HUB-EN200

Operating Instructions

Valid with SIINEOS version 2.8.2
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Legal information

Safety information

This documentation contains information that you must observe for your personal safety and to prevent material damage. Read the safety information carefully and always keep this documentation within easy reach.

The safety information is presented in descending order of hazard level as follows:

DANGER
Indicates an immediate danger to humans. Failure to comply will lead to irreversible injuries or death.

WARNING
Indicates an identifiable hazard to humans. Failure to comply may lead to irreversible injuries or death.

CAUTION
Indicates an identifiable hazard to humans or potential material damage. Failure to comply may lead to reversible injuries or material damage.

ATTENTION
Indicates potential material damage. Failure to comply may lead to material damage.

NOTE
Notes give you tips, recommendations and useful information on specific actions and issues.

TIP
A tip gives you tips, tricks and recommendations from in.hub that have proven to be helpful in handling the products.

Qualified personnel

The product associated with this documentation may only be handled by personnel qualified for the respective task. The device may only be installed, commissioned and operated in compliance with the associated documentation and the safety information contained therein.

Based on their training and experience, qualified personnel are able to recognize risks and avoid potential hazards when handling these products.

Knowledge of personal computers, operating systems and web applications is required. General knowledge in the field of automation technology is recommended.

Intended use

in.hub products may only be used for the applications specified in the corresponding technical documentation.

If third-party products and components are used, they must be recommended or approved by in.hub.

Proper storage, setup, assembly, installation, commissioning, operation and maintenance are essential for the correct and safe operation of the products.

The permissible ambient conditions must be complied with. Instructions in the associated documentation must be followed.

Brands

All designations marked with the "®" symbol are registered trademarks. The other designations in this document may be trademarks whose use by third parties for their own purposes may infringe the rights of the owner.

Disclaimer

in.hub accepts no liability for product malfunctions resulting from improper handling, mechanical damage, incorrect application and improper use.

The contents of this document have been checked for conformity with the product described. However, deviations cannot be ruled out, so that we cannot guarantee complete conformity. The information in this publication is regularly reviewed. Necessary corrections are included in subsequent editions.

1. General information

This document contains all the information you need to commission and use the device/software.

The document is intended for service technicians, system administrators and installers who connect the product with other units, configure it and commission it.

1.1. Scope of delivery

1× HUB-EN200

1× voucher for a 3-year licence SIINEOS

1× basic dashboard for Grafana

1× Operating Instructions as a PDF

If the HUB-EN200 is to be supplied with power via the backplane bus of a master gateway (HUB-GM200), please note that you will need additional DIN-rail bus connectors. You can order these at in.hub as an option for your HUB-EN200. Please contact service@inhub.de for this.

1.2. Other applicable documents

In addition to this document, please observe the following documents. You can find these in the in.hub download portal at https://download.inhub.de/:

• User Manual for the IoT (Internet of Things) operating system SIINEOS

• Operating Instructions for other devices that you wish to plug in or connect

1.3. Intended use

The HUB-EN200 is intended exclusively for use in the industrial sector and has been specially designed for the continuous recording of energy and power consumption as well as current patterns of machines and systems.

The HUB-EN200 is not measuring equipment within the meaning of ISO 9001, and is therefore not subject to mandatory testing and the requirements for measuring equipment management.

1.4. Disposal

Please observe the national regulations.

Do not dispose of the device with normal household waste, but appropriately for its nature and country-specific regulations, e.g. as waste electrical and electronic equipment (WEEE) or by commissioning a certified disposal company.

2. General product information

The HUB-EN200 is used for the continuous measurement and evaluation of currents and voltages in 1- and 3-phase networks with neutral conductors. This makes it ideal for monitoring the energy consumption of machines and systems.

It uses in.hub's own operating system SIINEOS (and is compatible with all systems that use SIINEOS) and can therefore be easily integrated into a wide range of operating environments and networks.

For more information on how you can use HUB-EN200 in your company, read the chapter Typical use cases in practice [32].

2.1. Intended use

The HUB-EN200 is ideal for:

- Current monitoring by recording current patterns, consumption and current peaks in 1-phase and 3-phase networks
- Performance monitoring through active power, apparent power, reactive power, active energy, reactive energy
- Energy management
- Productivity monitoring
- Process control

2.2. SIINEOS system software

The HUB-EN200 uses the Linux-based SIINEOS operating system to run InCore & Docker apps. SIINEOS is accessible via a management console (SMAC) and can be configured there. All network parameters are also set up here to enable communication with other network components.

When using a HUB-EN200 as an extension, the HUB-EN200 operating system of the master gateway is required to activate and configure the interfaces on the SIINEOS, where "all the threads come together".

2.3. Hardware – design and interfaces
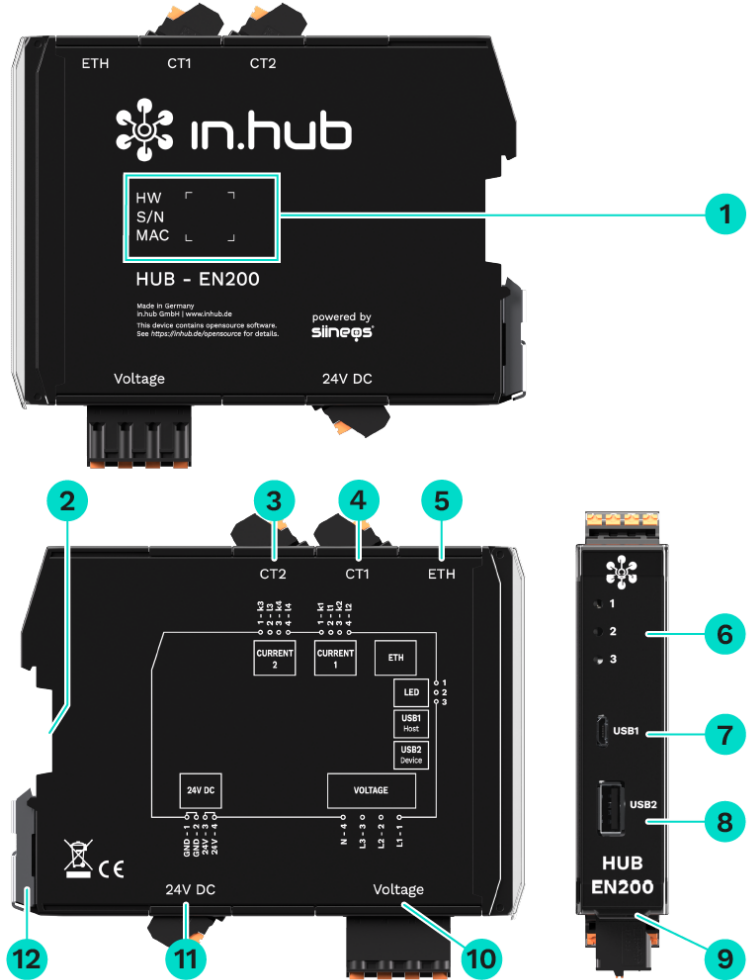
Side views and front view of the HUB-EN200 including interfaces

1	Device-specific information is stored in a barcode:
	HW: Hardware revision
	S/N: in.hub internal serial number
	MAC: Hardware address of the Ethernet network adapter.
2	Backplane bus
3	Connection option for 2 current sensors
	Sensor 3: k3 and l3
	Sensor 4: k4 and l4
4	Connection option for 2 current sensors
	Sensor 1: k1 and l1
	Sensor 2: k2 and l2
5	Ethernet

6	LEDs displaying the operating status
7	USB1 connection (host)
8	USB2 connection (device)
9	Protective flap Can be flipped upwards to open.
10	Voltage Connection to a 1- and 3-phase power network: L1, L2, L3, N
11	24 V DC power supply
12	Clamping device for mounting on the DIN rail

2.4. LED display

The three bicolour (red/green) LEDs on the front of the device indicate the following status:

LEDs on the front of the HUB-EN200

1	Device status
2	Function freely configurable in SIINEOS
3	Function freely configurable in SIINEOS	LED for device identification

Behaviour of LED 1	Colour	Meaning
LED off	–	Device is out of order
Lights up briefly	Red	Memory access
Flashing in heartbeat mode	Green	Module ready for operation
Permanently lit	Green	Error in the boot process

Behaviour of LED 3	Colour	Meaning
20× 1 Hz flashes	Red	The **Device identification** action has been triggered in the SIINEOS of the HUB-EN200.

2.5. Interfaces of the HUB-EN200

The following chapter gives an overview of the HUB-EN200 interfaces and provides the information you need to connect these interfaces.

2.5.1. USBs

- **USB1**

  - The Micro-USB connection **USB1** on the front of the device is only suitable for setting parameters and short-term power supply of the assembly – not as a permanent supply.

  - Located on the front of the HUB-EN200

  - Maximum power consumption = 2.5 W (500 mA)
    May vary depending on the device connected and the power supply.
    On an active 24 V power supply, the power consumption = 0.

  - USB2.0 supports full, high and low speed (480, 12 and 1.5 Mbit/s)

- **USB2**

  - Type-A socket

  - Located on the front of the HUB-EN200

  - Maximum power output = 2.5 W (500 mA) with 24 V supply

  - USB2.0 supports full, high and low speed (480, 12 and 1.5 Mbit/s)

> **NOTE**
> To access the USB ports on the front, you must open the protective flap upwards.

2.5.2. LED display

3× bicolour (red/green) LED on the front

2.5.3. Ethernet

Ethernet via RJ45 up to 100 Mbit/s

2.5.4. Power supply

- 24 V DC ± 10%

- Max. power consumption = 2.4 W (100 mA)

2.5.5. Backplane bus

- Max. number of modules on one master gateway: 3

- Voltage on the backplane bus of the master gateway = 24 V DC ± 10%

- Communication via Modbus RTU

2.5.6. CT1 and CT2

The two inputs CT1 and CT2 are technically identical.

> **⚠ ATTENTION**
>
> Please also pay attention to the markings and instructions on the sensor. TDK sensors of the CCT series have been tested and approved by in.hub. These can also be ordered directly via in.hub as accessories with pre-assembled supply cables.
>
> When commissioning with other sensors, make sure you know what load they can be connected to. In the event of improper use, in.hub accepts no liability for any damage that may occur.
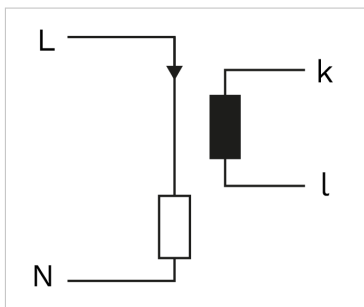
Connection of a current sensor

For a detailed description, see Connecting current sensors [19].

2.5.7. Voltage

• Permitted connections: 1-phase (L) or 3-phase (L1, L2, L3) with neutral conductor (N)

• Connection to a single-phase low-voltage network with a maximum voltage of 230 V

• Connection to a 3-phase power network with a maximum voltage of 400 V (phase–phase), 50 or 60 Hz

3. Assembly

The HUB-EN200 must be mounted on a DIN EN 60715 (35 mm) mounting rail. Observe the applicable safety and accident prevention regulations for specific areas of application, such as the Machinery Directive.

• Always work with the supply voltage switched off.

> ⚠️ **CAUTION**
> Electric shock due to conductive dirt can cause personal injury!
> • Avoid conductive contamination.
> • Only install devices in a control cabinet with the appropriate protection class.

• Maintain a minimum distance of 25 mm between the cable duct and the edge of the housing. This applies to both the top and bottom edges. This makes installation easier.

3.1. Mounting the device on the DIN rail

1. Make sure that the system's power supply is disconnected.

2. Turn the module so that the mounting foot (metal clamping device) is pointing down-wards.

3. Hold the device at an angle to the DIN rail.
   The recess on the back of the module is located above the mounting foot.

4. Click the module onto the DIN rail until you hear the mounting foot click into place.

5. After installation, check that the device sits firm and straight on the DIN rail.

3.2. Installation on a backplane bus

1. Make sure that the system's power supply is disconnected.

2. Make sure that the DIN-rail bus connector is attached to the master gateway or the previous module to which you want to connect the HUB-EN200.

3. Put another DIN-rail bus connector onto the DIN rail and push it along the DIN rail until directly next to the master gateway

4. Click the HUB-EN200 onto the DIN-rail bus connector you have just attached.

HUB-GM200 master gateway with a HUB-EN200

3.3. Dismantling the device

1. Make sure that the system's power supply is disconnected.

2. Use a screwdriver to pull the mounting foot (metal clamping device) downwards and remove the module from the DIN rail.

Removing the HUB-EN200 from the DIN rail

4. Installation

Read these instructions carefully and observe the safety instructions and warnings provided.

> **WARNING**
> Risk of personal injury from touching bare or stripped wires or from current measurement inputs on the device and current transformers that are dangerous to touch!
>
> 1. Disconnect the power supply of the system or devices and check this before starting work.
> 2. Earth the device's 24 V power supply connection.

4.1. Connecting a power-supply unit

The HUB-EN200 requires its own power supply if it is NOT connected directly via the backplane bus as an extension of a master gateway. Whenever the HUB-EN200 is installed as an individual device or spatially separated from the master gateway, you must provide it with a separate power supply.

> **NOTE**
> The HUB-EN200 is not supplied from the test voltage, but exclusively via a power supply unit.
>
> No power supply unit is included in the scope of delivery.

> **ATTENTION**
> When connecting **a** device of the HUB-EN200 type, the power supply unit must be rated for a voltage of at least 24 V ± 10% and a power output of 10 W.
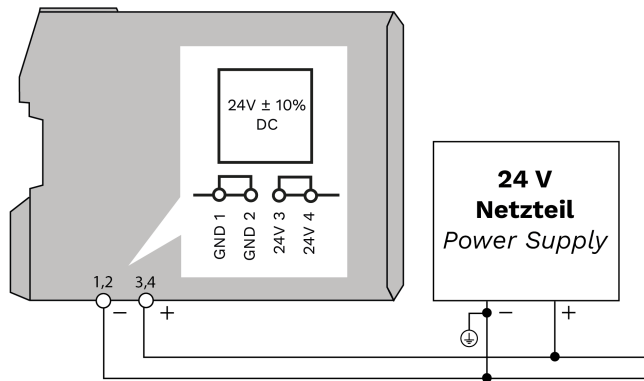
> **CAUTION**
> An incorrect power supply can cause irreparable material damage.
>
> • Ensure that the power supply corresponds to the specification of 24 V ± 10%.

1. To make installation easier, you can remove the plug with the terminal contacts from the **24 V DC** interface.
2. Clamp the power connection cable into the plug. Observe the following schematic diagram when doing this:

Schematic diagram of the power supply

When the operating voltage is correctly applied, the status LEDs on the front of the module light up – depending on the configuration – and signal the booting (start-up) of the SIINEOS system software.

4.2. Establishing a supply voltage via backplane bus

1. Mount the HUB-EN200 to the right of the master gateway on the backplane bus.

2. Log on to **SIINEOS on the master gateway** and navigate to **I/O management > I/O units**.

3. Create a new I/O unit of the type **Modbus client** and ensure that the **Enabled** slider is set to **On**.

4. For **Modbus type**, select the entry **Modbus RTU** and for the **Bus interface**, select **Backplane bus**.
   Leave all other parameters as they are.
   The HUB-EN200 is then automatically supplied with power.

Settings in the master gateway's SIINEOS to establish the power supply for a HUB-EN200 via backplane bus

For a detailed description of how to create a Modbus client RTU, please see the SII-NEOS User Manual.

> ✏️ **NOTE**
> You can supply up to 3 devices with power via backplane bus of the master gateway if you activate the Modbus RTU client as described above.

4.3. Connection diagrams

With the HUB-EN200 you can continuously monitor and analyse current, power, energy and voltage in 1-phase and 3-phase networks, and thus set up a comprehensive energy-management system for your machines and systems. Observe the following connection diagrams during the installation.
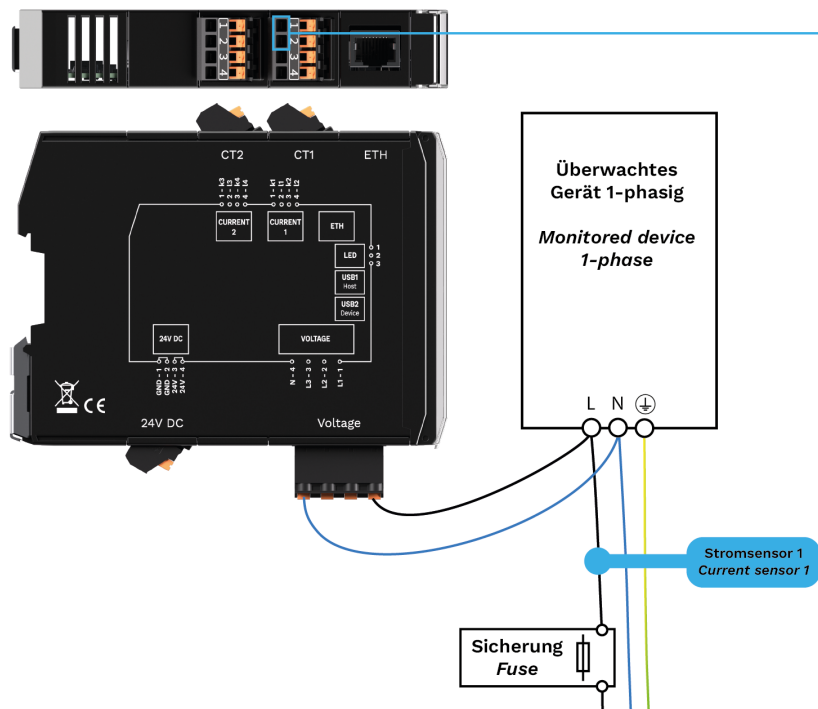
> ✏️ **NOTE**
> Ensure that the meter is connected for accuracy of voltage measurement, installing L1, L2, L3 and N as close as possible to the measurement object.

> 💡 **TIP**
> As an alternative to a fuse, you can also use a circuit breaker.

4.3.1. Connecting and monitoring a 1-phase device

4.3.2. Connecting and monitoring several 1-phase devices
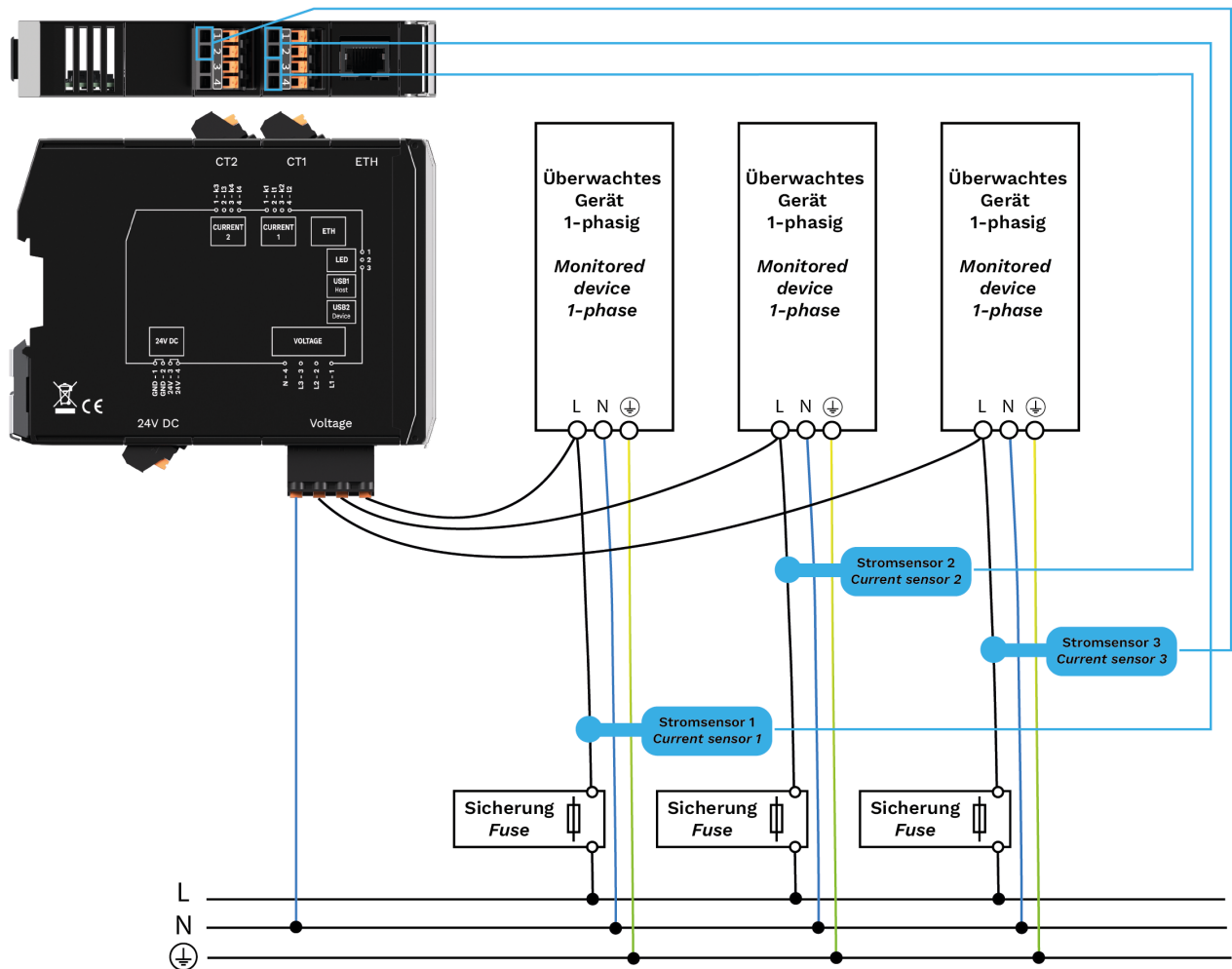
4.3.3. Connecting and monitoring a 3-phase device
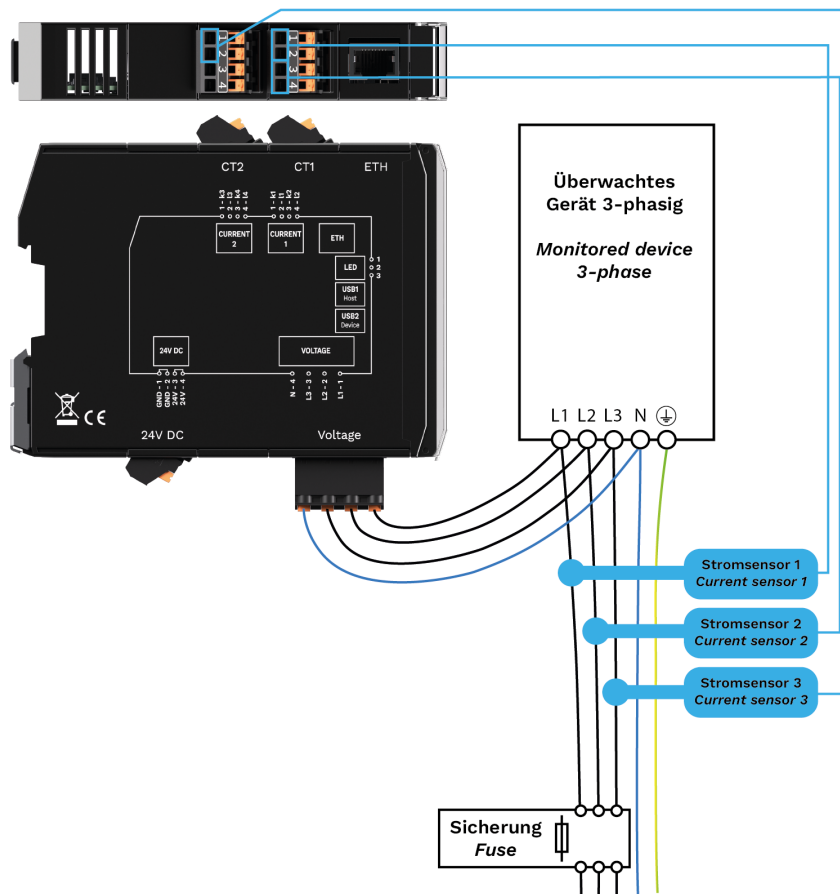
4.3.4. Monitoring neutral conductor current

Monitoring of the neutral conductor is only necessary to detect asymmetry in a 3-phase network. Moreover, some devices and machines do not have a neutral conductor.

4.4. Connecting current sensors

> **ATTENTION**
> These instructions refer to the connection of a TDK current sensor of the CCT series recommended by in.hub. If you connect a different current sensor, be sure to observe the transformation ratio and the intended load resistance of the sensor used.

> **NOTE**
> The current sensor recommended by in.hub may only be placed around an insulated conductor (at least category III basic insulation).

> ⚠️ **CAUTION**
>
> Operating errors can cause irreparable material damage to the device!
>
> - Make sure that no voltage is applied to the two interfaces **CT1** and **CT2**, but that only the connecting cables of the current sensors are connected.

1. Switch off the power to the device.

2. Set the current sensor aside.

3. Connect the connecting cable to the HUB-EN200.

   - To do this, take the end with the two wire-end ferrules.

   - Using a small screwdriver, first press down the orange actuator on pin **k1** (number 1 on the connector) and insert the connecting cable connected to k on the sensor. Release the orange actuator.

   - Repeat the procedure with the connecting cable that is connected to l on the sensor, and plug it into pin **l1** (number 2 on the connector).

Connecting cable at the HUB-EN200 (colours of the connecting cable as an example)

4. Connect the connecting cable to the current sensor. To do this, plug the connectors of the connecting cable and the current sensor into each other.
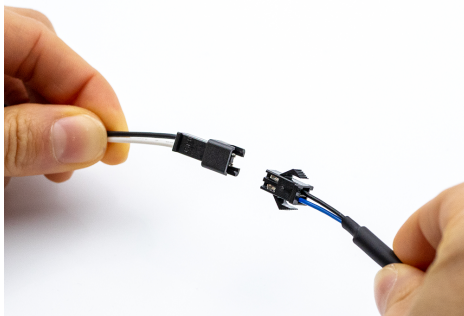
Connecting the connecting cable and the CCT-series current sensor

5. Open the separable core of the current sensor and insert the conductor to be measured into the channel.

> ✎ **NOTE**
> Pay attention to the direction of the current in the conductor.
>
> Insert only one cable at a time.
>
> Do not pinch the cable.

Opened current sensor with live cable (left) with schematic diagram for connecting the current sensor (right)
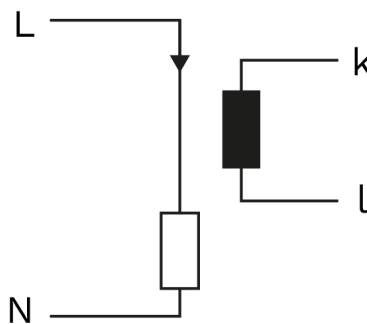
6. Close the separable core of the current sensor.

5. First steps with SIINEOS

This chapter contains the first steps for your work with SIINEOS. Details on the configuration and settings of your device in SIINEOS are described in separate user documentation, which is published with each new software version of SIINEOS. This allows you to benefit from new features and improvements in the SIINEOS software.

> **NOTE**
>
> The HUB-EN200 requires SIINEOS version 2.8.0 or later.
>
> SIINEOS updates and the user documentation can be downloaded from the download portal at https://download.inhub.de/siineos/.

5.1. Connecting HUB-EN200 with the PC

1. Use a Micro-USB cable to connect your PC with the HUB-EN200.
   In most cases, the USB connection provides enough power to operate the HUB-EN200 without having to connect an extra power supply.

> **NOTE**
>
> Under certain circumstances, the power supply may not be sufficient, e.g. with additional, energy-hungry USB devices connected to a USB port (device), with high computing power and/or if the rating of the USB port of your connected device is too low.
>
> No additional USB devices can be operated via the other USB connections when power is supplied via the **USB 1** connection. This is only possible with a 24 V supply.

LED 1 indicates the status of the device. If the connection is working correctly, **LED 1** lights up and flashes after a while. SIINEOS runs on the module.

2. When you connect the HUB-EN200 for the first time, additional drivers are installed. Check Windows Device Manager to see if a new device has been created:
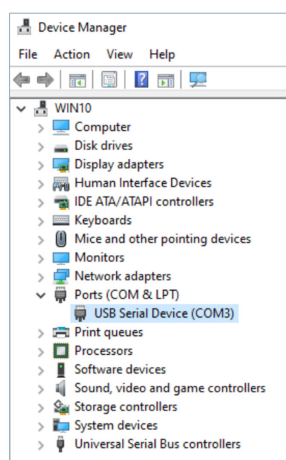
Windows Device Manager (example)

> ✏️ **NOTE**
> If the LED display does not light up and no drivers have been installed and no new device created, there is usually an insufficient power supply to the module. In this case, use an external power supply at the 24 V input.

5.2. Logging on to SIINEOS

We recommend that you use the latest versions of the **Firefox**, **Edge** or **Chrome** browsers for SIINEOS. Compatibility problems may occur with other or older browsers.

5.2.1. When logging on to SIINEOS for the first time

1. Connect the gateway or module to your PC using a micro USB cable (USB port on the front).

2. Enter the following address in your browser:
   http://192.168.123.1

3. Log on with the initial user data (**hubadmin**/**hubadmin**).
   The SIINEOS Management Console will open.

SIINEOS start page (example)

On the start page, you will now see information about your system, such as the current SIINEOS version, the device name, location, type, system resources, etc.

4. Select the **Users** page and change the password for the user **hubadmin**.

5.2.2. If you have already set up SIINEOS

1. In your browser, enter the individual IP network address that you have configured.

2. Log on with your user data and click on **Log in**.
   The SIINEOS Management Console will open.

5.3. Checking the SIINEOS version

1. Go to the SIINEOS start page by selecting the **Overview** page on the left.

"Overview" start page (example)

2. Check the SIINEOS version field to see which version is installed on your gateway.

3. Go to the download portal at https://download.inhub.de/siineos/ and check whether a new version of SIINEOS is available.

5.4. Installing SIINEOS updates

> ✎ **NOTE**
>
> You can only upload updates on the **System** page if you have a valid SIINEOS licence.
>
> If the licence has expired, you will be informed that you cannot import any updates.

1. Go to the download portal at https://download.inhub.de/siineos/ and select the required SIINEOS package.
    Two variants are available:

    - The complete software package for the gateways and modules, such as the HUB-GM200 or the HUB-EN200

    - The light version without Docker containers with a smaller file size for the HUB-IO100

2. When the download is complete, go to the **System** page in SIINEOS and select **Updates**.
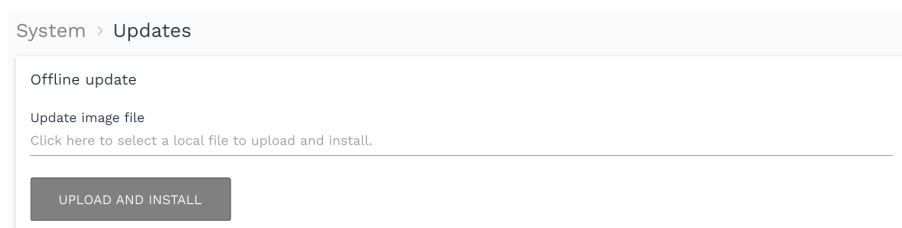
System > Updates

3. Click in the **Update image file** input field and select the software package provided by in.hub in `*.raucb` format from your local file-storage location.

4. Click on **Upload and install**.
   The installation will proceed automatically and takes about 1 minute. After a successful installation, you will be asked whether you want to restart the gateway.

5. Click on **Yes**.

6. After restarting, check that the new version of SIINEOS is displayed on the **Overview** page.

7. If the version has not been updated, proceed as follows:

   a. First delete your browser cache and refresh the page in your browser.

   b. If that doesn't work, switch off the power to the gateway and switch it on again after a few seconds.

   c. Start SIINEOS and check the version number.

5.5. Managing licences

With every new SIINEOS-enabled device you purchase, you will automatically receive a SIINEOS licence for 3 years. You can update SIINEOS as often as you like during the licence period and install the latest version on the device.

Once the licence period has expired, you can either continue working with the currently installed version of SIINEOS or you can purchase another licence from in.hub to benefit from the further development and product improvement of SIINEOS.

If you need an app licence or want to extend one, please refer to the relevant User Manual.

5.5.1. Requesting a voucher and activating a software licence

1. Please contact service@inhub.de and let us know the term for which you would like to purchase the licence.
   SIINEOS licences can be purchased for 1 year or 3 years.
   You can activate the software licence with the voucher you receive from us.

2. Navigate to the website https://apps.inhub.de/ and register or log on if you are already registered.
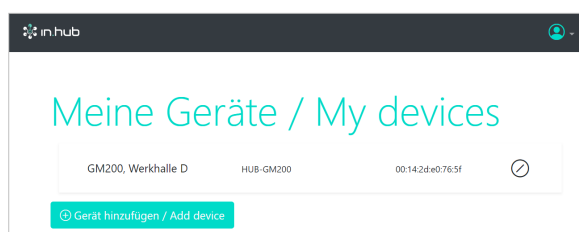
My devices (example)

3. If you want to extend a software licence, click on the device on which the software licence is to be renewed under **My devices**;
   – or –

if you want to activate the software licence for a new device, click on **Add device**.

Gerät hinzufügen / Add device

Name*

```
Name
```

Gerätetyp / Device type*

```
HUB-GM200                              ⌄
```

MAC-Adresse*

```
MM:MM:MM:SS:SS:SS
```

[Abbrechen / Cancel]   [Hinzufügen / Add]

Add device

4. Enter the **Name** of the device, select the **Device Type** and enter the MAC address of the device.
    The MAC address can be found via **SIINEOS > Networks > Ethernet 1**.
    NOTE: Only the MAC address of Ethernet 1 is recognized and accepted.

5. Click on **Add**.
    The **License activation** page opens:

Lizenfreischaltung / License activation

Bitte geben Sie einen Lizenzvoucher ein, um ihn einzulösen und die erworbene Softwarelizenz für dieses Gerät zu aktivieren. Wenn Sie keinen Voucher haben, wenden Sie sich bitte an den Händler, bei dem Sie das Gerät erworben haben.

Please enter a license voucher to redeem it and activate the purchased software license for this device. If you do not have a voucher, please contact the dealer from whom you purchased the device.

Gerät / Device

```
GM200, Werkhalle D
```

Voucher

```
|
```

● ○

[Abbrechen / Cancel]   [Weiter / Continue]

License activation

6. Copy the name of the voucher you received from in.hub into the **Voucher** field.

7. Click on **Next**.
    The information stored in the voucher, such as the term, product and validity, etc., will be displayed.

Voucher information (example: Activation of a SIINEOS licence valid for 3 years)

8. Check the details, especially whether the requested licence term matches the term specified here.

9. If the details are correct, click on Generate license.
The licence file is downloaded automatically.

5.5.2. Adding a licence file to SIINEOS

1. In SIINEOS, navigate to **Licensing**.
In the list, you will find all software licences that you have purchased and uploaded.

"Licensing" page (example)

2. Click on **Add license**.

3. Select the licence file from your file directory and click on **OK**.
The licence is added to the list. From that point on, you can make updates again or return to using a blocked app.

4. To remove a licence again – because it has become invalid, for example – select the licence ID and click on **Remove**.
This will not delete the licence file itself, but only remove it from the list.

> **NOTE**
> Make sure that the system time of your device and your current local time are synchronized. Otherwise, the licence-file upload may fail.

5.6. Configuring the current sensor and data communication

You perform the following tasks in the SIINEOS of the HUB-EN200. This allows you to configure the current sensor on the one hand and the method of data communication – via the backplane bus or the network – on the other. Of course, this also depends on how your HUB-EN200 is integrated. Data communication via backplane bus only needs to be set up if the HUB-EN200 is also connected to a master gateway via backplane bus.

1. Navigate to the **I/O management** page and select the I/O unit **HUB-EN200** that has already been created;

   – or –

   if the **I/O units** page is still empty, create a new I/O unit of the **HUB-EN200** type.

Device settings of the HUB-EN200 in "Advanced" viewing mode; in the example, data communication via network is activated

2. Optional: Change the name of the I/O unit and enter a location to find the device easily.

3. In the **Measurement settings** section, start by entering the information for the current sensor:

   a. **Transformation ratio**: Enter the transformation ratio of the connected AC sensor.

   b. In the **Advanced** viewing mode, you can also specify the **load resistance**.

4. For **data communication via the network**, make the following settings in the **Measurement settings** section:

   a. **Backplane bus ID**: This ID is not relevant for communication via network.

   b. Set the **Modbus TCP server enabled** slider to **On** and make sure that a Modbus TCP client is created in the master gateway.

5. For **data communication via the backplane bus**, make the following settings in the **Measurement settings** section:

a. **Backplane bus ID**: Enter a backplane bus ID that has not yet been assigned in the master gateway.

b. Set the **Modbus TCP server enabled** slider to **Off** and make sure that a Modbus RTU client is created in the master gateway.

6. Click on **Save**.

5.7. Configuring the signals of the HUB-EN200

1. In the SIINEOS of the HUB-EN200, navigate to **I/O management > I/O units** and select the created HUB-EN200.

2. Click on **Signals**.
   The signals for all channels of the HUB-EN200 have already been created.

I/O management > I/O units > EN200 > Signals

EDIT   QUICK EDIT

		Identifier ∧	Name	Group	Type	Value
☐	● ↪	ACTIVE_POWER_L1	Active power L1		DOUBLE	24,2 W
☐	● ↪	ACTIVE_POWER_L2	Active power L2		DOUBLE	0,0 W
☐	● ↪	ACTIVE_POWER_L3	Active power L3		DOUBLE	0,0 W
☐	● ↪	APPARENT_POWER_L1	Apparent power L1		DOUBLE	33,5 VA
☐	● ↪	APPARENT_POWER_L2	Apparent power L2		DOUBLE	0,0 VA
☐	● ↪	APPARENT_POWER_L3	Apparent power L3		DOUBLE	0,0 VA
☐	● ↪	CURRENT_L1	Current L1		DOUBLE	0,15 A
☐	● ↪	CURRENT_L2	Current L2		DOUBLE	0,00 A
☐	● ↪	CURRENT_L3	Current L3		DOUBLE	0,00 A
☐	● ↪	CURRENT_N	Current N		DOUBLE	0,00 A
☐	● ↪	LED_GREEN	Green LED		BOOL	0
☐	● ↪	LED_RED	Red LED		BOOL	0
☐	● ↪	VOLTAGE_L1	Voltage L1		DOUBLE	225,4 V
☐	● ↪	VOLTAGE_L2	Voltage L2		DOUBLE	3,5 V
☐	● ↪	VOLTAGE_L3	Voltage L3		DOUBLE	3,5 V

Signals of the HUB-EN200

3. Select the signal you want to configure.
   A window opens in which you will find three tabs.

Signal settings of the HUB-EN200 on the HUB-EN200 module (example)

4. Enable and configure the interface on the **Signal settings** tab.

    • Optional: Change the name of the interface.

    • Set the **Enabled** slider to **On**.

    • In the **Sampling interval** field, specify the interval at which the signal is to be sampled (in milliseconds).

    • Set the **Record signal values** slider to **On** if the values are to be recorded in the local VictoriaMetrics database.

    • In the **Recording interval** field, enter the desired time interval for the recording (in seconds).

5. Additional settings are available in **Advanced** viewing mode:

    a. **Use custom identifiers**: Set the slider to **On** if you want to enter your own identifier name.

    b. **Custom identifier**: Enter your own identifier name.

6. In the **Details** section, you can:

    a. For the measurements, see which Modbus address is assigned for the input register – once for the electrical value / raw value and once for the processed value. You can find an overview at Measurements and associated Modbus registers [41]

    b. For an LED signal, specify whether the **default state** of the LED is to be off or on.

7. On the **Signal processing** tab, you can specify how the signal value is to be processed. A detailed description of the **Signal processing** tab can be found in the current SIINEOS User Manual.

8. Click on **Save**.

9. On the **Measurement modelling** tab, you specify how the measurements are to be visualized. A detailed description of the **Measurement modelling** tab can be found in the current SIINEOS User Manual.

10. Finally, click on **Save & close**.

> **NOTE**
> If you are getting negative signal values, the current sensor may be incorrectly connected.

6. Typical use cases in practice

The following chapter explains the typical application options for a HUB-EN200. This module is very versatile and can be used on its own, in an in.hub system or in a third-party system.

Find out in which different scenarios the device can be used and which basic tasks are necessary to work with the HUB-EN200. For detailed step-by-step instructions, please refer to the relevant sections in this documentation.

6.1. Data collection and analysis on one device (with Grafana)

CASE 1: The HUB-EN200 is individually installed, has its own power supply and collects, processes and visualizes the data from the connected peripheral devices itself.

SIINEOS and Grafana are available for data processing and visualization. With in.hub's basic Grafana dashboard, you can get started right away.

1. Install the individual device on the DIN rail in the control cabinet.
2. Attach a power supply unit to establish the power supply.
3. Connect the current sensors.
4. Log on in the HUB-EN200's SIINEOS.
5. Activate the signals of the current sensors you would like to use in the **I/O management** and configure them.
6. Open the **Grafana** app, log on to Grafana (with **admin**/**admin**) and start the basic in.hub dashboard;
    – or –
    create your own dashboard and select the signals that are to be visualized.

6.2. Internal data collection and external data evaluation

CASE 2: The HUB-EN200 is individually installed and has its own power supply. A higher-level ERP/MES system collects the data from the connected peripheral devices, where it is processed and visualized using the applications there.

1. Install the individual device on the DIN rail in the control cabinet.

2. Attach a power supply unit to establish the power supply.

3. Connect the current sensors.

4. Log on in the HUB-EN200's SIINEOS.

5. Activate the signals of the current sensors you would like to use in the **I/O management** and configure them.

6. The data can now be retrieved from an external system, e.g. via OPC UA or MQTT.

6.3. Data collection with several HUB-EN200s and data evaluation on a master gateway

CASE 3: The HUB-EN200 is individually installed, has its own power supply and is connected via the network to an in.hub master gateway, such as the HUB-GM200. The HUB-EN200 forwards the data from the connected peripheral devices to the master gateway, where it is collected, processed and visualized.

Multiple devices from various locations can also transmit data to the master gateway via the network.

SIINEOS and Grafana are available for data processing and visualization. With in.hub's basic Grafana dashboard, you can get started right away.

> **TIP**
>
> The HUB-EN200 should be combined with a master gateway if, for example, you require more comprehensive signal-processing and data-visualization features for the measured sensor data.
>
> The combination of master gateway and HUB-EN200 allows a holistic view of the machinery and systems and a wide range of use cases, as a whole range of further data can be collected and processed via the master gateway.
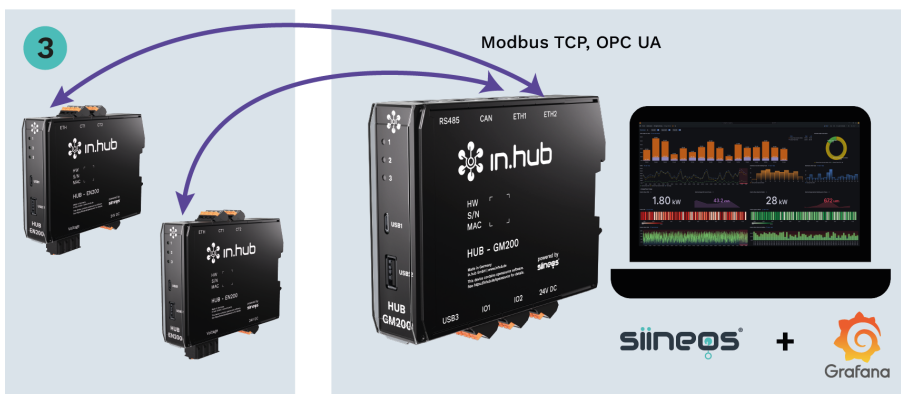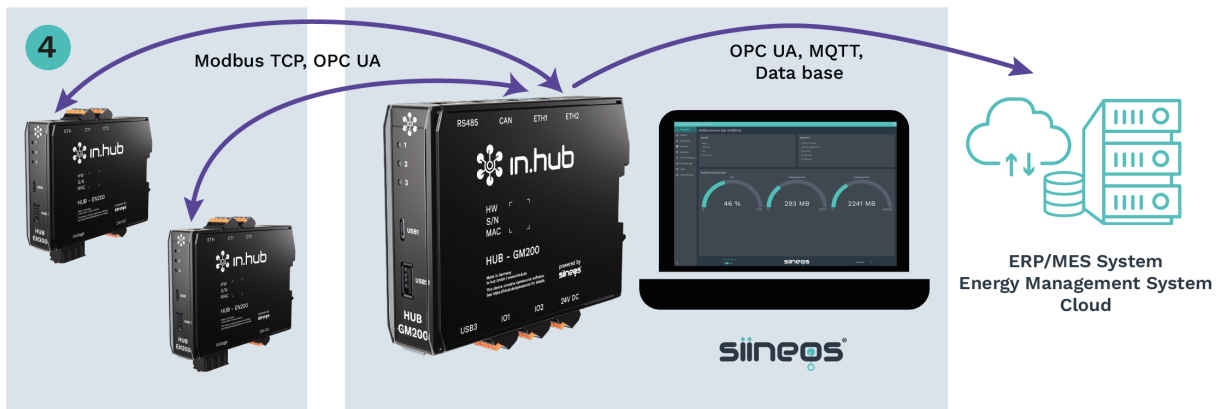

1. Install the individual device on the DIN rail in the control cabinet.

2. Attach a power supply unit to establish the power supply.

3. Connect the current sensors.

4. Log on in the HUB-EN200's SIINEOS.

5. Activate the signals of the current sensors you would like to use in the **I/O management** and configure them.

6. Make sure that the HUB-EN200 is accessible in the network.

7. Log on to SIINEOS on the master gateway.

8. Either create a **Modbus client** of type **TCP**: to do this, use the JSON file, for example, which you can find in the download portal;
   – or –
   create an **OPC UA client**:
   to do this, first activate the OPC UA Server app in SIINEOS on the HUB-EN200.

9. Open the **Grafana** app, log on to Grafana (with **admin**/**admin**) and start the basic in.hub dashboard;

   – or –

   create your own dashboard and select the signals that are to be visualized.

10. You can repeat the steps for each additional HUB-EN200 to obtain data from multiple devices.

6.4. Data collection with several HUB-EN200s and external data evaluation

CASE 4: Each HUB-EN200 is individually installed, has its own power supply and is connected via the network to an in.hub master gateway, such as the HUB-GM200. The HUB-EN200 forwards the data from the connected peripheral devices to the master gateway. A higher-level ERP/MES system collects the data from the master gateway, where it is processed and visualized using the applications there.

Multiple devices from various locations can also transmit data to the master gateway via the network.
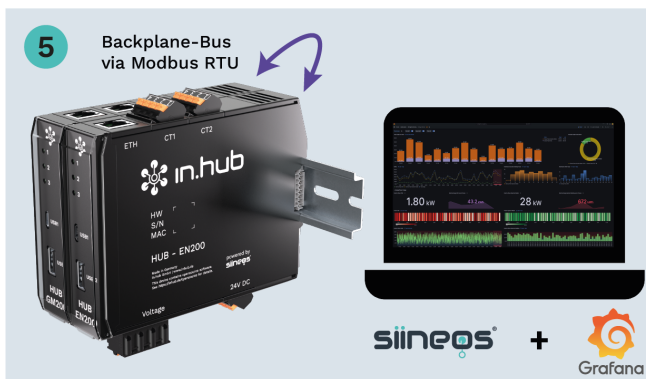

1. Install the individual device on the DIN rail in the control cabinet.

2. Attach a power supply unit to establish the power supply.

3. Connect the current sensors.

4. Log on in the HUB-EN200's SIINEOS.

5. Activate the signals of the current sensors you would like to use in the **I/O management** and configure them.

6. Make sure that the HUB-EN200 is accessible in the network.

7. Log on to SIINEOS on the master gateway.

8. Either create a **Modbus client** of type **TCP**: to do this, use the JSON file, for example, which you can find in the download portal;
    – or –
    create an **OPC UA client**:
    to do this, first activate the OPC UA Server app in SIINEOS on the HUB-EN200.

9. The data can now be retrieved from an external system, e.g. via OPC UA or MQTT.

10. You can repeat the steps for each additional HUB-EN200 to obtain data from multiple devices.

6.5. Connection to the backplane bus of the master gateway and internal data evaluation

CASE 5: The HUB-EN200 is connected to an in.hub master gateway, such as the HUB-GM200, via backplane bus and also draws its power supply through this connection. The HUB-EN200 forwards the data from the connected peripheral devices to the master gateway, where it is collected, processed and visualized.

Up to 3 devices can be connected to the master gateway via backplane bus.

SIINEOS and Grafana are available for data processing and visualization. With in.hub's basic Grafana dashboard, you can get started right away.

1. Install the device on the backplane bus of the master gateway, which is already located on the DIN rail in the control cabinet.

2. Connect the current sensors to the HUB-EN200.

3. In SIINEOS on the master gateway, add a **Modbus client** I/O unit of type **RTU** in the **I/O management** and select the **Backplane bus** interface.
    The HUB-EN200 is then automatically supplied with power.

4. In SIINEOS on the HUB-EN200, add an I/O unit of type **HUB-EN200** in the **I/O management** and make changes to the **device settings** as required, e.g. under **Backplane bus ID**.
    When using multiple HUB-EN200s, enter a separate Backplane bus ID for each device.

5. Activate the signals of the current sensors you would like to use in the **I/O management** and configure them.

6. In SIINEOS on the master gateway, open the **Grafana** app, log on to Grafana and start the basic in.hub dashboard;
    – or –
    create your own dashboard and select the signals that are to be visualized.

6.6. Connection to the backplane bus of the master gateway and external data evaluation

CASE 6: The HUB-EN200 is connected to an in.hub master gateway, such as the HUB-GM200, via backplane bus and also draws its power supply through this connection. The HUB-EN200 forwards the data from the connected peripheral devices to the master gateway. A higher-level ERP/MES system collects the data from the master gateway, where it is processed and visualized using the applications there.

Up to 3 devices can be connected to the master gateway via backplane bus.

1. Install the device on the backplane bus of the master gateway, which is already located on the DIN rail in the control cabinet.

2. Connect the current sensors to the HUB-EN200.

3. In SIINEOS on the master gateway, add a **Modbus client** I/O unit of type **RTU** in the **I/O management** and select the **Backplane bus** interface.
   The HUB-EN200 is then automatically supplied with power.

4. In SIINEOS on the HUB-EN200, add an I/O unit of type **HUB-EN200** in the **I/O management** and make changes to the **device settings** as required, e.g. under **Backplane bus ID**.

5. Activate the signals of the current sensors you would like to use in the **I/O management** and configure them.

6. The data can now be retrieved from an external system, e.g. via OPC UA or MQTT.

7. Technical data

Data	Values
Power supply	24 V DC ± 10 %
Max. power consumption	5 W
Processor	NXP® i.MX 6ULL
Memory	1 GB DDR3L RAM, 8 GB eMMC
Data interfaces	USB1: Host (Micro USB) USB2: Device (USB-A) Ethernet: 100 Mbit/s 3× status LEDs Backplane bus
Voltage and current measurement	1~ or 3~, 230 V / 400 V, 50 or 60 Hz, max. 4× AC current sensors, sampling rate up to 8 kHz and 16 bit, resolution of current and voltage measurement,
Protocols	OPC UA server + client MQTT broker client + server Modbus TCP/IP broker client + server
Operating system	SIINEOS IIoT operating system for configuration and data visualization (via Micro-USB or Ethernet)
Housing	Plastic (polyamide), black, flammability class UL 94 V0
Protection class	IP20
Dimensions	139 mm × 100 mm × 25 mm
Weight	150 g

Ambient conditions	Values
Temperature range	Storage: −40°C to 85°C Operation: 0°C to 50°C
Humidity	Storage: 10% to 95% RH, non-condensing Operation: 20% to 90% RH, non-condensing
Operating altitude	Max. 2000 m above sea level

Voltage measurement (voltage)	Values
3-phase, 4-wire system with nominal voltage (L–N/L–L)	max. 253 V / max. 440 V
Overvoltage category	300 V CAT III
Sampling frequency	8 kHz
Bandwidth	1 … 2000 Hz
Resolution	16 bit

Current measurement (CT1 and CT2)	Values
Internal measuring resistance	6 Ohm
Maximum current of inputs CT1 and CT2	117 mA eff.
Sampling frequency	8 kHz
Bandwidth	1 … 2000 Hz
Resolution	16 bit
Maximum measurable current with current transformer of the CCT series current sensor (n = 3000)	350 A (crest factor = 1.41) | 250 A (crest factor = 2)

Storage	Values
Recording interval	Minimum 1 second
Storage	Up to 7 GB usable
Data export	VictoriaMetrics

| SIINEOS	
Pre-installed software	**FlexPlorer**: Live data visualization
	Azure IoT Hub Connector: Connector to the Microsoft® IoT platform
	Cloud of Things Connector: Connector to the Telekom® IoT platform
	InGraf: Grafana data visualization
	NumCorder: Recording of scanned or entered barcodes / serial numbers

SIINEOS	
	OPC UA server: Counterpart to the OPC UA client, setting up of a server–client structure with one device
	NodeRED: Graphical programming of interfaces, services or hardware
	PromEx: Database configuration of VictoriaMetrics and Prometheus
	TOSIBOX®: Secure connectivity between the IoT devices
I/O interfaces to third-party systems/devices	**S7 PLC client**: Connector for the Siemens® S7 controller
	Sensirion SPS30: Temperature and humidity sensor
	TBEN-S1-8DIP: TBEN module from TURCK®
	TBEN-S2-4AI: TBEN module from TURCK®

7.1. Measurements and associated Modbus registers

Measurements	Modbus register: Raw value [unit]	Modbus register: Processed value [unit]
Active power L1	31 (UINT16) [W]	310+311 (FLOAT) [W]
Active power L2	32 (UINT16) [W]	320+321 (FLOAT) [W]
Active power L3	33 (UINT16) [W]	330+331 (FLOAT) [W]
Apparent power L1	41 (UINT16) [VA]	410+411 (FLOAT) [VA]
Apparent power L2	42 (UINT16) [VA]	420+421 (FLOAT) [VA]
Apparent power L3	43 (UINT16) [VA]	430+431 (FLOAT) [VA]
Current L1	11 (INT16) [mA]	110+111 (FLOAT) [A]
Current L2	12 (INT16) [mA]	120+121 (FLOAT) [A]
Current L3	13 (INT16) [mA]	130+131 (FLOAT) [A]
Current N	14 (INT16) [mA]	140+141 (FLOAT) [A]
Voltage L1	21 (INT16) [V]	210+211 (FLOAT) [V]
Voltage L2	22 (INT16) [V]	220+221 (FLOAT) [V]
Voltage L3	23 (INT16) [V]	230+231 (FLOAT) [V]

7.2. Schematic diagram
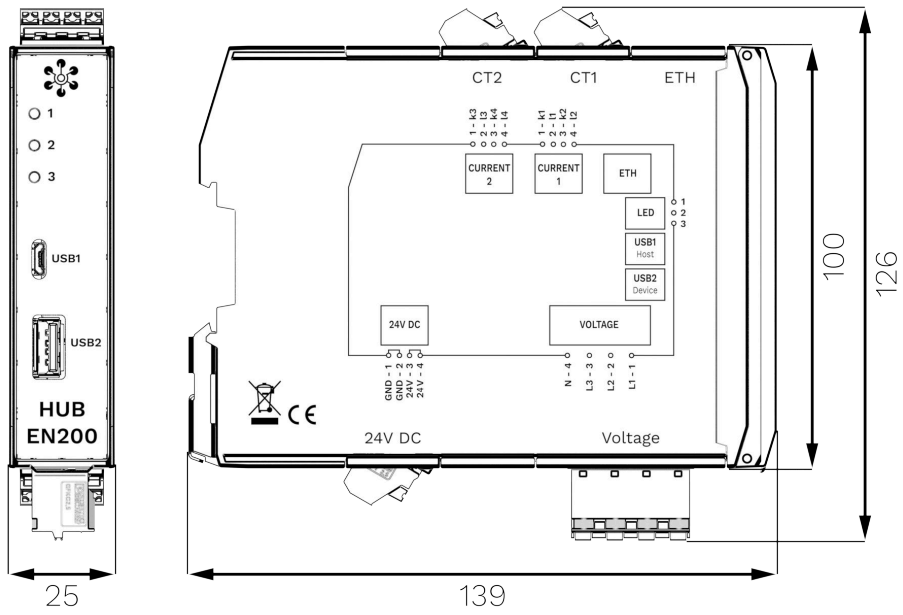
Dimensions of the HUB-EN200 in mm