in.hub

HUB-IO100

Operating Instructions

Valid with SIINEOS Light version 2.8.2
Document version 1.3 | Publication date:
17. February 2025

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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-IO100

1× voucher for a 3-year licence SIINEOS (light)

1× Operating Instructions as a PDF

If the HUB-IO100 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-IO100. 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-IO100 is intended exclusively for use in the industrial sector and is used for monitoring machines, systems and processes. Process data can be recorded, processed, visualized and made available via interfaces using the connection options provided.

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-IO100 extends your network of sensors, gateways, modules or peripheral devices. It has the in.hub's own SIINEOS operating system and is compatible with all systems that use SIINEOS. It can therefore be easily integrated into a variety of operational environments and networks.

For more information on how you can use HUB-IO100 in your company, read the chapter Typical use cases in practice [27].

2.1. Intended use

The HUB-IO100 is ideal for:

- Use as a stand-alone device when integrated into an existing operating ecosystem
- Extension of a master gateway (model HUB-GM200 or later) with additional interfaces
- Lean management
- Cost efficiency
- Process control

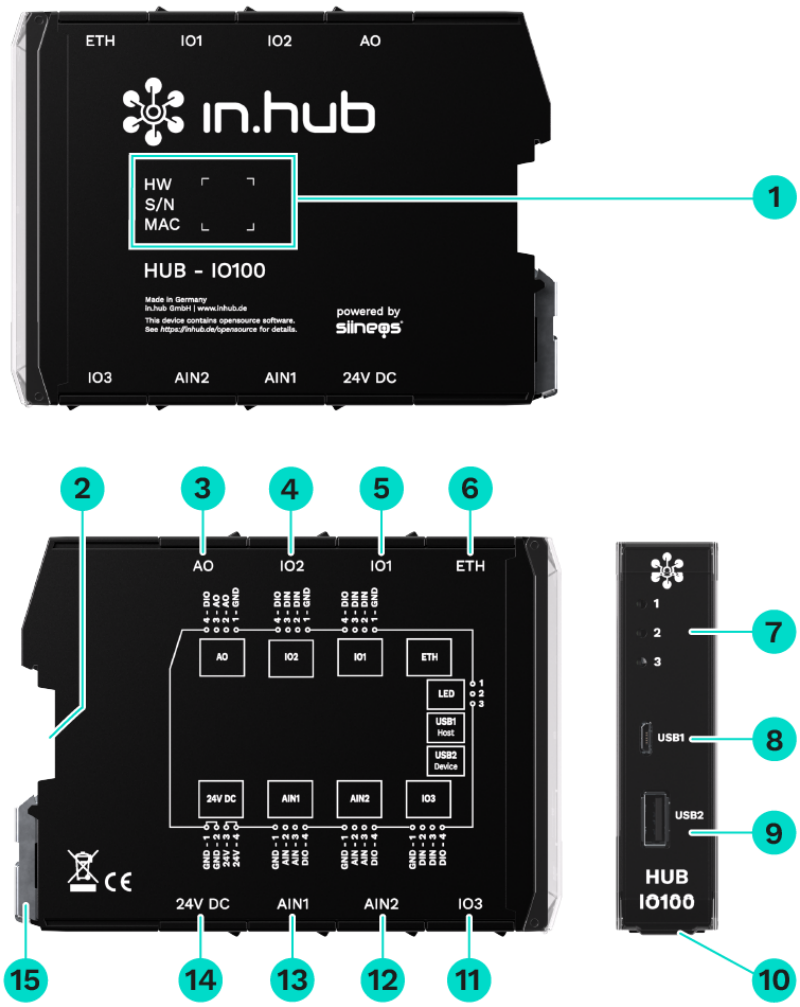
2.2. SIINEOS system software

The HUB-IO100 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.

NOTE
The HUB-IO100 works with the SIINEOS Light software version, which runs without a Docker container and has a smaller file size.

When using a HUB-IO100 as an extension, the HUB-IO100 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-IO100 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 interface
2	Backplane bus
3	Analogue output (AO)
4	Digital input/output (IO2)
5	Digital input/output (IO1)
6	Ethernet
7	LEDs displaying the operating status

8	USB1 connection (host)
9	USB2 connection (device)
10	Protective flap Can be flipped upwards to open
11	Digital input/output (IO3)
12	Analogue input (AIN2)
13	Analogue input (AIN1)
14	24 V DC power supply
15	Clamping device for mounting on the DIN rail

2.3.1. USB1 and USB2

The technical parameters of the USB interfaces can be found in the chapter USB interface specifications [39].

- Open the protective flap on the front upwards to access the two USB ports.
- The **USB1** port (host) is a type-B socket.
- The **USB2** port (device) is a type-A socket.
- 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.

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.

2.3.2. Pin assignment of digital and analogue interfaces

The technical parameters of the interfaces can be found in the chapter Specification of inputs and outputs [36].

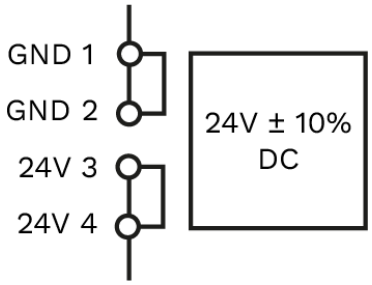
Pin assignment of interfaces IO1, IO2 and IO3		
1	GND	Ground / 0 V
2	DIN	Digital input
3	DIN	Digital input
4	DIO	Configurable in SIINEOS as a digital input or digital output

Pin assignment of the AO interface		
1	GND	Ground / 0 V
2	AO	Analogue output
3	AO	Analogue output
4	DIO	Configurable in SIINEOS as a digital input or digital output

Pin assignment of interfaces AIN1 and AIN2		
1	GND	Ground / 0 V
2	AIN	Analogue input
3	AIN	Analogue input
4	DIO	Configurable in SIINEOS as a digital input or digital output

2.3.3. Power supply

The module is supplied with power either by a 24 V power supply unit or via backplane bus of a master gateway. Please see the chapter Installation [14].



Pin assignment of the power-supply interface

2.3.4. 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-IO100

1	Device status
2	LED 2 is intended for communication and is not configurable
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-IO100.

3. Assembly

The HUB-IO100 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 downwards.
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-IO100.
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-IO100 onto the DIN-rail bus connector you have just attached.

HUB-GM200 master gateway with a HUB-IO100

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-IO100 from the DIN rail

4. Installation

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

CAUTION
Electric shock!

- Ensure that all devices and circuits are disconnected from the power supply when working on a gateway or module.

4.1. Connecting a power-supply unit

The HUB-IO100 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-IO100 is installed as an individual device or spatially separated from the master gateway, you must provide it with a separate power supply.

DANGER
Danger to life due to electric shock!

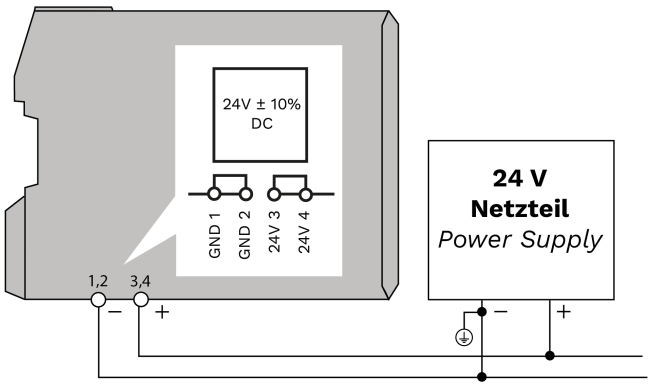
- Never connect the mains voltage.

ATTENTION
When connecting a device of the HUB-IO100 type, the power supply unit must be rated for a voltage of at least 24 V ± 10% and a power output of 24 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:

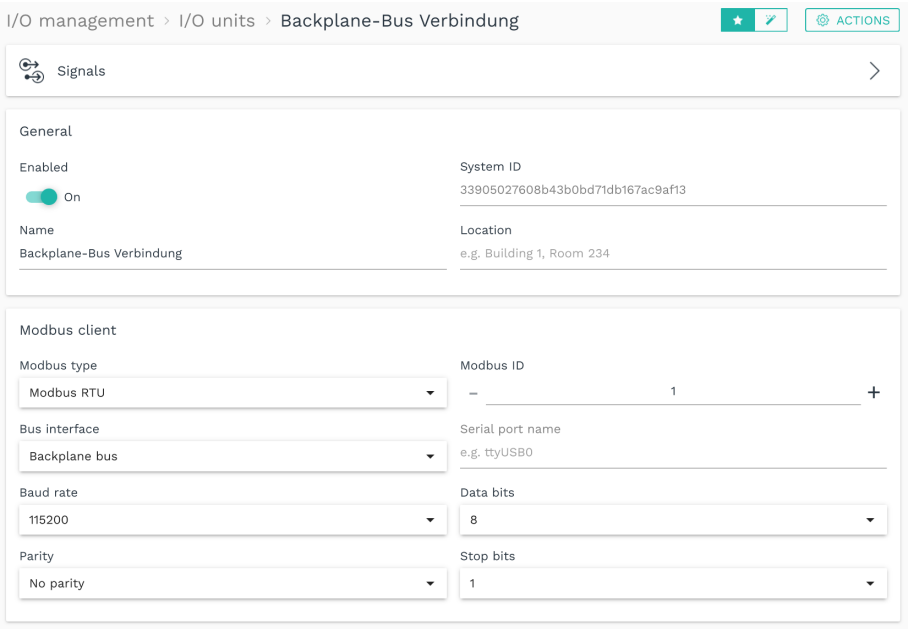


Schematic diagram of the power supply

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-IO100 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-IO100 is then automatically supplied with power.



Settings in the master gateway's SIINEOS to establish the power supply for a HUB-IO100 via backplane bus

For a detailed description of how to create a Modbus client RTU, please see the SIINEOS 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.

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-IO100 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/.

Please note that software version SIINEOS Light is required for HUB-IO100.

5.1. Connecting HUB-IO100 with the PC

1. Use a Micro-USB cable to connect your PC with the HUB-IO100.
   In most cases, the USB connection provides enough power to operate the HUB-IO100 without having to connect an extra power supply.

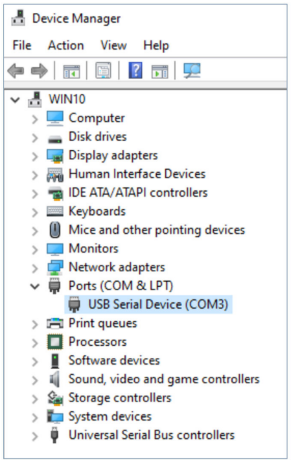
   NOTE

   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-IO100 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.
   NOTE: The HUB-IO100 works with the SIINEOS Light software bundle.
3. Go to the download portal at https://download.inhub.de/siineos/ and check whether a new version of SIINEOS is available.

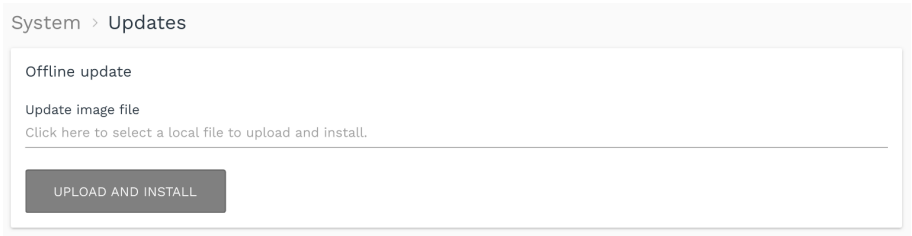
5.4. Installing SIINEOS updates

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

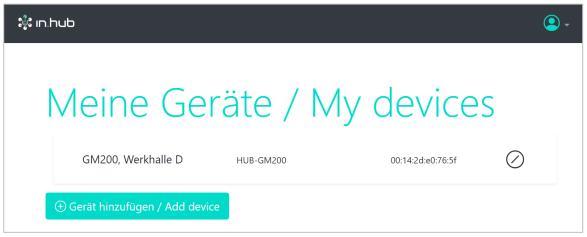
With every new SIINEOS-enabled device you purchase, you will automatically receive a SIINEOS licence for 3 years. You can update SIINEOS as often as you like during the licence period and install the latest version on the device.

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.

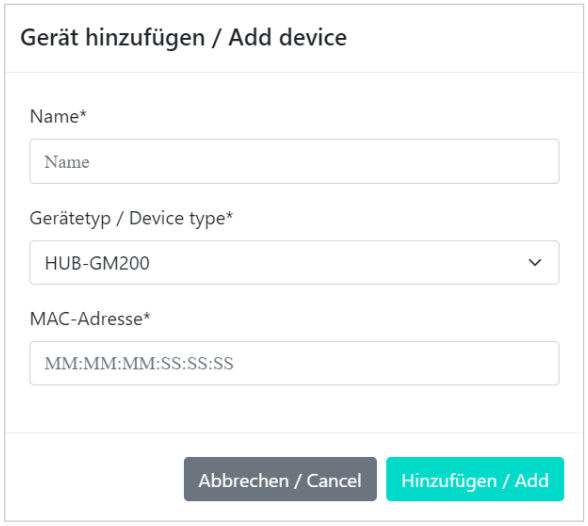
5.5.1. Requesting a voucher and activating a software licence

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.



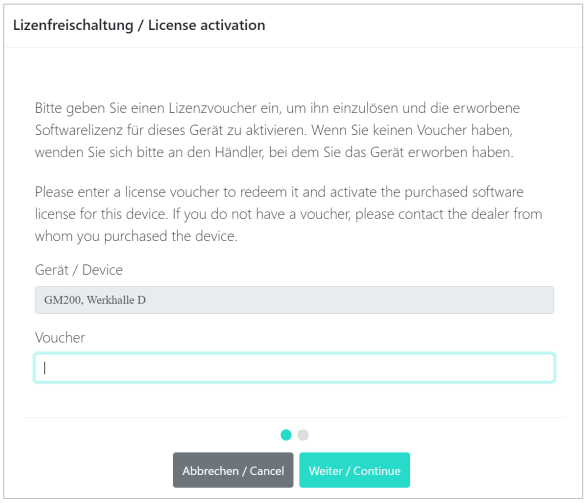
My devices (example)

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**.



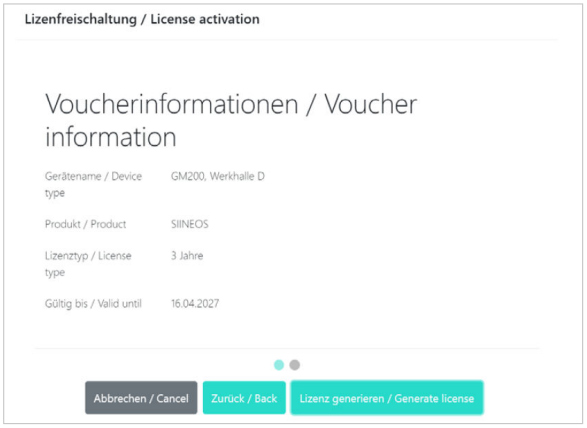
Add device

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:



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.

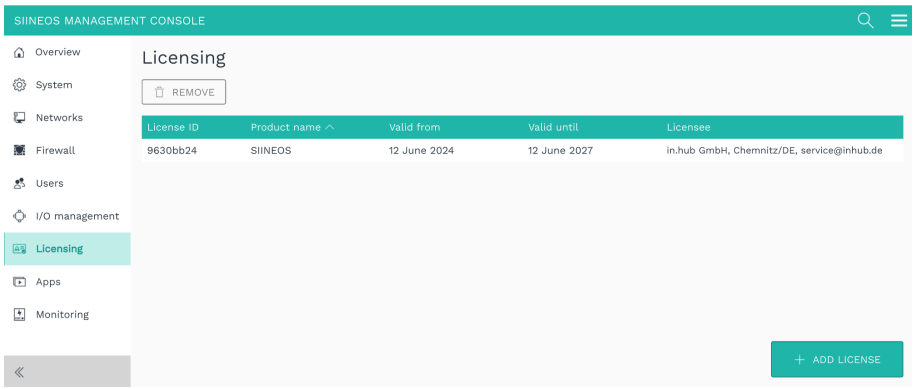


Voucher information (example: Activation of a SIINEOS licence valid for 3 years)

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)

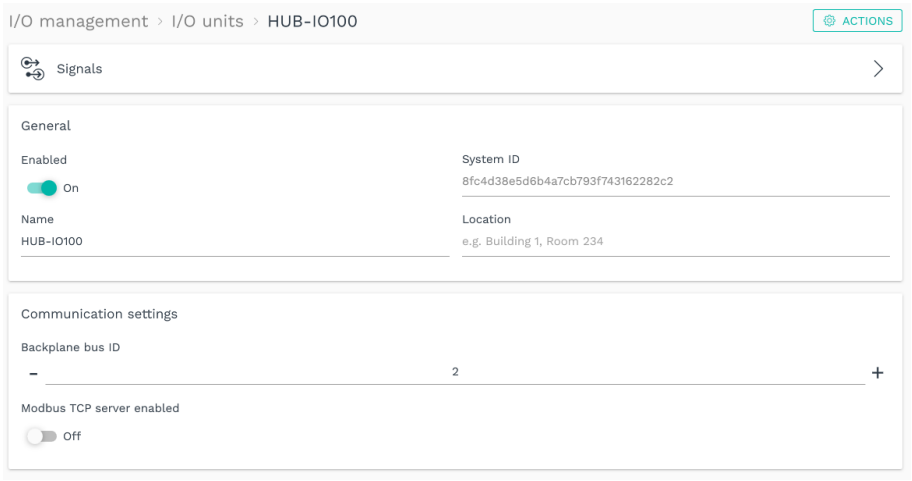
2. Click on **Add license**.
3. Select the licence file from your file directory and click on **OK**.
   The licence is added to the list. From that point on, you can make updates again or return to using a blocked app.
4. To remove a licence again – because it has become invalid, for example – select 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 data communication

You perform the following tasks in the SIINEOS of the HUB-IO100. This allows you to configure how data communication is to take place: via backplane bus or the network. This also depends on how your HUB-IO100 is integrated. Data communication via backplane bus only needs to be set up if the HUB-IO100 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-IO100** that has already been created;
   – or –
   if the **I/O units** page is still empty, create a new I/O unit of the **HUB-IO100** type.

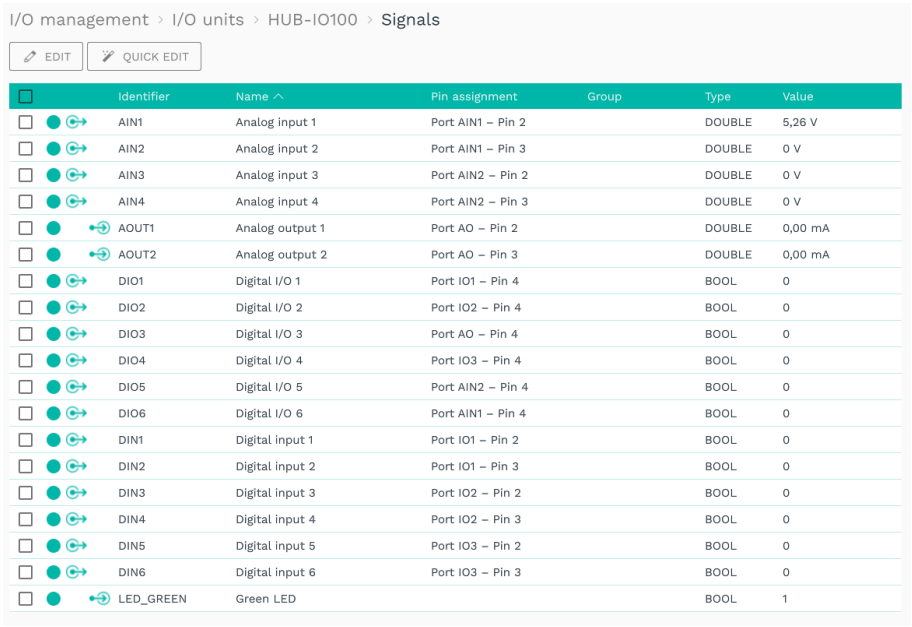


Device settings of the HUB-IO100; in the example, data communication via backplane bus is activated

2. Optional: Change the name of the I/O unit and enter a location to find the device easily.
3. For **data communication via the network**, enter the following in the **Communication 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.
4. For **data communication via backplane bus**, enter the following in the **Communication 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.
5. Click on **Save**.

5.7. Configuring the signals of the HUB-IO100

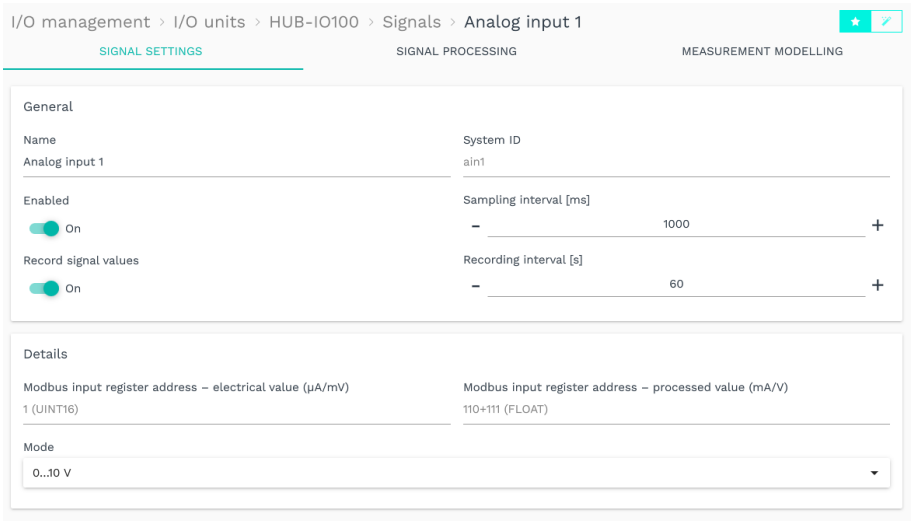
1. In the SIINEOS of the HUB-IO100, navigate to **I/O management > I/O units** and select the created HUB-IO100.
2. Click on **Signals**.
   The signals for all channels of the HUB-IO100 have already been created.



	Identifier	Name	Pin assignment	Group	Type	Value
	AIN1	Analog input 1	Port AIN1 – Pin 2		DOUBLE	5,26 V
	AIN2	Analog input 2	Port AIN1 – Pin 3		DOUBLE	0 V
	AIN3	Analog input 3	Port AIN2 – Pin 2		DOUBLE	0 V
	AIN4	Analog input 4	Port AIN2 – Pin 3		DOUBLE	0 V
	AOUT1	Analog output 1	Port AO – Pin 2		DOUBLE	0,00 mA
	AOUT2	Analog output 2	Port AO – Pin 3		DOUBLE	0,00 mA
	DIO1	Digital I/O 1	Port IO1 – Pin 4		BOOL	0
	DIO2	Digital I/O 2	Port IO2 – Pin 4		BOOL	0
	DIO3	Digital I/O 3	Port AO – Pin 4		BOOL	0
	DIO4	Digital I/O 4	Port IO3 – Pin 4		BOOL	0
	DIO5	Digital I/O 5	Port AIN2 – Pin 4		BOOL	0
	DIO6	Digital I/O 6	Port AIN1 – Pin 4		BOOL	0
	DIN1	Digital input 1	Port IO1 – Pin 2		BOOL	0
	DIN2	Digital input 2	Port IO1 – Pin 3		BOOL	0
	DIN3	Digital input 3	Port IO2 – Pin 2		BOOL	0
	DIN4	Digital input 4	Port IO2 – Pin 3		BOOL	0
	DIN5	Digital input 5	Port IO3 – Pin 2		BOOL	0
	DIN6	Digital input 6	Port IO3 – Pin 3		BOOL	0
	LED_GREEN	Green LED			BOOL	1

Signals of the HUB-IO100

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



“Signal settings” tab in “Standard” viewing mode

4. Enable and configure the interface on the **Signal settings** tab.
   a. Optional: Change the name of the interface.
   b. Set the **Enabled** slider to **On**.
   c. In the **Sampling interval** field, specify the interval at which the signal is to be sampled (in milliseconds).
   d. Set the **Record signal values** slider to **On** if the values are to be recorded in the local VictoriaMetrics database.
   e. 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 [40].
   b. For an LED signal, specify whether the **default state** of the LED is to be off or on.
   c. Configure additional parameters for the AIN, AO, DIN and DIO signals:

AIN (analogue input)	**Mode** Select the type of analogue interface for the connected sensor. Available options: 0–10 V / 4–20 mA
AOUT (analogue output)	**Output current** Output current in mA. Values from 0 to 24 can be set.
DIN (digital input)	To count how often the signal value has changed from 0 to 1, set the **Count rising edges** slider to **On**. To count how often the signal value has changed from 1 to 0, set the **Count falling edges** slider to **On**.
DIO (digital input/output)	**Mode** Specify whether this interface is to function as an input or output. • You have selected **Input**: To count how often the signal value has changed from 0 to 1, set the **Count rising edges** slider to **On**. To count how often the signal value has changed from 1 to 0, set the **Count falling edges** slider to **On**. • You have selected **Output**: Under **Default state**, set the slider to **On** if a 24-V supply voltage is to be output at the digital output.

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**.

6. Typical use cases in practice

The following chapter explains the typical application options for a HUB-IO100. 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-IO100. For detailed step-by-step instructions, please refer to the relevant sections in this documentation.

6.1. Data collection and visualization on one device

CASE 1: The HUB-IO100 is individually installed, has its own power supply and collects, processes and visualizes the data from the connected peripheral devices itself.

For data visualization, SIINEOS Light's own **FlexPlorer** app in in.hub is available.

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 peripheral devices.
4. Log on in the HUB-IO100's SIINEOS.
5. Activate the peripheral devices and their signals you would like to use in the **I/O management** and configure them.
6. Open the **FlexPlorer** app and view the data live.

6.2. Internal data collection and external data evaluation

CASE 2: The HUB-IO100 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 peripheral devices.
4. Log on in the HUB-IO100's SIINEOS.
5. Activate the peripheral devices and their signals 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-IO100s and data evaluation on a master gateway

CASE 3: The HUB-IO100 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-IO100 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.

The master gateway's SIINEOS is used for data processing and visualization, so you can also use Grafana.

TIP

The HUB-IO100 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-IO100 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 peripheral devices.
4. Log on in the HUB-IO100's SIINEOS.
5. Activate the peripheral devices and their signals you would like to use in the **I/O management** and configure them.
6. Make sure that the HUB-IO100 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-IO100.

9. Open the **Grafana** app, log on (with **admin**/**admin**) and create a dashboard in which your signals are to be visualized.
10. You can repeat the steps for each additional HUB-IO100 to obtain data from multiple devices.

6.4. Data collection with several HUB-IO100s and external data evaluation

CASE 4: Each HUB-IO100 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-IO100 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 peripheral devices.
4. Log on in the HUB-IO100's SIINEOS.
5. Activate the peripheral devices and their signals you would like to use in the **I/O management** and configure them.
6. Make sure that the HUB-IO100 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-IO100.
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-IO100 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-IO100 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-IO100 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.

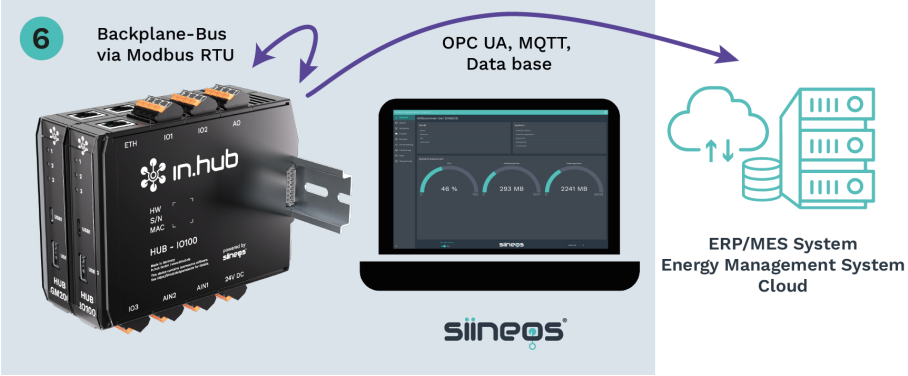
The master gateway's SIINEOS is used for data processing and visualization, so you can also use Grafana.

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 peripheral devices.
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-IO100 is then automatically supplied with power.
4. In SIINEOS on the HUB-IO100, add an I/O unit of type **HUB-IO100** in the **I/O management** and make changes to the **device settings** as required, e.g. under **Backplane bus ID**.
   When using multiple HUB-IO100s, enter a separate Backplane bus ID for each device.
5. Activate the peripheral devices and their signals you would like to use in the **I/O management** and configure them.
6. Open the **Grafana** app, log on (with **admin**/**admin**) and create a dashboard in which your signals are to be visualized.

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

CASE 6: The HUB-IO100 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-IO100 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 peripheral devices.
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-IO100 is then automatically supplied with power.
4. In SIINEOS on the HUB-IO100, add an I/O unit of type **HUB-IO100** in the **I/O management** and make changes to the **device settings** as required, e.g. under **Backplane bus ID**.
5. Activate the peripheral devices and their signals 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, max. 1 A
Typical power consumption	5 W
Max. power consumption	24 W
Processor	NXP® i.MX 6ULL
Memory	RAM: 256 MB DDR3L, Flash: 512 MB SLC NAND
Data interfaces	USB1: Host (Micro USB) USB2: Device (USB-A) Ethernet: 100 Mbit/s 3× status LEDs Backplane bus
Connections for peripheral devices	6× digital input/output 6× digital input 4× analogue input 2× analogue input
Protocols	OPC UA server + client MQTT broker server + client 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

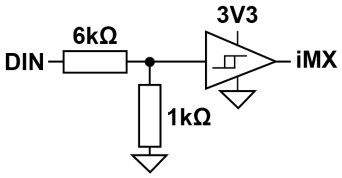
Ambient conditions	Values
Temperature range	Storage: –40°C to 85°C Operation: 0°C to 50°C
Humidity	Storage: 10% to 95% RH, non-condensing Operation: 20% to 90% RH, non-condensing

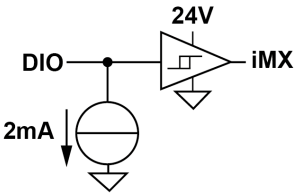
Ambient conditions	Values
Operating altitude	Max. 2,000 m above sea level

Storage	Values
Recording interval	Minimum 1 second
Storage	100 MB
Data export	VictoriaMetrics

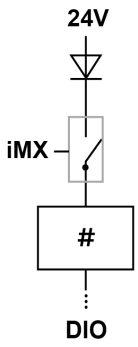
SIINEOS	
Pre-installed software	**FlexPlorer**: Live data visualization **Azure IoT Hub Connector**: Connector to the Microsoft® IoT platform **Cloud of Things Connector**: Connector to the Telekom® IoT platform **NumCorder**: Recording of scanned or entered barcodes / serial numbers **OPC UA server**: Counterpart to the OPC UA client, setting up of a server–client structure with one device **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®

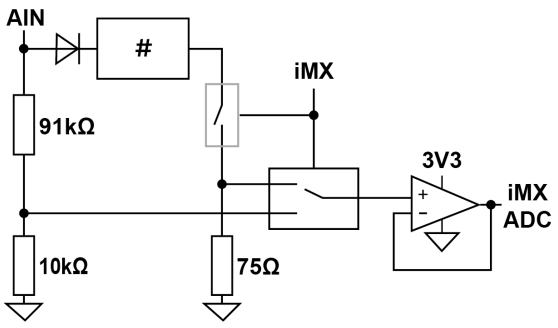
7.1. Specification of inputs and outputs

Digital input DIN	Values
Conformity	EN61131-2 Type 1
Switching threshold	Between 5 V and 15 V
Input resistance	Typ. 7 kΩ, max. 200 mW
Bandwidth	From 6 Hz (with 12 channels, 2 edges) to 150 Hz (with 1 channel, 1 edge)*
Permissible input voltage range	–3 to 30 V
Circuit diagram	

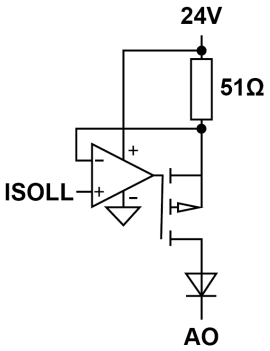
Configuration of DIO as a digital input	Values
Conformity	EN61131-2 Type 1/3
Switching threshold	Between 5 V and 11 V
Pull-down current	Typ. 2 mA
Bandwidth	From 6 Hz (with 12 channels, 2 edges) to 150 Hz (with 1 channel, 1 edge)*
Permissible input voltage range	–3 to 30 V
Circuit diagram	

Configuration of DIO as a digital output	Values
Power supply	From 24 V
Conformity	EN61131-2 nominal current 0.1 A
Max. output current	Typ. 120 mA
Switching interval	≥50 ms*

Configuration of DIO as a digital output	Values
Voltage drop to 24 V	Max. 1 V
Protective functions	Overload protection Reverse-current protection
Circuit diagram**	

Analogue input AIN	Values
Operating modes	Current Voltage
Measuring range	0–11 V / 0–24 mA
Resolution	12 bit
Input resistance	101 kΩ
Sampling interval	≥50 ms*
Permissible input voltage range	–3 to 30 V
Protective functions	Overload protection: in 20 mA mode, the current is limited to 22–30 mA
Circuit diagram**	

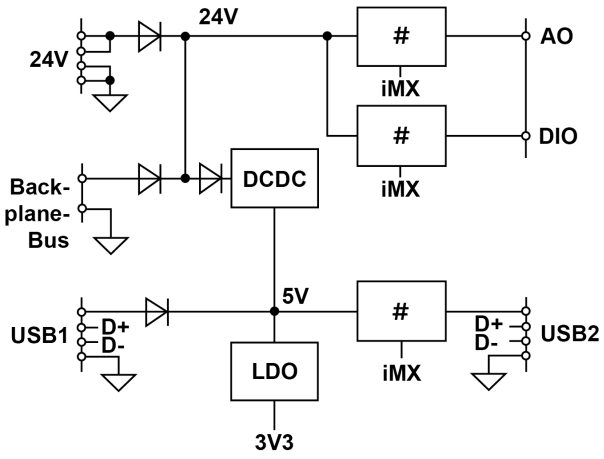
Analogue output AO	Values
Power supply	From 24 V

Analogue output AO	Values
Max. output current	25 mA
Voltage drop to 24 V	Max. 2 V
Resolution	12 bit
Sampling interval	≥50 ms*
Permissible input voltage range	–3 to 30 V
Protective functions	Overload protection Reverse-current protection
Circuit diagram	

*Only if processor is not busy

**The hash (#) in the circuit diagram indicates the overload protection.

7.2. USB interface specifications

USB connections	Values
Max. power consumption for **USB1** (Micro-USB on the front)	5 W (1 A) May vary depending on the device connected: • On a 24 V power supply, the power consumption is 0. • On a 5 V power supply, the digital and analogue outputs cannot be used.
Max. power output **USB2**	2.5 W (500 mA) with 24 V supply
Support for	Full, high and low speed (480, 12 and 1.5 Mbit/s)
Circuit diagram*	

*The hash (#) in the circuit diagram indicates the overload protection.

7.3. Backplane bus specification

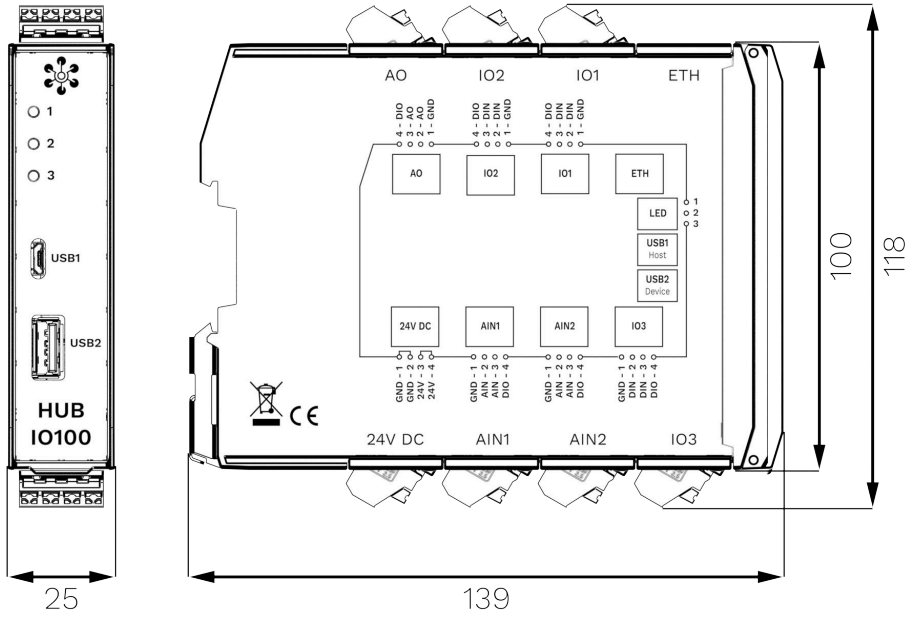
Backplane bus	Values
Voltage on the backplane bus of the master gateway	Voltage of the power supply unit minus 0.5 V
Communication	Via Modbus RTU
Max. number of modules on one master gateway	3

7.4. Measurements and associated Modbus registers

Measurements	Modbus register: Raw value [unit]	Modbus register: Processed value [unit]
Modbus input register		
AIN1 AIN1 socket – pin 2	1 (UINT16) [µA/mV]	110+111 (FLOAT) [mA/V]
AIN2 AIN1 socket – pin 3	2 (UINT16) [µA/mV]	120+121 (FLOAT) [mA/V]
AIN3 AIN2 socket – pin 2	3 (UINT16) [µA/mV]	130+131 (FLOAT) [mA/V]
AIN4 AIN2 socket – pin 3	4 (UINT16) [µA/mV]	140+141 (FLOAT) [mA/V]
Modbus holding register		
AOUT1 AO socket – pin 2	1 (UINT16) [µA]	210+211 (FLOAT) [mA]
AOUT2 AO socket – pin 3	2 (UINT16) [µA]	220+221 (FLOAT) [mA]
Modbus disk input register		
DIN1 IO1 socket – pin 2	1 (UINT16)	310+311 (FLOAT)
DIN2 IO1 socket – pin 3	2 (UINT16)	320+321 (FLOAT)
DIN3 IO2 socket – pin 2	3 (UINT16)	330+331 (FLOAT)
DIN4 IO2 socket – pin 3	4 (UINT16)	340+341 (FLOAT)
DIN5 IO3 socket – pin 2	5 (UINT16)	350+351 (FLOAT)
DIN6 IO3 socket – pin 3	6 (UINT16)	360+361 (FLOAT)
Modbus coil register		
DIO1 IO1 socket – pin 4	1 (UINT16)	410+411 (FLOAT)

Measurements	Modbus register: Raw value [unit]	Modbus register: Processed value [unit]
DIO2 IO2 socket – pin 4	2 (UINT16)	420+421 (FLOAT)
DIO3 AO socket – pin 4	3 (UINT16)	430+431 (FLOAT)
DIO4 IO3 socket – pin 4	4 (UINT16)	440+441 (FLOAT)
DIO5 AIN2 socket – pin 4	5 (UINT16)	450+451 (FLOAT)
DIO6 AIN1 socket – pin 4	6 (UINT16)	460+461 (FLOAT)

7.5. Schematic diagram



Dimensions of the HUB-IO100 in mm

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The original language of this document is German.

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