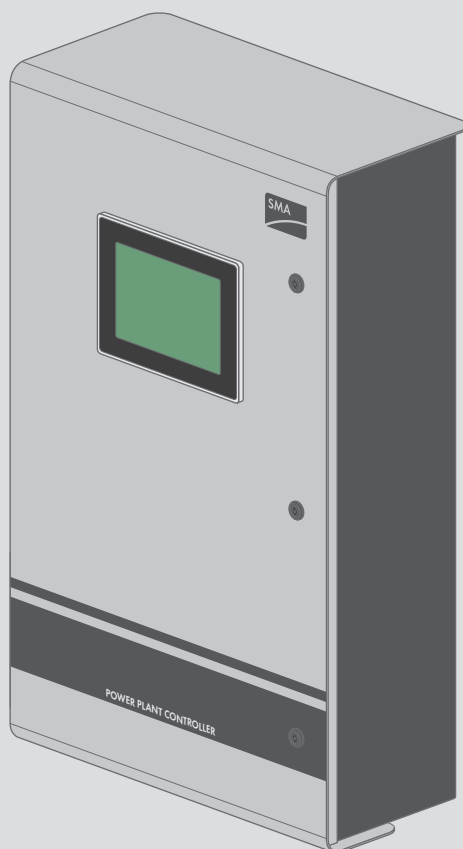


Operating manual
POWER PLANT CONTROLLER



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1 Information on this Document

1.1 Validity

This document is valid for:

- PPC-10 (Power Plant Controller) from production version A5 and software version 1.05.xx.R

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

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
- 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 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.

1.4 Symbols in the Document

Symbol	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
	A problem that might occur
	Example

1.5 Typographies in the document

Typography	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	• Select Settings > Date.
[Button] [Key]	• Button or key to be selected or pressed	• Select [Enter].

1.6 Designation in the document

Complete designation	Designation in this document
Modbus/TCP protocol	Modbus Protocol
SMA Cluster Controller	Modbus gateway
SMA Inverter Manager	Modbus gateway
Sunny Central CP XT	Sunny Central or inverter

1.7 Additional Information

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

Title and information content	Type of information
"PUBLIC CYBER SECURITY - Guidelines for a Secure PV System Communication"	Technical information

2 Safety

2.1 Intended Use

The Power Plant Controller is a device for the automatic control of large-scale PV power plants and the implementation of active power and reactive power setpoints in large-scale PV power plants according to grid operator specifications.

The Power Plant Controller with touch display is suitable for indoor use only. The Power Plant Controller without touch display is suitable for outdoor and indoor use.

The Power Plant Controller is designed for industrial use.

The Power Plant Controller must only be used with supported devices:

- Sunny Central Communication Controller (SC-COM) from firmware version 1.01
- Sunny Central XXXX(-EV)(-US) from firmware version 1.0
- SMA Cluster Controller from firmware version 1.0
- Sunny Tripower 60 / Sunny Highpower Peak 1 with Inverter Manager from firmware version 1.45
- Transducer and power analyzer:

Manufacturer*	Type
Janitza	UMG 604 / UMG 605**
Schneider Electric	ION 7550 / ION 7650 / ION 8600 / ION 8650 / ION 8800

* More transducers and power analyzers are available on request.

** When using the power analyzer Janitza UMG 604 / UMG 605, do not operate it in the same grid segment as the inverters connected to the Power Plant Controller, since mutual interference may occur.

All work on the product must only be performed using appropriate tools and in compliance with the ESD protection regulations.

The type label must remain permanently attached to the product.

Use this product only in accordance with the information provided in the enclosed documentation and with the locally applicable standards and directives. Any other application may cause personal injury or property damage.

Alterations to the product, 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 the intended use.

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

2.2 Safety Information

SAVE THESE INSTRUCTIONS

This section contains safety information that must be observed at all times when working on or with the product.

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 from electric shock due to live voltage**

High voltages are present in the live components of the product. Touching live components results in death or serious injury due to electric shock.

- Wear suitable personal protective equipment for all work on the product.
- Do not touch any live components.
- Disconnect the supply voltage before performing any work on the product.
- After disconnecting from voltage sources, wait one minute for the capacitors of the redundant voltage supply to discharge.
- Observe all warning messages on the product and in the documentation.

⚠ WARNING**Danger to life due to blocked escape routes**

In hazardous situations, blocked escape routes can lead to death or serious injury.

- An escape route must be available at all times. Make sure the minimum passage width of the escape route meets local standards.
- Observe the minimum clearances when installing the product.
- Do not place any objects in the escape route area.
- Remove all tripping hazards from escape routes.

NOTICE**Damage to the product due to sand, dust or moisture penetration**

Sand, dust or moisture penetration can damage the product or impair its functionality.

- Do not open the product during a dust storm, precipitation or when humidity exceeds 95%.
- Only perform maintenance work when the environment is dry and free of dust.

NOTICE**Property damage due to overvoltage**

When overvoltage occurs, the product can be damaged.

- Provide the product with external overvoltage protection.

NOTICE**Property damage due to unauthorized access**

An unlocked or insufficiently protected product can be opened and modified by unauthorized persons. This can result in property damage and yield losses.

- Lock the product after commissioning.
- Remove the key from the door lock.
- Store the keys in a safe place.
- Secure the user interface using a secure password.
- Secure your Internet connection from cyber attacks by appropriate safety measures.

NOTICE**Yield loss due to loss of system conformity**

Operation conforming to grid operator requirements is no longer guaranteed if the Power Plant Controller is switched off or if the default settings are loaded. This may lead to yield losses and to the grid operator disconnecting the system from the utility grid.

- Do not operate the system without the Power Plant Controller.
- Do not change the parameters set during commissioning without consulting the grid operator.

3 Product Overview

3.1 System Overview

The Power Plant Controller assumes the park management function in large PV plants. The PV system can combine both central inverters and decentralized string inverters, which are monitored and controlled by Cluster Controllers or Inverter Managers.

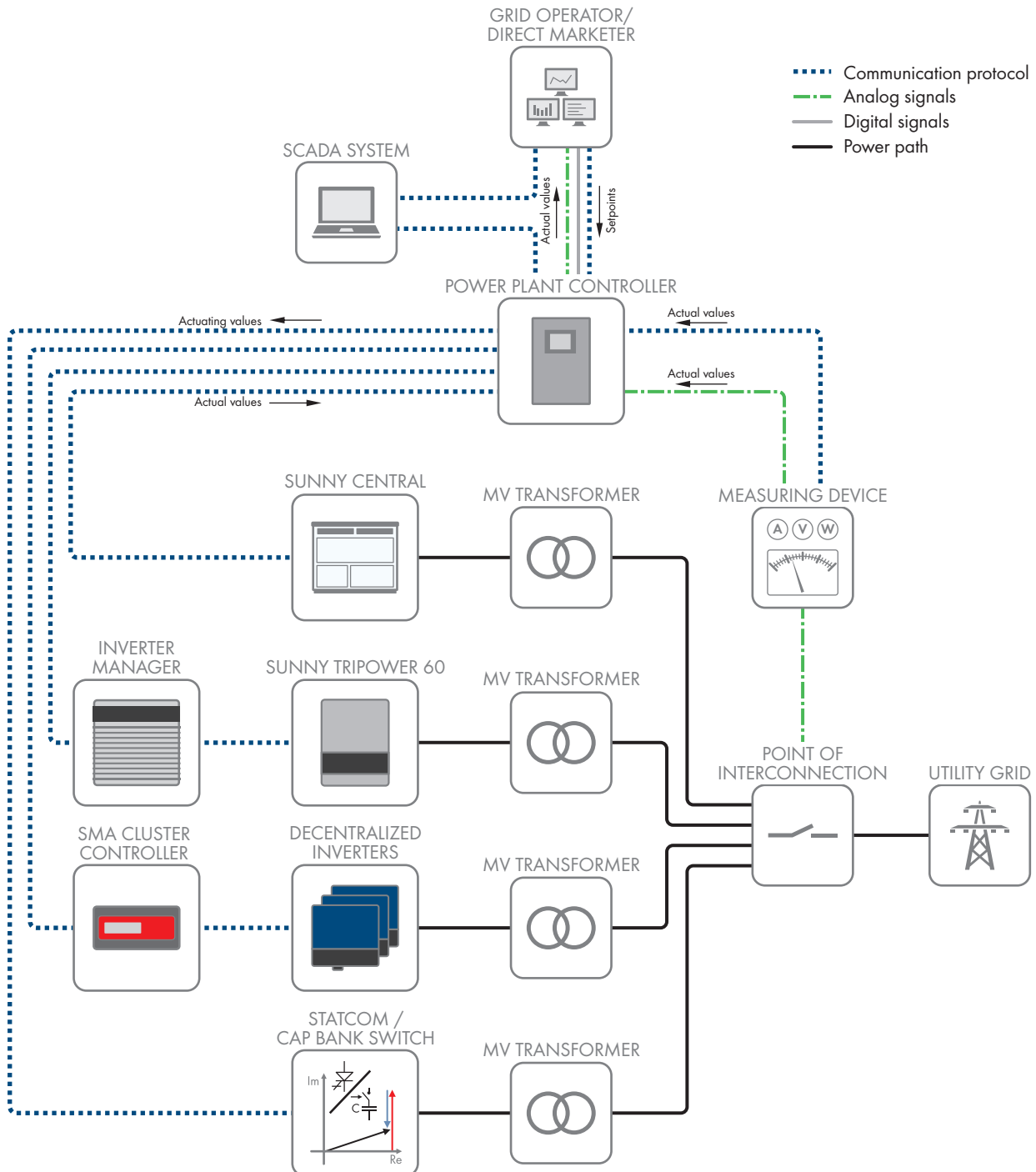


Figure 1: Principle of signal transfer in a PV plant with Power Plant Controller

In the Power Plant Controller, the setpoints for grid management services are received and compared with the values measured at the point of interconnection. Based on this comparison, the Power Plant Controller calculates the required control values and transmits these values to the Sunny Centrals and the Modbus gateways.

The Power Plant Controller can receive setpoints in digital and analog form and via Modbus/TCP protocol. The setpoints of a superordinate SCADA system are transmitted via Modbus/TCP protocol. Furthermore, setpoints can also be received from the grid operator via an optionally integrated protocol converter conforming to IEC 60870 5 101, IEC 60870 5 104, IEC 61850 or DNP3.

The measured values that the Power Plant Controller receives are measured at the point of interconnection, processed by a power analyzer, and transmitted to the Power Plant Controller as analog values or via Modbus protocol.

Transmission of the control values from the Power Plant Controller to the Sunny Central, Cluster Controller and the Inverter Manager devices takes place via Modbus/TCP protocol.

3.2 Design of the Power Plant Controller

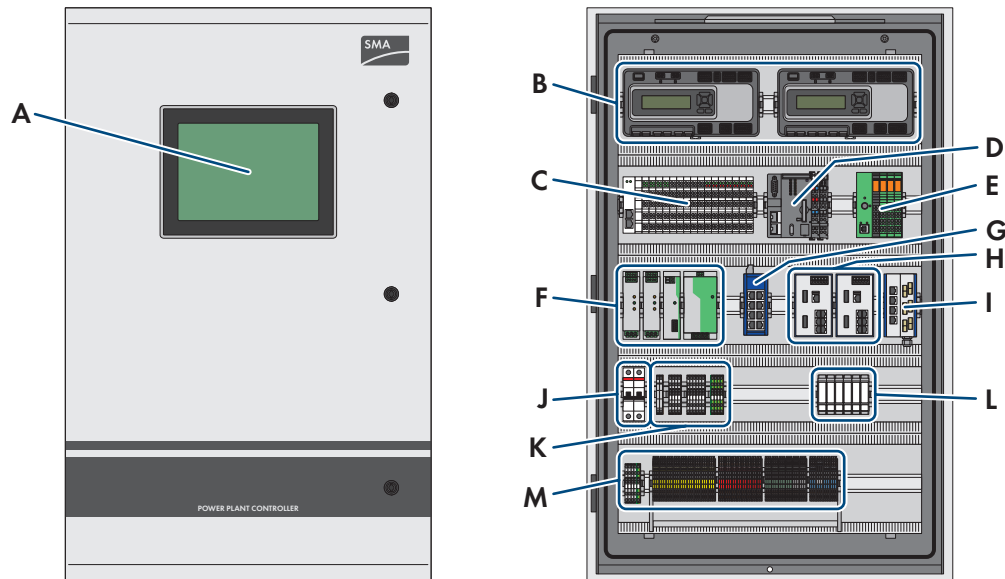


Figure 2: Exterior and interior views of the Power Plant Controller

Position	Designation
A	Touch display*
B	Control unit in redundant design
C	Additional I/O modules*
D	Protocol converter for protocols conforming to IEC 60870 5 101, IEC 60870 5 104, IEC 61850 or DNP3 for communication with the grid operator*
E	Protocol converter for communication with StatCom devices*
F	Power supply unit, redundancy and buffer module
G	Switch for internal network copper
H	Switch for network optical fibers and copper
I	Patch panel for optical fibers or copper
J	Miniature circuit-breaker
K	24 V fused terminals
L	De-energized surge arrester*

Position	Designation
M	Customer terminal block
* optional	

3.3 Operating and Display Elements of the Control Unit

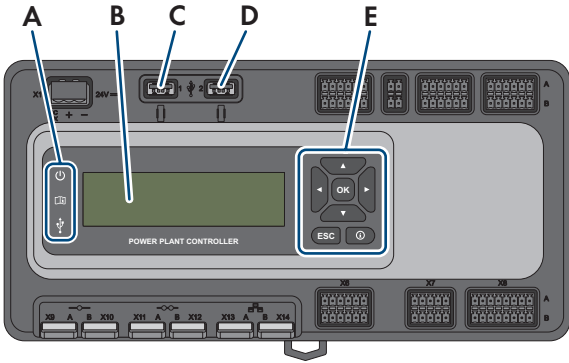


Figure 3: Operating and Display Elements of the Control Unit

Position	Designation
A	LEDs
B	Device display
C	USB port USB 1
D	USB port USB 2
E	Keypad The network settings of the three LAN interfaces of the Power Plant Controller can be displayed using the info button. Furthermore, various settings can be reset to the default settings using the keypad.

LEDs

LED	Designation	Explanation
	Power LED	• Glowing red: The Power Plant Controller is starting. • Glowing green: The start process has been completed. The Power Plant Controller is working normally.

LED	Designation	Explanation
	Status LED	The status LED is only relevant if the start process has been completed and the Power LED is glowing green. • Glowing red: The Power Plant Controller shows a disturbance. • Glowing yellow: The Power Plant Controller shows a warning. • Glowing green: The Power Plant Controller is working normally.
	Data carrier status LED	• Not glowing: The Power Plant Controller has not recognized a USB flash drive. • Glowing red: The USB flash drive is currently being written to and may not be removed. • Glowing yellow: The USB flash drive is currently being read. The USB flash drive may not be removed. • Glowing green: The Power Plant Controller can access the USB flash drive. It is safe to remove the USB flash drive.

4 User Interface

4.1 Design of the User Interface

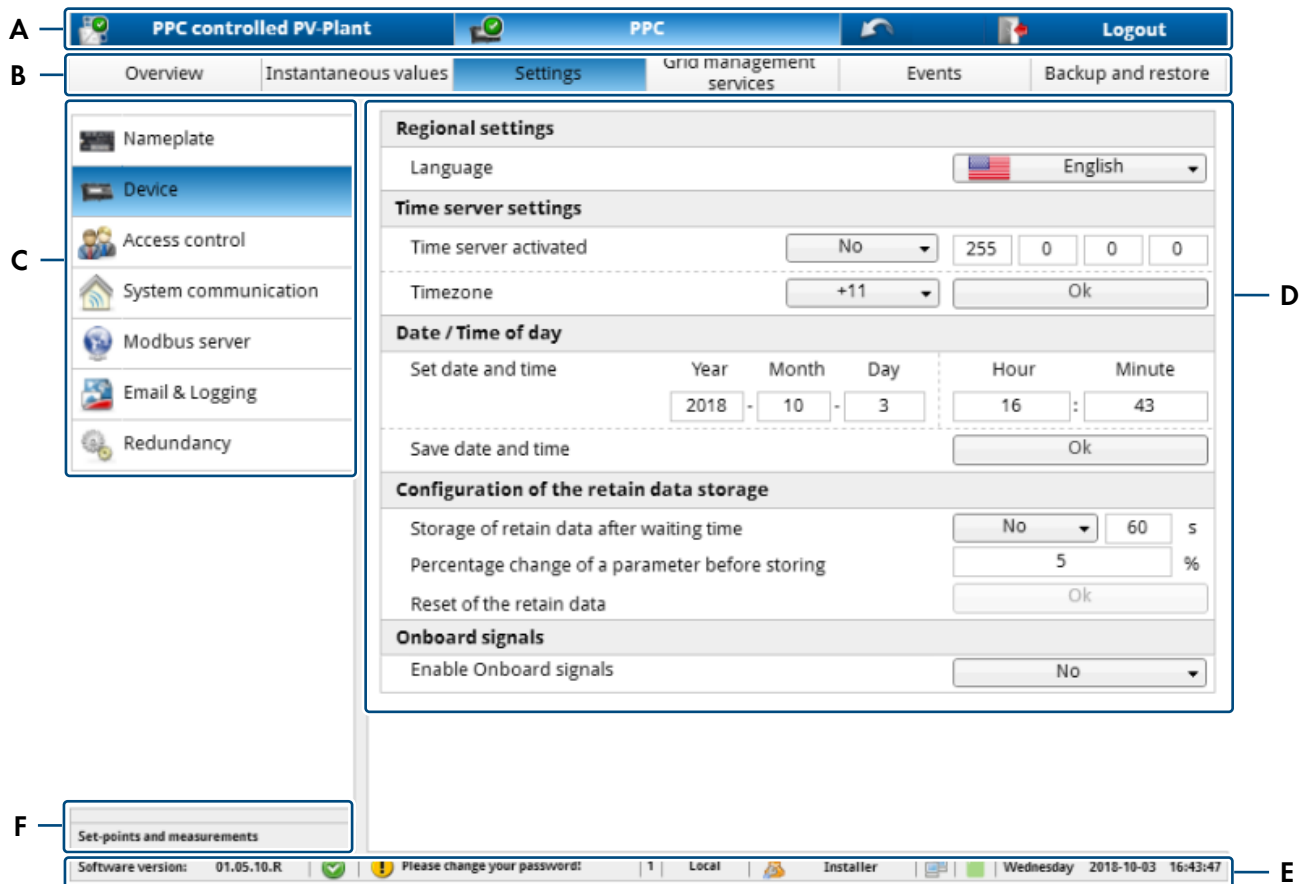


Figure 4: Design of the user interface (example)

Position	Explanation
A	Navigation bar first level
B	Navigation bar second level This navigation bar only appears if PPC has been selected in the navigation bar first level.
C	Left menu bar The design of the menu bar depends on the selection in the second level navigation bar.
D	Input and display area Display of current measured values and configured setpoints as well as entry of settings and setpoints. If an entry is not plausible, it will not be accepted and the field will turn red.
E	Status bar
F	Display of the current setpoints and measured values The display can be shown or hidden by clicking on the header. This display is not available on all pages.

Symbols on the user interface

Symbol	Explanation
	Leads to the last page opened in the user interface if several pages have already been visited
	Logs the user out of the user interface
	Jumps to the position in the user interface where the settings for this parameter or signal input can be made.
	Opens an info window with more detailed information on this parameter or measured value

Navigation bar first level



Figure 5: Design of the navigation bar first level (example)

Position	Explanation
A	Provides an overview of instantaneous values for the entire system
B	Opens the navigation bar second level where settings can be made for the Power Plant Controller and the connected devices
C	Logs the user or installer out of the user interface The Power Plant Controller is only protected from unauthorized access after logout.

Status bar



Figure 6: Design of the status bar (example)

Position	Explanation
A	Current software version
B	Status display redundancy function: ✓ This control unit controls the PV system. ⋯ This control unit currently does not control the PV system. ? The state of the redundancy function is unknown. ⚠ An error has occurred.
C	Opens the dialog to change the passwords This symbol only appears if the password is not in line with the security guidelines.
D	Indicates the number of users that currently have access to the user interface in addition to the user that has logged on to the user interface

Position	Explanation
E	Indicates which parameters the Power Plant Controller is using for control: • Local: The Power Plant Controller is using the parameters set on the user interface. • Remote: The Power Plant Controller is using the values received through communication.
F	Information on the status of the logged-in user
G	Information on the service life of the internal SD memory card: • green: The remaining service life of the SD memory card is sufficient. • yellow: The SD memory card has reached the end of its maximum service life. It must be replaced soon. • red: The SD memory card has reached the end of its maximum service life. It must be replaced immediately.
H	Information on the current system time of the Power Plant Controller

4.2 "PPC controlled PV plant"

Once you have logged in to the user interface of the Power Plant Controller, the system overview opens. The designation "PPC controlled PV plant" is used as a placeholder for the name that you give to your system.

Here you can find information on the name and total power of the PV plant, control values for active power and reactive power of the current control mode as well as setpoints and measurements for various control values.

For each instantaneous value, the field **Active values** indicates whether the default value or the redundant value is being used.

4.3 PPC

Menu field	Explanation
Overview	Displays the number and various instantaneous values of all installed Sunny Centrals and Cluster Controllers in the entire PV system, as well as the number of connected and inaccessible Modbus devices
Instantaneous values	Displays an overview of instantaneous values and status of the Sunny Centrals, the Cluster Controllers, the power analyzers and sensors as well as the status of the I/Os, the status of the Power Plant Controller, the task management and information on the Power Plant Controller and the status of the controller
Settings	In this area, the following settings can be displayed and adjusted: • Nameplate: Displays service-relevant information that cannot be changed • Device: User interface language settings and Power Plant Controller time settings as well as settings for an external time server can be made* • Access control: User group passwords can be changed and Service rights granted* • System communication: Displays IP addresses of Power Plant Controller, Sunny Central, Cluster Controller and Inverter Manager devices* • Modbus server: Configuration of the Modbus server* • Email & Logging: Configuration of database and e-mail address for event log • Redundancy: Configuration of the redundancy function (optional)

Menu field	Explanation
Grid management services*	In this area, the following settings can be displayed and the connected devices can be activated and deactivated: • Device table inverters: Displays the IP addresses of the Sunny Central devices and configuration of the communication between the Sunny Central devices and the Power Plant Controller, and the inverters can be activated and deactivated • Device table Modbus gateways: IP addresses of the Cluster Controller and Inverter Manager devices as well as configuration of the communication between these devices and the Power Plant Controller • Device table PPC slaves: Displays the IP addresses of the Power Plant Controller slaves and the type of slave operation as well as grouping of the slaves and entry of the number of Power Plant Controller slaves • Device table power analyzers: Configuration of the power analyzers used and entry of the corresponding IP address • Setpoints: Displays the selected setpoint (Remote (Modbus protocol or analog values) or Local (fixed setpoint) and displays the fixed setpoints for active power and reactive power with local setpoint transmission • Input signals: Displays the selected input signals as well as the scaling of the input signals from the transducer to the point of interconnection • Output signals: Selection of the output signals that are to be issued at the analog and digital outputs of the Power Plant Controller
Backup and restore*	Enables the current configuration of the Power Plant Controller to be saved or updated via SD memory card or USB flash drive

* This page can only be viewed if you are logged in as an installer.

5 Mounting

5.1 Requirements for Mounting

Requirements for the Mounting Location

⚠ WARNING

Danger to life due to fire or explosion if mounted at an unsuitable location

Mounting the product in areas with a high fire hazard can result in fire. This can result in death or serious injury.

- Do not install the product on flammable construction materials.
- Do not mount the product in areas containing highly flammable materials.
- Do not mount the product in potentially explosive atmospheres.

- ☐ The mounting location must not be in a living or office area.
- ☐ The mounting location must not block any escape routes.
- ☐ The mounting location must be freely and safely accessible at all times without the necessity for any auxiliary equipment (such as scaffolding or lifting platforms). Non-fulfillment of these criteria may restrict servicing.
- ☐ The mounting location and the mounting foundation must be suitable for the weight and dimensions of the Power Plant Controller (see Section 12, page 53).
- ☐ The ambient conditions at the mounting location must be suitable for the operation of the Power Plant Controller (see Section 12, page 53).
- ☐ The mounting location should not be exposed to direct solar irradiation.
- ☐ The Power Plant Controller with touch display must be mounted indoors.
- ☐ The Power Plant Controller must be mounted on a solid support surface.

Dimensions for Mounting

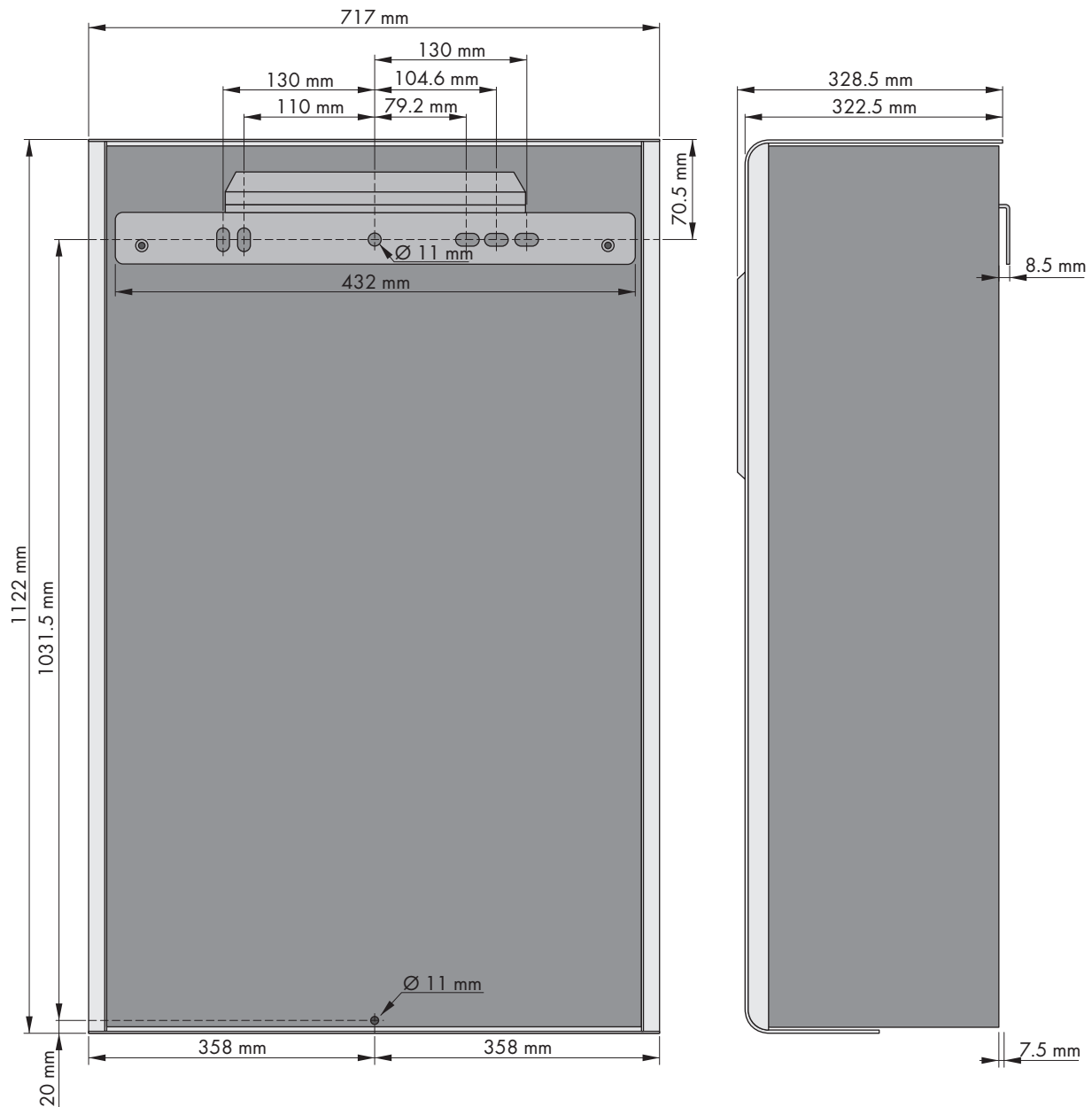


Figure 7: Dimensions of the Power Plant Controller

Minimum clearances

Observe the minimum clearances to ensure easy mounting, opening and closing of the Power Plant Controller. The opening angle of the door is 180°.

- ☐ Minimum clearances must be observed.

Permitted and prohibited mounting positions

- ☐ Only mount the Power Plant Controller in a permitted position.
- ☐ The Power Plant Controller should be mounted at eye level. This will make it easier to adjust settings on the display.
- ☐ The Power Plant Controller should be closed for mounting. This will prevent dust from penetrating the enclosure.

5.2 Mounting the Power Plant Controller

⚠ CAUTION

Danger of crushing from falling product if mounted incorrectly

The product is heavy. The product can fall when being transported incorrectly or if it is mounted incorrectly. This can result in crushing injuries.

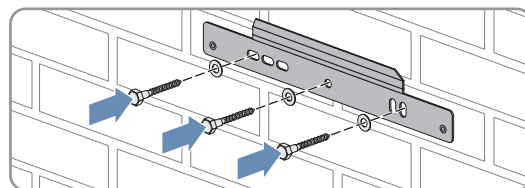
- Two people are needed to transport and mount the product.
- Use mounting material suitable for the support surface when mounting the product.

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

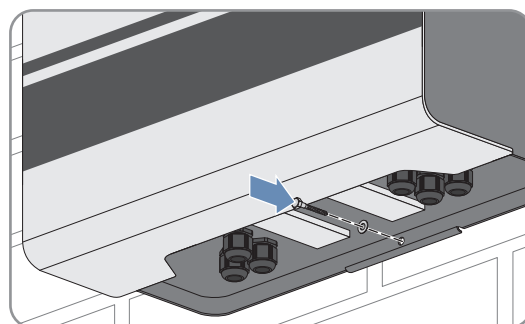
- ☐ At least four screws suitable for the support surface and the weight of the Power Plant Controller
- ☐ At least four washers
- ☐ If required, at least four screw anchors suitable for the support surface

Procedure:

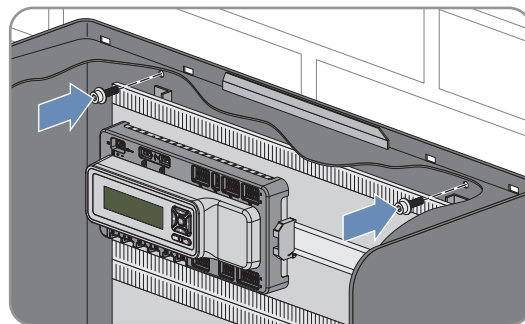
1. Align the wall mounting bracket horizontally on the wall and use it to mark the position of the drill holes. Use at least three holes in the wall mounting bracket.
2. Drill holes at the marked positions.
3. If necessary, insert screw anchors.
4. Attach the wall mounting bracket using suitable screws and washers.



5. Hook the Power Plant Controller into the wall mounting bracket.
6. Ensure that the Power Plant Controller is correctly positioned on the wall mounting bracket and that it can be secured from the inside with two screws.
7. Mark the drill hole on the underside of the Power Plant Controller.
8. Lift the Power Plant Controller vertically out of the wall mounting bracket and place it on a suitable support surface.
9. Drill the hole at the marked position.
10. If necessary, insert the screw anchor.
11. Hook the Power Plant Controller into the wall mounting bracket.
12. Attach the Power Plant Controller to the wall using suitable screws and washers.
13. Open the Power Plant Controller door.



14. Secure the Power Plant Controller from the inside to the wall mounting bracket using the two screws provided. Only fasten the screws hand-tight (torque: 6 Nm).



15. Close the Power Plant Controller door.
16. Ensure that the Power Plant Controller is securely attached.

6 Installation

6.1 Overview of the Connection Area

Bottom view of the Power Plant Controller

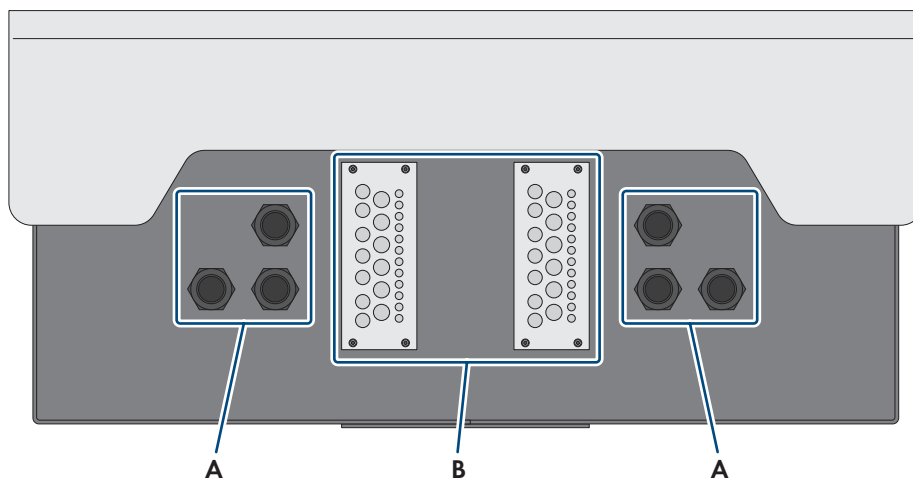


Figure 8: Bottom view of the Power Plant Controller

Position	Designation
A	Cable glands for the connection of pre-assembled cables
B	Cable entry plates for the connection of cables that are not pre-assembled

Terminals in the Power Plant Controller

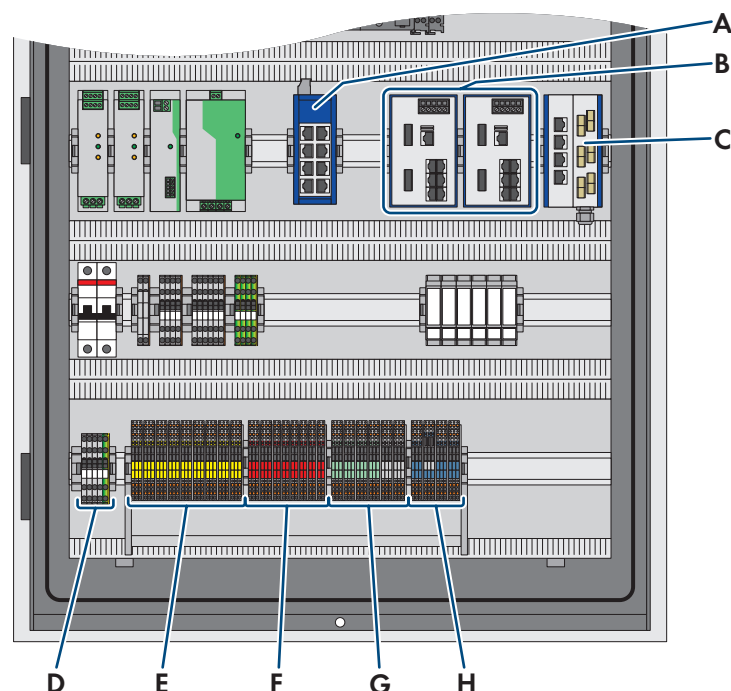


Figure 9: Terminals in the Power Plant Controller

Position	Designation	Explanation
A	-A7	Switch for internal network copper
B	-A3/-A4	Switch for network for optical fibers or copper
C	-A5	Patch panel for optical fibers or copper
D	-X300	Voltage supply
E	-X700	Digital inputs
F	-X701	Digital outputs
G	-X702	Analog inputs
H	-X703	Analog outputs

6.2 Connecting the Supply Voltage

The Power Plant Controller is equipped with a redundant voltage supply to ensure maximum system availability, e.g. in case of a failure of a line conductor or a DC voltage source.

⚠ DANGER

Danger to life due to electric shock

Danger of electric shock if work is executed incorrectly or under fault conditions. This will result in death or serious injury.

- Wear suitable personal protective equipment for all work on the product.
- Disconnect the supply voltage before performing any work on the product.
- After disconnecting from voltage sources, wait one minute for the capacitors of the redundant voltage supply to discharge.

Cable requirements:

- ☐ Conductor cross-section if bootlace ferrules are used: 0.25 mm² to 2.5 mm²
- ☐ Conductor cross-section if bootlace ferrules are not used: 0.25 mm² to 4 mm²

Requirements:

- ☐ The fuse protection of the supply voltage must comply with the country-specific requirements.
- ☐ No supply voltage must be present.
- ☐ External strain relief must be provided.

Procedure:

1. Insert the supply voltage cable into the Power Plant Controller (see Section 11.1, page 48).
2. Dismantle the supply voltage cable.
3. Strip 10 mm to 12 mm of the insulation from the cable's insulated conductors.
4. If you are using bootlace ferrules, crimp them gas-tight.
5. When connecting the AC supply voltage, perform the following steps:
 - Connect the insulated conductors to the connecting terminal plate **-X300** in accordance with the circuit diagram (see Section 11.2, page 49). Observe the correct terminal assignment and ensure that the insulation is not trapped.

Signal	Terminal
L1	Terminal 1
L2	Terminal 2
N	Terminal 3
PE	Terminal 4

- If you choose a single-phase voltage supply, you need to bridge the terminals 1 and 2.
6. When connecting the DC supply voltage, perform the following steps:
 - Connect the insulated conductors to the connecting terminal plate **-X300** in accordance with the circuit diagram (see Section 11.2, page 49). Observe the correct terminal assignment and ensure that the insulation is not trapped.

Signal	Terminal
L+	Terminal 1
L+	Terminal 2
L-	Terminal 3
PE	Terminal 4

- If you choose a single-phase voltage supply, you need to bridge the terminals 1 and 2.
7. Ensure that the cable is securely in place.

6.3 Connecting Digital Inputs and Outputs

Cable requirements:

- ☐ Conductor cross-section if bootlace ferrules are used: 0.14 mm² to 1.0 mm²
- ☐ Conductor cross-section if bootlace ferrules are not used: 0.14 mm² to 1.5 mm²

Requirements:

- ☐ External strain relief must be provided.

Procedure:

1. Strip 8 mm off the cable insulation.
2. If you are using bootlace ferrules, crimp them gas-tight.
3. Connect the cables to the connecting terminal plates **-X700** and **-X701** in accordance with the circuit diagram (see Section 11.2, page 49). Observe the correct terminal assignment and ensure that the insulation is not trapped.
4. Make sure that the cables are securely in place.

6.4 Connecting Analog Inputs and Outputs

Cable requirements:

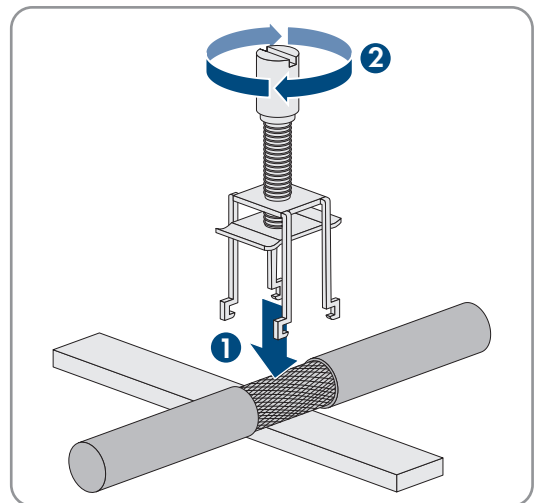
- ☐ Conductor cross-section if bootlace ferrules are used: 0.14 mm² to 1.0 mm²
- ☐ Conductor cross-section if bootlace ferrules are not used: 0.14 mm² to 1.5 mm²

Requirements:

- ☐ External strain relief must be provided.

Procedure:

1. Dismantle the cables.
2. Connect the shield contact of the cable:
 - Remove the shield clamping saddle from the busbar.
 - Press the shield clamping saddle down onto the shield of the dismantled cable until it snaps into place and fasten hand-tight.



3. Strip 8 mm off the cable insulation.
4. If you are using bootlace ferrules, crimp them gas-tight.
5. Connect the cables to the connecting terminal plates **-X702** and **-X703** in accordance with the circuit diagram (see Section 11.2, page 49). Observe the correct terminal assignment and ensure that the insulation is not trapped.
6. Make sure that the cables are securely in place.

6.5 Connecting Network Cables and Optical Fibers

Cable requirements:

- ☐ Network cable: at least CAT5E
- ☐ Optical fiber with multi-mode switch: class OM2 50/125 μm
- ☐ Optical fiber with single-mode network switch: class OM2 9/125 μm

To connect the network cables and the optical fibers to the patch panel, carry out the following steps in the given sequence. The exact procedure is described in the following sections.

Procedure:

1. Removing the modules from the patch panel enclosure
2. Install the optical fibers
3. Install the network cables
4. Mount the modules of the patch panel

Removing the modules from the patch panel enclosure

1. Remove the patch cables.
2. Loosen two screws on the front of each module.
3. Pull out the modules from the front of the patch panel enclosure.

Installing the optical fibers

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

- ☐ Optical fiber pigtails with subscriber connectors or
- ☐ Subscriber connectors

Requirement:

- ☐ The optical fibers must be inserted in the Power Plant Controller (see Section 11.1.1, page 48).

CAUTION

Damage to eyes and skin due to visible and invisible laser radiation

The product contains class 1 LED or laser components in accordance with IEC 60825-1 (2003). The laser beam appears at the end of the optical fiber. Incorrect handling with laser beams can result in damage to eyes and skin.

- Do not look into the laser beam.
- Do not look at the laser beam using optical instruments.
- Do not point the laser beam at persons.

NOTICE

Damage to optical fibers due to too tight bend radii

Excessive bending or kinking will damage the optical fibers.

- Observe the minimum permissible bend radii of the optical fibers.

Procedure:

1. Loosen the cable gland of the module.
2. Insert the optical fibers through the cable gland into the module.
3. Strip sufficient insulation off the optical fibers.

4. Install the optical fibers:

- If optical fiber pigtails are used, splice the optical fibers with the optical fiber pigtails and secure the splice points in the splice holders.
- If subscriber connectors are used, install the subscriber connectors on the optical fibers.
- Push the plug down until it locks in the adapters.

5. Position the fiber in the fiber holder. Observe the bend radii of the optical fibers.

6. Tighten the cable gland.

Installing the network cables**Requirement:**

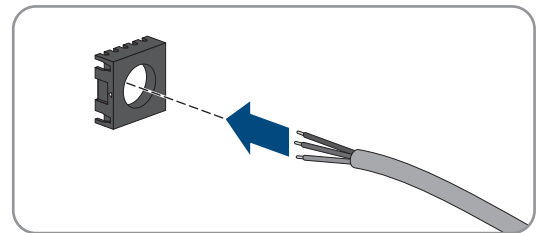
- ☐ The network cables must be inserted in the Power Plant Controller (see Section 11.1.1, page 48)

Procedure:

1. Take the RJ45 Keystone jacks out of the accessory kit.

2. Connect the network cables to the RJ45 Keystone jacks:

- Dismantle the network cable by 30 mm.
- Fold the braided shielding.
- Remove the foil shield from the insulated conductor pairs.
- With the adhesive side facing the inside, attach the aluminum foil from the outside so that it is flush with the braided shielding.
- Lead the network cable through the cable organizer.

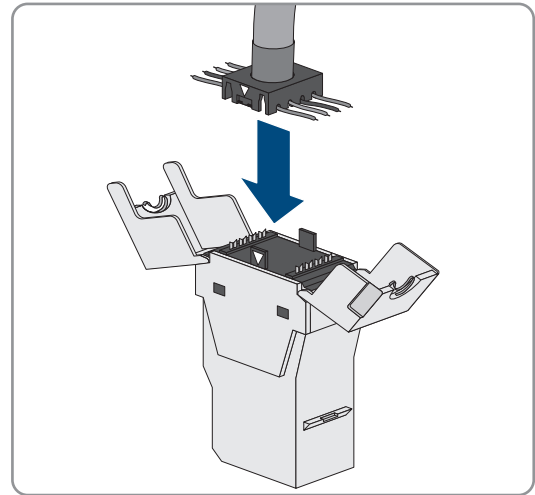


- Insert the conductors into the slots of the cable organizer. Use the appropriate color coding according to the standard of your choice.

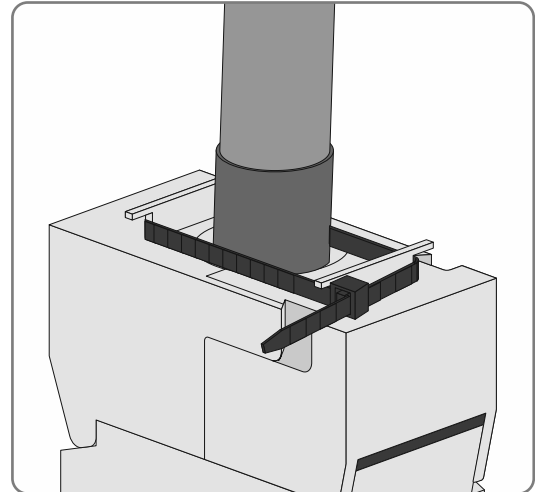
Insulated conductor pair	Insulated conductor color	Contact-568A	Contact-568B
1	white/blue	5	5
	blue	4	4
2	white/orange	3	1
	orange	6	2
3	white/green	1	3
	green	2	6
4	white/brown	7	7
	brown	8	8

- Shorten protruding conductors.

- Insert the cable organizer in the enclosure. Make sure that the white arrow of the cable organizer is pointing towards the white arrow on the enclosure.
- ☑ The cable organizer snaps into place.



- Push the folding parts of the enclosure back together using a suitable pair of pliers (e.g., pipe wrench).
 - ☑ The folding parts of the enclosure snap into place.
- Secure the cable retainer of the enclosure with a cable tie.



- Cut off the protruding end of the cable tie.
3. Push the RJ45 Keystone jacks into the cutouts of the module until they lock into place.
 4. Secure the network cables to the metal bracket with the Velcro strip provided.

Mounting the modules of the patch panel

1. Insert the module with the installed cables in the enclosure of the patch panel.
2. Attach the modules on the front side using two screws each.
3. Connect the patch cables. Observe the send and receive direction of the optical fibers.

7 Operation

7.1 Safety during Operation

NOTICE

Operation failure of the PV power plant due to incorrectly set parameters

If the parameter settings for grid management services are incorrect, the PV power plant may not be able to meet the requirements of the grid operator. This can involve yield losses and the inverter may have to be disconnected by the grid operator.

- When setting the modes of grid management services, ensure that the control procedures agreed with the grid operator are parameterized.
- If the inverter is operated with a Power Plant Controller, ensure that the mode for active power limitation and the mode for reactive power control are selected in the inverter via the Modbus protocol.

NOTICE

Yield loss when operating the product without redundancy function

The redundancy function ensures a trouble-free operation of the Power Plant Controller, even if a control unit fails. If the redundancy function is not activated, the redundant control unit will not be able to take control of the PV power plant if the master control unit fails. Yield losses can result.

- Always activate the redundancy function for the regular operation of the PV power plant.

NOTICE

Yield loss due to communication error when two control units attempt to control the systems simultaneously

Set-points may only be sent by one control unit. If several control units attempt to control the system simultaneously, the system communication can be disturbed. This may lead to yield losses and to the grid operator disconnecting the system from the utility grid.

- Make sure that one control unit has been configured as the master and one control unit as the redundant control unit for the redundancy operation.
- If the Power Plant Controller should not operate in redundancy operation, deactivate the communication of the second control unit to inverters and Modbus gateway.

7.2 Configuring the Network Settings on the Computer

Before your computer can communicate with the Power Plant Controller, you must set the computer to the network settings of the Power Plant Controller. The network settings include the IP address, subnet mask, gateway and DNS server address. Observe the structure of your system network (see Section 13.1, page 55).

Network	Default IP address
LAN1: Network for transducers, central inverters and Modbus gateways	172.16.0.61 *
LAN2: Internal network address of the Power Plant Controller	192.168.100.3
LAN3: Network for grid operator, SCADA	10.0.0.1

* Preferred network for configuring the Power Plant Controller via a PC

Power analyzers in the network

For some supported power analyzers it is necessary to put the power analyzer in the network where no inverters are connected.

Administrator rights in the operating system

To commission the communication unit, you need to have the appropriate administrator rights to change the network settings of the computer.

- Contact your network administrator if you are uncertain about administrator rights.

Procedure:

1. Note down the IP address of the computer.
2. Adjust the IP address of the computer to the address range of the Power Plant Controller.

7.3 Installing the Droid Sans Font on the Computer

You can access the user interface via the display of the Power Plant Controller or with a computer via the system network.

If you wish to access the user interface via the system network, you will need to have the license-free font Droid Sans installed on the computer to ensure error-free display.

Procedure:

- Check whether the Droid Sans font is already installed in the system. To do so, use the operating system help function where necessary. If this font is installed, no further steps are necessary. If the Droid Sans font is not yet installed, download it from the Internet and install.

7.4 Changing the Password for the User Groups

After initial login on the user interface of the Power Plant Controller, you should change the password of the Power Plant Controller to protect your system. As long as the password is still rated insecure by the system, the request **Please change your password!** will continue to be displayed in the bottom line of the user interface. The default passwords are not considered secure passwords.

User group	Password (default settings)
User	0000
Installer	1111

The user interface distinguishes between the user groups "user" and "installer". "Trained installers" can log in to the user group "installer" with a special password once they have completed a training by SMA Service. The user group is enabled after the training has been completed successfully. The user group "Trained installer" has read access for all parameters and write access for parameters that are necessary for performing certain tests in Australia.

To change the password for the "installer" user group, you must be logged in as an installer. To change the password for the "user" user group, you can be logged in as a user or an installer. Be sure to create a password that conforms to the guidelines for secure passwords (see Section 13.7, page 56). The password of the user group "Trained installer" cannot be changed.

Procedure:

1. Log into the user interface (see Section 11.4.1, page 51).
2. Go to **PPC > Settings > Access control**.
3. To change the user password:
 - Enter the new password in the field **Set user password**.
 - Repeat the new password in the field **Confirm password**.
4. To change the installer password:

- Enter the new password in the field **Set installer password**.
 - Repeat the new password in the field **Confirm password**.
5. To save the password changes, select the button [**Save**].
 6. To cancel the password changes, select the button [**Abort**].

7.5 Resetting Passwords

The passwords of the two user groups can be reset via the user interface or using the control unit keypad.

Resetting the passwords via the user interface

1. Log into the user interface as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Settings > Access control**.
3. For the option **Reset User and Installer password**, select the button [**OK**].
 - ☒ The passwords for the two user groups will be reset without any security prompts.

Resetting the passwords using the control unit keypad

1. On the control unit keypad, simultaneously press and hold the [**OK**] and [**Esc**] keys for five seconds.
2. Using the arrow keys on the keypad, navigate to the entry **Password - Reset**.
3. Select this action using the [**OK**] key.
 - ☒ A security prompt appears.
4. To reset the passwords of both user groups, select the [**OK**] key.

7.6 Assigning Access Rights for SMA Service

Various settings on the Power Plant Controller can only be made by SMA Service. You can grant SMA Service limited-time access to the Power Plant Controller for this. Upon expiry of the end date, you have sole access to the system.

Requirement:

- ☐ The Installer user group password must be accepted as being a secure password by the system (see Section 13.7, page 56).

Procedure:

1. Log into the user interface as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Settings > Access control**.
3. In the drop-down list **Prevent SMA Service support**: select the entry **No**.
4. In the field **Permit Service support until**: enter the desired end date for access. This entry must be made in the format YYYY-MM-DD.

7.7 Configuring the Automatic Logout Time

To protect the Power Plant Controller from unauthorized access, the Power Plant Controller logs the user out of the user interface after a defined time in which no entry has been made on the user interface.

Procedure:

1. Log into the user interface of the master control unit as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Settings > Access control**.
3. In the field **Automatic logout time**, set the time after which the inactive user is automatically logged out of the user interface.

7.8 Changing Language and Time Settings

You can change the language of the user interface and the time settings. For the time setting, you can choose between entering the date and time manually or having the time settings synchronized with an external time server.

Procedure:

1. Log into the user interface (see Section 11.4.1, page 51).
2. Go to **PPC > Settings > Device**.
3. To change the language of the user interface, select the desired language in the field **Language**.
4. To set up time input from a time server, proceed as follows:
 - In the drop-down list **Time server activated**, select **Yes**.
 - Enter the IP address in the field **IP address**.
 - To adjust the time zone, select the correct time difference to UTC in the drop-down list **Time zone**.
 - To save the settings, click the **[Ok]** button in the field **Save settings**.
5. To set the time manually, make the appropriate settings in the fields **Date** and **Time of day**.
6. To complete the time setting, click the **[OK]** button in the field **Save date and time**.

7.9 Reading Off the IP Address of the Power Plant Controller

The Power Plant Controller IP address can be read off via the user interface or the control unit keypad.

Reading off the IP address via the user interface

1. Log into the user interface (see Section 11.4.1, page 51).
2. Go to **PPC > Settings > System communication**.
3. Read off the IP addresses of the Power Plant Controller for LAN1 to LAN3.

Reading off the IP address via the control unit keypad

1. On the control unit keypad, press the **[i]** key.
2. Read off the IP addresses of the Power Plant Controller for LAN1 to LAN3.

7.10 Adjusting the Settings of the Modbus Server

The communication between the Power Plant Controller and the grid operator or a higher-level SCADA system takes place via Modbus protocol. Irrespective of this, communication to the grid operator can be implemented via the optional protocol converter.

You can disable communication with the grid operator via Modbus protocol and change the IP address of the Modbus server. You can configure whether setpoint changes are only to be accepted if the change counter register is increased simultaneously via the Modbus protocol.

Procedure:

1. Log into the user interface as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Settings > Modbus server > Standard**.
3. To adjust the profile of the Modbus server, select the desired entry in the drop-down list **Modbus server profile**.
4. To enable or to disable the Modbus server, select the option **Yes** or **No** in the drop-down list **Active**.
5. In the drop-down list **Enable IP address range**, select the desired option.
6. To enable automatic monitoring of the connection to the Modbus client, perform the following steps:
 - In the drop-down list **Setpoint supervision**, select the entry **Yes**.
 - Once setpoint supervision is enabled, enter the desired supervision duration in seconds in the entry field.
 - ☒ Once the waiting time has expired, the connection is interrupted by the Modbus server.

7. In the drop-down list **Enable change counter**, select **Yes** if required. If this is set to **No**, each change in the Modbus protocol will be accepted as a setpoint change.
8. To enable scaling of the input signals on the page **PPC > Grid management services > Input signals > Measured values**, select **Yes** in the drop-down list **Customized scaling**.
9. To view the entries in the individual Modbus registers, select [**Diagnostics**] and navigate to the desired Modbus register using [**Continue**] and [**Back**].

7.11 Managing Connected Devices

Unique names can be assigned to the inverters, Modbus gateways and Power Plant Controller connected to the Power Plant Controller, and each device can be activated and deactivated individually.

Procedure:

1. Log into the user interface as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Grid management services > Device table inverters**.
3. In the field **Device name**, change the name of the respective inverter.
4. In the field **Active**, change the status of the respective inverter.
5. Go to **PPC > Grid management services > Device table Modbus gateways**.
6. In the field **Number of Modbus gateways**, enter the number of Modbus gateways used.
7. In the field **Device name**, change the name of the respective Modbus gateway.
8. In the field **Active**, change the status of the respective Modbus gateway.
9. Go to **PPC > Grid management services > Device table PPC slaves**.
10. In the field **Number of PPC slaves**, enter the number of PPC slaves used.
11. In the field **Device name**, change the name of the respective PPC slave.
12. In the field **Active**, change the status of the respective PPC slave.

7.12 Configuring Output Signals

The digital and analog output signals can be configured individually. The signals can be activated and deactivated, the measured values to be issued can be selected and the display range of the analog signals can be set.

Procedure:

1. Log into the user interface as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Grid management services > Output signals**.
3. Configure the analog output signals:
 - Under **Output signals**, select the option **Analog**.
 - Select the desired output signal from the channel list **Output signals** on the right-hand side.
 - To activate issuing of this output signal, select the option **Yes** in the field **Activate function**.
 - In the field **Measured value**, enter the desired value.
 - To display an output signal regardless of the current measured value, select the option **Yes** in the field **Simulation** and enter the desired substitution value. The entry in this field takes precedence over the measured values.
 - If there are not any measured values present for the selected output signal, but a value is to be displayed despite this, select the option **Yes** in the field **Substitution value** and enter the desired substitution value.
 - To configure the signal range of the output signal, enter the signal range in the fields **x0** and **x1**.

- To configure the measurement range of the output signal, enter the measurement range in the fields **y0** and **y1**.

4. Configure the digital output signals:

- Under **Output signals**, select the option **Digital**.
- Select the desired output signal from the channel list **Output signals** on the right-hand side.
- To activate issuing of this output signal, select the option **Yes** in the field **Activate function**.
- In the field **Measured value**, enter the desired value.
- To display an output signal regardless of the current measured value, select the option **Yes** in the field **Simulation** and enter the desired output **TRUE** or **FALSE**. The entry in this field takes precedence over the measured values.
- If there are not any measured values present for the selected output signal, but a value is to be displayed despite this, select the option **Yes** in the field **Substitution value** and enter the desired output **TRUE** or **FALSE**.

7.13 Setting the Data Storage Frequency

The Power Plant Controller stores the change of control specifications on the internal SD memory card. The stored data are used for the redundancy function among other things.

In the first step it is checked whether the change exceeds a definable threshold. If this is the case, you can set how storing should occur:

- **Up to 100 times per day:** Each time the control specifications are changed, the parameters are stored to the SD memory card. Up to 100 storage processes per day are possible.
- **Maximum every ## seconds:** The parameters are saved after the set time interval has expired. The time interval can be between 60 seconds and 900 seconds.

i Shortened service life of the SD memory card due to frequently storing to the SD memory card

The internal SD memory card has been designed for a certain number of write cycles. If 100 storage processes on the SD memory card are performed per day, a service life of ten years can be expected. If the SD memory card is written to more frequently, the service life is reduced. To prevent malfunctions of the Power Plant Controller, the number of write cycles is monitored and an error message is issued by the Power Plant Controller before the end of the service life.

- Set the storage frequency according to your need.
- In case of a high storage frequency, retrieve the events and have the SD memory card replaced by SMA Service before the end of its service life.

Procedure:

1. Log into the user interface as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Settings > Device**.
3. In the field **Storage of retain data after waiting time** select whether a waiting time should be observed after the change of the control specifications before saving.
4. If the option **Yes** was selected, adjust the desired waiting time.
5. In the field **Percentage change of a parameter before storing** enter the threshold of the change from which the record is stored.

7.14 Backing Up and Restoring Settings

7.14.1 Backup Management Concept

All Power Plant Controller settings are regularly saved automatically and can also be saved manually. The settings for the installed inverters, Modbus gateways, PPC slaves, the time server, the power analyzers, the controller, the current setpoints, parameters and IP addresses are each saved in a separate file respectively. Thus, individual settings can also be restored.

Settings backup	Description
Automatic	All Power Plant Controller settings are saved daily at midnight to the SD memory card in the Power Plant Controller. The data is always saved alternately in the files AutoSave 1* and AutoSave 2* . This means that, in the event of an error, the records from two different days can be retrieved. The current file may be identified using the date display on the user interface.
Manual	All settings or specific individual settings can be saved to the SD memory card in the Power Plant Controller.

The settings are saved to the internal SD memory card and can also be exported to a USB flash drive.

The settings are restored via USB flash drive in two steps:

- **Importing the files to the SD memory card:** The selected files are transferred from the USB flash drive to the SD memory card; the current settings are not changed.
- **Adopting the imported files as the current settings:** After a prompt, the imported files can be adopted as the current Power Plant Controller settings.

7.14.2 Saving and Restoring Settings via the SD Memory Card

Backing Up Settings

1. Log into the user interface as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Backup and restore**.
3. To save individual settings to the Power Plant Controller SD memory card, in the area **Save and load**, select the button [**Save**] for the respective group.
4. To save all settings to the Power Plant Controller SD memory card, in the area **Save and load**, select the button [**Save**] in the field **All**.

Restoring Settings

1. Log into the user interface as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Backup and restore**.
3. Select the record from which the settings are to be loaded in the field **Data source for import**.

Entry	Explanation
Saved files	Settings are imported from the manually saved files.
AutoSave 1	Settings are imported from the file AutoSave 1 .
AutoSave 2	Settings are imported from the file AutoSave 2 .

4. To load individual settings, in the area **Save and load**, select the button [**Load**] for the respective group.
5. To load all settings, in the area **Save and load**, select the button [**Load**] in the field **All**.

7.14.3 Saving and Restoring Settings via USB Flash Drive

Backing Up Settings

Additionally required equipment

- ☐ USB flash drive with maximum 4 GB, FAT32 formatted if the data is to be saved to an external storage device

Procedure:

1. Plug the USB flash drive into the USB port **USB 1** or **USB 2** on the control unit.
 - ☒ The data carrier status LED glows green.
2. Log into the user interface as an installer (see Section 11.4.1, page 51).
3. Go to **PPC > Backup and restore**.
4. In the field **Port**, select the USB port to which the USB flash drive is connected.
5. Select the button **[Backup]** in the field **Ini files**.
 - ☒ A dialog appears asking whether the current Power Plant Controller setting are to be saved.
6. If the current Power Plant Controller settings are to be backed up to the USB flash drive, select **[Yes]**.
If the settings saved on the SD memory card are to be backed up to the USB flash drive, select **[No]**.

Restoring Settings

Additionally required equipment

- ☐ USB flash drive with maximum 4 GB, FAT 32 formatted

Requirement:

- ☐ A Power Plant Controller backup file *.ini must be available.
- ☐ A folder **PPC_Restore_Config** must have been created in the main directory of the USB flash drive.

Procedure:

1. Copy the Power Plant Controller backup file *.ini that is to be imported to the directory **PPC_Restore_Config** on the USB flash drive.
2. Plug the USB flash drive into the USB port **USB 1** or **USB 2** on the control unit.
 - ☒ The data carrier status LED glows green.
3. Log into the user interface as an installer (see Section 11.4.1, page 51).
4. Go to **PPC > Backup and restore**.
5. In the field **Port**, select the USB port to which the USB flash drive is connected.
6. Select the button **[Restore]** in the field **Ini files**.
7. To start copying to the SD memory card, select the button **[Execute]**.
 - ☒ If a USB flash drive with the folder **PPC_Restore_Config** has been recognized, a dialog box appears for starting the restore action.
8. If required, load the imported settings from the SD memory card as the current settings:
 - In the window **Load backup file**, select the data source from which the backup file is to be imported from the drop-down list.
 - To start the import, select the button **[Yes]**.
 - If the current settings are not to be changed, select the button **[No]**.

7.15 Resetting the Settings to the Default Settings

The Power Plant Controller settings can be reset via the control unit keypad.

NOTICE

Yield loss due to loss of system conformity

Operation conforming to grid operator requirements is no longer guaranteed if the Power Plant Controller is switched off or if the default settings are loaded. This may lead to yield losses and to the grid operator disconnecting the system from the utility grid.

- Do not operate the system without the Power Plant Controller.
- Do not change the parameters set during commissioning without consulting the grid operator.

Procedure:

1. On the control unit keypad, simultaneously press and hold the **[OK]** and **[Esc]** keys for five seconds.
2. If necessary, reset the network settings to the default settings:
 - Using the arrow keys on the keypad, navigate to the entry **Network - Reset**.
 - Select this action using the **[OK]** key.
 - ☒ A security prompt appears.
 - To reset the network settings, select the **[OK]** key.
3. If necessary, reset the device settings to the default settings:
 - Using the arrow keys on the keypad, navigate to the entry **Factory - Reset**.
 - Select this action using the **[OK]** key.
 - ☒ A security prompt appears.
 - To reset the device settings, select the **[OK]** key.

7.16 Calling Up the System Overview

7.16.1 Calling Up the Overview of the Entire System

In the overview **"PPC controlled PV plant"**, you will find an overview of the current data of the entire PV system and the status of the measured values.

To facilitate identification of your system, you can enter the name of your system on this page. This name then appears in the navigation bar first level instead of **"PPC controlled PV plant"**.

Procedure:

1. Log into the user interface (see Section 11.4.1, page 51).
 - ☒ The system overview **"PPC controlled PV plant"** opens.
2. If required, enter the name of the system in the field **PV plant name**.

7.16.2 Calling Up the Status and Current Data of All Devices in the System

1. Log into the user interface (see Section 11.4.1, page 51).
2. To call up an overview of the number of devices in the PV system and the status of these devices, select **PPC > Overview**.
3. To call up the data of the connected sensors, go to **PPC > Instantaneous values > General measured values**.
4. To call up the status and the current data of the connected inverters, go to **PPC > Instantaneous values > System communication > Inverter**.

5. To call up the status and the current data of the connected Cluster Controllers or Inverter Managers, go to **PPC > Instantaneous values > System communication > Modbus gateway**.
6. To call up the current data of the power analyzers, go to **PPC > Instantaneous values > System communication > Power analyzer**.

7.17 Configuring the Database and E-mail Address for Event Log

Configuring the event log on Power Plant Controllers without integrated touch display

To configure a database on a Power Plant Controller without touch display, please contact SMA Solar Technology AG.

MySQL

1. Log into the user interface as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Configuration > Email & Logging > MySQL**.
3. Select the desired entry in the drop-down list **Log enable**.
4. Select the desired entry in the drop-down list **Flightrecorder enable**.
5. Enter the data of the database to be used in the fields **Host**, **Port**, **Database**, **User** and **Password**.
6. In the field **Max. memory utilization**, enter the utilization as of which the oldest database entries will be overwritten.
7. To delete a database, select the database to be deleted in the **Clear database** area.

Email

1. Log into the user interface as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Configuration > Email & Logging > Email**.
3. Select the desired entry in the drop-down list **Activate email**:
4. In the drop-down list **TLS** select whether the data transmission via TLS should be encrypted.
5. In the fields **Smtip server / port**, **Pop3 server / port**, **User** and **Password**, enter the data of the e-mail provider.
6. Enter the e-mail addresses of the recipient and sender in the **Configuration** area.
7. In the field **Sending time** enter the time at which the e-mail is sent.
8. Enter the number of days zipped that are sent in an e-mail in the field **Number of zipped days**.
9. To send a test e-mail, click the **OK** button in the area **Test E-mail**.

7.18 Redundancy Function

7.18.1 Description of the Redundancy Function

The redundancy function is realized either by duplication of the control unit within a Power Plant Controller or by a second separate Power Plant Controller. Each control unit has its own IP address via which it must be configured. One of the control units is configured as master, the other control unit as redundant partner.

The redundancy function increases the reliability of the system. The two control units work in parallel, however, only the control unit configured as master actively sends control values to the inverter. If the master control unit has a stability problem, the redundant control unit automatically starts operation and works as the master control unit. As a result, the other control unit automatically becomes the redundant control unit. If the redundant control unit does not react for a specific time, the master control unit forces a restart of this control unit. After three unsuccessful restart attempts, the Power Plant Controller assumes that the control unit is defective and issues an error message.

When the control unit configured as master is functionally stable again, it reassumes the role of the master control unit and the other control unit returns to the redundant operation.

State	Explanation
No	The redundancy function of the control unit is completely deactivated. In this mode, the trouble-free operation of the product is not ensured, even if a control unit fails. Yield losses are possible.
Master	Configuration as the master control unit
Redundancy	Configuration as the redundant control unit
Write only - no redundancy	The redundancy function is deactivated in the Write only - no redundancy mode. Only writable modbus registers are activated. The control unit writes 20 Modbus registers to a computer system, which is defined by entering the IP address (see Section 7.18.3 "Configuring the "Write only - no Redundancy" Function", page 41). In this mode, the trouble-free operation of the product is not ensured, even if a control unit fails. Yield losses are possible.

The additional mode **Write only - no redundancy** can be used to write the 20 Modbus registers to a computer system for test purposes. The redundancy function in this mode is deactivated.

7.18.2 Configuring Redundancy

When configuring the redundancy function, it is set whether the two control units are reached via the IP address of the master control unit or whether each control unit is reached via its own IP address. If the option **Floating IP** is used on the redundant control unit, the Power Plant Controller is also reached with the master control unit's IP address in case of redundancy.

Requirement:

- ☐ Both control units are in the same network.

Configuring the control unit for master mode

1. Log into the user interface of the master control unit as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Configuration > Redundancy**.
3. In the drop-down list **Mode**, select the entry **Master**.
4. In the field **Switching time and control mode after error**, enter the desired switching time after an error and select **Control** from the drop-down list. Thus, the control unit also controls the system after a communication error.
5. In the field **Switching time from "inactive" to "active"**, enter the time that the Power Plant Controller waits after the defined waiting time has expired before switching, until the redundant or master control unit assumes control.
6. In the field **Set-point supervision [ms]**, enter the desired value.
7. Enter the internal network address of the redundant control unit (LAN2) in the **IP address (Redundancy PPC)** field (see Section 7.2, page 29).
8. If the redundancy option is implemented by a second separate Power Plant Controller, the IP address of the redundant control unit is entered in the field **IP address (Redundancy PPC)**.
9. Select the desired entry from the drop-down list **Modbus time server**. When set to **Yes**, the internal clocks of both control units synchronize with each other as soon as they deviate more than ten seconds (recommended).
10. In the area **Write channel**, select **UDP** or **TCP** from the drop-down list and enter the required port (default value: 508). Within a system network, communication via UPD is sufficient.
11. Enter the desired value in the field **Write idle time [ms]**. When the value **0** is entered, the control unit operates with a maximum processing time of 50 ms, which can be extended by entering an additional write idle time.

12. In the field **Write socket timeout [ms]**, enter the desired interval for checking the connection.
13. In the area **Read channel**, select **UDP** or **TCP** from the drop-down list and enter the required port (default value: 509). Within a system network, communication via UDP is sufficient.
14. In the field **Read Idle time [ms]** enter the required value. When the value **0** is entered, the control unit operates with a maximum processing time of 50 ms, which can be extended by entering an additional read idle time.
15. Enter the desired interval for checking the connection in the field **Read socket timeout [ms]**.
16. To have the connection information displayed, click the [**Connection**] button in the area **Diagnostics**.
17. To have the Modbus registers displayed, click the [**Modbus register**] button in the area **Diagnostics** (see Technical Information "POWER PLANT CONTROLLER - Modbus® Interface, Grid Management Services").

Configuring the control unit for redundancy mode

1. Log into the user interface of the redundancy control unit as an installer (see Section 11.4.1, page 51).
2. Go to **PPC > Configuration > Redundancy**.
3. In the drop-down list **Mode**, select the entry **Redundancy**.
4. In the field **Switching time and control mode after error**, enter the desired switching time after an error and select **Control** from the drop-down list. Thus, the control unit also controls the system after a communication error.
5. In the field **Set-point supervision [ms]**, enter the desired value.
6. If the Power Plant Controller is to be reached via the master control unit's IP address in case of redundancy as well, select **Yes** from the **Floating IP** drop-down list.
7. In the field **Switching time from "inactive" to "active"**, enter the time that the Power Plant Controller waits after the defined waiting time has expired before switching, until the redundant or master control unit assumes control.
8. In the field **Communication waiting time**, enter the time that the Power Plant Controller waits after the defined waiting time has expired before switching, until the Modbus communication with the devices configured under **Plant communication** is assumed by the redundant control unit.
9. In the drop-down list **Synchronization**, select which channels are to be used for the control during redundancy operation:
 - **Off**: No parameters are synchronized.
 - **Only MB registers**: All parameters on the Modbus server are synchronized. You can identify the parameters on the user interface by a green square.
 - **All**: All parameters that are on the Modbus server are synchronized as well as the parameters that the trained installer defined. You can identify the parameters on the user interface by a green square.
10. To define the forwarding of the IP address, enter the IP addresses of the redundant control unit for LAN1, LAN2 and LAN3 in the **Redundancy** field. These addresses can be found under **PPC > Settings > System communication > PPC**. During the initial setup of the redundancy function, the [**Import of IP addresses**] button can be selected. In this way, the IP addresses of the master and the redundant control unit are automatically entered.
11. To define the forwarding of the IP address, enter the IP addresses of the master control unit for LAN1, LAN2 and LAN3 in the **Master** field. These addresses can be found under **PPC > Settings > System communication > PPC** on the user interface of the master control unit.
12. In the area **Write channel**, select **UDP** or **TCP** from the drop-down list and enter the required port (default value: 508). Within a system network, communication via UDP is sufficient.
13. In the area **Read channel**, select **UDP** or **TCP** from the drop-down list and enter the required port (default value: 509). Within a system network, communication via UDP is sufficient.
14. To have the connection information displayed, click the [**Connection**] button in the area **Diagnostics**.
15. To have the Modbus registers displayed, click the [**Modbus register**] button in the area **Diagnostics** (see Technical Information "POWER PLANT CONTROLLER - Modbus® Interface, Grid Management Services").

7.18.3 Configuring the "Write only - no Redundancy" Function

A control unit may be used to write the 20 modbus registers to another computer system. The redundancy function is deactivated in this case.

Requirement:

- ☐ The control units and the computer system for writing the Modbus registers are in the same network.

Procedure:

1. If there is a second control unit, deactivate its communication to the inverters and Modbus gateways:
 - Log into the user interface of the second control unit as an installer (see Section 11.4.1, page 51).
 - **Go to PPC > Grid management services > Device table inverters.**
 - In the field **Active**, set the status of all inverters to **FALSE**.
 - Set **PPC > Grid management services > Device table Modbus gateways.**
 - In the field **Active**, change the status of all Modbus gateways to **FALSE**.
2. Log into the user interface of the control unit for writing the Modbus registers as an installer (see Section 11.4.1, page 51).
3. Go to **PPC > Configuration > Redundancy**.
4. In the drop-down list **Mode**, select the option **Write only - no redundancy**.
5. In the field **IP address (Redundancy PPC)**, enter the IP address of the Modbus server for writing the 20 Modbus registers (see Technical Information "POWER PLANT CONTROLLER - Modbus® Interface, Grid Management Services").
6. In the area **Write channel**, select **UDP** or **TCP** from the drop-down list and enter the required port (default value: 508). Within a system network, communication via UDP is sufficient.
7. Enter the desired value in the field **Write idle time [ms]**. When the value **0** is entered, the control unit operates with a maximum processing time of 50 ms, which can be extended by entering an additional write idle time.
8. In the field **Write socket timeout [ms]**, enter the desired interval for checking the connection.
9. To have the connection information displayed, click the [**Connection**] button in the area **Diagnostics**.
10. To have the Modbus registers displayed, click the [**Modbus register**] button in the area **Diagnostics** (see Technical Information "POWER PLANT CONTROLLER - Modbus® Interface, Grid Management Services").

8 Troubleshooting

8.1 Calling up Information on Software Version and Service-Relevant Information

You will find service-relevant information that is required in the event of an error in the **Nameplate** dialog.

Procedure:

1. Log into the user interface as an installer (see Section 11.4.1, page 51).
2. Select **PPC > Settings > Nameplate**.

8.2 Corrective Measures in the Event of a Disturbance

The Power Plant Controller does not start. The LEDs and the display are off.

Cause	Corrective measures
The Power Plant Controller is not connected to the voltage supply.	• Ensure that the voltage supply is correctly connected (see Section 6.2, page 23).
The voltage supply is reverse-connected or the power supply unit is defective.	• Ensure that the voltage supply is correctly connected (see Section 6.2, page 23). • If the voltage supply is connected correctly, replace the power supply unit.

The login page does not open.

Cause	Corrective measures
The Power Plant Controller could not start correctly. A system error has occurred.	• Disconnect the Power Plant Controller from the voltage supply and then reconnect. Note that this can lead to loss of PV plant data. • If the problem persists, contact the SMA Service Line (see Section 14, page 58).
The Power Plant Controller is not connected to the voltage supply.	• Ensure that the voltage supply is correctly connected (see Section 6.2, page 23).
The voltage supply is reverse-connected or the top-hat rail power supply unit is defective.	• Ensure that the voltage supply is correctly connected (see Section 6.2, page 23). • If the voltage supply is connected correctly, replace the top-hat rail power supply unit.

Cause	Corrective measures
A firewall is blocking the connection.	- Adjust the firewall settings in order to allow the required connection. - Ensure that port 8080 is activated.
There is a problem in the local area network (LAN).	- Ensure that the network cables are correctly connected to the Power Plant Controller (see Section 6.5, page 26). - Check whether the network components, network cables or connectors are defective or damaged. Replace defective or damaged network components, network cables or connectors. - Check whether the network settings of the individual network components are correct. Adapt the network settings if required. - Restart the Power Plant Controller. To do this, disconnect the Power Plant Controller from the voltage supply and then reconnect. Note that this can lead to loss of system data. - If the problem persists, contact the network administrator.

Login to the user interface has failed.

Cause	Corrective measures
The password entered is incorrect. Access to the Power Plant Controller is suspended for a maximum of five minutes.	Wait five minutes, then log in with the correct system password.

The user interface is not displayed properly.

Cause	Corrective measures
The Droid Sans font is not installed.	Install the Droid Sans font.

At least one device has the status Warning or Error.

Cause	Corrective measures
There may be a disturbance in one of the connected devices.	Refer to the device documentation.

Communication with at least one device is disturbed.

Cause	Corrective measures
There may be a disturbance in the device.	Refer to the device documentation.
The connection between the Power Plant Controller and the connected devices may have failed.	- Ensure that the network cables are connected correctly (see Section 6.5, page 26). - Check whether the network components, network cables or connectors are defective or damaged. Replace defective or damaged network components, network cables or connectors. - Check whether the network settings of the individual network components are correct. Adapt the network settings if required. - If the problem persists, contact the network administrator.

Communication with all devices is disturbed.

Cause	Corrective measures
There is a problem in the local area network (LAN).	- Ensure that the network cables are connected correctly (see Section 6.5, page 26). - Check whether the network components, network cables or connectors are defective or damaged. Replace defective or damaged network components, network cables or connectors. - Check whether the network settings of the individual network components are correct. Adapt the network settings if required. - Restart the Power Plant Controller. To do this, disconnect the Power Plant Controller from the voltage supply and then reconnect. - If the problem persists, contact the network administrator.

An incorrect total number of connected inverters is shown on the user interface or the display.

Cause	Corrective measures
The configuration of the connected devices has been entered incorrectly in the Power Plant Controller.	- Ensure that the inverters are in operation (see inverter installation manual). - Ensure that the network cables interconnecting the inverters are connected correctly (see Section 6.5, page 26). - Ensure that the network terminals of the Sunny Centrals are connected correctly to the Power Plant Controller. - Ensure that no network components, network cables or connectors are defective. - Ensure that the network addresses of the connected devices are entered correctly.

The parameters or settings of an individual device cannot be edited.

Cause	Corrective measures
You do not have the necessary authorization to edit the parameters.	Change the user group (see Section 11.4.1, page 51).

The Power Plant Controller cannot be accessed by the Modbus client.

Cause	Corrective measures
The required Modbus server is not activated.	• Ensure that the required Modbus server is enabled (see Section 7.10, page 32).
An incorrect IP address for the Power Plant Controller has been set in the Modbus client.	• Read off the IP address of the Power Plant Controller (see Section 7.9, page 32). • Ensure that the correct IP address for the Power Plant Controller is set in the Modbus client (see the manufacturer manual).

The Modbus profile contains measured values that are not supported by the Power Plant Controller.

Cause	Corrective measures
The Modbus configuration may be incorrect.	• Check the Modbus configuration using the assignment tables and adjust if required (see Section 7.10, page 32).

The Power Plant Controller is not responding within the response time specified by the Modbus client.

Cause	Corrective measures
The Modbus configuration may be incorrect.	• Check the Modbus configuration using the assignment tables and adjust if required (see Section 7.10, page 32).
An incorrect IP address for the Power Plant Controller has been set in the Modbus client.	• Ensure that the network cables are connected correctly (see Section 6.5, page 26). • Check whether the network components, network cables or connectors are defective or damaged. Replace defective or damaged network components, network cables or connectors. • Check whether the network settings of the individual network components are correct. Adapt the network settings if required. • If the problem persists, contact the network administrator.

A value specified in the Modbus profile is not being transmitted by the Power Plant Controller to the devices in the system.

Cause	Corrective measures
The Modbus configuration may be incorrect.	• Check the Modbus configuration using the assignment tables and adjust if required (see Section 7.10, page 32).
The specification of setpoints may have been set to Local .	• Via the user interface, check whether the specification of setpoints is set to Remote. If the specification of setpoints is set to Local, contact the SMA Service Line (see Section 14, page 58).

9 Maintenance

9.1 Maintenance and Replacement Intervals

Maintenance work	Interval	See
Checking the Mounting Location	24 months	Section 9.2.1, page 46
Checking the Enclosure and Enclosure Interior	24 months	Section 9.2.2, page 46
Replacing the internal SD memory card	maximum ten years, depending on the write cycle	To be carried out by Service

Replacing the SD memory card

The service life of the internal SD memory card depends on the number of performed write cycles. The control units of the Power Plant Controller monitor the number of performed storage cycles and indicate in the status bar whether an SD memory card needs to be replaced (see Section 4.1, page 14). In addition, when a critical amount of write cycles is reached, a warning is issued when logging on to the user interface.

9.2 Maintenance Work

9.2.1 Checking the Mounting Location

- Ensure that the mounting location is easily accessible without the need of auxiliary equipment.
- Make sure that the Power Plant Controller is securely mounted.

9.2.2 Checking the Enclosure and Enclosure Interior

Only perform maintenance work on the Power Plant Controller when the environment is dry and free of dust.

Procedure:

1. Check whether the Power Plant Controller enclosure is damaged.
If the enclosure is severely damaged, contact us (see Section 14, page 58).
2. Ensure that the enclosure is clean and that there are no foreign objects on or in the enclosure.
3. Ensure that the door lock is intact and clean.
4. Check whether the surrounding seals on the door frames are intact.
If a seal is damaged, replace the seal.
5. Ensure that all cable glands are tightly sealed.

10 Decommissioning

10.1 Disassembling the Power Plant Controller

Requirement:

- ☐ The voltage supply must be externally disconnected.

Procedure:

1. Open the Power Plant Controller door.
2. Remove all network cables and optical fibers.
3. Remove all signal cables.
4. Remove the voltage supply cable.
5. Release the cable glands.
6. Pull all cables out of the cable glands and the cable feed-through plate.
7. Disassemble the Power Plant Controller.

10.2 Disposing of the Power Plant Controller

i Proper disassembly and disposal

When the Power Plant Controller has reached the end of its service life, it becomes electronic waste. Electronic waste contains on the one hand valuable materials which can be recycled as secondary raw materials, and on the other, substances which are hazardous to the environment. Contact your local commercial disposal services for information on optimum material utilization.

11 Periodic Actions

11.1 Cable Entry

11.1.1 Leading Cables through Enclosure Opening with Membrane

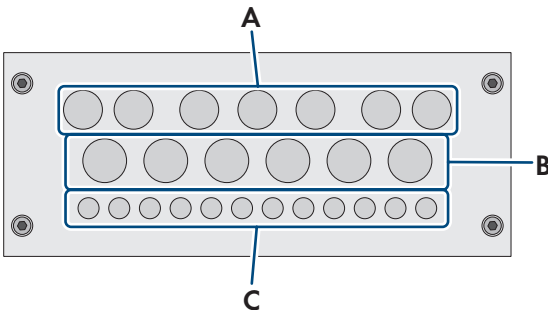


Figure 10: Overview of the membranes for inserting the cable

Position	Explanation
A	Membranes for cable cross-section from 4.8 mm to 9.7 mm
B	Membranes for cable cross-section from 4.8 mm to 12.0 mm
C	Membranes for cable cross-section from 3.2 mm to 6.5 mm

NOTICE

Damage to the product due to sand, dust and moisture because of leaky membranes

By piercing unnecessary or oversized holes, the membranes in the cable feed-through plate become leaky. Sand, dust and moisture penetration can damage the product and impair its functionality.

- Select membranes that match the cable diameter.
- Only pierce as many holes in the membranes of the cable feed-through plate as you need for the cables.
- The hole in the membrane must be smaller than the diameter of the cable to be led through.
- Only insert one cable in each membrane.

Procedure:

1. Pierce the appropriate membrane.
2. Insert the cables through the membranes.
3. Cut the cable to length.
4. Where necessary, attach the cables to an external cable support rail.

11.1.2 Leading Cables through Enclosure Opening with Cable Gland

NOTICE

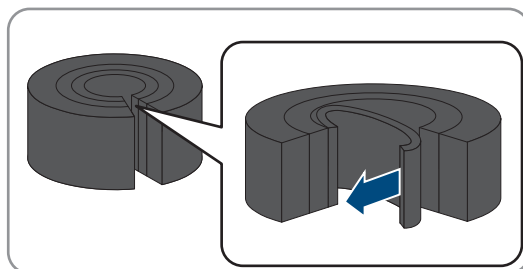
Damage to the product due to sand, dust and moisture because of leaky cable glands

Incorrect harnessing of the cable gland will cause the cable entries to leak. Sand, dust and moisture penetration can damage the product and impair its functionality.

- Only remove the number of sealing rings from the rubber seal in the cable gland to match the cable cross-section.
- Leave the sealing plugs in place in the unused cable glands.

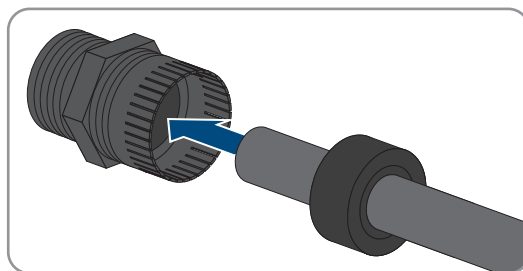
Procedure:

1. Unscrew the cable gland from the enclosure opening.
2. Remove the filler plug from the cable gland.
3. Remove the rubber seal from the cable gland.
4. To adjust the rubber seal to the diameter of the cable to be inserted, remove the corresponding number of sealing rings from the rubber seal:



Cable diameter	Number of sealing rings to be removed
4.5 mm to 5.0 mm	0
4.5 mm to 7.5 mm	1
7.0 mm to 10.0 mm	2
9.5 mm to 13.0 mm	3

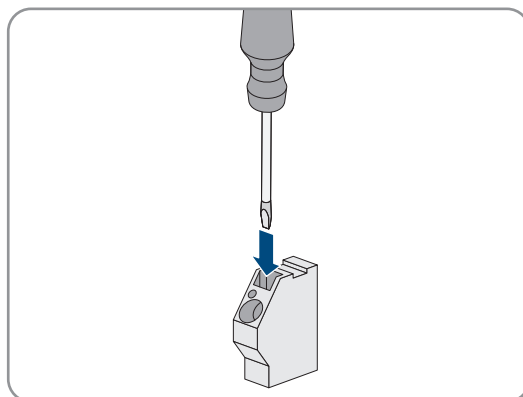
5. Lead the cable through the swivel nut of the cable gland. Ensure that the thread of the swivel nut is facing upwards.
6. Lead the cable above the swivel nut sideways through the rubber seal.
7. Insert the rubber seal with the cable in the cable gland.



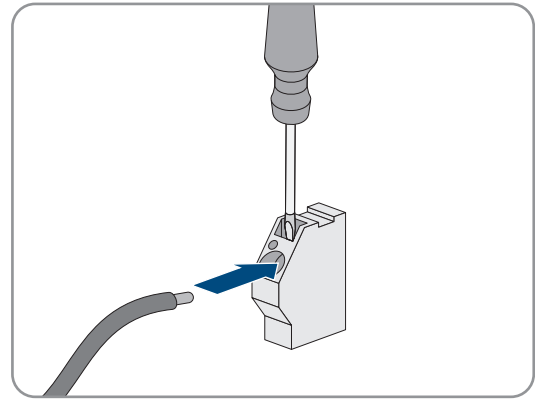
8. Cut the cable to length.
9. Tighten the cable gland.

11.2 Connecting the Cable to the Spring-Cage Terminals

1. Insert the cable into the Power Plant Controller.
2. Dismantle the cable outside the Power Plant Controller. This prevents contamination in the Power Plant Controller.
3. Strip the insulation off the wires. The insulation stripping length is 6 mm to 7 mm.
4. Insert the screwdriver into the clamping contact of the spring-cage terminal.



5. Insert the stripped insulated conductor into the terminal until it reaches the stop. When doing so, ensure that the insulation is not trapped.



6. Pull the screwdriver out of the clamping contact.

11.3 Switching the Power Plant Controller On and Off

Switching the Power Plant Controller Off

NOTICE

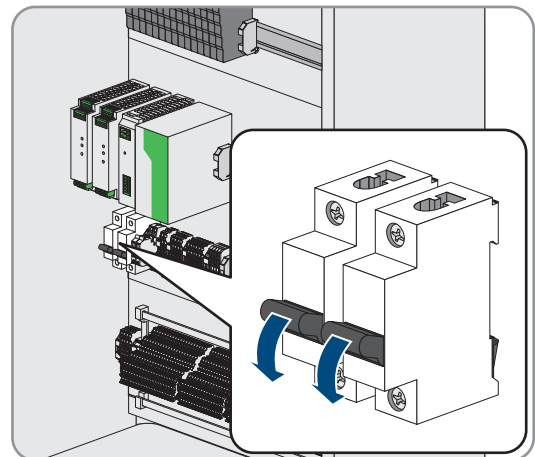
Yield loss due to loss of system conformity

Operation conforming to grid operator requirements is no longer guaranteed if the Power Plant Controller is switched off or if the default settings are loaded. This may lead to yield losses and to the grid operator disconnecting the system from the utility grid.

- Do not operate the system without the Power Plant Controller.
- Do not change the parameters set during commissioning without consulting the grid operator.

Procedure:

1. Open the Power Plant Controller door.
2. Switch off the circuit breakers.



3. Close and lock the Power Plant Controller door.
4. If necessary, disconnect the voltage supply externally.

Switching the Power Plant Controller On

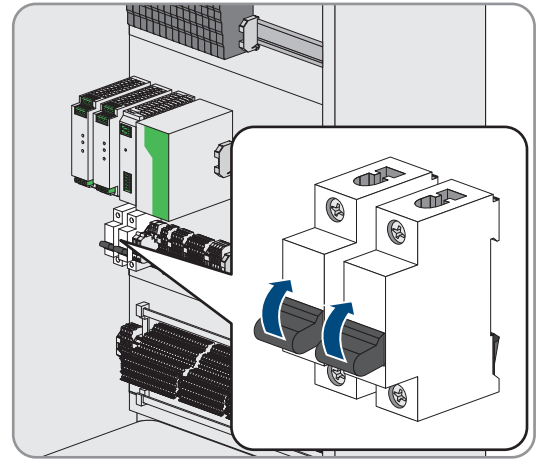
Requirement:

- ☐ Supply voltage must be present.

Procedure:

1. Open the Power Plant Controller door.

2. Switch on the circuit breakers.



3. Close and lock the Power Plant Controller door.

11.4 Settings on the User Interface

11.4.1 Logging Into the User Interface

To ensure the security of the Power Plant Controller against unauthorized access, the Power Plant Controller is protected with a waiting time after an incorrect password is entered. The waiting time after the first incorrect entry is 15 seconds. After that, the waiting time extends with each incorrect entry.

Logging In at the Touch Display

1. Activate the touch display by tapping.
2. Select the respective user group in the field **User level**.
3. Enter the password in the field **Password**.
4. Select [**Login**].

Logging In on the Computer

You can activate the user interface of the Power Plant Controller via the plant network. This enables visualization of the system data and adjustment of device settings of the PV plant and the Power Plant Controller on the computer. To access the user interface, the web browser Firefox as of version 13 must be installed on your computer. Other Internet browsers such as Chrome or Microsoft Internet Explorer can also be used. However, this may lead to deviations in the display.

Requirement:

- ☐ Java Runtime Environment must be installed on your computer.
- ☐ The Power Plant Controller must be properly connected to the local network (see Section 6.5, page 26).
- ☐ The IP address of the Power Plant Controller must be known (see Section 7.9, page 32).

Procedure:

1. Enter the IP address of the Power Plant Controller and press the enter key. If the user interface does not open, and changes, especially to the network settings of the Power Plant Controller, were made, wait approximately one minute and then re-enter the IP address of the Power Plant Controller in a new browser window.
2. Select the respective user group in the field **User level**.
3. Enter the password in the field **Password**.
4. Select [**Login**].

11.4.2 Logging Out of the User Interface

By logging out of the user interface of the Power Plant Controller, you will protect your PV plant from unauthorized access. If you do not log out of the user interface, you will automatically be logged off from the user interface after 15 minutes of inactivity. This time interval can be adjusted by SMA Service, if required.

Procedure:

- Select [**Logout**] in the navigation bar.

12 Technical Data

Enclosure	
Mounting type	Wall mounting
Material	Aluminum, powder-coated
Color of door	RAL9006 (white aluminum)
Color of enclosure body	RAL 7024 (graphite gray)
Lock cylinder	Lock cylinder
Mechanical Data	
Width x height x depth	720 mm x 1 125 mm x 325 mm
Maximum weight*	60 kg
* depending on the ordered option	
Option-Dependent Features	
Display*	Touch display, leading
Ethernet switch	optional / managed / unmanaged
Maximum number of analog inputs	12
Maximum number of analog outputs	7
Maximum number of digital inputs	18
Maximum number of digital outputs	16
* for indoor mounting only	
Voltage supply	
AC supply voltage	100 V _{AC} to 240 V _{AC}
DC supply voltage*	36 V _{DC} to 60 V _{DC}
DC supply voltage*	18 V _{DC} to 32 V _{DC}
Grid frequency	50 Hz / 60 Hz
Overvoltage category	2
Pre-fuse**	B16
* optional	
** depending on local directives, all poles must be connected	
Supported Products	
Central inverter	Sunny Central of the CP XT production series / Sunny Central of the HE-20 production series / Sunny Central XXXX(-EV)(-US)
Maximum number of central inverters	200

Supported Products

Decentralized inverters	Sunny Tripower via SMA Cluster Controller / Sunny Tripower 60 via Inverter Manager
Maximum number of SMA Cluster Controllers and/or Sunny Tripower 60	50
Transducer / power analyzer	Janitza UMG 604 / 605 Schneider Electric ION 7550 / 7650 / 8600 / 8650 / 8800

Ambient Conditions

Degree of protection*	IP54
Operating temperature range	-20°C to +50°C
Storage temperature range	-40°C to +70°C
Relative humidity, non-condensing	10% to 95%
Maximum operating altitude above MSL (without I/O ex- pansion)	4000 m
Maximum operating altitude above MSL (with I/O ex- pansion)	2000 m

* in accordance with IEC 60529

13 Appendix

13.1 Structure of the System Network

Two networks can be connected to the Power Plant Controller. This means that the control values can be transmitted to two PV system networks. The Power Plant Controller delivers the control values for the Modbus gateways and the control values for the Sunny Centrals via separate LAN interfaces.

To ensure the correct transmission of the control values, the following rules must be observed:

- If Sunny Centrals and Modbus gateways are installed in the PV plant, we recommend that the Modbus gateways are organized in separate networks.
- If the Sunny Central inverters and Modbus gateways have to be operated in the same network, only one network can be used for the transmission of control values. Thereby the time interval for transmitting output values is extended to at least the time interval determined for the Cluster Controller or Inverter Manager.

13.2 Principle of the Communication Network

The Power Plant Controller communicates with the connected devices, with the power analyzer, the grid operator, and the SCADA system via Modbus protocol.

The Modbus protocol is a communication protocol that is based on a client-server architecture.

13.3 Grid Supporting Functions of the Power Plant Controller

The Power Plant Controller supports the quality of the utility grid with various functions.

Power reduction in the event of over- or undervoltage

If the voltage of the utility grid falls below or exceeds the defined thresholds, the Power Plant Controller regulates the active power of the inverter in dependence of a configurable P(V) characteristic curve. Thus, the inverters connected to the Power Plant Controller reduce the amount of active power fed in slowly, instead of them disconnecting from the utility grid simultaneously.

Active power increase in the event of underfrequency (Active Power Reserve)

If the frequency of the utility grid falls below the defined thresholds, the Power Plant Controller increases the amount of active power fed in by the connected inverters. In order to provide this function, the connected inverters must be operated with an active power reserve in relation to the MPP power at nominal frequency.

Determination of the possible MPP power is performed via a connected SCADA system or in the Power Plant Controller via the evaluation of the measured data from solar irradiation sensors and temperature sensors.

13.4 System Stability

The Power Plant Controller takes over the park control in PV systems and communicates with the connected inverters and the connected SCADA system. To prevent possible disturbances and to ensure uninterrupted availability of the control, the Power Plant Controller is equipped with two control units. One control unit is configured as the master, and one as the redundant control unit. In case of a disturbance, the control can therefore be continued and a possibly necessary restart of a control unit does not result in control interruptions.

13.5 Evaluating the Measured Values of the Power Analyzers

In the Power Plant Controller, measured values from up to ten power analyzers can be processed. The measured values to be processed are active power, reactive power, voltage, frequency and displacement power factor. If the system feeds into different utility grids or there are several points of interconnection, the relevant data from several power analyzers can be added.

If power analyzers are operated redundantly at the same point of interconnection, the necessary measured values are automatically called up from another power analyzer.

How the measured values are processed in the Power Plant Controller is configured during commissioning depending on the requirements:

- The active power and reactive power of up to ten power analyzers can be added.
- The active power and reactive power of up to ten power analyzers can be averaged.
- When using up to two power analyzers on one utility grid, settings can be configured for the failure of one power analyzer (redundancy measurement).
- Switching between the settings for default measurement or redundancy measurement can be performed manually or automatically.
- Additionally, the measured values for active power and reactive power from default measurement and redundancy measurement can be added respectively. This is particularly relevant if setpoints are specified via analog inputs.

13.6 Setpoint Specification Under Fault Conditions

If a fault has occurred and transmission of the setpoints via Modbus protocol is not possible, the Power Plant Controller uses a substitution value or the last transmitted value. This is set for each specific system by SMA Service.

Basically, three communication errors are possible:

Error type	Control of the Power Plant Controller	Parameterization
The operator setpoints are not received by the Power Plant Controller	The control values are calculated with the last valid setpoint or with a substitution value.	Parameterization is carried out at the Power Plant Controller.
Actual values from the power analyzer are not received by the Power Plant Controller	New control values cannot be calculated. The controller switches to manual operation and transmits the last valid control value or a substitution value.	Parameterization is carried out at the Power Plant Controller.
Control value transmission to the devices is disturbed	Depending on the parameterization, the connected devices work with the last valid control values received or with a substitution value.	Parameterization is carried out at the connected devices.

Once the error in transmitting the setpoints of the Power Plant Controller via Modbus protocol has been eliminated, transmission of the control values calculated by the Power Plant Controller to the devices of the PV plant automatically recommences.

13.7 Directive for Secure Passwords

To protect the Power Plant Controller from unauthorized access, you must select a secure password. SMA Solar Technology AG recommends choosing the password in accordance with the following directive:

- The password has at least five characters.
- The password consists of letters, at least one number, and at least one special character.
- The password does not contain umlauts.

13.8 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.

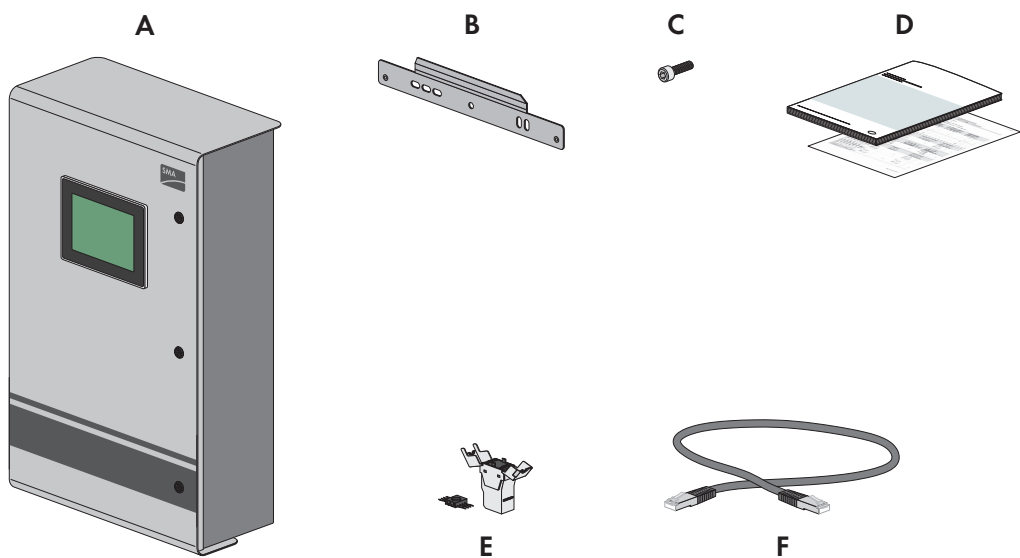


Figure 11: Scope of delivery

Position	Quantity	Designation
A	1	Power Plant Controller
B	1	Wall mounting bracket
C	2	Bolt
D	1 each	Documentation
E	4/8	Keystone jack*
F	2	Patch cable*

* optional

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
- Type of communication
- Type and number of PV modules
- Optional equipment, e.g. communication products
- Detailed description of the problem

Deutschland	SMA Solar Technology AG	Belgien	SMA Benelux BVBA/SPRL
Österreich	Niestetal	Belgique	Mechelen
Schweiz	Sunny Boy, Sunny Mini Central, Sunny Tripower: +49 561 9522-1499	België	+32 15 286 730
	Monitoring Systems (Kommunikationsprodukte): +49 561 9522-2499	Luxemburg	SMA Online Service Center: www.SMA-Service.com
	Fuel Save Controller (PV-Diesel-Hybridsysteme): +49 561 9522-3199	Luxembourg	
	Sunny Island, Sunny Boy Storage, Sunny Backup: +49 561 9522-399	Nederland	
	Sunny Central, Sunny Central Storage: +49 561 9522-299	Česko	SMA Service Partner TERMS a.s.
	SMA Online Service Center: www.SMA-Service.com	Magyarország	+420 387 6 85 111
		Slovensko	SMA Online Service Center: www.SMA-Service.com
		Türkiye	SMA Service Partner DEKOM Ltd. Şti. +90 24 22430605 SMA Online Service Center: www.SMA-Service.com
France	SMA France S.A.S. Lyon +33 472 22 97 00 SMA Online Service Center : www.SMA-Service.com	Ελλάδα	SMA Service Partner AKTOR FM.
		Κύπρος	Αθήνα +30 210 8184550 SMA Online Service Center: www.SMA-Service.com
España	SMA Ibérica Tecnología Solar, S.L.U.	United Kingdom	SMA Solar UK Ltd.
Portugal	Barcelona +34 935 63 50 99 SMA Online Service Center: www.SMA-Service.com		Milton Keynes +44 1908 304899 SMA Online Service Center: www.SMA-Service.com

Italia	SMA Italia S.r.l. Milano +39 02 8934-7299 SMA Online Service Center: www.SMA-Service.com	Australia	SMA Australia Pty Ltd. Sydney Toll free for Australia: 1800 SMA AUS (1800 762 287) International: +61 2 9491 4200
United Arab Emirates	SMA Middle East LLC Abu Dhabi +971 2234 6177 SMA Online Service Center: www.SMA-Service.com	India	SMA Solar India Pvt. Ltd. Mumbai +91 22 61713888
ไทย	SMA Solar (Thailand) Co., Ltd. กรุงเทพฯ +66 2 670 6999	대한민국	SMA Technology Korea Co., Ltd. 서울 +82-2-520-2666
South Africa	SMA Solar Technology South Africa Pty Ltd. Cape Town 08600SUNNY (08600 78669) International: +27 (0)21 826 0699 SMA Online Service Center: www.SMA-Service.com	Argentina Brasil Chile Perú	SMA South America SPA Santiago de Chile +562 2820 2101
Other countries	International SMA Service Line Niestetal 00800 SMA SERVICE (+800 762 7378423) SMA Online Service Center: www.SMA-Service.com		

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