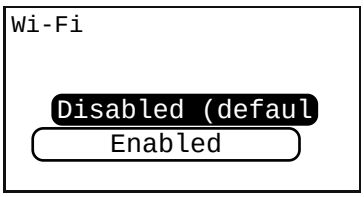
The IP address of the Wi-Fi connection is shown on the Network overview screen. To make any changes, open the Network settings menu, select Wi-Fi Setup and press Ok to (re-)configure the Wi-Fi. These settings can also be done in the HUB Portal, but an internet connection is needed for this to work. So, to set up the connection for the first time, it is necessary to use the controller itself.



Wi-Fi Setup

Wi-Fi Enable

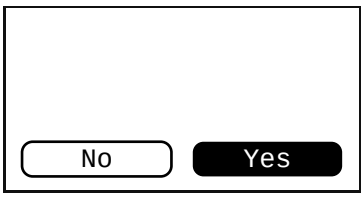
Enable or disable Wi-Fi



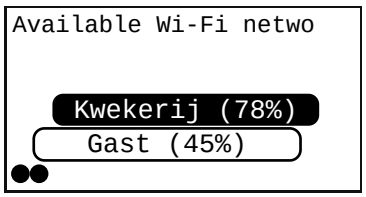
Enable or disable Wi-Fi

Wi-Fi Network

The device will ask to search for networks. A search will take a few seconds after which a network can be selected from a list.



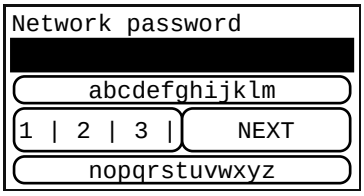
Search for networks



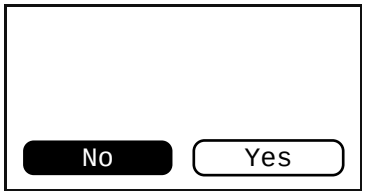
Available networks

Wi-Fi Password

Enter the network password and apply the Wi-Fi settings.



Enter password



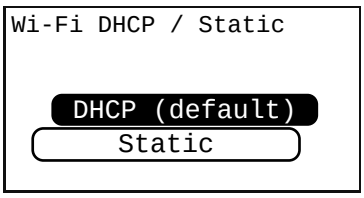
Apply settings

> ⚠ **Warning**
>
> For optimal use it is recommended to use the ethernet connection instead of Wi-Fi. Using Wi-Fi is dependent on the quality of the network and might result in stability and performance issues.

Wi-Fi IP settings

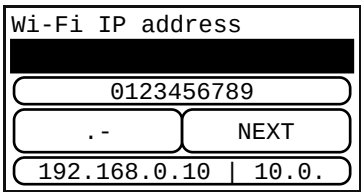
Select the type of Wi-Fi connection, options are:

- DHCP (default)
- Static

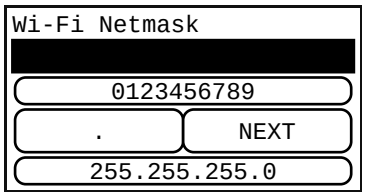


Wi-Fi DHCP / Static

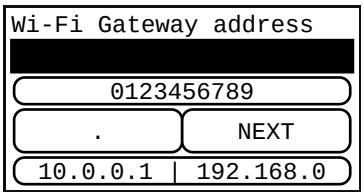
When Static is selected, enter the IP address, netmask, gateway and DNS server, in the same way as for ETH0.



Wi-Fi IP address



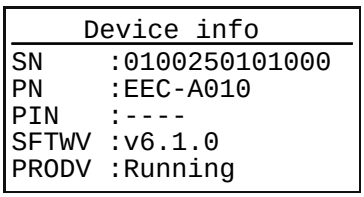
Wi-Fi Netmask



Wi-Fi Gateway address

Device info

This screen displays product information that is identical to the details on the product label. The current software version is also visible here, along with the minimum and maximum internal measured temperatures during its lifetime.

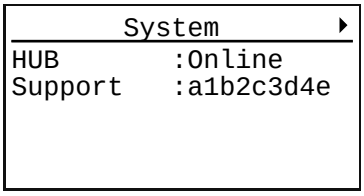


Device info

System

This page shows the connection status of the Embion EMS Controller.

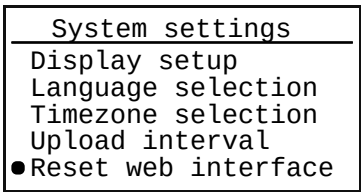
- HUB: the connection status with the HUB, for example Online.
- Support: shows the support ID when support is enabled. Support mode allows the manufacturer support team to remotely access the device to provide support. You can enable or disable this in the HUB Portal.



System

System settings can be changed either through the HUB Portal or by pressing Ok while viewing this screen. The following items can be configured:

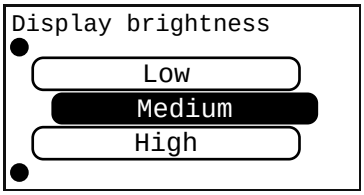
- Display setup (Display brightness and Display contrast)
- Language selection
- Timezone selection
- Upload interval
- Reset web interface password
- Factory reset



System settings

Display setup

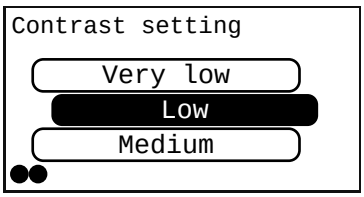
Display setup (Display brightness)



Display brightness

Select the low level of the backlight intensity. The Embion EMS Controller will reduce the backlight to the configured intensity when the buttons are not pressed for a while.

Display setup (Display contrast)

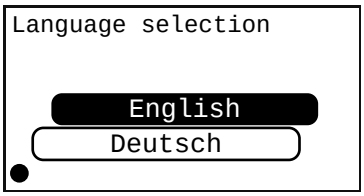


Display contrast

Configures the display's contrast. By hovering over the options, the display contrast will change to the selected intensity.

Language selection

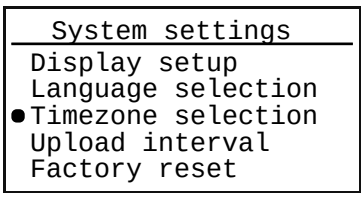
Configures the system language for all status and configuration pages.



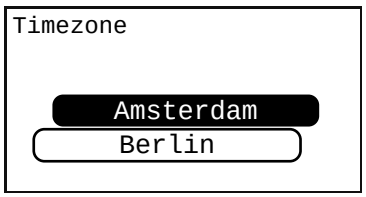
Language selection

Timezone

Sets the local timezone used by the Embion EMS Controller.



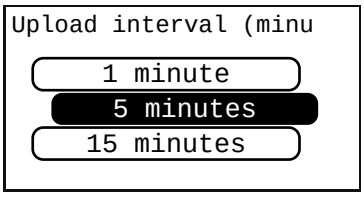
Timezone setting



Timezone selection

Data upload interval

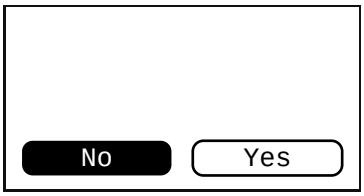
An upload interval of 1 (default), 5 or 15 minutes can be configured for asset data from EMS to HUB. This can be helpful in situations where there is a data limit like with a 4G modem. Data uploaded at 5 or 15 minute interval can't be restored to a smaller interval.



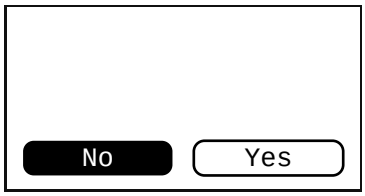
Upload interval

Factory Reset

Performs a factory reset of the device. Be aware that this process will delete all user settings and configurations, returning the device to its original state. The device will ask for confirmation twice.



Factory reset



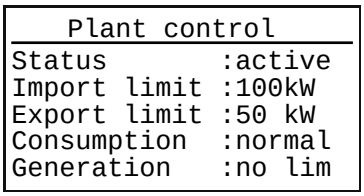
Confirm factory reset

After confirmation, the device will reboot and reset. This will take less than a minute during which nothing is shown on the display and both status LEDs will be off. Once finished, you will be presented with the First Time Use wizard to set up the device again. Note that any licence(s) will remain unaffected by the reset and will not be removed during this process.

> **Note**
>
> The factory reset can only be performed directly on the device; this option is not available in the HUB Portal settings.

Plant Control

This page shows the plant control status, import- and export limits, usage and energy generation.



Plant Control status