SOLAR ELECTRIC

KOSTAL

PLENTICORE plus

Hybrid inverter – G2

Operating manual

Legal notice

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Exclusion of liability

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General note on gender equality

is aware of how language impacts on gender equality and always makes an effort to reflect this in documentation. Nevertheless, for the sake of readability we are unable to use non-gender-specific terms throughout and use the masculine form instead.

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Valid from software (SW) version:

02.21

Contents

1. About this documentation

This documentation contains important information on the functional principles of your product as well as its safety and usage.

Read this documentation carefully and in full before you work with the product. Follow the instructions and safety specifications in this documentation during all activities.

Contents

1.1 Validity of the documentation

This documentation applies to the hybrid inverter of the

- PLENTICORE plus G2.

1.2 Content, function and intended audience of the documentation

Content and function of the document

This documentation is an operating manual and is part of the product it describes.

This documentation provides you with important information on the following topics:

- Structure and function of the product
- Handling the product safely
- Explanations, specifications and instructions for handling the product, from transportation to disposal
- Technical data

Target groups

This documentation is aimed at the following categories of people:

- System planners
- Plant owners
- Qualified staff in transport, storage, mounting, installation, operation, maintenance and disposal

1.3 Applicable documents and further information

To fully understand the content of this documentation and to perform the described work steps safely and in full, you require the following additional documents and information sources.

You can find all of the information about the product on our website in the ***Download*** area: **www.kostal-solar-electric.com/download/**

Applicable documentation

- Documentation for other components in the system
- The Quick Start Guide provided as part of the product's scope of delivery
- List of countries whose specifications the product meets
- Certificates and manufacturer declarations to forward to the energy supplier
- List of energy meters that are approved for use with the product
- List of batteries that are approved for use with the product
- List of inverter parameter values specific to each country
- List of events (error messages) that may occur in the inverter

Further information

- List of compatible partners: An overview of products from external partners that can be combined with products from to create optional upgrades.

Regulations

- Plant owner's operating regulations at the place of use
- Accident prevention regulations
- Regulations on work equipment safety
- Regulations on disposal and environmental protection
- Other applicable regulations at the place of use

1.4 Notes in this manual

A distinction is made in this manual between warnings and information notes. All notes are identified in the text line with an icon.

1.4.1 Warnings

DANGER

Indicates a direct hazard with a high level of risk, which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazard with a moderate level of risk, which, if not avoided, will result in death or serious injury.

CAUTION

Indicates a hazard with a low level of risk, which, if not avoided, will result in minor or slight injury or property damage.

INFO

Contains important instructions for installation and for trouble-free device operation in order to avoid damage to property and financial damages.

1.4.2 Meaning of symbols in information notes

The symbol indicates activities that may only be carried out by an electrician.

Information

2. Safety

This chapter provides you with important information on handling your product safely.

Contents

2.1 Proper use

Intended purpose

- This product is an inverter and is used to convert direct current from photovoltaic systems into alternating current.
- The alternating current generated may be used as follows:
  - Self-consumption
  - Feed-in to the public grid
  - Temporary storage in a battery storage unit, if available

Fields of use

- The product is intended for professional and private use.

Place of use

- The product is not intended for use in explosive or aggressive environmental conditions. Observe the specifications for the installation location.
- The product is intended for use indoors and outdoors.
- The product is only intended for stationary use.

Specifications for additional components, replacement parts and accessories

Additional components, replacement parts and accessories may only be used if they have been approved by for this product type.

You can find all of the information about the product on our website in the ***Download*** area:
www.kostal-solar-electric.com/download/

2.2 Improper use

Any use of the product other than the use described in this documentation and in the applicable documentation is improper and is therefore not permitted.

Making any changes to the product that are not described in this documentation is not permitted. Prohibited changes to the product will result in loss of warranty.

2.3 The operator's obligations

When using the product, the following obligations must be met:

Instruction

- Providing this documentation:
  - The operator must ensure that staff who carry out activities on and with the product have understood the content of the documentation for this product.
  - The operator must ensure that the documentation for this product is accessible to all users.
- Readability of the warning signs and labels on the product:
  - Warning signs and labels on the product must always remain legible after the product is installed.
  - The operator must replace any warning signs and labels that are no longer legible because they are old or damaged.

Occupational safety

- The operator must ensure that staff performing activities on and with the product are qualified to do so.
- The operator must ensure that the system is immediately shut down if there are discernible defects and must ensure that the defects are remedied.
- The operator must ensure that the product is only operated with the specified safety devices.

2.4 Qualification of the staff

The activities described in this documentation must only be performed by people who are qualified for the task. Depending on the activity, they require specific specialist knowledge in the following areas and knowledge of the relevant specialist terms:

- Electrics

The following additional, specific qualifications are required:

- Knowledge of all safety requirements for handling inverters
- Knowledge of the applicable regulations for handling the product. See **Applicable documents and further information, Page 10**.

2.5 Sources of danger

The product has been developed and tested in accordance with international safety requirements. Despite this, residual risks still exist and could cause personal injury and damage to property.

2.5.1 Danger of injury

Serious danger of injury or death from electric shock

When exposed to light, the PV modules generate a high DC voltage that is applied to the DC cables. Touching damaged live DC cables leads to life-threatening injuries or even death.

- Do not touch exposed live parts or cables.
- Before working on the product: De-energise product and secure it against being switched back on.
- For all work on the product: Wear suitable protective equipment and use suitable tools.

2.5.2 Material damage

Risk of fire due to damaged supply cables

When exposed to light, the PV modules generate a high DC voltage that is applied to the inverter's supply cables. Damaged inverter supply cables or damaged plugs can cause a fire.

- Carry out regular visual checks on the supply cables and plugs.
- If you detect defects: Notify qualified staff and have the parts replaced.

2.6 Safety devices

Safety devices required during installation

The following safety devices must be installed:

- Line circuit breaker
- Residual current device

2.7 Personal protective equipment

For certain activities, staff are obligated to wear protective equipment. The required protective equipment is specified in the relevant chapters.

An overview of the required protective equipment

- Rubber gloves
- Protective glasses

2.8 Emergency procedure

2.8.1 Fire procedure

1. Leave the danger zone immediately.
2. Notify the fire service.
3. Tell the emergency services that a PV system is in operation and state the location of modules, inverters, battery and separators.
4. Have any other measures carried out by qualified staff only.

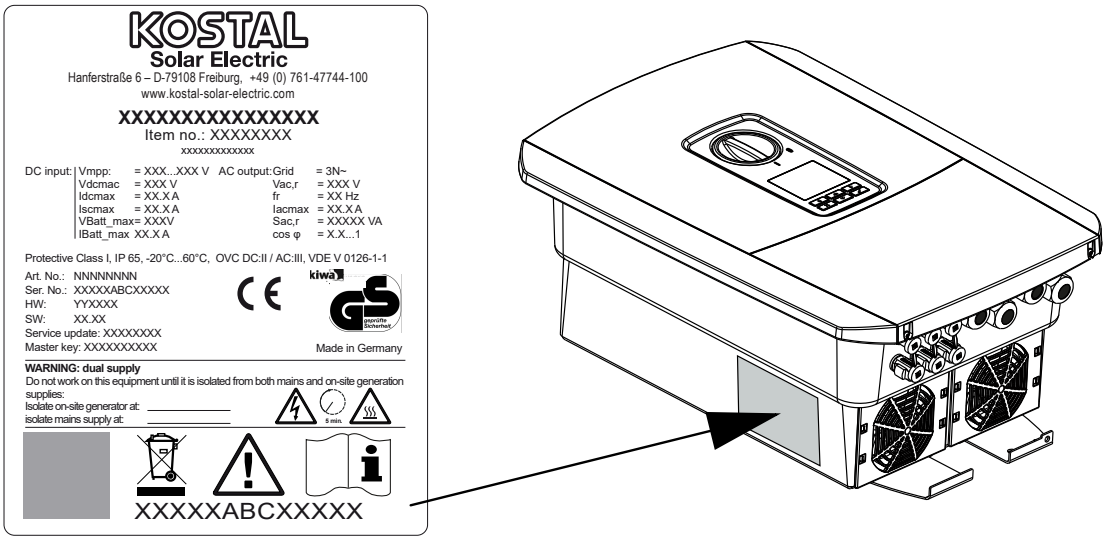
2.9 Observed standards and guidelines

The EU Declaration of Conformity lists standards and guidelines, the requirements of which are met by the product.

You can find all of the information about the product on our website in the ***Download*** area:
www.kostal-solar-electric.com/download/

3. Device and system description

3.1 Type plate and labels on the device



The type plate and other labels are attached to the device housing. These signs and labels must not be altered or removed.

The type plate gives you a quick overview of the most important data about the inverter. You will also require this information if you contact our service team.

You will find the following information on the type plate:

- Manufacturer
- Model
- Serial number and article number
- The ***master key*** for logging in as an installer
- Characteristics specific to the device
- QR code with the following information:
  Serial number, article number, hardware/software status, master key The QR code can be used to perform initial commissioning of the inverter via the KOSTAL Solar App.
- Details of the activated power in the inverter.

Symbol	Explanation
	Danger notice
	Danger due to electrical shock and discharge

Symbol	Explanation
	Danger due to burns
	Observe and read operating manual
	Danger due to electrical shock and discharge. Wait five minutes (discharge time of the capacitors) after shutdown
	Device must not be disposed of with household waste. Observe the local application of disposal requirements.
	CE marking The product satisfies the applicable EU requirements.
	Additional earth connection

3.2 System overview

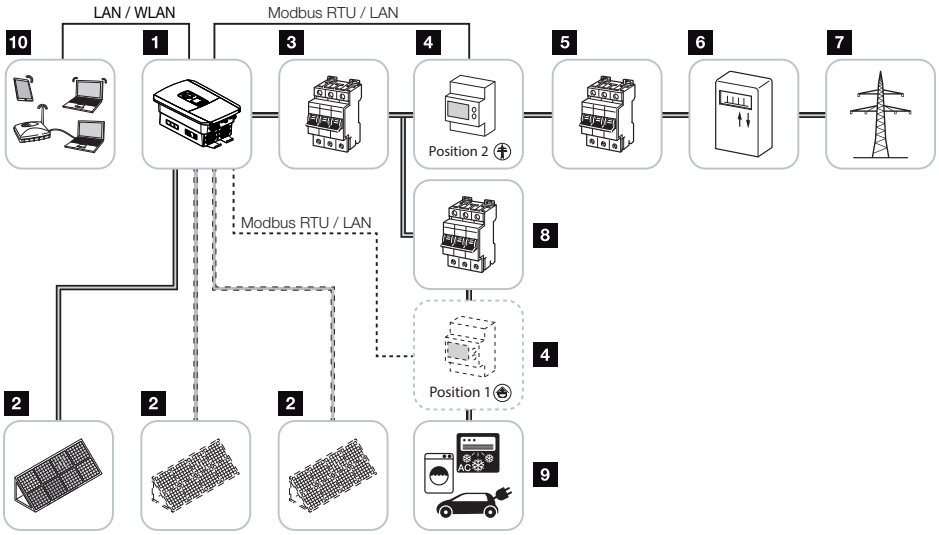
The PLENTICORE plus G2 is a three-phase hybrid inverter that can be used in three-phase grids.

The inverter can be used as follows.

As a PV inverter

If the inverter is used as a pure PV inverter, only PV generators are connected to the DC inputs. There must be at least one PV generator connected to the inverter.

The energy generated can be used for self-consumption in the house grid or is fed into the public grid.



1 Inverter

2 PV generators (number depending on type)

3 Circuit breaker Inverter

4 Digital energy meter (Modbus RTU)
Household consumption (position 1) or grid connection (position 2). Position 2 should be preferred.

5 Main fuse for the house

6 Feed-in meter or smart meter (not in all countries)

7 Public grid

8 Circuit breaker Power consumer

9 Power consumers

10 Communication connection Inverter

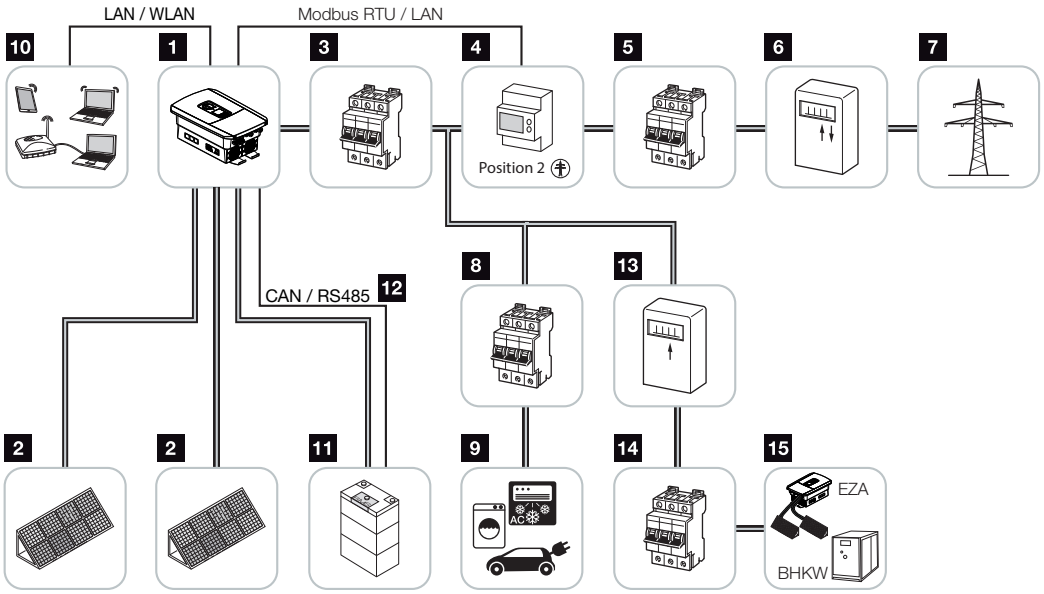
As a hybrid inverter (product extension required)

If the inverter is being used as a hybrid inverter, PV generators and a battery are connected to the inverter.

For the battery to be detected at the DC input for the battery, the ***battery function*** product upgrade must be activated in the inverter using an activation code.

The inverter is used to directly provide energy for self-consumption or to store surplus energy in the battery storage unit. The stored energy can be used for self-consumption in the house grid. Surplus energy that can no longer be stored is fed into the public grid.

In addition, energy from other AC energy suppliers (park controllers), e.g. PV systems, combined heat and power (CHP) units or small wind turbines, can be temporarily stored.



1 Inverter
2 PV generators (number depends on type)
3 Circuit breaker Inverter
4 Digital energy meter (Modbus RTU)
5 Main fuse for house
6 Consumption and feed-in meter or smart meter (not in all countries)
7 Public grid
8 Circuit breaker Electricity consumption
9 Power consumption
10 Communication connection Inverter
11 Battery system connection (optional after activation)
12 Communication connection to battery management system (BMS) via CAN or RS485 (depending on battery system)

13 Feed-in meter AC energy supplier

14 Circuit breaker AC energy supplier

15 AC energy supplier, e.g. CHP, or other generation systems (EZA), e.g. PV inverters (energy from the AC energy supplier can be temporarily stored in the battery)

Product extensions

Product extensions can be activated using activation codes. PLENTICOINs are required for this.

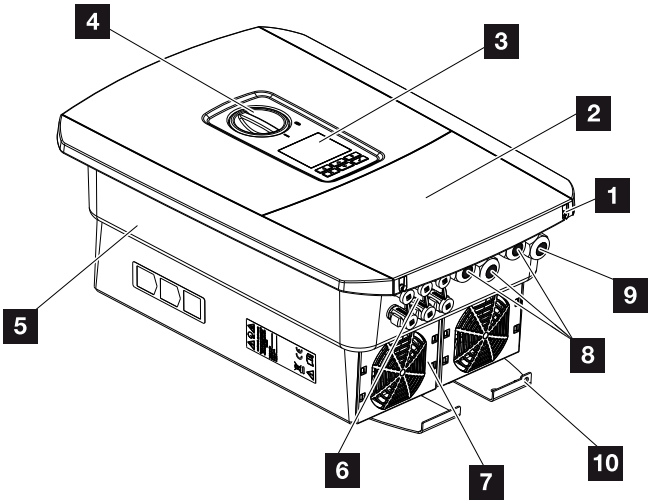
The PLENTICOIN is a single-purpose voucher for product extensions. The PLENTICOIN can be redeemed in the KOSTAL Solar Webshop for the required activation code (e.g. battery extension). The PLENTICOIN is purchased from specialist wholesalers.

The following product extensions are available and can be accessed with the PLENTICOIN in the KOSTAL Solar Webshop:

The product upgrades can then be activated using the KOSTAL Solar App, the inverter display or the inverter Webserver by going to ***Additional options*** and entering the activation code.

- **Battery upgrade**
  Allows a battery to be connected to the DC input for the battery.

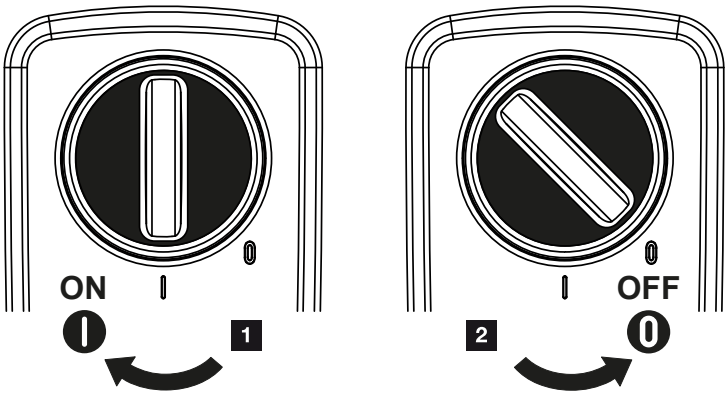
3.3 The inverter



1 Cover screws
2 Cover (terminal compartment)
3 Display
4 DC switch
5 Housing
6 Plug connectors for connecting the PV generators and battery system (battery connection only available after activation)
7 Fan
8 Cable openings for communication
9 Cable opening for mains cable
10 Additional PE connection, outside

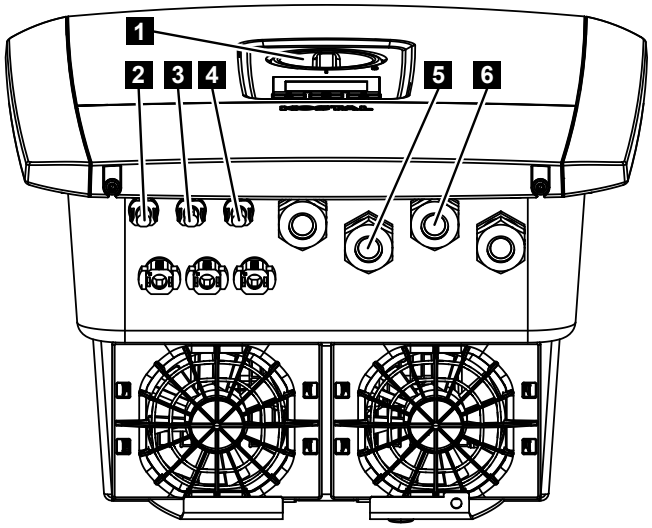
3.4 DC switch on the inverter

The DC disconnect switch can be used to switch the inverter on and off. The disconnect switch can also be locked.



1 Switching on the inverter
2 Switch off the inverter

3.5 The connection panel



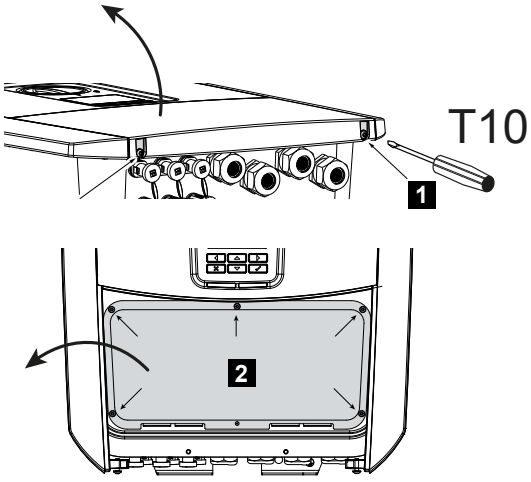
1 DC disconnect switch
2 DC connection 1 for PV generators
3 DC connection 2 for PV generators
4 DC connection 3 for PV generators or a battery storage unit (optional)
5 Cable entry for AC cable
6 Cable entry for communication cables

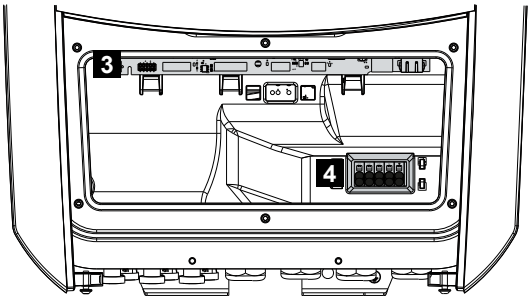
DC inputs

PV generators or a battery storage unit can be connected to the DC inputs.

- Input DC1: For PV generators
- Input DC2: For PV generators
- Input DC3: For PV generators or, optionally, a battery storage system via activation code (product extension)

3.6 The terminal compartment



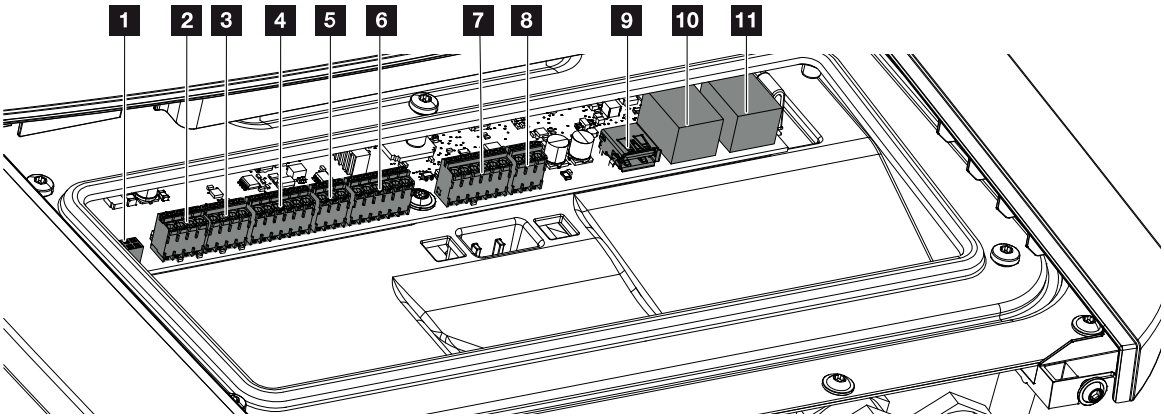


1 Cover screws
2 Screws Connection compartment
3 Interface card (SCB)
4 AC connection terminal

The connection compartment can be opened by pressing the retaining clips together. The connection compartment contains:

- the AC connection terminal,
- the interface card (SCB – Smart Communication Board)

3.7 Smart Communication Board (SCB)



The Smart Communication Board (SCB) is the communication and interface centre. All the connections for communicating with other components can be found on the SCB.

Item	Designation	Terminal	Pin	Explanation
1	Not used	X603		-
2	Digital switched outputs	X1401	1–2	Potential-free switched outputs OUT 1 (NO or NC contact)
			3–4	Potential-free switched outputs OUT 2 (NO or NC contact)
3	Digital switched outputs	X1402	5–6	Potential-free switched outputs OUT 3 (NO or NC contact)
			7–8	Potential-free switched outputs OUT 4 (NO or NC contact)
4	Digital interface terminal for ripple control receiver/external battery control	X401	1	REF (+12 to 14 V supply voltage)
			2	Input 1
			3	Input 2
			4	Input 3
			5	Input 4
			6	COM (0 V ground)
5	Terminal for ripple control receiver CEI for Italy	X403	1	***common ref*** connection
			2	***commando locale*** connection
			3	***signale esterno*** connection

Item	Designation	Terminal	Pin	Explanation
	Terminal for internal circuit breaker for central grid and system protection in accordance with VDE	X403	1	Switching contact connection for central grid and system protection control (-)
			2	--
			3	Switching contact connection for central grid and system protection control (+)
6	Battery communication terminal	X601	1	VDD (+12 to 14 V supply voltage)
			2	CANopen High interface (data +)
			3	CANopen Low interface (data -)
			4	RS485 interface B
			5	RS485 interface A
			6	GND (0 V ground)
7	Connection PIN 5-6 SPD monitor input (evaluation of external surge protection)	X402	1	--
			2	--
			3	--
			4	GND (0 V ground)
			5	PLC monitor
			6	GND (0 V ground)
8	Terminal for energy meter (Modbus RTU)	X452	1	Interface A RS485/Modbus RTU
			2	Interface B RS485/Modbus RTU
			3	GND
9	USB 2.0 interface	X171	1	USB 2.0 max. 500 mA (for service purposes)
10	Ethernet connection (RJ45)	X207	1	RJ45 max. 100 Mbit (LAN connection for connection to a router or other devices, e.g. inverter, KSEM)
11		X206	1	

3.8 Functions

3.8.1 product enhancements

Product extensions can be activated using activation codes. PLENTICOINs are required for this.

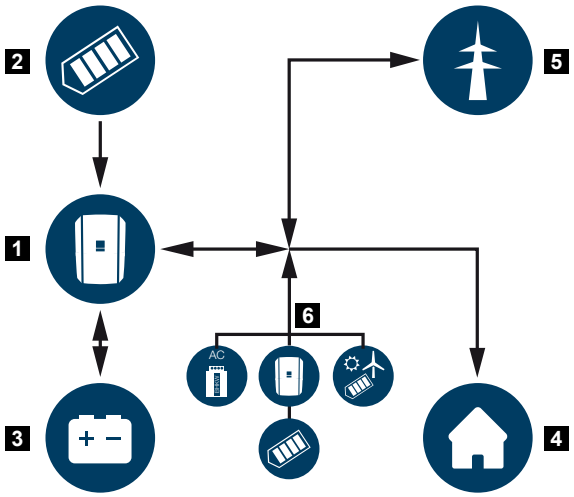
The PLENTICOIN is a single-purpose voucher for product extensions. The PLENTICOIN can be redeemed in the KOSTAL Solar Webshop for the required activation code (e.g. battery extension). The PLENTICOIN is purchased from specialist wholesalers.

The following product extensions are available and can be accessed with the PLENTICOIN in the KOSTAL Solar Webshop:

The product upgrades can then be activated using the KOSTAL Solar App, the inverter display or the inverter Webserver by going to ***Additional options*** and entering the activation code.

- **Battery upgrade**
  Allows a battery to be connected to the DC input for the battery.

3.8.2 Energy management



1 Inverter
2 PV generators
3 Battery
4 Consumers in the house grid
5 Public grid
6 Additional energy sources

The energy management system controls the distribution of energy between the DC side (PV generator) and the AC side (home network and public grid). To do this, the energy management system checks whether there is any consumption in the home network. The logic of the energy management system calculates and controls the optimal use of PV energy. The PV energy generated is primarily used for the consumer's own consumption. The remaining PV energy generated is fed into the public grid and remunerated.

The energy from PV generators is used for the following:

- local consumers
- Charging the battery
- Feed-in to the public grid in case of surplus

The energy from a connected battery is used for the following:

- Local consumers
- Feed-in to the public grid (only possible via external battery control/battery manager)

The energy from the public grid is used for the following:

- Local consumers
- Charging the battery, e.g. to protect the battery in winter or via external battery control/ battery manager.

The energy from additional AC generators is used for the following:

- Local consumers
- Charging the battery
- Feed-in to the public grid in the event of surplus

3.8.3 Recording home consumption

INFO

In order for the home consumption to be displayed, a compatible energy meter must be installed in the house network.

Connecting up an external energy meter (via Modbus RTU) enables the inverter to monitor and optimally control the flow of energy in the home for 24 hours.

- Using energy meter (Modbus RTU) to record house consumption
- 24-hour measurement
- Various types of energy meter can be used

INFO

You will find a list of **approved energy meters** and their purpose in the download area for the product on our website at **https://www.kostal-solar-electric.com**.

3.8.4 Storing energy

If external battery storage is connected to the battery DC input on the inverter (can be released using the battery activation code), the PV energy generated can be stored and accessed later on for self-consumption.

- The connection and battery use at the battery DC input on the inverter must be released beforehand in the inverter. To do this, the battery activation code can be purchased from the online KOSTAL Solar shop.
- You will find a list of approved KOSTAL Solar Electric battery storage systems on our website in the download area for the product.
- By using the smart generation and consumption forecast, usage of the generated energy is optimised beyond simply storing power, while fulfilling all power limitations stipulated by law.

3.8.5 Shadow management

If a connected PV string is partially shaded, e.g. by other parts of the building, trees or power lines, the entire PV string will no longer achieve its optimum performance. The affected PV modules act as a bottleneck, preventing the respective string from achieving a higher output.

The intelligent shade management integrated in the inverter now adjusts the MPP tracker of the selected string so that the PV string can always deliver its optimum performance despite partial shading.

Shadow management can be activated for each string via the web server under ***Service > General > Shadow Management***.

3.8.6 Communication

The inverter provides various interfaces for communication purposes. These establish a connection to other inverters, sensors, energy meters, batteries or a link to the Internet.

- **LAN**
  LAN connects the inverter to the local home network, through which it can then access the Internet and solar portal. In addition, there is a second LAN interface on the inverter's communication board to which another device (e.g. inverter) can be connected.
- **Wifi**
  Via Wifi, the inverter can be connected to a Wifi router located in the local home network, giving it access to the Internet and the solar portal.
- **Wifi access point**
  The inverter offers a Wifi access point for initial commissioning. This can then be used to connect to a smartphone or PC and carry out the initial commissioning via the web-based installation wizard.
- **WLAN bridge**
  If there are several KOSTAL inverters in a system, the inverter can be used as a WLAN bridge to the existing WLAN router. Additional inverters, energy meters or battery storage can be connected to this inverter using LAN cables to establish the connection to the local home network and the Internet.
- **RS485/Modbus (RTU)**
  Energy meters are connected to the Modbus interface and record the flow of energy within the house.

Secure communication

As with all devices that are connected to the Internet, all data transferred externally by the inverter is only transferred in encrypted form.

- **Security concept**:
  Encrypted transfer of data to the solar portal
- Data encryption in line with AES and SSL standards

3.8.7 Ripple control receiver / smart meter gateway

Once the system reaches a certain size, which may vary from one country to the next, the use of a ripple control receiver is mandatory. In some instances, the energy supplier also requires a smart meter gateway to be installed.

Contact your energy supplier for more information.

If a smart meter gateway is fitted in your house installation, the inverter can be connected to the smart meter gateway using a control box. The control box is connected to the inverter like a ripple control receiver.

For more information, see **Active power control, Page 241**

3.8.8 Central grid and system protection

Central grid and system protection is required in some countries. This monitors the voltage and frequency in the grid and in the event of a fault, shuts down the photovoltaic systems by means of a circuit breaker.

If your energy supplier requires central grid and system protection for your system, install an external monitoring device, which switches off the inverter via a normally closed contact. An additional circuit breaker is not needed because the shutdown is ensured by the double internal switches in the inverter.

3.8.9 Self-consumption control

To make the best possible use of the PV energy generated, self-consumption should be prioritised. To do this, the inverter allows consumers to be connected to it via an external relay. The consumers can then be switched on when there is sufficient PV power and thereby access the PV energy generated at that point in time.

For more information, see **Switched outputs, Page 224**.

3.8.10 External battery control

The inverter has a charge/discharge management system that can be configured via the web server under ***Battery > Battery settings***.

Here, among other things, the ***external battery control*** can be activated, which then implements the specifications of your energy supplier or other service providers, for example.

The external provider has access to the inverter's charge/discharge management system via the external battery management system. The provider can control this, for example, so that the battery energy can be used for domestic consumption or fed into the public grid to stabilise the grid (peak shaving) or provide grid services (primary control power).

INFO

The system installer is responsible for the correct selection and installation of the meter structure in the home network. The specifications of the energy supplier must be observed here.

The system owner is responsible for the correct use and selection of internal or external charging/discharging management.

3.8.11 Smart battery control

Applies to PLENTICORE plus G2 from software version 02.20.

The inverter has an intelligent generation and consumption forecast (intelligent battery control) which, in conjunction with a connected energy storage system, optimally supplies the generated electricity to consumers in your own household.

By using this feature, the majority of the energy produced can be used by the consumer themselves, thus helping to reduce electricity procurement costs.

The intelligent battery control recognises and takes into account the times of day when the most energy is needed in the household. The system then independently derives forecasts of how household consumption will develop in the future and regulates the charging or discharging of the battery accordingly.

This ensures that as much of the energy produced as possible is consumed by the household itself and that as little energy as possible is fed unused into the public grid.

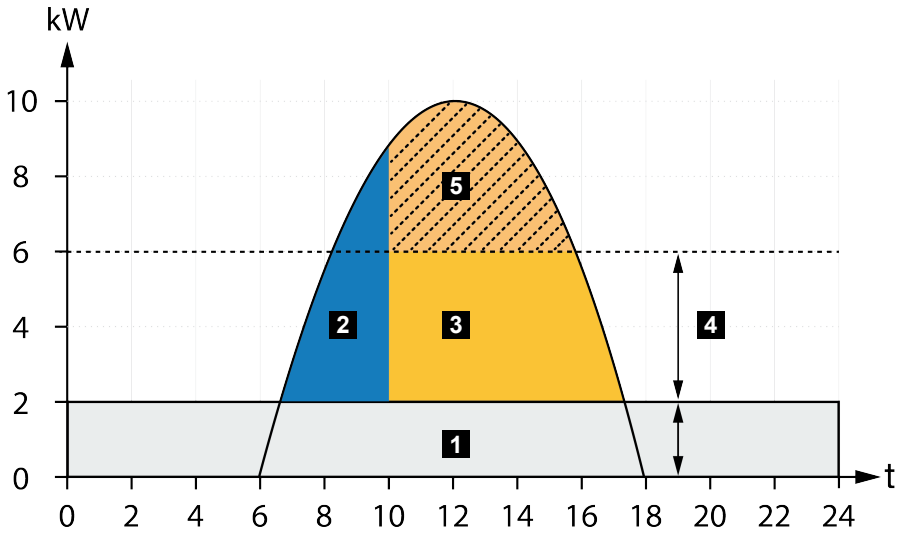
This function should not be used if an electric vehicle is also being charged via the domestic grid. In this case, it is not possible to determine a clear consumption forecast.

With the help of the intelligent generation and consumption forecast, the use of the generated energy is optimised beyond simple electricity storage, while at the same time complying with all legally prescribed power limitations (e.g. 60% EEG regulation).

Intelligent battery control should only be activated if curtailment has been activated in the inverter. This means that the connected PV power at the inverter must be greater than the power that the inverter feeds into the grid.

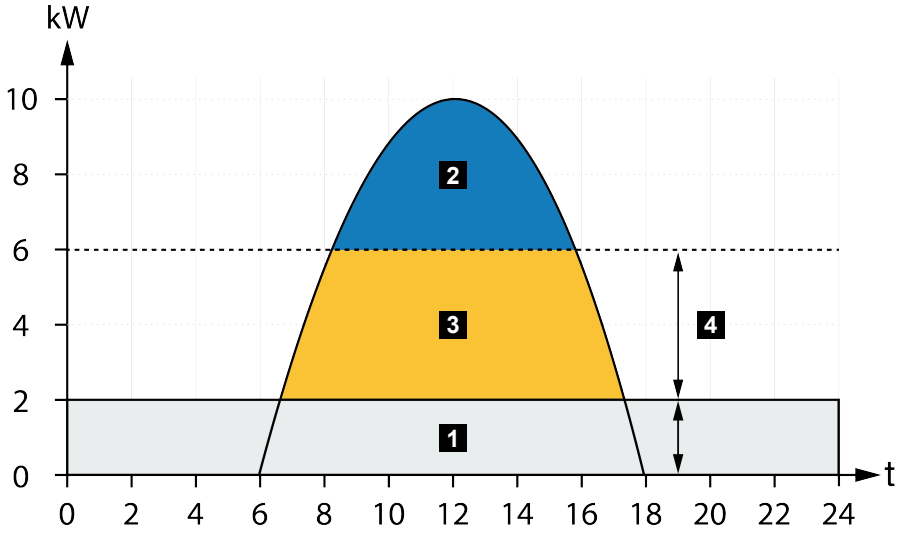
If the storage of excess AC energy from local generation (***Smart AC Link function***) has been activated, the ***Intelligent Battery Control*** function is not available.

Example of control without intelligent battery control



1 Home consumption (own requirement)
2 Battery charge
3 Feed-in to the public grid
4 Power limitation of feed-in to e.g. 50%
5 Unused PV energy

Example of control with intelligent battery control



1 Home consumption (own requirement)
2 Battery charge
3 Feed-in to the public grid
4 Power limitation of feed-in to e.g. 50%

The figure ***Control without intelligent battery control*** shows that without intelligent battery control, the PV energy generated remains unused, especially when there is high solar radiation, e.g. due to a power limitation of 50%.

With intelligent battery control and generation and consumption forecasting, the battery is only charged when the surplus energy cannot be consumed in the home network or fed into the public grid. This means that the PV energy generated is used sensibly or stored in the battery.

As a result, consumers increase their self-consumption and degree of self-sufficiency.

3.8.12 The Webserver

The Webserver is the graphic interface (displayed in the browser, e.g. Firefox, Microsoft Edge or Google Chrome) for querying and configuring the inverter.

The Webserver provides the following functions:

- Logging in to the device
- Querying the status
- Current power values for the PV generators
- Present consumption values
- Current values of grid connection (e.g. feed-in, consumption)
- Statistics
- Using the self-consumption terminal
- Displaying log data
- Displaying current version (e.g. software, firmware, hardware)
- Configuring the device
  (e.g. software update, enabling options, battery configuration, network settings, activating solar portal, implementing settings specified by the energy supplier, etc.)

3.8.13 The data logger

A data logger is integrated in the inverter. The data logger is a data storage system, which collects and stores the yield and performance data of the inverter and the storage system. Yield data is saved every 5 minutes.

INFO

Once the storage time has elapsed, the oldest data is always deleted.

For long-term backup, the data must be backed up with a PC or sent to a solar portal.

Saving interval	Storage time
5 minutes	Max. 365 days

For more information, see **System monitoring, Page 257**.

3.8.14 Event codes

There is no need to take action when an event occurs occasionally or only briefly and the device resumes operation afterwards. If an event persists or recurs frequently, the cause must be determined and rectified.

A list of the current event codes and measures can be found in the document **Ereignisliste/Event list**, which can be found in the **download area** for your product.

3.8.15 Service concept

The inverter includes smart monitoring. If an event occurs during operation, an event code is shown on the display and in the Webserver.

In a service scenario you, as the operator of the system, can read off the message and contact your installer or service partner.

3.8.16 KOSTAL Solar Terminal

The KOSTAL Solar Terminal is the central gateway for you as a user. You can find the KOSTAL Solar Terminal on our website or at this link:
https://terminal.kostal-solar-electric.com.

KOSTAL Solar Terminal

The KOSTAL Solar Terminal is a central hub for various applications. To use them, you have to register once. You will then be given a user account for all the applications offered in the KOSTAL Solar Terminal. You can find more information on our website **https://www.kostal-solar-electric.com**.

If you have already registered for the KOSTAL Solar Terminal, you can sign in using your user details.

You have the following applications available to you, depending on your user role:

- KOSTAL Solar Portal
- Online KOSTAL Solar shop
- KOSTAL Solar Plan
- Smart Warranty activation
- Solar repower check

3.8.17 KOSTAL Solar Portal

The KOSTAL Solar Portal is a free online platform for monitoring the PV system.

The Solar Portal enables the operation of the inverter to be monitored via the Internet. For this purpose, the inverter sends the PV system's yield data and event messages to the solar portal via the Internet.

The information is then stored in the solar portal. You can view and call up this information via the Internet.

This means that the KOSTAL Solar Portal protects your investment in a PV system from yield losses, e.g. by actively warning you by e-mail when an event occurs.

Register for the KOSTAL Solar Portal free of charge using the KOSTAL Solar Terminal at **https://terminal.kostal-solar-electric.com**.

KOSTAL Solar Terminal

The Solar Portal has the following functions:

- Worldwide portal access via the Internet
- Graphic representation of the power and yield data
- Visualisation of data and thus being made aware of how to optimise self-consumption
- Notification of events by e-mail
- Data export
- Sensor evaluation
- Display and proof of a potential active power reduction by the grid operator
- Storage of log data for long-term and reliable monitoring of your PV system
- Providing system data for the KOSTAL Solar App

Prerequisites for using the Solar Portal:

- The inverter must have a connection to the Internet.
- Data transfer to KOSTAL Solar Portal must be activated in the inverter.
- The inverter must not be assigned to any other PV system in the KOSTAL Solar Portal.
- The inverter must be assigned to your PV system in the KOSTAL Solar Portal.

You can find more information about this on our website **www.kostal-solar-electric.com**.

KOSTAL Solar Electric

3.8.18 The KOSTAL Solar Plan layout software

Our free KOSTAL Solar Plan tool makes the inverter layout easier for you.

Register for KOSTAL Solar Plan free of charge using the KOSTAL Solar Terminal at **https://terminal.kostal-solar-electric.com**.

Just enter the system details and individual customer details and receive a recommendation for a suitable KOSTAL solar inverter for the planned solar system. All KOSTAL solar inverters are considered for this. In addition, the customer's electricity consumption is considered and the potential self-consumption and self-sufficiency quotas are displayed using standard load profiles.

The KOSTAL Solar Plan covers the following areas of the inverter layout:

- ***Rapid layout***
  Manual inverter layout taking account of the inverter specifications.
- ***Standard layout***
  Automatic inverter layout with possible consideration of power consumption.

As well as providing an improved inverter layout, the KOSTAL Solar Plan also supports in preparing quotations. Customer, project and installer details can be added to the technical data entered by the user and included with the quotation as a PDF overview.

You can find additional information on our website **www.kostal-solar-electric.com** in the ***Installer portal*** area.

KOSTAL Solar Terminal

3.8.19 KOSTAL Solar App

The free KOSTAL Solar App offers you professional monitoring of your photovoltaic system. You can use the KOSTAL Solar App to access all the functions on your smartphone or tablet at any time.

To set up and use the app, you will need access to the KOSTAL Solar Terminal and the KOSTAL Solar Portal and to have an inverter set up there. To log in to the app, use the same login details as for the KOSTAL Solar Terminal.

You can use the KOSTAL Solar App to monitor your photovoltaic system and view relevant system data both at home and when you are out and about. It allows you to access the consumption and generation data over various time periods, such as day, week, month and year, and to view your photovoltaic system's historical data. This means that with the KOSTAL Solar App you are always up to date.

Download the free KOSTAL Solar App today and benefit from new and advanced functionalities.

Additional information about this product is available on our website **www.kostal-solar-electric.com** under ***Products > Tools and applications > KOSTAL Solar App***.

3.9 The inverter's internal protective functions

The following protective functions are implemented in the inverter.

- Insulation monitoring
- Residual current monitoring

WARNING

Issues with the inverter's protective function

Some protective functions, such as insulation monitoring and residual current monitoring, may be affected by high capacities of the PV generator to earth.

These protective functions have been proven for a total capacity of the PV generator and battery to earth of 10µF. If the PV generator has a higher capacity to earth, there are no assurances that these protective measures will work properly.

WARNING

Electric shock or risk of fire originating from connected device!

If the protective functions output an error, there is a potential risk of fire or electric shock originating from the connected devices. The error must therefore be rectified immediately and this may only be done by qualified maintenance staff.

The protective functions are not affected by external blocking diodes.

Please check the setup specifications and standards valid locally to establish whether additional protective measures are required on site.

Insulation monitoring

Before connecting to the grid, the inverter checks the insulation of the entire PV generator and battery to earth.

If this resistance falls below the limit of 100 kΩ, this is displayed as an insulation fault.

- ***The inverter reports an "insulation resistance" event.***

For as long as the error persists and the insulation resistance is too low, the inverter does not connect to the grid.

This protective function cannot be configured or deactivated.

Residual current monitoring

The inverter monitors the leakage current of the PV generator, including the battery, as soon as it is connected to the grid.

The internal residual current monitoring is AC/DC sensitive and corresponds to a type B RCD.

Residual current monitoring fulfils the following protective functions.

Fire prevention

If the residual current exceeds a value of 300mA, the inverter shuts down within 300ms.

- ***The inverter reports an "insulation monitoring" or "residual current too high" event.***

Before switching on again, the inverter checks the insulation to earth. If the insulation monitoring also detects an error or the insulation monitoring event occurs on a frequent basis, this may indicate that the insulation is damaged. The damage must be repaired immediately by qualified maintenance staff.

This protective function cannot be configured or deactivated.

Protection from electric shock

An electric shock usually leads to an erratic increase in residual current. The inverter detects erratic residual currents and, depending on the size of the increase, shuts down within the following times:

Sudden change in residual or earth fault current [mA]	Maximum response time [s]
30	0.3
60	0.15
90	0.04

- ***The inverter reports an "insulation monitoring" or "residual current too high" event.***

Before switching on again, the inverter checks the insulation to earth. If the insulation monitoring also detects an error or a **residual current too high** event occurs on a frequent basis, this may indicate that the insulation is damaged. The damage must be repaired immediately by qualified maintenance staff.

This protective function cannot be adjusted or deactivated.

Monitoring the DC element of the leakage current

If the DC element of the leakage current is too large, it may impair the function of upstream type A RCDs.

If the ***Compatibility of RCD type A*** function is active (default setting), the inverter also monitors the DC leakage current. If the DC leakage current reaches a value that may jeopardise the function of an upstream type A RCD, the inverter shuts down.

- ***The inverter reports a "DC residual current" event.***

Before switching on again, the inverter checks the insulation to earth. If the insulation monitoring also detects an error, this may indicate that the insulation is damaged. The damage must be repaired immediately by qualified maintenance staff.

However, depending on the PV generator used, a high DC leakage current may be totally normal. In this case, once the system has been checked by qualified staff, this monitoring can be deactivated once it has been ensured that all upstream RCDs are type B RCDs.

3.10 Making product data accessible

As per ***Data Act - Regulation (EU) 2023/2854 - Article 3 - Obligation to make product data and related service data accessible to the user***, information about stored data must be made accessible to users.

For PLENTICORE, the data is created and saved as follows.

The product generates the following data

The type, format and estimated scope of product data the networked product can generate;

- Log data about the inverter's Webserver:
  CSV format, size 40 kB .. 5 MB
- Access to log data using KOSTAL Solar Portal:
  XML format, size 2 .. 50 kB, every 15 minutes

Information about generating data

Data is generated as follows.

- Data is continuously generated and visualised
- Data will be continuously provided by Modbus protocol with an update cycle of one second.

Storing data on other devices

Specification as to whether the networked product is able to store data on a device or a remote server, including the intended archiving period where applicable;

- Log data is averaged locally over a period of five minutes and stored for 1.5 years
- If portal transfers are enabled, the data is transferred to external servers.

Data access

This section specifies how to access data or delete it if required, including the associated technological means as well as the applicable Terms and Conditions of Use and the applicable service quality.

- The log data can be downloaded via the inverter's integrated Webserver or via the appropriate inverter app.
- The log data can be deleted using the ***Reset User Settings*** function.
- It is also possible to download log data using the **KOSTAL Solar Portal**, providing portal data transfer has been enabled.

4. Transport and scope of delivery

4.1 Transport and storage

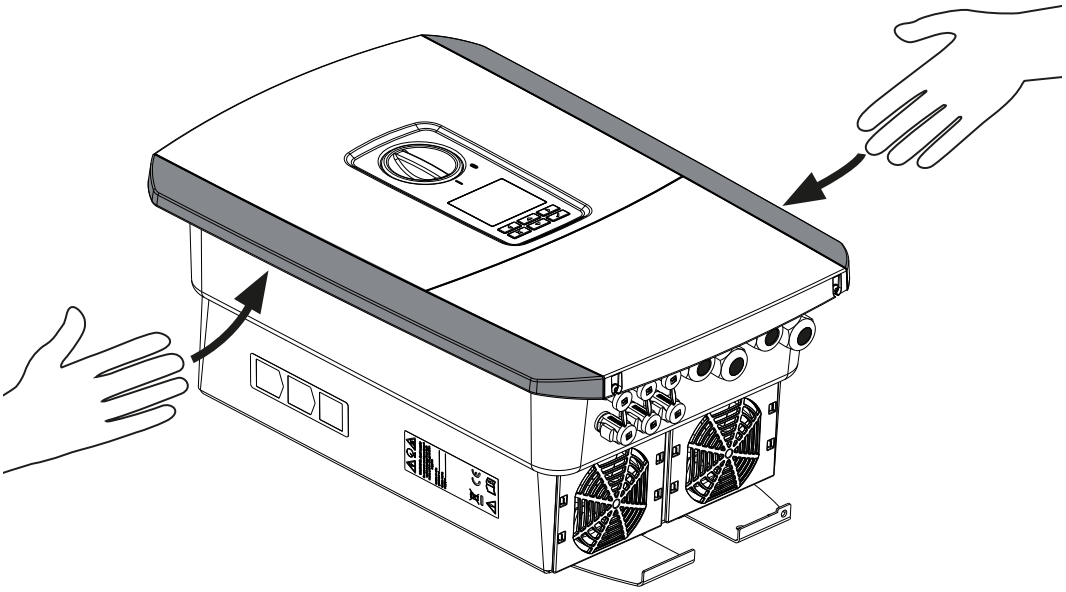
The function of the inverter has been tested and it has been carefully packaged prior to delivery. Upon receipt, check the delivery for completeness and any transport damage.

POSSIBLE DAMAGE

Potential risk of damage when setting the inverter down. Whenever possible, place the inverter on its back after unpacking.

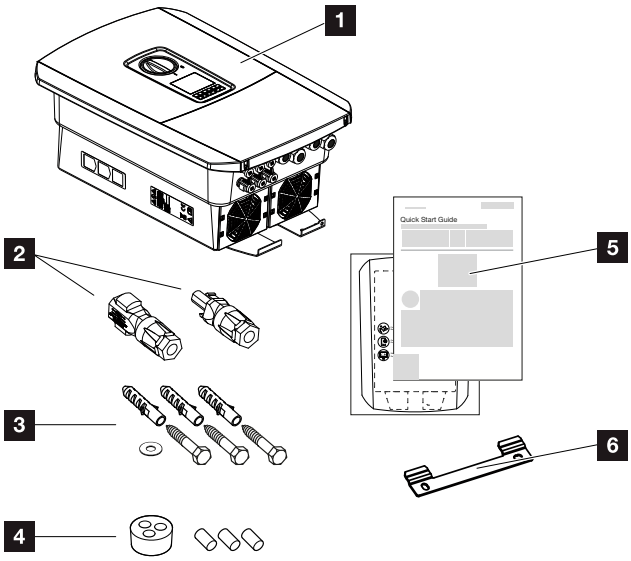
Complaints and damage claims are to be directly addressed to the shipping company.

If stored for a longer period before installation, all inverter components must be kept dry and dust-free in the original packaging.



For enhanced inverter transport, use the grip strips on the left and right side of the inverter.

4.2 Scope of delivery



1 Inverter
2 DC plug connector (each DC input: 1× plug, 1× socket)
3 3× screws 6×50 with screw anchor S8 and 1× washer
4 Plug seals for the cable gland of the network and signal cables
5 Short manual and drilling template
6 Wall mount

5. Installation

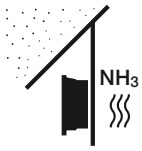
5.1 Selecting the installation site

Observe these instructions when selecting the installation site so that you select the correct one.

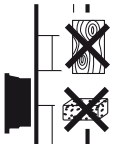
Protect inverter against exposure to direct sunlight.

Protect inverter from rain and splash water.

Protect inverter from falling parts which could enter the inverter's ventilation openings.



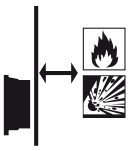
Protect the inverter against dust, contamination and ammonia gases. Rooms and areas containing livestock are not permitted as installation sites.



Mount inverter on a stable installation surface that can safely bear the weight. Plasterboard walls and wood planking are not permitted.

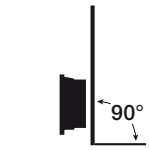
Mount inverter on a non-flammable installation surface.

WARNING! Some of the inverter components can reach temperatures of over 80 °C during operation. Select the installation site in accordance with the information provided in these instructions. Ensure that ventilation openings are always kept clear.

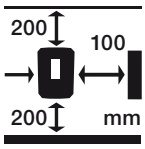


A sufficient safety distance from flammable materials and potentially explosive areas in the vicinity must be ensured.

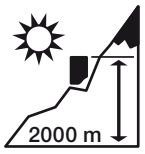
Inverters can cause noise when in operation. Install inverter in a way that prevents people from being disturbed by operation noises.



Mount inverters on vertical installation surfaces.



Maintain minimum distances and the necessary clearance.

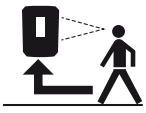


Inverter may only be installed up to an altitude of 2000 m.

The ambient temperature must be between -20 °C and +60 °C.

The air humidity must be between 4 % and 100 % (condensing).

Install inverters so that they are not accessible to children.



Inverters must be easily accessible and the display clearly legible.

5.2 Installation site for Wifi connection

The inverter can be connected to the Internet by WLAN. Make sure that there is also a good connection to the Wifi router at the installation site. Changing the installation location at a later date involves a lot of effort. The range is approx. 20-30 m. Walls reduce the range considerably.

The following points should be noted:

- Check in advance, e.g. with your mobile device, whether there is sufficient Wifi reception at the installation site.
- Measure the field strength. This should be as high as possible.
- If necessary, use repeaters to improve Wifi reception at the installation site.

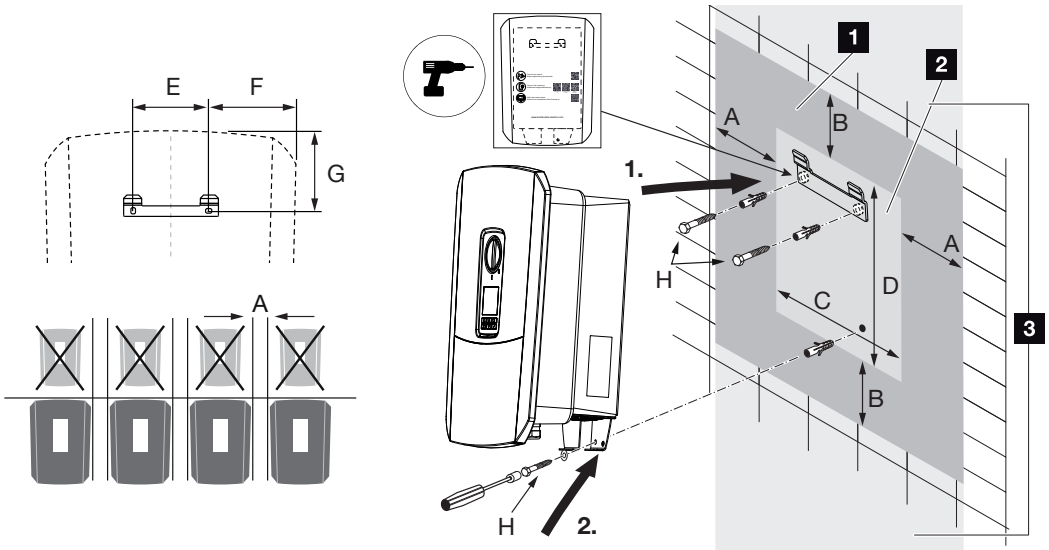
5.3 Wall mounting

IMPORTANT INFORMATION

Be absolutely sure to maintain the clearance around the inverter in order that the inverter remains cool.

IMPORTANT INFORMATION

To install the inverter, use the wall mount with two retaining bolts (included in scope of delivery) that are suitable for the substrate. Fix the inverter to the wall at the bottom using a third bolt and washer (included in scope of delivery).



1 Clearance

2 Outer dimensions of the inverter

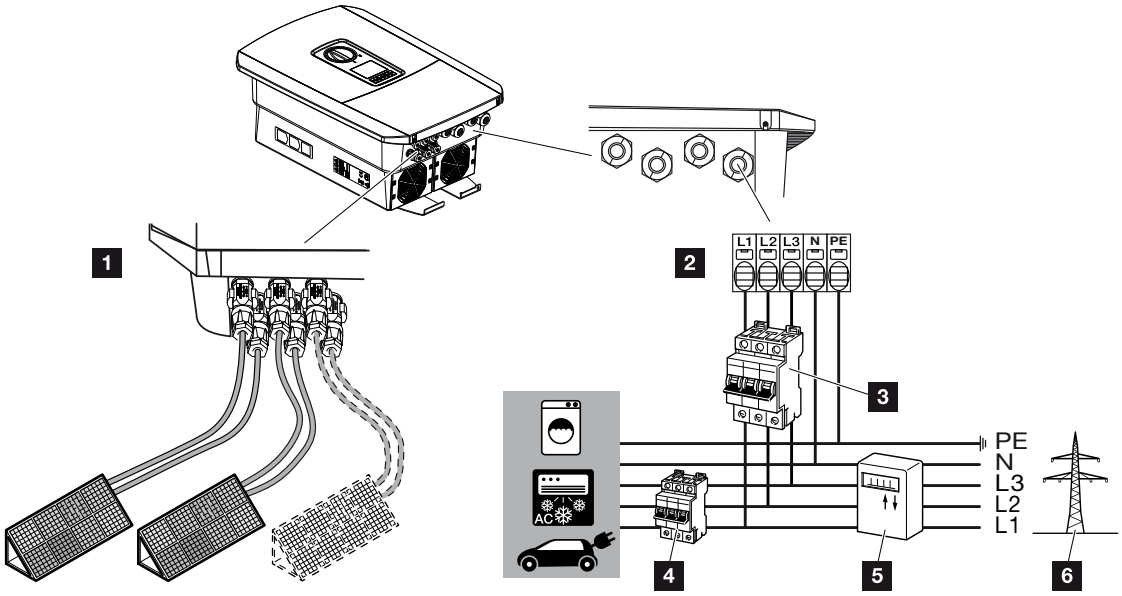
3 No other inverters may be mounted above or below the inverter.

The necessary dimensions for wall mounting and distances can be found in the table below. Use the drilling template supplied:

Dimensions in mm							
A	B	C	D	E	F	G	H
100	200	406	563	122	141	128	min. DIN571 A2-70 6×50

6. Electrical connection

6.1 Electrical connection



IMPORTANT INFORMATION

This product may cause direct current in the external protective earth conductor. A type A or B ≥ 300 mA residual current device (RCD) can be used on the AC side. The use of a type A RCD is enabled in the web server under ***Service*** > ***General*** > ***External hardware settings*** > ***Residual current devices***. (Default setting: RCD type A enabled).

1 Connections Inverter: DC connections

2 Inverter connections: AC connection terminal

NOTE! Ensure that the phase assignments of the AC connection terminal and the phases in the house network are consistent.

3 External connections: Circuit breaker inverter

4 External connections: Consumer circuit breaker

5 External connections: Energy meter

6 External connections: Public grid

6.1.1 Connecting the mains cable

1. Disconnect the house network from the power supply.

DANGER

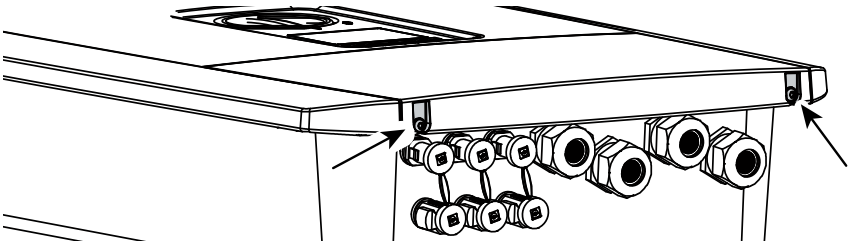
Risk of death due to electrical shock and discharge!

De-energise device and secure against being switched on again. **De-energising the inverter, Page 269**

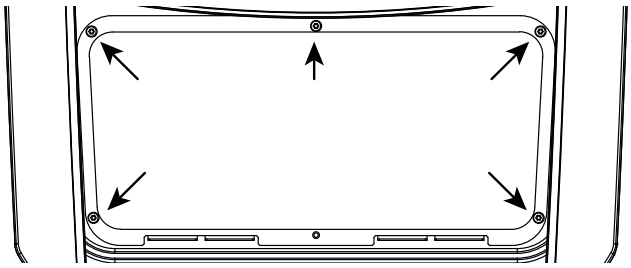
2. Secure the house fuses against being switched back on.
3. Switch the DC switch on the inverter to ***Off***.
4. Remove the screws from the lower cover and take off the cover.

IMPORTANT INFORMATION

When working inside the inverter, only use insulated tools to prevent short circuits.



5. Remove the screws from the connection compartment and take off the cover.



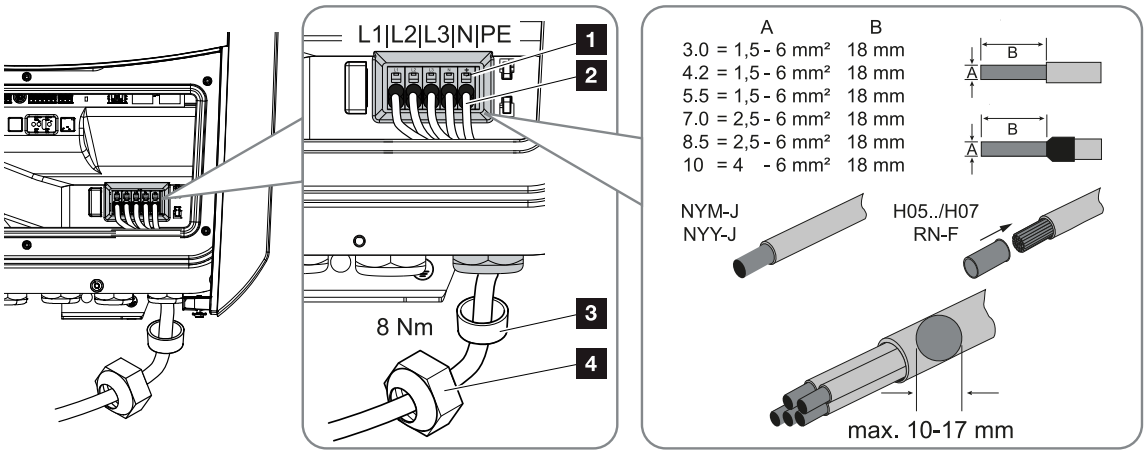
6. Lay the power cable from the power distributor to the inverter in a professional manner.

IMPORTANT INFORMATION

For the dimensioning of the required AC circuit breaker, see Technical data.

Single-core cables (type NYY-J or NYM-J) without ferrules can be used with the AC connection terminal.

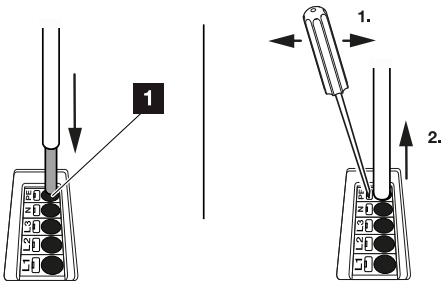
When using fine-stranded cables (type H05../H07RN-F), wire end ferrules must be used. Ensure that the contact length is 18 mm.



7. Insert the mains cable (2) into the inverter and seal it with the sealing ring (3) and union nut (4). Tighten the union nut to the specified torque. Tightening torque: 8 Nm (M25).
8. Leave the sealing ring in the screw connections that are not being used.
9. Connect the wires of the mains cable to the AC connection terminal (1) according to the labelling.

IMPORTANT INFORMATION

The inverter has spring-loaded terminal strips for connecting the AC cables. Insert the wires into the large round openings (item 1) of the connection terminal. The stripping length is 18 mm. Use wire end ferrules for stranded cables.



10. Install a circuit breaker in the grid connection cable between the inverter and the feed-in meter to protect against overcurrent.

CAUTION

Risk of fire due to overcurrent and heating of the mains cable

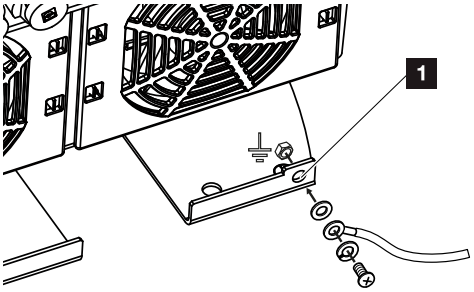
If mains cables are too small, they can heat up and cause a fire.

- Use a suitable cross-section.
- Install line circuit breaker to secure against overcurrent.

IMPORTANT INFORMATION

This product may cause direct current in the external protective earth conductor. A type A or B ≥ 300 mA residual current device (RCD) can be used on the AC side. The use of a type A RCD is enabled in the web server under ***Service*** > ***General*** > ***External hardware settings*** > ***Residual current devices***. (Default setting: RCD type A enabled).

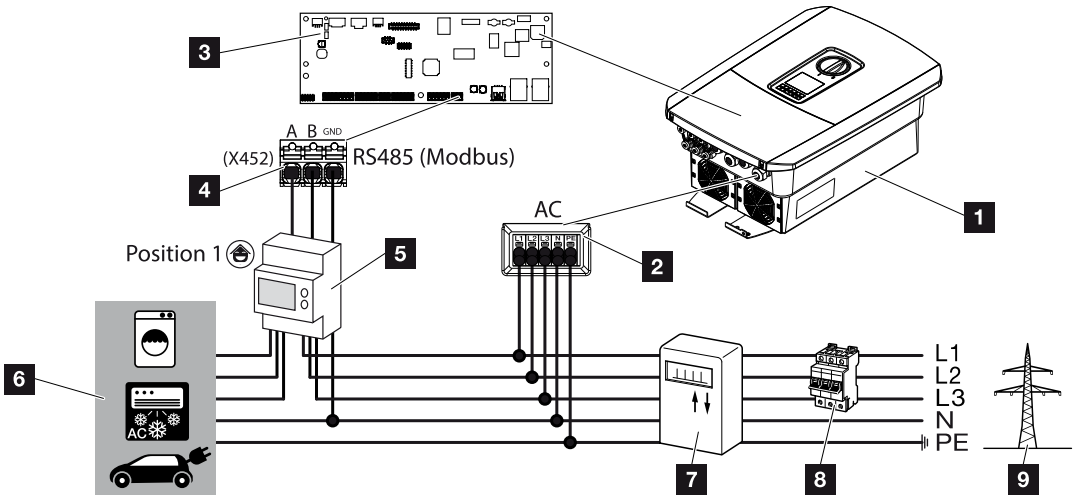
1. In countries where a second PE connection is required, connect it to the marked location on the housing (outside).



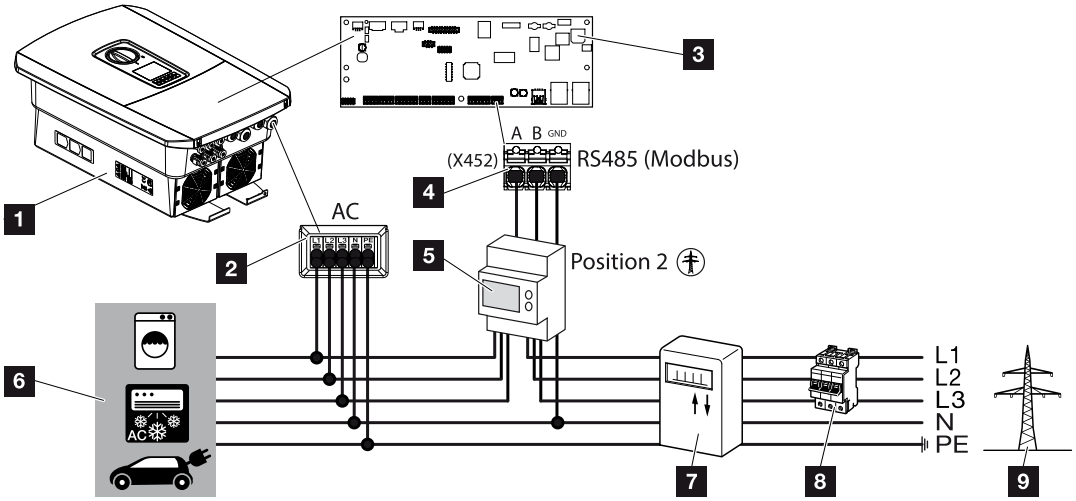
✓ The AC connection is now complete.

6.2 Energy meter connection

Wiring diagram for energy meter – house connection (position 1)



Wiring diagram for energy meter – grid connection (position 2)



1 Inverter
2 Inverter – AC terminal
3 Smart Communication Board
4 Terminal for energy meter
5 Digital energy meter (Modbus RTU)
6 Consumer device

7 Purchase and feed meter or smart meter
8 Line fuse for house
9 Public grid

6.2.1 Connecting energy meter

The energy meter is installed on a top-hat rail in the meter box or the main distributor.

INFO

Only energy meters which have been approved for the inverter by KOSTAL Solar Electric may be used.

You will find an **up-to-date list of approved energy meters** in the download area for the product on our website.

The energy meter can be fitted in 2 positions in the house network (position 1 = home consumption, position 2 = grid connection point). Both installation positions are possible, but position 2 is preferable. The installation position is queried and set in the installation wizard or can be set in the Webserver.

The diagram only provides one example because the connections may differ depending on the energy meter used.

1. De-energise the house grid.

DANGER

Risk of death due to electrical shock and discharge!

De-energise device and secure against being switched on again. **De-energising the inverter, Page 269**

2. Fit the energy meter on the top-hat rail in the control cabinet or power distributor.
3. Correctly route the communication cable from the inverter to the control cabinet and connect to the energy meter following the wiring diagram provided by the manufacturer.

INFO

The communication cable is subject to the following requirements:

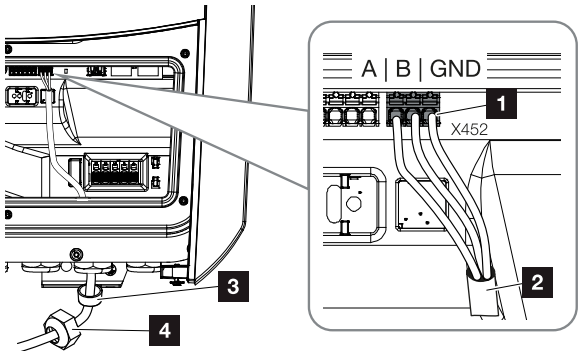
Conductor cross-section from 0.25 to 1.5 mm^2

Max. length 30 m

Length of stripped insulation 8 mm

Observe the specifications for cable cross-sections in the instructions for the energy meter.

4. Connect communication cable in inverter to terminal for energy meter.

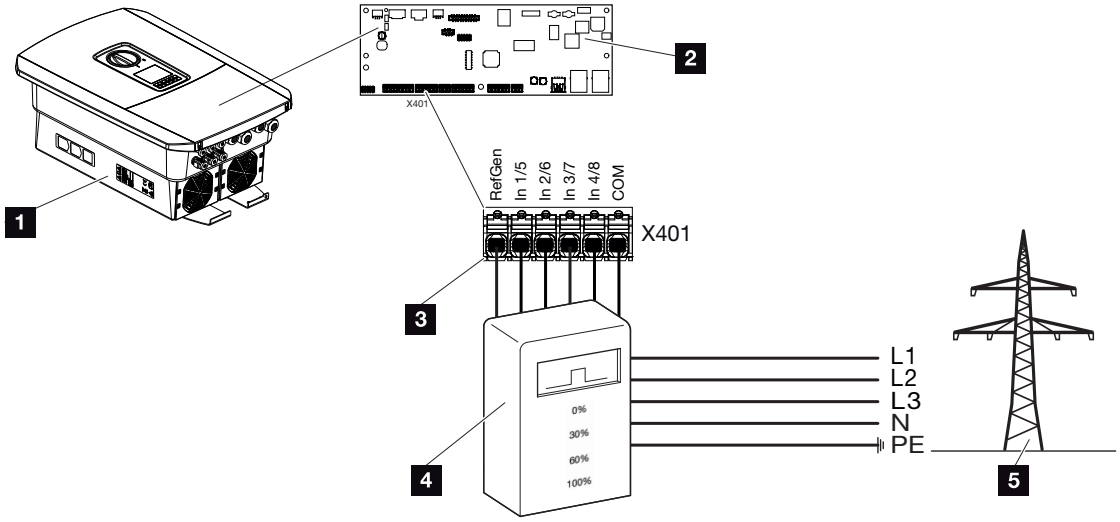


1 Terminal for energy meter (Modbus RTU)
2 Communication cable to energy meter
3 Sealing ring
4 Union nut

✓ The energy meter is connected.

The type of energy meter used is selected when the inverter is first installed or can be set using the inverter menu or Webserver.

6.3 Connecting ripple control receiver



1 Inverter
2 Smart Communication Board (SCB)
3 Control line for ripple control receiver
4 Ripple control receiver
5 Energy supply companies

Some energy supply companies (EVU) offer owners of PV systems the option of regulating their system via variable active power control, thereby increasing the feed-in to the public grid by up to 100%.

INFO

In some applications, a compatible energy meter may be seen as an attractively priced alternative to the ripple control receiver. Here the feed-in may well be limited by the energy supply company, but the inverter controls the flow of energy (self-consumption in house grid and feed-in to the public grid) in such a way that the self-produced energy is not lost or loss is kept to an absolute minimum.

Dynamic active power control can be activated in the inverter to this end. **Active power control, Page 241**

Ask your energy supply company or installer which application rule applies to you or whether another alternative (e.g. smart meter) is more suitable for you.

If a ripple control receiver is already connected to another KOSTAL inverter in the home network, it is possible to use the control signals from this ripple control receiver. To do this, the reception of broadcast control signals must be activated in the web server under ***Service*** > ***General*** > ***Grid connection***.

6.3.1 Overview of ripple control receivers Standard connection

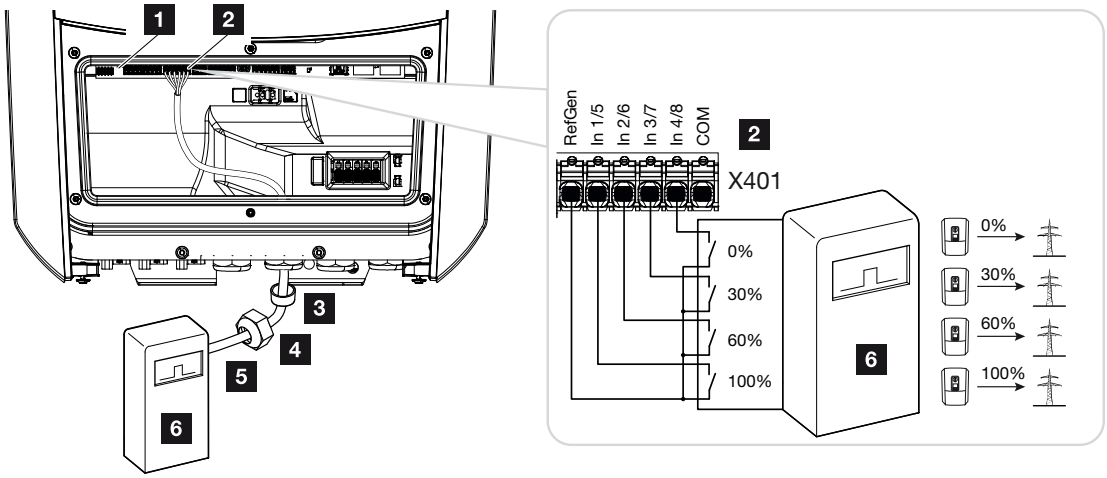
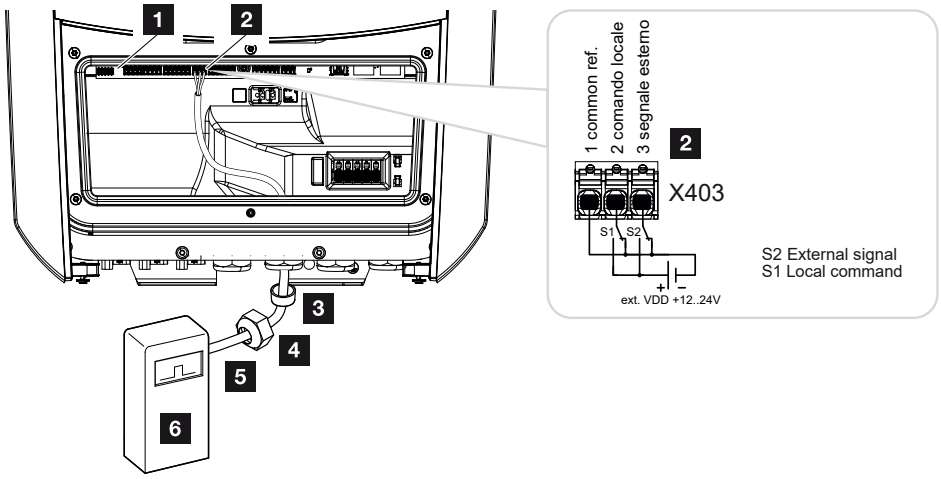


Fig. 1: Electrical connection for ripple control receiver

1 Smart communication board
2 Connection terminal
3 Sealing ring
4 Cap nut
5 Control line
6 Ripple control receiver

6.3.2 Overview of ripple control receivers Connection via CEI control signals for Italy

For Italy, the ripple control receiver is connected as follows.



1 Smart Communication Board
2 Terminal
3 Sealing ring
4 Union nut
5 Control line
6 Ripple control receiver

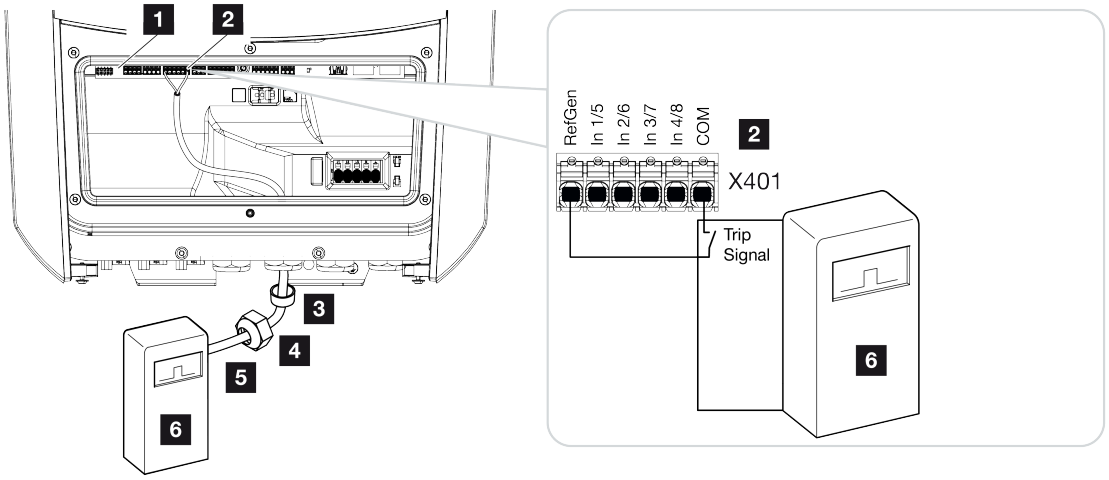
INFO

For Italy (standard CEI0-21), there must be no voltage applied to terminal X403 (VDD).

Connection to an external voltage source and a changeover switch to GND is mandatory here.

6.3.3 Overview of ripple control receivers Connection via trip control signal

If the inverter is to be controlled by the energy supplier via an external trip control signal, this is connected to the inverter as follows. No further settings are required in the inverter's Webserver for this function.



1 Smart Communication Board
2 Terminal
3 Sealing ring
4 Union nut
5 Control line
6 Ripple control receiver from the energy supply company with trip signal

6.3.4 Connecting ripple control receiver/control box

DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

INFO

The signal cable is subject to the following requirements:

Conductor cross-section from 0.2 to 1.5 mm^2

Max. length 30 m

Length of stripped insulation 8 mm

Observe the specifications for cable cross-sections in the manufacturer's instructions.

Perform the following steps:

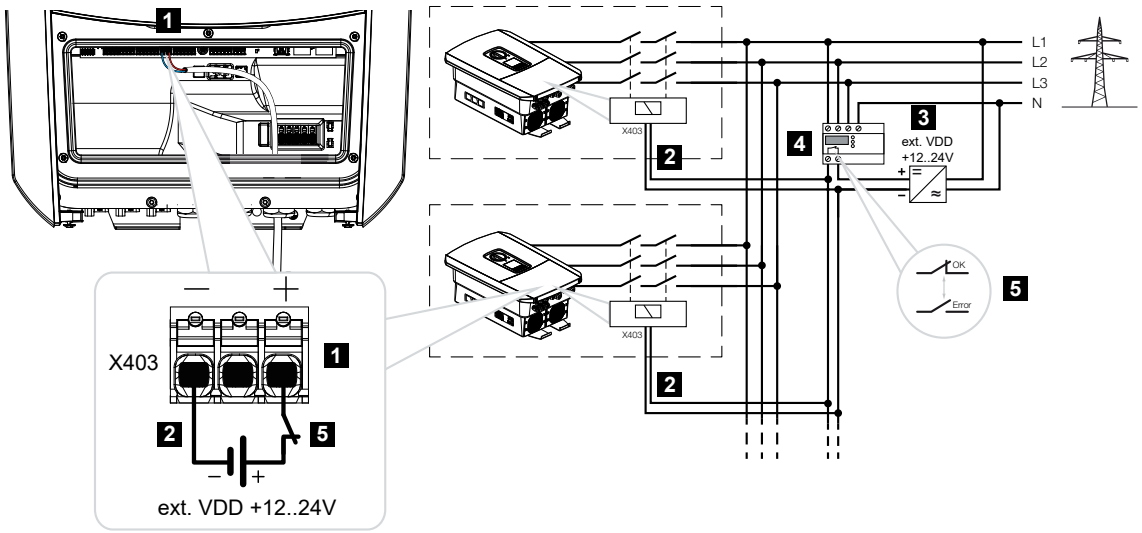
1. Switch the DC switch on the inverter to ***OFF***.
2. De-energise the house grid and secure it against being switched back on.
3. Fit ripple control receiver in control cabinet or power distributor.
4. Correctly route the communication cable from the inverter to the control cabinet and connect to the ripple control receiver following the wiring diagram provided by the manufacturer.
5. Connect communication cable in inverter to terminal for ripple control receiver.
6. Once the inverter has undergone initial commissioning, the ripple control receiver must be configured in the Webserver. Forwarding of the ripple control receiver's signals (distribution of broadcast control signals) to other inverters in the same house grid can also be activated.

✓ The ripple control receiver is connected.

6.4 Connecting central grid and system protection

Central grid and system protection is required in some countries. This monitors the voltage and frequency in the grid and in the event of a fault, shuts down the photovoltaic systems by means of a circuit breaker.

If your energy supplier requires central grid and system protection for your system, install an external monitoring device, which switches off the inverter via a normally closed contact. An additional circuit breaker is not needed because the shutdown is ensured by the double internal switches in the inverter.



1 Connection terminal X403
2 Control cable from NAS to inverter
3 External power source
4 Control unit for grid and system protection (NAS)
5 Switch contact of the grid and system protection control unit (NAS)

DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

Perform the following steps:

1. Switch the DC switch on the inverter to ***OFF***.
2. De-energise the house grid and secure it against being switched back on.

3. Fit the central grid and system protection in the control cabinet or power distributor.
4. Correctly route the communication cable from the inverter to the control cabinet and connect to the central grid and system protection following the wiring diagram provided by the manufacturer.

INFO

Signal cable requirements:

- wire cross-section from 0.34 to 1.5 mm^2 (rigid) or 0.34 to 1.0 mm^2 (flexible)
- bus length max. 30 m
- length of stripped insulation approx. 7.5 mm

5. Connect communication cable in inverter to X403 terminal for central grid and system protection.

✓ The central grid and system protection is connected.

After commissioning

1. Once the inverter has undergone initial commissioning, the central grid and system protection must be configured in the Webserver.

   The function can be activated by going to ***Service > General > CEI inputs/VDE > VDE (circuit breaker)***.

✓ Inverter set up for grid and system protection function.

6.5 External surge protection device (SPD)

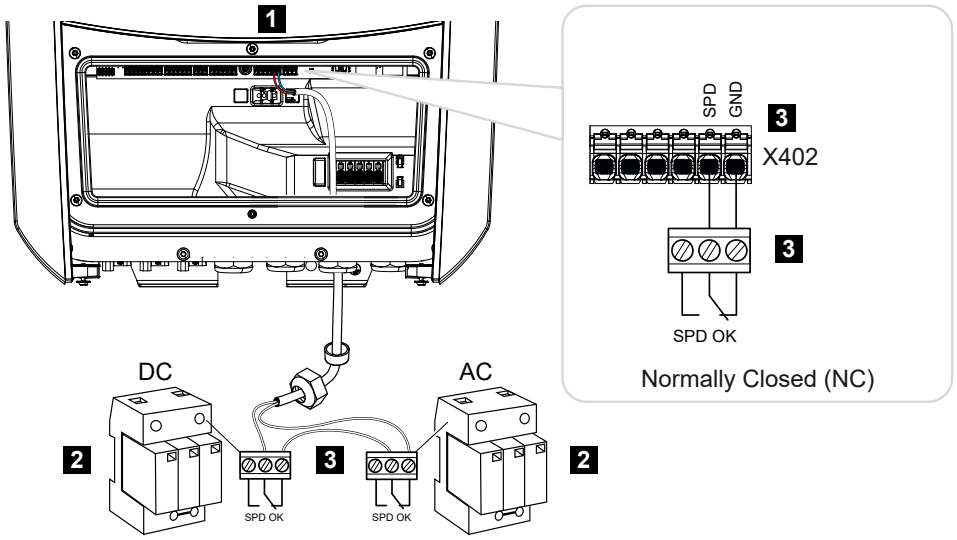
To protect the PV system from overvoltages, a surge protection device (SPD) should be installed on the DC side between the inverter and the PV generator and another should be installed on the AC side between the inverter and the grid.

If you have installed the optional internal DC overvoltage protection module in the inverter, no additional external protection is required on the DC side.

The inverter can evaluate available external surge protection devices and can issue a message if an event occurs. For this to work, connect the message output of the external overvoltage protection module(s) without potential (potential-free) to the monitor input at the inverter's X402 terminal.

After commissioning the inverter, the external evaluation of the surge protection device must be configured in the Webserver as normally open (NO) or normally closed (NC).

External surge protection device as normally closed

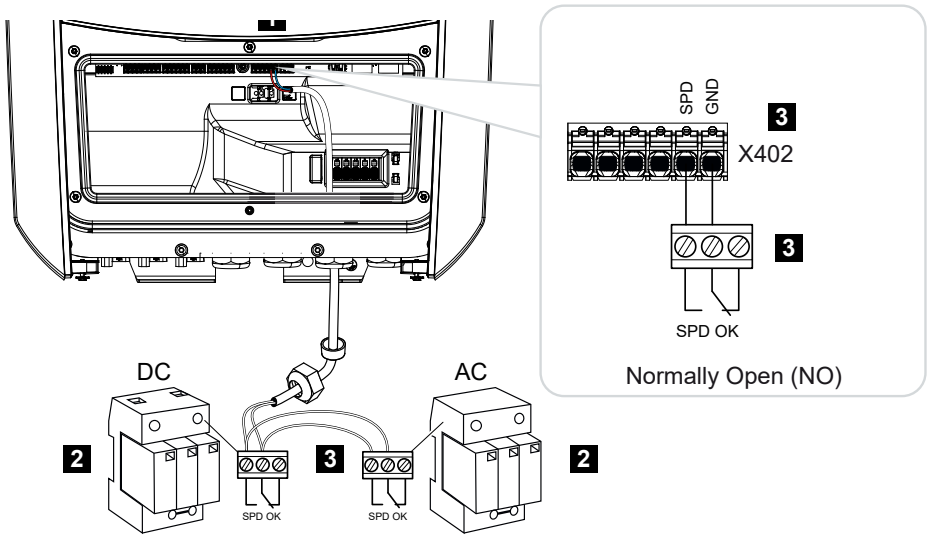


1 Connection terminal X402 Smart Communication Board (SCB

2 Surge protection devices (SPD) for AC and DC side

3 Control cable from SPD to inverter

External surge protection device as normally open



1 Connection terminal X402 Smart Communication Board (SCB
2 Surge protection devices (SPD) for AC and DC side
3 Control cable from SPD to inverter

Carry out the following steps to connect the signal cable

DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

INFO

The signal cable is subject to the following requirements:

Conductor cross-section from 0.2 to 1.5 mm^2

Max. length 30 m

Length of stripped insulation 8 mm

Observe the specifications for cable cross-sections in the manufacturer's instructions.

1. Switch the DC switch on the inverter to ***OFF***.
2. De-energise the house grid and secure it against being switched back on.
3. Install the SPD for AC and DC in the control cabinet or power distributor.

4. Correctly route the signal cable from the inverter to the control cabinet and connect to the SPD following the wiring diagram provided by the manufacturer.
   With two SPDs, pay attention to how the signal cables are connected to each other: in series (for NC) or in parallel (for NO).
5. Connect the communication cable in the inverter to terminal X402 for the surge protection device.
6. Once initial commissioning has been completed for the inverter, the overvoltage protection must be activated and configured in the Webserver (evaluation of overvoltage protection).

✓ The message contact for the external SPD is connected.

Activating evaluation of the external signal from the surge arrester

INFO

The IP address can be read on the inverter's display.

1. Open the web server. To do this, enter the inverter IP address in the address bar of your internet browser and confirm with ***ENTER***.

➔ The web server page opens.

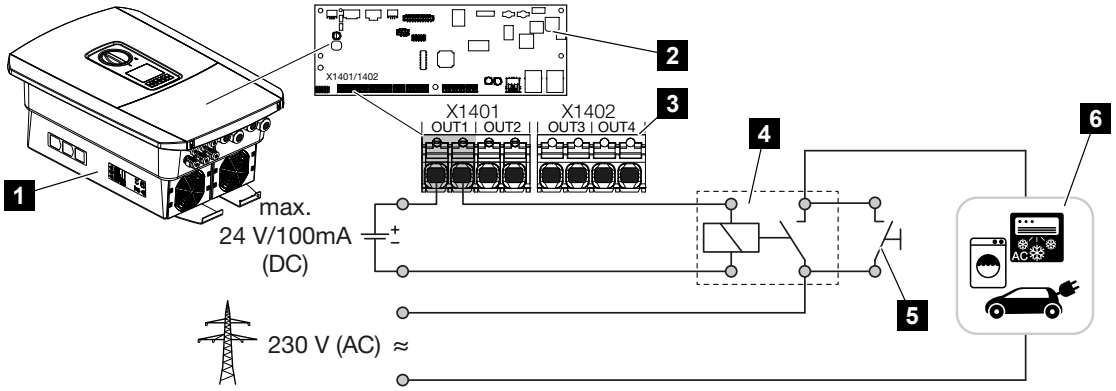
2. Log in to the web server as ***an installer***.
3. Select the menu item ***Service*** > ***General*** > ***Surge protection.***

➔ The ***Surge Protection*** page opens.

4. Activate***the evaluation of the external signal (terminal X402)***.
5. Under ***The signal is connected as***, select the function ***Normally Open (NO)*** or ***Normally Closed (NC)***.
6. Click on the ***Save*** button.

✓ The function is now active.

6.6 Connection of switched outputs



1 Inverter
2 Smart Communication Board
3 Connection terminal with four switching outputs (OUT 1–4)
4 Load relay
5 Bypass switch
6 Consumers/actuators

The inverter allows consumers to be connected to it via an external load relay, which can be switched on when there is sufficient PV or grid surplus feed-in power and thereby use the PV energy generated at that point in time.

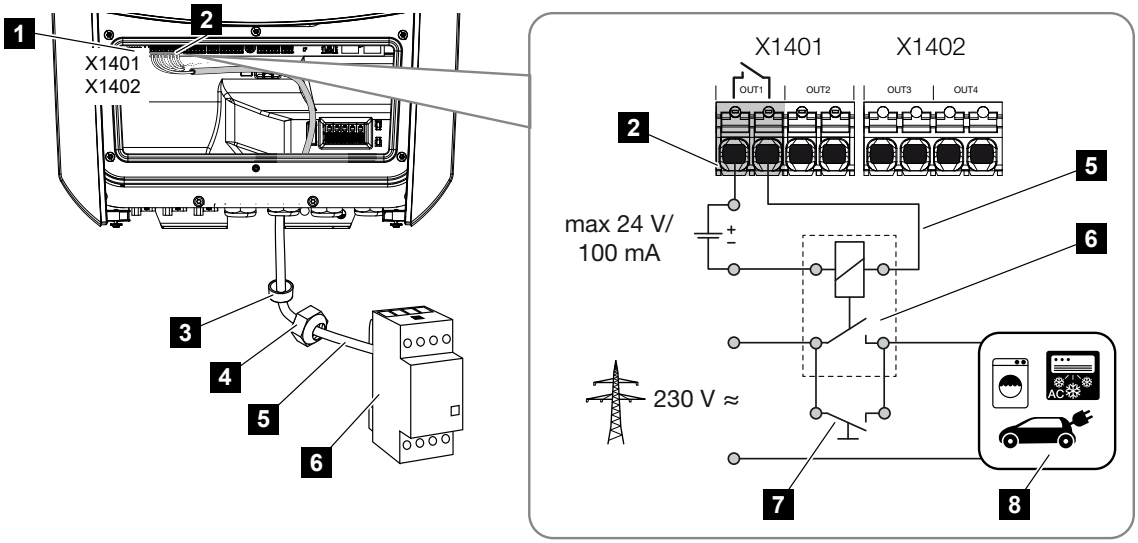
If there is an event message, the inverter can trigger an actuator connected to the switched output (warning light, message signal, smart home system), providing information about the event that occurred.

More information about configuration **Switched outputs, Page 224**.

Electrical connection of switched output

Check which connection method is required for the external device. For more information, please refer to the manual of the device to be controlled.

Switched output for 230 V loads via load relay:

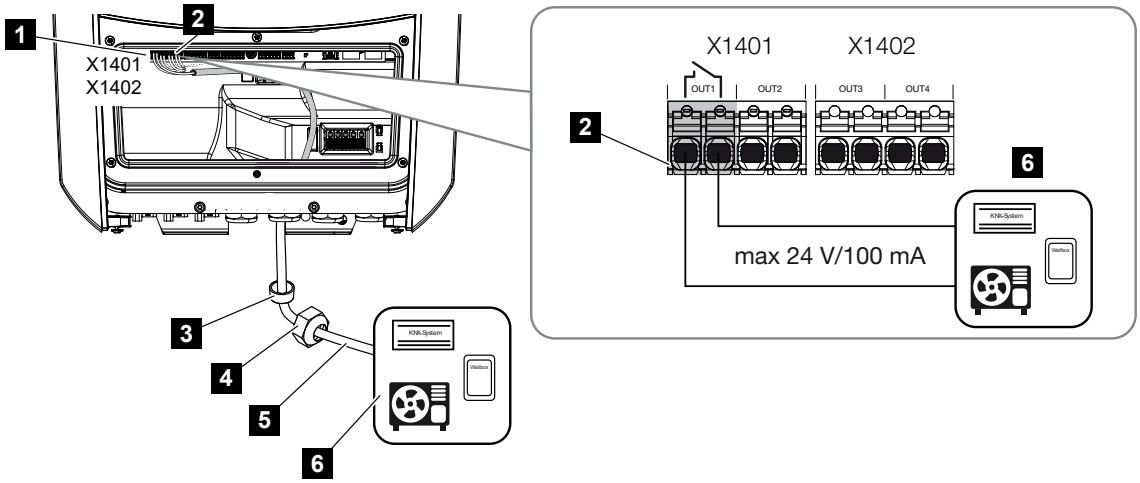


1 Smart Communication Board (SCB)
2 Connection terminal for own consumption control
3 Sealing ring
4 Cap nut
5 Control cable
6 Load relay / connection via potential-free contact
7 Bypass switch
8 Consumer

Use of a load relay to decouple and control 230 V loads.

- ***Load control operating mode:*** Here, an external load (e.g. washing machine or air conditioning system) is triggered.
- ***Events operating mode:*** As soon as an event is present, an external load (e.g. lamp or signal horn) is triggered.

Switched output for external devices via potential-free contact:



1 Smart Communication Board (SCB)
2 Connection terminal for own consumption control
3 Sealing ring
4 Union nut
5 Control cable
6 Load relay / connection via potential-free contact

Connection of external devices, for example a heat pump, wallbox or smart home system input module, directly to the digital input's switched output.

- ***SG Ready operating mode:*** Here, the switching signal (e.g. contact closes) for using the PV energy is routed directly to the heat pump's digital input.
- ***Wallbox operating mode:*** The charging process is started as soon as the contact is closed. The wallbox offers a digital/signal input for this purpose.
- ***Events/external control operating mode:*** The external device is controlled via a digital/signal input. This can be, for example, a KNX control unit or another smart home system.

To connect the electrical switched output, follow the steps below:

DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

INFO

Damage to the inverter

If loads need to be switched and require a higher load at the switched output than 24 V/ 100 mA, an external load relay must be installed between the inverter and the consumer. No consumers may be connected directly to the inverter.

If there are loads or consumers that are controlled via a potential-free switching contact (e.g. SG-ready heat pump control or smart home systems), these consumers can be connected directly to the switched output.

Switched output load, potential-free:
Max. load: 100 mA
Max. voltage: 24 V (DC)

INFO

The signal cable is subject to the following requirements:

Conductor cross-section from 0.2 to 1.5 mm^2

Length of stripped insulation 8 mm

1. De-energise the house grid.
2. Connect the load relay or consumer correctly to one of the switched outputs (e.g. OUT1) at the Smart Communication Board.
3. Correctly install and connect the other self-consumption control components.

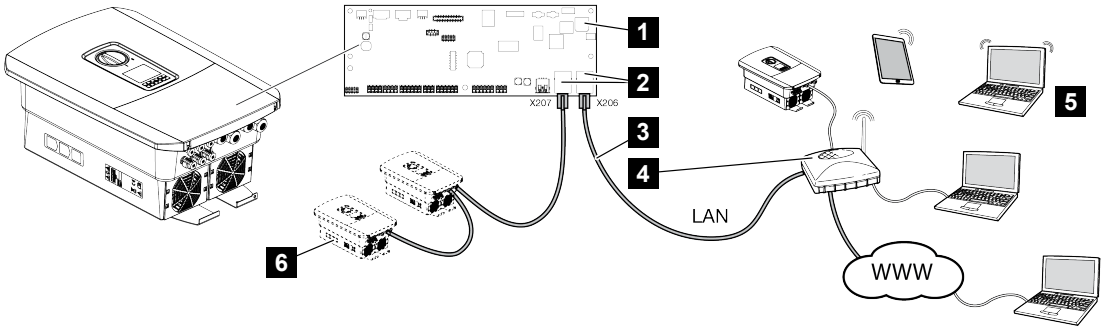
✓ The electrical connection is complete.

6.7 Communication connection

The inverter offers two ways to connect to other devices, the local home network or the Internet. Two LAN interfaces and Wifi are available in the inverter for this purpose.

- **Connection via LAN, Page 90**
- **Connection via Wifi, Page 92**

6.7.1 Connection via LAN



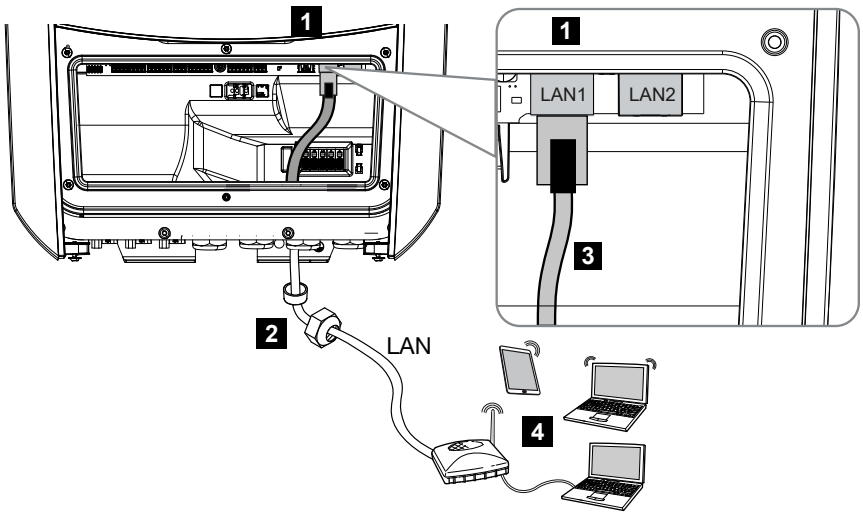
1 Smart Communication Board
2 RJ45 connection sockets (Ethernet/LAN)
3 LAN cable
4 Router with internet access
5 Computer / router / tablet / KOSTAL inverter (for configuration or data retrieval)
6 Other devices connected via LAN, e.g. KOSTAL solar inverters

The Smart Communication Board is the inverter's communication hub. Computers, routers, switches and/or hubs can be connected to the RJ45 connections.

If the Ethernet cable is connected to a router, the inverter is integrated into the local network and can be contacted by all computers or KOSTAL inverters incorporated into the same network.

Additional LAN devices can be connected via the second LAN interface in the inverter. Here, the inverter serves as a switch.

Connecting communication



1 LAN connection (RJ45 Ethernet)
2 Sealing ring with union nut
3 LAN cable
4 Computer (for configuration or data retrieval)

DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

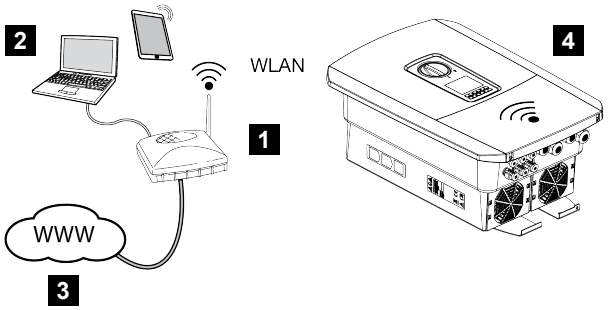
INFO

For connection with a computer or computer network (Ethernet 10BaseT, 10/100 Mbit/s), an Ethernet cable of category 5 (Cat 5e, FTP) or better with a max. length of 100 m is to be used.

1. Switch the DC switch on the inverter to ***OFF***.
2. De-energise the inverter and secure it against being switched back on.
3. Guide the Ethernet cable into the inverter.
4. Seal with sealing ring and union nut. Tighten union nut to the prescribed torque. Tightening torque: 8 Nm (M25).
5. Connect Ethernet cable to LAN interface of Smart Communication Board.
6. Connect the Ethernet cable to the computer or router.

✓ The inverter is connected to the internal network.

6.7.2 Connection via Wifi



1 Router (WiFi/LAN) in the home network with access to the Internet
2 Computer/tablet (for configuration or data retrieval)
3 Internet
4 Inverter with WLAN client

INFO

No Wifi and LAN connection to the same router at the same time.

If the inverter is already connected to the home network (e.g. to a router) via LAN, an additional connection to the same router in the home network via Wifi should be avoided. As a rule, preference should be given to a LAN connection over a Wifi connection because this connection is always more stable.

If you want to connect the inverter to the home network via Wifi alone, it is important to have a sufficiently strong signal quality at the installation site.

The inverter can also be used as a WLAN bridge for other devices (e.g. KOSTAL Smart Energy Meter, battery storage unit).

Connect the additional devices to the two LAN interfaces on the Smart Communication Board in the inverter.

The connection to the router can be configured during the initial installation or later via the inverter's Webserver.

To do this, the Wifi interface in the inverter must be set to ***Client mode*** via the Webserver under ***Settings > Network > Wifi > Wifi mode*** and a wireless network must be selected.

Using the inverter as a WLAN bridge

If there are several KOSTAL inverters in a system, the inverter can be used as a Wi-Fi bridge to the existing Wi-Fi gateway.

Additional inverters, energy meters or battery storage systems can be connected to this inverter via LAN cable to establish a connection to the local home network and the internet.

The WLAN bridge is automatically activated when the inverter is operating as a WLAN client and is connected to a WLAN gateway, a LAN cable is connected to the inverter for other devices, and the ***Obtain IPv4 address automatically*** function has been activated under the LAN interface.

INFO

WLAN bridge cannot be activated

The WLAN bridge can only be activated automatically if no other DHCP server is detected in the network. All other devices may only be connected via a LAN connection to the inverter, which serves as a WLAN bridge.

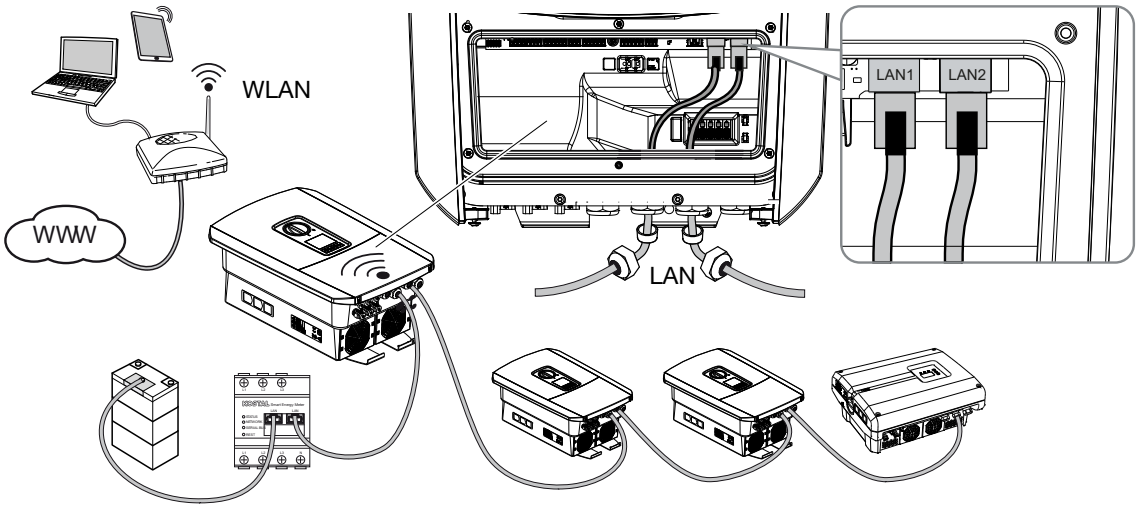
This means that no device that is connected via LAN to another router/gateway and obtains its network data via another DHCP server may be connected to the inverter that is to be used as the WLAN bridge.

INFO

Automatic IP address allocation not possible

With some router models, the automatic IP address allocation will not work for devices connected downstream of the inverter bridge. If the IP address allocation function is not working, set a static IP address in the router for the devices connected downstream of the inverter bridge.

Connecting other devices to the WLAN bridge



DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

INFO

A Category 5 Ethernet cable (Cat 5e, FTP) or better with a max. length of 100 m is required to connect other devices.

1. Switch the DC switch on the inverter to ***OFF***.
2. De-energise the inverter and secure it against being switched back on.
3. Guide the Ethernet cable into the inverter.
4. Seal with sealing ring and union nut. Tighten union nut to the prescribed torque. Tightening torque: 8 Nm (M25).
5. Connect the Ethernet cable to the LAN interface of the external device, e.g. inverter, energy meter or battery.
6. Connect other devices via Ethernet cable.

✓ The external devices are connected. After initial commissioning, the WLAN interface still has to be configured in the inverter.

6.7.3 Inverter with WLAN access point

The inverter can provide a Wi-Fi access point for smartphones or PCs. This access point can be used to perform initial commissioning, monitoring or device configuration.

The WLAN access point can be further configured after initial commissioning via the inverter's web server.

Using the inverter as a WLAN bridge

If there are several KOSTAL inverters in a system, the inverter can be used as a WLAN bridge.

Additional inverters, energy meters or battery storage systems can be connected to this inverter via LAN cable to establish a connection to the local home network and the Internet.

INFO

WLAN bridge cannot be activated

The WLAN bridge can only be activated if no other DHCP server is detected in the network. All other devices may only be connected to the inverter via a LAN connection.

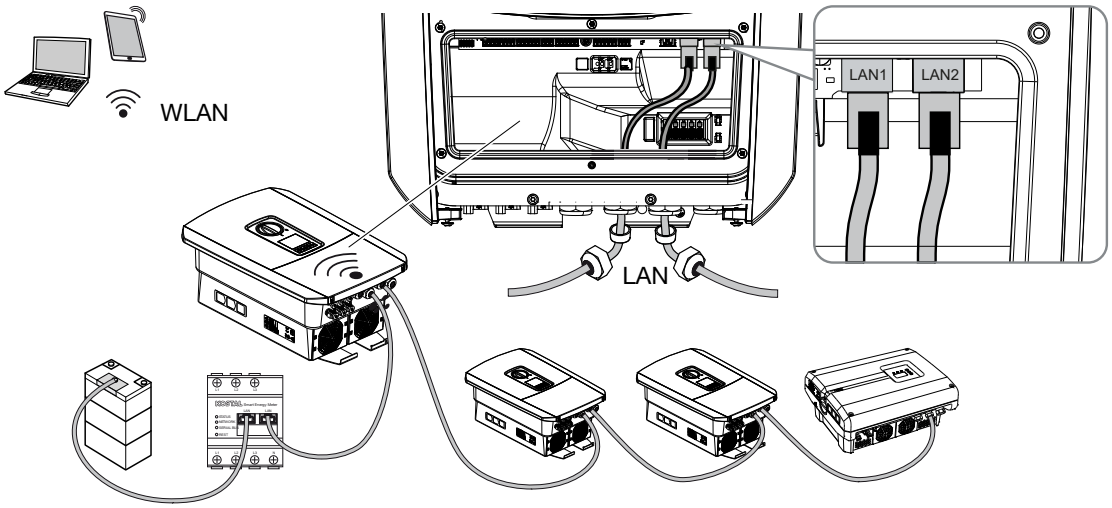
This means that no device that is connected to another router/gateway via LAN and obtains its network data from another DHCP server may be connected to the inverter that is to be used as a WLAN bridge.

INFO

Automatic IP address allocation not possible

With some router models, the automatic IP address allocation will not work for devices connected downstream of the inverter bridge. If the IP address allocation function is not working, set a static IP address in the router for the devices connected downstream of the inverter bridge.

Connecting additional devices to the WLAN bridge



DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

INFO

A Category 5 Ethernet cable (Cat 5e, FTP) or better with a max. length of 100 m is required to connect other devices.

1. Switch the DC switch on the inverter to ***Off***.
2. Disconnect the inverter from the power supply and secure it against being switched back on.
3. Guide the Ethernet cable into the inverter.
4. Seal with sealing ring and union nut. Tighten union nut to the prescribed torque. Tightening torque: 8 Nm (M25).
5. Connect the Ethernet cable to the LAN interface of the external device, e.g. inverter, energy meter or battery.
6. Connect additional devices via an Ethernet cable.

✓ The external devices are now connected. The WLAN interface in the inverter must still be configured after initial commissioning.

6.8 Connecting battery

On the inverter, you can connect a battery storage system to last DC input in place of a PV string.

However, this is only possible if the DC input has been released for this option. The battery storage connection is activated by entering a battery activation code. You can purchase the battery activation code from the online KOSTAL Solar shop.

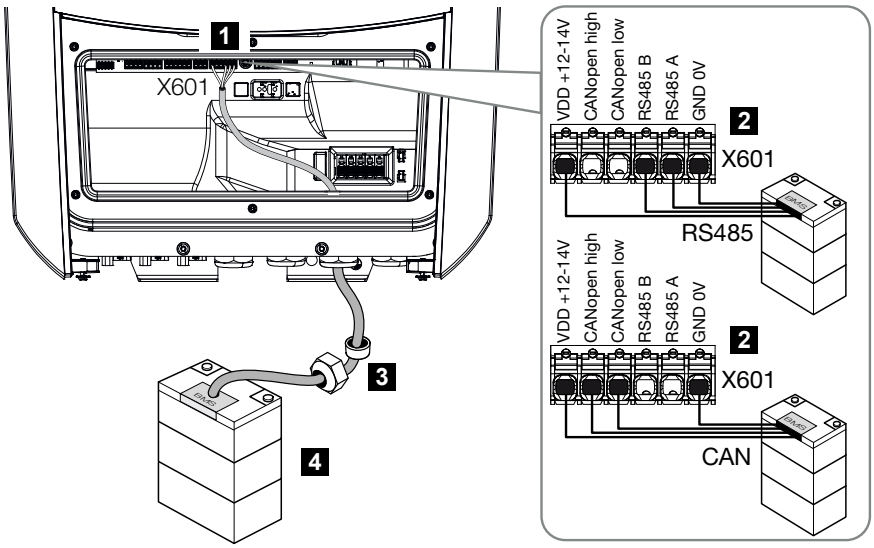
Please note the following:

- Battery use must be released in the inverter.
- Only battery storage systems (manufacturers) which have been approved by KOSTAL Solar Electric GmbH may be connected to the inverter.

INFO

A list of **approved battery storage systems** is available in the download area for the product on our website at **www.kostal-solar-electric.com**

6.8.1 Connecting battery communication



1 Connection terminal X601

2 Connection terminal Communication cable Battery storage (depending on the battery system)

3 Sealing ring with cap nut

4 Battery storage

DANGER

Risk of death due to electrical shock and discharge!

During operation, high voltages are present on the live parts and cables inside the product. Touching live parts or cables will result in death or life-threatening injuries from electrical shock.

- De-energise inverter and battery storage. Please also observe the instructions in the operating manual provided by the battery manufacturer.

INFO

The communication cable is subject to at least the following requirements. Please consult the manual provided by the battery manufacturer for more details.

Wire cross-section 0.25-1.5 mm^2

Outer diameter 5-7.5 mm

Max. length 30 m

Length of stripped insulation 8 mm

Twisted pair (e.g. Cat.7 / AWG23-19)

1. Switch the DC switch on the inverter to ***OFF***.
2. De-energise the battery storage unit.
3. De-energise the inverter and secure it against being switched back on.
4. Guide the communication cable from the battery storage unit into the inverter.
5. Seal with sealing ring and union nut. Tighten union nut to the prescribed torque. Tightening torque: 8 Nm (M25).
6. Connect the communication cable to the communication interface of the Smart Communication Board.
7. In the battery storage unit, connect the communication cable to the battery management system. To do this, consult the operating manual provided by the battery manufacturer.
8. To prevent communication errors between the battery and the inverter, both devices must be connected via an earth potential.

✓ The communication cable has been connected.

6.8.2 Activation of battery input

If DC input 3 on the inverter has not been activated for battery use, the ***battery activation code*** must be entered in the inverter so that it can be activated. There are three ways of doing this.

INFO

Be sure to use a valid activation code. If the details entered are incorrect, the inverter will be blocked after the 5th attempt and can only be enabled again by completely disconnecting the inverter from the AC and DC voltage supply.

Inputting code upon initial commissioning:

1. During initial commissioning, the commissioning wizard asks for the battery activation code under Extra options. In this case, enter the 10-digit activation code for the battery and confirm it.
2. Once this has been acknowledged, the DC input can be used to connect a battery storage unit.

✓ Activation is complete.

Code entry via web server:

After initial commissioning, the battery activation code can be entered via the web server.

1. Access the web server
2. Open the menu item ***Service*** > ***General*** > ***Additional options*** > ***Activate new additional option***.
3. Enter the 10-digit battery activation code and confirm.

✓ Activation is complete.

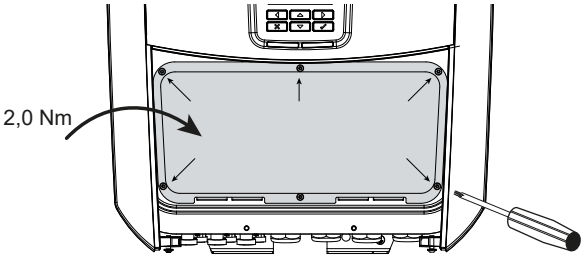
Code entry via inverter menu:

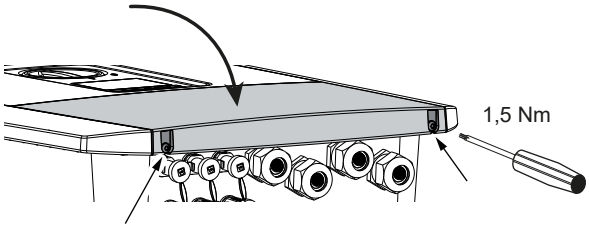
1. After initial commissioning, the battery activation code can be entered in the inverter via the following menu item.
2. ***Settings*** > ***General*** > ***Additional options*** > ***Activate options***
3. Enter the 10-digit battery activation code and confirm.

✓ Activation is complete.

6.9 Closing the inverter

1. Tighten all cable glands and check that they are properly sealed.
2. Check the fit of connected wires and strands in the inverter.
3. Remove any foreign objects (tools, wire cuttings, etc.) from the inverter.
4. Install the terminal compartment cover and screw it tight (2.0 Nm).
5. Fit cover on inverter and screw it tight (1.5Nm).





6.10 Connecting battery's DC cables

The DC cables of the battery may only be connected to the inverter when the inverter and the battery storage system are de-energised.

DANGER

Risk of death due to electrical shock and discharge!

The battery's DC cables may be energised.

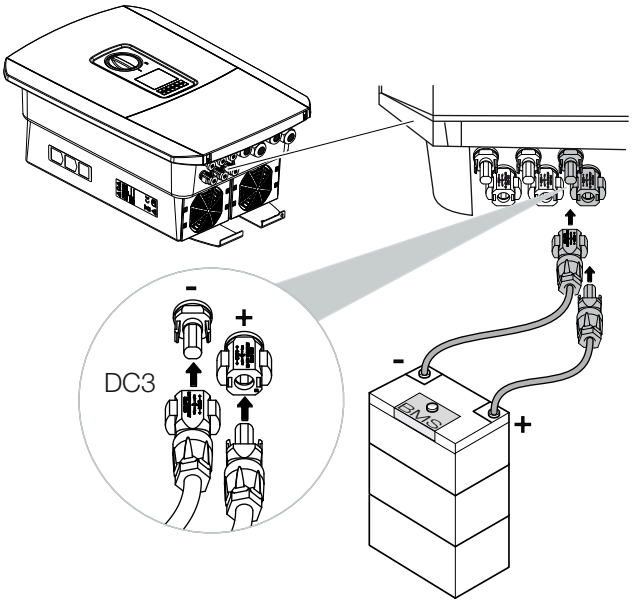
- Be sure to de-energise the battery storage system. Please also observe the instructions in the operating manual provided by the battery manufacturer.

INFO

Use flexible and tin-plated cables with double insulation according to EN 50618.

We recommend a cross-section of 6mm^2. Please observe the specifications of the plug manufacturer and the technical data for the inverter.

1. Disconnect the battery storage unit and inverter from the power supply.
2. Connect the plug to the positive cable and the socket to the negative cable in accordance with the relevant standards. The inverter is equipped with connectors from PHOENIX CONTACT (type SUNCLIX). When installing, it is essential to observe the manufacturer's current specifications (e.g. permissible tightening torque, etc.). Information on the SUNCLIX installation instructions can be found at: **www.phoenixcontact.com**
3. When installing the sockets and plugs on the DC cables of the battery, ensure that the polarity is correct!
4. Plug the sockets and plugs of the battery's DC cables into the inverter. Keep the sealing plugs from the connectors.



5. The configuration and selection of the battery type must be carried out on the web server after the initial installation.

✓ The DC cables of the battery are connected.

6.11 Solar module connection

Solar module connections

WARNING

Risk of fire due to improper installation!

Incorrectly fitted plugs and sockets may heat up and cause a fire.

- During installation, be sure to follow the manufacturer's requirements and manual. Properly mount plugs and sockets.

WARNING

Serious burns due to arcs on the DC side!

DC cables must never be connected to or disconnected from the device during operation, as dangerous arcs may form.

- De-energise DC side, then mount or remove plug connector!

WARNING

Injuries can result from destruction of the device!

When the maximum permitted input voltage/current at the DC inputs is exceeded, this may result in serious damage, which may destroy the device and cause serious injury to anyone present. Even briefly exceeding the voltage can cause damage to the device.

6.11.1 Note the following before connecting the DC plugs

- Set the system up in a voltage range between U_{MPPmin} and U_{MPPmax} to ensure the optimal layout for the solar modules and the highest yield possible. KOSTAL Solar Plan should be used as a planning tool for this.
- Check that the modules are planned and connected correctly.
- Earthing the generator frame is recommended.
- Measure the DC idling voltage. Please ensure that the maximum permitted DC idling voltage is not exceeded.
- Ensure that the plus and minus are not swapped (ensure that there is no polarity reversal) and that the string cables are not interchanged.
- Record all measuring values and make them available if there is a complaint.
- If the power of the solar modules is higher than that specified in the technical data, ensure that the operating point is still within the MPP voltage range of the inverter.

- Use the same solar module types within a PV string to prevent loss of yield.
- Ensure that the PV string's maximum short-circuit current does not exceed the maximum permitted short-circuit current of the inverter's DC connections.

Failure to comply with this will render any manufacturer's warranty, guarantee or liability null and void unless it can be proven that the damage was not due to non-compliance.

6.11.2 Connecting solar modules

Only solar modules of the following category may be connected: Class A as specified in IEC 61730.

The PV generators may only be connected to the inverter when this is voltage-free.

DANGER

Risk of death due to electrical shock and discharge!

The PV generators/cables may be live as soon as they are exposed to light.

DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

INFO

Damage possible

If the PV generators are incorrectly connected (including cross-connection on the inverter itself), the inverter may be damaged. Check the connections before commissioning.

INFO

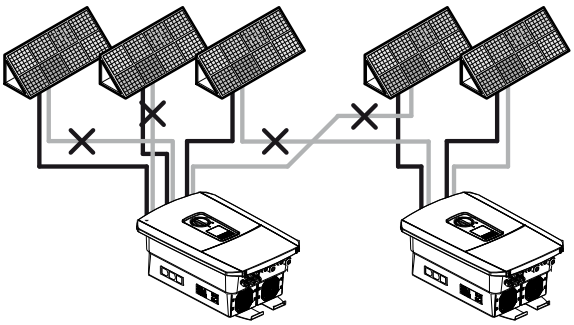
The solar module types used and the orientation should be the same within a PV string.

INFO

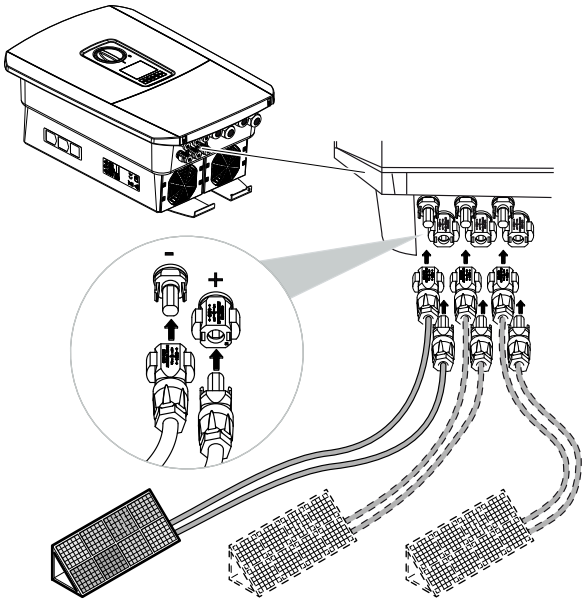
Use flexible and tin-plated cables with double insulation according to EN 50618.

We recommend a cross-section of 6mm^2. Please observe the specifications of the plug manufacturer and the technical data for the inverter.

1. Switch the DC switch on the inverter to ***OFF***.
2. De-energise the inverter and secure it against being switched back on.
3. If there is more than one inverter in a PV system, ensure that no cross-connection occurs when the PV generators are connected.



4. Check the strings for earth faults and short circuits and rectify these where appropriate.
5. Correctly fit the plug on the positive cable and the socket on the negative cable. The inverter is equipped with plug connectors from PHOENIX CONTACT (type SUNCLIX). During installation, always observe the most recent specifications from the manufacturer (e.g. use of special tools, permissible tightening torques etc.).
   Information on the SUNCLIX installation instructions can be found at:
   www.phoenixcontact.com
6. When mounting the sockets and plugs on the DC cables used by the solar modules, ensure their polarity is correct! The poles of the PV strings (PV field) must not be earthed.
7. Plug the sockets and plugs of the DC cables onto the inverter. Retain the plug seals from the plug connectors.



✓ The DC side is connected.

7. Initial commissioning

7.1 Initial commissioning

Initial commissioning can be carried out via the **KOSTAL Solar App**, the **web server** or the **inverter display** .

The required activation codes are requested during initial commissioning.

Product upgrades can be activated using activation codes. This requires PLENTICOINs, which can be obtained from wholesalers, our KOSTAL Solar Webshop or directly via the **KOSTAL Solar App**.

INFO

The installation process may vary depending on the software version of the inverter.

Switch on the inverter

For initial commissioning, at least ***the minimum input voltage (UDCmin)*** must be present. The power must also be sufficient to cover the inverter's own consumption during initial commissioning.

1. Connect the mains voltage via the circuit breaker.
2. If available, switch on the battery system via the battery switch.

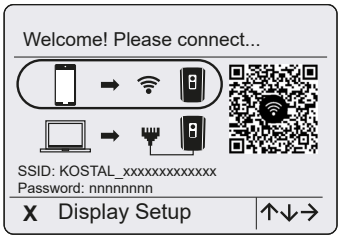
INFO

Further information on operation can be found in the operating instructions for the battery system.

➔ The battery system starts up.

3. Switch the DC switch on the inverter to ON.
4. If external DC disconnect points are available, switch on the DC strings one after the other.

➔ The installation wizard is shown on the display.



Initial commissioning via KOSTAL Solar App and setup wizard

A smartphone is required to input the data.

Initial commissioning is performed via the ***setup wizard*** in the **KOSTAL Solar App**.

The application is only available to installers. For this purpose, Pro mode must be activated in the **KOSTAL Solar App**.

Initial commissioning via KOSTAL Solar App and the setup wizard, Page 111

Initial commissioning via the inverter Webserver

The inverter's integrated Webserver is used to carry out initial commissioning. An additional device, e.g. a PC or smartphone that accesses the Webserver, is required to enter the data.

To do this, the user must first select and set up the network connection via the inverter display before a connection is made via the input device.

The potential connection methods are:

- **Wifi access point**: After switching on the inverter, it provides a Wifi access point. A connection to the inverter's Wifi access point can be established using a smartphone. The access data for this is shown as a QR code on the inverter's display.
- **LAN**: The inverter is connected to the local network via a LAN connection. The Webserver can then be accessed via a LAN-enabled device.

After selecting the connection method, the inverter's website is accessed and initial commissioning can be carried out.

Initial commissioning via web browser, Page 117

Initial commissioning via the inverter display

The inverter display is used to carry out initial commissioning. Here, the data is entered on the inverter.

Initial commissioning via display, Page 121

7.1.1 Initial commissioning via KOSTAL Solar App and the setup wizard

To carry out the installation via the **KOSTAL Solar App** and the ***setup wizard***, the following preconditions must be met.

- The **KOSTAL Solar App** must be installed on the smartphone.

Download on the App Store

KOSTAL Solar App

GET IT ON Google Play

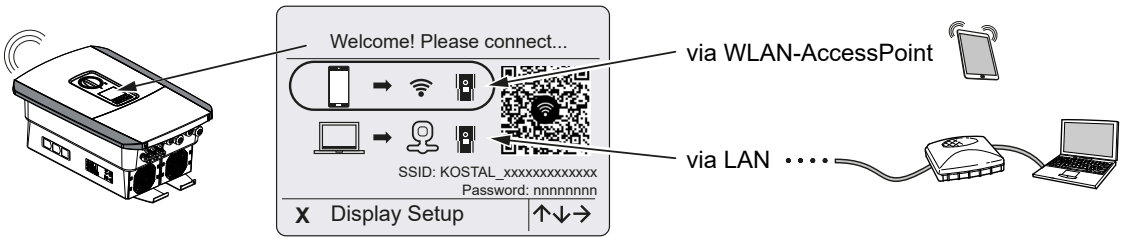
- As an installer, you have set up an account in the **KOSTAL Solar Terminal** and are configured as a ***fitter*** for your company. If you are, you will automatically receive a service code, which is required during initial commissioning. You can view the service code in the **KOSTAL Solar Terminal** by going to ***My profile***.

KOSTAL Solar Terminal

- The inverter's **WLAN access point** is used to perform the setup via the **KOSTAL Solar App**.

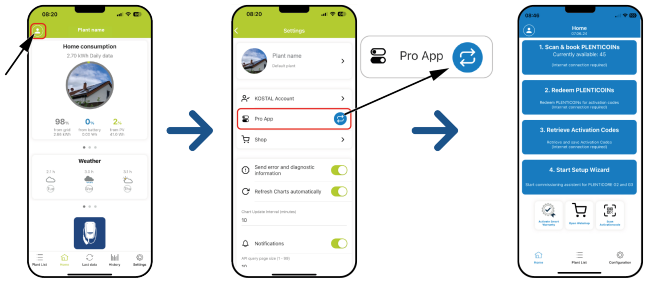
Selecting type of connection for inverter and calling up the KOSTAL Solar App

1. Choose connection via **WLAN access point** on the inverter.



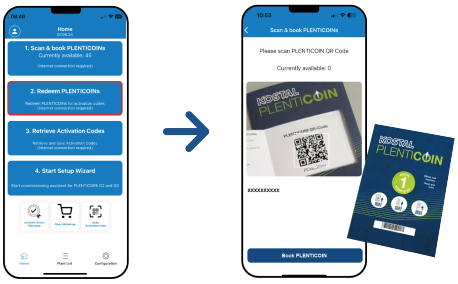
2. Launch the **KOSTAL Solar App** on your smartphone.

3. If you have not yet logged in to the **KOSTAL Solar Terminal**, you will be automatically prompted to log in. When you log in, your data will be automatically stored in the **KOSTAL Solar App**, including the service code, if you have been set up as a fitter. You can, however, also enter the service code manually during commissioning.
4. In the **KOSTAL Solar App**, switch to ***Pro mode***.
   To do this, go to the settings in the top left and activate ***Pro mode***.



Scanning & registering PLENTICOINs

There are certain ways in which product upgrades (e.g. for battery function and increased performance) can be made to the inverter. These are released in the inverter using activation codes. The activation codes required for the product upgrade can be redeemed in the online shop using PLENTICOINs. You can purchase PLENTICOINs from specialist retailers or the online KOSTAL Solar shop. They are credited to your company account via the **KOSTAL Solar App** or directly via the **online KOSTAL Solar shop**. The PLENTICOINs available are shown in the **KOSTAL Solar App**.



1. Go to ***Scan & register PLENTICOINs***.
2. Scan the QR code from the PLENTICOIN single-use voucher.

➔ The code is recognised and displayed.

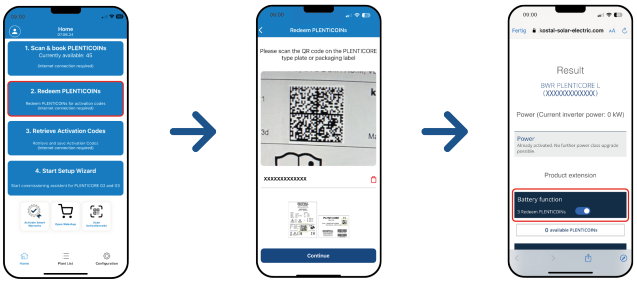
3. Press the ***Register PLENTICOINs*** button to assign the single-use voucher to your company account.

✓ The single-use voucher has been credited to your company account and can now be used in the **online KOSTAL Solar shop** to purchase product upgrades.

Redeeming PLENTICOINs

If you require a product upgrade that you didn't configure in advance for your inverter, you can use this menu item to purchase the product upgrade for your device and will then receive an activation code for it.

To do so, proceed as follows:



1. Go to ***Redeem PLENTICOINs***.
2. Scan the type plate on the inverter.

➔ The inverter serial number is displayed.

3. Click on ***Next***.
4. If you haven't yet logged into the **KOSTAL Solar Terminal**, enter your access details to do so.

➔ The product upgrades available for your inverter are then displayed for you.

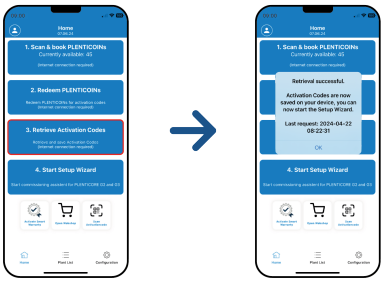
5. Select the product upgrade you need and scroll down.
6. Select ***Redeem PLENTICOINs now and retrieve your activation code*** to purchase the product upgrade. If you don't have enough PLENTICOINs, you can also purchase them directly by going to ***Instant PLENTICOIN purchase***.

✓ The activation code has been assigned to the inverter and is ready to be called up.

Calling up activation codes

For initial commissioning, you will have to transfer the activation code to the smartphone. The benefit of this is that even if you have no or very poor Internet reception, you will have the necessary information available during initial commissioning.

To do so, proceed as follows:



1. Go to ***Call up activation codes***.

➔ The activation codes that were assigned to your company account are called up.

2. Click on ***OK***.

✓ The activation codes are now on your smartphone and can be used for initial commissioning. The installation wizard uses the inverter serial number to automatically detect which product upgrades have been released.

Starting initial commissioning using the setup wizard

For initial commissioning, proceed as follows:

1. Call up the ***setup wizard***.
   Select ***Connect WLAN using QR code***.
   Scan the QR code from the inverter display with your smartphone and connect to the inverter's WLAN access point.

2. Select ***Accept*** in response to questions about connection losses.
3. Then connect to the inverter access point by selecting ***Connect*** and confirm with ***OK.***

➔ The smartphone is now connected to the inverter WLAN access point.

4. Now scan the QR code from the inverter type plate and press ***Next***.

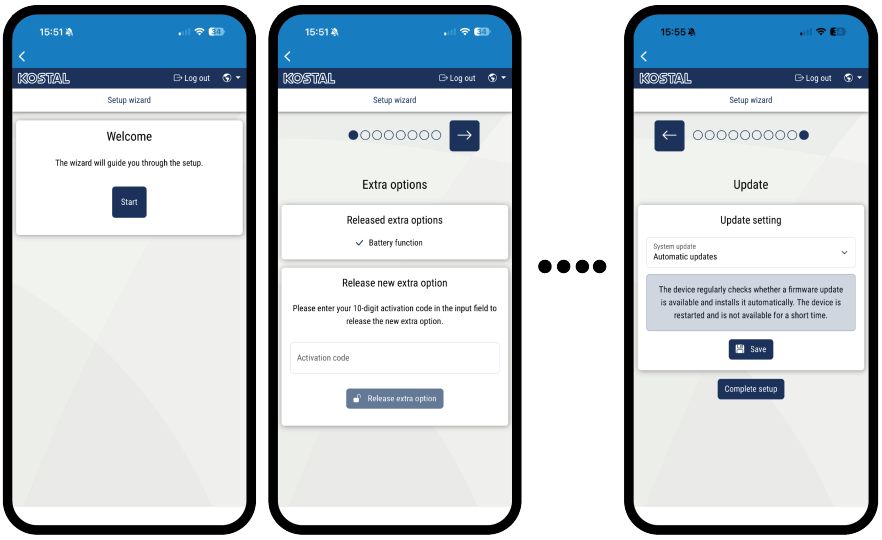
5. Press ***Next***.
6. If your installer service code cannot be automatically called up via the KOSTAL Solar Terminal, enter it here and press ***Next***.

✓ The Webserver connection is established and the initial setup wizard is displayed. Continue with **Setup wizard, Page 119**.

INFO

If a message appears saying that the inverter's WLAN is not connected to the Internet and mobile data should be used instead, remain connected to the inverter's WLAN.

Setup wizard via the KOSTAL Solar App

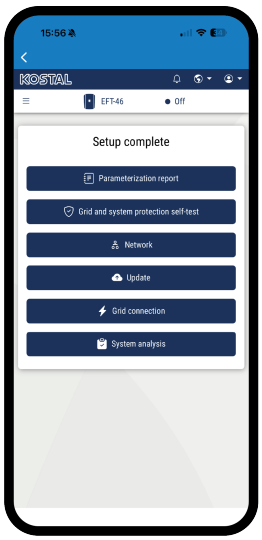


INFO

Activation codes purchased and received in advance with the KOSTAL Solar App are automatically transferred to the inverter and can be used during initial setup.

1. Press the right arrow key.
2. If this does not happen automatically, log in to the inverter as ***an installer*** using the ***master key*** and ***service code***. The ***master key*** can be found on the inverter's type plate.
3. Under ***Additional options***, activate the functions you require for this inverter (e.g. ***battery function***). The additional functions are usually subject to a charge.
4. Follow the instructions of the initial installation wizard.
5. Save each page using the ***Save*** button.
6. Press the right arrow key to go to the next page.

➔ Setup complete.

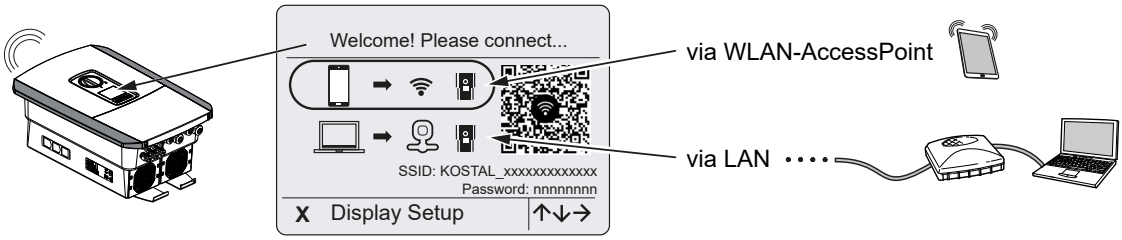


1. To update the inverter to the latest version, perform an update.
2. Finally, you can change the network settings, download the parameterisation report and, if necessary, start the self-test of the NA protection.

✓ The inverter has been set up and is ready for operation.

7.1.2 Initial commissioning via web browser

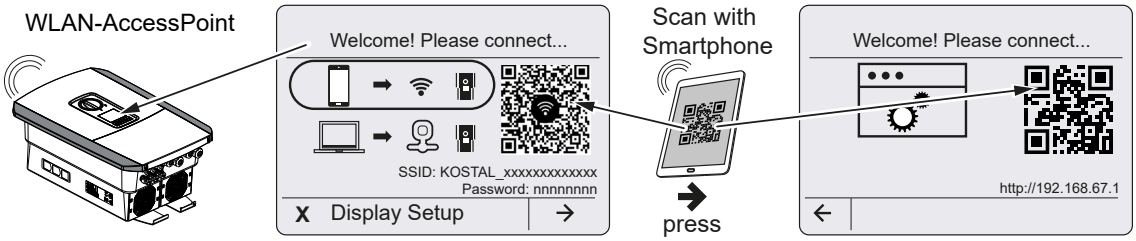
Initial commissioning via the web browser can be carried out using the inverter's WLAN access point or a LAN connection.



Select a connection for initial commissioning:

Selection: WLAN access point

The inverter's Wifi access point is used for the setup.



1. Choose to connect via the Wifi access point for initial commissioning:
2. Scan the QR code with your smartphone and connect to the inverter's Wifi access point. If this is not possible, you can establish the connection manually. Use the displayed SSID (KOSTAL_<inverter serial number>) and password (P<inverter item number>).
3. Press the right arrow key on the inverter.

➔ The QR code for the Webserver for the initial setup wizard is displayed.

4. Scan the QR code for the Webserver with your smartphone or enter the IP address displayed.

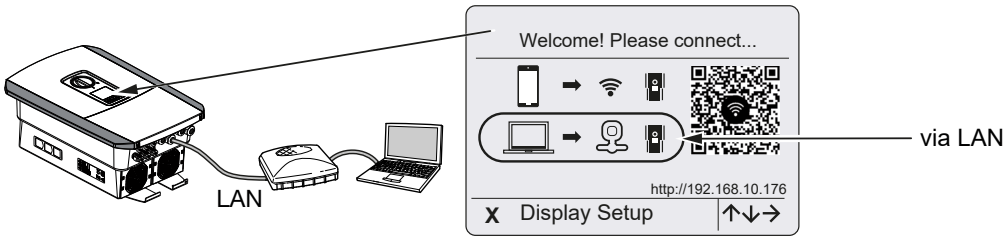
✓ The Webserver connection is established and the initial setup wizard is displayed. Continue with **Setup wizard, Page 119**.

If the Webserver initial setup wizard does not start in the browser, enter the WLAN IP address (192.168.67.1) shown on the inverter display into a web browser on your smartphone.

INFO

If the settings for the Wifi access point are not changed after initial commissioning (SSID/ password), the Wifi access point will be deactivated again after 120 minutes for security reasons. The Wifi access point can be configured in the Webserver under ***Settings > Network > Wifi > Wifi Mode > Access Point***.

Selection: LAN cable



The inverter is connected to a router in the local network via a LAN cable and automatically obtains an IP address via a DHCP server.

1. The inverter's Webserver can now be accessed in a web browser using an input device (e.g. PC). To do this, enter the IP address shown on the inverter display into a web browser on your input device.

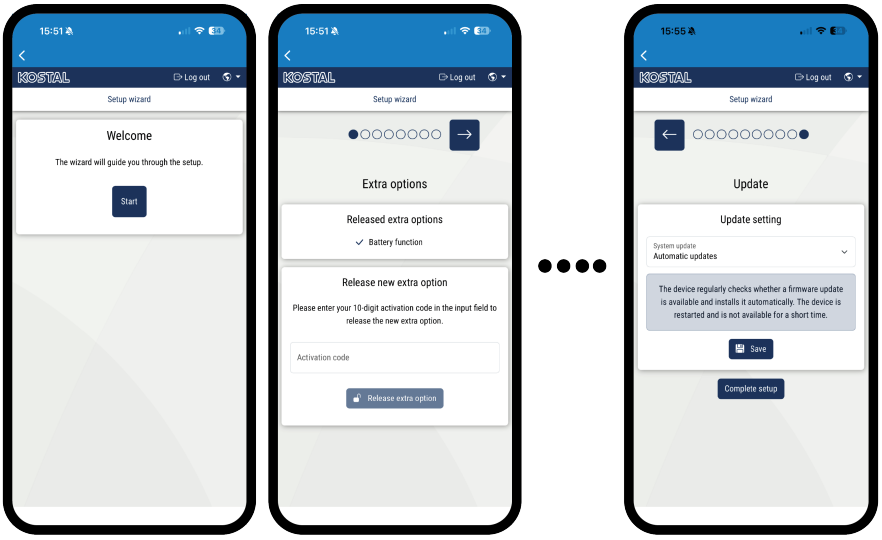
✓ The Webserver connection is established and the initial setup wizard is displayed. Continue with **Setup wizard, Page 119**.

INFO

If a message appears saying that the inverter's WLAN is not connected to the Internet and mobile data should be used instead, remain connected to the inverter's WLAN.

Setup wizard

Once the connection has been established, the web page for the initial setup of the inverter will open automatically in the web browser of the connected device. If this is not the case, please enter the IP address of the inverter manually in the browser. The address is shown on the inverter display.



INFO

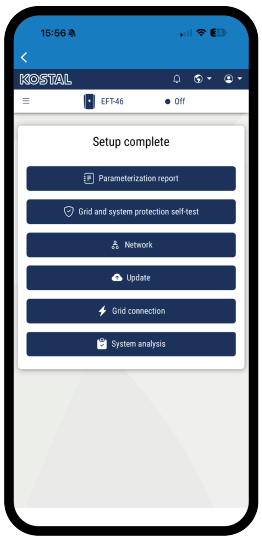
If a message appears stating that the inverter's Wi-Fi is not connected to the internet and that mobile data should be used instead, remain connected to the inverter's Wi-Fi.

INFO

Activation codes purchased and received in advance with the KOSTAL Solar App are automatically transferred to the inverter and can be used during initial setup.

1. Press the right arrow key.
2. If this does not happen automatically, log in to the inverter as ***an installer*** using the ***master key*** and ***service code***. The ***master key*** can be found on the inverter's type plate.
3. Under ***Additional options***, activate the necessary functions for this inverter (e.g. ***battery function***). The additional functions are usually subject to a charge.
4. Follow the instructions of the initial installation wizard.
5. Save each page using the ***Save*** button.
6. Press the right arrow key to go to the next page.

➔ Setup complete.

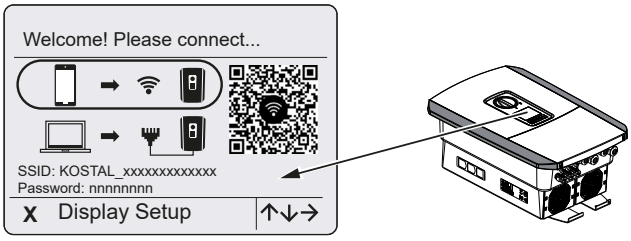


7. To update the inverter to the latest version, perform an update.
8. Finally, you can change the network settings, download the parameterisation report and, if necessary, start the self-test of the NA protection.

✓ The inverter has been set up and is ready for operation.

7.1.3 Initial commissioning via display

Initial commissioning is carried out via the inverter display. The data is entered on the inverter.



1. Press ***X*** on the inverter to start the installation via the display.

➔ The ***Language*** menu is displayed.

2. Select the language using the arrow keys and confirm with ***ENTER***.

1. Press the right arrow key to go to the next installation item.

➔ The ***Additional Options*** menu appears on the display.

INFO

This item can be used to enable options by entering an activation code in the inverter. The activation code, e.g. for connecting a battery to DC input 3 on the inverter, can be purchased from our online shop.

INFO

The currently activated additional options are displayed under ***Activated Options***.

2. Select***Activate option*** and confirm with ***ENTER***.
3. Enter the code you previously purchased at KOSTAL Solar Webshop.
4. Confirm your entry with √ at the end.

1. Press the right arrow key to go to the next installation item.

➔ The ***Date and Time*** menu is displayed.

2. Select the time zone and set the date/time or have it determined automatically and confirm with ***ENTER***.

INFO

Entering the date and time ensures that the downloaded log data is assigned the correct time.

3. Press the right arrow key to go to the next installation item.

➔ The ***Power Connection*** menu is displayed.

4. Use the arrow keys to select the appropriate menu item and confirm with ***ENTER***.
5. Use the arrow keys to select the ***Energy meter*** field and press ***ENTER*** . Select the installed energy meter from the list and ***confirm*** with ***ENTER*** .
1. Press the right arrow key to call up the next installation point.

➔ The ***Battery settings*** menu is displayed.

2. Use the arrow keys to select the ***battery type*** and press ***ENTER*** .
3. Press the right arrow key to go to the next installation item.

➔ The ***Solar Portal*** menu appears on the display.

4. Use the arrow keys to select the appropriate menu item.
5. Press ***ENTER*** and select the Solar Portal you are using, then confirm with ***ENTER***.
6. To activate the transfer, highlight the item and confirm with ***ENTER***.

➔ The transfer is activated.

7. Press the right arrow key to go to the next installation item.

➔ The ***Modbus/SunSpec (TCP)*** menu is displayed.

8. If you require the Modbus/SunSpec protocol via TCP, for example for external monitoring of the inverter, you can activate it here.
   To activate the Modbus/SunSpec protocol, highlight the item and confirm with ***ENTER***.
9. Press the right arrow key to go to the next installation item.

➔ The ***Updates*** menu appears on the display.

10. Select the update method for installing future software updates on the inverter and confirm with ***ENTER***.

INFO

You can choose between the system update methods ***Manual updates, Notify me of updates*** or ***Automatic updates***. The ***Automatic updates*** method is recommended.

The ***Notify me of updates*** and ***Automatic updates*** system update methods require the inverter to be connected to the internet.

11. Press the right arrow key to go to the next installation item.

➔ The ***Country/Policy*** menu appears on the display.

12. Select the country or policy used and confirm with ***ENTER***.

13. Press the right arrow key to go to the next installation item.
    ➔ ***Apply settings*** appears on the display.
14. Press ***ENTER*** to apply the settings.

INFO

If an incorrect country setting has been selected, it can ***be reset*** via the ***Country policy*** reset menu item on the inverter.

15. The settings are applied by the inverter.
    ✓ After installation, the inverter may restart. The initial commissioning is now complete.

The inverter is now operational and can be used.

INFO

If a software update for the inverter is available, install it first.

The latest software update can be found in the download area for the product on our homepage at **www.kostal-solar-electric.com**

INFO

In France, the installer is responsible for obtaining and affixing the additional mandatory labelling required on the inverter and the supply cables.

7.2 Configuring settings in the Webserver

After the initial installation, more settings can be made using the inverter's menu or more conveniently via the Webserver.

To do this, use a PC or tablet to log in on the Webserver as an installer. Initial commissioning is completed.

INFO

Grid parameters, limitation parameters and parameters specified by guidelines can only be changed with a service code.

To log in as an installer, you need the master key from the inverter's type plate and your service code, which can be requested from our service team.

Information about our service team can be found on our website at **www.kostal-solar-electric.com** > ***Service and support***.

After initial commissioning, the following settings should be made:

- Have the inverter settings made by the installer.
- Have the prescribed settings for grid feed-in made by the energy supplier (EVU).
- Register with **the KOSTAL Solar Terminal**, if you have not already done so.
- Register with **the KOSTAL Solar PORTAL**, if you have not already done so.
- Assign a password for the system operator.
- Update the inverter software. **Updating software, Page 279**
- If a battery is connected, configure the battery settings (e.g. the ***minimum state of charge, SoC***).
- If the battery is controlled externally by an energy supplier, configure the battery control. **External battery control, Page 251**
- If connected, configure the ripple control receiver. **Active power control, Page 241**
- If connected, configure the signal contact for an external surge protective device (SPD).
- If used and connected, configure the switching outputs (e.g. for a heat pump). **Switched outputs, Page 224**.
- Configure additional settings.

See also

- External battery control [▶ 251]
- Active power control [▶ 241]

7.3 Handover to the operator

Following successful installation and commissioning, all documents are to be handed over to the operator.

Instruct the operator in how to use the PV system and the inverter.

The operator must be made aware of the following points:

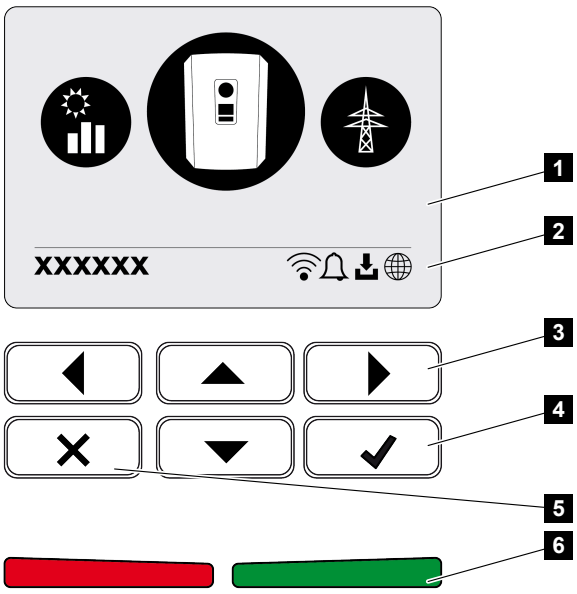
- Position and function of the DC switch
- Position and function of the AC line circuit breaker
- Procedure for disconnecting the device
- Safety when handling the device
- Appropriate procedure when checking and servicing the device
- Meaning of the LEDs and the display messages
- Contact person in the event of a fault
- The provision of system and inspection documentation in accordance with DIN EN 62446 (VDE 0126-23) (optional).

As the **installer and commissioning engineer**, have the operator confirm the proper handover with their signature.

As the **operator**, have the installer and commissioning engineer confirm that the installation of the inverter and the PV system is safe and complies with standards with their signature.

8. Inverter operation

8.1 Control panel



1 Display
2 Status display
3 Arrow key for navigating in the menus
4 ENTER key to confirm
5 DELETE key (for clearing or for exiting the menu)
6 Status LEDs: fault (red), warning (flashing red), feed-in (green), feed-in limited (green flashing)

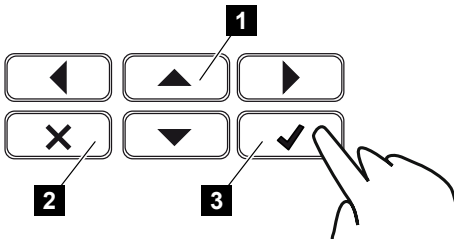
The inverter indicates the relevant operational status using two LEDs and the display.

INFO

When no key has been pressed for several minutes, the screensaver with the image of the inverter appears automatically on the display.

The operating values can be retrieved and settings adjusted on the display.

8.1.1 Operation of the display



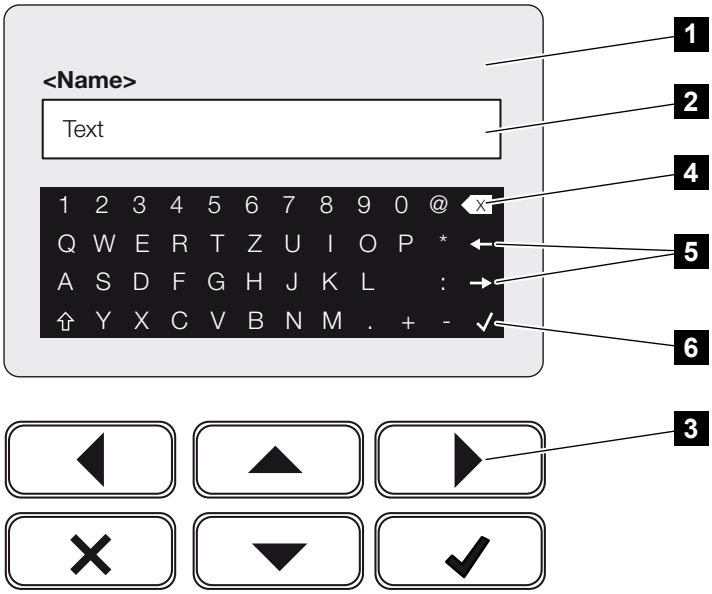
1 UP/DOWN/LEFT/RIGHT: Characters, buttons, functions and input fields are selected with the arrow keys.

2 DELETE/Cancel: Pressing DELETE deletes the selection, the entry or a value, cancels an entry or jumps to the menu above after confirming the entry.

3 ENTER/Confirm: Pressing the ENTER key activates the selected menu element or confirms the input. If you press ENTER in the input box, the value is saved.

8.1.2 Entry of text and numbers

The display can be used to enter texts and numbers (e.g. inverter name). When input is required, a keypad of letters and numbers appears under the input box in order to do this.



1 Inverter display

2 Input box

3 Arrow keys: Select the digits (confirm with ENTER or exit the menu by pressing X)

4 Backspace key: Delete individual digits on the left of the cursor

5 Arrow keys: Move the cursor within the text

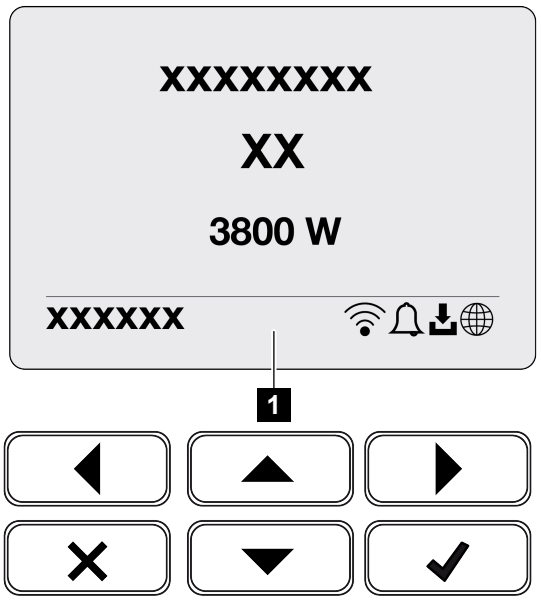
6 ENTER key: Save entry and close menu

8.2 Operational status (display)

The inverter's operational statuses are shown on the inverter's display:

INFO

The user interface/menu items in the inverter depend on the software installed in the inverter and may differ from the description here.



1 Display area, information and inverter status displayed

The following table explains the operational notifications that can appear on the display:

Symbol	Display	Explanation
---	Off	Input voltage on the DC side (photovoltaic modules) is too low or inverter switched off.
	Bell symbol	An event has occurred. For corrective measures, refer to the chapter " Event codes". The event can be viewed in the inverter menu under ***Service menu*** > ***Event list*** or called up by pressing the down button.
	Software update icon	A software update is available for the inverter. The software update can be started in the inverter menu under ***Service menu*** > ***Updates*** or via the inverter.

Symbol	Display	Explanation
	Globe symbol	Shows a successful connection to the solar portal.
	Wifi icon	Displays the Wifi connection status.

Display	Explanation
Shutdown by ext. signal	The feed-in is shut down as a result of an external signal from the energy supply company.
Starting	Internal control measurements according to VDE 0126
Starting, including check of DC generators	Device performs an internal check
Equalisation charge (only with battery connected)	The battery which is connected to the inverter is charged from the public grid using an equalisation charge. It can only be activated with installer access via the service menu.

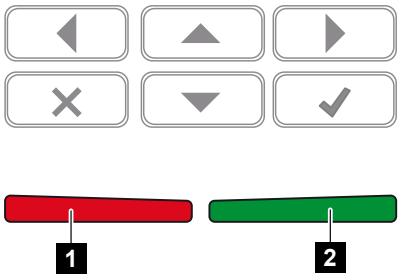
Display	Explanation
Battery sleep mode (only with battery connected)	If the battery charging status falls below the min. SoC (e.g. 5% for BYD batteries), the ***battery sleep mode*** status is displayed and the battery is disconnected from the system. Sleep mode is exited as soon as the battery can be charged with excess power. If the SoC of the battery falls below the minimum allowed SoC, the battery receives a trickle charge of x% of the total battery capacity from the grid to protect the battery. Trickle charge: 5% trickle charge the first time the SoC falls below the permitted value. 10% trickle charge the second time the SoC falls below the permitted value. 15% trickle charge the third time the SoC falls below the permitted value. Once sleep mode has been exited, the next trickle charge starts again with +5 %.
DC voltage too low	Electronics are ready for operation, DC voltage is still too low for feed-in.
Feed in	Measurement successful, MPP control active (MPP = maximum power point)
Feed-in ext. regulated	The feed-in is limited due to a fault (e.g. PV energy is restricted, **Active power control, Page 241**, too high temperature, fault)
Event xxxx, yyyy	An event is present. Up to two active events can be displayed. Remedial measures can be found in the chapter Event codes.
Ext. battery control active (only with battery connected)	The battery is controlled by an external management system. Ch. 8.1

Display	Explanation
DC check	There may be several causes for this message, e.g.: ■ the PV power may be too low, ■ there is currently no home consumption, ■ the feed-in requirements are not met and are being checked. As soon as the checks prove positive, the inverter feeds in again.
IP address	Inverter IP address
Insulation measurement	Device performs an internal check
Grid check	Device performs an internal check
Service charging (only with battery connected)	The battery which is connected to the inverter is charged from the public grid using an equalisation charge. It must be activated via the service menu. It can only be activated with installer access via the service menu.
Deep discharge protection (only with battery connected)	The battery which is connected to the inverter is charged from the public grid using an equalisation charge.
Impermissible DC voltage	DC voltage still too high.
Commutation detection	As soon as the inverter has been activated on the AC side, the DC strings are checked for commutation. All DC inputs are checked in the process. Once the check has been run without any errors, the message disappears. For the check to be run, there must be sufficient power at the DC strings (0.3 A). The DC input of the battery and all PV inputs are checked. During the check, only the DC connection that is being checked is active. The other DC connections are deactivated until the check is complete. Therefore, the PV strings may be deactivated for longer if the irradiation is very low, until all the inputs have been checked.

Display	Explanation
Waiting time ...	The device is not feeding into the public grid due to an event. Grid synchronisation: The inverter synchronizes itself with the public grid and feeds in. Grid check: A grid check is carried out. Grid error: There is an error in the public grid. As soon as this is rectified, the inverter feeds in again. Overheating: The inverter's temperature is too high. As soon as this has fallen, the inverter feeds in again.

8.3 Operational status (LEDs)

The LEDs indicate the current operational status of the inverter.



1 Red LED: Warning/fault

2 Green LED: Feed-in

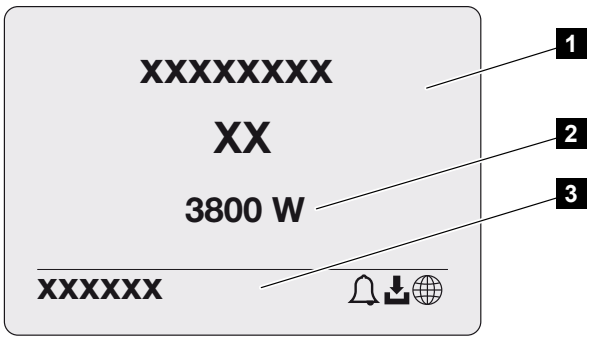
LED	Description
Red LED off	There are no faults present.
Red LED flashing	There is an event (warning) active.
Red LED lit up	A fault has occurred. Remedial measures can be found in the chapter Event codes.
Green LED off	Inverter not feeding in.
Green LED flashing	Inverter feeding in with limitation.
Green LED lit up	Inverter in feed-in mode.

9. User interface and menus

9.1 Inverter menu structure

The screensaver is displayed after start-up or if no key has been pressed for a long time.

Pressing any key activates the background lighting. The screensaver is exited by again pressing any key.



1 Inverter type with power class
2 Current AC power
3 Status line

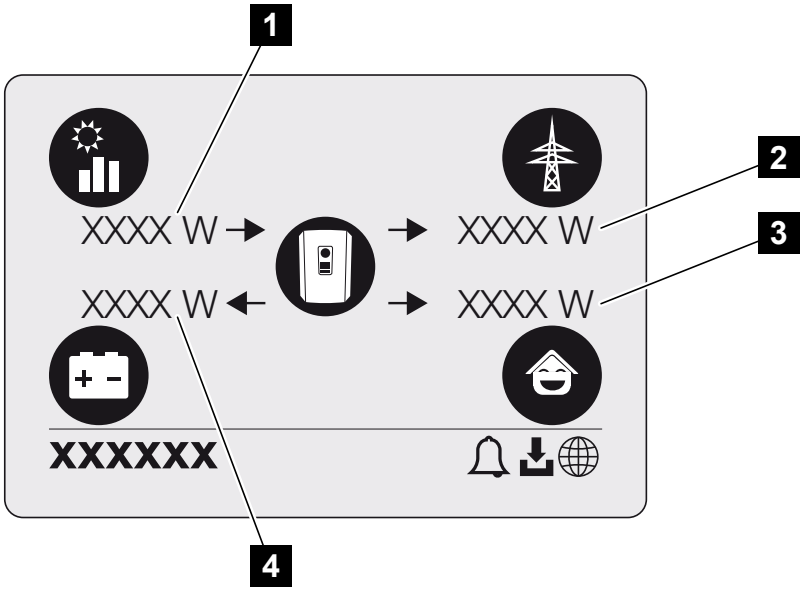
The information displayed on the status line changes every 5 seconds with the following content:

- IP address (if configured)
- Wifi status (if active)
- Inverter status
- Event code (if available)
- Solar portal connection active (if configured)

9.1.1 Power flow diagram

When the screensaver is being displayed, the power flow diagram can be displayed by pressing another key. The diagram is a very clear representation of the current power flow in the house grid and includes the relevant power values. The arrows indicate the direction in which power is flowing at present.

By pressing the OK key, you exit the power flow diagram and switch to the inverter menu level.



1 Indication of power being generated by the PV modules.

2 Indication of power, which is being fed into or drawn from the public grid.

3 Indication of power being consumed in the house.

4 Indication of power with which the battery is being charged or discharged.

INFO

In order for the home consumption to be displayed, a compatible energy meter must be installed in the house network.

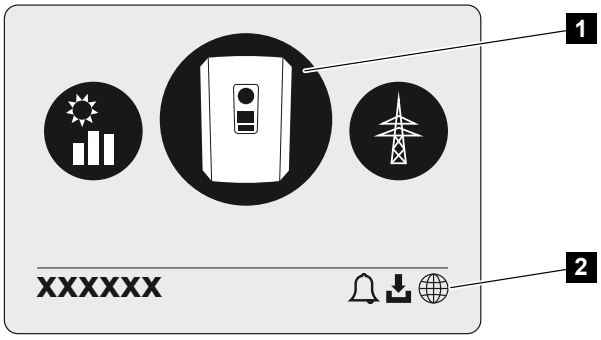
INFO

The battery must be activated and connected before it can be displayed.

9.1.2 Overview of inverter menus

INFO

The user interface/menu items in the inverter depend on the software installed in the inverter and may differ from the description here.



1 Active menu

2 Status line

The inverter provides the following menu items for querying statuses and configuring the inverter:

Symbol	Function
	Inverter settings
	Status query and information about the grid feed-in (AC side)
	House consumption status query
	Status query for the battery charging and discharging power

Symbol	Function
	PV generators status query (DC side)

9.2 Inverter menus

9.2.1 Menu – Settings/information

The inverter and additional components (e.g. energy meter) are configured under "Settings/information".

Basic setting

Setting the general parameters.

Parameter	Explanation
Language	Selection of menu language
Inverter name	Enter the inverter name. The characters a–z, A–Z, 0–9 and "-" can be used when changing the name. Spaces or special characters are not possible. The browser connection to the Webserver can be established with the new name following the name change. It is still possible to gain access with the serial number.
Date and time	Enter the time and date. Setting the time zone Activate/deactivate or automatic determination of time. The NTP server can be configured via the Webserver.

Communication

Set the communication parameters for the inverter's Ethernet connection.

INFO

The "Automatic" option is activated by default. This means that the inverter acquires its IP address from a DHCP server or automatically generates an IP address.

If the inverter is not allocated an automatic IP address through a DHCP server, the inverter can be configured using the item ***Manual***.

The data necessary for configuration, such as IP addresses, router addresses etc., can be found on your router/gateway.

Parameter	Explanation
Network IPv4	Activate the network protocol and configure the network interface (Ethernet) for the inverter. The ***Automatic*** option is activated by default. If configuring manually, the corresponding parameter values should be entered.
	Setting the DNS server: The ***Automatic*** option is activated by default. If configuring manually, the corresponding parameter values should be entered.
WLAN settings	Setting the communication parameters for a WLAN connection of the inverter. The inverter offers various options here.
	WLAN mode: WLAN off The inverter's WLAN interface is deactivated.
	WLAN mode: Access point The inverter offers a WLAN access point. This can be used, for example, to connect a PC or smartphone to the inverter for configuration or monitoring purposes. ***SSID***: Display of the inverter's SSID. The SSID consists of ***KOSTAL_*** and the serial number of the inverter, e.g. ***KOSTAL_91109ADE00053***. ***SSID visible***: The SSID is visible to other devices during WLAN searches. ***Encryption***: Selection of the Wi-Fi encryption. ***Password***: Enter a password. By default, this is the password item number, which can be found on the type plate. ***Radio channel***: Select the radio channel. By default, this should be set to "Auto".

Parameter	Explanation
	WLAN mode: Client The inverter is a Wi-Fi client and can connect to a Wi-Fi gateway in the local home network. In this case, it is no longer necessary to set up a LAN connection. ***Available networks***: Press the button to search for available networks in the vicinity of the inverter. The available networks in the vicinity of the inverter are then displayed. Select your local network to which the inverter should connect. ***SSID***: If the network you are looking for is not displayed, it may be because the network has been configured as invisible. In this case, you can enter the network name yourself. ***Password***: Enter the password for the Wi-Fi network.
WLAN IPv4	Configuration of the inverter's WLAN network interface. The Webserver on the inverter can be accessed via this IP address if there is a WLAN connection to the inverter. The ***Automatic*** option is activated by default. If configuring manually, the corresponding parameter values should be entered.
	Setting the DNS server: The ***Automatic*** option is activated by default. If configuring manually, the corresponding parameter values should be entered.
Network bridge	The Wi-Fi – LAN bridge can be used in the Wi-Fi modes ***Access Point*** and ***Client***. Additional devices can be connected to the LAN interface of the inverter, which serves as a Wi-Fi-LAN bridge. Data is then sent via the Wi-Fi interface to the router and into the Internet. Devices connected to the inverter must not be connected to another DHCP server through which they could receive network data (e.g. IP addresses).
Modbus SunSpec (TCP)	Activate the Modbus SunSpec (TCP) protocol

Parameter	Explanation
WLAN connection code	**NOTE! The WLAN access point in the inverter must be activated in advance.** The QR code for the inverter access point is output using this menu item. The direct connection can be used to connect with the smartphone and inverter. The Webserver can then be called up on the inverter using a web browser and by entering the inverter's IP address 192.168.67.1. The IP address is also shown on the inverter display.
EEBus configuration	You can activate the EEBus protocol on the inverter via this menu item. ***Devices*** Display of devices with which an EEBus connection has been established. ***EEBus QR code*** The QR code contains all the important information about the device needed to connect it to other EEBus-compatible devices.

Solar portal

Input for the solar portal configuration. If a solar portal is to be used, the log data and events are sent to the solar portal.

Parameter	Explanation
Solar portal	Selection of solar portal.
Activate	Activate to start sending to a solar portal.

Device information

Shows information about the versions installed on the inverter.

Parameter	Explanation
Article number	Article number of the inverter
Serial number	Inverter serial number
Hardware	Hardware version

Parameter	Explanation
MC	Main controller version
IOC	Input-output controller version
SW	Software version
National guideline	Country guidelines selected for the inverter
Max. grid feed-in	The configured maximum power that can be fed into the public grid
Insulation resistance	Measured insulation resistance value

Extra options

This function can be used to release additional options/functions for the inverter.

Parameter	Explanation
Release option	Enter an activation code, e.g. to connect a battery. This must be purchased in advance from the KOSTAL Solar Webshop.
Released options	Overview of options currently released in the inverter

INFO

The activation code can be purchased from the KOSTAL Solar Webshop.

You can access the shop via the KOSTAL Solar Terminal or by using this link: shop.kostal-solar-electric.com

Service menu

The installer or an experienced user can use the inverter's service menu to implement settings on the inverter.

INFO

The service menu items depend on the inverter software installed and may differ from the description here.

Some menu items can also be run without a service password. However, these items should only be run by experienced users because otherwise under certain circumstances the inverter may no longer function perfectly.

For the complete service menu to be displayed, the installer must request a code from the inverter manufacturer's service team.

The code is entered by going to the ***Service code input*** menu item.

Once the service code has been entered and confirmed, additional service menu entries appear.

Parameter	Explanation
Service code entry	Enter the service code provided by an installer to activate the additional menu items. The service code can be obtained by installers from our service department.
Fan test	Start fan test
Reset settings	Reset the inverter to factory settings. The following settings will be reset: language, inverter name, date/time, network settings, protocol, log data and solar portal.
Event list	Display of the last 10 events with date. Select an event and press the "OK" button to display a detailed view of the event.
Device restart	Restart the inverter.

Additional menu items after entering the service code

Parameter	Explanation
Grid connection	■ **Maximum grid feed-in** Set the maximum feed-in capacity. Requirements relating to this are generally specified by the energy supply company (e.g. a limitation to 60%). The inverter's max. power serves as the default. **NOTE! Incorrect settings due to lack of expertise. The plant owner is responsible for correctly setting the active power limitation. Your grid operator will provide details of the permissible active power for your system. We recommend that the installer configures all the settings.** ■ **Energy meter** Select the energy meter fitted in the building services. ■ **Sensor position** Select the position of the energy meter in the building services (grid connection or house consumption).
Reset national guidelines	Reset the country setting. After resetting, the inverter starts the commissioning wizard after a restart. **NOTE! Should the inverter not restart automatically, switch it off using the DC switch and also the AC line circuit breaker. Wait 10 seconds and then restart in reverse order.**

Update menu

The update menu can be used to set the software update method or to install updates manually.

INFO

You can find the latest update in the download area for the product on our website at **www.kostal-solar-electric.com**

Parameter	Explanation
System update	Select the inverter's system update method (software update). ■ **Manual updates** The update must be carried out manually. ■ **Notify about available updates** The inverter checks at regular intervals whether new software is available. A software update symbol appears on the inverter or in the Webserver if there is an update. The installation must then be started manually. ■ **Automatic updates** The inverter checks at regular intervals whether new software is available and then installs it automatically. This setting is recommended.
Check for updates	The system looks for current updates from the manufacturer. If a new update is available, it is displayed and can then be installed.

9.2.2 Menu – AC side (grid)

Shows the current values of the AC side.

Current AC power

Shows the current performance data of the grid side (AC) and how this is distributed to the phases.

Parameter	Explanation
Phase x	Voltage, current and power per phase fed into the public grid or taken from the public grid

Yield overview

Indicates the energy generated by the PV generators.

Parameter	Explanation
Day	Yield values for the current day (midnight to midnight)
Month	Yield values for the current month (Day 1 to Day 31)
Year	Yield values for the current year (1 Jan to 31 Dec).
Total	Total yield since commissioning

Grid parameter

Shows the inverter's current grid parameters.

Parameter	Explanation
Current grid frequency [Hz]	Grid frequency
Current cos phi	Current power factor (cos phi)
Current power	Power fed into the house grid by the inverter
Limitation on [W]	Current power curtailment setting

9.2.3 Menu – House consumption

Shows the home consumption and from which sources the home consumption is being covered (PV generator, battery or public grid).

INFO

In order for the home consumption to be displayed, a compatible energy meter must be installed in the house network.

INFO

A list of **approved energy meters** and their purpose is available in the download area for the product on our website at **www.kostal-solar-electric.com**

Current home consumption

Parameter	Explanation
Consumption	Current home consump.
From PV	Share of home consumption being covered by PV
From grid	Share of home consumption being covered by the public grid
From battery	Share of home consumption being covered by the battery

Daily house consumption

Parameter	Explanation
Consumption	Home consumption of current day
From PV	Share of home consumption that has been covered by PV
From grid	Share of home consumption that has been covered by the public grid
From battery	Share of home consumption that has been covered by the battery

Monthly house consumption

Parameter	Explanation
Consumption	Home consumption of current month
From PV	Share of home consumption that has been covered by PV
From grid	Share of home consumption that has been covered by the public grid
From battery	Share of home consumption that has been covered by the battery

Degree of self-sufficiency

The degree of self-sufficiency indicates what percentage of the house's total power requirement is covered by self-generated PV energy. The higher the value, the less energy has had to be purchased from the energy supplier.

Parameter	Explanation
Day	Display for current day (from midnight to midnight)
Month	Display for current month (Day 1 to Day 31)
Year	Display for current year (1 Jan to 31 Dec)
Total	Display for since initial commissioning

Self-consumption rate

The self-consumption rate shows the relationship between self-consumption and the total energy generated using the PV generators.

Parameter	Explanation
Day	Display for current day (from 00 to 24 hours)
Month	Display for current month (from day 1 to day 31)
Year	Display for current year (from 1 Jan. to 31 Dec.)
Total	Display for since initial commissioning

9.2.4 Menu – PV generator (DC side)

Shows the current values of the PV generators.

Current DC power

Shows the generated voltage, current and energy of the PV generators per DC input.

Parameter	Explanation
DC1	Shows the generated voltage, current and power of the PV generators for DC input 1
DC2	Shows the generated voltage, current and power of the PV generators for DC input 2
DC3	Shows the generated voltage, current and power of the PV generators for DC input 3 If there is a battery connected to DC input 3, this is not shown.

9.2.5 Menu – Battery

Displays the current battery values.

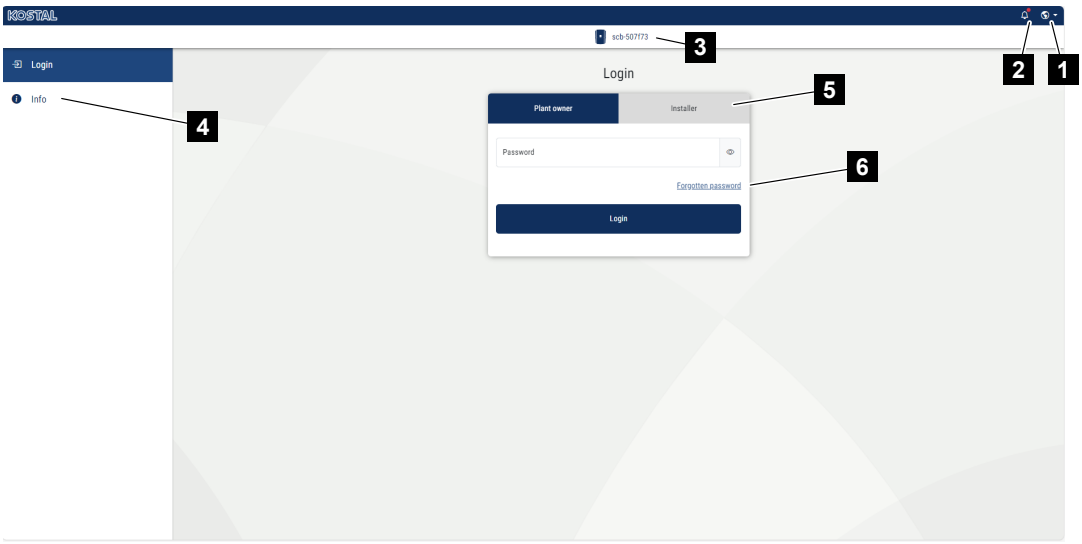
Battery status

If a battery is connected to the inverter, the current battery values are displayed here.

Parameter	Explanation
Charging status	Shows the battery's charging status (only when battery is connected).
Voltage	Shows the battery's voltage.
Charge / discharge current	A charging shows that the battery is being charged. A discharge shows that the battery is being discharged.
Number of cycles	Shows the battery's charging cycles.

9.3 The inverter Webserver

9.3.1 Calling up Webserver

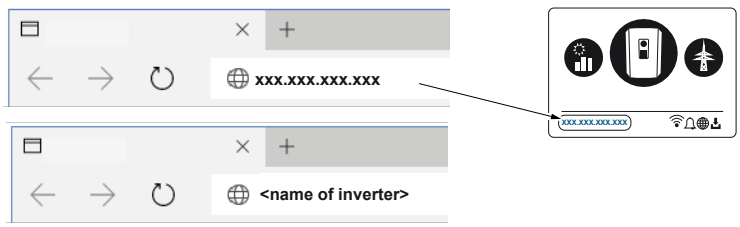


1 Language selection
2 Inverter notifications (e.g. status message for solar portal connection) and events. New
3 Name of the inverter
4 Retrieval of device information
5 Login as plant owner or installer
6 Reset password for Webserver

The Webserver forms the graphic interface between the inverter and user. Even if you don't log in, you can find information about your PV system here, This includes e.g. the device information and current inverter notifications or events.

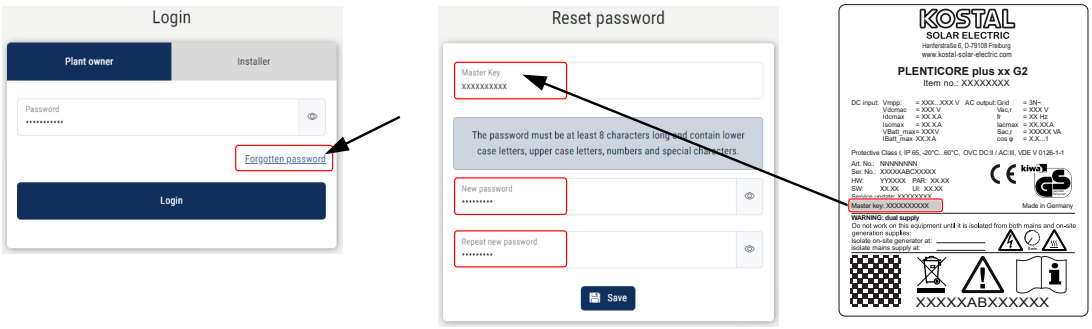
The Webserver is called up on the inverter via a web browser (e.g. Microsoft Edge, Firefox or Google Chrome). Both devices must be on the same network. Any device that has a web browser can be used to call up the Webserver (e.g. a PC, smartphone or tablet).

Enter the IP address or name of the inverter into the web browser. The inverter's IP address can be found on its display.



A user can log in to the Webserver as a ***Plant owner*** or ***Installer*** using ***Login***.

To log in as a ***plant owner***, you need a password, which has to be generated for the first login by clicking on ***Forgotten password***. For this, you also need the master key from the type plate.

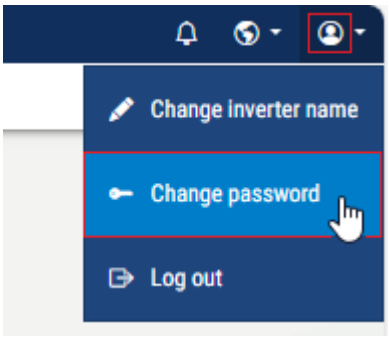


To log in as an ***installer***, you need the master key from the inverter's type plate and your service code, which can be requested from our service team.

Changing Webserver password for plant owner

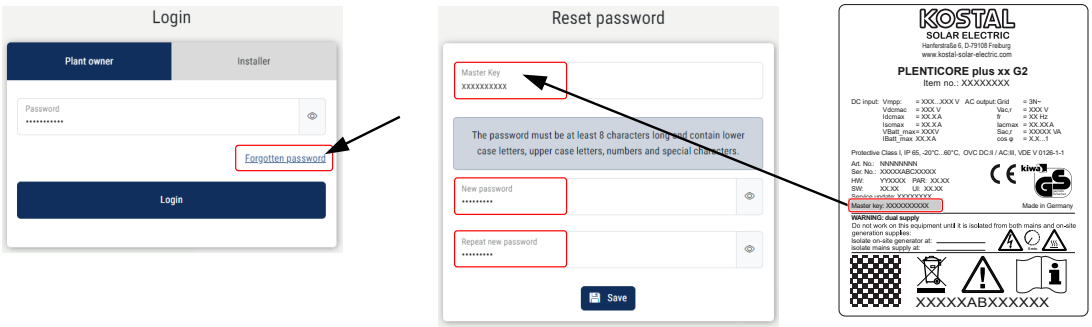
Once you have logged into the Webserver, you can change the password for logging in as plant owner. To do this, go to ***Change password*** at the top right in the personal area.

The password must comprise at least 8 characters and include the following characters: lower-case letters (a-z), upper-case letters (A-Z), numbers (0-9) and special characters.



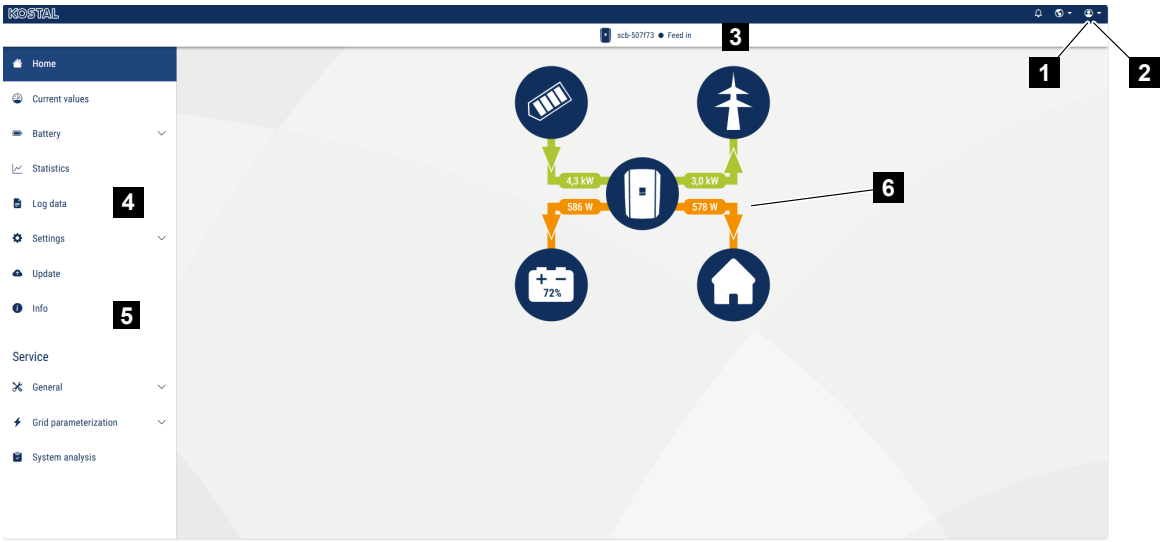
Forgotten Webserver password for logging in as plant owner

If you have forgotten the log-in password, you can create a new one when logging in as plant owner.



1. To do this, go to ***Forgotten password***.
2. Enter the inverter master key from the type plate
3. Enter new password.
4. Confirm password
5. Confirm input by selecting ***Save***

9.3.2 Start screen



1 Logged-in user
2 Log out/log out from the web server. Change password.
3 Inverter status
4 Inverter menus
5 Inverter menus for experts and installers
6 Energy flow diagram

INFO

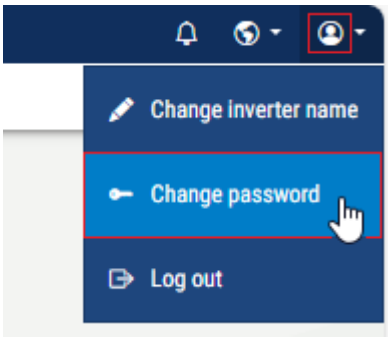
Once you have logged in as plant owner or installer, you can choose from different menu items. Different menus can be used, depending on the user role.

The menu items described here may differ depending on the software version in use.

The Webserver allows the user to view key information, current values, events and inverter versions.

Webserver menus in the top bar

The following menus are available to the user in the top menu line in the Webserver.



- **Notifications/events**
  You can access all notifications and events present in the inverter via the bell symbol in the uppermost menu line. If there are any new messages, this is indicated by a red dot next to the bell symbol. By clicking on an event message, you can access more information about the event.
- **Language setting**
  Here you can select the language in which you want to display the menus.
- **Personal area**
  - ***Change inverter name:*** You can use this menu item to change the inverter name. The name may be 1-63 characters long and contain letters, numerals or "-". The inverter name must not start with "-".
  - ***Change password:*** Once you have logged into the inverter, you can change the password by going to the Webserver menu item in the uppermost line. The password must comprise at least 8 characters and include the following characters: lower-case letters (a-z), upper-case letters (A-Z), numbers (0-9) and special characters.
  - ***Log out:***
    You can use this menu item to log out of the Webserver.

Web server menus in the sidebar

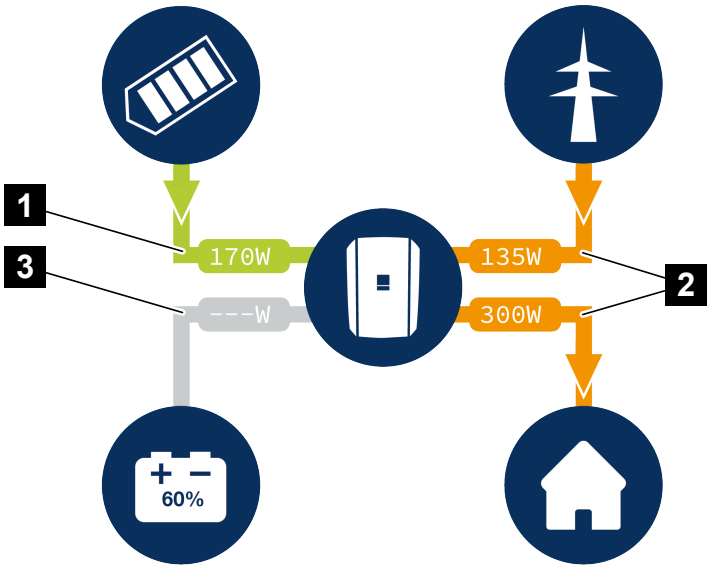
The following menus are available to users in the web server:

- **Home**
  Shows power flow diagram
- **Current values**
  Using various statistics, the user can display the current values for daily, monthly, annual and total yield. Detailed information can be displayed by expanding the statistics.
- **Battery**
  These menu items can be used to display information about the inverter battery or to configure the battery. Some menu items can only be configured by the installer using a service code.
- **Statistics**
  Shows information about the inverter's yield data for daily, monthly, annual or total time periods.
- **Log data**
  Here the inverter's log data can be downloaded in full or for a limited time period.
- **Settings**
  These menu items can be used to configure the basic settings for the inverter (e.g. inverter name, network settings, specifications relating to remuneration, retrieval of log data).
- **Update**
  This menu item can be used to update the inverter via a software update and to configure the system update method, e.g. with automatic updates.
- **Info**
  On the Info page, the user can view events pending in the inverter and the inverter's installed versions (e.g. software, MC, IOC, hardware). This information can also be viewed without logging in to the Webserver.
- **Service - General**
  These menu items can be used by the installer to configure the hardware of the inverter (e.g. active power reduction or activation of additional options). Some menu items can also be configured by the system operator without a service code (e.g. active power limitation, shadow management).
- **Service - Grid parameterisation**
  Using these menu items, the inverter parameters can be configured by the installer, e.g. reactive power or special grid settings that have been specified by the energy supplier.

9.3.3 Home menu

The ***Home*** menu displays the power flow diagram.

The directions of flow for the energy to and from the inverter are shown. The values indicate the power currently present.



1 Green: Energy is being supplied

2 Orange: Energy is being purchased/consumed

3 Grey: No energy flow

Clicking on a symbol calls up the ***Present values*** menu page.

9.3.4 Current values menu

The different statistics show the user the current energy values on the AC and DC side for the daily, monthly, annual and total yield. Detailed information can be displayed by expanding the statistics.

PV generator

Shows the generated voltage, current and energy of the PV generators per DC input.

Parameter	Explanation
DC input x	Shows the generated voltage, current and power of the PV generators per DC input.

Inverter

Displays the current status of the inverter and the current performance data of the grid side (AC) and how the energy is distributed across the phases.

Parameter	Explanation
Status	Operating status of the inverter. For more information, visit **Operational status (display), Page 131**
Digital inputs	Signal status of the connection terminal Digital interface for ripple control receivers (inputs 1–4). The display shows whether the feed-in, e.g. from the energy supplier or an external battery management system, is currently being limited. Settings, e.g. for user-defined active/reactive power reduction, can be made under ***Service > General > Digital inputs***. **Why active power control?, Page 242**
Output power	Shows how much power the inverter is feeding into the domestic grid.
Grid frequency	Shows the current grid frequency.
Cos phi	Indicates the current power factor (cos phi).

Parameter	Explanation
Power reduction to	Shows the current power curtailment setting. If an energy meter (e.g. a KOSTAL Smart Energy Meter) is installed in the home network and a power limit is set, the active power is dynamically limited taking into account the home consumption. This means that, in addition to the set power curtailment, the home consumption is added up to the maximum power limit of the inverter.
Phase x	Displays the power values per phase (x = 1, 2 or 3)

House consumption

Display of the current home consumption and the sources from which home consumption is covered.

INFO

In a device network comprising multiple KOSTAL inverters, the data is merged in the portal. Correct and complete visualisation takes place exclusively in the KOSTAL Solar Portal and in the KOSTAL Solar App and not in the individual inverter.

Parameter	Explanation
Current home consumption covered by	Shows the home consumption and the source from which it is currently covered.

Grid

Shows the current performance data of the grid side (AC).

Parameter	Explanation
Grid	**Feed-in**: PV energy is fed into the public grid. **Consumption**: Energy is purchased from the public grid to cover home consumption.

Battery

INFO

If all values are at zero, the battery is in sleep mode. You can check the status of the battery by going to ***Current values*** > ***Inverter***.

Parameter	Explanation
Status	***Charge***: The battery is being charged. ***Discharge***: Energy is being drawn from the battery.
Battery status	***Normal:*** Normal state ***Equalisation charge:*** The battery is charged from the grid for protection. ***Deep discharge protection:*** The battery is charged from the grid to protect against deep discharge. ***Ext. battery control:*** The battery is regulated via an external control system. ***Battery sleep mode:*** If the battery charging status falls below the configured minimum SoC, this status is displayed and the battery is disconnected from the system. As soon as sufficient excess PV power is available, sleep mode is cancelled and the battery is switched on again. ***Service charging:*** Service charging can only be started by the installer.
Voltage	Shows the battery's charge/discharge voltage.
Current	Shows the battery's charge/discharge current.
Power	Shows the battery's charge/discharge power.
Charging status	Shows the battery's charging status in %.
Charging cycles	Shows the battery's charging cycles.

9.3.5 Menu - Battery

If a battery is connected to the inverter, information about the battery can be accessed or configured.

Battery usage

- Configuration of battery usage, e.g. dynamic electricity tariff or time-controlled battery usage.

Battery settings

- Setting the battery control (only possible using the service code for installers).
- Configuration of battery charge states.
- Other battery settings: battery control, intelligent battery control, storage of excess AC energy.
- Advanced battery options (only possible with installer service code).

Battery information

- Retrieval of battery system data.
- Generate battery log data (only with KOSTAL HELIVOR HV battery).
- Download battery log data (only with KOSTAL HELIVOR HV battery).

Battery information

INFO

This menu item is only displayed if a KOSTAL HELIVOR HV storage system has been installed.

System data

The user can view the battery's system data on the information page.

Parameter	Explanation
Type designation	Name of the battery.
Number of parallel towers	Displayed only for HELIVOR HV battery systems. Number of storage towers connected in parallel. Up to 8 towers can be connected in parallel with the KOSTAL HELIVOR HV.
FW version	Display only for HELIVOR HV battery system. FW version of the battery.
Total capacity	Capacity of the battery.
Battery status	Status of the battery.
State of health	Displayed only if SoH is transmitted by the battery system (e.g. HELIVOR HV). The SoH (State of Health) of the battery indicates the health status/degree of ageing of the battery.
Charge cycles	Charge cycles that have been completed to date.
Voltage	Current charging/discharging voltage in V.
Current	Current charging/discharging current in amperes.
Power	Current charging/discharging power in W.
State of charge	Status: Charging or discharging State of charge in %

Log file

INFO

This menu item is only displayed if a KOSTAL HELIVOR HV storage system has been installed.

This menu item can be used to generate a log file for the HELIVOR HV battery and save it on the PC.

Parameter	Explanation
Status	Status of battery log file generation.
Generate log file	Start generation of log data. The log data is stored in an encrypted file.
Last log file	Date of last log file generation.
Download log file	Download the log data and save the file on your PC. The data can then be forwarded to KOSTAL Service or your installer for evaluation.

Battery settings

If a battery is connected to the inverter, the behaviour and usage of the battery can be configured here.

Parameter	Explanation
Battery type	Select the battery connected to the inverter.
Battery control **(only possible with service code)**	The battery can be controlled via an external battery management system (e.g. energy supplier). In this case, the charging and discharging power of the battery is controlled by the external provider. The system operator then receives remuneration from the external provider for the energy supplied, for example. **External battery control, Page 251** **Internal (default):** External control is deactivated. **Externally via digital I/O:** External battery management is carried out via the digital inputs on the Smart Communication Board (terminal X401) of the inverter. A default setting can be selected, or the digital inputs can be configured according to the provider's specifications. If the control signals are not received, the system switches to internal control. The device status can still be read out in parallel via Modbus (TCP) / SunSpec. **External battery control, Page 251** **Externally via Modbus (TCP):** External battery management is carried out via the Modbus RTU protocol. The control signals are received via the LAN interface. If the control signals are not received for the set duration, the system switches to internal control. It is still possible to read the device status via Modbus (TCP) / SunSpec in parallel. Additionally, set the time for ***external battery control timeout***. If the signals via Modbus are interrupted or fail to arrive, the system will switch to ***internal control*** after the time has elapsed.

Parameter	Explanation
Battery charging as of grid surplus of [W]	Enter a minimum grid surplus value as of which the battery is charged. (Default 50 W.) Example: If a value of 50 W is set, the battery is charged when feed-in into the public grid (grid surplus) is more than 50 W. Charging to the battery is blocked if the value is below 50 W.
Min. state of charge (SoC) [%]	Set the minimum depth of discharge of the battery.
Intelligent battery control	Not supported by all battery types. This function controls the charging and discharging of the battery completely automatically. This function should only be activated if the connected PV power is greater than the PV power of the inverter (inverter curtailment to 70%, for example). You should not use this function if an electric vehicle is being charged via a wallbox, as it is not possible to determine a clear consumption forecast in this case. If the ***storage of surplus AC energy from local generation (Smart AC Link function)*** has been activated, the "Intelligent Battery Control" function is not available. A detailed description can be found at Smart battery control
Storage of excess AC energy from local generation	If there is an additional AC energy source in the local house grid (e.g. an additional PV system or a combined heat and power unit), the AC energy generated can be stored in a battery connected to the PLENTICORE. **NOTE! The function can only be activated if the energy meter has been installed at the grid connection point (position 2).** **Activated:** The AC energy generated can be stored in the battery. **Deactivated**: Extra generated AC energy is not stored in the battery.

Advanced battery options

This menu item only appears once you have logged in as installer.

Parameter	Explanation
Advanced battery options (only possible with service code)	**Start battery charging** If the battery's ***SoC*** is very low during initial commissioning, this function can be used to charge the battery to 100% once. Charging takes place independently of the energy source. In this case, ***service charging*** is displayed on the inverter. If there is no energy meter or if there is a communication timeout of the external battery control, the charging process is terminated at a charge status of 50%.

Battery usage

If a battery is connected to the inverter, usage of the battery can be configured here.

The following options can be used to optimise battery usage:

Parameter	Explanation
No optimisation	The battery is used as normal for charging and discharging. All other settings should be configured under the battery settings.
Time-controlled battery usage	There are times when electricity costs are relatively high (different tariff models). It may therefore make sense to allow the battery to discharge during these periods and to allow charging outside these periods. The times set here can be overridden by specifications from an activated external battery management system. ***No restriction:*** No conditions have been set for this period. ***Battery charging blocked, discharging permitted for domestic use:*** The battery is not charged during this period. However, discharging the battery for domestic use is permitted. ***Battery discharge blocked, charging permitted when there is excess energy:*** The battery is not discharged during this period. However, as soon as there is excess energy, the battery is charged. **NOTE! Please note whether local guidelines permit charging the storage unit from the public grid. If in doubt, ask your installer.**

9.3.6 Statistics menu

Provides information about the inverter's yield data for the day, month, year or total periods.

Parameter	Explanation
Day	Shows the yield/consumption values for the current day.
Month	Shows the yield/consumption values for the current month.
Year	Shows the yield/consumption values for the current year.
Total	Shows all yield/consumption values that have accumulated in the inverter.
Diagram	**Self-consumption:** Displays the self-consumption of all of the energy produced. **Degree of self-sufficiency:** The degree of self-sufficiency indicates what percentage of the house's total power requirement is covered by self-generated PV energy. The higher the value, the less energy has had to be purchased from the energy supplier.
CO2 saving	Shows the purely arithmetical CO2 saving that has been saved by the PV energy generated.
House consumption	Shows the home consumption. **From PV:** Shows how much PV energy has been used for home consumption. **From grid:** Shows how much energy has been obtained from the public grid. **From battery:** Shows how much energy from the battery has been used for home consumption.

9.3.7 Log data menu

Access the log data from the inverter.

INFO

The data is saved in the inverter for around 365 days. When the internal memory is full, the oldest data will be overwritten.

Parameter	Explanation
Log data download	***Restricted time period:*** Download a selected time period of log data from the inverter (max. 100 days).

The log data of the inverter can be downloaded as a file (logData.csv). The data in the file is in CSV format and can be viewed with any spreadsheet programme (e.g. Excel).

The data is saved on your hard drive. After saving, this data can be displayed and further processed.

INFO

If the inverter is not connected to a solar portal, the log data should be regularly backed up.

For more information, see **The log data, Page 258**.

9.3.8 Settings menu

These menu items can be used to configure the basic settings for the inverter (e.g. inverter name, network settings, specifications relating to remuneration, retrieval of log data).

Time settings

Set time/date or select a time server.

Parameter	Explanation
Use time server (NTP)	Activate/deactivate a time server (NTP server). After activation, the time from the time server is used. By using the NTP server, the switch between summer and winter time is also performed automatically.
Date	Date entry. The time can be taken from the PC.
Time	Time entry. The time can be taken from the PC.
NTP server	Input for IP address or name of NTP server (Network Time Protocol). Other, alternative NTP servers can be added via Plus (+). There are numerous free NTP servers on the network which can be used here.
Time zone	Setting the time zone

Network

Set the inverter's network communication parameters.

The settings for the inverter’s LAN or Wifi connection can be configured here.

For a Wifi connection, you can choose between a client connection where the inverter connects to a Wifi router via Wifi or an access point where the inverter itself provides a Wifi network which other devices can then use to connect to the inverter in order to access it.

LAN settings

Set the inverter's network communication parameters for LAN. The inverter is connected directly to a router via a LAN cable.

Parameter	Explanation
Automatically acquire IPv4 address	If the box is ticked, the IP address is generated automatically by a DHCP server. Most routers provide a DHCP server as standard. **NOTE! The option "Automatically acquire IP address" is activated by default. This means that the inverter obtains its IP address from a DHCP server.**
IPv4 address (only with manual configuration)	Enter the IP address of the inverter **NOTE! If the inverter is not allocated an IP address automatically through a DHCP server, the inverter can be configured manually.** **NOTE! The data necessary for configuration, such as IP addresses, subnet mask, router addresses and DNS addresses, can be found on your router/gateway.**
Subnet mask (only with manual configuration)	Enter the subnet mask, e.g. 255.255.255.0
Router/gateway (only with manual configuration)	Enter the IP address of the router
DNS server 1 (only with manual configuration)	Enter the IP address of the DNS server (Domain Name System)
DNS server 2 (only with manual configuration)	Enter the IP address of the backup DNS server (Domain Name System)

Wifi settings

Set the communication parameters for the inverter's Wifi connection. The inverter offers various modes here.

- **Wifi mode – off**

The inverter's Wifi interface is deactivated.

Parameter	Function
Status	WLAN is switched off.
WLAN mode	***Off***

- **Wifi mode – *access point***

The inverter offers a Wifi access point. This can be used, for example, to log a PC or smartphone in to the inverter to configure or monitor the inverter.

Parameter	Function
Bottlenecks	Displays the connection quality to the WLAN gateway.
WLAN mode	***Access point***
SSID	Displays the inverter's SSID. The SSID consists of ***KOSTAL_*** and the inverter's serial number, e.g. ***KOSTAL_91109ADE00053***.
Password	Enter a password. By default this is the article number starting with **P** that can be found on the type plate.
QR code	Displays the data as a QR code. Scan the code with a smartphone and connect to the inverter. The network data is displayed under the QR code and is provided by the inverter as an access point.
Advanced settings – access point Here the settings for the inverter access point can be changed manually.	
SSID visible	The name of the inverter Wifi network is set to visible by default. You can deactivate this here.
Encryption	Select an encryption.
Radio channel	The default value of ***auto*** does not have to be changed.
IPv4 address	IP address at which the inverter access point can be reached.
Subnet mask	The default value does not have to be changed.

Parameter	Function
Router/gateway	The default value does not have to be changed.
DNS server 1	The default value does not have to be changed.
DNS server 2	A second DNS server is not required.

LAN settings in combination with WLAN access point

We would recommend not changing these settings.

Parameter	Function
Automatically acquire IPv4 address	If the box is ticked, the inverter can be used as a WLAN bridge. Other devices connected to the inverter via LAN are assigned an IP address via the inverter's DHCP server. (Default) If ***Automatically acquire IPv4 address*** is deactivated, the WLAN bridge is deactivated. The following data can now be assigned manually for the inverter so that the inverter can also be contacted via a LAN connection.
IPv4 address	Inverter IP address. If there are problems with the standard IP address, another one can be entered here.
Subnet mask	Configured subnet mask value.
Router/gateway	IP address for the internal gateway (192.168.67.1).
DNS server 1	IP address for the DNS server (192.168.67.1).
DNS server 2	IP address for the backup DNS server (192.168.67.1).

- **Wifi mode – *client***

The inverter is a Wifi client and can connect to a Wifi gateway in the local home network. In that case, a LAN connection no longer needs to be set up.
If there are several KOSTAL inverters in a system, the inverter can be used as a Wifi bridge to the Wifi gateway. Additional inverters, energy meters or battery storage can be connected to this inverter using LAN cables to establish the connection to the local home network and the Internet.

Parameter	Function
Bottlenecks	Displays the connection quality to the WLAN gateway.

Parameter	Function
Search wireless networks	Press the button to search for available networks in the vicinity of the inverter. The available networks in the vicinity of the inverter are then displayed. Select your local network to which the inverter should connect.
SSID	If the network you are looking for is not displayed, this may be because it has been configured to not be visible. You can then enter the network name yourself here.
Password	Enter the password for the network you are looking for here.
Automatically acquire IPv4 address	If the box is ticked, the WLAN IP address is generated automatically by an external DHCP server. Most routers provide a DHCP server as standard. If ***Automatically acquire IPv4 address*** is deactivated, the following data must be assigned manually.
IPv4 address	Inverter IP address. If there are problems with the standard IP address, another one can be entered here.
Subnet mask	Configured subnet mask value.
Router/gateway	IP address for the internal gateway (192.168.67.1).
DNS server 1	IP address for the DNS server (192.168.67.1).
DNS server 2	IP address for the backup DNS server (192.168.67.1).

LAN settings in combination with WLAN client

We would recommend not changing these settings.

Parameter	Function
Automatically acquire IPv4 address	If the box is ticked, the inverter can be used as a WLAN bridge. Other devices connected to the inverter via LAN are assigned an IP address via the inverter's DHCP server. (Default) If ***Automatically acquire IPv4 address*** is deactivated, the WLAN bridge is deactivated. The following data can now be assigned manually for the inverter so that the inverter can also be contacted via a LAN connection.
IPv4 address	Inverter IP address. If there are problems with the standard IP address, another one can be entered here.
Subnet mask	Configured subnet mask value.

Parameter	Function
Router/gateway	IP address for the internal gateway (192.168.67.1).
DNS server 1	IP address for the DNS server (192.168.67.1).
DNS server 2	IP address for the backup DNS server (192.168.67.1).

Wifi - LAN bridge

The Wifi - LAN bridge can be used in the ***Access Point*** and ***Client*** Wifi modes. Further devices can be connected to the LAN interface of the inverter, which serves as a Wifi - LAN bridge. Data is sent on to the router and across the Internet via the Wifi interface. In this case, devices connected to the inverter must not be connected to another DHCP server via which they could receive network data (e.g. IP addresses).

Parameter	Function
Enabling packet forwarding between Wifi and LAN	The ***Wifi bridge*** is activated by default. You can deactivate it here should you wish to. If there is no DHCP server in the network, the Wifi bridge is activated by plugging in a LAN cable and establishing the connection to another inverter or similar device. If an inverter has already been integrated into a local network via LAN and has received network data via another DHCP server, the Wifi bridge is not activated.

Network diagnostics

The inverter allows the connection to the Internet orKOSTAL Solar Portal to be checked using the ***Traceroute*** and ***Ping*** commands.

Parameter	Explanation
Ping	Determines the path to a specific host by sending ICMP (Internet Control Message Protocol) echo request messages with different TTL (Time to Live) values to the target. Each gateway along the path must decrement the TTL in an IP packet by at least 1 before it is forwarded. In fact, the TTL is a maximum connection counter. When the TTL of a packet reaches 0, the gateway is expected to return an ICMP Time Exceeded response to the inverter.
IP address/website	Enter IP address or domain name, e.g. **www.google.com**
Ping count	Number of echo requests sent (1-50)
Ping packet size	Number of data bytes being sent (4-1472 bytes)
Ping timeout	Wait time for a response in milliseconds (100-2000 ms)

Parameter	Explanation
Traceroute	Determines the path by sending the first echo request message with a TTL of 1 and increasing the TTL by 1 on each subsequent transmission until the target responds or the maximum number of hops is reached. The maximum number of hops is 20 by default and can be specified in the ***Traceroute max. TTL*** field. The path is determined by examining the ICMP timeout messages returned by intermediate gateways and the echo response message returned by the target. However, some gateways do not return Time Exceeded messages for packets with expired TTL values and are not visible to the Traceroute tool. In this case, a row of asterisks (*) is displayed for this hop.
IP address/website	Enter IP address or domain name, e.g. **www.google.com**
Traceroute max. TTL	Maximum number of hops (maximum TTL to be reached) in the path to search for the target (10-30)

Modbus/SunSpec (TCP)

Activate the protocol, which can be used in the inverter to exchange data with external data loggers linked to the inverter via the LAN interface.

Parameter	Explanation
Activate Modbus	Output of the parameter port (1502) and the parameter ID (71) for Modbus/SunSpec. Activate the protocol on the LAN TCP/IP interface. Used for an external data logger, for example. Little-endian and big-endian can be chosen for the byte order. **NOTE! KOSTAL devices and most partner applications use the default setting "little-endian". In some cases it may be necessary to change the byte order to "big-endian".**

EEBus

You can activate the EEBus protocol on the inverter using this menu item.

EEBus is a data communication standard for devices in the Smart Home. The EEBus standard is openly accessible to all device manufacturers.

Parameter	Explanation
Activate ***EEBus***	The EEBus protocol is activated on the inverter. To allow external EEBus devices to communicate with the inverter, you must trust the external EEBus devices.
Deactivate ***EEBus***	The EEBus protocol is deactivated on the inverter. EEBus devices connected externally to the inverter can no longer exchange data.

This device

Overview of the EEBus device information.

Parameter	Explanation
SKI	***Subject Key Identifier*** (device code/key) of the inverter. This is required for the connection to other EEBus devices. The QR code pictured includes the ***SKI***.
Model	Model name
Name	Name of the EEBus device. The inverter name can be changed by going to ***Settings > Basic settings***.
QR code	The QR code contains all key information about the device for connecting it with other EEBus-compatible devices.

Applications

Here, the applications available to the inverter are displayed. These can be used to read out or control the inverter.

Parameter	Explanation
Monitoring of Inverter (MOI)	The inverter provides inverter values. Connected devices can read out this value.
Monitoring of Battery (MOB)	The inverter provides battery values. Connected devices can read out this value.

Parameter	Explanation
Limitation of Power Production (LPP)	Limitation of power generation This application allows the inverter feed-in to be controlled by external sources.
Monitoring of Power Consumption (MPC)	Monitoring of power consumption The inverter provides consumption values. Connected devices can read out this value.

Paired devices

Displays the devices that are connected via EEBus.

Click on the device to see further information about the device or EEBus connection.

Parameter	Explanation
Model	Model name
Make	Manufacturer
Type	Information about the device type, e.g. energy manager.
Status	Reports on the status of the connection. Available: A connection with the device can be requested. Hourglass - connection pending: The other party still needs to confirm the connection. Communication disrupted: The connection is currently disrupted. If this persists, check the connection to the external EEBus device. Tick - Paired: The connection is active. Revoke trust: If you click on an EEBus device, another window opens in which you can disconnect the connection by clicking on ***Decouple*** (revoke trust).

Decoupling EEBus device

The ***Decouple*** action (revoke trust) is used to disconnect a connected and coupled EEBus device.

Clicking on the EEBus device symbol opens a dialogue window with further details.

1. Click on ***Decouple*** (revoke trust) and close the window.

➔ The status has changed. The EEBus device is now again listed under ***Available devices***. On the other hand, the connection should still be checked and decoupled.

✓ Device decoupled.

Available devices

Displays the available devices that have been found in the local network and that can be connected via EEBus.

If you click on an EEBus device on the list, more information about the device is displayed.

INFO

Only devices, which can communicate with the inverter for the purposes of power regulation (LPCC/LPP) or data retrieval (MOI/MOB/MGCP) should be coupled.

Other EEBus-capable devices may be coupled, but are not controlled by the inverter. This can lead to error messages or malfunctions for the coupled devices.

The following EEBus-capable devices are supported:

- control boxes at grid connection point (e.g. Smart Meter Gateway or control box from grid operator)
- energy management systems (device for managing the energy consumption / power generation of connected devices in the house)
- electric mobility devices (e.g. wallboxes)
- heating, ventilation and air conditioning devices/systems (e.g. heat pump)
- other inverters (PV/battery/hybrid inverter)
- domestic appliances, which support EEBus (e.g. washing machine, dryer, fridge etc.)

Click on the device you want to connect to and pair it. The devices then appear on the ***Paired devices*** list. The other party now needs to confirm the request for the connection to be fully set up.

Parameter	Explanation
Model	Model name
Make	Manufacturer
Type	Information about the device type, e.g. energy manager.

Decoupling EEBus device

Clicking on the EEBus device symbol opens a dialogue window with further details. To connect EEBus devices to each other, both devices must be coupled.

1. To do this, click on ***Couple*** (pair) and close the window.

➔ The status has changed to ***Connection pending*** (hourglass).

✓ The counterparties now need to confirm the connection again. Once this has been done, the status changes to ***Coupled*** (paired, green tick).

Current limitation

If a limitation has been activated, you will see the current power limitation here.

You will see the fallback values in case of connection loss for LPC and LPP under the Info symbol.

Received limitations

History of received limitations.

Parameter	Explanation
Type	Shows the use case for which the limitation applies.
Limit	Received value of limitation.
Valid from	The limitation is valid from date/time.
Valid until	The limitation is valid until date/time.

Solar portal

Input for the solar portal configuration. If you are using a solar portal, the log data and events can be sent to the solar portal.

INFO

The solar portal can only be used for inverters which are linked to the Internet.

Parameter	Explanation
Use portal	Activates the transfer to the solar portal.
Portal	Select the KOSTAL Solar Portal or other portals. When selecting ***Other portals***, a portal code must be entered and confirmed with ***Apply***.
Last transfer	Indicates when the inverter last transferred data to the solar portal (provided the function is active).
Last successful transfer	Indicates when the inverter last successfully transferred data to the solar portal (provided the function is active).
Activate log data export with FTP push	If ***Use portal*** has been activated and the ***KOSTAL Solar Portal*** has been selected, the log data can be transferred to an external FTP server and saved. A description of the data can be found at **Log file: Entries, Page 260**. To do this, activate the log data export and configure the ***FTP push settings***. ***Server***: Enter the server address at which the FTP server can be reached. ***Port***: Enter the port address (default value is 21). ***Directory***: Specify the directory in which to store the files on the server. ***Export interval***: Select the time interval for the transfer. ***Use encryption***: Use encryption for the data transfer. The server must support encryption for this function to work. ***Authentication required***: If the server is accessed using an ID and password, enter the data for this here. ***Connection status***: Displays the current connection status with the server. ***Last successful export:*** Time of the last successful data transfer.

Factory settings

Reset inverter to factory settings.

Parameter	Explanation
Reset to factory settings	All the settings made (other than choice of guidelines and grid parameters) will be lost. The device will then be restarted. **NOTE! The option "Automatically acquire IP address" is activated for the network by default. This means that the inverter obtains its IP address from a DHCP server. In this case, the same IP address is usually assigned to the inverter via the DHCP server.**

9.3.9 Update menu

This menu can be used to install a software update on the inverter.

Various update methods are available to the user for this purpose.

If a KOSTAL HELIVOR HV battery system is connected to the inverter, the menu item ***HELIVOR – Perform update*** also appears. This menu can be used to perform a manual software update of the battery.

If ***Automatic Update*** is selected under ***System Update***, the devices will always be provided with the latest updates. In this case, an update will be performed for both devices, **the inverter and the battery**.

Parameter	Explanation
System update	**Manual updates:** The inverter must be updated manually. To do this, click ***on Search for updates*** or drag an update file into the field below. The inverter update is then initiated by clicking on the ***Execute*** button. **Updating software, Page 279** **Notify me of new updates:** The inverter checks at regular intervals whether an update is available. If a new update is available, this is indicated by the software update icon in the header. The inverter update can then be initiated by clicking on the ***Execute*** button. **Automatic updates (recommended):** In this case, a new update is installed on the inverter as soon as it becomes available.

PLENTICORE – Perform update

Parameter	Explanation
Search for updates	This function can be used to search for current updates on the manufacturer's server. The inverter update is then initiated by clicking the ***Execute*** button. **Updating software, Page 279**
Select update file	This function allows you to select an update file on your PC.
Upload and execute	The update file is loaded onto the device and the update is initiated.

HELIVOR – Perform update

This menu item allows you to perform a manual software update of the battery. The current software for the battery can be found in the download area for the product.

Parameter	Explanation
Select update file	This function allows you to select an update file on your PC.
Upload and execute	The update file is loaded onto the device and the update is initiated.

9.3.10 Info menu

On the Info page, the user can view events pending in the inverter and the inverter's installed version (e.g. software, MC, IOC, hardware). This information can also be viewed without logging in to the Webserver.

Device information – Devices

Shows information about the versions installed on the inverter. Information about the device can also be viewed without logging in to the Webserver.

Parameter	Explanation
Name	Name of inverter Can be changed by going to ***Settings*** > ***Basic settings***.
Type designation	Inverter type designation
Serial number	Inverter serial number
Article number	Article number of the inverter
SW version	Software version (SW)
MC version	Main controller software version
IOC version	I/O controller software version
Web app version	Webserver app version
HW version	Hardware version
Insulation resistance R_iso	Insulation resistance measuring value
Guideline	The configured country setting for the inverter
Display showing functions that have been released (e.g. battery input)	Display showing status (e.g. released)
Battery SoH	Battery state of health as %. As a characteristic value of a battery, the battery state of health describes the battery's level of ageing compared with its rated or new value and specifies this as a percentage. The value is only displayed if it is transmitted by the battery.
Licenses	Licenses and legal information Information about Open Source software, developed by third parties and licensed using vehicles including GPL and/or LGPL.

Device information – Network

Provides information about the assigned network settings.

LAN parameter	Explanation
Network configuration	**Static:** The network settings have been assigned manually. **DHCP:S** The network settings have been obtained automatically.
IPv4 address	Shows the specified IP address of the inverter
Subnet mask	Shows the specified subnet address
Gateway	Shows the router/gateway address
DNS server	Shows the address of the 1st and 2nd DNS server (Dynamic Name Server)
MAC address	Shows the physical address of the network interface

Not all parameters are displayed in all modes.

Wifi parameter	Explanation
Mode	**Wifi off:** The inverter's Wifi interface is deactivated. **Access point:** The inverter offers a Wifi access point. **Client:** The inverter is a Wifi client and can connect to a Wifi gateway in the local home network.
SSID	Name of Wifi network
Network information	**Static:** The network settings have been assigned manually. **DHCP:** The network settings have been obtained automatically.
IPv4 address	Shows the specified IP address of the inverter
Subnet mask	Shows the specified subnet address
Gateway	Shows the router/gateway address
DNS server	Shows the address of the 1st and 2nd DNS server (Dynamic Name Server)
MAC address	Shows the physical address of the network interface

Solar portal parameters	Explanation
Last connection to the solar portal	Last transfer, shown in minutes or as a time

9.3.11 Menu - Service - General

In the service menu, the installer will find more options for configuring the inverter. Configuring these settings requires precise knowledge of the requirements of the public grid specified by the energy supply company (e.g. reducing active power, setting parameters specified by the energy supply company).

INFO

The settings in this menu require special knowledge of the grid configuration.

Grid connection

Selection of the connected energy meter on the inverter and the feed-in limitation to the public grid.

INFO

The settings in this menu can only be configured after logging in as the installer.

INFO

You will find a list of **approved energy meters** and their purpose in the download area for the product on our website at **https://www.kostal-solar-electric.com**.

Parameter	Explanation
Energy meter	Selection of connected energy meter.
Sensor position	Select the position of the energy meter fitted in the building services. Grid connection point = position 2 Home consumption = position 1 **Energy meter connection, Page 72**

Parameter	Explanation
Limitation of active power to [W] **(configurable without service code)**	Set the max. feed-in capacity. Requirements relating to this are generally specified by the energy supply company (e.g. a limitation to 60 %). The inverter's max. power serves as the default. Use the calculator to easily calculate the reduction. **NOTE! Incorrect settings possible due to lack of expertise. The plant owner is responsible for correctly setting the active power limitation. Your grid operator will provide details of the permissible active power for your system. We recommend that the installer configures all the settings.**
Enable reception of broadcast control signals	If a ripple control receiver is connected to the digital inputs of another inverter, the signals for active and reactive power control can be distributed to all inverters in the local area network (LAN) via UDP broadcast. Similarly, a local energy manager can generate signals for active and reactive power control in the local network. **Enabled:** The inverter is controlled by a ripple control receiver connected to another inverter. **Deactivated (default):** The signals are not evaluated. The inverter is not controlled by a ripple control receiver connected to another inverter.

Shadow management

MPP tracking optimisation settings.

Parameter	Explanation
Shadow management	If PV strings are partially shaded, the affected PV string will no longer achieve its optimum performance. If shadow management is activated, the inverter adjusts the MPP tracker of the selected PV string so that it can operate at the maximum possible power. If module optimisers have been used for individual solar modules in the PV string, shadow management must be deactivated in the inverter.

External hardware settings

Define hardware settings.

Parameter	Explanation
Residual current protection equipment	**Compatibility of type A RCD:** If this function has been activated, type A RCDs can be used as residual current protection equipment. In such cases, the inverter shuts down when the residual current becomes incompatible with a type A RCD. If the function is deactivated, a type B RCD must be used as residual current protection equipment if an RCD is stipulated.

Digital inputs

INFO

The settings in this menu can only be configured after logging in as the installer.

Parameter	Function
None	There is nothing connected to the digital inputs.
Active power control	For connecting a ripple control receiver with standard switching specifications. Detailed description in the chapter on own consumption. **Active power control, Page 241** Activates the distribution of ripple control signals in the home network. **Enabled:** If a ripple control receiver is connected to the inverter, the control signals from this ripple control receiver are distributed via UDP in the local LAN network. This means that other inverters can also be controlled via the connected ripple control receiver. **Deactivated:** The control signals are not distributed via UDP in the local LAN network. **Distribution of control signals for active/reactive power control:** If the control signals are to be distributed via UDP in the local LAN network (home network), activate the ***distribution of the broadcast control signals***. This allows other inverters in the local LAN network to also be controlled.

Parameter	Function
Custom active/reactive power control	For connecting a ripple control receiver. Unlike standard active power control, this option allows you to specify up to 16 settings. These are usually specified by the energy supplier. Detailed description in the chapter on own consumption. **Active power control, Page 241** Activates the distribution of ripple control signals in the home network. **Enabled:** If a ripple control receiver is connected to the inverter, the control signals from this ripple control receiver are distributed via UDP in the local LAN network. This means that other inverters can also be controlled via the connected ripple control receiver. **Deactivated:** The control signals are not distributed via UDP in the local LAN network. **Distribution of control signals for active/reactive power control:** If the control signals are to be distributed via UDP in the local LAN network (home network), activate the ***distribution of the broadcast control signals***. This allows other inverters in the local LAN network to also be controlled.
External battery management	If you have activated external control via the digital I/O ports in the ***Battery settings*** menu, you can define the functions of the inputs here. Assign the desired charge or discharge power to the inputs.

CEI/VDE inputs

Terminal for ripple control receiver CEI for Italy.

Contact terminal for internal circuit breaker for central grid and system protection.

Parameter	Explanation
Operating mode	***Not used*** The inputs are not activated.
	CEI Activate the CEI input (terminal X403). The switchable shutdown limits must be configured under ***Grid and system protection***. More information can be found under the ripple control receiver connection via CEI control signals for Italy
	VDE (circuit breaker) Activate the function in the inverter for the terminal (X403 terminal). More information can be found under connection for central grid and system protection.

Switched outputs

The inverter is equipped with four switched outputs. The switched outputs can switch external consumers for the purpose of increasing self-consumption or can be configured as indicators for statuses or events.

A detailed description can be found in and a description of installation in Connection of switched outputs.

Set the function of the switched outputs (terminal X1401 and X1402) on the Smart Communication Board. The 2-pin terminal can be assigned various functions.

Parameter	Explanation
Output	Shows outputs 1-2 on terminal X1401 and outputs 3-4 on terminal X1402.
Operating mode	Select mode: ***Off***: The switched output is deactivated. ***Load control***: Switches on consumers when conditions are set (e.g. PV surplus). ***SG ready***: Using the SG Ready function is a simple and cost-effective solution to increase PV self-consumption by using a heat pump. The inverter makes it possible to control a heat pump compatible with SG Ready. The SG Ready specification's operating statuses 2 (normal operation) and 3 (start-up recommendation) are supported. ***Wallbox:*** For controlling a wallbox so that it starts the charging process for an electric vehicle connected to the wallbox under certain conditions. The wallbox must have a control input. For more information, please refer to your wallbox's manual. ***Events***: The output is switched when a certain event occurs. The event must be selected from the list. ***External control***: The output can be switched by an external energy management system via the Modbus/TCP protocol.

Parameter	Explanation
State	Select the function of the switched output. Function as potential-free ***normally open contact (NO)*** or ***normally closed contact (NC***). ***Normally open contact (NO)*** Normally, the contact is open. The contact is closed when the set conditions are met. ***Normally closed (NC)***. Normally, the contact is closed. The contact is opened when the set conditions are met.

Battery use for switching based on PV power

The settings made here apply to all outputs where switching is configured based on PV power.

Parameter	Explanation
The switched output is only activated when SoC (%) >=	If the switch-on conditions are met, the battery may be discharged to the set SoC by the connected consumer.
Allow battery discharge only if SoC (%) >=	If the switch-on conditions are met, the battery may be discharged to the set SoC by the connected consumer.

Overvoltage protection

External AC/DC overvoltage protection

Activate the evaluation of an external message signal. The inverter can evaluate the message output of the overvoltage modules (SPD) and output a message if an event occurs. Information on connection and wiring can be found under Connecting the signal contact for the external overvoltage protection (SPD – Surge Protective Device).

INFO

The settings in this menu can only be configured after logging in as the installer.

Parameter	Explanation
Evaluation of the external message signal	Activate the function
The monitor signal is interconnected as	Select overvoltage module switching status ***Normally open contact (NO)*** Normally, the contact is open. If an error occurs, the contact closes and the inverter issues a message. ***Normally closed (NC)***. Normally, the contact is closed. If an error occurs, the overvoltage module's contact opens and the inverter issues a message.

Extra options

This function can be used to release additional options for the inverter. This may be e.g. releasing the input to connect battery storage.

Parameter	Explanation
Released options	Overview of options currently released in the inverter
Activate new additional option	Enter an activation code, e.g. to connect a battery. **NOTE! The activation code can be purchased via PLENTICOINs from the KOSTAL Solar Webshop or wholesale. You can access the shop via the KOSTAL Solar Terminal.**

Device restart

Run restart can be used to restart the inverter. A confirmation prompt appears asking you if you really want to restart the device.

Restarting the device interrupts the feed-in.

The restart takes several minutes. After restarting, you have to log back in.

9.3.12 Menu - Service - Network parameterisation

The following menu items can be used to set the parameters in the inverter which are specified by the grid operator.

INFO

The settings in this menu can only be configured after logging in as the installer.

INFO

The settings may only be adjusted by trained and qualified electricians.

The electrician is responsible for ensuring that the applicable standards and regulations are observed and implemented. Work that could affect the electrical power system of the respective energy supply company at the site of the solar energy feed-in may only be carried out by qualified electricians expressly authorised (licensed) by the energy supply company.

This includes changes to the factory preset parameters of the inverter.

The parameters may only be changed on the inverter upon request from the grid operator.

Inappropriate settings can be hazardous and lead to injury or even death of the user or third parties. Material damage to the device and other equipment can also occur.

Parameterisation report

The parameterisation report provides you with an overview of all the important settings for the inverter.

The report can be used to check whether all of the specifications from the energy supplier are set correctly in the inverter. You can print out the report and hand it over to the customer or energy supplier.

The report contains the following parameters:

- Information on the ***device***
- ***Technical data*** on the type plate for the DC input and AC output
- ***Energy management*** (e.g. limitation of active power)
- ***External hardware settings: Residual current protection equipment***
- ***Reactive power settings***
- Settings on the ***digital inputs***
- ***Settling time for external reactive power control***
- ***Settling time for external active power control***
- ***Power reduction if overfrequency occurs and power increase if underfrequency occurs P(f)***
- ***Power reduction at overvoltage P(U)***
- ***UVRT / OVRT*** Configuration of the electrical ability to provide dynamic grid support through electrical generation units
- ***Start-up ramp***
- ***Grid and system protection*** with shutdown limits, start-up conditions

Reactive power settings

The following can be selected:

Parameter	Explanation
No reactive power mode active	No reactive power is set.
Reactive power Q	The grid operator (energy supply company) specifies a fixed reactive power in Var.
Displacement factor cos ϕ	The grid operator specifies a fixed displacement factor cos ϕ.
Reactive power/voltage characteristic curve Q(U)	The grid operator specifies a characteristic curve Q(U).
Displacement factor/power curve cos ϕ	The grid operator specifies a characteristic curve for cos ϕ (P).

Start-up ramp

- **Configuration of the start-up ramp (can only be configured with service code)**

Parameter	Explanation
Ramp time [s]	Specifies the time in seconds after a restart or mains fault that the inverter waits before switching on. The ramp time is also used for P(f) and P(U).

UVRT / OVRT

Configuration of the electrical ability to provide dynamic grid support through electrical generation units.

Parameter	Explanation
UVRT	Configuration of under-voltage ride-through LVRT is the electrical ability to provide dynamic grid support through electrical generation units.
OVRT	Configuration of over-voltage ride-through HVRT is the electrical ability to provide dynamic grid support through electrical generation units.

P(f)

Configuration of power reduction at overfrequency P(f).

Parameter	Explanation
Activation of power reduction at overfrequency P(f)	Activation or deactivation of the function.
Overfrequency characteristic curve	The characteristic curve is defined by a change in frequency which is expressed as in percentage of the rated frequency and causes a 100 % change in rated output.
Activation of power increase at underfrequency P(f)	Activation or deactivation of the function.
Underfrequency characteristic curve	The characteristic curve is defined by a change in frequency which is expressed as in percentage of the rated frequency and causes a 100 % change in rated output.
Conditions for returning to normal mode	Input of frequency range and waiting time in seconds.

P(U)

Configuration of power reduction at overvoltage P(U).

Parameter	Explanation
Activation of power reduction if overvoltage occurs P(U)	Activation or deactivation of the function.
Reduction curve	The characteristic curve is defined by a voltage start and end point. The power is reduced by 0% at the start point and by 100% at the end point.
Settling time	Selection of the settling time
Conditions for returning to normal mode	The reduction in power ends once the voltage has fallen below the specified value and the stated waiting time has passed.

Settling time

Set the settling time when externally controlling the reactive power or active power using ripple control receiver or Modbus.

Parameter	Explanation
Settling time [s]	When externally controlling the reactive power (Q, cos ϕ), the settling time can be set in seconds. Select the specifications of the grid operator (energy supply company) here.
Mode	With external control of active power, the following parameters can be set. Standard: no further details needed (default) PT1: Selection of the settling time in seconds. Power gradient: Input of maximum power limit gradient. Enter the specifications of the grid operator (energy supply company) here.

Grid and system protection

The settings for the grid and system protection may only be changed in exceptional cases for good reason and in consultation with the grid operator (energy supply company).

Parameter	Explanation
Shutdown limits for voltage	The settings for the grid and system protection may only be changed in exceptional cases for good reason and in consultation with the grid operator (energy supply company). Enter the specified values in the corresponding fields.
Shutdown limits for frequency	
Start-up conditions	
Conditions for starting up after a grid error	
Rate of change of frequency	

Grid and system protection self-test

Performs a self-test with the set values and outputs the result.

10. KOSTAL Solar App/Tools

10.1 KOSTAL Solar App

The free KOSTAL Solar App offers you professional monitoring of your photovoltaic system. You can use the KOSTAL Solar App to access all the functions on your smartphone or tablet at any time.

To set up and use the app, you will need access to the KOSTAL Solar Terminal and the KOSTAL Solar Portal and to have an inverter set up there. To log in to the app, use the same login details as for the KOSTAL Solar Terminal.

You can use the KOSTAL Solar App to monitor your photovoltaic system and view relevant system data both at home and when you are out and about. It allows you to access the consumption and generation data over various time periods, such as day, week, month and year, and to view your photovoltaic system's historical data. This means that with the KOSTAL Solar App you are always up to date.

Download the free KOSTAL Solar App today and benefit from new and advanced functionalities.

Additional information about this product is available on our website **www.kostal-solar-electric.com** under ***Products > Tools and applications > KOSTAL Solar App***.

10.2 KOSTAL Solar Portal

The KOSTAL Solar Portal is a free online platform for monitoring the PV system.

The Solar Portal enables the operation of the inverter to be monitored via the Internet. For this purpose, the inverter sends the PV system's yield data and event messages to the solar portal via the Internet.

The information is then stored in the solar portal. You can view and call up this information via the Internet.

This means that the KOSTAL Solar Portal protects your investment in a PV system from yield losses, e.g. by actively warning you by e-mail when an event occurs.

Register for the KOSTAL Solar Portal free of charge using the KOSTAL Solar Terminal at **https://terminal.kostal-solar-electric.com**.

KOSTAL Solar Terminal

The Solar Portal has the following functions:

- Worldwide portal access via the Internet
- Graphic representation of the power and yield data
- Visualisation of data and thus being made aware of how to optimise self-consumption
- Notification of events by e-mail
- Data export
- Sensor evaluation
- Display and proof of a potential active power reduction by the grid operator
- Storage of log data for long-term and reliable monitoring of your PV system
- Providing system data for the KOSTAL Solar App

Prerequisites for using the Solar Portal:

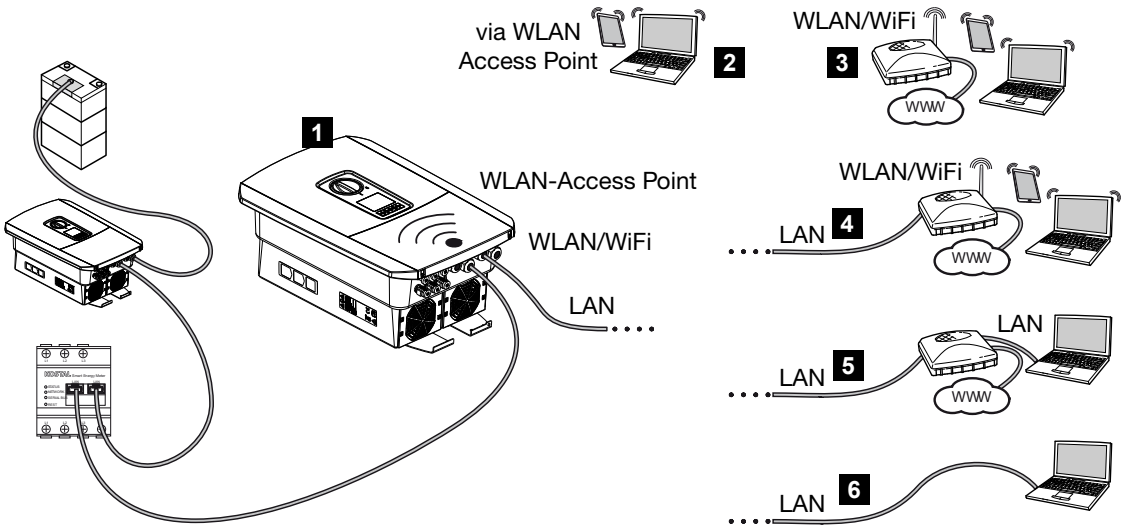
- The inverter must have a connection to the Internet.
- Data transfer to KOSTAL Solar Portal must be activated in the inverter.
- The inverter must not be assigned to any other PV system in the KOSTAL Solar Portal.
- The inverter must be assigned to your PV system in the KOSTAL Solar Portal.

You can find more information about this on our website **www.kostal-solar-electric.com**.

KOSTAL Solar Electric

11. Connection types

11.1 Connecting methods between inverter/ computer



1 Inverter with LAN/WLAN interface and WLAN access point

2 WLAN access point connection for initial commissioning or for direct access to the inverter Webserver on site

3 WLAN connection via WLAN router

4 LAN connection via WLAN router

5 LAN connection via switch/hub/router

6 LAN direct connection

The inverter can be contacted via a computer or tablet using various types of connection to configure it or retrieve data. Several settings should be noted here. These are explained in more detail on the following pages.

INFO

If the inverter is to be accessed via the Internet, this shouldn't take place using unencrypted HTTP access (port 80).

Instead, preference should be given to encrypted access via HTTPS (port 443) and a VPN connection.

For settings relating to the router or Internet, please contact the provider of the router, your provider or a network specialist.

11.2 Using inverter as WLAN bridge for other devices

If several devices have been installed in a system and they are connected together via LAN, the inverter can be used as a WLAN bridge.

The inverter offers the following interfaces for this:

- 2 x LAN interfaces to which other devices can be connected
- WLAN interface for communicating with a WLAN router
- WLAN access point for communication with a computer

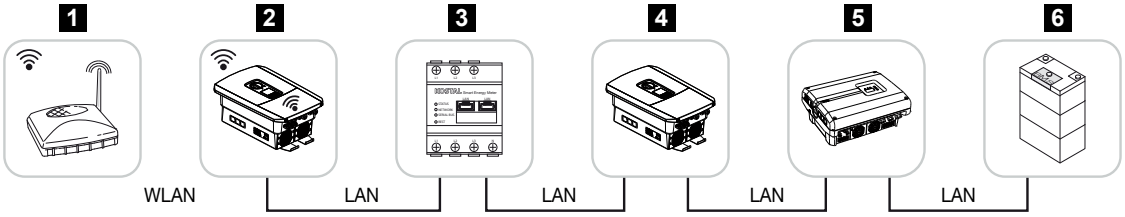
Inverter as a Wifi bridge

If there are several KOSTAL inverters in a system, the master inverter can be used as a Wifi bridge to the Wifi router in the local network. Other available slave devices are connected to the master inverter via LAN cable.

INFO

Automatic IP address allocation not possible

With some router models, the automatic IP address allocation will not work for devices connected downstream of the inverter bridge. If the IP address allocation function is not working, set a static IP address in the router for the devices connected downstream of the inverter bridge.



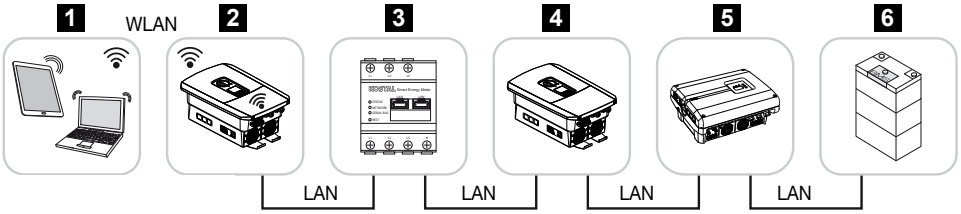
1 DSL/WLAN router in the local home network
2 Master inverter as WLAN client with WLAN bridge function and LAN interfaces for other devices
3 KOSTAL Smart Energy Meter with two LAN interfaces
4 Other inverters with two LAN interfaces
5 Other inverters with two LAN interfaces
6 Storage system with LAN interface

Inverter as access point

The inverter can be used as a WLAN access point. Tablets, smartphones or PCs use the inverter WLAN access point for initial commissioning or for monitoring other KOSTAL inverters.

Other inverters, energy meters or storage systems are connected to the master inverter via LAN cable.

If there is not a DHCP server in the network, the ***WLAN bridge*** is activated by plugging in a LAN cable and establishing the connection to another inverter or similar device. If an inverter has already been integrated into a local network via LAN and is receiving network data via another DHCP server, the ***WLAN bridge*** is not activated.



1 Tablet, smartphone or PC with WLAN access on the master inverter
2 Master inverter with WLAN access point and LAN interfaces (gateway)
3 KOSTAL Smart Energy Meter with two LAN interfaces
4 Other inverters with two LAN interfaces
5 Other inverters with two LAN interfaces
6 Storage system with LAN interface

11.3 Settings on the computer

The items listed below relate to the Windows 10 operating system.

- In the computer's Internet protocol (TCP/IP), the options ***Automatically acquire IP address*** and ***Automatically acquire DNS server address*** must be activated. (If the computer can already access the network in which the inverter is located, these settings are no longer required.)

  You can go to the Internet protocol (TCP/IP) settings via the control panel:
  Control Panel > ***Network and Sharing Center*** > ***Change Adapter Settings***.

  Right-click on ***LAN connection*** > ***Properties > Select "Internet protocol (TCP/IPv4)" > Properties***.

- In the computer's LAN settings, the option "Use proxy server for LAN" must be deactivated.

  You can reach the LAN settings via the control panel:
  Control Panel > ***Internet options*** > Tab: ***Connections*** > ***LAN settings***.

11.4 Create LAN direct connection between inverter/computer

This variant is mainly used when configuring using the Webserver on site.

DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

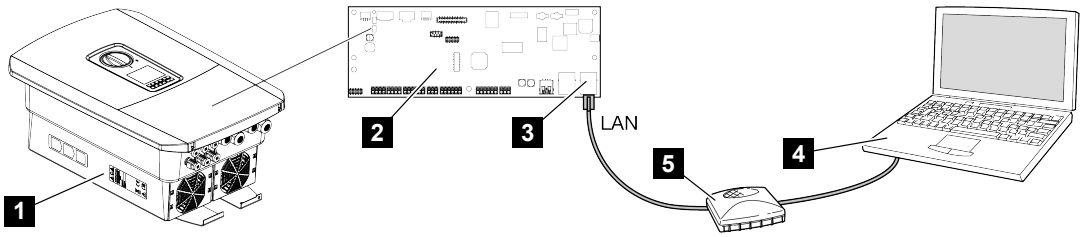
INFO

Use a patch cable of category 5 (Cat 5e) or better with a length of max. 100 m.

INFO

If the inverter is connected directly to the PC and has not yet been given its own IP address via a DHCP server, the inverter automatically generates an IP address itself or an IP address can be configured manually. This can then be entered into the browser's address bar on the PC to access the Webserver.

Connecting the Ethernet cable to a router integrates the inverter into your own network and the inverter can then be contacted by all computers incorporated in the same network.



1 Connect inverter with Ethernet cable
2 Smart Communication Board with LAN interface
3 Ethernet cable (LAN)
4 PC
5 Router

Connect inverter with router or computer

1. Turn the DC switch on the inverter to OFF.
2. Switch off inverter AC line circuit breaker and secure it against being switched on again.
3. Remove the cover.
4. Remove the terminal compartment's cover.
5. Insert Ethernet cable into the inverter and seal with sealing ring and union nut. Tighten union nut to the prescribed torque. Tightening torque: 8 Nm (M25).
6. Connect Ethernet cable to LAN interface of Smart Communication Board.
7. Connect Ethernet cable to a router or computer.
8. Close cover of terminal compartment and inverter (2.0 Nm).
9. Activate fuses and DC switch.

✓ The inverter is connected to the computer.

11.5 Remove LAN direct connection between inverter/computer

DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

INFO

Leave the Ethernet cable connected to the inverter. This makes it possible to easily carry out further queries or setting configurations on the inverter.

If connecting through a router, there is no need to remove the connection.

Remove the connection between inverter and computer

1. Turn the DC switch on the inverter to OFF.
2. Switch off inverter AC line circuit breaker and secure it against being switched on again.
3. Remove the cover.
4. Remove the terminal compartment's cover.
5. Disconnect Ethernet cable from the inverter and remove from the inverter
6. Put the plug seal back in place in the cable feed.
7. Close the inverter cover.
8. Switch on the line circuit breaker.
9. Switch the DC switch on the inverter to ON.

✓ The inverter is once again in operation.

12. Switched outputs

12.1 Switched outputs at a glance

Four digital switched outputs with a load capacity of 24 V/100 mA each are available at the inverter's X1401/X1402 terminals. These can be used to control existing loads or actuators.

In addition, events that occur can be signalled. If there is an event message, the inverter can trigger an actuator connected to the switched output (warning light, message signal, smart home system), providing information about the event that occurred.

For this purpose, the switched outputs can be configured for the different operating modes via the Webserver. The corresponding switched output is activated or deactivated as soon as the configured conditions occur.

In the ***Load control***, ***SG ready*** and ***Wallbox*** modes, you can select the basis for the switched output to be activated. You can decide whether the output switches based on the excess power fed into the utility grid or when a certain PV power is exceeded.

The ***Battery use for switching based on PV power*** area can be used to configure how a connected battery is used. The settings made here apply to all switched outputs that switch based on ***PV power*** . If the switch-on conditions are met, the battery may be discharged to the set SoC by the connected consumer.

For information on connecting self-consumption control, see Connection of switched outputs.

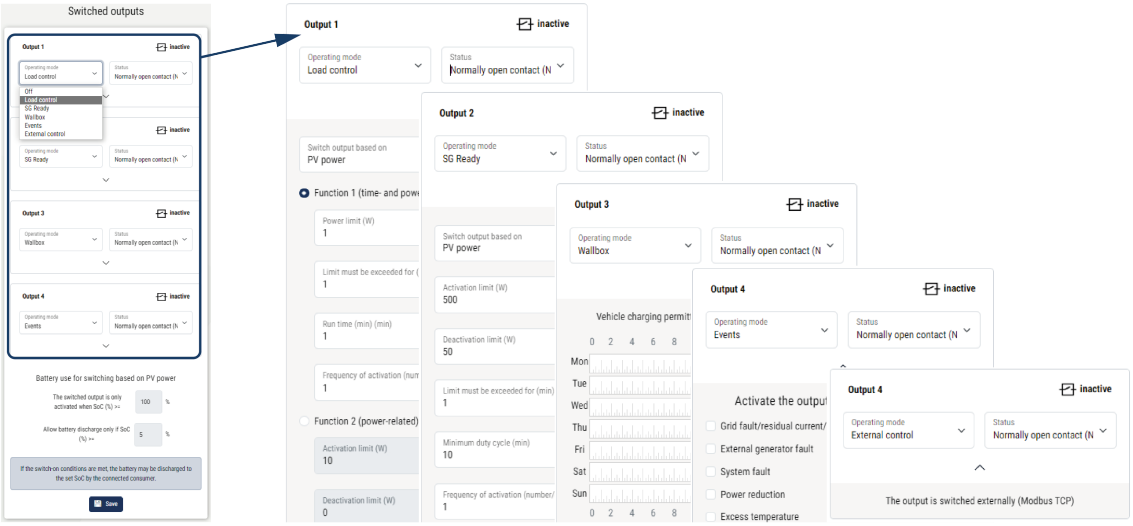
Configure self-consumption control

1. Open the web server.
2. Go to ***Service*** > ***General*** > ***Switching outputs***.
3. Under Configuration for ***Output x***, select the ***Operating mode*** and the ***Status*** of the switch.
4. Under ***Output x:…***, configure the conditions, e.g. ***output switches based on*** > ***PV power*** or ***grid surplus***.
5. If ***Switch output based on PV power*** has been selected, the ***Battery use for switching based on PV power*** can be configured if desired. This setting applies to all switched outputs that are to be switched based on PV power.
   The switched output is only activated when SoC [%] >=: This determines the SoC from which the relevant switched output, and therefore also the battery, may be used. If the switched outputs are to be used independently of the battery's SoC, set the value to 5%. This means that the battery is always used jointly. If you want the battery to have a reserve, set the value higher or even to 100%. This means that charging the battery has higher priority than using the switched output.
   Allow battery discharge only if SoC [%] >= If the output has been activated, the battery can be used. It is discharged down to the SoC entered here. If the battery should not be used, set the value to 100%.
6. Save the settings.

✓ The configuration is now complete.

Possible operating modes

- ***Load control***: The switched output is activated as soon as the configured excess occurs. A consumer can then be switched on via a relay **Set up self-consumption control for load control, Page 228**
- ***SG ready***: Generated energy can be made available to a heat pump **Set up self-consumption control for heat pumps (SG Ready), Page 231**
- ***Wallbox***: Use energy to charge an electric vehicle **Set up self-consumption control for wallbox, Page 233**
- ***Events***: Activate the switched output for certain events, e.g. to activate a signal horn **Set up switched output for reporting events, Page 235**
- ***External control***: The output is switched externally (via Modbus/TCP) and can thus switch a consumer, e.g. a battery **Switched output via external control, Page 237**

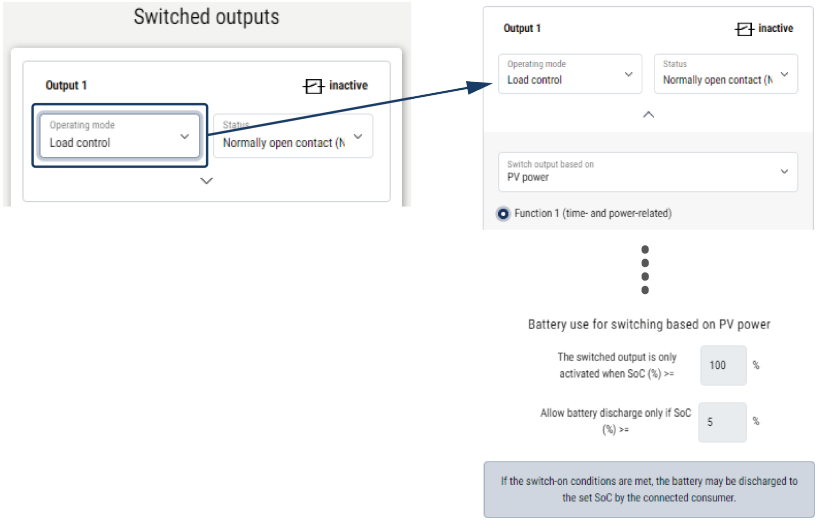


Possible statuses

- ***Normally open contact (NO)***: Normally the contact is open (NO = normally open). The contact is closed when the set conditions are met.
- ***Normally closed contact (NC)***: Normally the contact is closed (NC = normally closed). The contact is opened when the set conditions are met.

12.2 Set up self-consumption control for load control

Switches on consumers when conditions are set (e.g. PV surplus).



1. Select output, e.g. output 1, and the ***load control operating mode***.
2. Under ***Status***, select whether the switch is closed or opened when the set conditions are met.
3. Underneath, select the set output, e.g. output 1, and set the conditions.
4. Select whether the switched output is to be switched at a specific ***PV power*** or ***grid surplus*** .
5. Choose function 1 or function 2.

INFO

You can find more detailed explanations regarding the selection of function 1 or function 2 in the course of the chapter.

6. Enter values for the function.
7. Optionally activate the value for ***Leave switched output activated in event of power loss or fault*** using the checkbox and enter the time period.
8. Optionally select ***Battery use for switching based on PV power***.
9. Click on "Save".

✓ The "Self-consumption control" function is active.

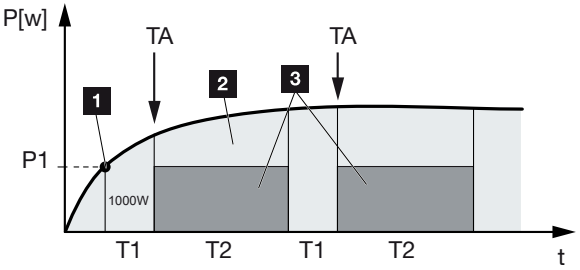
Function 1

Control of self-consumption by time

When a certain output **P1** has been generated for a certain time **T1**, the function is activated and the consumer is connected.

The inverter remains in ***Self-consumption*** mode for the run time **T2**. Following the run time **T2**, the inverter ends self-consumption.

This is the end of the interval. This interval can be repeated several times with the ***Activation*** option.



1 Power limit

2 Feed-in to the public grid

3 Self-consumption via self-consumption contact

P1: Power limit

This is the minimum power (in watts) that must be generated (e.g. 1000 W) before the consumer is switched on. You can enter any value from 1 watt to 999,000 watts.

T1: Period of stable exceeding of the power limit (P1)

The inverter must exceed the set **power limit** for this period of time (in minutes) before the consumer is switched on. You can enter any value between 1 and 720 minutes (= 12 hours).

T2: Run time

The connected consumer is switched on for this period (in minutes) when both of the above conditions have been met. You can enter any value between 1 and 1440 minutes (= 24 hours). The run time ends when the inverter shuts off. The run time is ended and not continued again if the inverter has not produced any current for three hours.

TA: Frequency of activation [number/day]

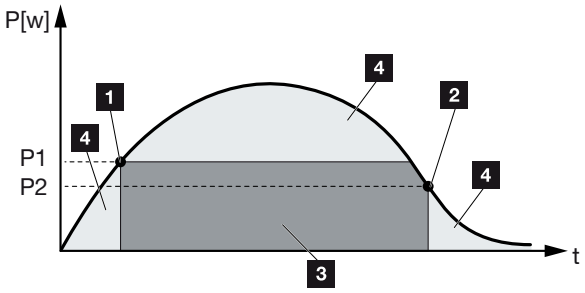
Number/day indicates how often self-consumption is activated per day.

Function 2

Control of self-consumption by output

When a certain output P1 has been generated (e.g. 1000 W), the inverter switches.

When the output falls below P2 (e.g. 700 W), the inverter ends self-consumption and resumes feeding current into the grid.



1 Activation limit
2 Deactivation limit
3 Self-consumption via self-consumption contact
4 Feed-in to the public grid

P1: Activation limit
This is the minimum power (in watts) that must be produced before the consumer is activated. You can enter any value from 1 watt to 999,000 watts.

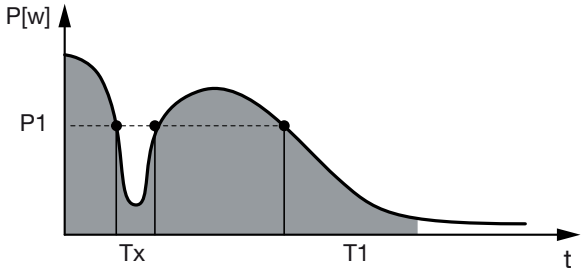
P2: Deactivation limit
The consumer is switched off when the power generated falls below this value.

Other options

Leave switched output activated in event of power loss or fault

With this function, self-consumption is only discontinued after the set delay time **T1**. In the event of power loss, fault **(Tx)** and failure to achieve the shutdown limit, the consumer remains switched on for the set time **(T1)**.

If the fault period or the period of power loss is shorter than the set delay time, self-consumption remains activated.



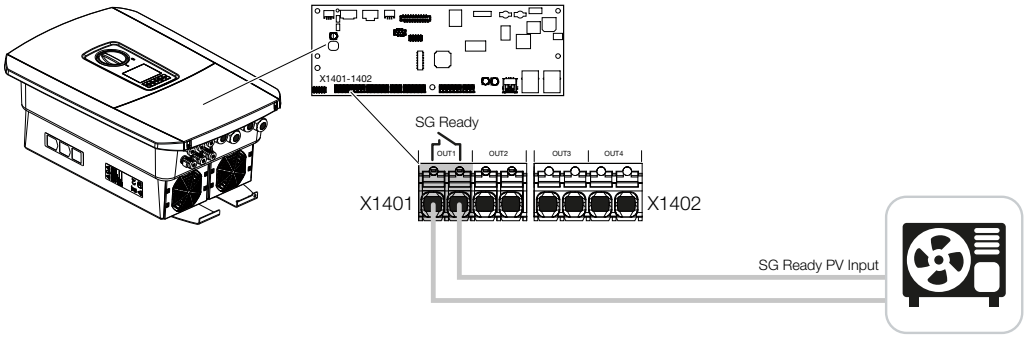
P1: Power limit

T1: Delay time in the event of power loss/fault

Tx: Fault, power loss or failure of the inverter

Dashed area: Self-consumption active

12.3 Set up self-consumption control for heat pumps (SG Ready)



Using the **SG Ready** function is a simple and cost-effective solution to increase PV self-consumption by using a heat pump. The inverter allows a heat pump with **SG Ready** compatibility to be controlled.

The **SG Ready** specification's operational status 2 (normal operation) and operational status 3 (start-up recommendation) are supported.

The heat pump/heating element is switched on when the set conditions are met. The **SG Ready** mode can be configured for this purpose via the inverter's Webserver menu.

In this mode, the switching signal is used to give the heat pump a start-up recommendation (in accordance with **operational status 3 of** the **SG Ready specification**). In this operational status, the heat pump runs within the controller in boosted operation for heating and domestic hot water preparation.

The configured switch-on limit should therefore at least correspond to the power consumption required for boosted operation.

For further information on connection and power consumption, please refer to the heat pump's operating manual.

Example setting: Webserver

Switched output no. 1 (OUT1) is used. This should switch based on grid excess power. According to the manufacturer, the heat pump's boosted operation (operating mode 3) requires 1700 W.

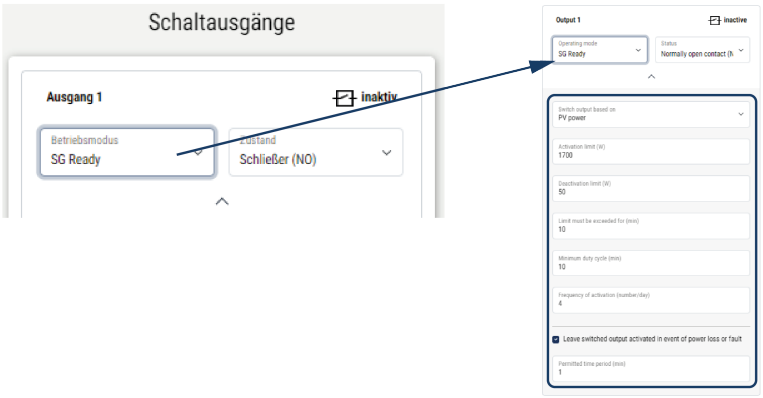
The ***activation limit*** is set to the 1700 W required for boosted operation.

50 W is entered under ***deactivation limit*** .

As soon as the 1700 W power is exceeded for the set period, the output becomes active for the selected duration, which is at least 10 minutes. The grid excess drops below the deactivation limit to approx. 0 W as soon as the heat pump switches to enhanced operation.

After the ***minimum duty cycle*** has elapsed, the switched output becomes inactive again.

You can set the maximum number of times the behaviour described above may be repeated per day in the ***Frequency of activation*** field.



INFO

If the output is to be switched based on ***PV power***, we recommend adding the base load of the house consumption (approx. 150 to 500 W) to the activation and deactivation limit.

SG Ready settings

Parameter	Explanation
Switch output based on	Grid excess or PV power.
Activation limit [W]	The switched output is activated as of this value.
Deactivation limit [W]	Below this value, the switched output is deactivated.
Limit must be exceeded for [min]	The activation/deactivation limit must be exceeded by the number of minutes specified before the switched output is activated/deactivated. This prevents devices from being repeatedly switched on/off if, for example, no PV energy is available for a short time. 10 minutes is reasonable here.
Minimum duty cycle [min]	The switched output remains active at least until the set time has been reached. This prevents devices from being repeatedly switched on/off. The **SG Ready** specification states that the signal must be active for at least 10 minutes. Therefore, it is not possible to set a lower value.
Frequency of activation [number/day]	Indicates the maximum number of activations per day. For heat pumps, it is recommended to enter a maximum of 10 activations per day.

12.4 Set up self-consumption control for wallbox

The inverter allows a compatible wallbox connected to the switched output to be controlled. This is a simple and cost-effective solution to increase PV self-consumption by using a wallbox.

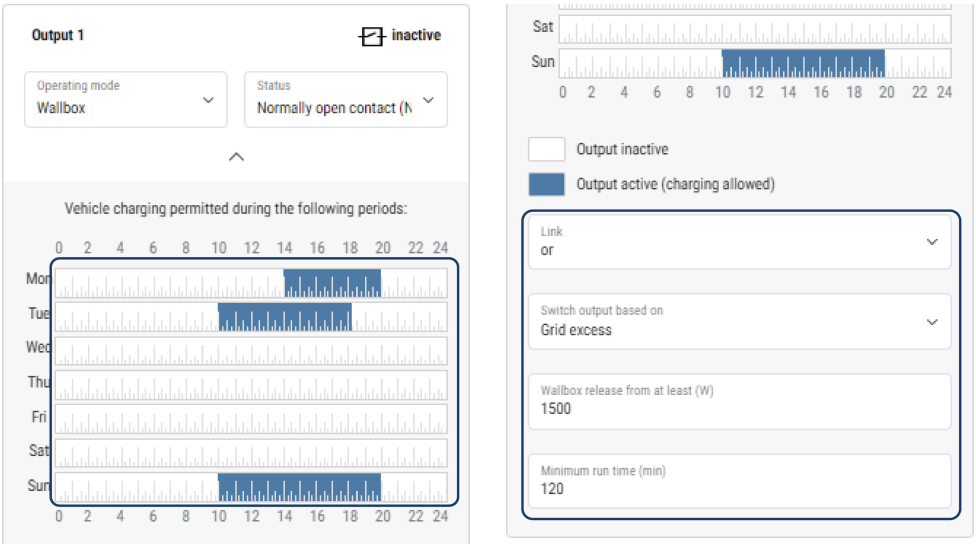
Using the switching signal, the inverter can give the wallbox approval for charging or change the charging current specification. For further information on activation, please refer to the wallbox manual.

The period during which the output can be activated can be set based on a 24h period for each day of the week. Charging the electric vehicle is permitted during the set time periods.

With the help of an AND link/an OR link, the approval to charge the electric vehicle can additionally be combined with the PV power or grid surplus power.

This makes it possible to charge an electric vehicle directly from PV. Charging the connected battery is given secondary priority. This means that the electric vehicle is charged first via the wallbox and only then is the storage system charged.

It is not possible to use the storage system connected to the inverter when the output is active.



Parameter	Explanation
Allow vehicle charging during the following periods	The table allows configuration of the time periods in which the electric vehicle may generally be charged. The time periods can be set via mouse click/tap. The first click sets the start time and the second the end time. Then select the function (active/inactive).

Parameter	Explanation
Link	No link/AND link/OR link If ***No*** linkage is selected, the lower switching settings based on power and the wallbox enable are greyed out.
Switch output based on	***Grid excess***: There is excess available at the grid connection point. ***PV power***: Excess PV is available.
Wallbox enable if power [W] >=	Activated when the power is greater than the set value.
Minimum run time [min]	The switched output remains active at most until the set time has been reached.

12.5 Set up switched output for reporting events

The output is switched when one or more events are active in the inverter. The user is informed about the event at the same time. The output can, for example, switch to a smart home system that processes the signal.

Example: The output can be used to switch off a consumer if a certain event occurs or to activate a signal lamp to indicate a fault.

1. Select event from the list.
2. Optionally select ***Battery use for switching based on PV power***.
3. Click on ***Save***.

✓ The "Self-consumption control" function is active.

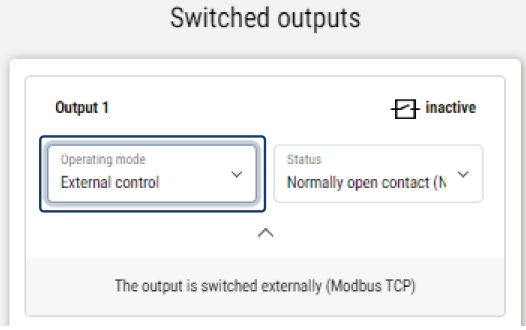
A switched output can be configured for the following events.

Event	*Setting condition*	*Resetting condition*
Grid fault/residual current/insulation fault	A grid fault/residual current/insulation fault is active.	A grid fault/residual current/insulation fault is no longer active.
External generator fault	An external generator fault is active.	An external generator fault is no longer active.
Power reduction	Power reduction is active.	Power reduction is no longer active.
System fault	A system fault is active.	A system fault is no longer active.
Excess temperature	Excess temperature is active.	Excess temperature is no longer active.
Fan fault	A fan fault is active.	A fan fault is no longer active.
Energy meter fault	An energy meter fault is active.	An energy meter fault is no longer active.
Battery malfunction	A battery malfunction is active.	A battery malfunction is no longer active.
Battery communication fault	The event (ID 5013) is active.	The event (ID 5013) is no longer active.
Ext. overvoltage protection defective	There is an active signal at the SPD monitor input.	There is no longer an active signal at the SPD monitor input.
External insulation fault	An insulation fault is active.	An insulation fault is no longer active.

Event	*Setting condition*	*Resetting condition*
External residual current	Residual current is active.	Residual current is no longer active.
Internal parameterisation fault	A parameterisation fault is active.	A parameterisation fault is no longer active.
Internal communication fault	A communication fault is active.	A communication fault is no longer active.

12.6 Switched output via external control

The switched output can be switched by an external energy management system via the Modbus/TCP protocol.



INFO

Activate Modbus/TCP in the inverter.

The Modbus/TCP protocol must be activated in the inverter under ***Settings > Modbus / SunSpec (TCP)***.

13. Overvoltage protection

13.1 Configure evaluation of external overvoltage protection in the Webserver

If a surge protection device (SPD) has been installed in your system, you can connect the potential-free signal contact of the surge protection module to terminal X402 of the inverter and monitor the correct functioning of the module. In the event of a fault, the inverter outputs an event code and reports this to the KOSTAL Solar Portal.

You can also set up a switching output for event reporting **Set up switched output for reporting events, Page 235**.

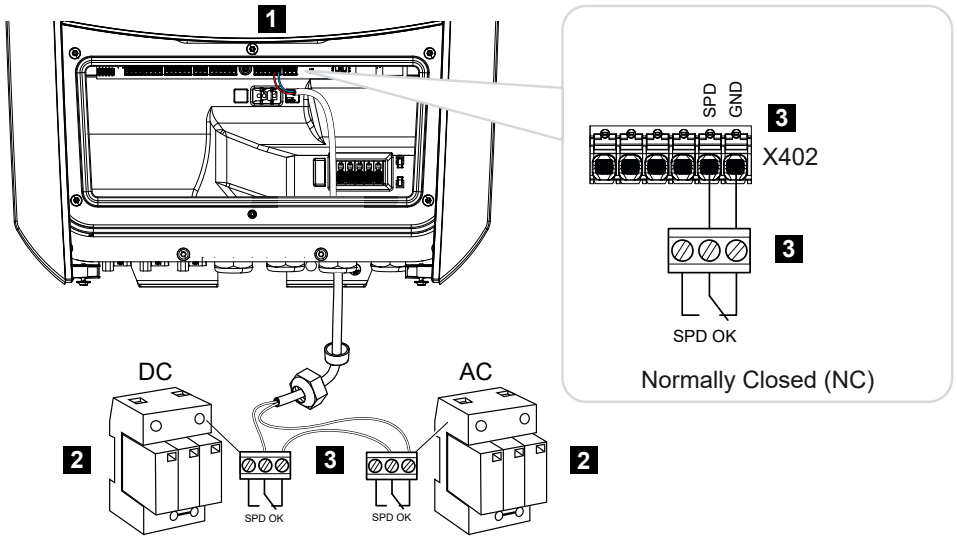


Fig. 2: Surge protection device (SPD) as a normally closed contact

1 Connection terminal X402 Smart Communication Board (SCB
2 Surge protection devices (SPD) for AC and DC side
3 Control cable from SPD to inverter

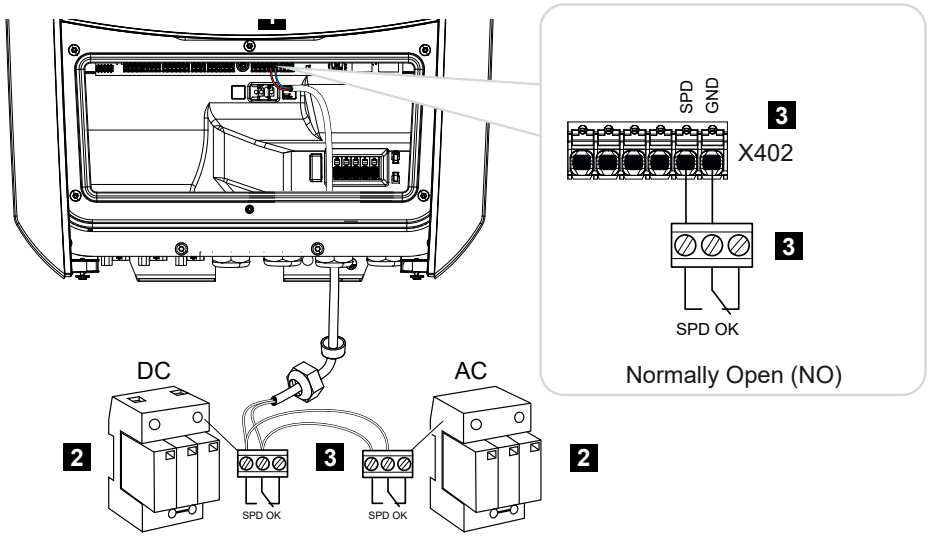


Fig. 3: Surge protection device (SPD) as a normally open contact

1 Connection terminal X402 Smart Communication Board (SCB
2 Surge protection devices (SPD) for AC and DC side
3 Control cable from SPD to inverter

Activating evaluation of the external signal from the surge arrester

INFO

The IP address can be read on the inverter's display.

1. Open the web server. To do this, enter the inverter IP address in the address bar of your internet browser and confirm with ***ENTER***.

➔ The web server page opens.

2. Log in to the web server as ***an installer***.
3. Select the menu item ***Service*** > ***General*** > ***Surge protection.***

➔ The ***Surge Protection*** page opens.

4. Activate***the evaluation of the external signal (terminal X402)***.
5. Under ***The signal is connected as***, select the function ***Normally Open (NO)*** or ***Normally Closed (NC)***.
6. Click on the ***Save*** button.

✓ The function is now active.

14. Active power control

14.1 Why active power control?

In some countries, or through the local energy supply company (EVU), it may be stipulated that not the full output (e.g. only 60%) of the PV system may be fed into the public grid.

In this case, some energy suppliers offer PV system owners the option of having their system regulated by the energy supplier via variable active power control, thereby increasing the generation output back to up to 100%.

Ask your energy supplier which application rule applies to you.

The planner of a PV system can usually choose between several types of active power control:

- Limiting the feed-in power to a defined percentage of the PV power at the grid connection point
  Limitation of the PV feed-in capacity, Page 243
- Limiting the feed-in power via active power control with a ripple control receiver
  Active power control with a ripple control receiver, Page 244
- Limiting the feed-in power via an intelligent metering system (FNN control box)
  Active power control using smart measuring systems, Page 247
- Limiting the feed-in power via an intelligent metering system with EEBus
  Active power control via EEBus, Page 249

14.2 Limitation of the PV feed-in capacity

The feed-in power must be reduced to the value specified by the energy supplier (e.g. 70%) if the energy supplier stipulates a reduction in PV power and you cannot implement active power control with a ripple control receiver or do not wish to do so.

INFO

Incorrect settings due to lack of expertise.

The system operator is responsible for correctly setting the active power limitation. Your grid operator will provide details of the permissible active power for your system.

We recommend that the installer configures all the settings.

Ask your EVU which power limitation applies to you.

The power limitation can be set via the following menus.
Inverter web server: ***Service*** > ***General*** > ***Grid connection*** > ***Limit active power to [W]***
Inverter: ***Settings/Information*** > ***Service menu*** > ***Grid connection*** > ***Maximum grid feed-in***

INFO

In some applications, a compatible energy meter may be seen as an attractively priced alternative to the ripple control receiver. Here the feed-in may well be limited by the energy supply company, but the inverter controls the flow of energy (self-consumption in house grid and feed-in to the public grid) in such a way that the self-produced energy is not lost or loss is kept to an absolute minimum.

Dynamic active power control can be activated in the inverter to this end. **Active power control, Page 241**

14.3 Active power control with a ripple control receiver

The active power of the inverter can be controlled directly by the energy supply company via a ripple control receiver.

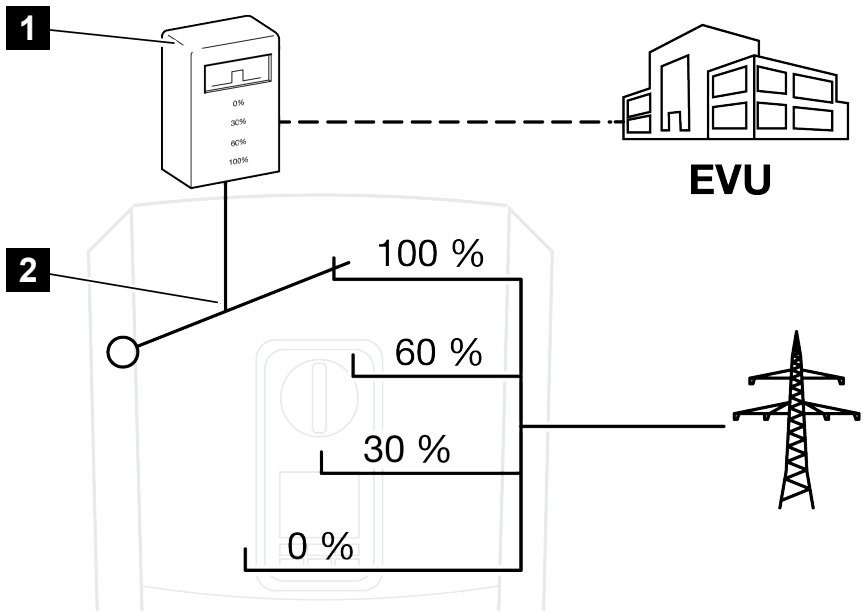
INFO

The ripple control receiver can be connected directly to the inverter's Smart Communication Board or is connected to another inverter.

With this technology, the generated power can be regulated at four levels:

INFO

The four standard specifications for power limitation can be changed using the Webserver. However, the provisions of the energy supply company must be observed.



1 Ripple control receiver

2 Control electronics of the inverter

- If the active power control is to be controlled by the ripple control receiver on the inverter, please perform the following steps: **Activating active power control, Page 245**
- If the active power control is to be controlled by another ripple control receiver, please perform the following steps: **Activate receipt of control signals for active power control, Page 245**

14.3.1 Activating active power control

1. Connect the inverter and computer. **Connecting methods between inverter/ computer, Page 217**
2. Start your internet browser.
3. Enter the IP address of the inverter to which the ripple control receiver is connected in the address bar of the browser and confirm with ***Return***.

INFO

The IP address can be found on the inverter display.

➔ The web server page will open.

4. Log in to the web server as an installer.
5. Select the menu item ***Service*** > ***General*** > ***Digital inputs***.

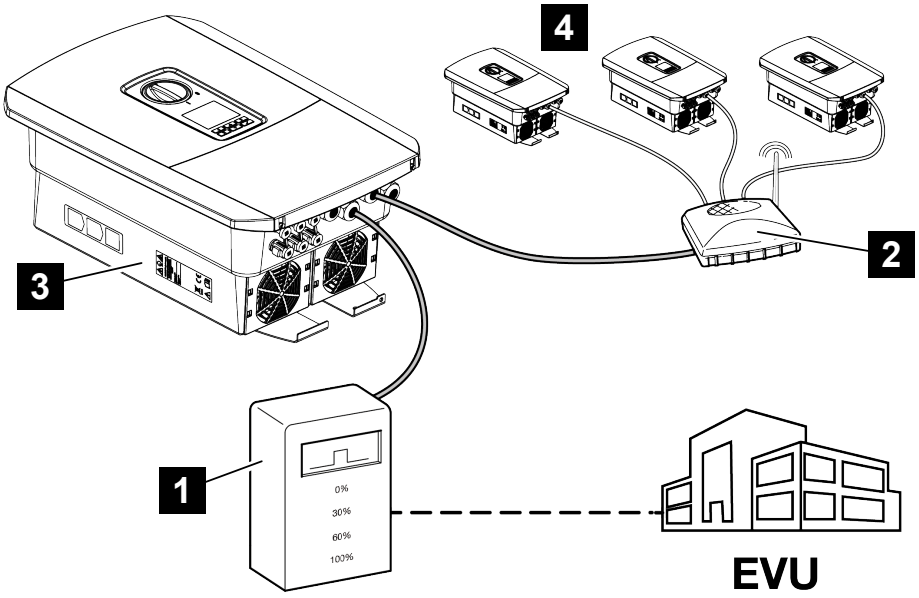
➔ The ***Digital Inputs*** page opens.

6. Select the ***Active power control*** function.
7. If the control signals of this ripple control receiver are to be distributed via UDP in the local LAN network (home network), activate the item ***Activate distribution of ripple control signals***. This allows other inverters to be controlled via the connected ripple control receiver in the local LAN network.
8. Click on the ***Save*** button.

✓ Active power control is now active.

14.3.2 Activate receipt of control signals for active power control

If a ripple control receiver is already connected to another KOSTAL solar inverter in the home network, it is possible to use the control signals from this ripple control receiver.



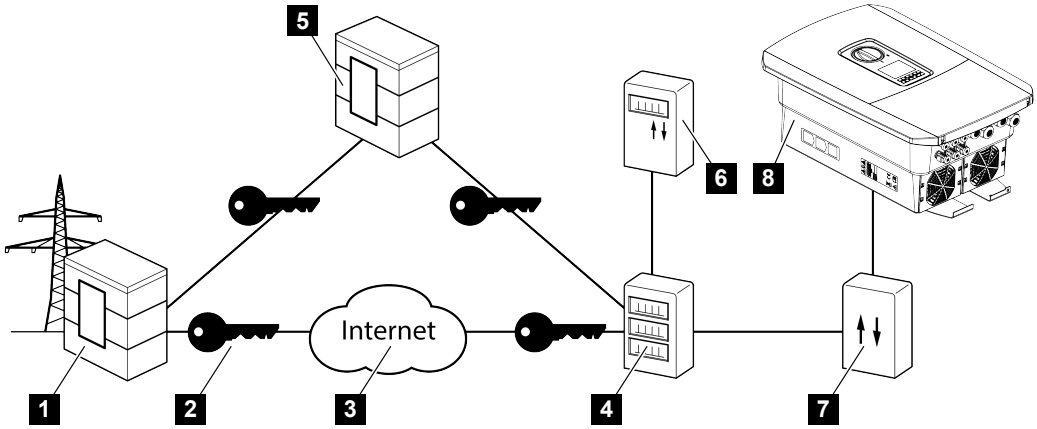
1 Ripple control receiver
2 Router/switch
3 Inverter with ripple control receiver, which distributes the control signals in the house network
4 Inverter without ripple control receiver, which uses the control signals of another ripple control receiver

To do this, carry out the following steps:

1. Log in to the web server as an installer.
2. ***Select*** the menu item ***Service > General > Grid connection*** .
3. Select the function ***Receive broadcast control signals activated***.
4. Click on the ***Save*** button.

✓ Broadcast control signal reception is now active.

14.4 Active power control using smart measuring systems



1 Energy supply company
2 Encryption
3 World Wide Web (Internet)
4 Smart meter gateway
5 Gateway
6 Digital power meter
7 Control box
8 Inverter

Smart measuring systems have a key role to play in the energy networks of the future.

In this context, a smart measuring system comprises a measuring device (smart meter or digital power meter), which records the measurement data, and a communication unit (the smart meter gateway), which transmits the data to the energy provider via a secure connection. A control box, connected to the inverter, can then be used by the energy supply company to control the inverter and thereby regulate the PV system's feed-in.

These smart measuring systems are already mandatory in some countries. Ask your energy supply company what applies to you.

Connecting the control box

DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

1. Disconnect the inverter's connection compartment from the power supply.
2. Mount the control box on the top-hat rail in the control cabinet or power distributor.
3. Lay the signal cable professionally from the inverter to the control cabinet and connect it to the control box according to the manufacturer's connection diagram (tightening torque: 0.2 Nm).
4. Connect the signal cable in the inverter to the connection terminal for ripple control receivers **Connecting ripple control receiver, Page 76**.
5. Connect the control box to the smart meter gateway.

✓ The control box is now connected.

Enable active power control in the web server

The inverter must be connected to the local LAN network.

1. Start an Internet browser on the computer.
2. Access the web server of the inverter.
   To do this, enter the inverter IP address in the address bar of the Internet browser and confirm with ***ENTER***. The IP address can be read on the inverter display.

➔ The web server page opens.

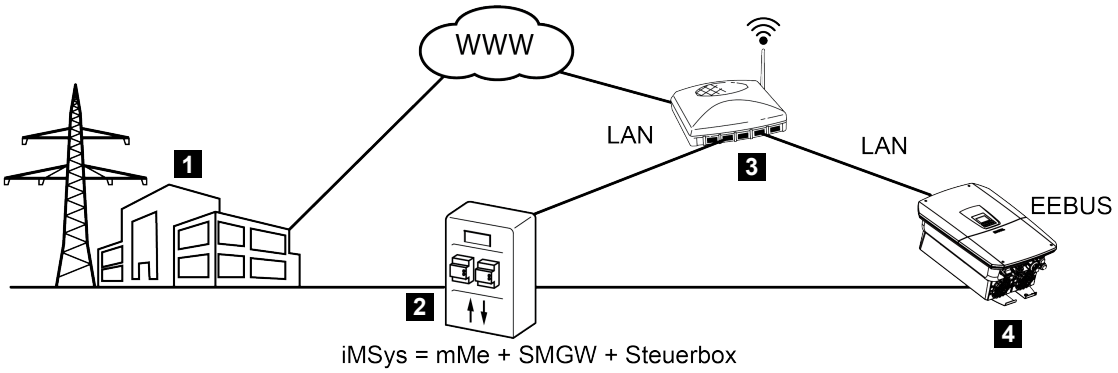
3. Log in to the web server as an installer.
4. Select the menu item ***Service*** > ***General*** > ***Digital inputs***.

➔ The ***Digital Inputs*** page opens.

5. Select a function.
   Active ***power control*** or ***power limitation in accordance with §14a EnGW***
6. If the control signals are to be distributed via UDP in the local LAN network (home network), activate the item ***Activate distribution of broadcast control signals***. This allows other inverters in the local LAN network to be controlled as well.
7. Click on the ***Save*** button.

✓ Active power control is now active.

14.5 Active power control via EEBus



1 Energy supply company

2 Smart measuring system (iMSys) comprising modern measurement equipment (mME), a Smart Meter Gateway (SMGW) and a control box (CLS gateway - EEBus interface)

3 Router in the local house network

4 Inverter

The energy supplier can use a smart measurement system with CLS adapter (EEBus interface) that is connected to the inverter to control the inverter via the EEBus protocol and thereby regulate the feed-in (LPP) of the PV system.

The control signals are sent from the CLS adapter to the inverter via LAN interface. To do this, the EEBus protocol just needs to be activated in the inverter and the EEBus receiver set up. The receiver is the CLS adapter, which has been fitted in the smart measurement system by the operator of the metering point and serves as a digital interface (EEBus).

Connecting communication cable of control box

DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

1. Connect the LAN cable correctly from the control box (CLS adapter) in accordance with the manufacturer's connection plan or connect it directly to the inverter.

✓ The connection has been established with the inverter.

Activating EEBus in the inverter

The EEBus protocol must be activated in the inverter.

1. Call up the inverter's Webserver.
2. Log in to the Webserver as the plant owner or installer.
3. Select the menu item ***Settings*** > ***EEBus***
4. Activate EEBus.
5. Go to ***Available devices*** and select the EEBus device, e.g. the CLS adapter, and click on it.
6. Now pair the device in the new window that opens.

➔ The counterpart must now also pair the inverter. so that the inverter can be controlled via EEBus protocol.

✓ EEBus activated. The inverter can now be controlled by the energy supplier using the EEBus protocol. No further settings are required in the inverter.

15. External battery control

15.1 External battery control

With external battery control, an external market participant, e.g. an energy supply company (ESC), controls the charging/discharging of the battery using an external energy management system.

In this case, the energy from the battery can be fed into the public grid or drawn from the public grid as required, e.g. by the ESO, in order to stabilise it. The battery energy can also be used in your own home network.

Information on the configuration of the external control system can be obtained from the relevant service provider (e.g. energy supply company).

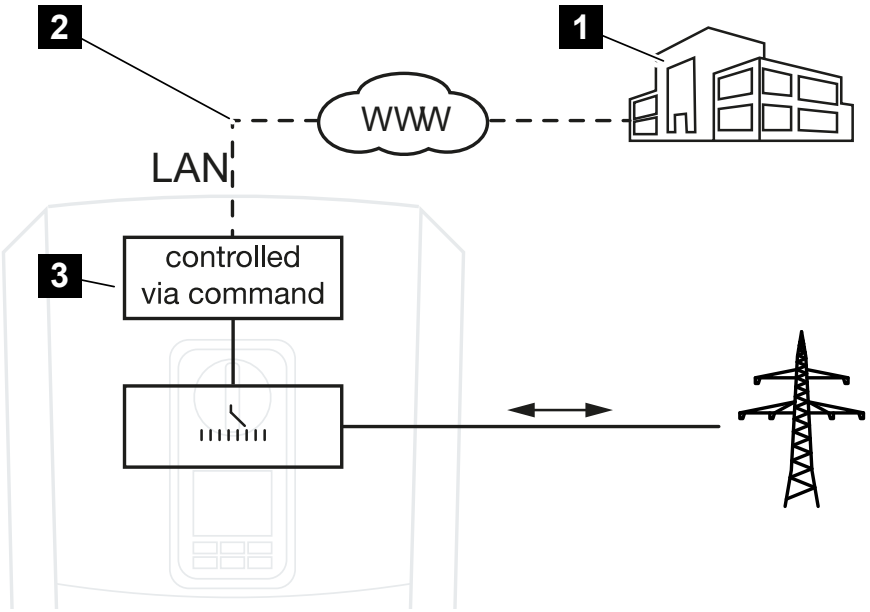
The advantage for the system owner is that they receive remuneration from the external provider for the energy provided, for example.

The external battery control can be activated and configured in the web server under the ***battery settings.***

The following interfaces are available for control:

- External battery control via Modbus (TCP) **External battery control via Modbus (TCP), Page 253**
- External battery control via digital inputs **External battery control via digital inputs, Page 255**

15.2 External battery control via Modbus (TCP)



1 External energy management system (e.g. energy supply company)
2 Control via Modbus (TCP)
3 Control electronics of the inverter

If external battery control via Modbus (TCP) is selected, the inverter receives the control signals for charging and discharging the connected battery via Modbus (TCP).

To do this, the inverter must be connected to the internet via Ethernet (LAN).

The internal energy management remains active, but is overridden by the external specifications regarding charging and discharging power.

The following commands are possible:

- Charging/discharging the battery via current specification in percent or watts
- Charging/discharging the battery via power specification in percent or watts
- Range specification of a min./max. SoC in percent

If external control signals are not received for a longer period of time, the inverter returns to internal battery control. The time specification for this is set in the web server. The specifications of the external provider must be observed.

Activating external battery control via Modbus (TCP)

The inverter must be connected to the local LAN network.

1. Start an Internet browser on the computer.
2. Call up the web server of the inverter.
   To do this, enter the inverter IP address in the address bar of the Internet browser and confirm with ***ENTER***. The IP address can be read on the inverter display.

➔ The web server page opens.

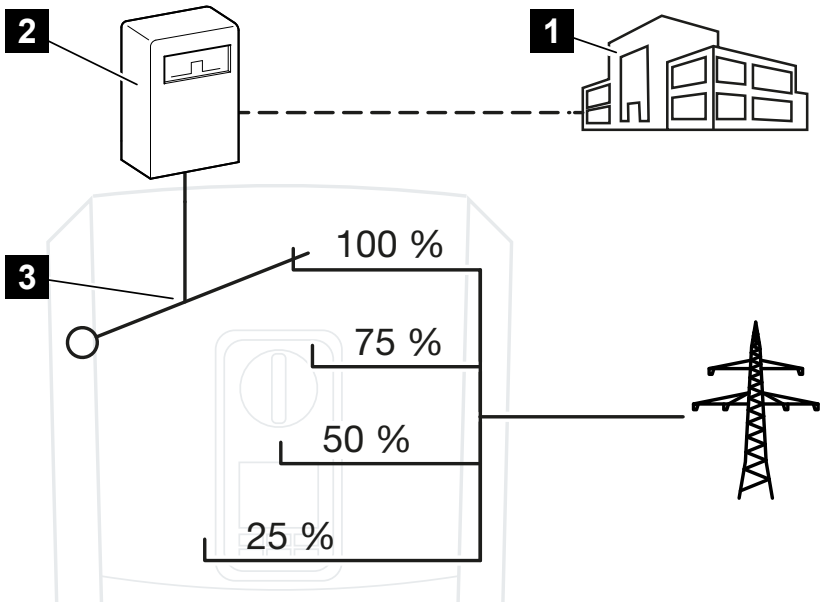
3. Log in to the web server as ***an installer***.
4. Select the menu item ***Battery*** > ***Battery settings***.

➔ The ***Battery settings*** page opens.

5. Under ***Battery control***, select the function ***External via Modbus protocol (TCP)***.
6. Click on the ***Save*** button.

✓ The function is now active.

15.3 External battery control via digital inputs



1 External energy management system (e.g. energy supply company)
2 External control box
3 Inverter control electronics

If ***external battery control via digital inputs*** is selected, the inverter receives the control signals for charging and discharging the connected battery via the digital inputs of the Smart Communication Board (SCB).

It is important that the digital inputs are configured accordingly in the web server.

The internal energy management remains active, but is overridden by the external specifications for charging and discharging power.

The following commands are possible:

- Charging/discharging the battery via power specification in percent

The specifications of the external supplier must be observed.

Activate external battery control via digital inputs

1. Connect the inverter and computer. **Connecting methods between inverter/computer, Page 217**
2. Start the internet browser.

3. Open the web server. To do this, enter the IP address of the inverter to which the external control box is connected in the address bar of the browser and confirm with ***ENTER***.

INFO

The IP address can be read on the inverter's display.

➔ The web server page will open.

4. Log in to the web server as ***an installer***.
5. Select the menu item ***Battery*** > ***Battery settings***.

➔ The ***Battery Settings*** page opens.

6. Under ***Battery control***, select the ***External via digital I/O*** function.
7. Click on the ***Save*** button.

✓ The function is now active.

Configuring the digital inputs

1. Select the menu item ***Service*** > ***General*** > ***Digital Inputs***.
2. The ***Digital Inputs*** page opens.
3. Under Operating mode, select the ***External battery management*** function.
4. Click on the ***Save*** button.

✓ The function is now active.

16. System monitoring

16.1 The log data

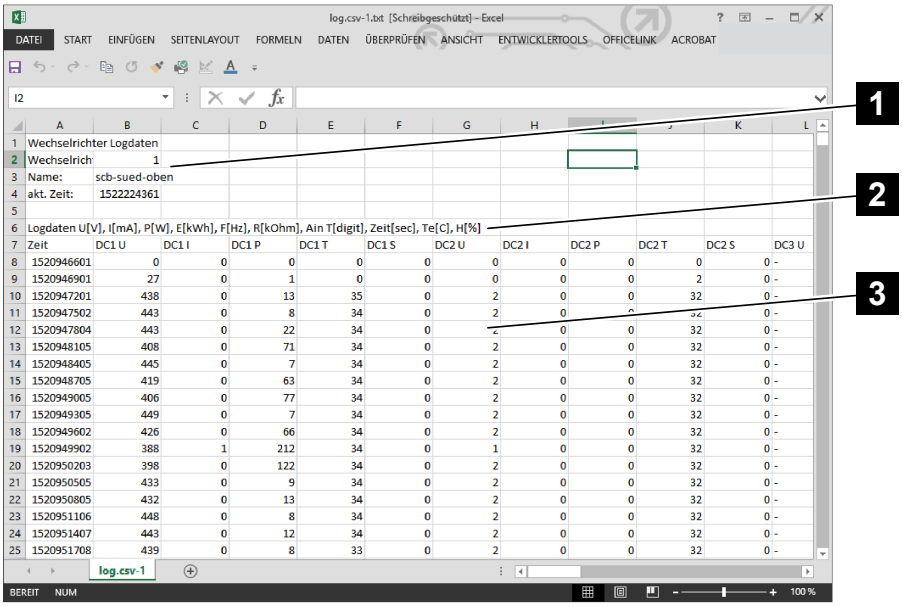
The inverter is equipped with a data logger, which regularly records the following data from the system:

- Inverter data
- External energy meter data
- Grid data
- ENS data

For information on how to retrieve, store and graphically display log data, see **Retrieving, storing and graphically depicting log data, Page 262**.

The log data can be used for the following purposes:

- Check operating characteristics of the system
- Determine and analyse errors
- Download and graphically depict yield data



1 File header
2 Physical variables
3 Log file entries

16.1.1 Log file: File header

The log file contains a file header with information on the inverter:

Entry	Explanation
Inverter number	Number of the inverter (always 1)
Name	Can be assigned by the user via the browser
Current time	The system time valid at the time the file was created in seconds. This makes allocation possible (e.g. 1372170173 Unix time stamp = 25.06.2013 16:22:53) **NOTE! A Unix time stamp converter can be found online.**

16.1.2 Log file: Physical variables

The file header is followed by the units of the physical variables. The following table explains the abbreviations for the physical variables:

Entry	Explanation
U	Voltage in volts [V]
I	Current strength in milliamps [mA]
P	Power in watts [W]
E	Energy in kilowatt hours [kWh]
F	Frequency in Hertz [Hz]
R	Resistance in kiloohms [kOhm]
T	Counting unit in points [digits]
AIn T	Counting unit in points [digits]
Time	Time in seconds [sec] since commissioning
TE	Temperature in degrees Celsius [°C]
H	No function [%]

16.1.3 Log file: Entries

The units of physical quantities are followed by various entries in the log file.
The following table explains the various entries in the log file and may vary depending on the model:

Entry	Explanation
Time	Time in seconds since the inverter was started up
DC x U	DC voltage: Input voltage of the respective string (x = 1, 2 and 3) in V
DC x I	DC current: Input current of the respective string (x = 1, 2 and 3) in mA
DC x P	DC power: Input power of the respective string (x = 1, 2 and 3) in W
DC x T	DC temperature: Information for service. Temperature of the respective phase (x = 1, 2 and 3) in digital values
DC x S	DC status: Information for servicing the respective strings (x = 1, 2 and 3)
AC x U	AC voltage: Output voltage of the respective phase (x = 1, 2 and 3) in V
AC x I	AC current: Output current of the respective phase (x = 1, 2 and 3) in mA
AC x P	AC power: Output power of the respective phase (x = 1, 2 and 3) in W
AC x T	AC temperature: Information for service. Temperature of the respective phase (1, 2 and 3) in digital values
AC F	AC frequency: Mains frequency in Hz
FC I	Fault current: Measured fault current in mA
AIn1-4	Not used
AC S	AC status: Information for servicing the operating status of the inverter
ERR	General faults
ENS S	Status of the ENS (grid monitoring device with assigned switching elements): Status of grid monitoring
ENS Err	Faults in the ENS (network monitoring device with assigned switching devices)
SH x P	Power of the external current sensor: Power of the respective phase (x = 1, 2 and 3) in W
SC x P	Own consumption on the respective phase (x = 1, 2 and 3) in W
HC1 P	Not used
HC2 P	Household consumption in W from the PV modules
HC3 P	Household consumption in W from the grid
SOC H	Battery state of charge (SoC)
BAT Te	Battery temperature
BAT Cy	Number of battery charge cycles

Entry	Explanation
KB S	Internal communication status when connected to AC mains
Total E	Total energy in kWh generated by the inverter and fed into the AC grid in the house.
OWN E	Own consumption: Current energy consumption in kWh in the household, which is covered by the inverter.
HOME E	Household consumption: Current energy consumption in kWh in the household, which is covered by the inverter and from the AC grid.
Iso R	Insulation resistance in kOhm when connected to the AC grid.
Event	POR (Power On Reset) event: Communication restarts after a loss of AC voltage.

16.2 Retrieving, storing and graphically depicting log data

There are several options for retrieving and permanently storing the log data:

Option 1: Download the log data with a computer

1. In the Webserver, go to ***Log data***.
2. Select time period (max. 100 days) and confirm with ***Download***.

✓ The log data (logdata.csv) can be saved onto a computer and displayed and further processed with any common spreadsheet program (e.g. Excel).

Option 2: Transfer log data to an external FTP server

1. In the Webserver, go to ***Settings > Solar Portal***.
2. Activate the item ***Log data export with FTP push*** and enter the necessary external server data.

✓ The log data are transferred in the interval to the external FTP server and can be displayed and processed further with any common spreadsheet program (e.g. Excel).

Option 3: Transfer log data to a solar portal and display it

With a solar portal it is possible to monitor the PV system and performance data via the Internet.

A solar portal has the following functions, which, however, may differ depending upon the portal:

- Graphic depiction of performance data
- Worldwide online access to the portal
- Email notification of errors
- Data export (e.g. Excel file)
- Long-term storage of log data

Prerequisites for data transfer to a solar portal:

- Device has Internet connection
- Registration with a solar portal (e.g. KOSTAL Solar Portal)

- Selection of a solar portal
- Activation of data transfer in the inverter

Activation of data transfer to a solar portal via the control panel

INFO

A correctly set-up network connection/Internet connection is a prerequisite for data transfer.

It may take as much as 20 minutes following activation (dependent upon the portal) until the data export is visible on the solar portal KOSTAL Solar Portal.

The KOSTAL Solar Portal is preset as the standard solar portal.

1. On the inverter control panel, select the ***Settings/Information*** menu.
2. Confirm with the ***ENTER*** key.
3. Use the ***UP***, ***DOWN*** and ***ENTER*** keys to select the menu ***Solar Portal*** > ***Portal***.
4. Select a solar portal.
5. Press and hold down the ***ENTER*** key.
6. Select the ***Activate*** field and confirm with ***ENTER***.

✓ Data transfer to the solar portal is now enabled. The name of the solar portal is displayed. The data export to the solar portal is being executed.

16.3 Retrieving and saving KOSTAL HELIVOR HV log data

If a KOSTAL HELIVOR HV battery system is connected to the inverter, the log data can be generated by the battery via the inverter.

Generate the log data via the following menu item and save it on the PC:

1. Open the menu item ***Battery > Battery info*** in the web server.
2. Generate a log file using the ***Generate log file*** button.
3. The last log file generated can be saved on the PC using the ***Download log file*** button. This can then be sent to the service department for evaluation in the event of service requests. The file is saved in .csv format.

16.4 The KOSTAL Solar Portal

The solar portal of KOSTAL Solar Electric GmbH is a free Internet platform for monitoring the PV system.

The inverter sends the PV system's yield data and event messages to the solar portal via the internet.

The information is then stored in the solar portal. You can view and call up this information via the Internet.

Prerequisites for using the solar portal

- The inverter must have a connection to the Internet.
- The inverter must not yet be logged onto the solar portal.
- The inverter must not yet be assigned to a plant.

To use the solar portal, follow these two steps:

- Activate data transfer to the solar portal in the inverter. Activation can be performed using the Webserver or the inverter menu.

INFO

If there are multiple inverters in a system, data transfer to the KOSTAL Solar Portal must be set up separately for each inverter and, if necessary, for the KOSTAL Smart Energy Meter.

- Register for free via the KOSTAL Solar Terminal on the KOSTAL Solar Electric GmbH website.

17. Switching the inverter on and off

17.1 Switching on the inverter

1. Activate supply voltage via the line circuit breaker.
2. If present, switch on the battery storage unit using the battery switch. For more information about operation, refer to the operating manual for the battery storage system.

➔ The battery storage unit starts up.

3. Move the DC switch on the inverter to the ON position.

➔ The inverter starts up.

➔ During start-up, the LEDs in the control panel of the inverter light up briefly.

➔ The screensaver appears on the display and shows the device type. The screensaver is deactivated when a key is pressed twice.
When no key has been pressed for several minutes, the screensaver with the image of the inverter appears automatically on the display.

✓ The inverter is in operation.

17.2 Switching off the inverter

To interrupt the inverter's feed-in to the public grid, proceed as follows.

Additional steps are necessary for repair work on the inverter. For this, the entire inverter must be made voltage-free.

1. Turn the DC switch on the inverter to OFF.
2. If external DC voltage separators are present, switch off the DC strings consecutively.
3. If a battery is connected, switch off the battery storage. A detailed description of how to switch off the battery storage is available in the operating manual provided by the battery manufacturer.

✓ The inverter no longer feeds into the public grid. The inverter remains energised and monitoring is still performed.

17.3 De-energising the inverter

When working in the inverter's terminal compartment, this area must be de-energised.

1. Turn the DC switch on the inverter to OFF.
2. If used, switch off the power supply for the switched outputs.
3. If external DC voltage separators are present, switch off the DC strings consecutively.
4. If a battery is connected, switch off the battery storage. A detailed description of how to switch off the battery storage is available in the operating manual provided by the battery manufacturer.
5. Switch off the AC line circuit breaker.
6. Secure the entire voltage supply against being restarted.

✓ The inverter's terminal compartment is now voltage-free.

DANGER

Risk of death due to electrical shock and discharge!

When working on the DC feed cables (PV or battery), these must be disconnected from the inverter. Touching live parts or cables will result in death or life-threatening injuries from electrical shock.

17.4 When working on the DC feed cables

DANGER

Risk of death due to electrical shock and discharge

During operation, high voltages are present on the live parts and cables inside the product. Touching live parts or cables will result in death or life-threatening injuries from electrical shock.

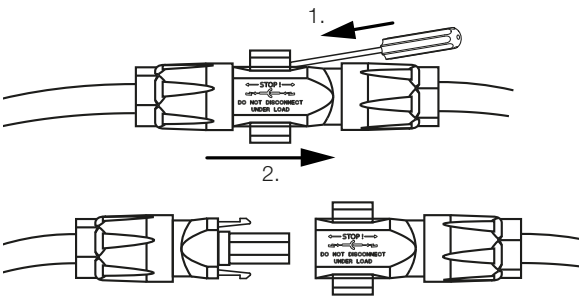
When working on the DC feed cables, the inverter must be made completely voltage-free and the DC feed cable must be removed.

Perform these steps to do so:

1. Turn the DC switch on the inverter to OFF.
2. If used, switch off the power supply for the self-consumption output.
3. If used, switch off the power supply for the switched outputs.
4. If external DC voltage separators are present, switch off the DC strings consecutively.
5. If a battery is connected, switch off the battery storage. A detailed description of how to switch off the battery storage is available in the operating manual provided by the battery manufacturer.
6. Switch off the AC line circuit breaker.
7. Secure the entire voltage supply against being restarted.
8. Disconnect all DC connections on the inverter. To do this, unlock the engaging clips with a screwdriver and disconnect the plug.

INFO

Information on the SUNCLIX mounting instructions can be found at: **www.phoenixcontact.com**.



9. Ensure that all connections are voltage-free.

✓ The inverter is now completely voltage-free.

Work on the inverter can now be carried out.

Use insulated tools when working on the DC feed cables because they may be live.

18. Maintenance

18.1 Maintenance and cleaning

Once correctly installed, the inverter runs virtually maintenance-free.

The following maintenance tasks are to be carried out for the inverter:

Activity	Interval
Check cable connections and plugs	1x annually
Clean fans, see **Fan cleaning, Page 275**. Then carry out a fan test. The fan test can be started by going to ***Service menu > Fan test***.	1x annually

POSSIBLE DAMAGE

Dirty or blocked fans mean that the inverter is not adequately cooled. Insufficient cooling of the inverter may result in power reduction or the failure of the system.

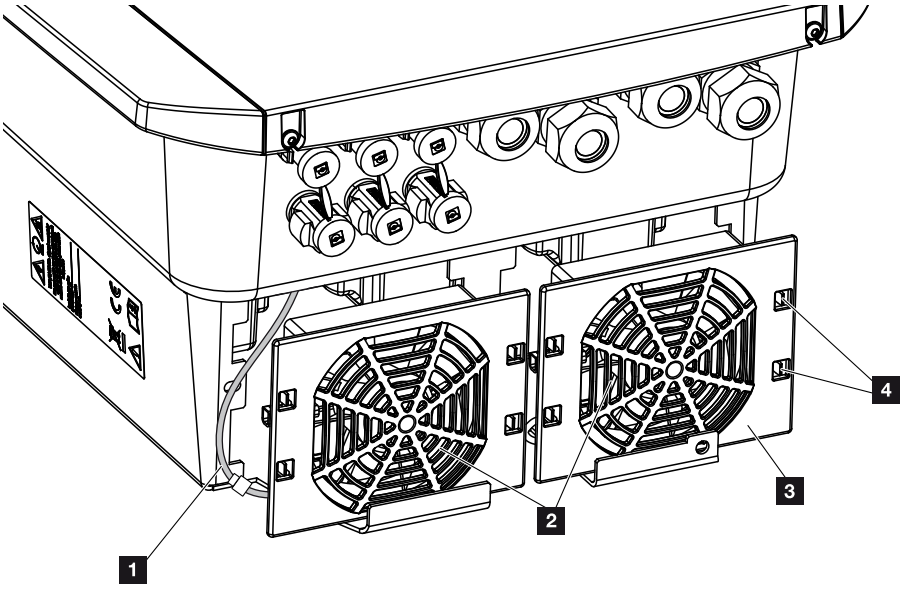
Always mount inverters in such a way that falling parts cannot fall into the inverter through the ventilation grille.

If no maintenance work is carried out, this will result in exclusion of the warranty (see 'Exclusion of warranty' in our service and warranty conditions).

18.2 Housing cleaning

The housing may only be wiped down with a damp cloth. Abrasive cleaners are not permitted.

18.3 Fan cleaning

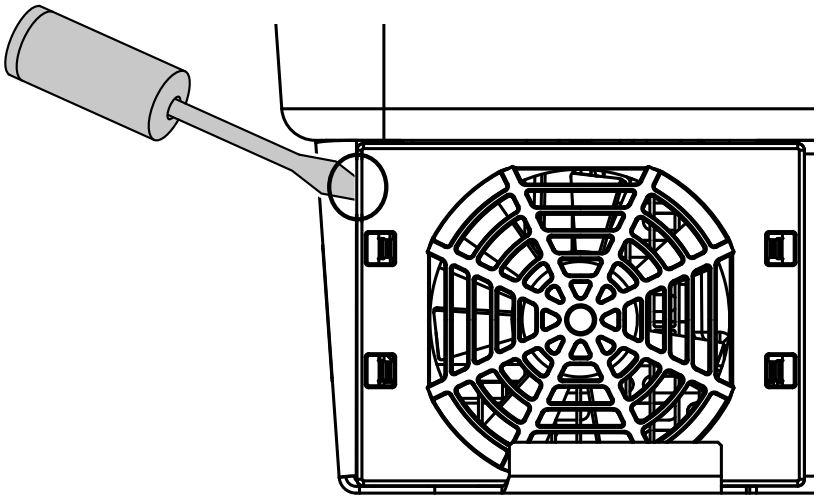


1 Fan cable
2 Fan
3 Fan grille
4 Fastening straps

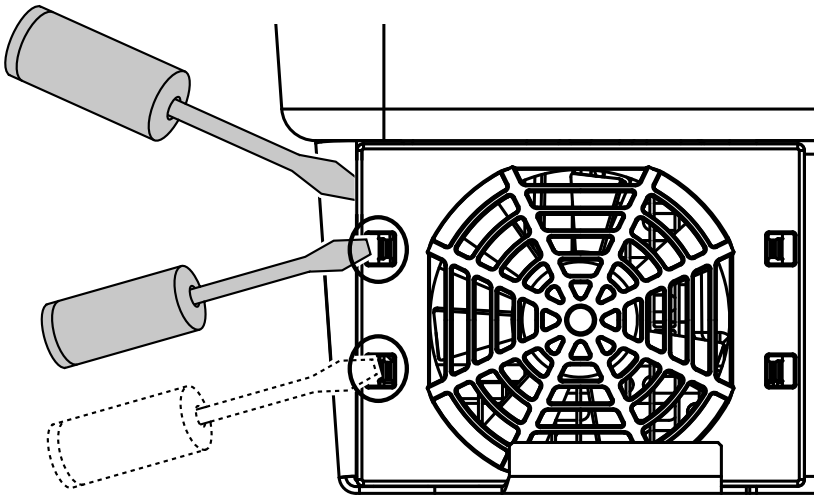
Procedure

The fan may only be removed and cleaned if the inverter is switched off. Otherwise, the fan may start up.

1. Turn the DC switch on the inverter to OFF. **DC switch on the inverter, Page 30**
2. Remove the fan. To do this, place a screwdriver at the edge of the fan grille and apply a little pressure to the fan grille.



3. With a second screwdriver, press the fastening straps toward the centre of the fan. Pull the fan unit slightly forward.

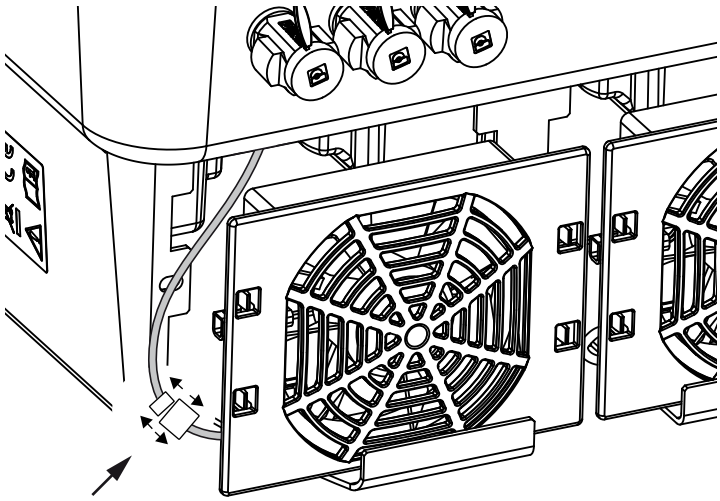


4. Completely remove the fan unit from the housing. To do this, disconnect the plug of the fan cable.

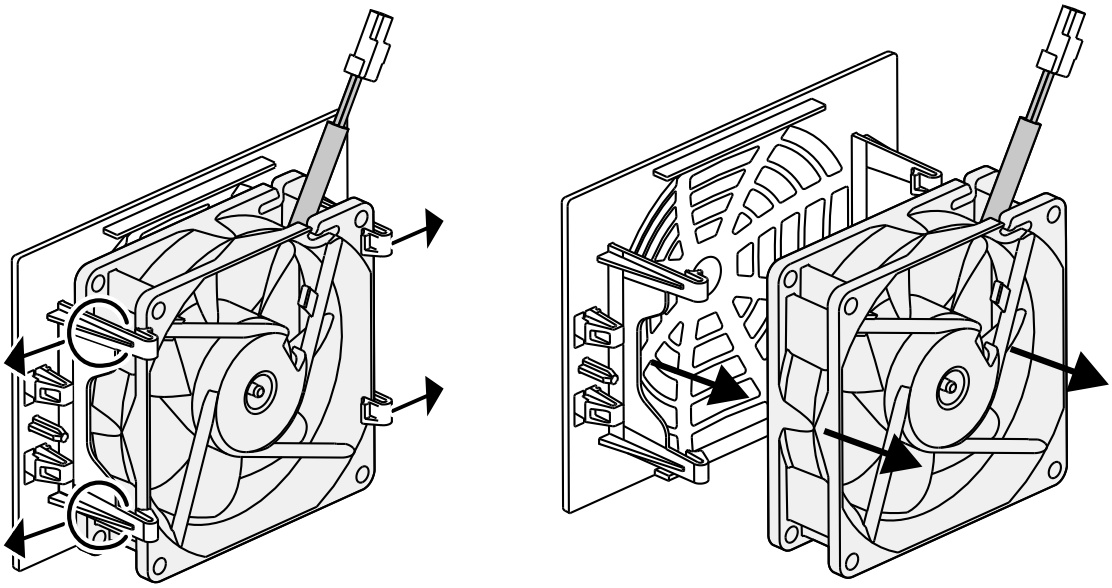
INFO

Note how the cable is routed inside the housing.

When installing the fan, the fan cable must be relaid in exactly the same way.



5. The fan can also be pulled off the fan grille. To do this, press the fastening straps slightly outward and pull off the fan.

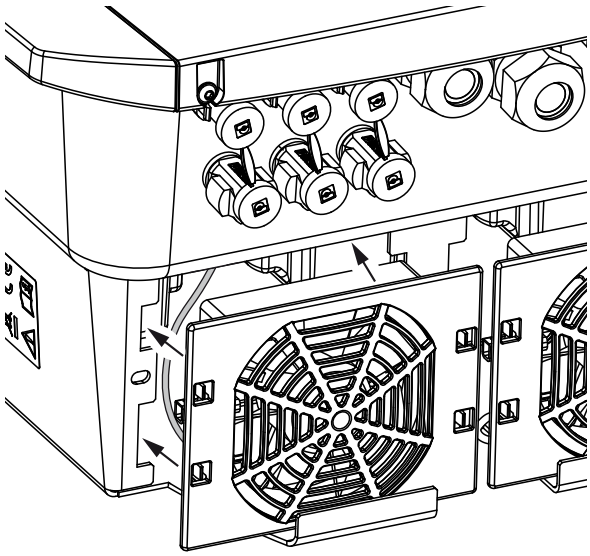


6. Clean fan and housing opening with a soft brush.

7. Note the following when installing the fan:
   - The fan has been correctly installed in the fan frame (air flow direction).
   - The cable points into the housing.
   - The cable of the fan is not pinched.

INFO

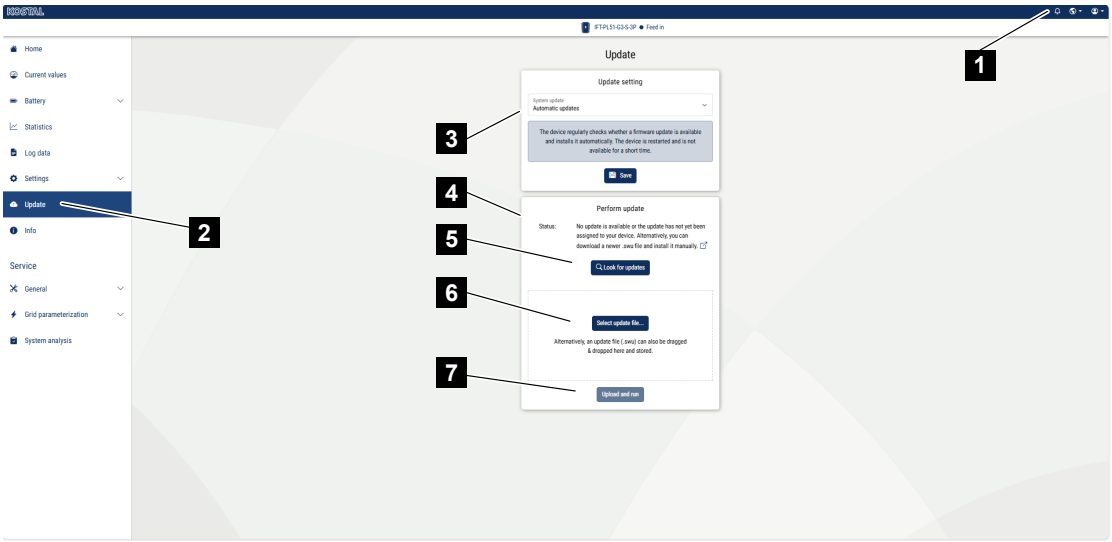
When installing the fan ensure that the cables are laid so that they do not run into the fan. If this is not done, the fan may fail or noise may result.



8. Reconnect the fan cable and insert the fan into the housing. When switching on for the first time, check whether the air from the fan is drawn inwards.
9. Start up the inverter. **Switching on the inverter, Page 267**.

✓ Fan cleaning carried out.

18.4 Updating software



1 Notification when a software update is available

2 Call up the update menu

3 Configure update method: Manual updates, Notify about available updates or Automatic updates

4 Status line

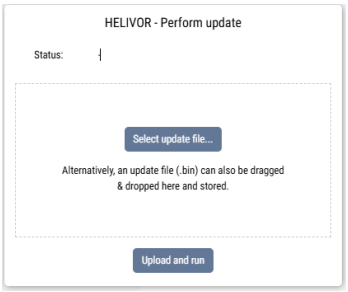
5 Check for updates on the Internet

6 Manual installation via local update file

7 Save settings or perform software update

If new software is available for the inverter, it can be updated via the ***Update*** menu item on the inverter. This updates the software and user interface of the Smart Communication Board to the latest version.

Updating software for KOSTAL HELIVOR HV battery system



If a KOSTAL HELIVOR HV battery system is connected to the inverter, the menu item ***HELIVOR – Perform update*** also appears. This menu can be used to perform a manual software update of the battery.

If ***Automatic Update*** is selected under ***System Update***, the devices will always be provided with the latest updates. In this case, an update will be performed for both devices, **the inverter and the battery**.

18.4.1 Update methods

If a software update is available, it can be performed in three ways.

Under ***Update*** > ***System Update***, you can choose between the update methods. Then, you need to confirm your choice by clicking the ***Save*** button.

Manual updates

The update is performed manually. For more information, see "Performing a manual update".

Notify me of new updates
(The inverter must be connected to the internet.)

The inverter checks at regular intervals whether a software update is available. If a new update is available, you will find the information under Notifications (bell icon).

The update can be started in the ***Update*** menu by clicking the ***Execute*** button.

Automatic updates (recommended)
(The inverter must be connected to the internet.)

In this case, a new software update is installed as soon as it is available.

18.4.2 Perform manual update of inverter

Updating the inverter using the Webserver is a very simple process.

1. Call up the Webserver, see Accessing the Webserver.
2. Go to ***Update***.
3. If the inverter is connected to the Internet, use the ***Look for updates***function.
   If the inverter has no connection to the Internet, download the update for the inverter from the manufacturer's website to your computer. Click on the ***Select upload file*** button and select the update file (*.swu) on the computer or drag the update file into the field.

INFO

You can find the latest update in the download area for the product on our website at **www.kostal-solar-electric.com**

4. Start the installation using ***Execute***.

➔ The inverter recognises the update file and starts the installation.

5. If you want to install the software update, confirm with ***OK***.

➔ The software update is installed on the inverter. Once the software update has been installed, the inverter is restarted. It can take up to 10 minutes for the inverter to re-start. Following the update, the installer's display shows that the installation has been successful.

INFO

Following a successful software update, the inverter automatically returns to feed-in mode.

6. Once the software update has been successfully installed, the current software version can be queried on the inverter or Webserver.
   This is done in the inverter's menu by going to: ***Settings/information*** > ***Device information*** or in the Webserver by going to ***Info***.

✓ The update has been installed.

18.4.3 Performing a manual update of the KOSTAL HELIVOR battery

The battery can be easily updated via the web server.

1. Access the web server, see Accessing the Webserver.
2. Select the ***Update*** menu item.
3. Download the update file for the battery from the manufacturer's website to your computer.

INFO

You can find the latest update in the download area for the product on our website at **www.kostal-solar-electric.com**

4. Press the ***Select upload file*** button and select the update file (*.bin) on your computer or drag the update file into the field.
5. Start the installation by clicking ***Upload and run***.

➔ The battery will recognise the update file and start the installation.

6. If you want to install the software update, confirm the question with ***OK***.

➔ The software update will be installed.

7. Once the software update has been successfully installed, you can check the current FW version of the software.
   To do this, call up the following menu item in the inverter's web server: ***Battery > Battery info***.

✓ The update has been installed.

18.5 Event codes

There is no need to take action when an event occurs occasionally or only briefly and the device resumes operation afterwards. If an event persists or recurs frequently, the cause must be determined and rectified.

A list of the current event codes and measures can be found in the document **Ereignisliste/Event list**, which can be found in the **download area** for your product.

19. Technical information

19.1 Technical data

Subject to technical changes. Errors excepted.
You can find current information at **www.kostal-solar-electric.com**.

Power class

Hybrid inverters	Unit	PLENTICORE plus G2					
Power class		3.0	4.2	5.5	7.0	8.5	10

Input side (DC)

PLENTICORE plus G2	Unit	3.0	4.2	5.5	7.0	8.5	10
Max. PV power	kWp	4.5	6.3	8.25	10.5	12.75	15
Max. PV power per DC input	kWp	6.5					
Nominal DC power	kW	3.09	4.33	5.67	7.22	8.76	10.31
Rated input voltage (Udc,r)	V	570					
Start input voltage (Udc,start)	V	150					
Max. system voltage (Udc,max)	V	1000					
MPP range at rated output (Umpp,min)	V	180		225	290	345	405
MPP range at rated output (Umpp,max)	V	720					
Operating voltage range (Udc,workmin)	V	120					
Operating voltage range (Udc,workmax)	V	900					
Max. input current (Idc,max) per DC input	A	15					
Max. DC short-circuit current (Isc_pv)							
Max. PV short-circuit current (Isc,pv) per DC input	A	16.25					
Number of DC inputs		3					
Number of DC inputs for battery (optional)		1					
Number of independent MPP trackers		3					

Input side (DC3 battery input)

PLENTICORE plus G2	Unit	3.0	4.2	5.5	7.0	8.5	10
Battery input min. working voltage range (Udc,workbatmin)	V	120					
Battery input max. working voltage range (Udc,workbatmax)	V	650					
Battery input max. charge/discharge current	A	15/15					

Output side (AC)

PLENTICORE plus G2	Unit	3.0	4.2	5.5	7.0	8.5	10
Rated power, cos ϕ = 1 (Pac,r)	kW	3	4.2	5.5	7	8.5	10

PLENTICORE plus G2	Unit	3.0	4.2	5.5	7.0	8.5	10
Output apparent power (Sac,nom, Sac,max)	kVA	3,0/3,0	4,2/4,2	5,5/5,5	7,0/7,0	8,5/8,5	10/10
Min. output voltage (Uac,min)	V	320					
Max. output voltage (Uac,max)	V	500					
Rated alternating current (Iac,r)	A	4.33	6.06	7.94	10.1	12.27	14.43
Max. output current (Iac,max)	A	4.81	6.74	8.82	11.23	13.63	16.04
Inrush current (IInrush)	A	2.46			6.72		
Short-circuit current (peak/RMS)	A	6.8/4.8	9.5/6.7	12.5/8.8	15.9/11.2	19.3/13.6	22.8/16.1
Number of feed-in phases		3					
Grid connection		3N~, 230/400 V, 50 Hz					
Rated frequency (fr)	Hz	50					
Grid frequency (fmin - fmax)	Hz	47/53					
Setting range for the power factor (cos ϕAC,r)		0.8...1					
Power factor at rated power (cos ϕAC,r)		1					
THD	%	3					

Unit characteristics

PLENTICORE plus G2	Unit	3.0	4.2	5.5	7.0	8.5	10
Standby	W	7.9					

Efficiency

PLENTICORE plus G2	Unit	3.0	4.2	5.5	7.0	8.5	10
Max. efficiency	%	97.1			97.2		
European efficiency	%	95.3	95.5	96.2	96.5		
MPP adjustment efficiency	%	99.9					

System data

PLENTICORE plus G2	Unit	3.0	4.2	5.5	7.0	8.5	10
Topology: Without galvanic isolation – transformerless		Yes					
Protection class in accordance with IEC 60529		IP 65					
Protective class according to IEC 62103		I					
Overvoltage category according to IEC 60664-1 on input side (PV generator)		II					
Overvoltage category according to IEC 60664-1 on output side (grid connection)		III					
Pollution degree		4					
Environmental category (outdoor installation)		Yes					
Environmental category (indoor installation)		Yes					

PLENTICORE plus G2	Unit	3.0	4.2	5.5	7.0	8.5	10
UV resistance		Yes					
AC cable diameter (min-max)	mm	8…17					
AC cable cross-section (min-max)	mm^2	1.5…6			2.5…6		4…6
PV cable cross-section (min-max)	mm^2	2.5…6					
Battery cable cross-section (min-max)	mm^2	4…6					
Torque of screws in terminal compartment	Nm	2					
Torque of screws in cover	Nm	1.5					
Max. fuse protection on output side (AC) IEC 60898-1	A	B16 / C16					B25 / C25
Compatibility with external residual current protection devices		Type A RCD					
Internal operator protection in accordance with EN 62109-2		Yes					
Independent disconnection device according to VDE V 0126-1-1		Yes					
Electronic DC disconnection device integrated		Yes					
Reverse polarity protection, DC side		Yes					
Height/width/depth	mm	563 / 405 / 233					
Weight	kg	19.6	21.6				
Cooling principle – regulated fans		Yes					
Max. air throughput	m^3/h	184					
Noise emission (typical)	dB(A)	39					
Ambient temperature	°C	-20…60					
Max. operating altitude above sea level	m	2000					
Relative humidity	%	4…100					
Connection technology, DC side		SUNCLIX plug					
Connection technology, AC side		Spring-type terminal strip					
Connection technology, COM		Push-in terminals					

Interfaces

PLENTICORE plus G2	Unit	3.0	4.2	5.5	7.0	8.5	10
Ethernet (RJ45/100 Mbit/s)		2					
Wi-Fi (2.4 GHz [IEEE 802.11 b/g/n])		Yes					
RS485/CAN (for battery communication)		1					
Energy meter connection for collecting energy data (Modbus RTU)		1					
Digital inputs		Yes (e.g. for ripple control receiver or external battery control, CEI, OVP evaluation)					
Digital outputs		4 (24 V, 100 mA)					
Webserver (user interface)		Yes					

Directives / Certification

Directives / Certification
CE, GS, CEI 0-21, CEI10/11, EN 62109-1, EN 62109-2, EN 60529, EN 50438*, EN 50549-1*, NA/EEA, G98, G99, IFS2018, IEC 61727, IEC 62116, RD 1699, RFG, TF3.3.1, TOR generators, UNE 206006 IN, UNE 206007-1 IN, UTE C15-712-1, VDE 0126-1-1, VDE-AR-N 4105, VJV2018 (* does not apply to all national annexes)

Noise emission: Measured under rated output at an ambient temperature of 23 °C. If a string connection is unfavourable or there is a higher ambient temperature, the noise emission may be up to 48 dB(A).

MPP working voltage range: MPP range 120 V to 180 V (with limited current of 9.5-13 A) to 680 V to 720 V (with limited current of 11 A). A detailed layout should be produced using the KOSTAL Solar Plan user software.

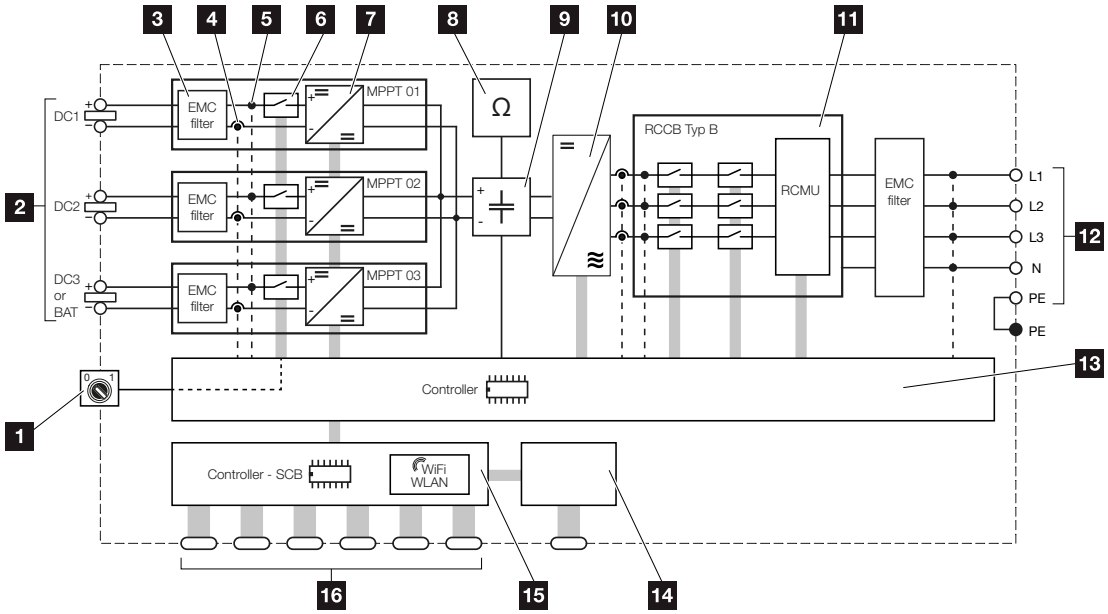
Automatic disconnection device in accordance with VDE V 0126-1-1, for Austria: The inverter is equipped "with automatic disconnection device in accordance with ÖVE/ÖNORM E 8001-4-712".

Overvoltage category II (DC input): The device is suitable for connection to PV strings. Long feed cables out of doors or a lightning protection system in the vicinity of the PV system may make lightning protection or surge protection equipment necessary.

Overvoltage category III (AC output): The device is suitable for permanent connection in the grid distribution behind the meter and the line protection fuse. If the connection cable travels outdoors over long distances, overvoltage protection devices may be necessary.

Degree of contamination 4: Contamination results in continuous conductivity, e.g. due to conductive dust, rain or snow; indoors or outdoors.

19.2 block diagram



1 DC switch
2 DC input
3 Electromagnetic compatibility (EMC) filter
4 Current measuring point
5 Voltage measuring point
6 Electronic DC isolation point
7 DC actuator
8 Insulation monitoring
9 DC link
10 Inverter bridge
11 Grid monitoring and disconnection
12 3-phase AC output
13 System control with MPP tracker
14 Display
15 Smart Communication Board (SCB)
16 Interfaces (e.g. Ethernet, USB, energy meter)

20. Accessories

20.1 Activating battery connection

For the inverter, it is possible to release the third PV input (DC3) as a connection for battery storage. To do this, you can purchase **a battery activation code** from our KOSTAL Solar Webshop and enter this in the inverter. You can then use the third PV input to connect a battery.

You can access the KOSTAL Solar Webshop via the KOSTAL Solar Terminal at **https://terminal.kostal-solar-electric.com**.

KOSTAL Solar Terminal

You will find a list of approved batteries in the download area for the inverter.

Should you have any further questions, please contact our sales team or your service partner.

- Purchase battery activation code from the KOSTAL Solar Webshop .
- Enter battery activation code in inverter or via the Webserver.
- Connect battery to third PV input (DC3) on the inverter.
- Select the settings for the battery in the Webserver.

You can find more information about this on our website **www.kostal-solar-electric.com**.

KOSTAL Solar Electric

21. Warranty and service

Information about the service and warranty conditions can be found in the download area for the product at **www.kostal-solar-electric.com**.

For service information and in the event of parts being needed, we require your device type and the serial number. You will find this information on the type plate on the exterior of the housing.

If you have any technical questions, please call our service hotline:

- Germany and other countries (language: German, English):
  +49 (0)761 477 44-222
- Switzerland:
  +41 32 5800 225
- France, Belgium, Luxembourg:
  +33 16138 4117
- Greece:
  +30 2310 477 555
- Italy:
  +39 011 97 82 420
- Poland:
  +48 22 153 14 98
- Spain, Portugal (language: Spanish, English):
  +34 961 824 927

Spare parts

If spare parts or accessories are required for troubleshooting, use only original spare parts and accessories manufactured and/or approved by the manufacturer.

22. Appendix

22.1 EU Declaration of Conformity

KOSTAL Solar Electric GmbH hereby declares that the devices described in this document complies with the basic requirements and other relevant conditions of the directives listed below.

- Directive 2014/53/EU
  (RED Radio Equipment and Telecommunications Terminal Equipment) Provision of radio equipment
- Directive 2011/65/EU
  (RoHS) to limit the use of certain hazardous substances in electrical and electronic equipment

You will find a detailed EU Declaration of Conformity for the product in the download area at:

www.kostal-solar-electric.com

22.2 Open Source licence

This product contains Open Source software, developed by third parties and licensed using vehicles including GPL and/or LGPL.

For more details on this and a list of the Open Source software used and the associated licence texts, go to ***Licences***.

You will find ***Licences*** on the website (Webserver) under ***Info > Device area > Licenses.***

22.3 Decommissioning and disposal

To dismantle the inverter, proceed as follows:

DANGER

Risk of death due to electrical shock and discharge!

- De-energise device and secure against being switched on again.

1. De-energise inverter on AC and DC side.
2. Remove inverter cover.
3. Remove terminal compartment cover.
4. Loosen terminals and cable glands.
5. Remove all DC cables, AC cables and communication cables.
6. Mount terminal compartment cover.
7. Mount inverter cover.
8. Remove lock screw on the underside of the inverter.
9. Lift the inverter off the wall.

✓ Inverter dismantled

Proper disposal

Electronic equipment labelled with a dustbin with a line through it may not be disposed of with household waste. This equipment can be handed in to waste collection points free of charge.

Find out about the local requirements for the separate collection of electrical and electronic equipment in your country.

www.kostal-solar-electric.com

01/2026 - EN - DOC03022610-0005 - Subject to technical changes. Errors excepted.
You can find current information at www.kostal-solar-electric.com.