Operating manual

SMA DATA MANAGER L

ENGLISH

EDML-10-BE-en-13 | Version 1.3

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You can download the current warranty conditions from the Internet at www.SMA-Solar.com.

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The licenses for the installed software modules (open source) can be found in the user interface of the product.

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1 Information on this Document

1.1 Validity

This document is valid for:

- EDML-10 (SMA Data Manager L) from firmware version 1.8

1.2 Target Group

The tasks described in this document must only be performed by qualified persons. Qualified persons must have the following skills:

- Training in the installation and configuration of IT systems
- Training in how to deal with the dangers and risks associated with installing, repairing and using electrical devices and installations
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of all applicable laws, standards and directives
- Knowledge of and compliance with this document and all safety information
- Knowledge of operation and control of PV power plants on medium-voltage grids and high-voltage grids

1.3 Content and Structure of this Document

This document describes the mounting, installation, commissioning, configuration, operation, troubleshooting and decommissioning of the product as well as the operation of the product user interface.

You will find the latest version of this document and further information on the product in PDF format and as eManual at www.SMA-Solar.com. You can also call up the eManual via the user interface of the product.

Illustrations in this document are reduced to the essential information and may deviate from the real product.

1.4 Levels of warning messages

The following levels of warning messages may occur when handling the product.

⚠ DANGER
Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION
Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, can result in property damage.

1.5 Symbols in the Document

Icon	Explanation
	Information that is important for a specific topic or goal, but is not safety-relevant
☐	Indicates a requirement for meeting a specific goal
☑	Desired result
	Example

1.6 Typographical Elements in the Document

Typographical element	Use	Example
bold	• Messages • Terminals • Elements on a user interface • Elements to be selected • Elements to be entered	• Connect the insulated conductors to the terminals **X703:1** to **X703:6**. • Enter **10** in the field **Minutes**.
>	• Connects several elements to be selected	• Go to **Settings > Date**.
[**Button**] [**Key**]	• Button or key to be clicked on or pressed down	• Select [**Enter**].
#	• Placeholder for variable components (e.g., parameter names)	• Parameter **WCtlHz.Hz#**

1.7 Designations in the Document

Complete designation	Designation in this document
SMA Data Manager L	Data Manager, product

1.8 Additional Information

For more information, please go to www.SMA-Solar.com.

Title and information content	Type of information
"Direct Marketing Interface"	Technical information
"SMA Modbus® Interface - SMA DATA MANAGER"	Technical Information
"PUBLIC CYBER SECURITY - Guidelines for a Secure PV System Communication"	Technical Information
"RS485 Cabling Plan"	Installation Manual
"SMA COM GATEWAY / SMA DATA MANAGER M - Compatibility and Application Options"	Technical Information
"SMA DATA MANAGER / SUNNY PORTAL powered by ennexOS - Functions"	Technical Information
"SMA SPEEDWIRE FIELDBUS"	Technical information
"SUNNY PORTAL powered by ennexOS"	User Manual
"SMA GRID GUARD 10.0 - Grid Management Services via Inverter and System Controller"	Technical Information
"WAGO-I/O-SYSTEM 750 with SMA DATA MANAGER M"	Installation Manual
"SMA DATA MANAGER M / SMA DATA MANAGER M Lite - Storage of active power limitation and reactive power setpoint"	Technical Information
"SMA DATA MANAGER M / SMA DATA MANAGER L - Fault ride-through (FRT) behavior"	Technical Information
Answers to frequently asked questions	FAQ on product page
For questions on the implementation of grid management services	Netzsystemdienstleistungen.Info@SMA.de
User information on the operation and features of the product	User information on the user interface

2 Safety

2.1 Intended Use

The SMA Data Manager L is the central communication unit for monitoring, control and grid-compliant output regulation of large-scale PV power plants with central or string inverters. The following is included into the SMA infrastructure via the Ethernet interface of the SMA Data Manager L: system components and systems including energy generators and loads, I/O systems and meters. At the same time, the SMA Data Manager L supports communication with up to 200 devices.

The product is designed for indoor use only.

All components must remain within their permitted operating ranges and their installation requirements at all times.

Use SMA products only in accordance with the information provided in the enclosed documentation and with the locally applicable laws, regulations, standards and directives. Any other application may cause personal injury or property damage.

Alterations to the SMA products, e.g., changes or modifications, are only permitted with the express written permission of SMA Solar Technology AG. Unauthorized alterations will void guarantee and warranty claims and in most cases terminate the operating license. SMA Solar Technology AG shall not be held liable for any damage caused by such changes.

Any use of the product other than that described in the Intended Use section does not qualify as appropriate.

The enclosed documentation is an integral part of this product. Keep the documentation in a convenient, dry place for future reference and observe all instructions contained therein.

This document does not replace any regional, state, provincial, federal or national laws, regulations or standards that apply to the installation, electrical safety and use of the product. SMA Solar Technology AG assumes no responsibility for the compliance or non-compliance with such laws or codes in connection with the installation of the product.

The type label must remain permanently attached to the product.

2.2 IMPORTANT SAFETY INSTRUCTIONS

Keep the manual for future reference.

This section contains safety information that must be observed at all times when working.

The product has been designed and tested in accordance with international safety requirements. As with all electrical or electronical devices, there are residual risks despite careful construction. To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and observe all safety information at all times.

⚠ DANGER

Danger to life due to electric shock from touching an ungrounded product in the event of an error

A product that is not grounded may be energized in the event of an error. Touching an ungrounded product results in death or serious injury due to electric shock in the event of an error.

- Ensure that the product is integrated in the existing surge protection.
- Ground the enclosure of the product.
- Ensure that the voltage of the digital input does not exceed 30 V DC with respect to ground potential.

⚠ WARNING

Danger to life due to electric shock

Under fault conditions, when working on the power supply circuit there may be dangerous voltages present on the product. This can result in death or serious injury.

- For power supply units with a fixed connection, make sure that a disconnection unit (e.g. miniature circuit breaker) is present outside the power supply unit.
- For power supply units with a plug connection, make sure that the electrical outlet for the power supply unit is close to the power supply unit.
- The disconnection unit and the electrical outlet for the power supply unit must be freely accessible at all times.

⚠ CAUTION

Risk of burns due to hot enclosure parts

Some parts of the enclosure can get hot during operation. Touching hot enclosure parts can result in burn injuries.

- Do not touch the enclosure during operation.
- Wear suitable personal protective equipment.

NOTICE

Damage to the product due to condensation

If the product is moved from a cold environment to a warm environment, condensation may form in the product. This can damage the product or impair its functionality.

- When there are large temperature differences, wait until the product has reached room temperature to connect the voltage supply.
- Make sure the product is dry.

NOTICE

Manipulation of system data in networks

You can connect the supported SMA products to the Internet. When connected to the Internet, there is a risk that unauthorized users can access and manipulate the data of your system.

- Set up a firewall.
- Close unnecessary network ports.
- If absolutely necessary, only enable remote access via a virtual private network (VPN).
- Do not use the port forwarding feature. This also applies to the used Modbus ports.
- Disconnect system components from other network components (network segmentation).

NOTICE

Failure and damage of product and system by interrupting the supply voltage

If the supply voltage of the product is interrupted during operation or a firmware update, a failure of the product or the entire system may occur. This may result in loss of external setpoints and a non-permitted starting behavior of the system. In addition, the device can be irreversibly damaged.

- Ensure that the supply voltage of the product is never interrupted during operation. To do this, use an uninterruptible power supply with 7 minutes bridging time.

i Electrical installations (for North America)

All installations must conform with the laws, regulations, codes and standards applicable in the jurisdiction of installation (e.g. *National Electrical Code*® ANSI/NFPA 70 or *Canadian Electrical Code*® CSA-C22.1.).

- Before connecting the product to the utility grid, contact your local grid operator. The electrical connection of the product must be carried out by qualified persons only.
- Ensure that the cables or conductors used for electrical connection are not damaged.

i IP addresses of Modbus devices

In systems with Modbus devices, static IP addresses must be assigned to all Modbus devices. Suitable IP addresses can be assigned to the Modbus devices from the free address supply of the network segment either manually or dynamically via DHCP.

If the IP addresses are to be assigned dynamically, DHCP must be activated in the router (see the router manual). Make sure that the Modbus devices do not contain variable IP addresses but always the same IP addresses (static DHCP).

This also applies to data managers that are used as subordinated devices (slaves).

IP addresses in local networks

In local networks in which no DHCP server is active, suitable IP addresses from the free address pool of the network segment must be assigned to all nodes to be integrated during initial commissioning.

If the IP addresses in the local network are to be assigned dynamically, DHCP must be activated in the router (see the router manual). The DCHP server automatically assigns the appropriate network settings to your nodes in the local network. A manual network configuration is therefore not necessary.

Completion of data after interruption of communication

If the data communication between the Data Manager and SMA products connected via SMA Speedwire is interrupted, the data will be retrieved subsequently for the time of the interruption. Data is retrieved with a maximum interruption period of 7 days. Existing data of newly connected SMA products will not be transmitted until the Data Manager is commissioned. Historical data of SMA products are only available in the user interface of the SMA product.

Possible causes for the interruption of the data communication can be:

- Interruptions of the SMA Speedwire connection
- Resetting connected SMA products over a period of several hours
- Voltage supply interruption

2.3 Supported Products

Supported SMA Products

Availability of SMA products in your country

Not all SMA products are available in all countries. For information on whether an SMA product is available in your country, contact your distributor.

Inverters:

- All SMA inverters with integrated or retrofitted Speedwire/Webconnect interfaces are supported. Information on whether an SMA inverter has an integrated Speedwire/Webconnect interface or can be retrofitted with a Speedwire/Webconnect interface can be found on the SMA inverter product page at www.SMA-Solar.com.

  All SMA central inverters with integrated Modbus interfaces are supported.

Additional products:

- SMA Com Gateway from firmware version 01.00.40.R
- SMA Energy Meter from firmware version 1.1 (not available in all countries)
- Sunny Portal powered by ennexOS
- 1 SMA Inverter Manager with 1 Sunny Tripower Storage 60
- 1 SMA Inverter Manager with up to 42 Sunny Tripower 60 / Sunny Highpower Peak1
- SMA Hybrid Controller
- SMA Data Manager M

Supported Products from Other Manufacturers

Energy meters:

- Power Analyser of the UMG 604 series from Janitza electronics GmbH
- WattsOn-Mark II Precision Energy Meter from Elkor Technologies Inc.
- PowerLogic ION7550 / ION7650 / ION8600 / ION8650 / ION8800 from Schneider Electric

External I/O Systems:

- ioLogik E1241 from Moxa Europe GmbH
- ioLogik E1242 from Moxa Europe GmbH
- ioLogik E1260 from Moxa Europe GmbH
- WAGO-I/O-SYSTEM 750 of WAGO Kontakttechnik GmbH & Co. KG (see Section 13, page 59)
- PFC200 of WAGO Kontakttechnik GmbH & Co. KG (see Section 13, page 59)
- PFC200-BUNDLE of WAGO Kontakttechnik GmbH & Co. KG (see Section 13, page 59)

Predefined SMA Modbus profiles

The external I/O systems are controlled via Modbus profiles. A selection of predefined SMA Modbus profiles is available via the user interface and is regularly updated. In addition, user-defined Modbus profiles can be created, but they are only executed every 1000 ms.

Sensors (only in conjunction with external I/O systems):

- Irradiation sensors that can output a current signal in the range from 4 mA to 20 mA
- Anemometers that can output a current signal in the range from 4 mA to 20 mA
- Temperature sensors with a Pt100 measuring shunt

The linearization of the temperature sensors' data takes place in the I/O system. In the case of solar irradiation sensors and anemometers, however, the sensor itself must be designed for a linearization of the data.

Signal receivers and digital signal sources:

- Signal sources with relay contacts

Routers and network switches:

- Routers and network switches for Fast Ethernet with a data transfer rate of at least 100 Mbit/s. All network components used must support version 2 or version 3 (IGMPv2 or IGMPv3) of the IGMP protocol. Do not use an IGMP Snooping Switch as per RFC 4541.

3 Scope of Delivery

Check the scope of delivery for completeness and any externally visible damage. Contact your distributor if the scope of delivery is incomplete or damaged.

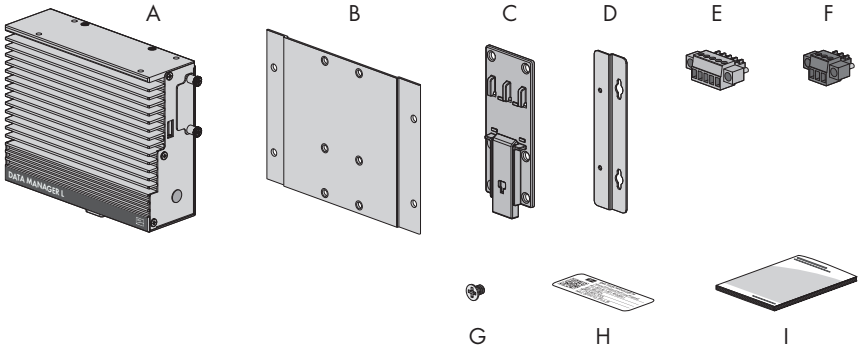


Figure 1: Components included in the scope of delivery

Position	Quantity	Designation
A	1	SMA Data Manager L
B	1	Mounting plate for mounting on the DIN rail (TH 35-7.5)
C	1	DIN rail mounting bracket for mounting on the DIN rail (TH 35-7.5)
D	2	Wall mounting brackets for mounting on a wall
E	2	Terminal blocks for digital signals
F	1	Terminal block for voltage supply
G	14	Screws for attaching the wall and DIN rail mounting brackets
H	2	Labels with internet address, registration ID (RID), identification key (PIC), device key and MAC addresses of the Ethernet interfaces
I	1	Quick Reference Guide

4 Product Overview

4.1 Product Description

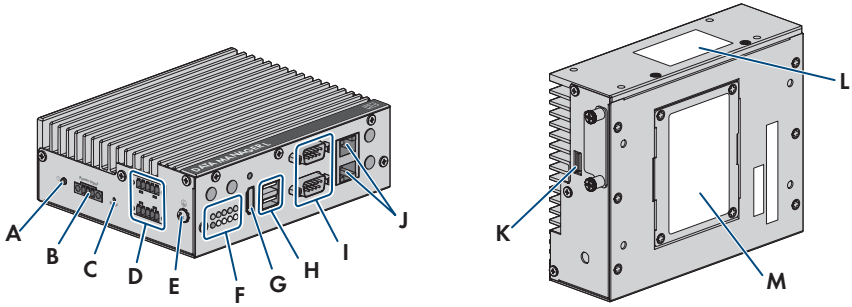


Figure 2: Design of the product

Position	Designation
A	Operation button Starts the product
B	Terminal for the voltage supply
C	Reset button Performs a restart
D	Terminal for digital signals
E	Connection point for connecting the grounding conductor
F	LEDs The LEDs indicate the operating state of the product.
G	HDMI
H	USB 2.0 ports for manual updates
I	Terminal for serial signals
J	Network Ports
K	USB 3.0 port for manual updates

Position	Designation
L	Labels with internet address, registration ID (RID), identification key (PIC), device key and MAC addresses of the Ethernet interfaces
M	Type label The type label clearly identifies the product. The type label must remain permanently attached to the product. You will find the following information on the type label: • Device type (Type) • Serial number • Date of manufacture • Device-specific characteristics

4.2 Symbols on the Product

Icon	Explanation
	Beware of hot surface The product can get hot during operation.
	No function
	No function
	No function
	Operation button Enables the restart of the product
	Operation LED Indicates whether the product is in operation.
	Internal Memory The symbol and LED signalize the status of the data transmission of the internal storage system.
	No function
	No function

Icon	Explanation
	Grounding conductor This symbol indicates the position for connecting a grounding conductor.
	Ground This symbol indicates the position for the connection to ground.
	WEEE designation Do not dispose of the product together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site.
	The product is suitable for indoor installation.
	No function
	CE marking The product complies with the requirements of the applicable EU directives.
	UKCA marking The product complies with the regulations of the applicable laws of England, Wales and Scotland.
	FCC designation The product complies with the requirements of the applicable FCC standards.
	China RoHS labeling The product complies with the requirements of the applicable Chinese directives.
	RoHS labeling The product complies with the requirements of the applicable EU directives.
	UL 60950-1 and CAN/CSA-C22.2 No. 60950-1 are the standards applied by Underwriters Laboratories to the product to certify that it meets the requirements of the *National Electrical Code*® and the *Canadian Electrical Code*®.
	RCM (Regulatory Compliance Mark) The product complies with the requirements of the applicable Australian standards.

4.3 LED Signals

LED	Status	Explanation
Operation LED ⏻	glowing green	Normal operation
	Off	The product is off.
Internal memory ⛁	flashing yellow	The products is sending or receiving data.
	Off	No connection. The product is not sending or receiving data.

Network port LEDs

i The colors of the network port LEDs and what each color indicates are not standardized

The colors used by SMA Solar Technology AG for the Link LED and the Activity LED and what each color indicates may be different to those used in third-party products.

Position	Designation	Color	Explanation
A	Link LED	Green	Shows the network connection status.
B	Activity LED	Yellow	Shows network connection activity.

All other LEDs on the product have no function.

4.4 Sunny Portal

Sunny Portal is an Internet portal which enables you to monitor systems and to visualize system data.

The Sunny Portal serves as the user interface for the extended configuration of the product, of system sections, systems, system groups and the entire system portfolio. The Sunny Portal monitors and analyzes the system and its components on all levels.

There are two Sunny Portal versions: the classical Sunny Portal (https://www.sunnyportal.com) and the newly developed Sunny Portal powered by ennexOS (https://ennexOS.sunnyportal.com). Both systems differ in their supported functions. With an existing user account, you can log into both portals, the Sunny Design (system planning software from SMA) as well as the app SMA 360°.

The SMA Data Manager L only supports the Sunny Portal powered by ennexOS.

4.5 Interfaces and Functions

The product can be equipped or retrofitted with the following interfaces and functions: The availability of the functions depends on the product version and additional options purchased.

For more information on the current and future functions, see the product page at www.SMA-Solar.com (e.g. detailed descriptions of function or information on parameterization).

User interface for configuration and monitoring

The product is equipped as standard with an integrated webserver, which provides a user interface for configuring and monitoring the product.

Once a connection has been established to a smart end device (e.g. laptop or tablet PC), the product's user interface can be called up using a web browser.

Connected SMA products can be configured and commissioned via the user interface of the product.

SMA Speedwire

The product is equipped with SMA Speedwire as standard. SMA Speedwire is a type of communication based on the Ethernet standard. SMA Speedwire is designed for a data transfer rate of 100 Mbps and enables optimum communication between Speedwire devices within systems.

Dashboard

On the dashboard of the user interface, information on the product, the plant and its components is displayed clearly and at a glance using widgets. The dashboard display can vary depending on the system's functional scope and user rights.

Information, such as yield forecast, system section visualization and inverter comparison, are available via the extended functions in Sunny Portal.

Modbus

The product can be retrofit with a Modbus interface. For this, an additional RS232-RS485 adapter is required (not part of the scope of delivery). The Modbus interface is deactivated by default and must be configured as needed.

The Modbus interface of the supported SMA products is designed for industrial use – via SCADA systems, for example – and has the following tasks:

- Remote query of measured values
- Setpoint specifications for system control

For the communication with connected Modbus devices, predefined Modbus profiles and user-created Modbus profiles can be used. User-created Modbus profiles can be exported and transferred to another product.

Modbus TCP

The product supports the SMA Modbus profile via the interface of the Modbus client (Modbus TCP) (see technical information "SMA Modbus® Interface - SMA DATA MANAGER").

SunSpec Modbus

The product supports the standardized SunSpec Modbus profile via the interface of the Modbus client (Modbus TCP/RTU). The SunSpec Modbus profile from the SunSpec Alliance contains a comprehensive set of measured values and parameters for Modbus devices in decentralized power generation systems (e.g. inverters, energy meters, weather stations). The product has data points of

the SunSpec Alliance and therefore conforms with the SunSpec Modbus profile of the underlying specification version (see www.sunspec.org). Connected Modbus devices compatible with the SunSpec Modbus profile are automatically integrated into the system with the appropriate Modbus profile.

Plant-wide parameterization

You can use the system parameter assistant to change the parameters of connected devices at the same time and to compare them. Simply select the desired devices from a list and change the parameters that are suitable for simultaneous change. The status of the parameter changes is accessible at all times.

Energy monitoring

Several SMA Energy Meters and Modbus energy meters from other manufacturers can be connected for comprehensive energy monitoring. The product can also read out, save and display the generation and consumption data of the meters.

In addition, energy meters (e.g. a gas meter) can be registered via the extended functions in Sunny Portal. The meter readings can be entered manually and displayed.

FTP Push

The FTP Push function can be used to upload collected system data to a freely selectable external FTP server. The collected system data is uploaded to the specified folder up to 1 time per hour per day. Here, the system data is exported in an unchangeable XML format. The system data and user data is transmitted via standard FTP protocol to the FTP server without encryption.

Grid management services

The product is equipped with service functions for grid management.

Depending on the requirements of the grid operator, you can activate and configure the functions (e.g. active power limitation) via operating parameters.

The setpoints from the grid operator can either be implemented via open-loop control or closed-loop control. The setpoints are specified via Modbus, analog or digital signals or manually via the user interface. The implementation of the setpoints is reported back to the grid operator.

Active power limitation

The setpoint for active power limitation is specified in percent. The total system power is taken as the reference value. The setpoints are specified via Modbus, analog or digital signals or manually via the user interface.

Zero export

Some grid operators permit connection of PV systems only on condition that no active power is fed into the utility grid. The PV energy is therefore consumed exclusively at the place where it is generated.

When specifications at the point of interconnection are actively controlled, this product enables the limitation the active power feed-in for the connected SMA inverters and of third-party inverters to 0% as long as these are connected via SunSpec Modbus and support this function.

Reactive power control

The reactive power control can take place through direct parameter settings (Q, cos φ) in the installation assistant or a variable specification from the grid operator via the Modbus interface or via analog signals. The reactive power control as characteristic curve function can also be regulated as a function of the voltage at the point of interconnection Q(V). The values are specified as a percentage of the maximum AC power. A proper meter for measuring the relevant electrical variables (V, P, Q) is required at the grid-connection point. A pure voltage measurement is not sufficient. A suitable energy meter is also required at the point of interconnection for cos φ specifications in control mode.

Direct selling

A direct marketer can use the product for remotely controlling the system via the built-in direct marketing interface. In this process, control signals of the direct marketer are transferred to the system. The function is activated via the user interface of the product.

Licensed Functions

The product has basic functions that are available for all systems. Furthermore, additional licensed functions can be purchased.

5 Mounting

5.1 Requirements for Mounting

Requirements for the mounting location:

⚠ WARNING

Danger to life due to fire or explosion

Despite careful construction, electrical devices can cause fires. This can result in death or serious injury.

- Do not mount the product in areas containing highly flammable materials or gases.
- Do not mount the product in potentially explosive atmospheres.

☐ The mounting location must be inaccessible to children.

☐ The mounting location must be suitable for the weight and dimensions of the product (see Section 12, page 57).

☐ The mounting location must not be exposed to direct solar irradiation. Direct solar irradiation can cause the product to overheat.

☐ The mounting location should be freely and safely accessible at all times without the need for any auxiliary equipment (such as scaffolding or lifting platforms). Non-fulfillment of these criteria may restrict servicing.

☐ All ambient conditions must be met (see Section 12, page 57).

Permitted and prohibited mounting positions:

☐ The product may only be mounted in a horizontal position.

Dimensions for mounting:

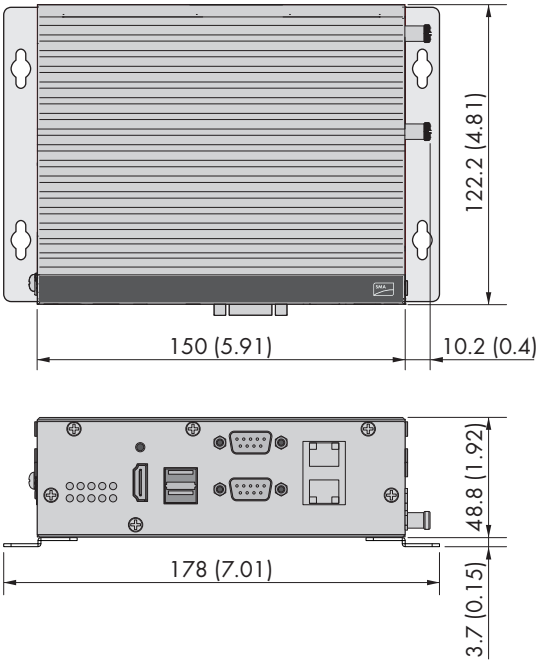


Figure 3: Dimensions for wall mounting (Dimensions in mm (in))

Recommended clearances:

If you maintain the recommended clearances, adequate heat dissipation will be ensured. Thus, you will prevent power reduction due to excessive temperature.

Maintaining the recommended clearances ensures that all terminals on the product can be reached.

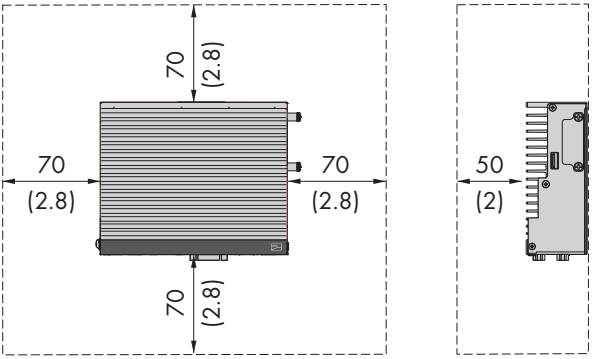


Figure 4: Recommended clearances (dimensions in mm (in))

5.2 Mounting the Product on the DIN Rail

There are two options for mounting the product on the DIN rail:

- Mounting the product with the back to the DIN rail
- Mounting the product with the top to the DIN rail

Additionally required mounting material (not included in the scope of delivery):

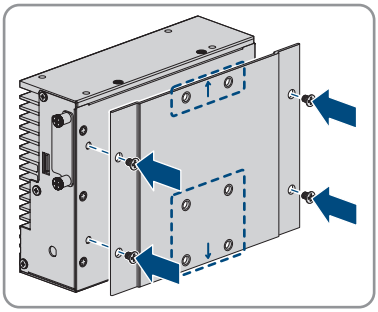
☐ Top-hat rail (TH 35-7.5)

Requirement:

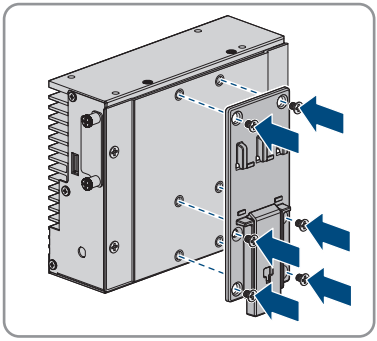
☐ The top-hat rail must be securely mounted.

Mounting the product with the back to the DIN rail

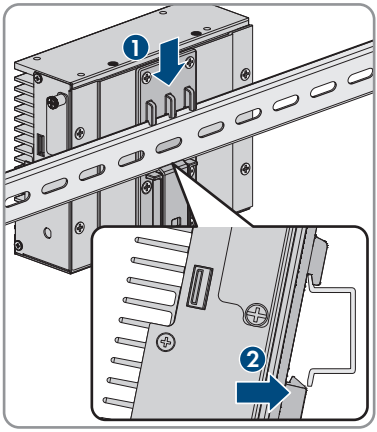
1. Attach the mounting plate to the back of the product using four of the supplied screws. Ensure that four of the six central drill holes are at the bottom and the other two drill holes at the top.



2. Attach the DIN rail bracket to the mounting plate using six of the supplied screws.



3. Position the product onto the DIN rail from above and press on the bottom.

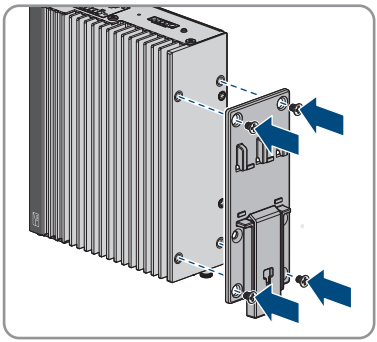


☑ The product snaps audibly into place.

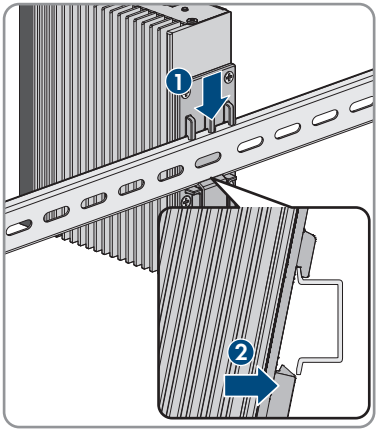
4. Ensure that the product is securely in place.

Mounting the product with the top to the DIN rail

1. Attach the DIN rail bracket to the top of the product using four of the supplied screws. Make sure that the lock for releasing the DIN rail bracket protrudes over the outer edge of the product.



2. Position the product onto the DIN rail from above and press on the bottom.



☑ The product snaps audibly into place.

3. Ensure that the product is securely in place.

5.3 Mounting the Product on the Wall

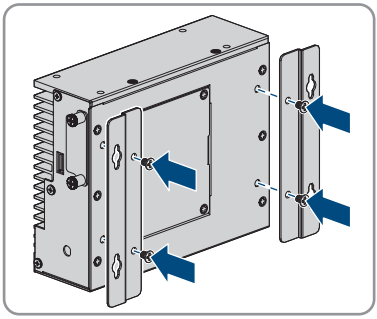
Additionally required mounting material (not included in the scope of delivery):

☐ 4 screws Take note of the diameter of the holes in the wall mounting brackets, the condition of the wall and the weight of the product.

☐ If necessary: screw anchors and washers (depending on support surface)

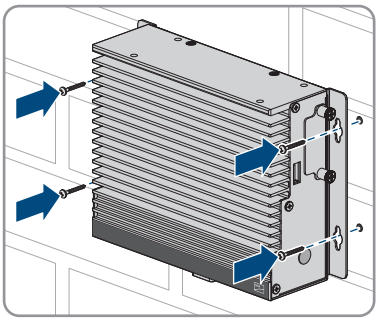
Procedure:

1. Attach both wall mounting brackets to the back of the product using two of the supplied screws each. Keep in mind that the holes for attachment to the wall are located on the outside and stick out from the product to the rear.



2. Align the product horizontally on the wall and use the wall mounting bracket to mark the position of the drill holes.
3. Drill the marked drill holes.
4. Insert screw anchors into the drill holes if the support surface requires them.

5. Insert the supplied screws through the holes and tighten. Use the washers if necessary.



6. Ensure that the product is securely in place.

6 Connection

6.1 Overview of the Connection Area

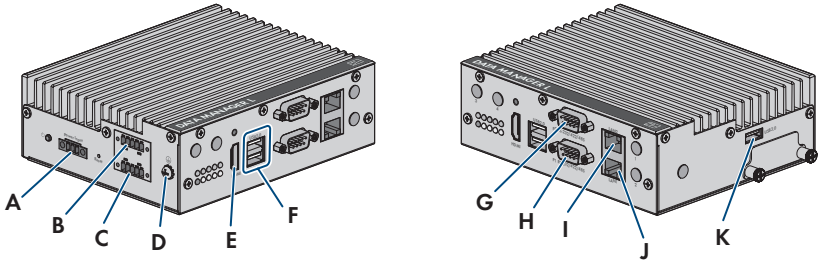


Figure 5: Overview of the connection area

Position	Designation	Explanation
A	Power Input	Jack for connecting the voltage supply
B	DI	Jack for the connection of digital input signals
C	DO	Jack for the connection of digital output signals
D	⏚	Connection point for connecting the grounding conductor
E	HDMI	Reserved for future applications
F	USB2.0	USB 2.0 ports for manual updates
G	P2 RS-232/422/485	Reserved for future applications
H	P1 RS-232/422/485	Socket for connecting an RS232-RS485 adapter for the optimal Modbus connection
I	LAN2	Network port with status LEDs for the connection to a network with external nodes
J	LAN1	Network port with status LEDs for the connection to a network with internal nodes
K	USB3.0	USB 3.0 port for manual updates

6.2 Preparing the Connection Cable

Always proceed as follows to prepare each connection cable for connection to multipole plugs.

Procedure:

1. Strip 40 mm (1.57 in) of cable sheath from the end of the connection cable to which the multipole plug is to be attached. When doing so, ensure that no pieces of cable fall into the enclosure.

2. Strip off 6 mm (0.24 in) of the conductor insulation from each of the required connection cable conductors.
3. Trim unneeded insulated conductors of the connection cable flush with the cable sheath.
4. If needed, push 1 bootlace ferrule onto 1 stripped insulated conductor as far as it will go and crimp using a crimping tool.

6.3 Connecting Signal Source to Digital Input

The digital signals can be transmitted to the **DI** jack. A buffer module, for example, can be used as a digital signal source.

Additionally required material (not included in the scope of delivery):

- ☐ Digital signal source with up to 4 potential-free contacts
- ☐ Connection cable

Signal cable requirements:

The cable length and quality affect the quality of the signal. Observe the following cable requirements:

- ☐ Number of wires: at least 2
- ☐ Conductor cross-section: 0.2 mm² to 1.5 mm² (32 AWG to 16 AWG)
- ☐ Maximum cable length: 30 m (98 ft)
- ☐ UV-resistant for outdoor use

Requirements:

- ☐ The signal source must be technically suitable for connection to the digital inputs (see Section 12, page 57).
- ☐ The connection cable must be prepared for connection to the multipole terminal block (see Section 6.2, page 27).

Overview:

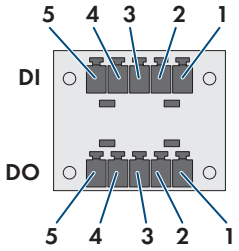


Figure 6: Pin assignment for terminal **DI/DO**

Pin	Pin assignment	Explanation
1	DI1	Condition of the buffer module
2	DI2	Reserved for future applications

Pin	Pin assignment	Explanation
3	DI3	Fast stop[1)]
4	DI4	Reserved for future applications
5	24 V	Voltage supply output
1	DO1	Reserved for future applications
2	DO2	Reserved for future applications
3	DO3	Reserved for future applications
4	DO4	Reserved for future applications
5	GND	Ground

Circuitry overview:

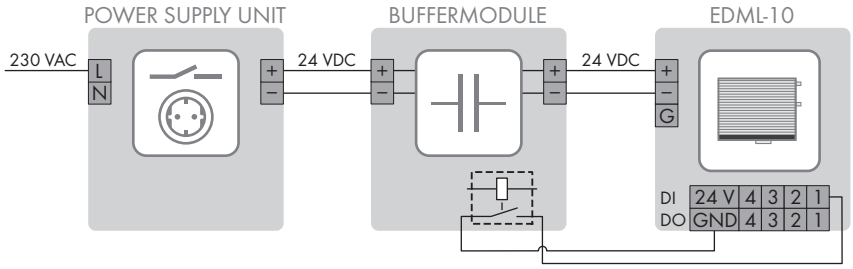


Figure 7: Connection of a buffer module (example)

Procedure:

1. Connect the connection cable to the digital signal source (see the manual from manufacturer).
2. Connect the connection cable to the supplied 5-pole terminal blocks. To do this, release the screws of the required terminal points using a suitable tool, plug the wires into the terminal points and tighten the screws of the terminal points hand-tight.
3. Connect the 5-pole terminal blocks to terminal **DI**. Observe the pin assignment.
4. Ensure that the wires are correctly connected and fit tightly.
5. Note the terminal assignment.

6.4 Connecting RS485 Devices

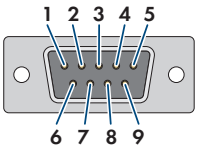
The product is suitable for the communication with RS232 devices. By using an additional RS232-RS485 adapter and a serial extension cord, the product can be retrofit for the communication with RS485 devices via Modbus RTU.

Additionally required mounting material (not included in the scope of delivery):

☐ RS232-RS485 adapter galvanic isolation (e.g. the TCC-100I-T from Moxa)

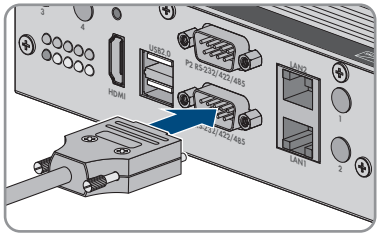
[1)] For information on SMA products with fast-stop function see manual of the SMA products.

☐ Serial RS232 extension cord with 1 DB-9 socket (9 pin contacts, D-sub) and 1 DB-9 plug (9 pin contacts, D-sub)

Connector on the device	Position	Assignment
	1	DCD
	2	RxD
	3	TxD
	4	DTR
	5	GND
	6	DSR
	7	RTS
	8	CTS

Procedure:

1. Connect the RS232-RS485 adapter to the desired RS485 device. Observe the specifications of the adapter manufacturer.
2. Connect the connector of the serial RS232 extension cord to the RS232-RS485 adapter. Observe the specifications of the adapter manufacturer.
3. Connect the socket of the RS232 extension cord with terminal **P1 RS-232/422/485** on the Data Manager.



6.5 Connecting the network

There are two ways to connect the product to a network:

- Connect the network communication with internal nodes
- Connect the network communication with external nodes

Interference in data transmission due to unshielded power cables

If unshielded power cables are used, they generate an electromagnetic field during operation which may induce interference in network cables during data transmission.

- When laying network cables without separating strip, observe a minimum clearance of 200 mm (8 in) to unshielded energy cables.
- When laying network cables with separating aluminum strip, observe a minimum clearance of 100 mm (4 in) to unshielded energy cables.
- When laying network cables with separating steel strip, observe a minimum clearance of 50 mm (2 in) to unshielded energy cables.

Additionally required material (not included in the scope of delivery):

☐ One or two network cables

Network cable requirements:

The cable length and quality affect the quality of the signal. Observe the following cable requirements:

☐ Cable type: 100BaseTx

☐ Cable category: minimum CAT5e

☐ Plug type: RJ45 of Cat5, Cat5e, Cat6 or Cat6a (Cat7 plugs cannot be used)

☐ Shielding: S/UTP, F/UTP or higher

☐ Number of insulated conductor pairs and insulated conductor cross-section: at least 2 x 2 x 0.22 mm² (2 x 2 x 24 AWG)

☐ Maximum cable length between 2 nodes when using patch cables: 50 m (164 ft)

☐ Maximum cable length between 2 nodes when using installation cables: 100 m (328 ft)

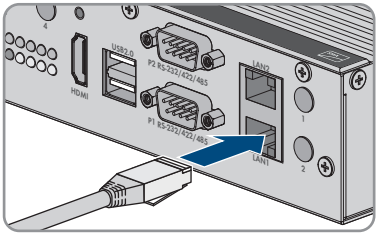
☐ UV-resistant for outdoor use.

Connect the network communication with internal nodes:

SMA Solar Technology AG recommends using the network port **LAN1** for the network communication with internal nodes (e.g. inverter and energy meter). Network port **LAN1** is preconfigured with the static IP address 172.16.1.22.

Procedure:

1. Plug the RJ45 plug of the network cable into the network port **LAN1** until the RJ45 plug snaps into place.



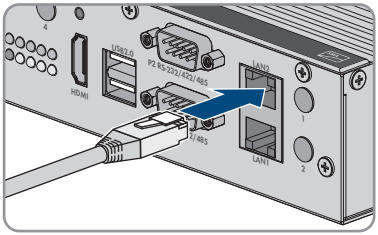
2. Connect the other end of the network cable to the network.

Connect the network communication with external nodes

SMA Solar Technology AG recommends using the network port **LAN2** for the network communication with external nodes (e.g. SCADA system, Sunny Portal). Network port **LAN2** is preconfigured with the static IP address 192.168.100.22.

Procedure:

1. Plug the RJ45 plug of the network cable into the network port **LAN2** until the RJ45 plug snaps into place.



2. Connect the other end of the network cable to the network.

6.6 Connecting the Voltage Supply

⚠ WARNING

Danger to life due to electric shock

Under fault conditions, when working on the power supply circuit there may be dangerous voltages present on the product. This can result in death or serious injury.

- For power supply units with a fixed connection, make sure that a disconnection unit (e.g. miniature circuit breaker) is present outside the power supply unit.
- For power supply units with a plug connection, make sure that the electrical outlet for the power supply unit is close to the power supply unit.
- The disconnection unit and the electrical outlet for the power supply unit must be freely accessible at all times.

NOTICE

Damage to the product due to condensation

If the product is moved from a cold environment to a warm environment, condensation may form in the product. This can damage the product or impair its functionality.

- When there are large temperature differences, wait until the product has reached room temperature to connect the voltage supply.
- Make sure the product is dry.

Additionally required material (not included in the scope of delivery):

- 1 power supply unit
- 1 AC connection cable
- 1 connection cable for the connection of the power supply unit to the product
- 1 grounding cable

- 1 ring terminal lug M4 for grounding cable

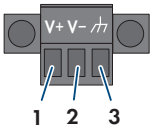
Requirements for the power supply unit:

- Short-circuit current: < 8 A
- Nominal output power: 18 W
- DC output voltage: 9 V to 36 V
- Compliance with the requirements on current sources with limited power in accordance with IEC 60950

Requirements for the connection cable for the connection of the power supply unit to the product:

- Core cross-section: 0.5 mm² to 1.5 mm² (16 AWG to 20 AWG)
- Number of insulated conductors: 3
- Maximum cable length: 3 m (9.8 ft)

Plug assignment:

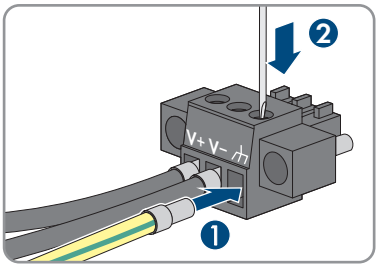
Plug	Position	Assignment
	1	Input voltage 9 to 36 V DC+
	2	Input voltage 9 to 36 V DC-
	3	Ground (GND)

Grounding cable requirements:

- Core cross-section: 0.5 mm² to 1.5 mm² (16 AWG to 20 AWG)
- Number of insulated conductors: 1
- Maximum cable length: 3 m (9.8 ft)

Procedure:

1. Mount the power supply unit (see the manufacturer manual).
2. Connect the connection cable to the power supply unit (see the manufacturer manual). Make a note of the insulated conductor colors and trim the unused insulated conductors back to the cable sheath.
3. Connect the connection cable to the supplied 3-pole terminal block. To do this, release the screws of the required terminal points using a suitable tool, plug the wires into the terminal points and tighten the screws of the terminal points hand-tight. Observe the pin assignment.



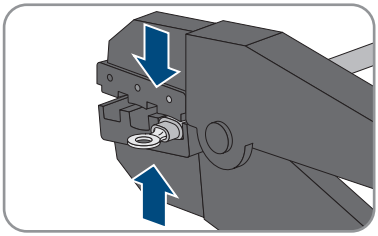
4. Trim unused insulated conductors flush with the cable sheath.

5. Plug the 3-pole terminal block into the jack **Power Input** and attach.
6. Connect the AC connection cable to the power supply unit (see the manufacturer manual).
7. **⚠ WARNING**

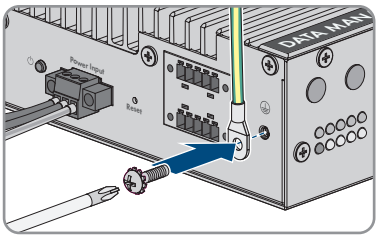
   Danger to life due to electric shock

   Lethal voltages are present at the connection point of the utility grid. This can result in death or serious injury.

   - Disconnect the connection point from voltage sources and ensure that the connection point is voltage-free.
8. Connect the other end of the AC connection cable to the voltage supply.
9. Dismantle the grounding cable and strip the insulation according to the ring terminal lug used.
10. Insert the stripped section of the grounding cable into the ring terminal lug and crimp using a crimping tool.



11. Attach the ring terminal lug to the product at the point shown. Use M4 screw with tooth lock washer for this (PH1, torque: 2.5 Nm (22.2 in-lb)).



12. Connect the connection point to the utility grid.

☑ The product starts operation (see Section *7*, page 35).

7 Commissioning

7.1 Establishing a Direct Connection via Ethernet

Requirements:

- ☐ The product must be commissioned.
- ☐ A smart device (e.g. laptop) with an Ethernet interface must be available.
- ☐ The product must be connected directly to the smart device.
- ☐ The respective latest version of one of the following web browsers must be installed on the smart device: Chrome, Edge, Firefox or Safari.
- ☐ JavaScript must be enabled in the web browser of the smart device.

Procedure:

1. Open the web browser of your smart end device and enter the IP address **172.16.1.22** or **192.168.100.22** in the address bar. Note the assignment of the IP addresses to the network terminals.
2. **Web browser signals a security vulnerability**

   After the IP address has been entered, a message might appear indicating that the connection to the user interface of the product is not secure. SMA Solar Technology AG guarantees the security of the user interface.

   - Continue loading the user interface.

☑ The login page of the user interface opens.

7.2 Establishing a Connection via Ethernet in the local network

Access addresses of the product

To connect a web browser to the product, the serial number of the product must be available. The serial number is part of the access addresses of the product.

- Access address for Apple and Linux systems: **SMA[serial number].local** (e.g. SMA0123456789.local)
- Access address for Windows and Android systems: **https://SMA[serial number]** (e.g. https://SMA0123456789)

Requirements:

- ☐ The product must be connected to the local network via a network cable (e.g. via a router).
- ☐ The IPv4 protocol must be used.
- ☐ A smart end device (e.g. laptop or tablet PC) must be available.
- ☐ The smart device must be in the same local network as the product.
- ☐ The respective latest version of one of the following web browsers must be installed on the smart device: Chrome, Edge, Firefox or Safari.
- ☐ JavaScript must be enabled in the web browser of the smart device.

Procedure:

1. First, establish a direct connection via Ethernet (see Section 7.1, page 35).
2. Select **Change network configuration**. Observe that the manual network configuration is set by default.
3. Set the network interface **LAN1** or **LAN2** and select [**Yes**].
   ☑ This automatically configures the network settings via DHCP server.
4. Close the web browser of your end device, open again and enter the product's access address in the address bar of the web browser. Then press the Enter key.
5. **Web browser signals a security vulnerability**
   After the IP address has been entered, a message might appear indicating that the connection to the user interface of the product is not secure. SMA Solar Technology AG guarantees the security of the user interface.
   - Continue loading the user interface (scroll to bottom and click proceed/advance).

☑ The login page of the user interface opens after a few seconds.

7.3 Commissioning the Product

After you have connected the product with the local network, the login page of the user interface opens.

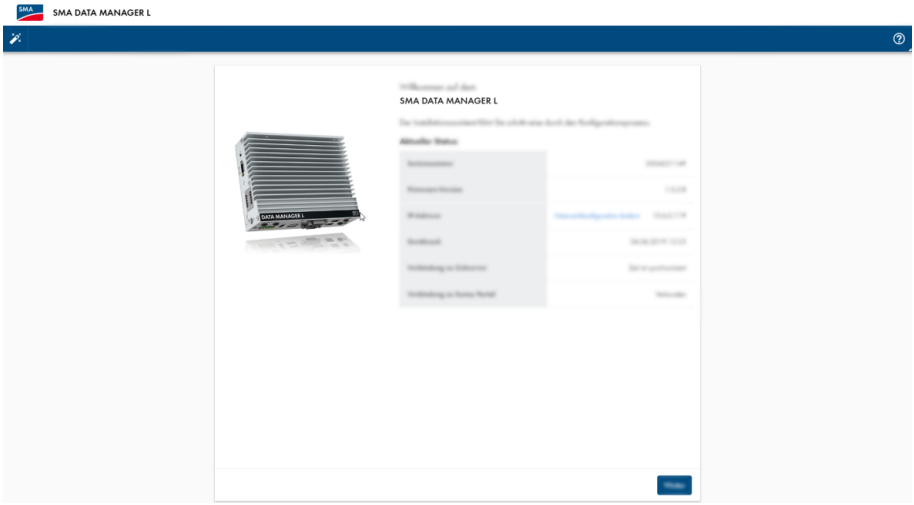


Figure 8: Login page of the user interface

Requirements:

☐ All devices in the local network must be in operation and connected to the product via an Internet router.

☐ There must be an active Internet connection.

☐ An NTP server must be available in the local network or via the Internet. If there is no NTP server available, the time set in the web browser can be used as system time.

☐ The connected Modbus devices must be configured to send their setpoints in cyclic intervals (maximum cycle time: 1 minute; recommended cycle time: 1 second).

i Restart at different system time

An NTP server must be available in the local network or via the Internet. If there is no NTP server available, the time set in the web browser is used as system time. If the difference between the time in the web browser and the system time is more than one minute, the time is synchronized and the product restarted.

Configuring the network settings

1. To configure the network settings, select **Change the network configuration**. Observe that the manual network configuration is set by default.
2. If the network settings are to be configured automatically via the DHCP server, select [**Yes**].
3. Configure network settings and confirm with [**Save**].

Starting the installation assistant

1. Select [**Continue**] on the login page of the user interface.
2. Create administrator account and select [**Next**]. Observe that only one user with administrator authorization can be created on each Data Manager.
   ☑ The installation assistant will open.
3. Follow the installation assistant steps listed and make the settings appropriate for your system (device registration, master or slave configuration, meter configuration, grid management service).
   ☑ A successful commissioning is confirmed by a message.

7.4 Registering in Sunny Portal

Once you have carried out the commissioning on the user interface of the product, you can make further system configurations in Sunny Portal. For this, all products of a system must be registered in Sunny Portal.

The SMA Data Manager L only supports the Sunny Portal powered by ennexOS.

i Profiles for data communication

Different profiles are available to control the intensity of data communication in the system. The profiles can be edited in the system properties at any time in Sunny Portal to adjust the intensity. Note that when switching from a low to a high intensity data communication, the data from the past is not retroactively adjusted. The adjustment applies from the date of the change. The following profile can be selected for data communication:

- High (default setting): Devices send all relevant data to the Sunny Portal every 5 minutes.
- Medium: Devices send all relevant data to the Sunny Portal every 15 minutes.
- Low: Devices send the most important data to the Sunny Portal 6 times per day.

Requirements:

☐ The product must be in operation and connected to the local network via an Internet router.

☐ The registration ID (RID), identification key (PIC) and the Internet address of the type label or of other provided labels must be available.

☐ The operation LED must glow green.

☐ An active Internet connection must be established.

Procedure:

1. Call up the Internet address https://ennexOS.SunnyPortal.com in the web browser.
2. Register as a new user in Sunny Portal or log into Sunny Portal as an existing user.
3. Create a new system or add product to an existing system.

Register as a new user in Sunny Portal.

1. Call up the Internet address https://ennexOS.SunnyPortal.com in the web browser.
2. Select **I require a user account**.
3. Enter the necessary data for registration.
4. Select [**Register**].
   ☑ After a few minutes you will receive an e-mail containing a confirmation link for registration in Sunny Portal.
5. If you have not received an e-mail from Sunny Portal, check whether the e-mail has been redirected to a folder for junk mail or whether an incorrect e-mail address has been entered.
6. Follow the confirmation link in the e-mail within 48 hours.
   ☑ Sunny Portal opens a separate window to confirm successful registration.
7. Call up the Internet address https://ennexOS.SunnyPortal.com in the web browser.
8. Enter the e-mail address and the Sunny Portal password in the fields **User** and **Password**.
9. Select [**Login**].

Log in to Sunny Portal as an existing user.

Requirement:

☐ You must have access to a user account in Sunny Portal, Sunny Places or Sunny Design.

Procedure:

1. Call up the Internet address https://ennexOS.SunnyPortal.com in the web browser.
2. Enter the e-mail address and the Sunny Portal password in the fields **User** and **Password**.
3. Select [**Login**].

Create new PV system

The system setup assistant is a step-by-step guide to the processes required for the registration of your system in Sunny Portal.

i Service access

To ensure a better quality of service, activate the switch for service access during registration.

Procedure:

1. Log into Sunny Portal.

2. Select the menu **Configuration**.
3. Select [**Create system**] in the context menu.
   ☑ The system setup assistant opens.

Add product to an existing system

Procedure:

1. Log into Sunny Portal.
2. Select system.
3. Select the menu **Configuration**.
4. Select [**Device management**] in the context menu.
5. Select the ⊕ button.
   ☑ The system setup assistant opens.

8 Operation

8.1 Design of the User Interface

The user interface of the SMA product (e.g. SMA Data Manager) and the user interface of Sunny Portal are uniform.

The product is configured and commissioned on site via the user interface of the product.

The Sunny Portal serves as the user interface for the extended configuration of the product, of system sections, systems, system groups and the entire system portfolio. The Sunny Portal monitors and analyzes the system and its components on all levels.

The number of functions and menus depends on whether you are on the local user interface of the product or in Sunny Portal.

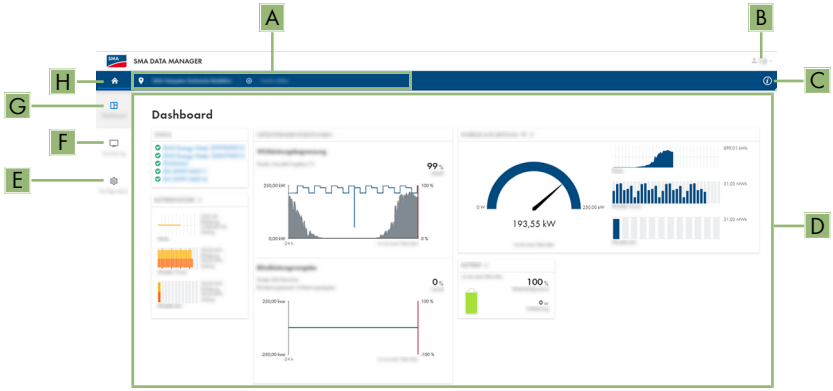


Figure 9: Design of the user interface (example)

Position	Designation	Description
A	Focus navigation	Enables the navigation between the following levels: • System • Device
B	User settings	Provides the following functions: • Configuring personal data • Log out

Position	Designation	Description
C	System information	Displays the following information: • System time • IP Address • Firmware version • Serial number • Licenses • Redirecting to help pages
D	Content area	Displays the dashboard or content of the selected menu
E	Configuration	Offers different configuration options, depending on the scope of the connected devices and the selected level.
F	Monitoring	Displays depending on the selected device the following information on the current level and the superior levels: • Energy and power • Instantaneous values • Status list • Event monitor
G	Dashboard	Displays information and instantaneous values of the device or system currently selected.
H	Home	Opens the user interface homepage

8.2 User Groups and User Rights

One user with administrator authorization can be created on each product via the user interface. As administrator, you can add further system users in Sunny Portal. Thus, users have access to their Sunny Portal system and local access via the user interface of the product. In Sunny Portal, you can assign users to different user groups. The user groups have different rights in their Sunny Portal system. The following user groups are possible:

- Administrator
- Installer
- User

The scope of functions can be changed by means of updates and purchase of additional apps.

Rights	User group		
	Administrator	Installer	User
Displaying analysis tool[2)]	–	–	–
Displaying system properties	✓	✓	✓
Configuring system properties[2)]	–	–	–

[2)] Function available in Sunny Portal

Rights	User group		
	Administrator	Installer	User
Creating and configuring system groups[2)]	–	–	–
Displaying system monitoring[2)]	–	–	–
Configuring system monitoring[2)]	–	–	–
Displaying configuration of system monitoring[2)]	–	–	–
Displaying user rights[2)]	–	–	–
Configuring user rights[2)]	–	–	–
Configuring notifications[2)]	–	–	–
Displaying notification configuration[2)]	–	–	–
Displaying CO_2 widget[2)]	–	–	–
Exporting data and parameters	✓	✓	–
Set the intensity of the data communication[2)] • Every 5 minutes • Every 15 minutes • Every 4 hours	✓ ✓ ✓	✓ ✓ ✓	– – –
Displaying energy balance[2)]	–	–	–
Displaying energy balance widget[2)]	–	–	–
Displaying energy and power	✓	✓	✓
Displaying event monitor	✓	✓	–
Displaying yield widget[2)]	–	–	–
Entering device data manually (e.g. gas meter)[2)]	–	–	–
Change device properties	✓	✓	–
Adding devices to systems	✓	✓	–
Displaying grid management service widget	✓	✓	✓
Importing parameters	✓	✓	–
Configuring parameter values	✓	✓	–
Displaying performance ratio widget[2)]	–	–	–
Activating service access	✓	✓	–

Rights	User group		
	Administrator	Installer	User
Configuring the SMA Smart Connected[2)]	–	–	–
Displaying status widget	✓	✓	✓
Creating and configuring system sections[2)]	–	–	–
Displaying weather widget	✓	✓	✓

8.3 Configuring Limitation of Active Power Feed-In

With the Data Manager, you can implement grid operator specifications for the limitation of the active power feed-in from 0% to 100% in your system. The setpoint for limitation of active power feed-in is specified in percent. The total system power is taken as the reference value. If your grid operator requires the system not to feed in any active power, you must limit the active power feed-in to a fixed value of 0% and additionally adjust the preset value for the active power gradient. Thus, it is possible to limit the active power feed-in to 0% within a few seconds. To compensate for load step changes and to establish a safety distance to the active power limitation, a negative value can be set. This achieves a timely limitation of the active power feed-in. The value for the limitation of the active power feed-in should be adjusted to the load step changes accordingly. No further inverter settings are necessary.

NOTICE

Responsibility of the system operator for grid management service specifications

The system operator is responsible for the correctness of the configurations and information on grid management services and system power. Incorrect settings and specifications can result in device and system damages.

- Set the grid management service specifications required by the grid operator and laid down in the standards correctly. Contact the grid operator if necessary.
- Enter correct values for system power. Adjust the values for system power during system expansions.
- Ensure that all required default values are applied or sent cyclically.

Supported inverters for the limitation of the active power feed-in to 0%

The limitation of the active power feed-in to 0% are only supported by inverters that support the fallback function. In the event of a communication failure between the product and the inverter, the inverter is reduced to an output power of 0% during fallback). For more information see the inverter manual at www.SMA-Solar.com.

Requirements:

☐ The configuration for the active power limitation must be agreed upon with the responsible grid operator.

☐ There must be an appropriate energy meter installed at the grid-connection point within the system.

Procedure:

1. Log into the user interface of the Data Manager.
2. Select the menu item **Grid management service** in the menu **Configuration**.
3. Select the button **Configuration and activation** in the **Active power** row.
   ☑ The installation assistant will open.
4. Confirm every step with [**Continue**]
5. Enter the total PV array power in the field **Total system power**.
6. Select the operating mode **Closed-loop control**.
7. Select the setpoint **Manual control**.
8. Enter the value 0 in the field **Active power setpoint**.
   To set the limitation of the active power feed-in to 0% of the total system power, for example, enter the value 0 in the **Active power setpoint** field.
   To set the limitation of the active power feed-in to -10% of the total system power, for example, enter the value -10 in the **Active power setpoint** field. Keep in mind that, in this case, power will always be drawn from the utility grid.
9. Activate the switch to adjust the modification speed of the setpoint.
10. Enter the value 1 in the field **Setting time**
11. Enter the value 100 in the field **Active power gradient**.
12. Click on [**Save**].

8.4 Configuring Reactive Power as a Function of Grid Voltage

With the data manager, you can implement reactive power as a function of grid voltage (Q(V)) into your system.

NOTICE

Responsibility of the system operator for grid management service specifications

The system operator is responsible for the correctness of the configurations and information on grid management services and system power. Incorrect settings and specifications can result in device and system damages.

- Set the grid management service specifications required by the grid operator and laid down in the standards correctly. Contact the grid operator if necessary.
- Enter correct values for system power. Adjust the values for system power during system expansions.
- Ensure that all required default values are applied or sent cyclically.

Requirements:

☐ There must be an appropriate energy meter installed at the grid-connection point within the system.

Procedure:

1. Log into the user interface of the Data Manager.
2. Select the menu item **Grid management service** in the menu **Configuration**.
3. Select the button **Configuration and activation** in the **Reactive power** row.
   ☑ The installation assistant will open.
4. Confirm every step with [**Continue**]
5. Select the operating mode **Closed-loop control**.
6. Select the setpoint **Reactive power/Voltage characteristic curve Q(V)**.
7. Follow the installation assistant steps and make the settings according to the specifications required by the grid operator and laid down in the standards.
8. Click on [**Save**].
9. For new and replaced inverters, select the **Parameters** menu item in the **Configuration** menu and set the following parameters: Country standard of the inverter; Operating mode of the inverter's feed-in management.

8.5 Configuring Modbus Devices

Connected Modbus devices can be used, for example, as energy meters for generation and consumption data at the grid-connection point or for energy monitoring. For this, predefined Modbus profiles, user-created Modbus profiles or the SunSpec Modbus profile must be used. The Modbus profiles will then be assigned to the Modbus devices.

i IP addresses of Modbus devices

In systems with Modbus devices, static IP addresses must be assigned to all Modbus devices. Suitable IP addresses can be assigned to the Modbus devices from the free address supply of the network segment either manually or dynamically via DHCP.

If the IP addresses are to be assigned dynamically, DHCP must be activated in the router (see the router manual). Make sure that the Modbus devices do not contain variable IP addresses but always the same IP addresses (static DHCP).

This also applies to data managers that are used as subordinated devices (slaves).

Creating a New Modbus Profile

1. Log into the user interface of the Data Manager.
2. Select the menu item **Device administration** in the menu **Configuration**.
3. Select the ⊕ button.
4. Select **Modbus devices** and confirm with [**Next**].
5. Select **Manage Modbus profiles**.
6. Select **Create a new Modbus profile**.
7. Fill out the entry fields and select [**Save**].

Registering a New Modbus Device and Assigning a Modbus Profile

Requirement:

☐ The connected Modbus devices must be configured to send their setpoints in cyclic intervals (maximum cycle time: 1 minute; recommended cycle time: 1 second).

☐ The Modbus devices must be in operation and connected to the Data Manager.

Procedure:

1. Log into the user interface of the Data Manager.
2. Select the menu item **Device administration** in the menu **Configuration**.
3. Select the ⊕ button.
4. Select **Modbus devices** and confirm with [**Next**].
5. Fill out the input fields and confirm with [**Next**].
   ☑ Available Modbus devices in the system are searched for and displayed.
6. Select the Modbus devices to be added to the system and select [**Save**].

☑ The connected Modbus device can be used as an energy meter for generation and consumption data at the point of interconnection, for energy monitoring or as sensor for wind speed, solar irradiation, and temperature.

SunSpec Modbus Profile

The product supports the standardized SunSpec Modbus profile via the interface of the Modbus client (Modbus TCP/RTU). The connected Modbus devices must conform with the SunSpec specification (see manufacturer manual). The mandatory data of the following SunSpec models are supported:

Common model:

- 1, 11, 12

PV inverter:

- 101, 102, 103, 120, 121, 122, 123, 126, 127, 128, 129, 130, 131, 132, 160

Energy meters:

- 201, 202, 203, 204, 211, 212, 213, 214

8.6 Configuring a System with several Data Managers

Several Data Managers can be integrated into one system. There are three options for using the Data Manager:

- Stand-alone master
- Superordinate master
- Slave

In systems with master and slaves, all slaves must first be commissioned to add them when the master is commissioned. To subsequently use a stand-alone master or a superordinate master as a slave, the product must be reset to the default settings.

Stand-alone master

Select the option **Stand-alone master (recommended)** in the installation assistant if you use the Data Manager as a stand-alone device without other subordinate Data Managers for open-loop or closed-loop control of your system.

Superordinate master

Select the option **Superordinate master** in the installation assistant if you use the Data Manager as a superordinate device with other subordinate Data Managers for open-loop or closed-loop control of your system. With this option, the superordinate Data Manager forwards the open-loop or closed-loop control commands to the subordinate Data Manager via Modbus. For this, subordinate Data Managers must be integrated as Modbus devices into the system of the superordinate Data Manager. Meters at the grid-connection point must be connected to the superordinate Data Manager. The Modbus server must be activated in the superordinate Data Manager.

Slave

Select the option **Slave** in the installation assistant if you want to use the Data Manager as subordinate device. With this option, the subordinate Data Manager receives the open-loop and closed-loop control commands of a superordinate device. These commands are forwarded as open-loop control commands to the connected devices. In systems with a superordinate Data Manager as master, all slaves must first be commissioned to be able to integrate them into the system of the superordinate Data Manager. To do this, select the operating mode **Control** and the signal source **Modbus** for the subordinate Data Manager.

8.7 Speedwire Encryption of the System Communication

Speedwire encryption is used to encrypt system communication between all compatible Speedwire devices. In order to be able to use the Speedwire encryption in the system, all connected Speedwire devices, apart from the SMA Energy Meter, must support the SMA Speedwire Encrypted Communication function.

Speedwire encryption for systems with one Data Manager

In systems with more than one Data Manager, there can be overlaps in the system encryption.

- Only enable the Speedwire encryption in systems with one Data Manager.

Requirements:

☐ All devices in the local network must be in operation and connected to the product via an Internet router.

☐ All devices must support the Speedwire encryption.

Procedure:

1. Log into the user interface of the Data Manager.
2. Select the menu item **Device administration** in the menu **Configuration**.
3. Select the ⊕ button.
4. Select **SMA Speedwire devices** and confirm with [**Next**].
   ☑ All SMA Speedwire devices in the systems are searched for and displayed.

5. Enable SMA Speedwire encryption and select [**Continue**].
6. Assign a new system password and select [**Save**].

8.8 Switching Digital Outputs Based on Thresholds

The digital outputs of connected I/O systems can be switched depending on measured values or states. In this way, heat pumps or relays, for example, can be controlled by specifying a defined output. A tolerance (hysteresis) dependent on the selected operator prevents the digital outputs from switching even with slight power fluctuations.

Operator	Tolerance
Greater than or equal to (>=)	1 %
Less than or equal to (<=)	1 %
Equal to	5 %

The following limiting values and parameters are available:

- Alarm in case of warning or error
- Alarm in case of error
- System active power
- System reactive power
- System active power at point of interconnection (grid feed-in)
- System reactive power at the point of interconnection
- Reactive power setpoint
- Setpoint of active power limitation
- System-wide state of charge of batteries (SOC)
- Active access through direct selling
- Mean or peak value of the 3 voltages at the point of interconnection (depending on activation and settings of function Q(U))

Requirements:

☐ All devices in the local network must be in operation and connected to the product via an Internet router.

Procedure:

1. Log into the user interface of the Data Manager.
2. Select the menu item **Grid management services** in the menu **Configuration**.
3. Select the button **To the configuration** in the **Assigning analog outputs** row.
4. To configure the digital outputs of a connected device, select the button ⊕.
5. Fill out the entry fields and select [**Save**].

8.9 Creating and importing a backup file

As soon as the product and all devices are in operation and your system is optimally configured, SMA Solar Technology AG recommends creating a backup file. If you replace your product or reset your existing product to the default settings, the backup file can be used to transfer configuration information. The backup file includes the following system and device configuration data for your product:

- Grid management services
- FTP
- Network
- Sensors
- Analog and digital inputs
- Analog and digital outputs
- Energy meter
- Sunny Portal setting
- Self-defined Modbus profiles
- System password
- User interface login data
- List of connected devices

Note that the following information is not included in the backup file:

- Notifications
- Historic energy and performance values
- Configuration of individual inverters

Creating a backup file

Procedure:

1. Log into the user interface of the Data Manager.
2. Select the Data Manager.
3. Select the menu item **Update and backup** in the menu **Configuration**.
4. Select the [**Create backup file**] button.
5. Enter a password to encrypt the backup file and confirm with [**Create and download backup file**]. Please note that the password will be needed later for importing the backup file.
   ☑ An Ibd file with all parameter settings will be downloaded.

Importing a backup file

The backup file will be imported when commissioning a new or reset product. After you have connected the product with the local network, the login page of the user interface opens.

Requirements:

☐ A new or reset product must be available.

☐ The backup file and the corresponding password must be available.

☐ Should the backup file be reused in a reset product, the file name must not be changed.

Procedure:

1. Select [**Start restoration**] on the login page of the user interface.
   ☑ The installation assistant will open.
2. Follow the installation assistant steps and, at the appropriate point, select the previously saved lbd file. Note that the backup file password will be needed here.
3. Confirm with [**Upload backup file**].
   ☑ The lbd file with all parameter settings will be uploaded to the product. The product restarts automatically. This process can take several minutes.

8.10 Resetting the Product

i Loss of data due to replacement or due to resetting to default settings

If the product is reset to the default settings or replaced, all data saved in the product and the admin account will be deleted. The data saved in Sunny Portal can be transmitted to the product after calling up the Sunny Portal system again.

Procedure:

1. Log into the user interface of the Data Manager.
2. Select the Data Manager in the focus navigation.
3. Select the menu item **Device properties** in the menu **Configuration**.
4. Select the button [**If you want to reset the device to the default settings, click here**].
5. Select [**Reset**].

8.11 Deleting the Admin Account

In case the password gets lost, the admin account can be reset and newly created. All system data will be retained.

Requirements:

☐ The device key from the label on the product or from the supplied label must be present.

Procedure:

1. Open the user interface of the product.
2. Select the [**Delete admin account?**] button.
3. Enter the device key from the label on the product or from the supplied label.
4. Select [**Delete**].

☑ The product is performing a restart. Then a new admin account can be created.

9 Firmware Update

9.1 Updating the Product Firmware

Coordinate the execution of the firmware update with Service

During a firmware update of the Data Manager, the system is not actively controlled. If devices continue to operate during the firmware update, these devices may enter a fallback state according to their configuration.

- In order to prevent feed-in losses and restrictions in the provision of grid management services, firmware updates should always be coordinated with and monitored by Service.

Requirements:

☐ A USB flash drive with maximum 32 GB storage capacity and file system FAT32 must be available.

☐ USB flash drive at least in the version 2.0

☐ The product must be commissioned.

Procedure:

1. Create an **update** folder on the USB flash drive.
2. Check the update file with the required firmware for device assignment and save it in the **update** folder on the USB stick. The update file is only available from the Service (see Section 14, page 60).
3. Rename update file **update.upd**.
4. Plug the USB flash drive into a USB port on the product.
   ☑ After the new firmware update has been downloaded successfully, the internal memory LED flashes. This procedure can take several seconds.
   ☑ The device restarts automatically. During the restart, a short acoustic signal sounds. The start-up procedure can take up to two minutes.
   ☑ After the successful firmware update, the internal memory LED glows. If the internal memory LED does not glow, repeat the firmware update.
5. Once the firmware has been successfully updated, pull the USB flash drive out of the USB port on the product.

9.2 Updating the Firmware of Connected SMA Products

Firmware update for connected SMA inverters

When updating the firmware of connected SMA inverters, there are different procedures for string inverts with SMA Speedwire communication and central inverters with Modbus communication.

- Carry out the firmware update for string inverters with SMA Speedwire communication as described in this section.
- To arrange for a firmware update for central inverters with Modbus communication, contact Service.

Requirements:

- ☐ The Data Manager must be in operation.
- ☐ The Data Manager must be connected via the local network with the connected SMA products (SMA Speedwire communication).
- ☐ The connected SMA products must support the update function.
- ☐ The connected SMA products must be in operation.
- ☐ A USB flash drive with maximum 32 GB storage capacity and file system FAT32 must be available.
- ☐ USB flash drive at least in the version 2.0

Procedure:

1. Create an **update** folder on the USB flash drive.
2. Download the desired update file with the file ending ***.up2** at www.SMA-Solar.com.
3. Save the update file in the **update** folder on the USB flash drive.
4. Plug the USB flash drive into a Data Manager USB port.
   - ☑ The firmware of the connected SMA products will be updated. The firmware update installs each SMA product at night and restarts at sunrise. This only affects the grid feed-in minimally.
5. In the **Event monitor** menu on the Data Manager user interface, check whether the firmware has been updated successfully.
6. Once the firmware has been successfully updated, pull the USB flash drive out of the Data Manager USB port.

10 Troubleshooting

Problem	Cause and corrective measures
Obsolete or incorrect measured values are displayed.	**Connection to VPN or Internet is disrupted.** • Ensure that the network cable is connected correctly and that the network port Link LED is glowing. or • Check the status of the connected devices in the device overview in Sunny Portal.
	The energy meter is connected incorrectly. • Connect the energy meter correctly (see energy meter manual). or • Swap the channels for purchased-electricity and feed-in meters in the meter configuration on the user interface.
	The display in your web browser is not updated. • Reload the page in your web browser or delete the cache in your web browser.
Not all devices are being detected.	**Not all devices are in operation.** • Ensure that all devices are in operation.
	There are too many devices in the system. • Ensure that no more than permissible devices are in the system.
	The network configuration of the local network is incorrect. • Ensure that the network configuration is correct. SMA Solar Technology AG recommends automatic network configuration.
The Data Manager user interface cannot be called up.	**The firmware has been updated to a newer version.** • After a firmware update, errors may arise when restarting the products. Repeat the restart and login at the user interface. • If the restart of the product fails again, contact Service.
Modified parameters are not adopted even after a waiting time of about one minute.	**Parameters are modified by 2 users simultaneously.** • Ensure that parameters cannot be modified at the same time on the user interface of the product and in Sunny Portal.
The Data Manager cannot be registered in Sunny Portal.	**The Internet connection via a proxy server is not possible.** • Contact your network administrator.
	The PIC or RID entry is incorrect. • Verify your entry.

Problem	Cause and corrective measures
The firmware of a connected SMA product was not updated during a firmware update via USB flash drive.	**The firmware version downloaded is not the latest or is not suitable for the SMA product.** • The firmware version must be later than the firmware version installed on the SMA product. Ensure that you have downloaded the correct firmware version for your SMA product and update the firmware again.
	The DC input voltage is not sufficient for a firmware update. • With older inverters, a firmware update is only possible above a certain DC input voltage. Depending on the time of day, the weather, and the condition of the PV modules (e.g. affected by pollution or covered with snow), the DC input voltage may be too low for a firmware update. Ensure that there is sufficient DC voltage present and update the firmware again.
	The transmission quality in the local network is not sufficient. • Errors can occur during data transmission if the transmission quality in the local network is too low. Check the network status of your local network and, if necessary, contact your network administrator.
No data are displayed on the user interface of the Data Manager.	**The buffer capacitor of the Data Manager's real-time clock might have discharged due to being without voltage supply for a longer time period.** • Ensure that the Data Manager has access to a time server on the Internet or in the local network to obtain a current time.

Answers to frequently asked questions can be found in the tab FAQ on the product page at www.SMA-Solar.com.

11 Decommissioning the Product

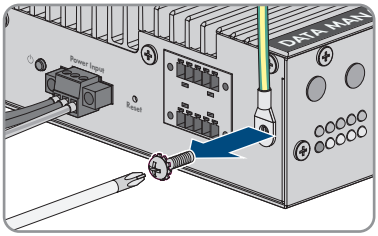
⚠ WARNING

Danger to life due to electric shock

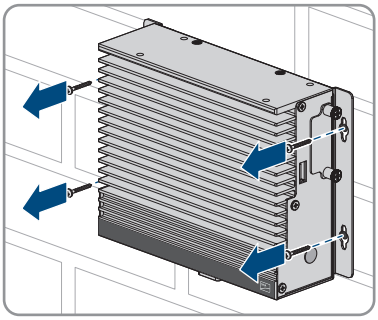
Lethal voltages are present at the connection point of the utility grid. This can result in death or serious injury.

- Disconnect the connection point from the utility grid using the separator (e.g. miniature circuit breaker).

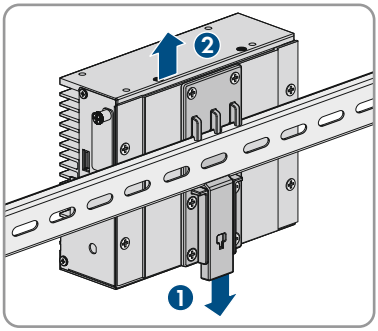
1. Release the 3-pole terminal block of the power supply unit using a suitable tool and pull out of the **Power Input** jack.
2. Remove grounding cable. Loosen the screw on the ring terminal lug (PH1).



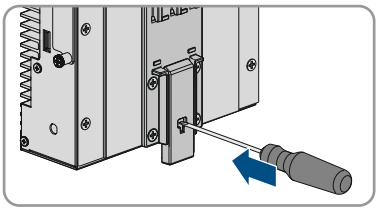
3. Unlock the RJ45 connectors of the network cable and pull out of the network ports.
4. Release the 5-pole terminal blocks using a suitable tool and pull out of the **DI/DO** port.
5. If the product is mounted to the wall, unscrew the screws from the wall mounting bracket and take down the product.



6. If the product is mounted to a DIN rail, take down the product from the DIN rail. Use a suitable tool to loosen the DIN rail bracket lock and lift the product off the DIN rail.



7. Set the released lock of the DIN rail bracket back to the starting position. To do this, use a suitable tool to press against the clamp in the opening of the lock.



8. If the product is to be disposed of, dispose of the product in accordance with the locally applicable disposal regulations for electronic waste.

12 Technical Data

Communication

SMA devices	Max. 200 devices
• incl. I/O systems and power analyzers	Max. 10 devices (e.g. Ethernet, Modbus TCP)

Connections

Voltage supply	3-pole terminal
Network (LAN)	2 x 10/100/1000 Mbps (RJ45)
Serial interface	1 x RS232, D-sub 9[3]
USB	1 x USB 3.0, type A 2 x USB 2.0, type A
Digital inputs	4 x DI, 0 V DC to 30 V DC
Digital outputs	4 x DO, 0 V DC to 30 V DC

Voltage supply

Supply voltage	9 V DC to 36 V DC, typ. 24 V DC (UPS[4] > 5s)
Input voltage range	9 V DC to 36 V DC
Electric current/power consumption	2 A at 9 V DC (typ. 18 W)

Ambient Conditions in Operation

Ambient temperature	-40°C to +70°C
Permissible range for relative humidity (non-condensing)	5% to 95%
Maximum operating altitude above mean sea level (MSL)	3000 m (≥70 kPa)
Degree of protection	IP20

General Data

Dimensions without wall mounting bracket (W x H x D)	150 mm x 120.2 mm x 48.8 mm
Weight	940 g
Mounting location	Indoors
Mounting type	Top-hat rail mounting / wall mounting
Material type	Aluminum

[3] Prepared for RS485 converter e.g. the TCC-100I-T from Moxa Europe GmbH

[4] Operation only on uninterruptible power supply with potential-free contact

Equipment

CPU	Intel® Atom™ processor (Quad Core, 1.91 GHz)
Data storage	Solid State Disk (SSD), 128 GB
Warranty	63 months from date of delivery (see SMA limited factory warranty)
Certificates and approvals	www.SMA-Solar.com

13 Accessories

You will find the accessories for your product in the following overview. If required, these can be ordered from SMA Solar Technology AG or your distributor.

Designation	Brief description	SMA order number
Top-hat rail power supply unit[5)]	DIN rail power supply unit for SMA Data Manager M	CLCON-PWRSUPPLY
WAGO-I/O-SYSTEM 750	I/O system by WAGO Kontakttechnik GmbH & Co. KG (2ETH, 1RS232/485)	115214-00.01
PFC200	Controller by WAGO Kontakttechnik GmbH & Co. KG (8DI, 8DO, 4AI, 4AO, 2RTD)	PFC200
PFC200-BUNDLE	I/O system by WAGO Kontakttechnik GmbH & Co. KG (8DI, 8DO, 4AI, 4AO, 4RTD)	PFC200-BUNDLE

[5)] Not permitted in all countries. For information on whether an accessory is permitted in your country, visit the website of the SMA subsidiary of your country at www.SMA-Solar.com or contact your distributor.

14 Contact

If you have technical problems with our products, please contact the SMA Service Line. The following data is required in order to provide you with the necessary assistance:

- Device type
- Serial number
- Firmware version
- Event message

You can find your country's contact information at:

https://go.sma.de/service

15 EU Declaration of Conformity

within the scope of the EU directives

- Electromagnetic compatibility 2014/30/EU (29.3.2014 L 96/79-106) (EMC)
- Low Voltage Directive 2014/35/EU (29.3.2014 L 96/357-374) (LVD)
- Restriction of the use of certain hazardous substances 2011/65/EU (L 174/88, June 8, 2011) and 2015/863/EU (L 137/10, March 31, 2015) (RoHS)

SMA Solar Technology AG confirms herewith that the products described in this document are in compliance with the fundamental requirements and other relevant provisions of the above-mentioned directives. The entire EU Declaration of Conformity can be found at www.SMA-Solar.com.

16 UK Declaration of Conformity

according to the regulations of England, Wales and Scotland

- Electromagnetic Compatibility Regulations 2016 (SI 2016/1091)
- Electrical Equipment (Safety) Regulations 2016 (SI 2016/1101)
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (SI 2012/3032)

SMA Solar Technology AG confirms herewith that the products described in this document are in compliance with the fundamental requirements and other relevant provisions of the above-mentioned regulations. The entire UK Declaration of Conformity can be found at www.SMA-Solar.com.

SMA Solar UK Ltd.
Countrywide House
23 West Bar, Banbury
Oxfordshire, OX16 9SA
United Kingdom

17 Compliance Information

FCC Compliance

This device complies with Part 15 of the FCC Rules.

Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications made to this equipment not expressly approved by SMA Solar Technology AG may void the FCC authorization to operate this equipment.

ENERGY
THAT
CHANGES

SMA

www.SMA-Solar.com