Operating Instructions

Fronius Verto

15.0 / 18.0 208-240
25.0 / 27.0
30.0 / 33.3
36.0 480

EN | Operating Instructions

42,0426,0490,EN 004-18042024

Contents

Safety rules

Explanation of safety notices

⚠ WARNING!

Indicates a potentially hazardous situation.

▶ Death or serious injury may result if appropriate precautions are not taken.

⚠ CAUTION!

Indicates a situation where damage could occur.

▶ If not avoided, minor injury and/or damage to property may result.

NOTE!

Indicates a risk of flawed results and possible damage to the equipment.

If you see any of the symbols depicted in the "Safety rules" chapter, special care is required.

General

The device has been manufactured in line with the state of the art and according to recognised safety standards. In the event of incorrect operation or misuse, there is a risk of:

- Serious or fatal injury to the operator or third parties
- Damage to the device and other material assets belonging to the operating company

All personnel involved in commissioning, maintenance and servicing of the device must:

- Be suitably qualified
- Have knowledge of and experience in dealing with electrical installations
- Read and follow these Operating Instructions carefully

In addition to the Operating Instructions, all applicable local rules and regulations regarding accident prevention and environmental protection must also be followed.

All safety and danger notices on the device:

- Must be kept in a legible state
- Must not be damaged
- Must not be removed
- Must not be covered, pasted or painted over

Only operate the device when all protection devices are fully functional. If the protection devices are not fully functional, there is a risk of:

- Serious or fatal injury to the operator or third parties
- Damage to the device and other material assets belonging to the operating company

Any safety devices that are not fully functional must be repaired by an authorized specialist before the device is switched on.

Never bypass or disable protection devices.

For the location of the safety and danger notices on the device, refer to the chapter headed "Warning notices on the device" in the Operating Instructions for your device.

Faults that could compromise safety must be remedied before switching on the device.

Environmental conditions

Operation or storage of the device outside the stipulated area will be deemed as not in accordance with the intended purpose. The manufacturer accepts no liability for any damage resulting from improper use.

Qualified personnel

The servicing information contained in these operating instructions is intended only for the use of qualified service engineers. An electric shock can be fatal. Do not carry out any actions other than those described in the documentation. This also applies to qualified personnel.

All cables and leads must be secured, undamaged, insulated and adequately dimensioned. Loose connections, scorched, damaged or inadequately dimensioned cables and leads must be immediately repaired by authorised personnel.

Maintenance and repair work must only be carried out by an authorised specialist.

It is impossible to guarantee that bought-in parts are designed and manufactured to meet the demands made on them, or that they satisfy safety requirements. Use only original spare parts (also applies to standard parts).

Do not carry out any alterations, installations, or modifications to the device without first obtaining the manufacturer's permission.

Components that are not in perfect condition must be changed immediately.

Noise emission values

The sound power level of the inverter is specified in the **Technical data**.

The device is cooled as quietly as possible with the aid of an electronic temperature control system; this depends on the amount of converted power, the ambient temperature, the level of soiling of the device, etc.

It is not possible to provide a workplace-related emission value for this device because the actual sound pressure level is heavily influenced by the installation situation, the grid quality, the surrounding walls and the properties of the room in general.

EMC measures

In certain cases, even though a device complies with the standard limit values for emissions, it may affect the application area for which it was designed (e.g., when there is equipment that is susceptible to interference at the same location, or if the site where the device is installed is close to either radio or television receivers). If this is the case, then the operator is obliged to take action to rectify the situation.

Data protection

The user is responsible for the safekeeping of any changes made to the factory settings. The manufacturer accepts no liability for any deleted personal settings.

Copyright

The text and illustrations are all technically correct at the time of printing. We reserve the right to make changes. The contents of the operating instructions shall not provide the basis for any claims whatsoever on the part of the purchaser. If you have any suggestions for improvement, or can point out any mistakes that you have found in the instructions, we will be most grateful for your comments.

Protective earthing (PE)

Connection of a point in the device, system or installation to earth to protect against electric shock in the event of a fault. When installing a safety class 1 inverter (see **Technical data**), the ground conductor connection is required.

When connecting the ground conductor, ensure that it is secured against accidental disconnection. All the points listed in **Connecting the inverter to the public grid (AC side)** on page 35 must be observed. When using cable glands, ensure that the ground conductor will be strained last in the event of failure of the cable gland. When connecting the ground conductor, the minimum cross-section requirements specified by the respective national standards and guidelines must be observed.

General information

Fronius Verto

Device concept

The inverter transforms the direct current generated by the solar modules into alternating current. This alternating current is fed into the public grid and synchronized with the grid voltage in use.

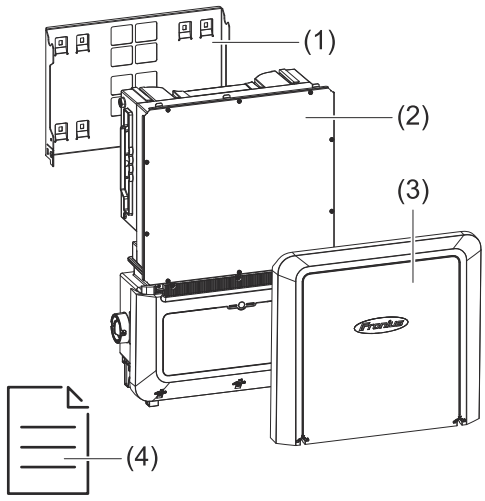
The inverter is intended for use in grid-connected photovoltaic systems.

The inverter automatically monitors the public grid. Whenever conditions in the electric grid are inconsistent with standard conditions (for example, grid switch-off, interruption), the inverter will immediately stop producing power and interrupt the supply of power into the grid.
The grid is monitored by monitoring the voltage, frequency and islanding conditions.

After installation and commissioning, the inverter's operation is fully automatic; the inverter draws the maximum possible power from the PV modules.
Depending on the operating point, this power is used in the home or fed into the grid.

When its temperature gets too high, the inverter automatically reduces the output power or switches off completely, in order to protect itself.
Reasons for the temperature being too high include a high ambient temperature or insufficient heat dissipation (for example, inadequate heat dissipation when installed in switch cabinets).

Scope of supply



(1) Mounting bracket (mounted on inverter on delivery)
(2) Inverter
(3) Housing cover
(4) Quick Start guide

Intended use

The inverter is intended to convert direct current from solar modules into alternating current and to feed this into the public grid.

Utilisation not in accordance with the intended purpose comprises:
- Utilisation for any other purpose, or in any other manner
- Alterations to the inverter are not permitted unless expressly recommended by Fronius
- Installation of components is not permitted unless expressly recommended or sold by Fronius

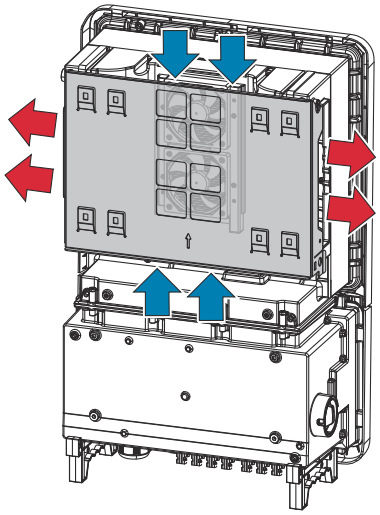
The manufacturer is not responsible for any damage resulting from improper use. All warranty claims are considered void in such cases.

Intended use also means:
- Carefully reading and obeying all the instructions, as well as safety and danger notices in the Operating Instructions
- Installation in accordance with chapter "**Installation**" from page **23**.

When designing the photovoltaic system, ensure that all components of the photovoltaic system are operated exclusively within their permissible operating range.

Take into account the grid operator's regulations for energy fed into the grid and connection methods.

Thermal concept



Ambient air is drawn in by the fan on the top and bottom and blown out at the device sides. The even heat dissipation allows several inverters to be installed next to each other.

NOTE!

Risk due to insufficient cooling of the inverter.
This may result in a loss of power in the inverter.
- ▶ Do not block the fan (for example, with objects that protrude through the touch guard).
- ▶ Do not cover the ventilation slots, even partially.
- ▶ Make sure that the ambient air can always flow through the inverter's ventilation slots unimpeded.

Fronius Solar.web

With Fronius Solar.web or Fronius Solar.web Premium, the PV system can be easily monitored and analysed by the system owner and installer. If configured accordingly, the inverter transmits data such as power, yields, load, and energy balance to Fronius Solar.web. For more information see **Solar.web - monitoring & analysis**.

Configuration is carried out via the setup wizard, see chapter **Installation with the app** on page **48** or **Installation using the web browser** on page **48**.

Prerequisites for configuration:
- Internet connection (download: min. 512 kBit/s, upload: min. 256 kBit/s)*.
- User account on **solarweb.com**.
- Completed configuration via the setup wizard.

* The information given does not constitute an absolute guarantee of faultless function. High error rates in the transmission, reception fluctuations or transmission drop-outs can have a negative effect on the data transfer. Fronius recommends testing the Internet connection on site according to the minimum requirements.

Local communication

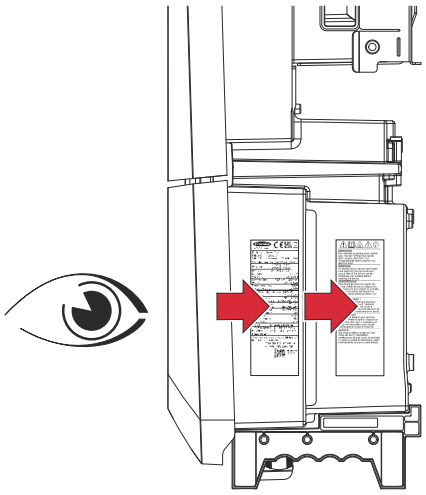
The inverter can be found via the Multicast DNS protocol (mDNS). It is recommended to search for the inverter by the assigned host name.

The following data can be retrieved via mDNS:
- NominalPower
- Systemname
- DeviceSerialNumber
- SoftwareBundleVersion

Protection of people and equipment

Warning notices on the device

Technical data, warning notices and safety symbols are affixed to the inverter. These warning notices and safety symbols must not be removed or painted over. They warn against incorrect operation which can lead to serious injury and damage.



Symbols on the rating plate:

CE mark – confirms compliance with applicable EU directives and regulations.

UKCA mark – confirms compliance with applicable UK directives and regulations.

WEEE mark – waste electrical and electronic equipment must be collected separately and recycled in an environmentally sound manner in accordance with the European Directive and national law.

Safety symbols:

General warning symbol
Observe the danger conveyed by the additional symbol(s).

Heed the instructions
Do not use the functions described until you have thoroughly read and understood the following documents:
- These Operating Instructions, in particular the safety rules.
- All Operating Instructions for the system components of the photovoltaic system, especially the safety rules.

Warning of a hot surface
Take care not to come into contact with hot surfaces.

Warning of electrical voltage
Take care not to come into contact with electrical voltage.

Allow the capacitors of the inverter to discharge (2 minutes)!

Warning notice text:

WARNING!

An electric shock can be fatal. Before opening the device, it must be disconnected and de-energised at the input and output.

Central grid and system protection

The inverter offers the option to use the integrated AC relays as coupling switches in conjunction with a central grid and system protection unit (in accordance with VDE-AR-N 4105:2018:11 §6.4.1). For this purpose, the central trigger device (switch) must be integrated into the WSD chain as described in the chapter "WSD (Wired Shut Down)".

WSD (wired shutdown)

The wired shutdown (WSD) interrupts the inverter feeding energy into the grid if the trigger device (switch, e.g. emergency stop or fire alarm switch) has been activated.

If an inverter (secondary device) fails, it is bypassed and the other inverters continue operating. If a second inverter (secondary device) or the inverter (primary device) fails, the operation of the entire WSD chain is interrupted.

For installation, see **Installing the WSD (wired shutdown)** on page **46**.

RCMU

The inverter is equipped with a universal current-sensitive residual current monitoring unit (RCMU = Residual Current Monitoring Unit) in accordance with IEC 62109-2 and IEC63112.
This device monitors residual currents from the PV module to the AC output of the inverter and disconnects the inverter from the grid in the event of unauthorised residual current.

Safe state

If one of the following safety devices is triggered, the inverter switches to a safe state:
- WSD
- Isolation monitoring
- RCMU

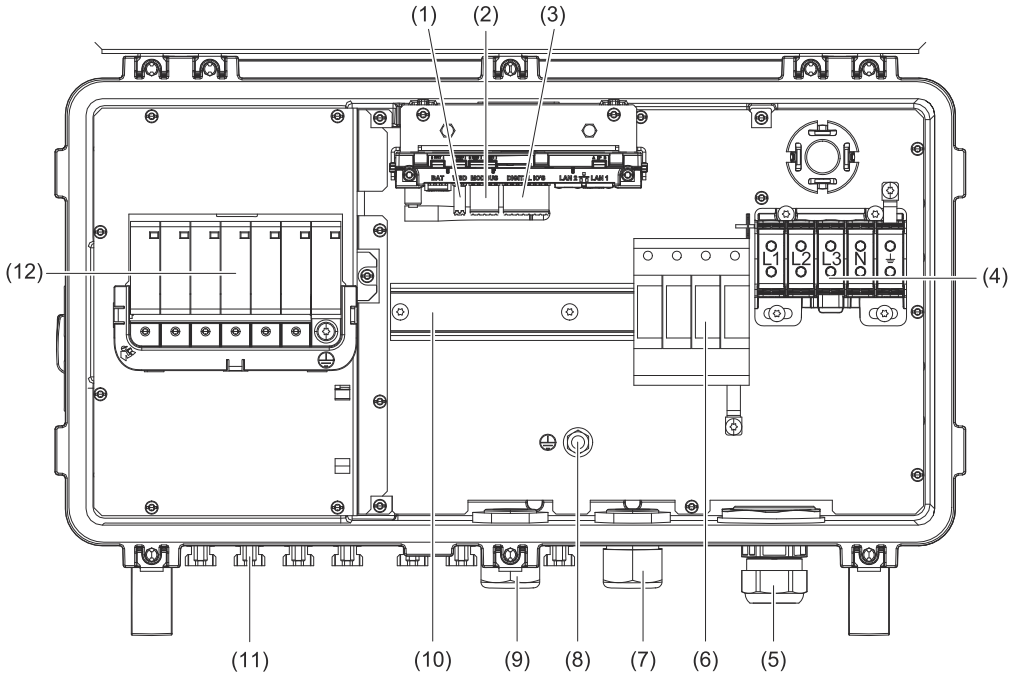
In the safe state, the inverter no longer feeds energy in and is disconnected from the grid by opening the AC relays.

Surge protective device

The inverter is equipped with an integrated surge protective device on the DC and AC side in accordance with IEC 62109-2. The surge protective device protects the system against damage in the event of a surge.

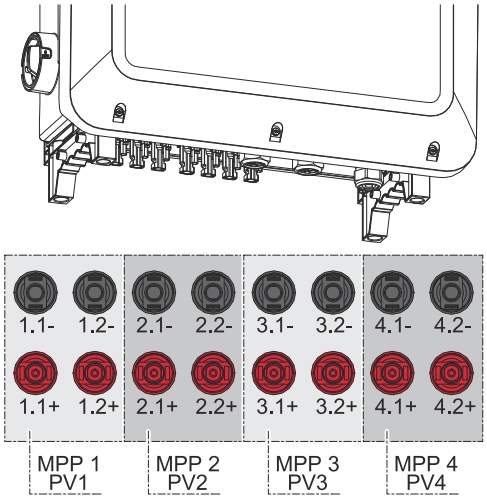
Control elements and connections

Connection area

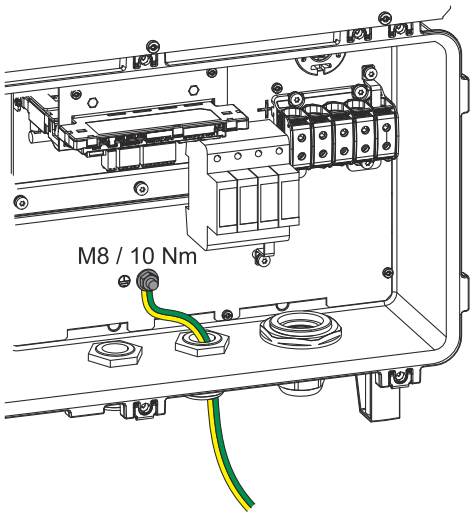


(1) Push-in WSD (wired shutdown) terminal
(2) Push-in terminals in the data communication area (Modbus)
(3) Push-in terminals in the data communication area (digital inputs and outputs)
(4) 5-pin AC terminal
⏚ = ⏚
(5) Cable bushing/cable gland AC
(6) AC SPD (surge protective device)
(7) Optional cable bushing
(8) Earthing clamping bolts
(9) Cable bushing/cable gland in the data communication area
(10) DIN rail (mounting option for third-party components)
(11) DC connections MC4
(12) DC SPD (surge protective device)

PV connections



Ground electrode bolt

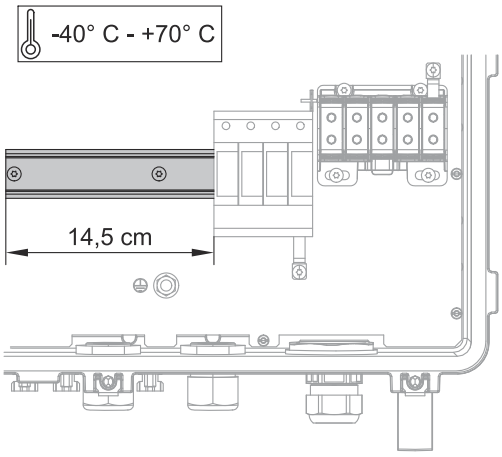


The ground electrode bolt ⏚ allows additional components to be earthed, such as:

- AC cable
- Module mounting system
- Ground rod

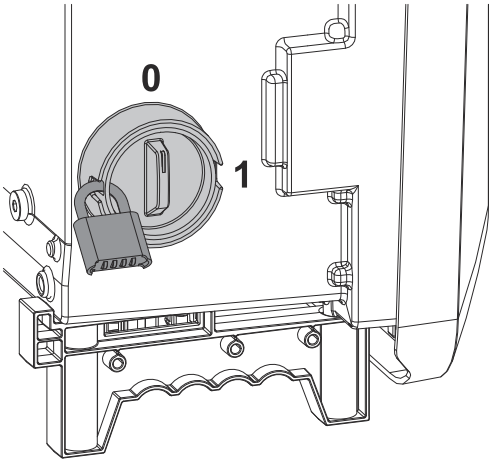
If further earthing options are required, suitable terminals can be fitted to the DIN rail.

Mounting option for third-party components



In the connection area there is space for mounting third-party components. Components up to a maximum width of 14.5 cm (8 DU) can be mounted on the DIN rail. The components must have a temperature resistance of -40 °C to +70 °C.

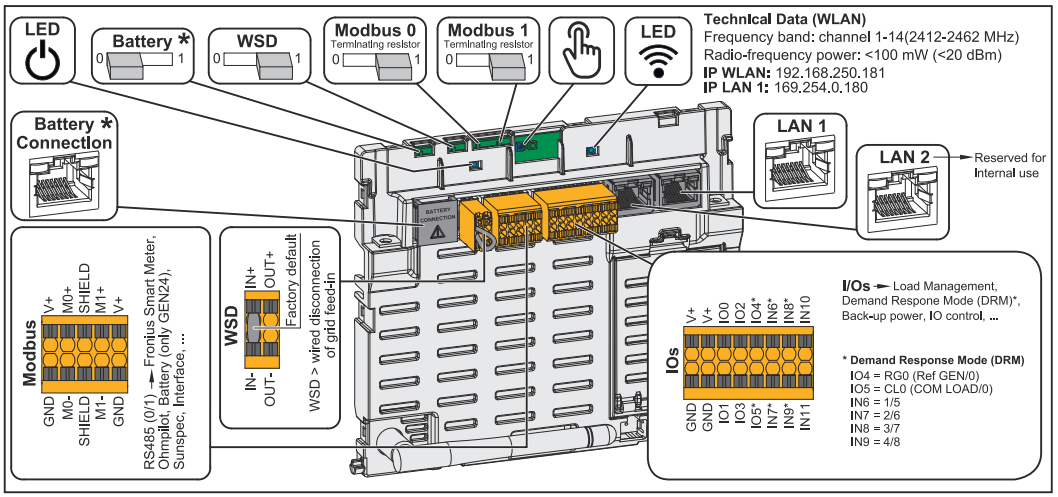
DC disconnector



The DC disconnector has 2 switch settings: On / Off.

IMPORTANT!
In the Off switch position, a conventional padlock can be used to secure the inverter against being switched on. The national guidelines must be complied with in this respect.

Data communication area

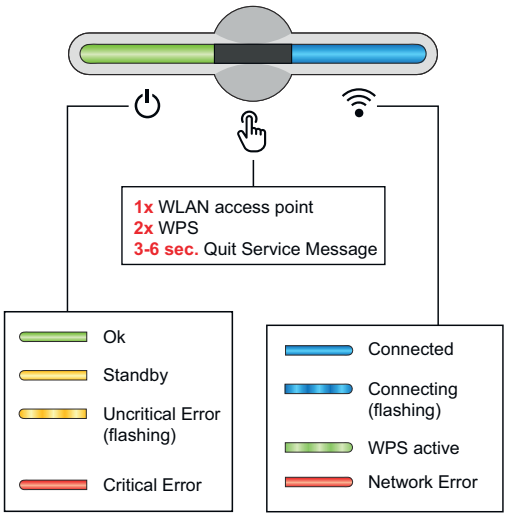


Not in use

Operating status LED	Indicates the inverter operating status.
WSD (wired shutdown) switch	Defines the inverter as a WSD primary device or WSD secondary device. **Position 1:** WSD primary device **Position 0:** WSD secondary device
Modbus 0 (MB0) switch	Switches the terminating resistor for Modbus 0 (MB0) on/off. **Position 1:** Terminating resistor on (factory setting) **Position 0:** Terminating resistor off
Modbus 1 (MB1) switch	Switches the terminating resistor for Modbus 1 (MB1) on/off. **Position 1:** Terminating resistor on (factory setting) **Position 0:** Terminating resistor off

Optical sensor	To operate the inverter. See chapter **Button functions and LED status indicator** on page **19**.
Communication LED	Indicates the inverter connection status.
LAN 1	Ethernet connection for data communication (e.g. WLAN router, home network or for commissioning with a laptop see chapter **Installation using the web browser** on page **48**).
LAN 2	Reserved for future functions. Only use LAN 1 to avoid malfunctions.
I/Os terminal	Push-in terminal for digital inputs/ outputs. See chapter **Permissible cables for the data communication connection** on page **33**. The designations (RGO, CLO, 1/5, 2/6, 3/7, 4/8) on the terminal refer to the Demand Response Mode function, see chapter **Demand Response Modes (DRM)** on page **55**.
WSD terminal	Push-in terminal for the WSD installation. See chapter "**WSD (wired shutdown)**" on page **15**.
Modbus terminal	Push-in terminal for the installation of Modbus 0, Modbus 1, 12 V and GND (ground). The data connection to the connected components is established via the Modbus terminal. **The inputs M0 and M1 can be selected for this purpose.** Max. 4 Modbus participants per input, see chapter **Modbus** on page **62**.

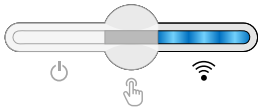
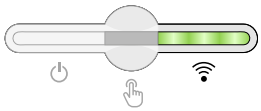
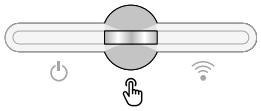
Button functions and LED status indicator

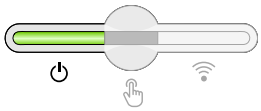
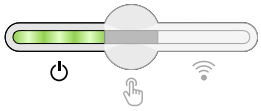
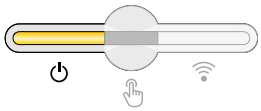
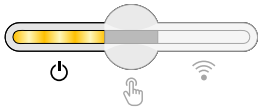
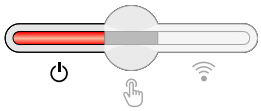
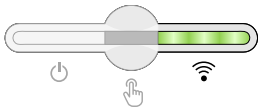
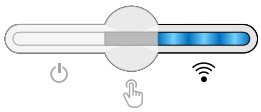
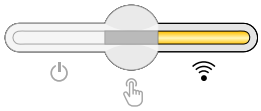
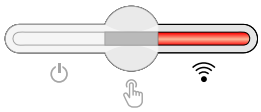


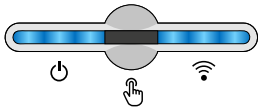
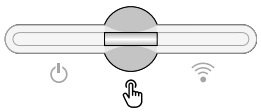
The status of the inverter is shown via the operating status LED. In the event of faults, carry out the individual steps in the Fronius Solar.web live app.

The optical sensor is actuated by touching with a finger.

The status of the connection is shown via the communication LED. To establish the connection, carry out the individual steps in the Fronius Solar.web live app.

Sensor functions	
	1x = WLAN access point (AP) is opened. Flashing blue
	2x = WLAN Protected Setup (WPS) is activated. Flashing green
	3 seconds (max. 6 seconds) = the service message is acknowledged. Flashing white (rapidly)

LED status indicator	
	The inverter is operating correctly. Lights up green
	The inverter starts. Flashing green
	The inverter is in standby, is not operational (e.g. no feed-in at night) or is not configured. Lights up yellow
	The inverter indicates a non-critical status. Flashing yellow
	The inverter indicates a critical status and there is no grid power feed process. Lights up red
	The network connection is being established via WPS. 2x= WPS search mode. Flashing green
	The network connection is being established via WLAN AP. 1x= WLAN AP search mode (active for 30 minutes). Flashing blue
	The network connection is not configured. Lights up yellow
	The inverter is operating correctly, a network fault is indicated. Lights up red

LED status indicator	
	The inverter is performing an update. ⏻ / Flashing blue
	There is a service message. Lights up white

Internal schematic connection diagram of the IOs

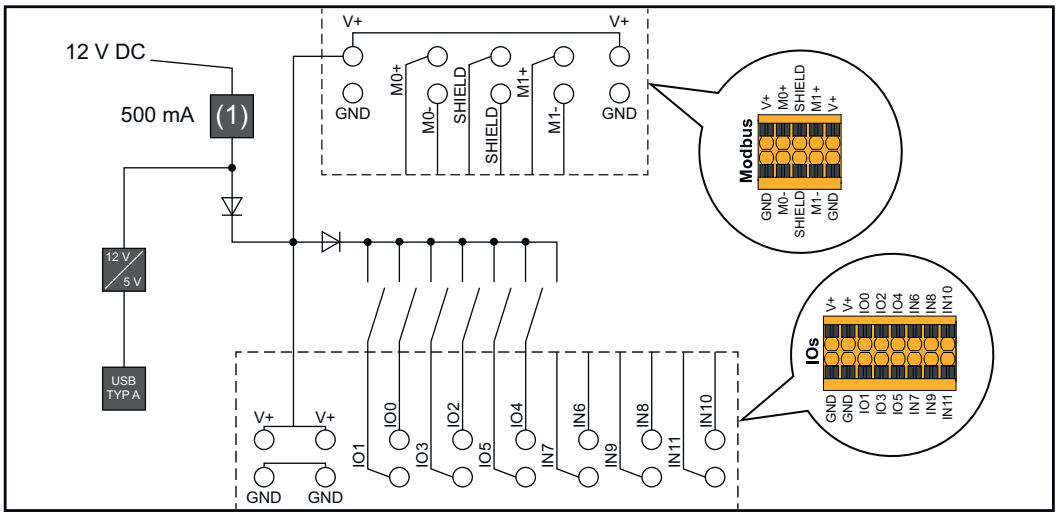
On the V+/GND pin, it is possible to feed in a voltage of around 12.5–24 V (+ max. 20%) with an external power supply. The outputs IO 0–5 can then be operated with the external voltage. A maximum of 1 A can be drawn per output, with a maximum of 3 A allowed in total. The fuse protection must be located externally.

⚠ CAUTION!

Risk of polarity reversal at the terminals due to improper connection of external power supplies.
This may result in severe damage to the inverter.

- ▶ Check the polarity of the external power supply with a suitable measuring device before connecting it.
- ▶ Connect the cables to the V+/GND outputs with the correct polarity.

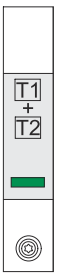
IMPORTANT!
If the total output (6 W) is exceeded, the inverter switches off the entire external power supply.



(1) Power limitation

Surge protective device (SPD)

Surge protective device (SPD)



The surge protective device (SPD) protects against temporary overvoltages and dissipates surge currents (e.g. lightning strike). Building on an overall lightning protection concept, the SPD helps to protect your PV system components.

If the surge protective device is triggered, the colour of the indicator changes from green to red (mechanical display).

A tripped SPD must be replaced immediately by an authorised specialist company with a functioning SPD in order to maintain the full protective function of the unit.

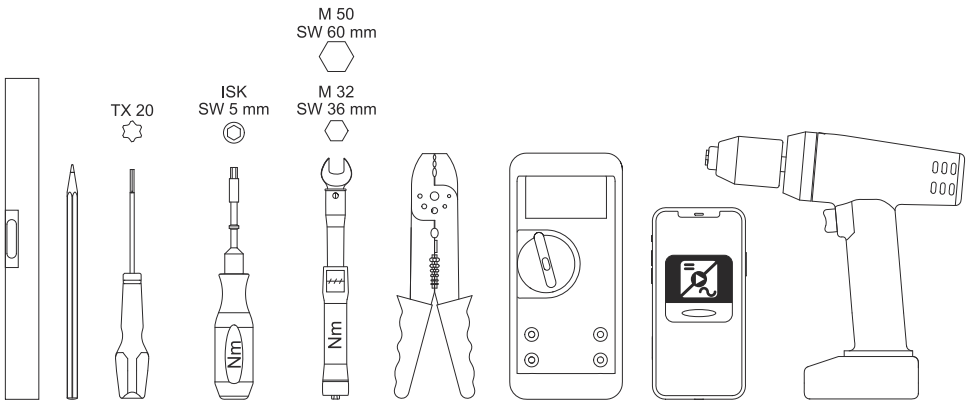
There is the option of a digital indication when an SPD has tripped. For setting this function, see PDF "Temporary SPD Triggering" in the Service & Support area at www.fronius.com

IMPORTANT!
After setting the function described above, the inverter will also respond if the 2-pole signal cable of the surge protective device is interrupted or damaged.

Installation

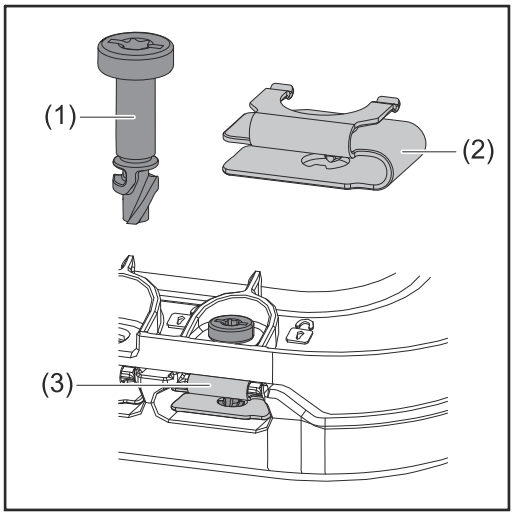
General

Tools required



- Spirit level
- Pencil
- TX20 screwdriver
- Hex socket torque wrench 5 mm
- Torque wrench M32, M50
- Wire stripper for cables and wires
- Multimeter for measuring voltage
- Smartphone, tablet or PC for setting up the inverter
- Drill driver

Quick-lock system



A quick-lock system (3) is used to mount the connection area cover and front cover. The system is opened and closed with a half-rotation (180°) of the captive screw (1) into the quick-lock spring (2).

The system is independent of torque.

NOTE!

Danger when using a drill driver.
This may result in the destruction of the quick-lock system due to overtorque.

- ▶ Use a screwdriver (TX20).
- ▶ Do not turn the screws more than 180°.

System component compatibility

All installed components in the photovoltaic system must be compatible and have the necessary configuration options. The installed components must not restrict or negatively influence the functioning of the photovoltaic system.

NOTE!

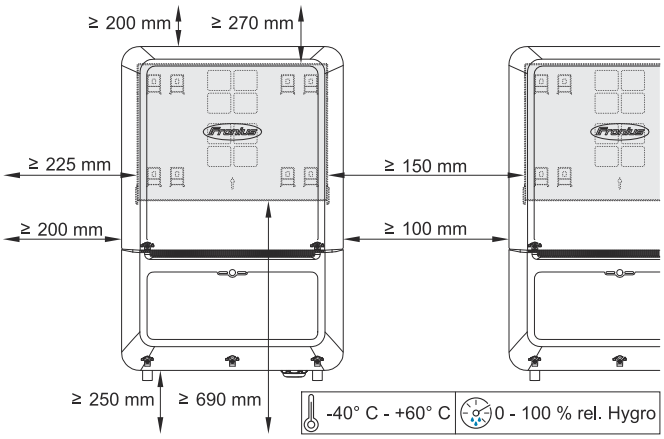
Risk due to components in the photovoltaic system that are not compatible and/or have limited compatibility.
Incompatible components may limit and/or negatively affect the operation and/or functioning of the photovoltaic system.

- ▶ Only install components recommended by the manufacturer in the photovoltaic system.
- ▶ Before installation, check the compatibility of components not expressly recommended with the manufacturer.

Installation location and position

Choosing the location of the inverter

Please note the following criteria when choosing a location for the inverter:



Only install on a solid, non-flammable surface.

Max. ambient temperatures:
-40 °C - +60 °C

Relative humidity:
0 - 100%

When installing the inverter in a switch cabinet or similar closed environment, it is necessary to make sure that the hot air that develops will be dissipated by forced-air ventilation.

When installing the inverter on the outer walls of cattle sheds, it is important to maintain a minimum clearance of 2 m between the inverter and the ventilation and building openings on all sides.

The following substrates are permissible for installation:
- Walls (corrugated metal walls [mounting rails], brick walls, concrete walls, or other non-flammable surfaces sufficiently capable of bearing loads)
- Mast or support (installed using mounting rails, behind the PV modules directly on the PV mounting system)
- Flat roofs (if installing on a foil roof, make sure that the foils adhere to the fire protection requirements and are thus not easily flammable. Ensure compliance with the national provisions.)
- Covered car park roofs (no overhead installation)

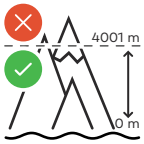
The inverter is suitable for indoor installation.

The inverter is suitable for outdoor installation.

Due to its protection class IP 66, the inverter is insensitive to water jets from all directions and can also be used in humid environments.

In order to minimise the heating up of the inverter, do not expose it to direct insolation.

The inverter should be installed in a protected location, for example, below the PV modules or under an overhanging roof.



The inverter must not be installed or used at altitudes above 4,000 m.

Do not install the inverter in:
- Areas where it may be exposed to ammonia, corrosive gases, acids or salts (e.g. fertiliser storage areas, vent openings for livestock stables, chemical plants, tanneries, etc.)

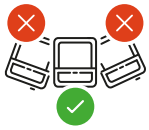
During certain operating phases the inverter may produce a slight noise. For this reason it should not be installed in an occupied living area.

Do not install the inverter in:
- Areas where there is an increased risk of accidents from farm animals (horses, cattle, sheep, pigs, etc.)
- Stables or adjoining areas
- Storage areas for hay, straw, chaff, animal feed, fertilizers, etc.

The inverter is designed to be dustproof (IP 66). In areas of high dust accumulation, dust deposits may collect on the cooling surfaces, and thus impair the thermal performance. Regular cleaning is necessary in such situations. We therefore recommend not installing the device in areas and environments with high dust accumulation.

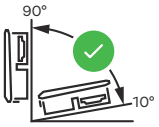
Do not install the inverter in:
- Greenhouses
- Storage or processing areas for fruit, vegetables or viticulture products
- Areas used in the preparation of grain, green fodder or animal feeds

Installation position of inverter



The inverter is suitable for vertical installation on a vertical wall or column.

Do not install the inverter:
- At an angle
- In the horizontal position
- With the connection sockets facing upwards
- On a base



The inverter is suitable for a horizontal installation position or for installation on a sloping surface.

Do not install the inverter:

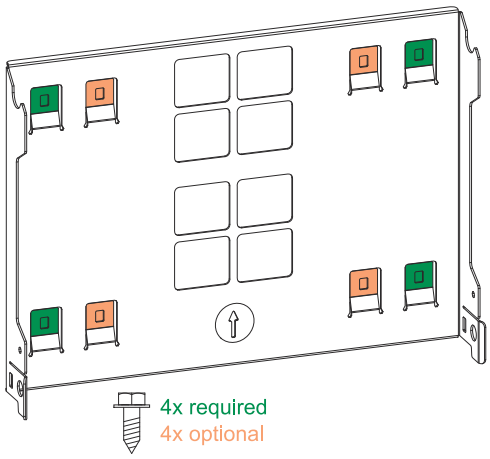
- On a sloping surface with the connection sockets facing upwards
- Overhanging with the connection sockets facing down
- On the ceiling

Install the mounting bracket and hang up the inverter

Selecting the fixing material

Use the corresponding fixing materials depending on the subsurface and observe the screw dimension recommendations for the mounting bracket.
The installer is responsible for selecting the correct type of fixing.

Properties of the mounting bracket



The mounting bracket (illustration) can also be used as a guide.

The pre-drilled holes on the mounting bracket are intended for screws with a thread diameter of 6-8 mm (0.24-0.32 inches).

Unevenness on the installation surface (for example, coarse-grained plaster) is largely counterbalanced by the mounting bracket.

The mounting bracket must be fixed to the four outer tabs (marked in green). The 4 inner tabs (marked in orange) can be used in addition if required.

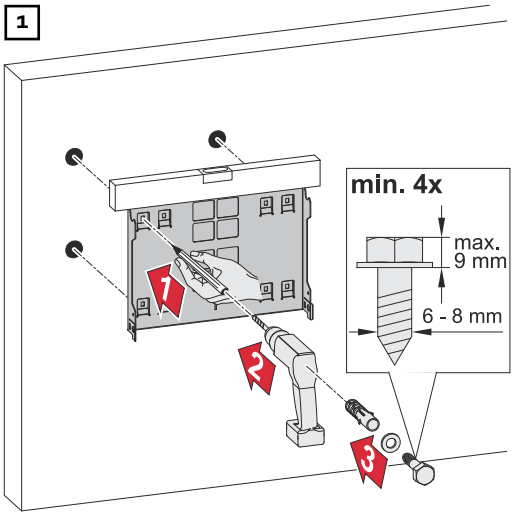
Do not deform the mounting bracket

NOTE!

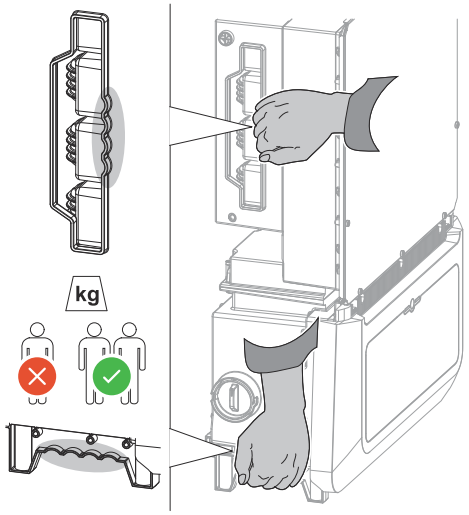
When fitting the mounting bracket to the wall or column, ensure that the mounting bracket does not become deformed.
A deformed mounting bracket may make it difficult to clip/swivel the inverter into position.

Fitting the mounting bracket to a wall

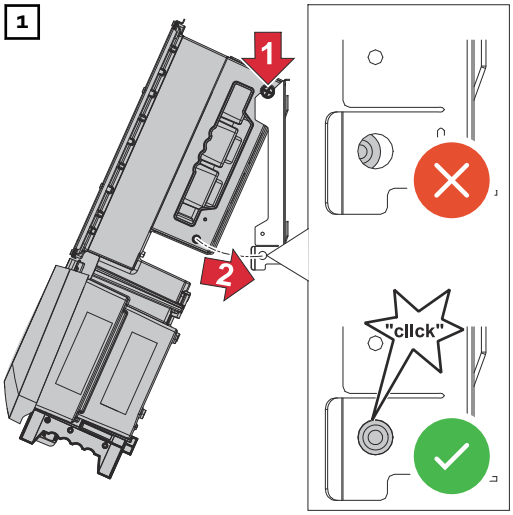
IMPORTANT!
When installing the mounting bracket, make sure that it is installed with the arrow pointing upwards.



Attaching the inverter to the mounting bracket



There are integrated grips on the side of the inverter which facilitate lifting/attaching.



Clip the inverter into the mounting bracket from above. The connections must point downwards.

Push the lower part of the inverter into the snap-in tabs of the mounting bracket until the inverter audibly clicks into place on both sides.

Check that the inverter is correctly positioned on both sides.

Prerequisites for connecting the inverter

Connecting aluminium cables

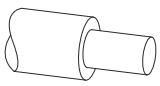
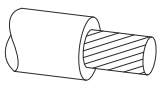
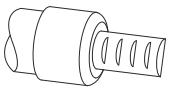
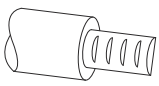
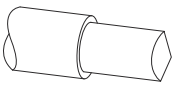
Aluminium cables can be connected to the grid connections.

NOTE!

When connecting aluminium cables:

- ▶ Observe national and international guidelines regarding the connection of aluminium cables
- ▶ To protect the aluminium strands from oxidation, grease them with a suitable grease.
- ▶ Follow the instructions of the cable manufacturer

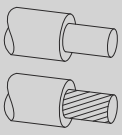
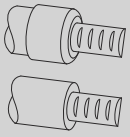
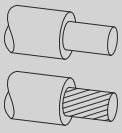
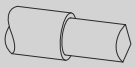
Different cable types

Solid	Fine-stranded	Fine-stranded with ferrule and collar	Fine-stranded with ferrule without collar	Sectoral
				

Permissible cables for the electrical connection

Round copper or aluminium wires with a cross section of 4 to 35 mm² can be connected to the terminals of the inverter as described below.

The torques must be maintained according to the following table:

Cross section	Copper		Aluminium	
				
35 mm²	10 Nm	10 Nm	14 Nm	14 Nm
25 mm²	8 Nm	8 Nm	12 Nm	10 Nm
16 mm²			10 Nm	
10 mm²	6 Nm	6 Nm	⊗	⊗
6 mm²				
4 mm²	⊗			

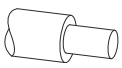
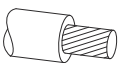
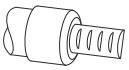
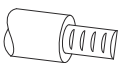
The earthing must be carried out with at least a 10 mm² copper or 16 mm² aluminium conductor.

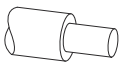
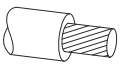
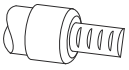
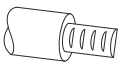
Permissible cables for the data communication connection

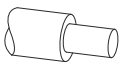
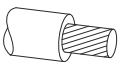
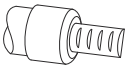
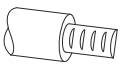
Cables with the following design can be connected to the terminals of the inverter:

- Copper: round, solid
- Copper: round, fine-stranded

IMPORTANT!
Connect the individual conductors to an appropriate ferrule if several individual conductors are connected to one input of the push-in terminals.

WSD connections with push-in terminal						
Distance max.	**Stripping length**					**Cable recommendation**
100 m 109 yd	10 mm 0.39 inch	0.14-1.5 mm² AWG 26 - 16	0.14-1.5 mm² AWG 26 - 16	0.14-1 mm² AWG 26 - 18	0.14-1.5 mm² AWG 26 - 16	min. CAT 5 UTP (unshielded twisted pair)

Modbus connections with push-in terminal						
Distance max.	**Stripping length**					**Cable recommendation**
300 m 328 yd	10 mm 0.39 inch	0.14-1.5 mm² AWG 26 - 16	0.14-1.5 mm² AWG 26 - 16	0.14-1 mm² AWG 26 - 18	0.14-1.5 mm² AWG 26 - 16	min. CAT 5 STP (shielded twisted pair)

IO connections with push-in terminal						
Distance max.	**Stripping length**					**Cable recommendation**
30 m 32 yd	10 mm 0.39 inch	0.14-1.5 mm² AWG 26 - 16	0.14-1.5 mm² AWG 26 - 16	0.14-1 mm² AWG 26 - 18	0.14-1.5 mm² AWG 26 - 16	Single conductor possible

LAN connections
Fronius recommends at least CAT 5 STP (shielded twisted pair) cables and a maximum distance of 100 m (109 yd).

Cable diameter of the AC cable

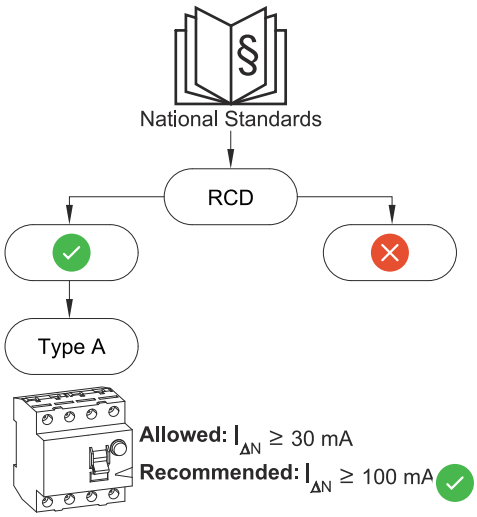
For a standard M32 cable gland **with a large reducer (green)**:
Cable diameter from **12-14 mm**

For a standard M32 cable gland **with a small reducer (red)**:
Cable diameter from **17-19 mm**

For a standard M32 cable gland **without a reducer**:
Cable diameter from **20.5-24.5 mm**

For an M50 cable gland:
Cable diameter from **≤35 mm**

Maximum alternating current fuse protection



NOTE!

The national regulations of the grid operator or other factors may require a residual current circuit breaker in the AC connection lead.
For this situation, a type A residual current circuit breaker is generally adequate. Nevertheless, false alarms can be triggered for the type A residual current circuit breaker in individual cases and depending on local conditions. For this reason, in accordance with national legislation, Fronius recommends that a residual current circuit breaker with a tripping current of at least 100 mA suitable for frequency converters be used.

IMPORTANT!
As a maximum, the inverter can be used with an automatic circuit breaker 125 A / 315 A (type 2 / type 1+2 AC-SPD).

Verto	AC output	Recommended fuse rating
15.0 208-240	15 kW	63 A
18.0 208-240	18 kW	63 A
25.0	25 kW	63 A
27.0	27 kW	63 A
30.0	29.9 kW	63 A
33.3	33.3 kW	63 A
36.0 480	36 kW	63 A

Connecting the inverter to the public grid (AC side)

Safety

⚠ WARNING!

Danger due to incorrect operation and incorrectly performed work.
This can result in serious injury and damage to property.
- ▶ Read the Installation and Operating Instructions before installing and commissioning the equipment.
- ▶ Only qualified personnel are authorised to commission your inverter and only within the scope of the respective technical regulations.

⚠ WARNING!

Danger due to grid voltage and DC voltage from solar modules that are exposed to light.
An electric shock can be fatal.
- ▶ Prior to any connection work, disconnect the inverter on the AC side and the DC side.
- ▶ Only an authorised electrical engineer is permitted to connect this equipment to the public grid.

⚠ WARNING!

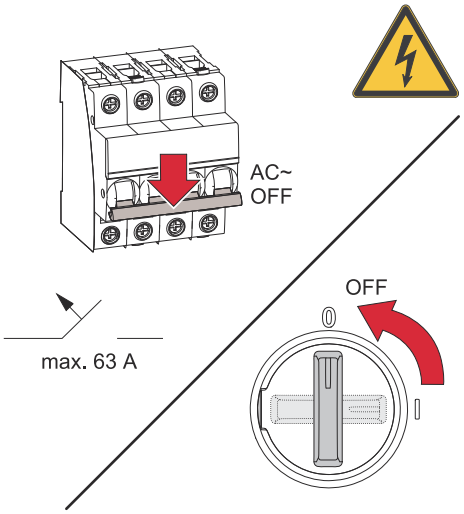
Danger due to damaged and/or contaminated terminals.
This can result in serious injury and damage to property.
- ▶ Before making any connections, check the terminals for damage and contamination.
- ▶ Remove contamination in the de-energized state.
- ▶ Have defective terminals repaired by an authorised specialist.

Connecting the inverter to the public grid (AC side)

It is not possible to operate the inverter in unearthed grids, such as IT grids (insulated grids without ground conductor).

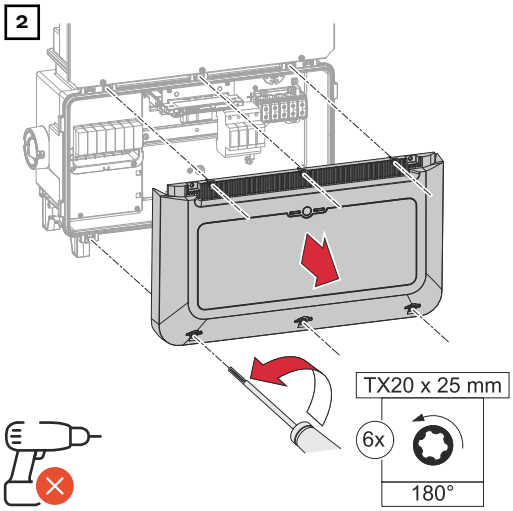
IMPORTANT!
The ground conductor must be dimensioned longer and laid in a loop to allow for movement so that it is strained last in the event of failure of the cable gland.

1



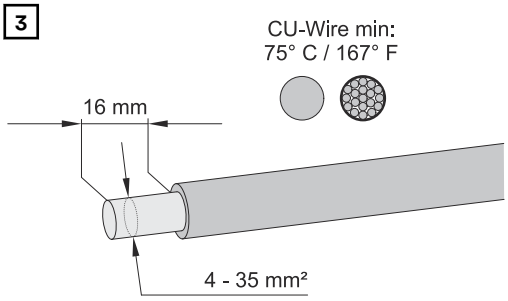
Turn off the automatic circuit breaker. Ensure that the DC disconnector is in the "Off" switch position.

2



Loosen the six screws of the connection area cover by rotating them 180° to the left using a screwdriver (TX20). Remove the connection area cover from the device.

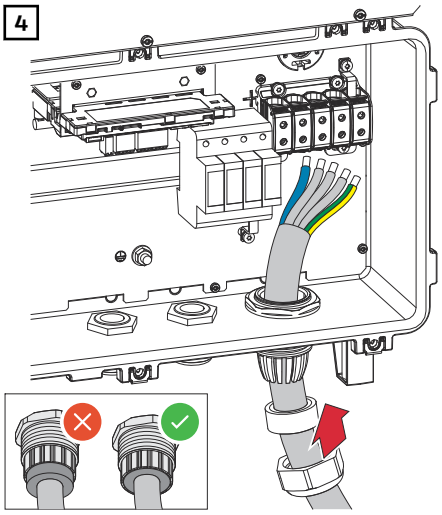
3



Strip the insulation of the single conductors by 16 mm.
Select the cable cross section in accordance with the instructions in **Permissible cables for the electrical connection** from page **32**.

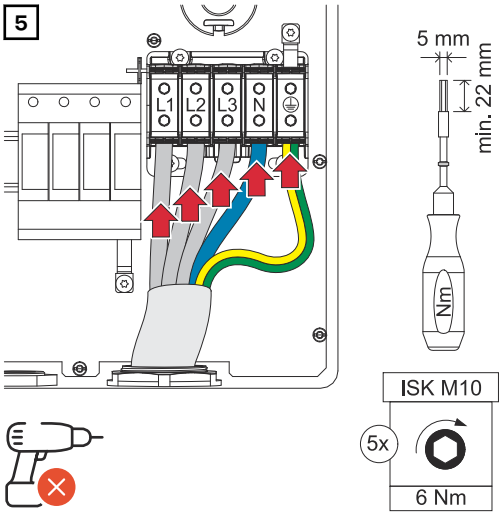
IMPORTANT!
Only one conductor may be connected to each pin. Two conductors can be connected to a single pin using a twin ferrule.

4



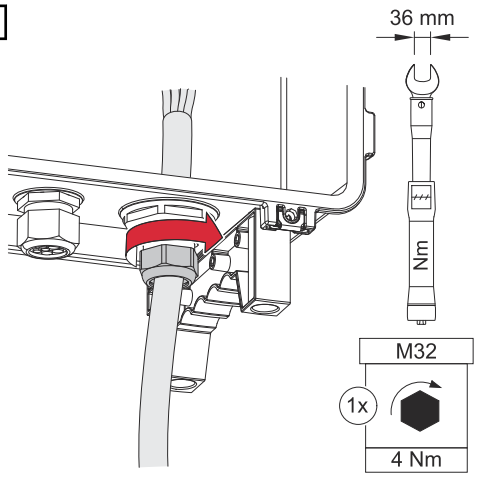
For more information on the cable gland, see chapter **Cable diameter of the AC cable** on page **33**.

5



L1	Phase conductor
L2	Phase conductor
L3	Phase conductor
N	Neutral conductor
PE	Ground conductor

6



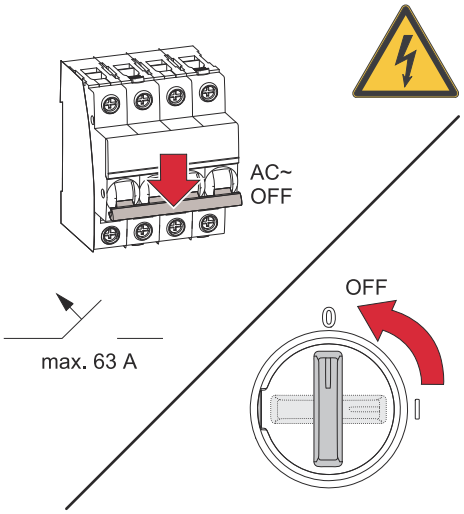
Fasten the union nut of the cable gland with a torque of 6-7 Nm.

Connecting the inverter to the public grid with the PEN conductor (AC side)

It is not possible to operate the inverter in unearthed grids, such as IT grids (insulated grids without ground conductor).

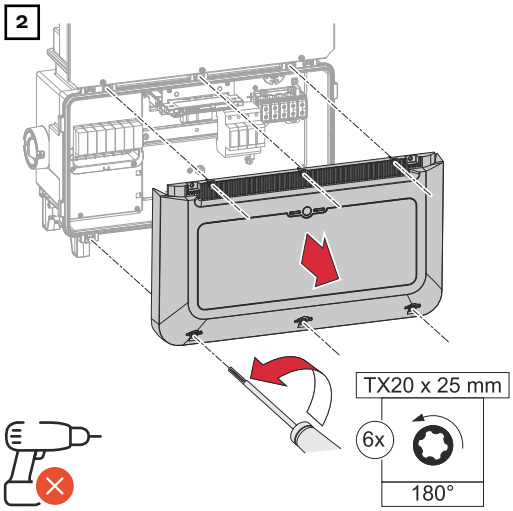
IMPORTANT!
The ground conductor must be dimensioned longer and laid in a loop to allow for movement so that it is strained last in the event of failure of the cable gland.

1



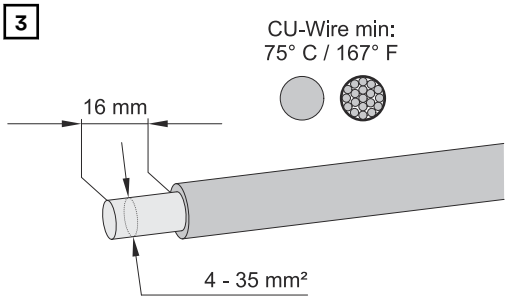
Turn off the automatic circuit breaker. Ensure that the DC disconnector is in the "Off" switch position.

2



Loosen the six screws of the connection area cover by rotating them 180° to the left using a screwdriver (TX20). Remove the connection area cover from the device.

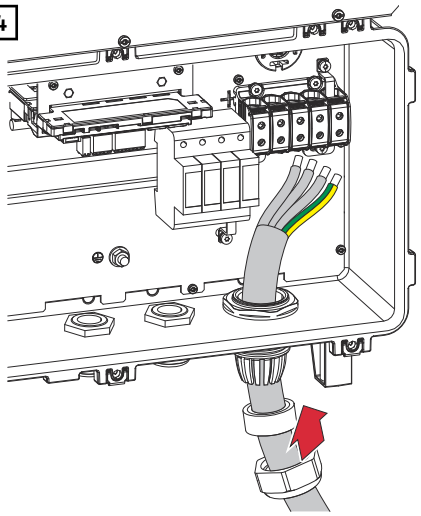
3



Strip the insulation of the single conductors by 16 mm.
Select the cable cross section in accordance with the instructions in **Permissible cables for the electrical connection** from page **32**.

IMPORTANT!
Only one conductor may be connected to each pin. Two conductors can be connected to a single pin using a twin ferrule.

4

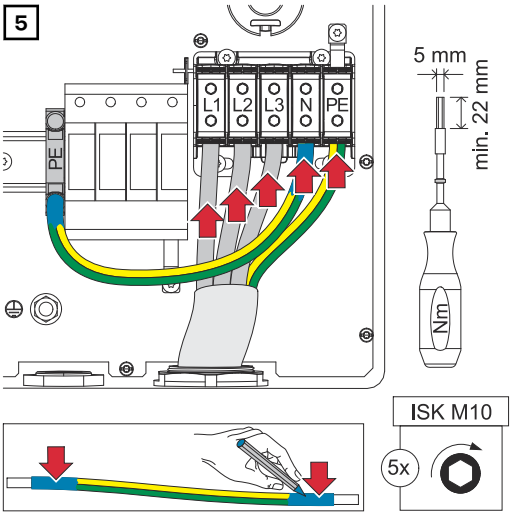


For more information on the cable gland, see chapter **Cable diameter of the AC cable** on page **33**.

NOTE!

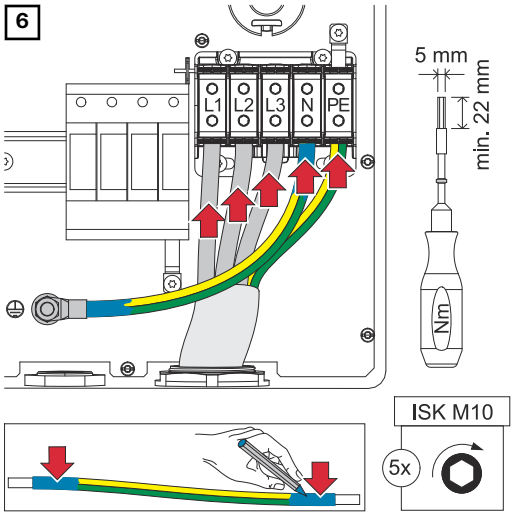
The PEN conductor must be produced with ends that are permanently marked blue, according to the national provisions.

5



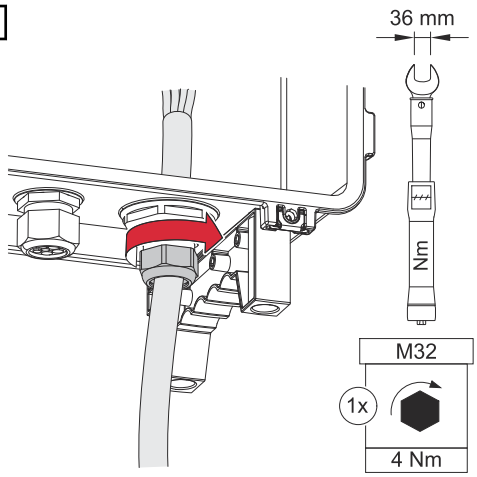
PEN-conductor - version: Terminal on DIN rail

6



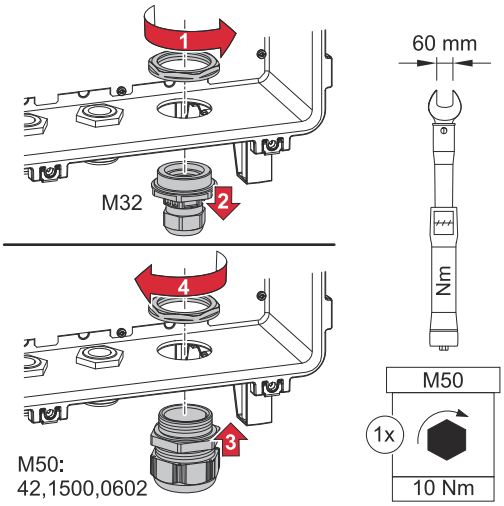
PEN-conductor - version: Earthing stud

7



Fasten the union nut of the cable gland with a torque of 6-7 Nm.

Replacing the PG gland



Connecting solar module strings to the inverter

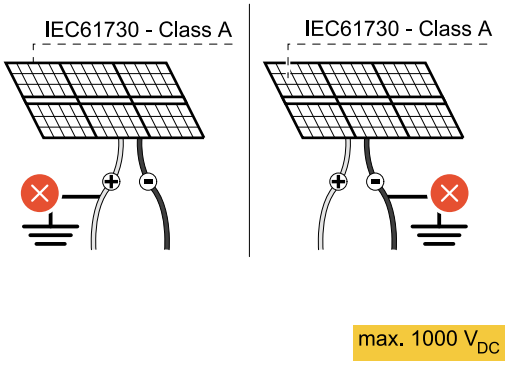
General comments regarding PV modules

To enable suitable PV modules to be chosen and to use the inverter as efficiently as possible, it is important to bear the following points in mind:

- If insolation is constant and the temperature is falling, the open-circuit voltage of the PV modules will increase. The open-circuit voltage must not exceed the maximum permissible system voltage. If the open-circuit voltage exceeds the specified values, the inverter will be destroyed and all warranty claims will be forfeited.
- The temperature coefficients on the data sheet of the PV modules must be observed.
- Exact values for sizing the PV modules can be obtained using suitable calculation tools, such as the **Fronius Solar.creator**.

IMPORTANT!
Before connecting up the PV modules, check that the voltage for the PV modules specified by the manufacturer corresponds to the actual measured voltage.

IMPORTANT!
The PV modules connected to the inverter must comply with the IEC 61730 Class A standard.



IMPORTANT!
Solar module strings must not be earthed.

Safety

⚠ WARNING!

Danger due to incorrect operation and incorrectly performed work.
This can result in serious injury and damage to property.

- ▶ Commissioning as well as maintenance and service work in the power module of the inverter must only be carried out by service personnel trained by Fronius and only within the scope of the respective technical regulations.
- ▶ Read the Installation and Operating Instructions before installing and commissioning the equipment.

⚠ WARNING!

Danger due to grid voltage and DC voltage from solar modules that are exposed to light.
This can result in serious injury and damage to property.

- ▶ Ensure that the AC and DC side of the inverter are de-energised before carrying out any connection, maintenance or service tasks.
- ▶ Only an authorised electrical engineer is permitted to connect this equipment to the public grid.

⚠ WARNING!

Danger due to damaged and/or contaminated terminals.
This can result in serious injury and damage to property.

- ▶ Before making any connections, check the terminals for damage and contamination.
- ▶ Remove contamination in the de-energized state.
- ▶ Have defective terminals repaired by an authorised specialist.

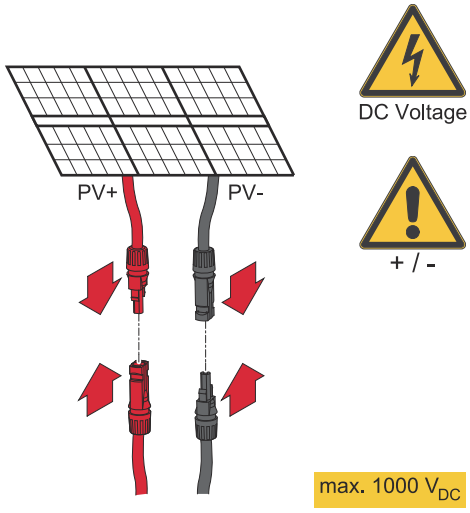
Module array - general information

Several independent PV inputs are available. These can be connected to a different number of modules.

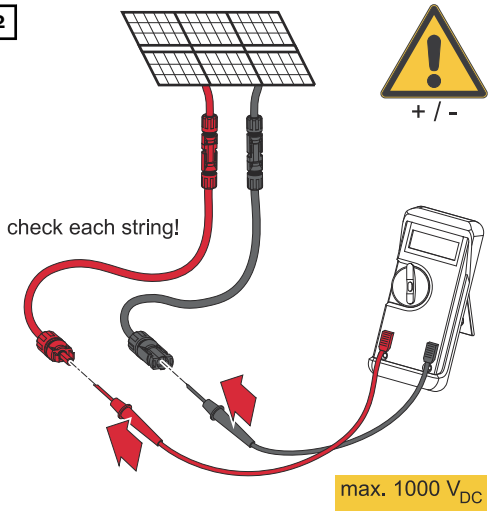
When using for the first time, set up the module array according to the respective configuration (also possible later in the **"System configuration"** menu under the **"Components"** menu item).

Connecting the solar module strings to the inverter

1



2



Use a suitable measuring instrument to check the voltage and polarity of the DC cabling.

⚠ CAUTION!

Danger due to polarity reversal at the terminals.
This may result in severe damage to the inverter.

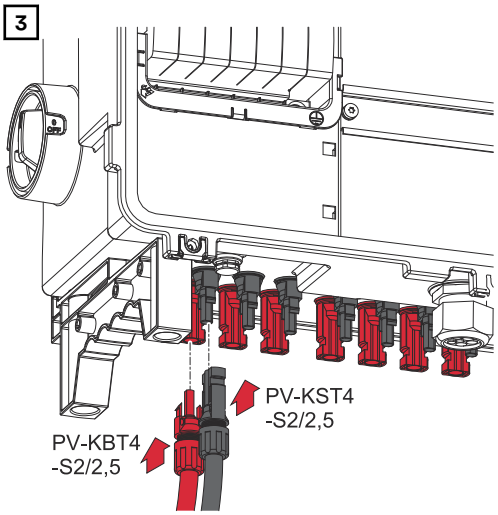
- ▶ Use a suitable measuring instrument to check the polarity of the DC cabling.
- ▶ Use a suitable measuring instrument to check the voltage (**max. 1,000 V_{DC}**)

⚠ CAUTION!

Risk of damage as the result of incompatible plug connectors.
Incompatible plug connectors can cause heat damage that may result in a fire.

▶ Only use the original plug connectors (MC4) manufactured by Stäubli (formerly Multi-Contact).

3



Connect the PV cables from the solar modules to the MC4 connectors as labelled.

Unused MC4 connectors on the inverter must be covered with the cover plates supplied with the inverter.

Connecting the data communication cable

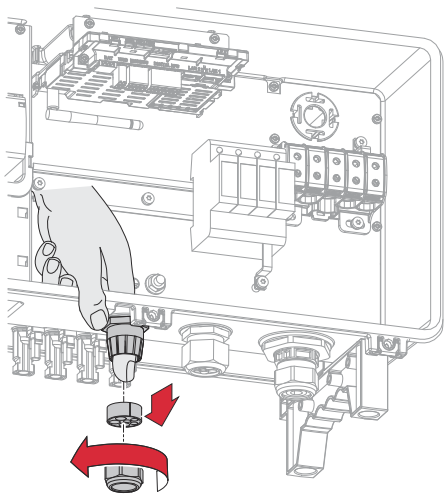
Routing data communication cables

IMPORTANT!
If data communication cables are wired into the inverter, observe the following points:

- Depending on the number and cross section of the wired data communication cables, remove the corresponding blanking plugs from the sealing insert and insert the data communication cables.
- Make sure that you insert the corresponding blanking plugs into any free openings on the sealing insert.

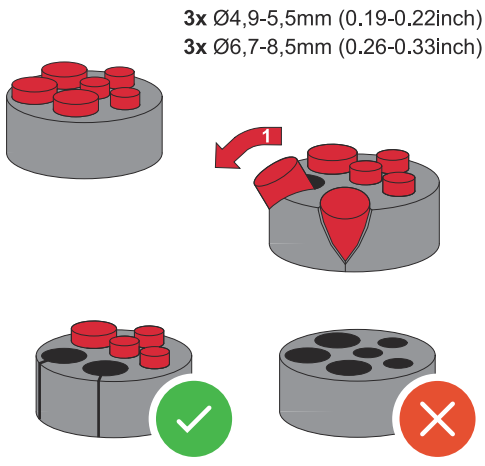
IMPORTANT!
Should the blanking plugs be missing or improperly fitted, then safety class IP66 cannot be guaranteed.

1



Undo the cable gland union nut and push out the sealing ring and the blanking plug from the inside of the device.

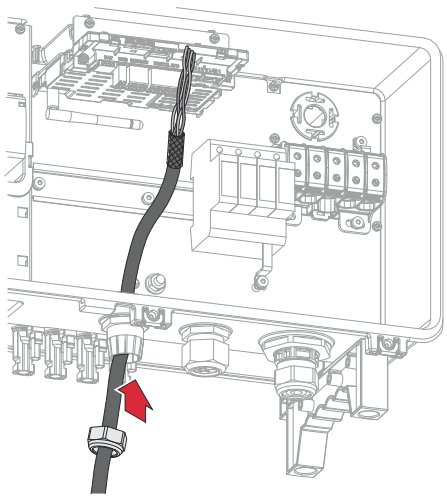
2



Open up the sealing ring at the location where the blanking plug is to be removed.

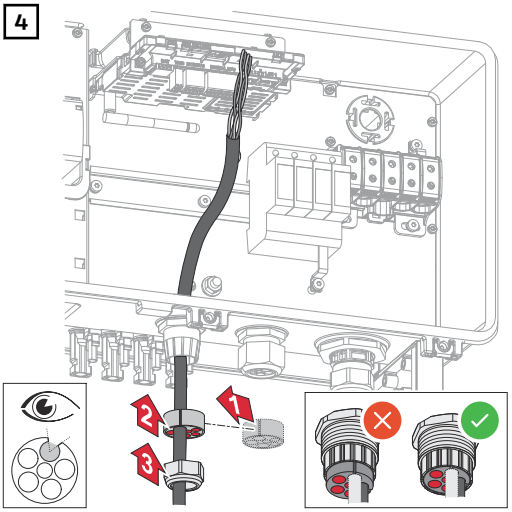
***** Liberate the blanking plug by moving it sideways.

3



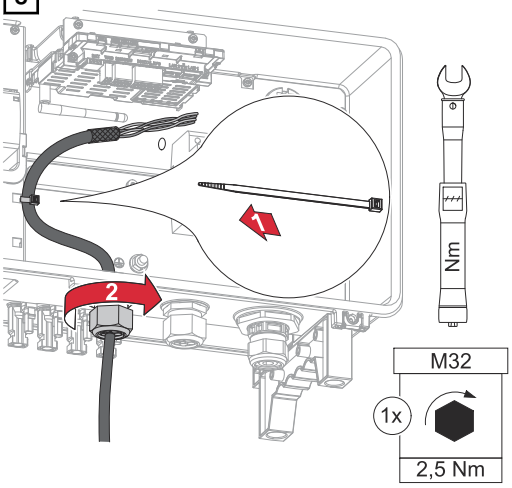
Guide the data cables first through the cable gland union nut and then through the housing opening.

4



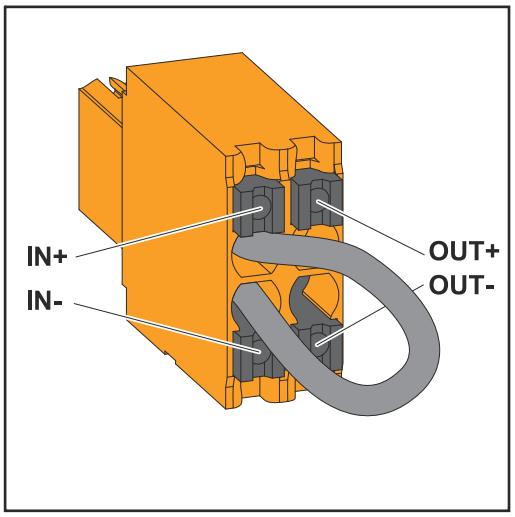
Insert the sealing ring between the union nut and the housing opening. Press the data cables into the seal's cable guide. Then press in the seal until it reaches the underside of the cable gland.

5



Secure the data cable to the protective cover of the DC SPD surge protective device with a cable tie. Tighten the union nut for the cable gland to a torque of min. 2.5 to max. 4 Nm.

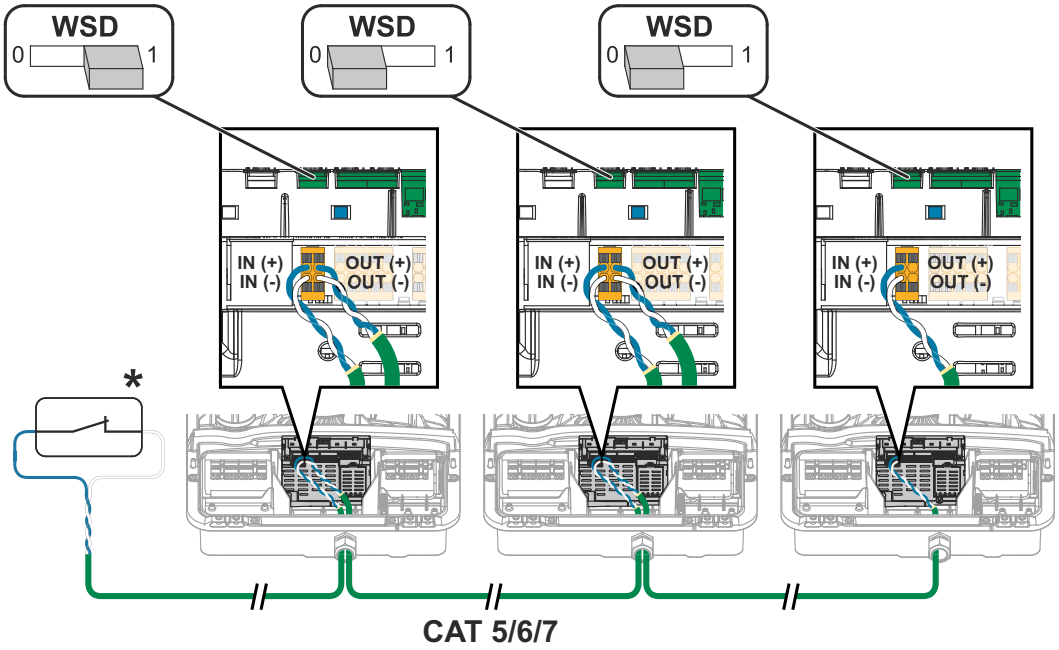
Installing the WSD (wired shutdown)



IMPORTANT!
The push-in WSD terminal in the inverter's connection area is delivered with a bypass ex works as standard. The bypass must be removed when installing a trigger device or a WSD chain.

The WSD switch of the first inverter with connected trigger device in the WSD chain must be in position 1 (primary device). The WSD switch of all other inverters should be in the 0 (secondary device) position.

Max. distance between 2 devices: 100 m
Max. number of devices: 28

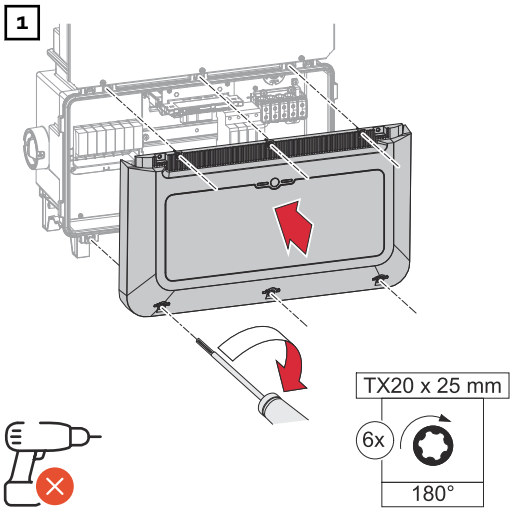


* Floating contact of the trigger device (e.g. central grid and system protection). If several floating contacts are used in a WSD chain, they must be connected in series.

Closing and commissioning the inverter

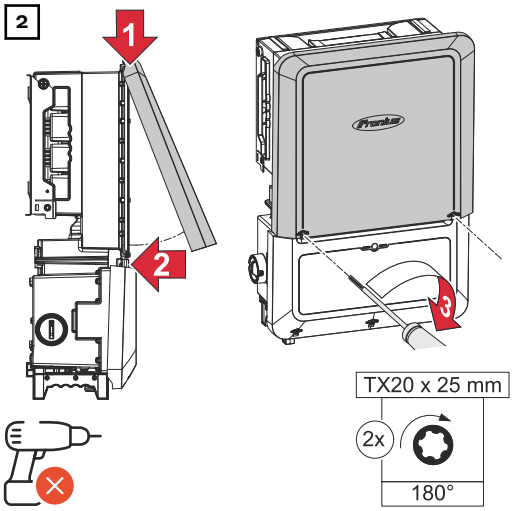
Closing the inverter's connection area/housing cover, and commissioning

1



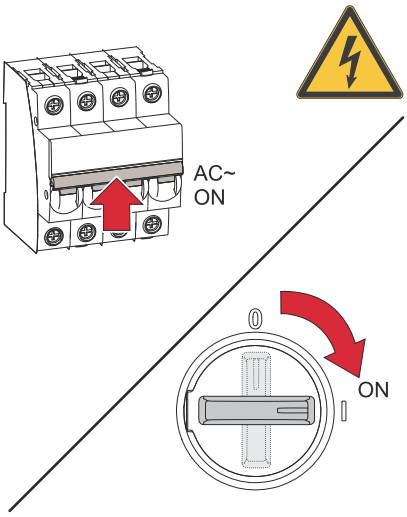
Place the cover on the connection area. Tighten the six screws by rotating them 180° to the right using a screwdriver (TX20).

2



Clip the housing cover onto the inverter from above.
Press on the lower part of the housing cover and tighten the two screws by rotating them 180° to the right using a screwdriver (TX20).

3



Turn the DC disconnector to the "On" switch position. Switch on the automatic circuit breaker.

IMPORTANT! Open WLAN Access Point with the optical sensor, see chapter **Button functions and LED status indicator** on page **19**

Starting the inverter for the first time

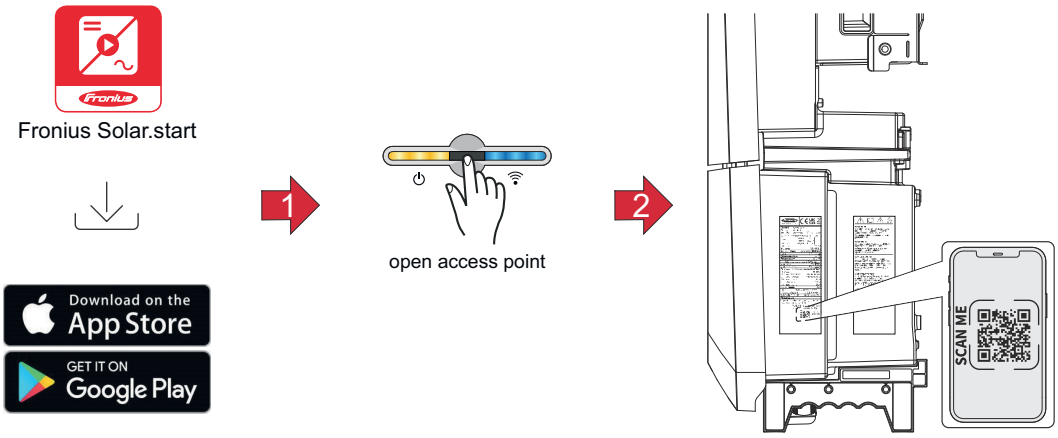
When starting the inverter for the first time, various setup settings must be configured.

If the setup process is cancelled before the process is complete, any data that has been input up to this point is lost and the start screen with the installation wizard is shown again. If the process is interrupted, such as in the event of a power outage, the data is saved. Commissioning may be continued from the point at which the process was interrupted once the power supply has been restored. If the setup was interrupted, the inverter feeds energy into the grid at maximum 500 W and the operating status LED flashes yellow.

The country setup can only be set when starting the inverter for the first time. If the country setup needs to be changed at a later date, please contact your installer / Technical Support team.

Installation with the app

The "Fronius Solar.start" app is required for this installation method. Depending on the end device with which the installation will be carried out, download the app for the respective platform.



1 Download and install the Fronius Solar.start app.

2 Open the access point by touching the sensor → Communication LED flashes blue.

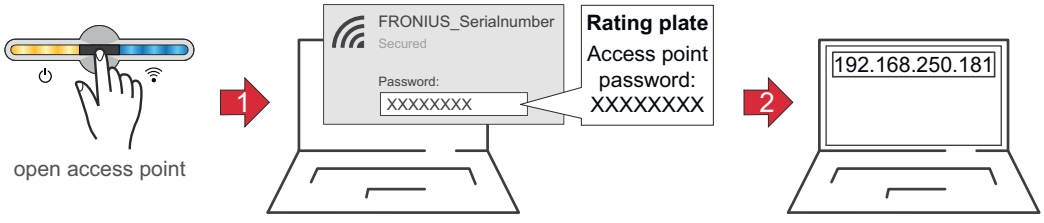
3 Open the Solar.start app and follow the installation wizard. Scan the QR code on the rating plate with a smartphone or tablet to connect to the inverter.

4 Add system components in Solar.web and start up the PV system.

The network wizard and the product setup can be carried out independently of each other. A network connection is required for the Solar.web installation wizard.

Installation using the web browser

WLAN:



1 Open the access point by touching the sensor

✓ *Communication LED flashes blue.*

2 Establish the connection to the inverter in the network settings (the inverter is displayed with the name "FRONIUS_" and the serial number of the device).

3 Enter the password from the rating plate and confirm.
IMPORTANT!
To enter the password on a Windows 10 operating system, the link "Connect using a security key instead" must first be activated to establish a connection with the password.

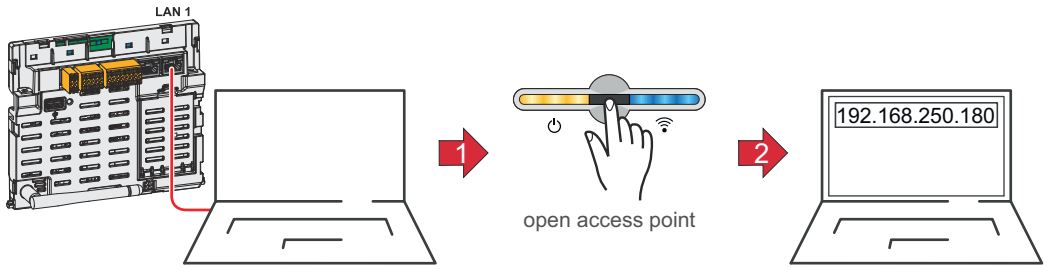
4 In the browser address bar, enter and confirm the IP address 192.168.250.181. The installation wizard is opened.

5 Follow the installation wizard in the individual sections and complete the installation.

6 Add system components in Solar.web and start up the PV system.

The network wizard and the product setup can be carried out independently of each other. A network connection is required for the Solar.web installation wizard.

Ethernet:



1 Establish a connection to the inverter (LAN1) with a network cable (CAT5 STP or higher).

2 Open the access point by touching the sensor once

✓ *Communication LED flashes blue.*

3 In the browser address bar, enter and confirm IP address 169.254.0.180. The installation wizard is opened.

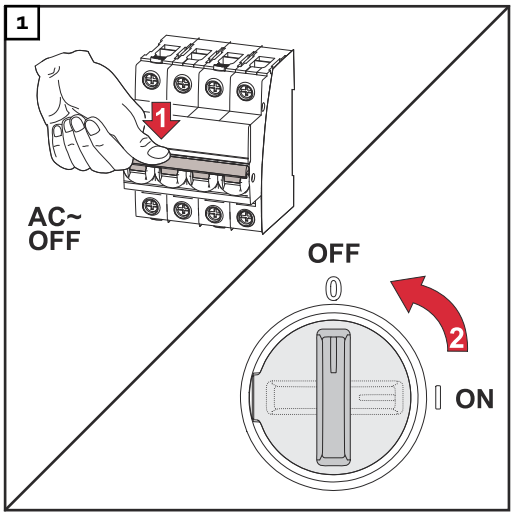
4 Follow the installation wizard in the individual sections and complete the installation.

5 Add system components in Solar.web and start up the PV system.

The network wizard and the product setup can be carried out independently of each other. A network connection is required for the Solar.web installation wizard.

Switching off current supply and restarting the inverter

De-energising the inverter and switching it on again



1. Turn off the automatic circuit breaker.
2. Turn the DC disconnector to the "Off" switch position.

To start up the inverter again, follow the steps listed above in reverse order.

Settings - user interface of the inverter

User settings

User login

1. Open the user interface of the inverter in your browser.
2. In the **"Login"** menu, log in using your user name and password, or go to the **"User"** menu and click on the **"User login"** button and then log in with your user name and password.

IMPORTANT!
Depending on the user's authorization, settings can be executed in the individual menus.

Selecting the language

1. In the **“User”** menu, click on the **“Language”** button and select the desired language.

Device configuration

Components

Select **"Add component+"** to add all available components to the system.

PV generator
Activate the MPP tracker and enter the connected PV power in the associated field.

Primary meter
To ensure smooth operation in conjunction with other energy producers, it is important to install the Fronius Smart Meter at the feed-in point. The inverter and other producers must be connected to the public grid via the Fronius Smart Meter.
This setting also affects the behaviour of the inverter at night. If the function is deactivated, the inverter switches to standby mode as soon as there is no more PV power available. The inverter restarts as soon as sufficient PV power is available.
If the function is activated, the inverter remains permanently connected to the grid so that energy can be drawn from other producers at any time.
After connecting the meter, the position must be configured. A different Modbus address needs to be set for each Smart Meter.
The Watt value on the generator meter is the sum of all generator meters. The Watt value on the consumption meter is the value of all secondary meters.

Ohmpilot
All Ohmpilots available in the system are displayed. Select the desired Ohmpilot and add it to the system via "Add".

Functions and I/Os

Load management
Up to 4 pins can be selected for load management here. Additional load management settings are available in the **"Load management"** menu item.
Default: Pin 1

Australia - Demand Response Mode (DRM)
The pins for control via DRM can be set here:

Mode	Description	Information	DRM pin	I/O pin
DRM0	Inverter disconnects itself from the grid	DRM0 occurs if there is an interruption or short circuit on the REF GEN or COM LOAD leads, or if the combinations DRM1 - DRM8 are invalid. The mains relays open.	REF GEN COM LOAD	IO4 IO5
DRM1	Import $P_{nom} \leq 0\%$ without disconnection from the grid	currently not supported	DRM 1/5	IN6
DRM2	Import $P_{nom} \leq 50\%$	currently not supported	DRM 2/6	IN7
DRM3	Import $P_{nom} \leq 75\%$ & $+Q_{rel}^{*} \geq 0\%$	currently not supported	DRM 3/7	IN8

Mode	Description	Information	DRM pin	I/O pin
DRM4	Import P_{nom} ≤ 100%	currently not supported	DRM 4/8	IN9
DRM5	Export P_{nom} ≤ 0% without disconnection from the grid	currently not supported	DRM 1/5	IN6
DRM6	Export P_{nom} ≤ 50%	currently not supported	DRM 2/6	IN7
DRM7	Export P_{nom} ≤ 75% & $-Q_{rel}^{*}$ ≥ 0%	currently not supported	DRM 3/7	IN8
DRM8	Export P_{nom} ≤ 100%	currently not supported	DRM 4/8	IN9

The percentages always refer to the nominal device output.

IMPORTANT!
If the Demand Response Mode (DRM) function is enabled and no DRM control is connected, the inverter switches to Standby mode.

Demand Response Modes (DRM)

Here you can enter a value for the apparent power input and the apparent power output for the Australia country setup.

Inverter

"Enforce Standby"
When the function is activated, the feed-in mode of the inverter is interrupted. This enables a powerless shutdown of the inverter and protects its components. When the inverter is restarted, the standby function is automatically deactivated.

"PV 1" to **"PV 4"**

Parameter	Value range	Description
"Mode"	Off	The MPP tracker is deactivated.
	Auto	The inverter uses the voltage at which the max. possible power of the MPP tracker is possible.
	Fix	The MPP tracker uses the voltage defined in the **"UDC fix"**.
"UDC fix"	150-870 V	The inverter uses the fixed preset voltage used at the MPP tracker.
"Dynamic Peak Manager"	Off	The function is deactivated.
	On	The entire solar module string is checked for optimisation potential and determines the best possible voltage for feed-in mode.

"Ripple Control"
Ripple control signals are signals sent out by the energy company to switch controllable loads on and off. Depending on the installation situation, ripple control

signals may be attenuated or amplified by the inverter. The settings below can be used to counteract this if necessary.

Parameter	Value range	Description
"Reduction of Influence"	Off	The function is deactivated.
	On	The function is activated.
"Frequency of Ripple Control Signal"	100-3,000 Hz	The frequency specified by the energy company must be entered here.
"Grid Inductance"	0.00001-0.005 H	The value measured at the feed-in point must be entered here.

"Measures against RCD/RCMU false triggers"
(when using a 30 mA residual current circuit breaker)

NOTE!

National regulations, the grid operator's specifications or other factors may require a residual current circuit breaker in the AC connection lead.
For this situation, a type A residual current circuit breaker is generally adequate. Nevertheless, false alarms can be triggered for the type A residual current circuit breaker in individual cases and depending on local conditions. For this reason, in accordance with national legislation, Fronius recommends that a residual current circuit breaker with a tripping current of at least 100 mA suitable for frequency converters be used.

Parameter	Value range	Description
"Switch-Off before 30mA RCD Trip"	0	No measures to prevent false tripping.
	1	The inverter switches off at 15 mA before the residual current circuit breaker trips.
"Leakage current factor to reduce RCMU/RCD false trips"	0-0.25 (default: 0.16)	Reducing the setting value reduces the leakage current and raises the intermediate circuit voltage, which slightly reduces the efficiency. Setting value 0.16 enables optimum efficiency.

"Iso Warning"

Parameter	Value range	Description
"Iso Warning"	Off	The isolation warning is deactivated.
	On	The isolation warning is activated. A warning is issued in the event of an isolation fault.
"Iso Alternative Mode"	Accurate	Isolation monitoring is performed with the highest accuracy and the measured insulation resistance is displayed on the user interface of the inverter.
	Fast	Isolation monitoring is performed with lower accuracy, which shortens the duration of the isolation measurement, and the isolation value is not displayed on the user interface of the inverter.

Parameter	Value range	Description
"Isolation Warning Threshold"	100- 10,000 kΩ	If this threshold is undershot, status code 1083 is displayed on the user interface of the inverter.

System

General

General settings

1 In the **"System name"** input field, enter the name of the system (max. 30 characters).

2 **"Synchronize time automatically"** enabled → select "Area time zone" and "Location time zone". The date and time are applied from the time zone entered.

2 **"Synchronize time automatically"** disabled → enter or select "Date", "Time", "Area time zone" and "Location time zone".

3 Click on the **"Save"** button.

Update

All available updates are made available on the product page and in the "Download search" area under **www.fronius.com** .

Firmware update

1 Drag the firmware file into the "Drag&Drop file here" field or select it using "Select file".

The update will start.

Setup wizard

The guided setup wizard can be accessed here.

Restoring the factory settings

All settings
All configuration data is reset with the exception of the country setup. Changes to the country setup may only be carried out by authorized personnel.

All settings with no network
All configuration data is reset with the exception of the country setup and the network settings. Changes to the country setup may only be carried out by authorized personnel.

Event Log

Current Messages
All current events of the connected system components are shown here.

IMPORTANT!
Depending on the type of event, these must be confirmed via the "tick" button in order to be processed further.

History
All events of the connected system components that no longer exist are shown here.

Information

This menu displays all system information and the current settings.

Save as PDF

1. Click on the "Save as PDF" button.
2. Individually select information with the "tick" next to the information or tick to "Select all".
3. Enter the file name in the input field and click on the "Save" button.

The PDF is created and displayed.

License Manager

The licence file contains the performance data and the scope of functions of the inverter. When replacing the inverter or data communication area, the licence file must also be replaced.

Licensing - online (recommended):
An Internet connection and completed configuration on Solar.web is required.

1. Complete the installation work (see chapter **Closing the inverter's connection area/housing cover, and commissioning** on page **47**).
2. Connect to the user interface of the inverter.
3. Enter the serial number and verification code (VCode) of the defective and replacement unit. The serial number and the VCode can be found on the rating plate of the inverter (see chapter **Warning notices on the device** on page **14**).
4. Click on the **"Start online licensing"** button.
5. Skip the Terms of use and Network settings menu items by clicking on **"Next"**.

The licence activation starts.

Licensing - offline:
There must be no Internet connection for this. When licensing offline with an established Internet connection, the licence file is automatically uploaded to the inverter. Therefore, when uploading the licence file, the following error occurs: "The licence has already been installed and the wizard can be closed".

1. Complete the installation work (see chapter **Closing the inverter's connection area/housing cover, and commissioning** on page **47**).
2. Connect to the user interface of the inverter.
3. Enter the serial number and verification code (VCode) of the defective and replacement unit. The serial number and the VCode can be found on the rating plate of the inverter (see chapter **Warning notices on the device** on page **14**).
4. Click on the **"Start offline licensing"** button.
5. Download the service file onto the end device by clicking on the **"Download service file"** button.
6. Open the website **licensemanager.solarweb.com** and log in with your user name and password.
7. Drag or upload the service file into the **"Drop service file here or click to upload"** field.
8. Download the newly generated licence file onto the end device using the **"Download license file"** button.
9. Go to the user interface of the inverter and drag the licence file into the "Drag & drop license file here" field, or select it via "Choose license file".

The licence activation starts.

Support

Enable Support User

1 Click the **"Enable Support User"** button.

The support user is enabled.

IMPORTANT!
The support user only allows Fronius Technical Support to implement settings on the inverter via a secure connection. The button **"Terminate Support User Session"** deactivates the access.

Generate support info (for Fronius Support team)

1 Click on the **"Generate support info"** button.

2 The sdp.cry file is downloaded automatically. To download manually, click on the **"Download Support-Info"** button.

The sdp.cry file is saved in the downloads.

Activate Remote Access

1 Click on the **"Activate Remote Access"** button.

Remote maintenance access for the Fronius Support team is enabled.

IMPORTANT!
Remote maintenance access gives Fronius Technical Support exclusive access to the inverter via a secure connection. Diagnostic data is transmitted here that can be used for troubleshooting purposes. Only enable remote maintenance access following a request from the Fronius Support team.

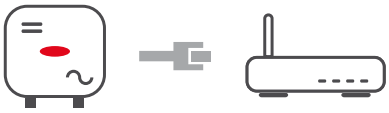
Communication

Network

Server addresses for data transfer
If a firewall is used for outgoing connections, the following protocols, server addresses and ports must be allowed for successful data transfer:
- Tcp fronius-se-iot.azure-devices.net:8883
- Tcp fronius-se-iot-telemetry.azure-devices.net:8883
- Tcp fronius-se-iot-telemetry.azure-devices.net:443
- Udp sera-gen24.fronius.com:1194 (213.33.117.120:1194)
- Tcp cure-se.fronius.com:443
- Tcp firmware-download.fronius.com:443
- Tcp froniusseiot.blob.core.windows.net:443
- Tcp provisioning.solarweb.com:443
- Upd/Tcp 0.time.fronius.com:123

When using FRITZ!Box products, the Internet access must be configured to be unlimited and unrestricted. The DHCP Lease Time (validity) must not be set to 0 (=infinite).

LAN:



Establishing a connection:

1. Enter host name.
2. Select connection type **"automatic"** or **"static"**.
3. For connection type **"static"**: enter IP address, subnet mask, DNS and gateway.
4. Click on the **"Connect"** button.

✓ *The connection is established.*

After connecting, the status of the connection should be checked (see "**Internet Services**" on page **64**).

WLAN:

Establishing a connection via WPS:

☐ The access point of the inverter must be active. It is opened by touching the sensor → communication LED flashes blue.

1. Establish the connection to the inverter in the network settings (the inverter is displayed with the name "FRONIUS_" and the serial number of the device).
2. Enter the password from the rating plate and confirm.
   IMPORTANT!
   To enter the password on a Windows 10 operating system, the link "Connect using a security key instead" must first be activated to establish a connection with the password.
3. In the browser address bar, enter and confirm the IP address 192.168.250.181.

4 In **Network Settings**, click on the "**Enable**" button under **WLAN - WPS**.

5 Activate WPS on the WLAN router (see documentation provided with the WLAN router).

6 Click the **"Start"** button. The connection is established automatically.

7 Log in to the user interface of the inverter.

8 Check network details and Fronius Solar.web connection

After connecting, the status of the connection should be checked (see "**Internet Services**" on page **64**).

Select and connect WLAN network:

The networks found are shown in the list. Clicking on the refresh button ↻ will carry out a second search of the available WLAN networks. The **"Find network"** input field can be used to further restrict the selection list.

1 Select network from the list.

2 Select connection type **"automatic"** or **"static"**.

3 For connection type **"automatic"**: enter WLAN password and host name.

4 For connection type **"static"**: enter IP address, subnet mask, DNS and gateway.

5 Click on the **"Connect"** button.

✓ *The connection is established.*

After connecting, the status of the connection should be checked (see "**Internet Services**" on page **64**).

Access point:

The inverter serves as an access point. A PC or smart device connects directly to the inverter. It is not possible to connect to the internet. The **"Network name (SSID)"** and **"Network key (PSK)"** can be assigned in this menu.
It is possible to operate a connection via WLAN and via access point simultaneously.

Modbus

Modbus RTU interface 0 / 1

If one of the two Modbus RTU interfaces is set to Slave, the following input fields are available:

Baud rate The baud rate influences the transmission speed between the individual components connected in the system. When selecting the baud rate, ensure that it is the same at both the sending and receiving end.
Parity The parity bit can be used to check the parity. It detects transmission errors. A parity bit can safeguard a specific number of bits. The value (0 or 1) of the parity bit must be calculated by the sender and is checked by the recipient using the same calculation. The parity bit can be calculated for even and odd parity.

SunSpec Model Type
Depending on the SunSpec model, there are two different settings.

float: SunSpec Inverter Model 111, 112, 113 or 211, 212, 213.
int + SF: SunSpec Inverter Model 101, 102, 103 or 201, 202, 203.

Meter address

The value entered is the identification number (Unit ID) assigned to the meter.Can be found on the user interface of the inverter in the **Communication** → **Modbus** menu.
Factory setting: 200

Meter address
The value entered is the identification number (Unit ID) assigned to the meter.
Can be found on the user interface of the inverter in the **Communication** → **Modbus** menu.
Factory setting: 1

Slave as Modbus TCP

This setting is necessary to enable inverter control via Modbus. If the function **Slave as Modbus TCP** is activated, the following input fields are available:

Modbus port
Number of the TCP port that is to be used for Modbus communication.

SunSpec Model Type
Depending on the SunSpec model, there are two different settings.

float: SunSpec Inverter Model 111, 112, 113 or 211, 212, 213.
int + SF: SunSpec Inverter Model 101, 102, 103 or 201, 202, 203.

Meter address
The value entered is the identification number (Unit ID) assigned to the meter.Can be found on the user interface of the inverter in the **Communication** → **Modbus** menu.
Factory setting: 200

Inverter address
The value entered is the identification number (Unit ID) assigned to the inverter. Can be found on the user interface of the inverter in the **Communication** → **Modbus** menu.
Factory setting: This value is invariably defined as 1.

Inverter control via Modbus

If this option is activated, the inverter is controlled via Modbus.
Inverter control includes the following functions:
- on/off
- Power reduction
- Specification of a constant power factor (cos phi)
- Specification of a constant reactive power value
- Battery control specifications with battery

Restrict Control
An IP address can be entered here, which is the only one authorised to control the inverter.

Remote control

Remote control and **Profiles**
The grid operator/energy supplier can influence the output power of the inverter by means of remote control. The prerequisite for this is for the inverter to have an active internet connection.

Parameter	Value range	Description
Remote control	Off	Remote control of the inverter is deactivated.
	On	Remote control of the inverter is activated.
Allow remote control for regulatory purposes (Technician)	Deactivated/ Activated	The function **Allow remote control for regulatory purposes** may be mandatory for proper operation of the system. *)
Allow remote control for Virtual Power Plants (Customer)	Deactivated/ Activated	If the **Allow remote control for regulatory purposes** function is enabled (technician access required), the **Allow remote control for Virtual Power Plants** function is automatically enabled and cannot be disabled. *)

***) Cloud Control**
A virtual power plant is an interconnection of several power plant operators to form a network. This network can be controlled via the cloud over the internet. The inverter must have an active internet connection for this. System data is transmitted.

Fronius Solar API

The Fronius Solar API is an IP-based, open JSON interface. When enabled, IOT devices on the local network can access inverter information without authentication. For security reasons, the interface is deactivated at the factory and must be activated if it is required for a third-party application (e.g. EV charger, smart home solutions, etc.) or the Fronius Wattpilot.

For monitoring, Fronius recommends using Fronius Solar.web, which provides secure access to inverter status and production information.

When performing a firmware update to version 1.14.x, the setting of the Fronius Solar API is adopted. The Solar API is activated for systems with a version below 1.14.x. Above this version it is deactivated but can be switched on and off in the menu.

Activate the Fronius Solar API
Enable the **"Activate communication via Solar API"** function on the user interface of the inverter in the **"Communication"** → **"Solar API"**menu.

Internet Services

This menu displays information about the connections and the current connection status. In case of problems with the connection, a short error description is shown.

Safety and grid requirements

Country setup

⚠ WARNING!

Danger due to unauthorised error analyses and repair work.
This can result in serious injury and damage to property.
- ▶ Fault analyses and repair work on the photovoltaic system may only be carried out by installers/service technicians from authorised specialist companies in accordance with national standards and guidelines.

NOTE!

Risk due to unauthorised access.
Incorrectly set parameters can negatively influence the public grid and/or the inverter feeding energy into the grid, and lead to a loss of conformity with the standard.
- ▶ The parameters may only be adjusted by installers/service technicians from authorised specialist companies.
- ▶ Do not give the access code to third parties and/or unauthorised persons.

NOTE!

Risk due to incorrectly set parameters.
Incorrectly set parameters can negatively influence the public grid and/or cause faults and failures on the inverter, and lead to the loss of conformity with the standard.
- ▶ The parameters may only be adjusted by installers/service technicians from authorised specialist companies.
- ▶ The parameters may only be adjusted if the energy provider permits or requires this.
- ▶ Only adjust the parameters taking into account the nationally applicable standards and/or directives and the specifications of the energy provider.

The "Country Setup" menu area is intended exclusively for installers/service technicians from authorised specialist companies. To request the access code required for this menu area, see chapter **Requesting inverter codes in Solar.SOS**.

The selected country setup for the respective country contains preset parameters according to the nationally applicable standards and requirements. Depending on local grid conditions and the specifications of the energy provider, adjustments to the selected country setup may be necessary.

Requesting inverter codes in Solar.SOS

The "Country Setup" menu area is intended exclusively for installers/service technicians from authorised specialist companies. The inverter access code required for this menu area can be requested in the Fronius Solar.SOS portal.

Requesting inverter codes in Solar.SOS:

1. Go to **solar-sos.fronius.com** in a browser
2. Log in with your Fronius account
3. On the top right, click on the drop-down menu

4 Select the menu item **Show inverter codes**

✓ *A contract page appears on which the request for the access code to change the grid parameters for Fronius inverters is located*

5 Accept the Terms of use by checking **Yes, I have read and agree to the terms of use** and click **Confirm & Save**

6 After that, the codes can be retrieved in the drop-down menu at the top right under **Show inverter codes**

⚠ CAUTION!

Risk due to unauthorised access.
Incorrectly set parameters can negatively influence the public grid and/or the inverter feeding energy into the grid, and lead to a loss of conformity with the standard.

- ▶ The parameters may only be adjusted by installers/service technicians from authorised specialist companies.
- ▶ Do not give the access code to third parties and/or unauthorised persons.

Feed-in limitation

Energy companies or grid operators may stipulate feed-in limitations for an inverter (e.g. max. 70% of kWp or max. 5 kW).
The feed-in limitation takes account of self-consumption by the household before the power of an inverter is reduced:

- A custom limit can be set.
- A Fronius Smart Meter can be connected to the Modbus push-in terminal of the data communication area at the M0/M1- / M0/M1+ connections for Modbus data.

With the inverter, any PV power that is not allowed to be fed into the public grid is used by the Fronius Ohmpilot so that it does not go to waste. The feed-in limitation is only active if the power of feeding in is higher than the set power reduction.

"Power limitation" deactivated
The inverter converts the entire available PV power and feeds it into the public grid.

"Power limitation" activated
Feed-in is limited with the following selection options:

- **"Limit Entire System"**
  The entire photovoltaic system is limited in accordance with a set feed-in limit. The value of the total permissible power of feeding in must be set.
- **"Limit per phase - weakest phase"**
  Each individual phase is measured. If the permissible feed-in limit is exceeded on one phase, the total power of the inverter is reduced until the value on the affected phase is permissible again (see example 1). This setting is only necessary if required by national standards and regulations. The value of the permissible power of feeding in per phase must be set.
- **"Limit per phase - asymmetric generation"**
  The optimum is determined per phase. The inverter regulates the individual phases in such a way that the sum of the phases does not exceed the set value (see example 2). This setting is only necessary if required by national standards and regulations. The value of the permissible power of feeding in per phase must be set.

Example 1: "Limit per phase - weakest phase" (setting value: 1,000 W) - symmetrical				
	Phase 1	Phase 2	Phase 3	Total
Max. possible production [W]	10,000	10,000	10,000	30,000
Set value "Limit per phase" [W]	1,000			3,000
Load demand in the household network [W]	2,000	3,000	5,000	10,000
Output power of inverter [W]	3,000	3,000	3,000	9,000
Load coverage in the household network via PV system [W]	2,000	3,000	3,000	8,000
Purchase + / feed-in - from/to the public grid [W]	-1,000	0	2,000	1,000

Explanation of the example: The weakest phase in the load demand in the household network is determined. In this case, the phase is 1 with 2,000 W. The limit for the phase of 1,000 W is added to these 2,000 W. This results in 3,000 W. This result is applied to all 3 phases. Phase 1 (2,000 W) and phase 3 (3,000 W) can be covered. Phase 3 (5,000 W) cannot be covered and a 2,000 W purchase from the public grid is required for this phase.

Example 2: "Limit per phase - asymmetric generation" (setting value: 1,000 W) - asymmetrical				
	Phase 1	Phase 2	Phase 3	Total
Max. possible production [W]	10,000	10,000	10,000	30,000
Set value "Limit per phase" [W]	1,000			3,000
Load demand in the household network [W]	2,000	3,000	5,000	10,000
Output power of inverter [W]	3,000	4,000	6,000	13,000
Load coverage in the household network via PV system [W]	2,000	3,000	5,000	10,000
Purchase + / feed-in - from/to the public grid [W]	-1,000	-1,000	-1,000	-3,000

Explanation of the example: The optimum is determined per phase (phase 1: 3,000 W, phase 2: 4,000 W, phase 3: 6,000 W). The difference per phase must not exceed 3,000 W. Phase 1 (2,000 W), phase 2 (3,000 W) and phase 3 (5,000 W) can be covered.

"Total DC system power"
Input field for the total DC system power in Wp.
This value is used if the **"Maximum grid feed-in power"** is specified in %.

"Export Limit Protection (Hard Limit Trip)"
If this value is exceeded, the inverter switches off within max. 5 seconds. This value must be higher than the value set for **"Dynamic power reduction (Soft Limit)"**.

"Dynamic power reduction (Soft Limit)"
If this value is exceeded, the inverter will regulate down to the set value within the time required by national standards and regulations.

"Maximum grid feed-in power"
Input field for the "Maximum grid feed-in power" in W or % (setting range: -10 to 100%).
If there is no meter in the system or if a meter has failed, the inverter limits the power of feeding in to the set value.

Example: Feed-in limitation (without consideration of the efficiency)	
PV system to Fronius inverter	30,000 W
Loads in the house	1,000 W
Maximum grid feed-in power	60% = 18,000 W
Power at grid feed-in point	3,000 W
Power at inverter output	4,000 W
In this example, no more than 3,000 W may be fed into the public grid at the grid feed-in point. However, any loads that are located between the inverter and the grid feed-in point can be supplied by additional power from the inverter.	

Activate the function **"Reduce inverter power to 0% if meter connection has been lost."** for control in the event of a Fail-Safe.

I/O power management

General
In this menu item, settings relevant for a distribution network operator (DNO) are made. An effective power limitation in % and/or a power factor limitation can be set.

IMPORTANT!
Select the **"Technician"** user for settings in this menu item, enter and the password for the **"Technician"** user and confirm. Settings in this menu area must only be made by trained and qualified personnel.

"**Input pattern**" (assignment of individual I/Os)
1 click = white (contact open)
2 clicks = blue (contact closed)
3 clicks = grey (not used)

"**Power factor (cos φ)**"
"**ind**" = inductive
"**cap**" = capacitive

"**DNO feedback**"
When the rule is enabled, output **"DNO feedback"** (pin 1 recommended) must be configured (e.g. for operating a signalling device).

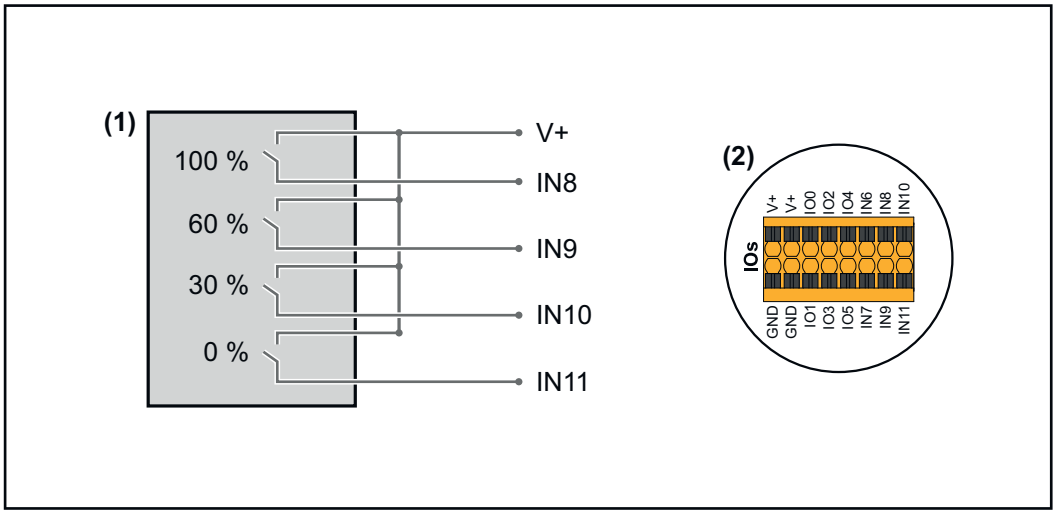
For "**Import**" or "**Export**", the data format *.fpc is supported.

Control priorities
For setting the control priorities for the ripple control signal receiver, the export limitation and control via Modbus.

1 = highest priority, 3 = lowest priority

Connection diagram - 4 relay

The ripple control signal receiver and the I/Os terminal of the inverter can be connected to one another in accordance with the connection diagram.
If the distance between the inverter and the ripple control signal receiver exceeds 10 m, at least a CAT 5 cable is recommended and the shield must be connected at one end to the push-in terminal of the data communication area (SHIELD).



(1) Ripple control signal receiver with 4 relays, for effective power limiting.
(2) I/Os of the data communication area.

Use the preconfigured file for 4-relay mode:

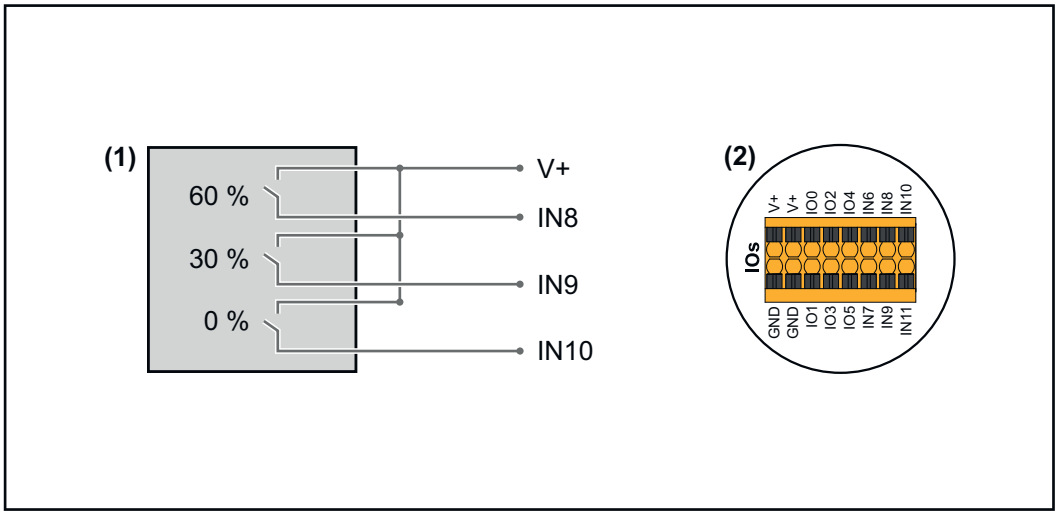
1. Download the file (.fpc) **under 4-relay mode** onto the end device.
2. Upload the file (.fpc) in the **"I/O Power Management"** menu using the **"Import"** button.
3. Click on the **"Save"** button.

The settings for 4-relay mode are stored.

I/O power management settings - 4 relays

Connection diagram - 3 relay

The ripple control signal receiver and the I/Os terminal of the inverter can be connected to one another in accordance with the connection diagram.
If the distance between the inverter and the ripple control signal receiver exceeds 10 m, at least a CAT 5 cable is recommended and the shield must be connected at one end to the push-in terminal of the data communication area (SHIELD).



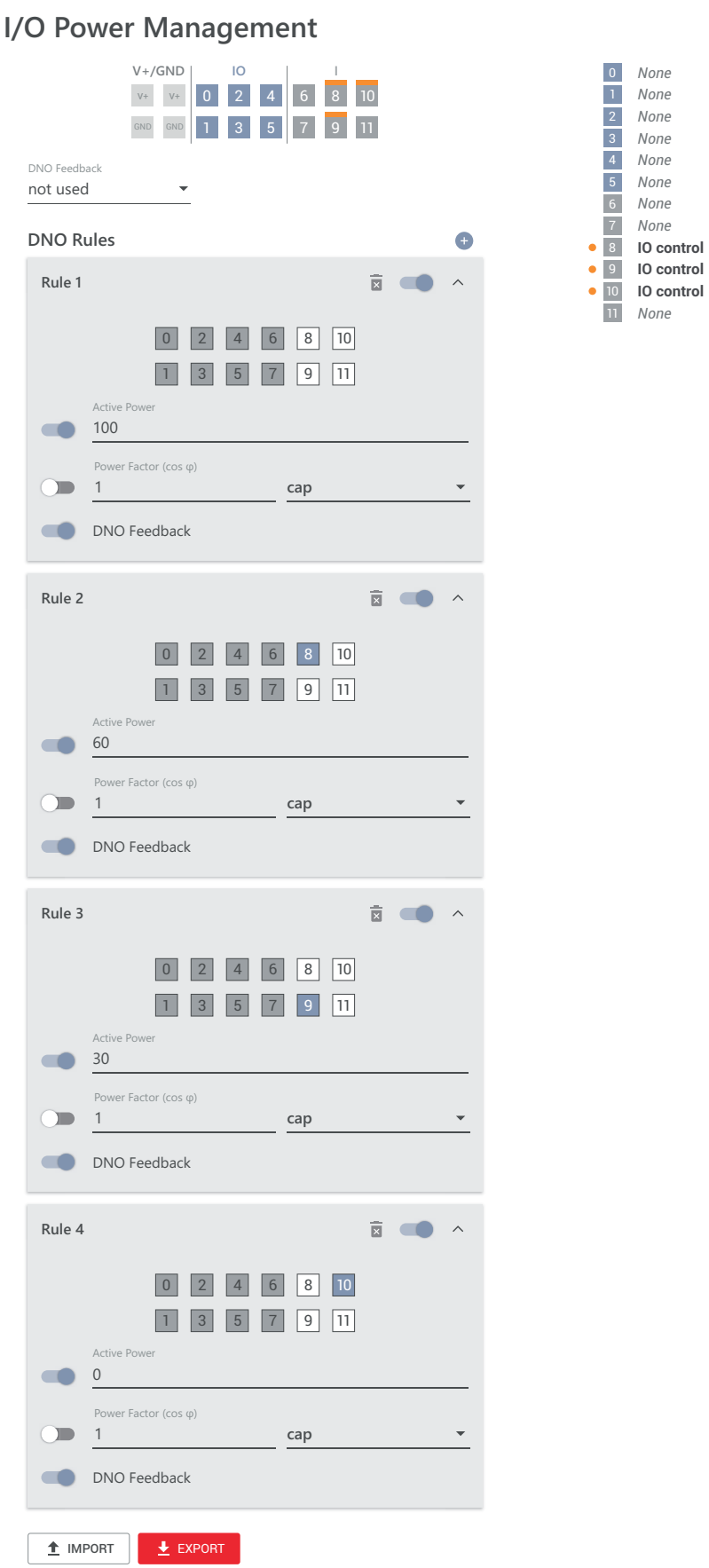
(1) Ripple control signal receiver with 3 relays, for effective power limiting.
(2) I/Os of the data communication area.

Use the preconfigured file for 3-relay mode:

1. Download the file (.fpc) **under 3-relay mode** onto the end device.
2. Upload the file (.fpc) in the **"I/O Power Management"** menu using the **"Import"** button.
3. Click on the **"Save"** button.

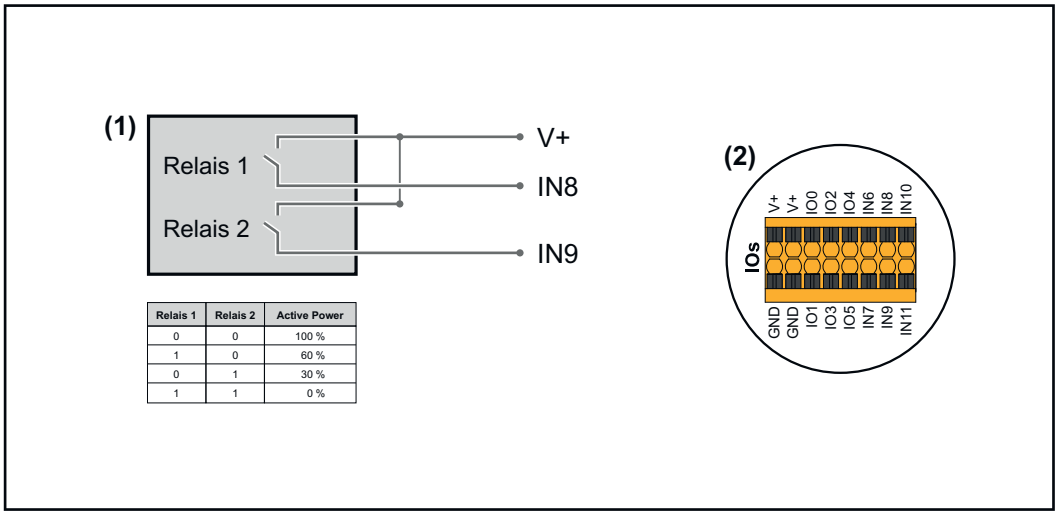
The settings for 3-relay mode are stored.

I/O power management settings - 3 relays



Connection diagram - 2 relay

The ripple control signal receiver and the I/Os terminal of the inverter can be connected to one another in accordance with the connection diagram.
If the distance between the inverter and the ripple control signal receiver exceeds 10 m, at least a CAT 5 cable is recommended and the shield must be connected at one end to the push-in terminal of the data communication area (SHIELD).



Relais 1	Relais 2	Active Power
0	0	100 %
1	0	60 %
0	1	30 %
1	1	0 %

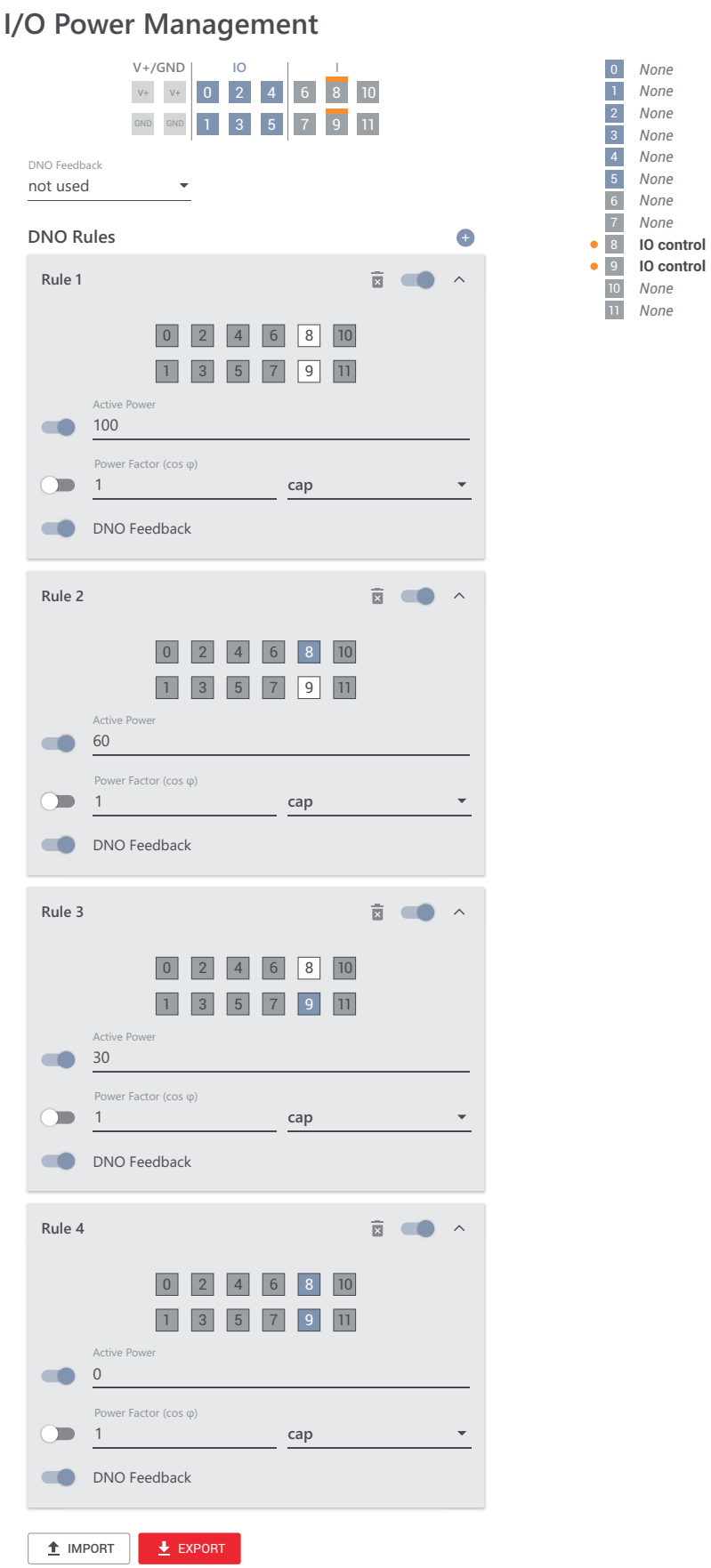
(1) Ripple control signal receiver with 2 relays, for effective power limiting.
(2) I/Os of the data communication area.

Use the preconfigured file for 2-relay mode:

1. Download the file (.fpc) **under 2-relay mode** onto the end device.
2. Upload the file (.fpc) in the **"I/O Power Management"** menu using the **"Import"** button.
3. Click on the **"Save"** button.

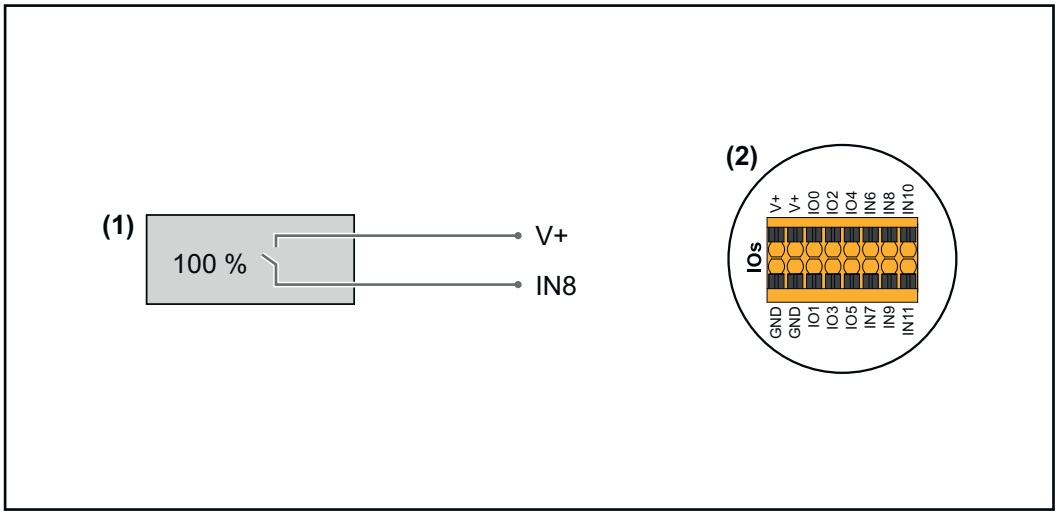
The settings for 2-relay mode are stored.

I/O power management settings - 2 relays



Connection diagram - 1 relay

The ripple control signal receiver and the I/Os terminal of the inverter can be connected to one another in accordance with the connection diagram.
If the distance between the inverter and the ripple control signal receiver exceeds 10 m, at least a CAT 5 cable is recommended and the shield must be connected at one end to the push-in terminal of the data communication area (SHIELD).



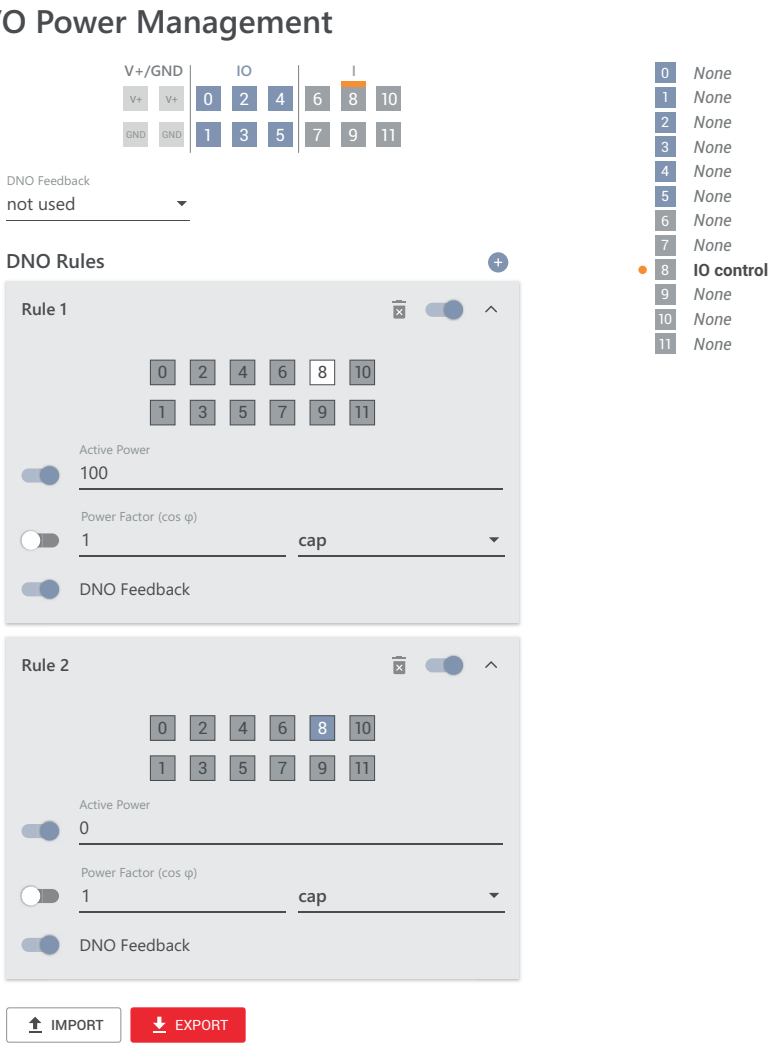
(1) Ripple control signal receiver with 1 relay, for effective power limiting.
(2) I/Os of the data communication area.

Use the preconfigured file for 1-relay mode:

1. Download the file (.fpc) **under 1-relay mode** onto the end device.
2. Upload the file (.fpc) in the **"I/O Power Management"** menu using the **"Import"** button.
3. Click on the **"Save"** button.

The settings for 1-relay mode are stored.

I/O power management settings - 1 relay



Autotest (CEI 0-21)

Description

The **"Autotest"** can be used to check the protection function required by Italian standards for monitoring the voltage and frequency limit values of the inverter during commissioning. In normal operation, the inverter constantly checks the current voltage and frequency actual value of the grid.
After starting the autotest, various individual tests run automatically one after the other. Depending on network conditions, the duration of the test is about 15 minutes.

IMPORTANT!

The inverter may only be commissioned in Italy after an autotest has been successfully performed (CEI 0-21). If the autotest is not passed, feeding energy into the grid is not permitted. Once the autotest is started, it must be completed successfully. The autotest cannot be started during backup power operation.

U max	Test for checking the maximum voltage in phase conductors
U min	Test for checking the minimum voltage in phase conductors
f max	Test for checking the maximum grid frequency
f min	Test for checking the minimum grid frequency
f max alt	Test for checking an alternative maximum grid frequency

f min alt	Test for checking an alternative minimum grid frequency
U outer min	Test for checking the minimum external voltages
U longT.	Test for checking the 10-minute mean voltage value

"Save as PDF"

1 Click on the **"Save as PDF"** button.

2 Enter the file name in the input field and click on the **"Print"** button.

The PDF is created and displayed.

Note on the autotest
The limit values are set in the **"Grid Code"** menu.
The access code for the **"Grid Code"** menu corresponds to the installer code (PROFI menu) and is only made available after a written request to Fronius. A corresponding application form is available from the national technical support.

Appendix

Care, maintenance and disposal

General

The inverter is designed in such a way that no additional maintenance work builds up. Nevertheless, a few points must be considered during operation to ensure that the inverter works perfectly.

Maintenance

Maintenance and servicing may only be carried out by Fronius-trained service technicians.

Cleaning

Clean the inverter as required with a damp cloth.
Do not use cleaning agents, abrasives solvents or similar to clean the inverter.

Safety

⚠ WARNING!

Danger from grid voltage and DC voltage from PV modules.
This can result in serious injury and damage to property.
- ▶ The connection area must only be opened by an authorised electrician.
- ▶ The separate power stage set area must only be opened by Fronius-trained service technicians.
- ▶ Prior to any connection work, disconnect the inverter on the AC side and the DC side.

⚠ WARNING!

Danger of residual voltage from capacitors.
This can result in serious injury and damage to property.
- ▶ Allow the capacitors of the inverter to discharge (2 minute).

Disposal

Waste electrical and electronic equipment must be collected separately and recycled in an environmentally responsible manner in accordance with the EU Directive and national law. Used equipment must be returned to the distributor or through a local, authorised collection and disposal system. Proper disposal of the old device promotes sustainable recycling of material resources. Ignoring this may lead to potential health/environmental impacts.

Packaging materials
Collected separately. Check your municipality's regulations. Reduce the volume of the box.

Guarantee provisions

Fronius manufacturer's warranty

Detailed, country-specific warranty terms are available on the internet: www.fronius.com/solar/warranty

To obtain the full warranty period for your newly installed Fronius inverter or storage system, please register at: www.solarweb.com.

Status codes and remedy

Display

Status codes are displayed on the user interface of the inverter in the **"System"** → **"Event Log"** menu or in the user menu under **"Notifications"** or in Fronius Solar.web*.

* with corresponding configuration, see chapter **Fronius Solar.web** on page **12**.

Status Codes

1030 - WSD Open (operation LED: lights up red)

Cause: A device connected in the WSD chain has interrupted the signal line (e.g. a surge protective device) or the bypass ex works has been removed and no trigger device has been installed.

Remedy: If the SPD surge protective device is triggered, the inverter must be repaired by an authorised specialist.

OR: Install the bypass ex works or a trigger device.

OR: Set the WSD (wired shutdown) switch to position 1 (WSD primary device).

⚠ WARNING!

Danger due to work that has been carried out incorrectly.
This can result in serious injury and damage to property.

- ▶ Installing and connecting a surge protective device (SPD) must only be carried out by service personnel trained by Fronius and only within the scope of the respective technical regulations.
- ▶ Follow the safety rules.

Technical data

Verto 15.0
208-240

Input data	
Maximum input voltage (at 1,000 W/m²/ -10 °C in an open circuit)	1,000 V_{DC}
Start-up input voltage	150 V_{DC}
MPP voltage range	180 - 870 V_{DC}
Number MPP-controller	4
Maximum input current ($I_{DC\ max}$) PV1 / PV2 / PV3 / PV4 per string	 28 / 28 / 28 / 28 A 28 A
Max. short circuit current [8] Total PV1 / PV2 / PV3 / PV4 per string	120 A 40 / 40 / 40 / 40 A 40 A
$I_{SC\ PV}$[8] Total PV1 / PV2 / PV3 / PV4	150 A 50 A / 50 A / 50 A / 50 A
Maximum PV field power ($P_{PV\ max}$) Total PV1 / PV2 / PV3 / PV4	22,5 kWp 20 / 20 / 20 / 20 kWp
DC overvoltage category	2
Max. inverter backfeed current to the array [3]	50 A[4]
Max. capacity of the PV generator against earth	3,000 nF
Insulation resistance test limit value between module array and earth (on delivery) [7]	34 kΩ
Adjustable range of insulation resistance test between module array and earth [6]	34 - 10,000 kΩ
Limit value and tripping time of the sudden residual current monitoring (on delivery)	30 / 300 mA / ms 60 / 150 mA / ms 90 / 40 mA / ms
Limit value and tripping time of the continuous residual current monitoring (on delivery)	300 / 300 mA / ms
Adjustable range of continuous residual current monitoring [6]	30 - 1,000 mA
Cyclic repetition of the insulation resistance test (on delivery)	24 h
Adjustable range for the cyclic repetition of the insulation resistance test	-

Output data	
Grid voltage range	176 - 528 V_{AC}
Rated grid voltage	120 | 127 | 139 V_{AC}[1]
Rated power	15 kW
Rated apparent power	15 kVA

Output data	
Rated frequency	50 / 60 Hz [1]
Maximum output current / phase	53.7 A
Initial short circuit alternating current / phase I_K	53.7 A
Power factor (cos phi)	0 - 1 ind./cap.[2]
Grid connection	3~ (N)PE 208 / 120 V_{AC} 3~ (N)PE 220 / 127 V_{AC} 3~ (N)PE 240 / 139 V_{AC}
Maximum output power	15 kW
Rated power	15 kW
Nominal output current / phase	41.7 / 39.4 / 36 A
Total harmonic distortion	< 3%
AC overvoltage category	3
Current (inrush) [5]	A peak / A rms over ms [4]
Maximum output fault current / duration	42.2 A / 29.4ms

General data	
Night-time power loss = standby consumption	16 W
European efficiency (180 / 525 / 870 V_{DC})	96.04 / 96.87 / 96.68%
Maximum efficiency	97.50%
Safety class	1
EMC emission class	B
Pollution degree	3
Permitted ambient temperature	-40 °C - +60 °C
Permitted storage temperature	-40 °C - +70 °C
Relative humidity	0-100%
Sound pressure level	54.6 dB(A) (ref. 20 µPa)
Protection class	IP66
Dimensions (height x width x depth)	838.4 x 573.8 x 277.5 mm
Weight	43 kg
Inverter topology	Non-insulated trans-formerless

Protection devices	
DC disconnector	Integrated
Cooling principle	Controlled forced-air ventilation
RCMU [9]	Integrated
DC isolation measurement [9]	Integrated [2]
Overload performance	Operating point shift power limitation

Protection devices	
Active anti-islanding method	Frequency conversion method
AFCI	Integrated
AFPE (AFCI) classification (according to IEC63027) [9]	F-I-AFPE-1-4/4-2 Full coverage Integrated AFPE 1 monitored string per input port 4/4 input ports per channel (AFPE1 for MPP1 & MPP2: 4, AFPE2 for MPP3 & MPP4: 4) 2 monitored channels

Verto 18.0 208-240

Input data	
Maximum input voltage (at 1,000 W/m²/ -10 °C in an open circuit)	1,000 V_{DC}
Start-up input voltage	150 V_{DC}
MPP voltage range	220 - 870 V_{DC}
Number MPP-controller	4
Maximum input current ($I_{DC\ max}$) PV1 / PV2 / PV3 / PV4 per string	 28 / 28 / 28 / 28 A 28 A
Max. short circuit current [8] Total PV1 / PV2 / PV3 / PV4 per string	120 A 40 / 40 / 40 / 40 A 40 A
$I_{SC\ PV}$ [8] Total PV1 / PV2 / PV3 / PV4	150 A 50 A / 50 A / 50 A / 50 A
Maximum PV field power ($P_{PV\ max}$) Total PV1 / PV2 / PV3 / PV4	27 kWp 20 / 20 / 20 / 20 kWp
DC overvoltage category	2
Max. inverter backfeed current to the array [3]	50 A [4]
Max. capacity of the PV generator against earth	3,600 nF
Insulation resistance test limit value between module array and earth (on delivery) [7]	34 kΩ
Adjustable range of insulation resistance test between module array and earth [6]	34 - 10,000 kΩ
Limit value and tripping time of the sudden residual current monitoring (on delivery)	30 / 300 mA / ms 60 / 150 mA / ms 90 / 40 mA / ms
Limit value and tripping time of the continuous residual current monitoring (on delivery)	300 / 300 mA / ms

Input data	
Adjustable range of continuous residual current monitoring [6]	30 - 1,000 mA
Cyclic repetition of the insulation resistance test (on delivery)	24 h
Adjustable range for the cyclic repetition of the insulation resistance test	-

Output data	
Grid voltage range	176 - 528 V_{AC}
Rated grid voltage	120 | 127 | 139 V_{AC} [1]
Rated power	18 kW
Rated apparent power	18 kVA
Rated frequency	50 / 60 Hz [1]
Maximum output current / phase	53.7 A
Initial short circuit alternating current / phase I_K	53.7 A
Power factor (cos phi)	0 - 1 ind./cap.[2]
Grid connection	3~ (N)PE 208 / 120 V_{AC} 3~ (N)PE 220 / 127 V_{AC} 3~ (N)PE 240 / 139 V_{AC}
Maximum output power	18 kW
Rated power	18 kW
Nominal output current / phase	50 / 47.2 / 43.2 A
Total harmonic distortion	< 3%
AC overvoltage category	3
Current (inrush) [5]	A peak / A rms over ms [4]
Maximum output fault current / duration	42.2 A / 29.4 ms

General data	
Night-time power loss = standby consumption	16 W
European efficiency (220 / 545 / 870 V_{DC})	95.68 / 96.14 / 95.57%
Maximum efficiency	96.49%
Safety class	1
EMC emission class	B
Pollution degree	3
Permitted ambient temperature	-40 °C - +60 °C
Permitted storage temperature	-40 °C - +70 °C
Relative humidity	0-100%
Sound pressure level	54.6 dB(A) (ref. 20 µPa)
Protection class	IP66

General data	
Dimensions (height x width x depth)	838.4 x 573.8 x 277.5 mm
Weight	43 kg
Inverter topology	Non-insulated trans-formerless

Protection devices	
DC disconnector	Integrated
Cooling principle	Controlled forced-air ventilation
RCMU [9]	Integrated
DC isolation measurement [9]	Integrated [2]
Overload performance	Operating point shift power limitation
Active anti-islanding method	Frequency conversion method
AFCI	Integrated
AFPE (AFCI) classification (according to IEC63027) [9]	F-I-AFPE-1-4/4-2 Full coverage Integrated AFPE 1 monitored string per input port 4/4 input ports per channel (AFPE1 for MPP1 & MPP2: 4, AFPE2 for MPP3 & MPP4: 4) 2 monitored channels

Verto 25.0

Input data	
Maximum input voltage (at 1,000 W/m²/ -10 °C in an open circuit)	1,000 V_{DC}
Start-up input voltage	150 V_{DC}
MPP voltage range	300 - 870 V_{DC}
Number MPP-controller	4
Maximum input current ($I_{DC\ max}$) PV1 / PV2 / PV3 / PV4 per string	 28 / 28 / 28 / 28 A 28 A
Max. short circuit current [8] Total PV1 / PV2 / PV3 / PV4 per string	120 A 40 / 40 / 40 / 40 A 40 A
$I_{SC\ PV}$ [8] Total PV1 / PV2 / PV3 / PV4	150 A 50 A / 50 A / 50 A / 50 A
Maximum PV field power ($P_{PV\ max}$) Total PV1 / PV2 / PV3 / PV4	37.5 kWp 20 / 20 / 20 / 20 kWp

Input data	
DC overvoltage category	2
Max. inverter backfeed current to the array [3]	50 A [4]
Max. capacity of the PV generator against earth	5,000 nF
Insulation resistance test limit value between module array and earth (on delivery) [7]	34 kΩ
Adjustable range of insulation resistance test between module array and earth [6]	34 - 10,000 kΩ
Limit value and tripping time of the sudden residual current monitoring (on delivery)	30 / 300 mA / ms 60 / 150 mA / ms 90 / 40 mA / ms
Limit value and tripping time of the continuous residual current monitoring (on delivery)	300 / 300 mA / ms
Adjustable range of continuous residual current monitoring [6]	30 - 1,000 mA
Cyclic repetition of the insulation resistance test (on delivery)	24 h
Adjustable range for the cyclic repetition of the insulation resistance test	-

Output data	
Grid voltage range	176 - 528 V_{AC}
Rated grid voltage	220 | 230 | 254 | 277 V_{AC} [1]
Rated power	25 kW
Rated apparent power	25 kVA
Rated frequency	50 / 60 Hz [1]
Maximum output current / phase	53.7 A
Initial short circuit alternating current / phase I_K	53.7 A
Power factor (cos phi)	0 - 1 ind./cap. [2]
Grid connection	3~ (N)PE 380 / 220 V_{AC} 3~ (N)PE 400 / 230 V_{AC} 3~ (N)PE 440 / 254 V_{AC} 3~ (N)PE 480 / 277 V_{AC}
Maximum output power	25 kW
Rated power	25 kW
Nominal output current / phase	37.9 / 36.2 / 32.8 / 30.1 A
Total harmonic distortion	< 3%
AC overvoltage category	3
Current (inrush) [5]	A peak / A rms over ms [4]
Maximum output fault current / duration	42.2 A/ 29.4 ms

General data	
Night-time power loss = standby consumption	16 W
European efficiency (300 / 585 / 870 V_{DC})	97.04 / 97.35 / 97.36%
Maximum efficiency	97.74%
Safety class	1
EMC emission class	B
Pollution degree	3
Permitted ambient temperature	-40 °C - +60 °C
Permitted storage temperature	-40 °C - +70 °C
Relative humidity	0-100%
Sound pressure level	54.6 dB(A) (ref. 20 µPa)
Protection class	IP66
Dimensions (height x width x depth)	838.4 x 573.8 x 277.5 mm
Weight	43 kg
Inverter topology	Non-insulated transformerless

Protection devices	
DC disconnector	Integrated
Cooling principle	Controlled forced-air ventilation
RCMU [9)]	Integrated
DC isolation measurement [9)]	Integrated [2)]
Overload performance	Operating point shift power limitation
Active anti-islanding method	Frequency conversion method
AFCI	Integrated
AFPE (AFCI) classification (according to IEC63027) [9)]	F-I-AFPE-1-4/4-2 Full coverage Integrated AFPE 1 monitored string per input port 4/4 input ports per channel (AFPE1 for MPP1 & MPP2: 4, AFPE2 for MPP3 & MPP4: 4) 2 monitored channels

Verto 27.0

Input data	
Maximum input voltage (at 1,000 W/m²/ -10 °C in an open circuit)	1,000 V_{DC}

Input data	
Start-up input voltage	150 V_{DC}
MPP voltage range	330 - 870 V_{DC}
Number MPP-controller	4
Maximum input current ($I_{DC\ max}$) PV1 / PV2 / PV3 / PV4 per string	 28 / 28 / 28 / 28 A 28 A
Max. short circuit current [8] Total PV1 / PV2 / PV3 / PV4 per string	120 A 40 / 40 / 40 / 40 A 40 A
$I_{SC\ PV}$[8] Total PV1 / PV2 / PV3 / PV4	150 A 50 A / 50 A / 50 A / 50 A
Maximum PV field power ($P_{PV\ max}$) Total PV1 / PV2 / PV3 / PV4	40.5 kWp 20 / 20 / 20 / 20 kWp
DC overvoltage category	2
Max. inverter backfeed current to the array [3]	50 A[4]
Max. capacity of the PV generator against earth	5,400 nF
Insulation resistance test limit value between module array and earth (on delivery) [7]	34 kΩ
Adjustable range of insulation resistance test between module array and earth [6]	34 - 10,000 kΩ
Limit value and tripping time of the sudden residual current monitoring (on delivery)	30 / 300 mA / ms 60 / 150 mA / ms 90 / 40 mA / ms
Limit value and tripping time of the continuous residual current monitoring (on delivery)	300 / 300 mA / ms
Adjustable range of continuous residual current monitoring [6]	30 - 1,000 mA
Cyclic repetition of the insulation resistance test (on delivery)	24 h
Adjustable range for the cyclic repetition of the insulation resistance test	-

Output data	
Grid voltage range	176 - 528 V_{AC}
Rated grid voltage	220 | 230 | 254 | 277 V_{AC}[1]
Rated power	27 kW
Rated apparent power	27 kVA
Rated frequency	50 / 60 Hz [1]
Maximum output current / phase	53.7 A
Initial short circuit alternating current / phase I_K	53.7 A
Power factor (cos phi)	0 - 1 ind./cap.[2]

Output data	
Grid connection	3~ (N)PE 380 / 220 V_{AC} 3~ (N)PE 400 / 230 V_{AC} 3~ (N)PE 440 / 254 V_{AC} 3~ (N)PE 480 / 270 V_{AC}
Maximum output power	27 kW
Rated power	27 kW
Nominal output current / phase	40.9 / 39.1 / 35.4 / 32.5 A
Total harmonic distortion	< 3%
AC overvoltage category	3
Current (inrush) [5)]	A peak / A rms over ms [4)]
Maximum output fault current / duration	42.2 A/29.4 ms

General data	
Night-time power loss = standby consumption	16 W
European efficiency (330 / 600 / 870 V_{DC})	97.09 / 97.79 / 97.40%
Maximum efficiency	98.03%
Safety class	1
EMC emission class	B
Pollution degree	3
Permitted ambient temperature	-40 °C - +60 °C
Permitted storage temperature	-40 °C - +70 °C
Relative humidity	0-100%
Sound pressure level	54.6 dB(A) (ref. 20 µPa)
Protection class	IP66
Dimensions (height x width x depth)	838.4 x 573.8 x 277.5 mm
Weight	43 kg
Inverter topology	Non-insulated trans-formerless

Protection devices	
DC disconnector	Integrated
Cooling principle	Controlled forced-air ventilation
RCMU [9)]	Integrated
DC isolation measurement [9)]	Integrated [2)]
Overload performance	Operating point shift power limitation
Active anti-islanding method	Frequency conversion method
AFCI	Integrated

Protection devices	
AFPE (AFCI) classification (according to IEC63027) [9]	F-I-AFPE-1-4/4-2 Full coverage Integrated AFPE 1 monitored string per input port 4/4 input ports per channel (AFPE1 for MPP1 & MPP2: 4, AFPE2 for MPP3 & MPP4: 4) 2 monitored channels

Verto 30.0

Input data	
Maximum input voltage (at 1,000 W/m²/ -10 °C in an open circuit)	1,000 V_{DC}
Start-up input voltage	150 V_{DC}
MPP voltage range	360 - 870 V_{DC}
Number MPP-controller	4
Maximum input current ($I_{DC\ max}$) PV1 / PV2 / PV3 / PV4 per string	28 / 28 / 28 / 28 A 28 A
Max. short circuit current [8] Total PV1 / PV2 / PV3 / PV4 per string	120 A 40 / 40 / 40 / 40 A 40 A
$I_{SC\ PV}$[8] Total PV1 / PV2 / PV3 / PV4	150 A 50 A / 50 A / 50 A / 50 A
Maximum PV field power ($P_{PV\ max}$) Total PV1 / PV2 / PV3 / PV4	45 kWp 20 / 20 / 20 / 20 kWp
DC overvoltage category	2
Max. inverter backfeed current to the array [3]	50 A[4]
Max. capacity of the PV generator against earth	6,000 nF
Insulation resistance test limit value between module array and earth (on delivery) [7]	34 kΩ
Adjustable range of insulation resistance test between module array and earth [6]	34 - 10,000 kΩ
Limit value and tripping time of the sudden residual current monitoring (on delivery)	30 / 300 mA / ms 60 / 150 mA / ms 90 / 40 mA / ms
Limit value and tripping time of the continuous residual current monitoring (on delivery)	300 / 300 mA / ms
Adjustable range of continuous residual current monitoring [6]	30 - 1,000 mA
Cyclic repetition of the insulation resistance test (on delivery)	24 h

Input data	
Adjustable range for the cyclic repetition of the insulation resistance test	-

Output data	
Grid voltage range	176 - 528 V_{AC}
Rated grid voltage	220 | 230 | 254 | 277 V_{AC} [1)]
Rated power	29.99 kW
Rated apparent power	29.99 kVA
Rated frequency	50 / 60 Hz [1)]
Maximum output current / phase	53.7 A
Initial short circuit alternating current / phase I_K	53.7 A
Power factor (cos phi)	0 - 1 ind./cap.[2)]
Grid connection	3~ (N)PE 380 / 220 V_{AC} 3~ (N)PE 400 / 230 V_{AC} 3~ (N)PE 440 / 254 V_{AC} 3~ (N)PE 480 / 270 V_{AC}
Maximum output power	29.99 kW
Rated power	29.99 kW
Nominal output current / phase	45.5 / 43.5 / 39,4 / 36,1 A
Total harmonic distortion	< 3%
AC overvoltage category	3
Current (inrush) [5)]	A peak / A rms over ms [4)]
Maximum output fault current / duration	42.2 A/ 29.4 ms

General data	
Night-time power loss = standby consumption	16 W
European efficiency (360 / 615 / 870 V_{DC})	97.25 / 97.80 / 97.45%
Maximum efficiency	98.02%
Safety class	1
EMC emission class	B
Pollution degree	3
Permitted ambient temperature	-40 °C - +60 °C
Permitted storage temperature	-40 °C - +70 °C
Relative humidity	0-100%
Sound pressure level	54.6 dB(A) (ref. 20 µPa)
Protection class	IP66
Dimensions (height x width x depth)	838.4 x 573.8 x 277.5 mm
Weight	43 kg

General data	
Inverter topology	Non-insulated transformerless

Protection devices	
DC disconnector	Integrated
Cooling principle	Controlled forced-air ventilation
RCMU [9)]	Integrated
DC isolation measurement [9)]	Integrated [2)]
Overload performance	Operating point shift power limitation
Active anti-islanding method	Frequency conversion method
AFCI	Integrated
AFPE (AFCI) classification (according to IEC63027) [9)]	F-I-AFPE-1-4/4-2 Full coverage Integrated AFPE 1 monitored string per input port 4/4 input ports per channel (AFPE1 for MPP1 & MPP2: 4, AFPE2 for MPP3 & MPP4: 4) 2 monitored channels

Verto 33.3

Input data	
Maximum input voltage (at 1,000 W/m²/ -10 °C in an open circuit)	1,000 V_{DC}
Start-up input voltage	150 V_{DC}
MPP voltage range	400 - 870 V_{DC}
Number MPP-controller	4
Maximum input current ($I_{DC\ max}$) PV1 / PV2 / PV3 / PV4 per string	 28 / 28 / 28 / 28 A 28 A
Max. short circuit current [8)] Total PV1 / PV2 / PV3 / PV4 per string	120 A 40 / 40 / 40 / 40 A 40 A
$I_{SC\ PV}$ [8)] Total PV1 / PV2 / PV3 / PV4	150 A 50 A / 50 A / 50 A / 50 A
Maximum PV field power ($P_{PV\ max}$) Total PV1 / PV2 / PV3 / PV4	50 kWp 20 / 20 / 20 / 20 kWp
DC overvoltage category	2
Max. inverter backfeed current to the array [3)]	50 A [4)]

Input data	
Max. capacity of the PV generator against earth	6,660 nF
Insulation resistance test limit value between module array and earth (on delivery) [7)]	34 kΩ
Adjustable range of insulation resistance test between module array and earth [6)]	34 - 10,000 kΩ
Limit value and tripping time of the sudden residual current monitoring (on delivery)	30 / 300 mA / ms 60 / 150 mA / ms 90 / 40 mA / ms
Limit value and tripping time of the continuous residual current monitoring (on delivery)	300 / 300 mA / ms
Adjustable range of continuous residual current monitoring [6)]	30 - 1,000 mA
Cyclic repetition of the insulation resistance test (on delivery)	24 h
Adjustable range for the cyclic repetition of the insulation resistance test	-

Output data	
Grid voltage range	176 - 528 V_{AC}
Rated grid voltage	220 | 230 | 254 | 277 V_{AC} [1)]
Rated power	33.3 kW
Rated apparent power	33.3 kVA
Rated frequency	50 / 60 Hz [1)]
Maximum output current / phase	53.7 A
Initial short circuit alternating current / phase I_K	53.7 A
Power factor (cos phi)	0 - 1 ind./cap.[2)]
Grid connection	3~ (N)PE 380 / 220 V_{AC} 3~ (N)PE 400 / 230 V_{AC} 3~ (N)PE 440 / 254 V_{AC} 3~ (N)PE 480 / 270 V_{AC}
Maximum output power	33.3 kW
Rated power	33.3 kW
Nominal output current / phase	50.5 / 48.3 / 43.7 / 40.1 A
Total harmonic distortion	< 3%
AC overvoltage category	3
Current (inrush) [5)]	A peak / A rms over ms [4)]
Maximum output fault current / duration	42.2 A/29.4 ms

General data	
Night-time power loss = standby consumption	16 W
European efficiency (400 / 635 / 870 V_{DC})	97.23 / 97.76 / 97.47%

General data	
Maximum efficiency	97.98%
Safety class	1
EMC emission class	B
Pollution degree	3
Permitted ambient temperature	-40 °C - +60 °C
Permitted storage temperature	-40 °C - +70 °C
Relative humidity	0-100%
Sound pressure level	54.6 dB(A) (ref. 20 µPa)
Protection class	IP66
Dimensions (height x width x depth)	838.4 x 573.8 x 277.5 mm
Weight	43 kg
Inverter topology	Non-insulated transformerless

Protection devices	
DC disconnector	Integrated
Cooling principle	Controlled forced-air ventilation
RCMU [9)]	Integrated
DC isolation measurement [9)]	Integrated [2)]
Overload performance	Operating point shift power limitation
Active anti-islanding method	Frequency conversion method
AFCI	Integrated
AFPE (AFCI) classification (according to IEC63027) [9)]	F-I-AFPE-1-4/4-2 Full coverage Integrated AFPE 1 monitored string per input port 4/4 input ports per channel (AFPE1 for MPP1 & MPP2: 4, AFPE2 for MPP3 & MPP4: 4) 2 monitored channels

Verto 36 480

Input data	
Maximum input voltage (at 1,000 W/m²/ -10 °C in an open circuit)	1,000 V_{DC}
Start-up input voltage	150 V_{DC}
MPP voltage range	440 - 870 V_{DC}

Input data	
Number MPP-controller	4
Maximum input current ($I_{DC\ max}$) PV1 / PV2 / PV3 / PV4 per string	 28 / 28 / 28 / 28 A 28 A
Max. short circuit current [8] Total PV1 / PV2 / PV3 / PV4 per string	120 A 40 / 40 / 40 / 40 A 40 A
$I_{SC\ PV}$[8] Total PV1 / PV2 / PV3 / PV4	150 A 50 A / 50 A / 50 A / 50 A
Maximum PV field power ($P_{PV\ max}$) Total PV1 / PV2 / PV3 / PV4	50 kWp 20 / 20 / 20 / 20 kWp
DC overvoltage category	2
Max. inverter backfeed current to the array [3]	50 A[4]
Max. capacity of the PV generator against earth	7,200 nF
Insulation resistance test limit value between module array and earth (on delivery) [7]	34 kΩ
Adjustable range of insulation resistance test between module array and earth [6]	34 - 10,000 kΩ
Limit value and tripping time of the sudden residual current monitoring (on delivery)	30 / 300 mA / ms 60 / 150 mA / ms 90 / 40 mA / ms
Limit value and tripping time of the continuous residual current monitoring (on delivery)	300 / 300 mA / ms
Adjustable range of continuous residual current monitoring [6]	30 - 1,000 mA
Cyclic repetition of the insulation resistance test (on delivery)	24 h
Adjustable range for the cyclic repetition of the insulation resistance test	-

Output data	
Grid voltage range	176 - 528 V_{AC}
Rated grid voltage	254 V_{AC} | 277 V_{AC}[1]
Rated power	36 kW
Rated apparent power	36 kVA
Rated frequency	50 / 60 Hz [1]
Maximum output current / phase	53.7 A
Initial short circuit alternating current / phase I_K	53.7 A
Power factor (cos phi)	0 - 1 ind./cap.[2]
Grid connection	3~ (N)PE 440 / 254 V_{AC} 3~ (N)PE 480 / 277 V_{AC}
Maximum output power	36 kW
Rated power	36 kW

Output data	
Nominal output current / phase	47.2 A / 43.3 A
Total harmonic distortion	< 3%
AC overvoltage category	3
Current (inrush) [5]	A peak / A rms over ms [4]
Maximum output fault current / duration	42.2 A / 29.4 ms

General data	
Night-time power loss = standby consumption	16 W
European efficiency (440 / 655 / 870 V_{DC})	97.47 / 97.72 / 97.85%
Maximum efficiency	98.13%
Safety class	1
EMC emission class	B
Pollution degree	3
Permitted ambient temperature	-40 °C - +60 °C
Permitted storage temperature	-40 °C - +70 °C
Relative humidity	0-100%
Sound pressure level	54.6 dB(A) (ref. 20 µPa)
Protection class	IP66
Dimensions (height x width x depth)	838.4 x 573.8 x 277.5 mm
Weight	43 kg
Inverter topology	Non-insulated transformerless

Protection devices	
DC disconnector	Integrated
Cooling principle	Controlled forced-air ventilation
RCMU [9]	Integrated
DC isolation measurement [9]	Integrated [2]
Overload performance	Operating point shift power limitation
Active anti-islanding method	Frequency conversion method
AFCI	Integrated

Protection devices	
AFPE (AFCI) classification (according to IEC63027) [9)]	F-I-AFPE-1-4/4-2 Full coverage Integrated AFPE 1 monitored string per input port 4/4 input ports per channel (AFPE1 for MPP1 & MPP2: 4, AFPE2 for MPP3 & MPP4: 4) 2 monitored channels

WLAN

WLAN	
Frequency range	2412–2462 MHz
Channels / power used	Channel: 1–11 b,g,n HT20 Channel: 3–9 HT40 <18 dBm
Modulation	802.11b: DSSS (1 Mbps DBPSK, 2 Mbps DQPSK, 5.5/11 Mbps CCK) 802.11g: OFDM (6/9 Mbps BPSK, 12/18 Mbps QPSK, 24/36 Mbps 16-QAM, 48/54 Mbps 64-QAM) 802.11n: OFDM (6.5 BPSK, QPSK, 16-QAM, 64-QAM)

Surge protective device DC Verto 25.0 - 27.0 SPD type 1+2

General data	
Continuous operating current (I_{cpv})	< 0.1 mA
Rated discharge current (I_n) - 15 x 8/20 µs pulses	20 kA
Lightning surge current (I_{imp}) Max. discharge capacity @ 10/350 µs	5 kA
Protection level (U_p) (star-shaped mounting)	3.6 kV
Short-circuit strength PV (I_{scpv})	15 kA

Disconnector	
Thermal disconnector	Integrated
External fuse	None

Mechanical properties	
Disconnection indicator	Mechanical indicator (red)
Remote communication of the connection interruption	Output on the changeover contact

Mechanical properties	
Housing material	Thermoplastic UL-94-V0
Test standards	IEC 61643-31 / EN 61643-31

Surge protective device DC Verto 25.0 - 27.0 SPD type 1

General data	
Continuous operating current (I_{cpv})	< 0.1 mA
Rated discharge current (I_n) - 15 x 8/20 µs pulses	20 kA
Protection level (U_p) (star-shaped mounting)	3.6 kV
Short-circuit strength PV (I_{scpv})	15 kA

Disconnector	
Thermal disconnector	Integrated
External fuse	None

Mechanical properties	
Disconnection indicator	Mechanical indicator (red)
Remote communication of the connection interruption	Output on the changeover contact
Housing material	Thermoplastic UL-94-V0
Test standards	IEC 61643-31 / EN 61643-31

Surge protective device DC Verto 30.0 - 33.3 SPD type 1+2

General data	
Rated discharge current (I_n) - 15 x 8/20 µs pulses	20 kA
Protection level (U_p) (star-shaped mounting)	4 kV
Short-circuit strength PV (I_{scpv})	9 kA

Disconnector	
Thermal disconnector	Integrated
External fuse	None

Mechanical properties	
Disconnection indicator	Mechanical indicator (not green)
Remote communication of the connection interruption	Output on the changeover contact
Housing material	Thermoplastic UL-94-V0

Surge protective device DC Verto 30.0 - 33.3 SPD type 1

General data	
Rated discharge current (I_n) - 15 x 8/20 µs pulses	20 kA
Lightning surge current (l_{imp}) Max. discharge capacity @ 10/350 µs	5 kA
Protection level (U_p) (star-shaped mounting)	4,000 kV
Short-circuit strength PV (I_{scpv})	9 kA

Disconnector	
Thermal disconnector	Integrated
External fuse	None

Mechanical properties	
Disconnection indicator	Mechanical indicator (not green)
Remote communication of the connection interruption	Output on the changeover contact
Housing material	Thermoplastic UL-94-V0

Explanation of footnotes

1) The values stated are defaults; the inverter is configured specifically to suit the requirements of the relevant country.
2) Depending on the country setup or device-specific settings (ind. = inductive; cap. = capacitive).
3) Maximum current from a defective PV module to all other PV modules. From the inverter itself to one PV side of the inverter, it is 0 amperes.
4) Guaranteed by the electrical configuration of the inverter
5) Current peak when switching on the inverter
6) Specified values are standard values; depending on the requirement and PV power, these values must be adjusted accordingly.
7) Specified value is a maximum value; exceeding the maximum value may negatively affect the function.
8) $I_{SC\ PV} = I_{SC\ max} \geq I_{SC}$ (STC) x 1.25 according to e.g.: IEC 60364-7-712, NEC 2020, AS/NZS 5033:2021
9) Software class B (single-channel with periodic self-test) per IEC60730-1 Annex H.

Integrated DC disconnector

General data	
Product name	Benedict LS32 E 7905
Rated insulation voltage	1000 V_{DC}
Rated impulse withstand voltage	8 kV
Suitability for insulation	Yes, DC only

General data	
Utilisation category and / or PV utilisation category	In accordance with IEC/EN 60947-3 utilisation category DC-PV2
Rated short-time withstand current (I_{cw})	Rated short-time withstand current (I_{cw}): 1000 A
Rated short-circuit making capacity (I_{cm})	Rated short-circuit making capacity (I_{cm}): 1000 A

Rated operating current and rated breaking capacity				
Rated operating voltage (U_e)	Rated operating current (I_e)	$I_{(make)}$ / $I_{(break)}$	Rated operating current (I_e)	$I_{(make)}$ / $I_{(break)}$
≤ 500 V_{DC}	14 A	56 A	36 A	144 A
600 V_{DC}	8 A	32 A	30 A	120 A
700 V_{DC}	3 A	12 A	26 A	88 A
800 V_{DC}	3 A	12 A	17 A	68 A
900 V_{DC}	2 A	8 A	12 A	48 A
1000 V_{DC}	2 A	8 A	6 A	24 A
Number of pins	1	1	2	2

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