Instruction manual

BY000002

IoT Gateway

- / Monitoring and analyses of machines and processes
- / Easy remote access & device updates
- / Preventive maintenance
- / Machine data acquisition
- / High IT security
- / DIN rail mounting

IoT gateway master module for Industry 4.0 / IoT and IIoT

Version 1.0 / 25.08.2022

Foreword

These operating instructions contain all the information you need for start-up and use of the IoT gateway.

This manual is intended both for installers, programmers and testers who commission the device themselves and connect it to other units (automation systems, mobile terminals, personal computers, etc.), and for service and maintenance technicians who install extensions or perform fault analyses.

Table of contents

Abbreviations

The following abbreviations are used in these operating instructions:

CAN	Controller Area Network
DC	Direct Current
LED	Light-Emitting Diode
IoT	Internet of Things
CPU	Central Processing Unit
VPN	Virtual Private Network
VNC	Virtual Network Computer
SMAC	SIINEOS Management Console

I Legal notice

Warning concept

This manual contains information that you must observe for your personal safety and to prevent damage to property. Depending on the hazard level, the warnings are presented in decreasing order as follows:

DANGER

Indicates an immediate danger to humans. Will cause irreversible injury or death if not avoided.

WARNING

Indicates a recognizable hazard for humans. Can lead to irreversible injuries or death if not observed.

CAUTION

Indicates a recognizable danger to people or possible damage to property. Can lead to reversible injuries or damage to property if not observed.

ATTENTION

Note on possible damage to property. May cause damage to property if not observed.

Note: Under Note you will find tips, recommendations and useful information on specific action steps and facts.

If several hazard levels occur, the warning for the highest level is always used. If the warning triangle is used in a warning against personal injury, then a warning against property damage can also be added to the same warning.

Qualified personnel

The product associated with this documentation may only be handled by personnel who are qualified for the respective task. Furthermore, the product may only be handled in compliance with the associated documentation and the safety and warning instructions contained therein. Due to their training and experience, qualified personnel are capable of recognizing risks and avoiding possible hazards when handling these products.

Basic knowledge required

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

Safety instructions

Be sure to read the safety instructions carefully before start-up of this product. Observe the corresponding instructions in the manual. Always keep the operating manual within easy reach.

Intended use

Ipf electronic gmbh products may only be used for the applications intended in the corresponding technical documentation.

If third-party products and components are used, they must be recommended or approved by ipf electronic gmbh.

Proper storage, erection, assembly, installation, start-up, operation and maintenance are essential for the correct and safe operation of the products.

The permissible ambient conditions must be complied with. Notes in the associated documentation must be observed.

Brands

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Disclaimer

The contents of this publication have been certified to be in accordance with the hardware described. Nevertheless, deviations cannot be ruled out, so that we cannot accept any liability for complete conformity. The information in this publication is checked regularly. Necessary corrections will be included in subsequent editions.

2 General instructions for use

2.1 Scope of delivery

1 x BY000002

SIINEOS Software

1 x instruction manual (PDF)

2.2 General instructions for use

ipf electronic gmbh accepts no liability for malfunctions of the device resulting from improper handling, mechanical damage, incorrect application and use for other than the intended purpose. Improper handling of the device can significantly reduce the life of the product.

2.3 Intended use

The devices are intended exclusively for use in the industrial sector and are used to monitor machines, systems and processes. Process data can be recorded, processed, actuated and analyzed with the aid of the connection options provided.

2.4 Safety requirements

The product should be handled in accordance with the DIN standards listed below:

- DIN EN 61340-5-1:2017-07 Electrostatic properties - Part 5-1: Protection of electronic components against electrostatic phenomena - General requirements
- DIN EN 61010-1:2020-03 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements
- DIN EN 60664-1:2008-01 Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests

2.5 Network Security

Please keep in mind that the product does not communicate encrypted within the internal network. Therefore, protect your network from unauthorized access from the outside! Special care must be taken when integrating the product into a network with Internet access. Please consult your system administrator in advance.

2.6 Disposal

The device must be disposed of properly and does not belong in normal household waste.

2.7 Service & Support

If you have any questions about specific applications of the product or technical parameters, please do not hesitate to contact us.

Mail: hotline@ipf.de

Tel: +49 2351 9365 65 (Hotline)

Via these contact details you will be connected with the relevant contact persons.

3 General product information

The BY000002 IoT gateway has been specially developed for use in industrial environments. It has a variety of different interfaces to connect sensors and actuators directly to the gateway. The IoT gateway is primarily used on the store floor to connect the field and control level with the plant management level and the company level. It is also used in individual monitoring, specifically to monitor, control or regulate processes in a closed loop.

3.1 Intended use

The BY000002 is ideal for:

- Parameter monitoring in the process for
  - Preventive maintenance
  - Machine data acquisition
  - Condition monitoring and yield monitoring on production lines
  - Monitoring of environmental influences on the process for compliance with standard guidelines and occupational health and safety (including temperature, humidity, particle concentration, corrosion)
- Soft PLC (Programmable Logic Control (unit) in software)
- The use as process control computer and traceability server
- The use as remote access point at machines and plants for remote maintenance via VPN or VNC (cloud service)
- Process monitoring using machine learning / AI algorithms.

3.2 Hardware - structure and interfaces

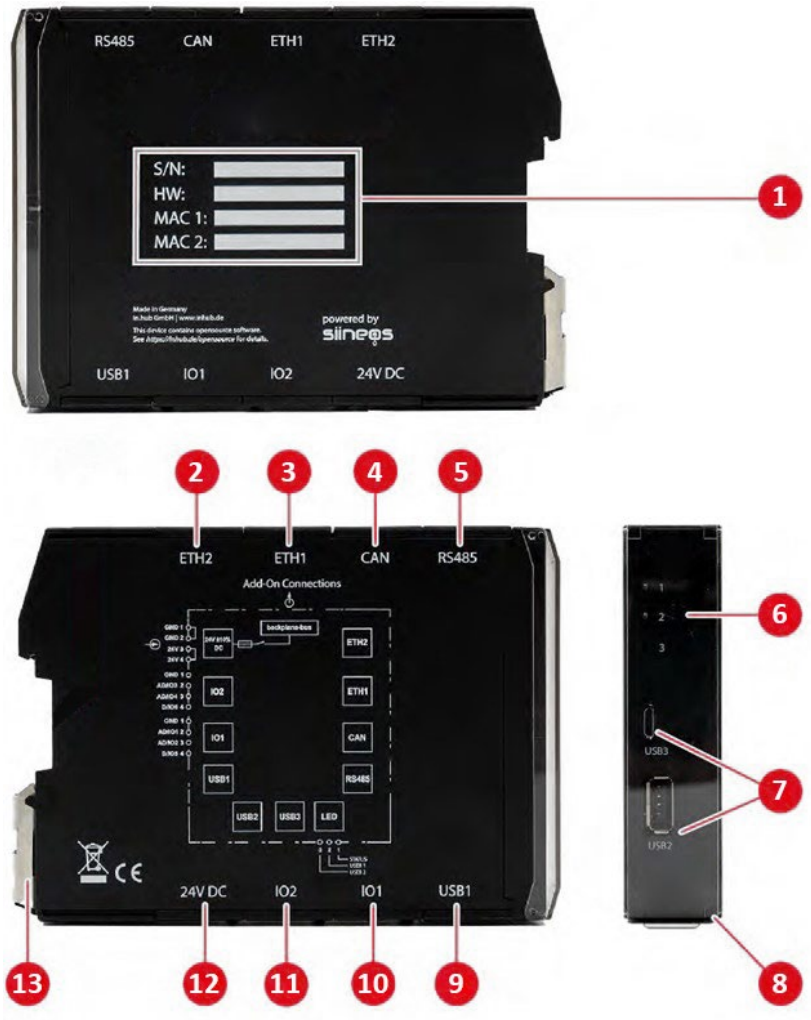

Fig. 1: Side views and front view of the BY000002 incl. interfaces

1	Device specific information S/N: ipf electronic gmbh -internal serial number HW: Hardware revision MAC 1: Hardware address of the Ethernet 1 network adapter MAC 2: Hardware address of the Ethernet 2 network adapter
2	Ethernet 2
3	Ethernet 1
4	CAN bus
5	RS485
6	LEDs for displaying the operating status
7	USB2 (Host) and USB3 (Device)
8	Protection cap Can be folded upwards.
9	USB1 (Host)
10	Input/Output 1
11	Input/Output 2
12	Power supply with 24V DC
13	Clamping device for mounting on the support rail

3.3 LED display

The three LEDs on the front panel of the device indicate the following status:

Fig. 2: LED display

1	Device status
2	Function freely configurable in the user software
3	Function freely configurable in the user software

3.3.1 LED device status (red-green)

LED behavior	Color	Meaning
LED off		Device is out of service
Flashing in heartbeat mode 2Hz	Green	Module functional
Permanent light up	Green	Error in the boot process
1Hz flashing	Red	Device error

3.4 SIINEOS Platform

The BY000002 uses the Linux-based SIINEOS platform to run InCore & Docker Apps. SIINEOS can be configured via the browser-based SIINEOS Management Console (SMAC). This includes settings for the network interfaces so that the device is accessible on the network as desired and can communicate with other devices.

In Chapter *6 Software*, page 19, you will learn how to set up and configure the SIINEOS platform and how to install the user software.

4 Mounting

The IoT gateway is intended for mounting on a DIN rail according to DIN EN 60715:2017.

- Always work in disconnected status.

WARNING Electric shock due to conductive contamination can cause personal injury!

- Avoid conductive pollution.
- Only install devices in a switching cabinet with the appropriate degree of protection.

- Recommendation: 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 mounting easier.

4.1 Mounting and dismounting the module to/from the mounting rail

1. Make sure that the system is disconnected.
2. Turn the module so that the metal clamping device is facing down.
3. Hold the device at an angle to the mounting rail.
   The recess on the back of the module is via the clamping device.
4. Click the module onto the mounting rail until the clamping device audibly clicks into place.
5. After mounting, check that the device is seated firmly and straight on the mounting rail.
6. To disassemble, pull down the clamping device with a screwdriver and remove the module from the mounting rail.

Fig. 3: Removing the module from the mounting rail (exemplary representation)

5 Start-up

Observe the applicable safety and accident prevention regulations for specific areas of application, e.g. the Machinery Directive.

5.1 Interfaces of the BY000002

The following chapter gives an overview via the interfaces of the gateway and provides information you need to connect these interfaces.

For the position of the interfaces at the module please refer to chapter *3.2 Hardware - Structure and interfaces*, page 11.

5.1.1 CAN

Note: By default, termination is set for the CAN and RS485 interfaces.

Therefore place the module at the end of a bus structure and switch over the devices that formed the termination until then.

- Voltage output = 24 V / 0.7 A, reverse polarity and overload protected

  Note: Pin 8 for the power supply must be activated in the software.
- Maximum baud rate = 1 Mbit/s

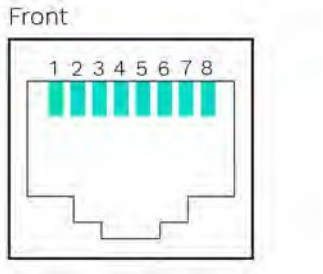

Fig. 6: Pin assignment of the CAN interface

Pins	Signal	Description
1	CAN_H	CAN_H Bus line (dominant high)
2	CAN_L	CAN_L Bus line (dominant low)
3	CAN_GND	Ground / 0V / V-
4	-	Not assigned
5	-	Not assigned
6	-	Not assigned
7	GND	Ground / 0V / V-
8	24 V	Power supply

5.1.2 RS485

Note: By default, termination is set for the CAN and RS485 interfaces.

Therefore place the module at the end of a bus structure and switch over the devices that formed the termination until then.

- Voltage output = 24 V / 0.7 A, reverse polarity and overload protected

  Note: Pin 7 for the power supply must be activated in the user software.
- Maximum baud rate = 2.5 Mbit/s

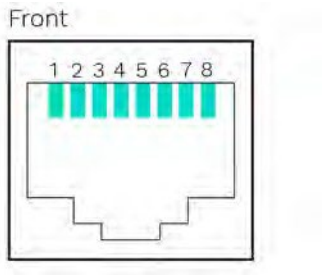

Fig. 7: Pin assignment of the RS485 interface

Pins	Signal	Description
1	-	Not assigned
2	-	Not assigned
3	-	Not assigned
4	D1/B/B'	Transreceiver Terminal 1, V1 Voltage (V1 > V0 for binary 1 [OFF] status)
5	D0/A/A'	Transreceiver Terminal 0, V0 Voltage (V0 > V1 for binary 0 [ON] status)
6	-	Not assigned
7	24 V	Power supply
8	GND	Ground / 0 V / V-

5.1.3 IO1 and IO2

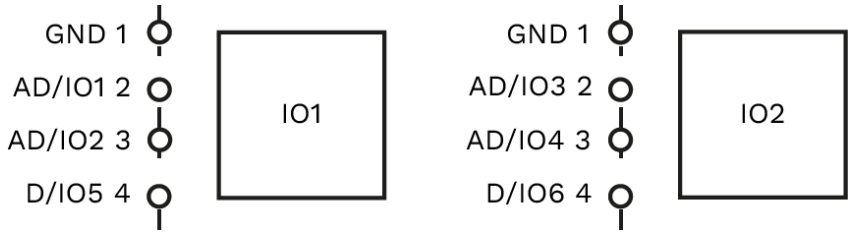

Fig. 8: Schematic drawing of the IO1 and the IO2 interface

Pins	Signal IO1	Signal IO2	Description
1	GND 1	GND 1	Ground / 0 V / V-
2	AD/IO1	AD/IO3	Configurable in: Analog or digital input -or- Digital output
3	AD/IO2	AD/IO4	
4	D/IO4	D/IO6	Digital input or output

Note: Whether a pin is addressed as analog input or as digital input or output must be defined via the user software.

Specification of the digital output (IO1 to IO6)

- Voltage drop is max. 1 V to the 24 V operating voltage
- Max. Output current = 120 mA
- Reverse polarity protected and protection against reverse current

Specifications of the digital input (IO1 to IO6)

- Compliant with EN61131-2 Type1/3
- Switching threshold between 5 V and 11 V
- Pulldown current ~2 mA
- Bandwidth < 100 kHz
- Dielectric strength according to EN61131-2 30V

Specification of the analog input (AD/IO1 to AD/IO4)

- Overload protection
- Reverse polarity protected
- Operational modes: voltage, current

Operational mode voltage	Operational mode current
Measuring range = 0 to 11 V Dielectric strength = 30 V Resolution = 12 bit Input resistance = 122 kΩ Bandwidth = 1 kHz	Measuring range = 0 to 24 mA Max. Input current = 30 mA Resolution = 12 bit Bandwidth = 1 kHz

5.1.4 Power supply

- 24 V ± 10 %
- Max. Power consumption = 120 W

5.1.5 Ethernet 1 and Ethernet 2

- 10BASE-T/100BASE-TX according to IEEE 802.3u with HP Auto MDI/MDI-X

5.1.6 USB

- **USB1** and **USB2**
  - Located on the front and bottom of the BY000002
  - Maximum power output = 2.5 W (500 mA)
  - USB2.0 supports Full-, High- and Low-Speed (480, 12 and 1.5 Mbit/s)
- **USB3**
  - Micro USB port
  - Located on the front of the BY000002
  - Maximum power consumption = 6.5 W (1.3 A)
  - May vary depending on connected device and power supply. With an active 24V power supply, the power consumption = 0.
  - USB2.0 supports Full-, High- and Low-Speed (480, 12 and 1.5 Mbit/s)

Note: To access the USB2 and USB3 ports, you must flip up the protective flap on the front panel.

5.1.7 LED display

- 3 x bicolor LED (red/green) on the front side

> **Note**: The LED lights and their status display are configured in the user software.
> See also Chapter 3.3 LED display, page 12.

5.2 BY000002 Connect to power supply

Prerequisite: The module is correctly mounted on the mounting rail. See *4.1 Mounting and dismounting the module to/from the mounting rail*, page 13.

1. For easier mounting, you can remove the connector with the terminal contacts from the interface **24V DC.**

WARNING Incorrect voltage supply can lead to irreparable damage to property!

➢ Note that the voltage supply corresponds to the parameter of 24 V ± 10 %.

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2. Clamp the cable tail of the power connection into the connector as shown in the following diagram:

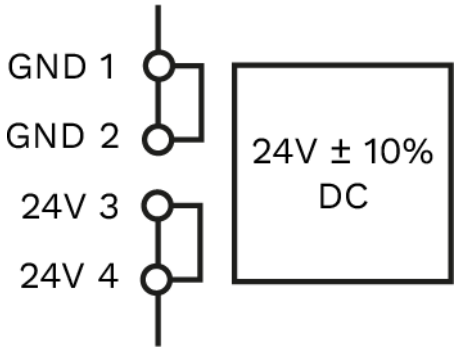

Fig. 9: Schematic drawing of the voltage supply

3. If the operating voltage is correctly applied, the status LEDs light up on the front of the module - depending on the configuration - and signal the booting of the SIINEOS platform.

6 Setting up the SIINEOS platform

In this chapter, you will find detailed step-by-step instructions for setting up and configuring the SIINEOS platform and installing the user software.

In short form, you can also get help via tooltips in the UI of the SIINEOS Management Console when you move the mouse over a button or an input field.

In the download area of the ipf electronic gmbh website you can also download all current technical documents, as well as software packages, tutorials and installation instructions.

6.1 Connecting the BY000002 with the PC

1. Use a micro USB cable tail to connect your PC to the **USB3** interface on the front of the BY000002.

   In most cases, the USB port provides sufficient power to run the Gateway to operate without having to connect an extra power supply.

   LED 1 indicates the status of the device. If the connection is working correctly, LED 1 lights up and flashes after some time. The SIINEOS platform is running on the module.

2. When you connect the IoT gateway for the first time, additional drivers are installed. Check in the Windows Device Manager whether a new device has been created:

Fig. 10: Windows Device Manager (exemplary representation)

Note: If the LED display does not light up, no drivers are installed or no new device has been created, there is usually an insufficient power supply to the module. In this case, use an external power supply and observe the parameters in chapter *5.1.4 Power supply*, page 16.

6.2 Program user software

Note: This step is performed by the customer's own software developer.

If you have purchased a ready-programmed user software, we will provide you with the current version of the user software, see *6.3 Uploading user software to the SIINEOS platform*, page 19.

1. On your PC, go to the ipf electronik gmbh download area and select **Incore Downloads > Incore SDK Installer** here to download the Software Development Kit (InCore Framework).
2. To install and set up the Software Development Kit and some necessary applications, please follow the instructions in the download section **> INCORE INSTALL GUIDE.**
3. Once installation and setup are complete, you can program the application software according to your in-house requirements.

   Please refer to the developer documentation. It provides ready-to-use software blocks to quickly build the IoT/IIoT application: https://incore.readthedocs.io/en/latest/
4. Store the finished software bundle locally on your PC in *.raucb format.

6.3 Upload user software to the SIINEOS platform

Note: Make sure that the gateway is connected to the PC via a micro USB cable (**USB3-connector on** the front panel).

1. Enter the address http://192.168.123.1/smac in the browser to open the SIINEOS management console.
2. Log in with the initial user data (**hubadmin/hubadmin**). The SIINEOS

   management console opens.
3. On the **Updates** page you can upload and install the software bundle in *.raucb format.

   The installation is done automatically.
4. Restart the module.

   After the restart you can work with the application software.

6.4 Logging into the SIINEOS Management Console

Note: The latest versions of **Firefox, Edge** or **Chrome** browsers are recommended for the SIINEOS Management Console. Using other or older browsers may cause compatibility issues.

Note: Make sure that the gateway is connected to the PC via a micro USB cable (**USB3-connector on** the front panel).

When you log in to SIINEOS for the first time

1. Enter the following address in your browser:

   http://192.168.123.1/smac

2. Log in with the initial user data (**hubadmin/hubadmin**). The SIINEOS management console opens.

Fig. 11: SIINEOS Management Console start page

On the start page you will now see information about your system, e.g. name of the device, location, type, system resources, etc.

Select the **Users** page and change the user's password **hubadmin**. See Chapter *6.5.6 Managing users*, Page 30.

If you have already set up SIINEOS

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

   See Chapter *6.5.3 Setting up* network *parameters*, Page 25.

2. Log in with your user data and click **Log** in. The SIINEOS Management Console opens.

6.5 Configure SIINEOS Management Console

6.5.1 Configure system information

On the **System** page, you can configure the following system information.

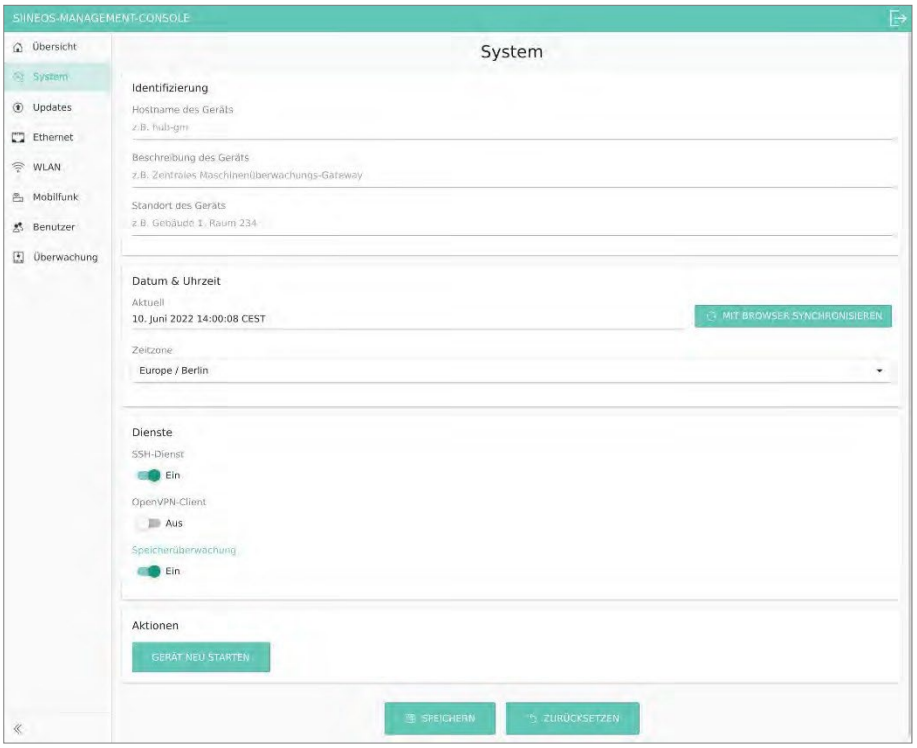

Fig. 12: "System" page (UI shown serves only as an example)

I. Fill in the input fields as follows:

Identification	**Host name of the device** Enter a name to uniquely identify the module on the network.
	Description of the device Enter what the device is used for.
	Location of the device Enter the physical location of the device to quickly locate the switching cabinet and module when needed.

Date & Time	**Current** Initially the UTC time is displayed. 1. Click **Sync with browser to** synchronize the date settings of the device with your computer. When the device becomes disconnected, this setting is lost. You will then have to synchronize with the browser again. The time zone is retained. 2. Select the **time zone**. **Note**: For automatic synchronization of the time, the network address of an internal **NTP server** can be entered on the **WLAN** or **Ethernet** page. Otherwise, the device attempts to synchronize with a time server on the Internet. However, this requires functioning access to the Internet.
Services	The SSH service enables direct access to the system and to data, as well as troubleshooting. In conjunction with the OpenVPN client, a BY000002 module can also be accessed outside the local network.
	SSH service In case you want to access the device with an SSH client, set the slider to **On**.
	OpenVPN client If you want the device to establish a VPN tunnel to your company network, set the slider to **On**. This assumes that an OpenVPN server is running at the company headquarters. Via SSH/SCP copy the client configuration file incl. the key files to the folder /storage/system/openvpn/client and enter the file name (without file extension) in the **Configuration name** input field. **Note**: Make sure that the extension of the configuration file is *.conf. Files with the extension *.ovpn must be renamed.
	Memory monitoring Set the slider to **On** to automatically restart the device when the memory is insufficient.

2. When you have completed the input, click **Save**.
3. Click **Restart device** for the settings to take effect.

6.5.2 Install software updates

As soon as a SIINEOS update is available, it will be provided by **ipf electronic gmbh.**

> **Note:** Check the website regularly for new updates.

1. Go to the download section of www.ipf-electronic.de/ and select the current SIINEOS package.

   Two variants are available - the complete software package and a light variant without Docker containers with a smaller file size.

2. When the download is complete, go to the **Updates** page in the SIINEOS Management Console.

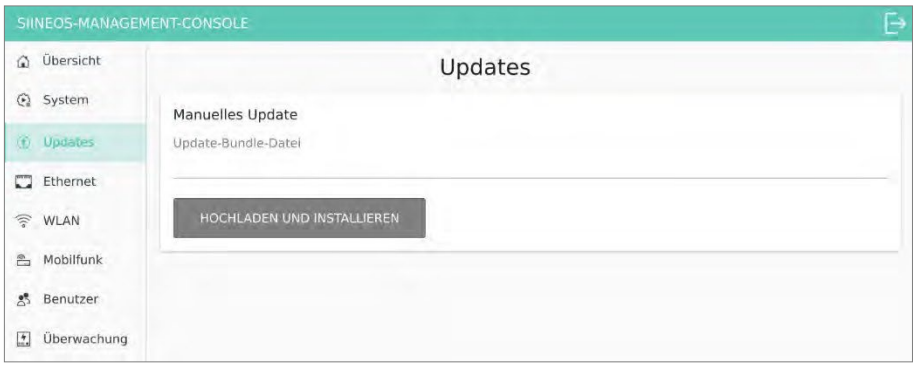

Fig. 13: Updates page (UI shown is only an example)

3. Click in the **Update bundle file** input field and select the software bundle from your local file store.
4. Click **Upload and Install**.

   After successful installation, the device will restart automatically.

6.5.3 Set up network parameters

On the **Ethernet** page you can activate/deactivate the network interfaces Ethernet 1 and Ethernet 2 of your device and enter the respective network parameters.

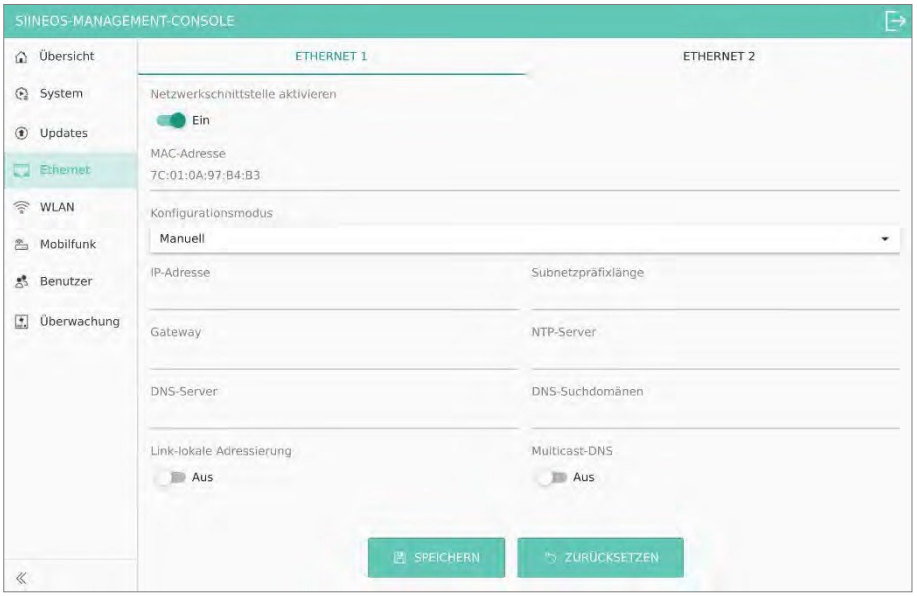

Fig. 14: "Ethernet" page (UI shown serves only as an example)

1. First select the Ethernet interface you want to configure via the two tab cards.
2. To enable the interface, set the **Network interface** slider to to **On**.

   The MAC address printed on the housing of the IoT gateway is displayed.
3. In the **Configuration Mode** drop-down list, select either **Manual** or **Automatic (DHCP)**, depending on whether you want to enter the network settings manually or obtain them automatically via a DHCP server.
4. If you selected **Manual**, fill in the input fields as follows:

IP address	Enter the desired IPv4 or IPv6 address of the device to be assigned to the Ethernet 1 or Ethernet 2 interface, respectively.
Subnet prefix length	Enter the subnet prefix length of the IPv4 or IPv6 address. For IPv4 addresses, the value **24 is** typically entered here for networks with subnet mask **255.255.255.0** or the value **16** for networks with subnet mask **255.255.0.0.**
Gateway	Enter the IP address of the gateway.
NTP server (optional)	Enter the IP address or computer name of the time server from which the device is to obtain its system time.

DNS server	Enter the IP address of the DNS server via which names of computers in the network / on the Internet are to be resolved.
DNS search domains (optional)	Enter the internal DNS domain of your company network, e.g. lan.mycompany.com.
Link-local addressing (optional)	Set the slider to **On** if you need a link-local address for local communication within the network segment. The device generates the link-local address automatically so that communication in the same network segment is possible without DHCP or static IP address.
Multicast DNS (optional)	Set the slider to **On** if all participants in the network are to be addressed directly instead of a request to a DNS server. Devices are then accessible in the network under **<hostname>.local.**

5. If you have selected **Automatic (DHCP)**, you can select or deselect the following parameters:

IPv6 Autoconfiguration	By default, the slider is set to **On**, which means that along with the IPv4 address, an IPv6 address is also automatically configured using IPv6 router advertisements from the network and the DHCPv6 client is started.
Use routes from DHCP server	By default, the slider is set to **On if the** routes/gateways it receives from the DHCP server are to be registered in the system. Set the slider to **Off** if you only want to access the local network via this interface and access the Internet via another interface if necessary.

6. If you have configured both **Ethernet 1** and **Ethernet 2,** click on **Save** to save all changes.

   On the **Overview** page, the entries you have made here are shown in the field **IP addresses** to see.

6.5.4 Set up WLAN

On the **WLAN** page you can connect to a WLAN.

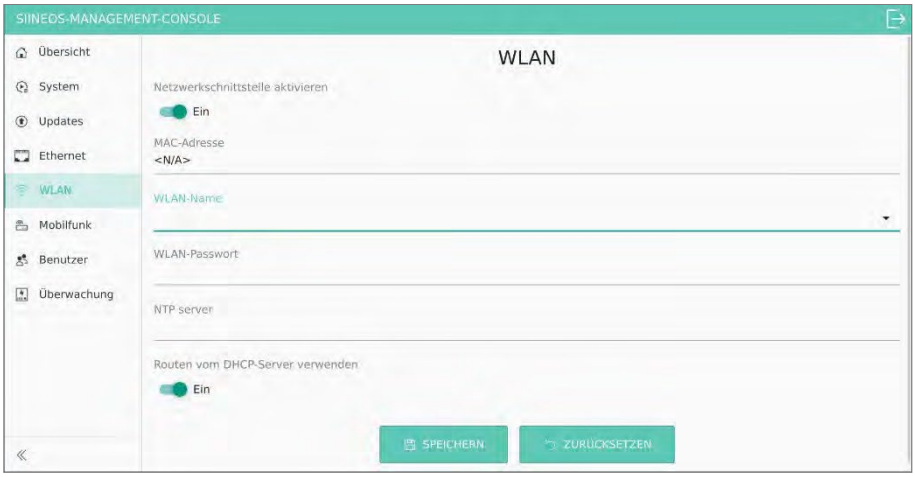

Fig. 15: "WLAN" page (UI shown serves only as an example)

1. Connect a commercially available wireless adapter via the USB1 or USB2 interface. (e.g. TP Link Wireless N Nano USB Adapter).
2. To connect to a WLAN, set the slider **Enable network interface** to **On**.

   The MAC address, which is also printed on the housing of the IoT gateway, is displayed.
3. Enter the name and password of the WLAN you want to connect to.
4. Optional: Enter the IP address of an NTP server from which the device should obtain its system time.
5. Optional: Set the **Use routes from DHCP server** slider to **Off** to access only the local network via this interface and access the Internet via another interface if necessary.

6.5.5 Set up mobile connection

An LTE stick can be connected via the USB1 or USB2 interfaces to establish Internet access in environments without a network. The device can connect to a cloud via this access, for example, or the device can be accessed remotely via the VPN tunnel.

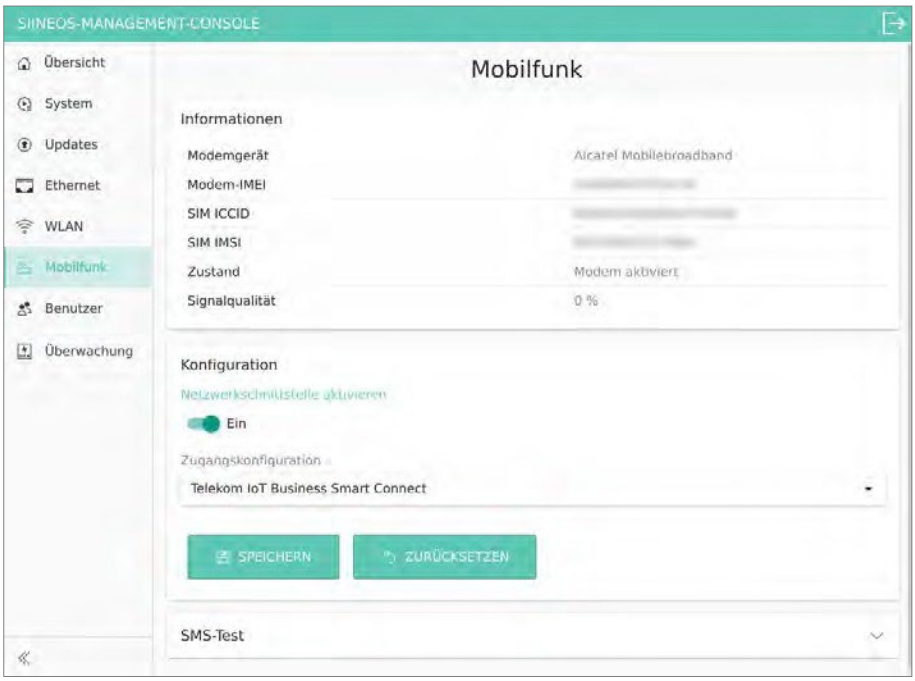

Fig. 16: "Mobile communications" page (UI shown serves only as an example)

1. If you want to use an LTE stick as a network interface, set the **Enable network interface** slider to **On**.
2. **In the Access Configuration** drop-down list, select a predefined SIM card/mobile operator or **Custom.**

   Under **Custom** you will find the following settings:

APN	Access point (Access Point Name) Enter the address of the access point you received from your mobile operator to establish communication of the terminal device to the mobile network.
Username	If the network provider has specified a user name along with the APN, enter it here.
Password	If the network provider has specified a password along with the APN, enter it here.
PIN	Enter the PIN of the SIM card. **Note**: Make sure you enter the correct PIN for the SIM card inserted. Otherwise, the card will be blocked after three failed attempts.

Allow roaming	If you want to allow roaming, set the slider to **On**. **Note:** If you have a SIM card with roaming service, you can enable this function to dial into non-provider networks when needed.
Mobile data	By default, this function is turned on. If you want to use the **ipf electronic gmbh** LTE stick only for sending SMS, set the slider to **Off**.

3. To check whether your entries are correct, enter a message text and the cell phone number of the terminal under **SMS Test** and click **Send SMS.**
4. If no SMS arrives, check if the signal quality is sufficient.

6.5.6 Manage users

On the **Users** page, you can add user profiles, assign predefined roles to users, and edit, disable, or delete profiles.

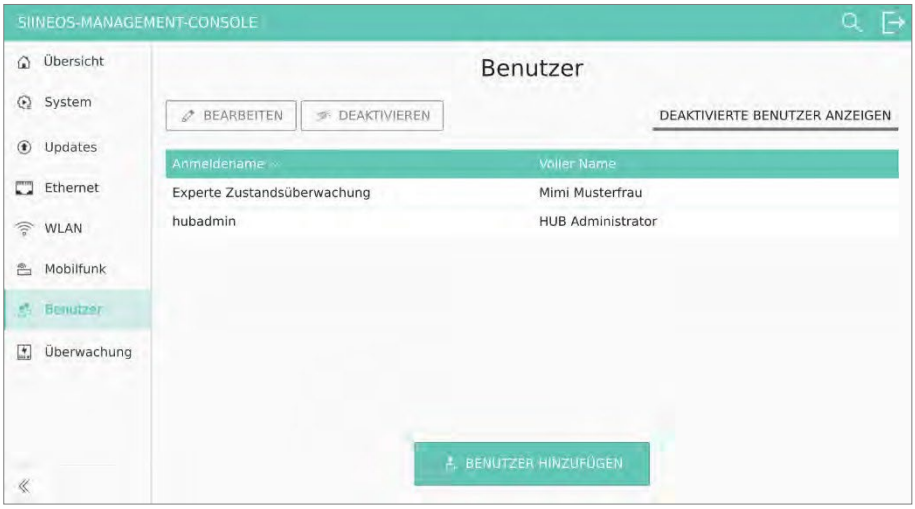

Fig. 17: "User" page (UI shown serves only as an example)

1. To add a user, click **Add User**.
2. Enter the login name, full name, and a password. The password must

   consist of at least 8 characters.
3. Assign one of the following user roles to the user:

   System administrator: Can log in to the SIINEOS management console and configure the system

   Application administrator: Can log in to the administration interface of the user software (app) and configure it.

   Application user: Can log in to protected areas of the user software (app), where e.g. sensitive information is displayed
4. Click **OK**.

   The user is created and appears in the list.
5. To edit a user, select the corresponding row in the list and click **Edit**.

   The same window opens as when creating a user. Here you can change all the details and/or assign a different user role.
6. To deactivate a user, e.g. because the user is absent for a longer period of time, select the corresponding row in the list and click **Deactivate**.
7. To restore a deactivated user, click **Activate**.

6.5.7 Monitor system

On the **Monitoring** page, you can monitor the load of the processor and the network interfaces, as well as the data traffic of your module live.

The page also has the function of a diagnostic tool that allows you to check if e.g. data enters and leaves at the correct interface.

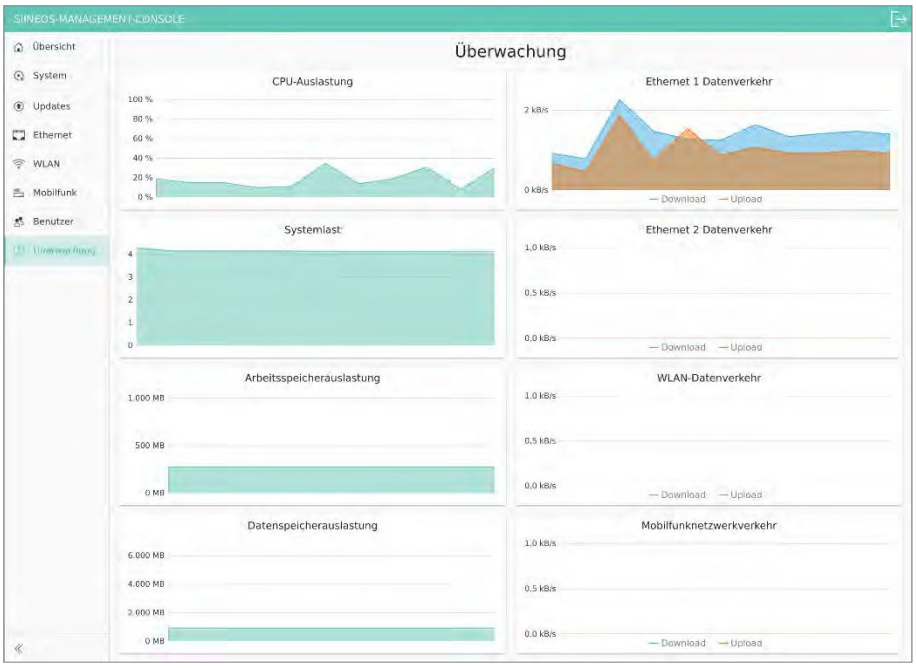

Fig. 18: "Monitoring" page (UI shown serves only as an example)

5. Technical data

Data	Values
Power supply voltage range	24 V ± 10 % | reverse polarity protected and overload protected
Max. Power consumption (total device)	120W
Processor	Colibri IMX7D 1 GB 32-bit, 2 x ARM Cortex-A7 CPU ARM®, 1 x Cortex-M4 CPU Cores®, Cryptographic Acceleration and Assurance Module, Secure Real-Time Clock
Memory	1 GBD DDR3L RAM, 4 GB eMMC
Interfaces	2 x 100MbE, 2 x USB2.0 Host, 1 x USB2.0 Device, 1 x CAN, 1 x RS485
HMI	Status LEDs
Protocols	Modbus RTU, Modbus TCP/IP, CAN, MQTT, HTTP, Cloud of Things, OPC U/A, DB/SQL
Temperature range	0 °C to 50 °C
Storage temperature range	-20 °C to 85 °C
Housing	Plastic (polyamide), black Inflammability class according to UL 94 V0
Protection class	IP20
Dimensions (L x H x W)	139mm x 100mm x 25mm
Weight	181g

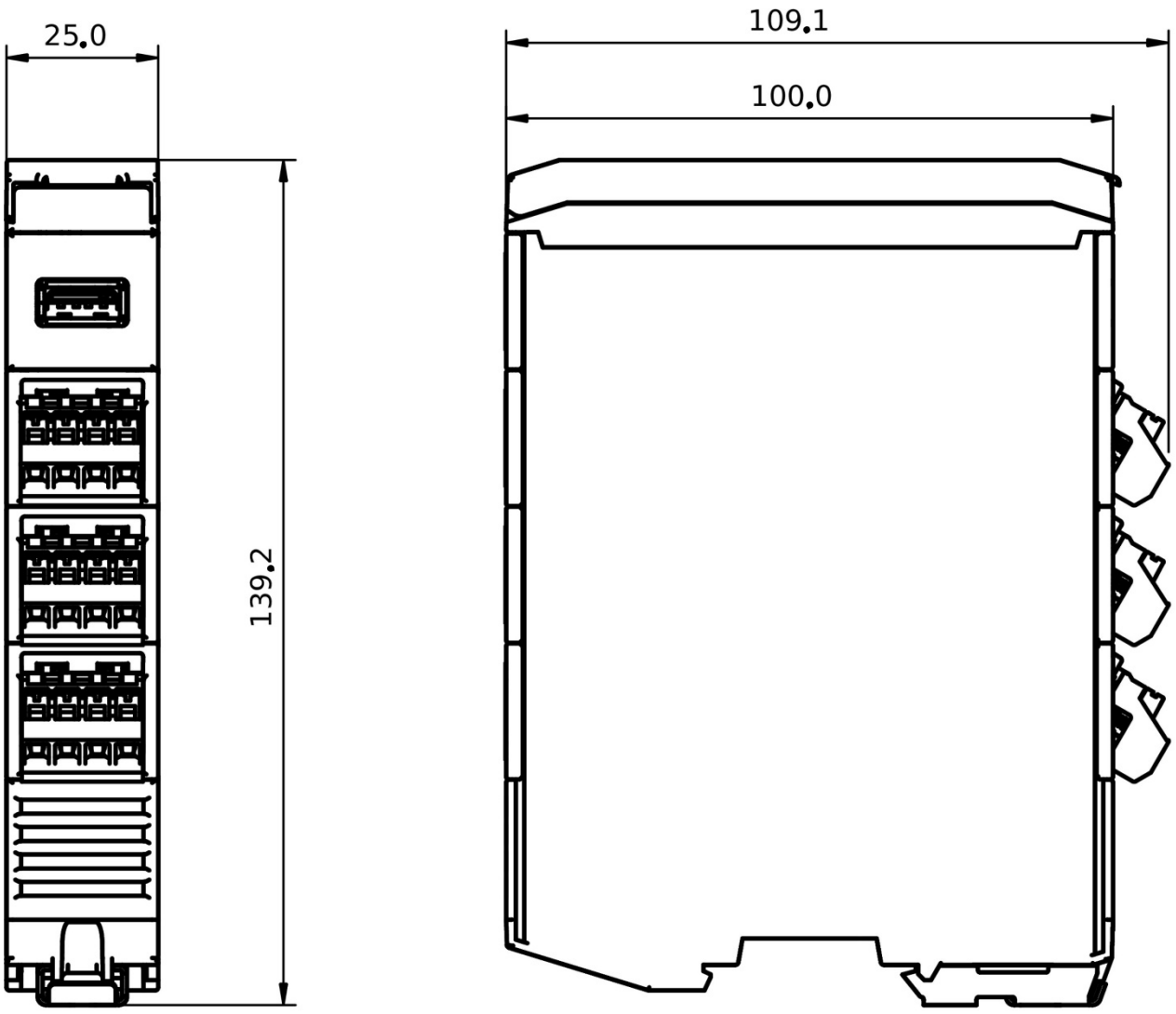

Fig. 19: Schematic drawing of the BY000002