![Fronius logo]

Operating Instructions

Fronius Verto

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

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Safety rules

Explanation of safety instructions

⚠ **WARNING!**

Indicates a potentially dangerous situation.
▶ Death or serious injury may result if appropriate precautions are not taken.

⚠ **CAUTION!**

Indicates a potentially harmful situation.
▶ Minor injury or damage to property may result if appropriate precautions are not taken.

NOTE!

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

Please pay special attention when one of the symbols from the "Safety rules" chapter appears in these instructions.

General

The device has been manufactured in line with the state of the art and taking into account recognized safety regulations. If used incorrectly or misused, 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
- Have fully read and precisely followed these Operating Instructions

In addition to the Operating Instructions, all applicable local 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 danger 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.

Any equipment malfunctions which impair safety must be remedied before the device is turned on.

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 under-dimensioned cables and leads must be repaired immediately by an authorized specialist.

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

It is impossible to guarantee that externally (aka, third-party) procured 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.

Data on noise emission values

The sound pressure level of the inverter is indicated in the **Technical data**.

The cooling of the device takes place via an electronic temperature control system at the lowest possible noise level and depends on the power used, ambient temperature, and the soiling level 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 power 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, the operator is obliged to take action to rectify the situation.

Data backup   With regard to data security, the user is responsible for:
- backing up any changes made to the factory settings
- saving and storing personal settings

Copyright   Copyright of these operating instructions remains with the manufacturer.

Text and illustrations were accurate at the time of printing, subject to change. We are grateful for suggestions for improvement and information on any discrepancies in the operating instructions.

Equipment grounding (GND)   Grounding a point in the device, system, or installation serves as a protective measure against electric shock in the event of a fault. When installing an inverter from safety class 1 (see **Technical data**), a ground conductor connection is required.

When connecting the ground conductor, ensure that it is secured to prevent unintentional disconnection. All of the points listed in the chapter headed **Connecting the inverter to the public grid (AC side)** on page **35** must be observed. When using strain-relief devices, it is important to ensure that the ground conductor is loaded last in the event of a failure. The respective national standards and regulations and requirements for minimum cross-section must be observed when connecting the ground conductor.

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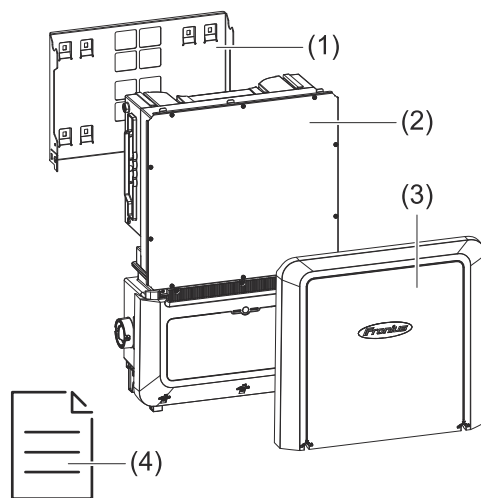
(1)	Mounting bracket (mounted on inverter on delivery)
(2)	Inverter
(3)	Housing cover
(4)	Quick Start Guide

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

Utilization not in accordance with the intended purpose comprises:
- Utilization 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 following 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
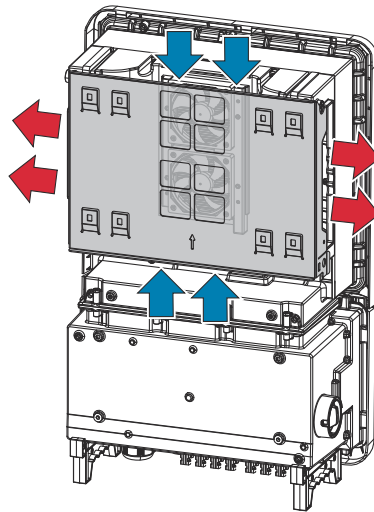
Ambient air is drawn in by the fan on the top and bottom and blown out at the device sides. The even heat dissipation allows several inverters to be installed next to each other.

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

System owners and installers can easily monitor and analyze the PV system using Fronius Solar.web or Fronius Solar.web Premium. With the appropriate configuration, the inverter transmits data such as power, yield, load, and energy balance to Fronius Solar.web. More detailed information can be found at **Solar.web - Monitoring & analysis**.

Configuration is carried out using the Setup wizard; see the chapter headed **Installation with the app** on page **48** or **Installation using the web browser** on page **48**.

Requirements for configuration:
- Internet connection (download: min. 512 kbit/s, upload: min. 256 kbit/s)*.
- User account at **solarweb.com**.
- Completed configuration using the Setup wizard.

* These specifications do not provide an absolute guarantee of flawless operation. High error rates in the transmission, fluctuating receptions or misfires can have an adverse effect on data transfer. Fronius recommends onsite testing to ensure that the connections meet the minimum requirements.

Local communication

The inverter can be found via the Multicast DNS (mDNS) protocol. We recommend searching for the inverter using the assigned host name.

The following data can be called up 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.
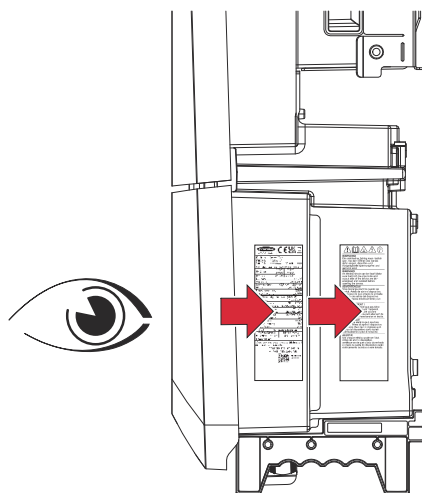
Symbols on the rating plate:

$C\epsilon$ CE label—confirms compliance with applicable EU directives and regulations.

UKCA 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 manual
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 touch 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-energized at the input and output side.

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's grid power feed if the trigger device (switch, e.g., Emergency Stop or fire alarm contact) has been activated.

If an inverter (slave) fails, it is bypassed and the other inverters continue operating. If a second inverter (slave) or the inverter (master) 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 an RCMU (RCMU = residual current monitoring unit) according to IEC 62109-2 and IEC63112.
It monitors residual currents from the PV module up to the AC output and disconnects the inverter from the grid when an improper residual current is detected.

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.

Operating controls and connections

Connection area
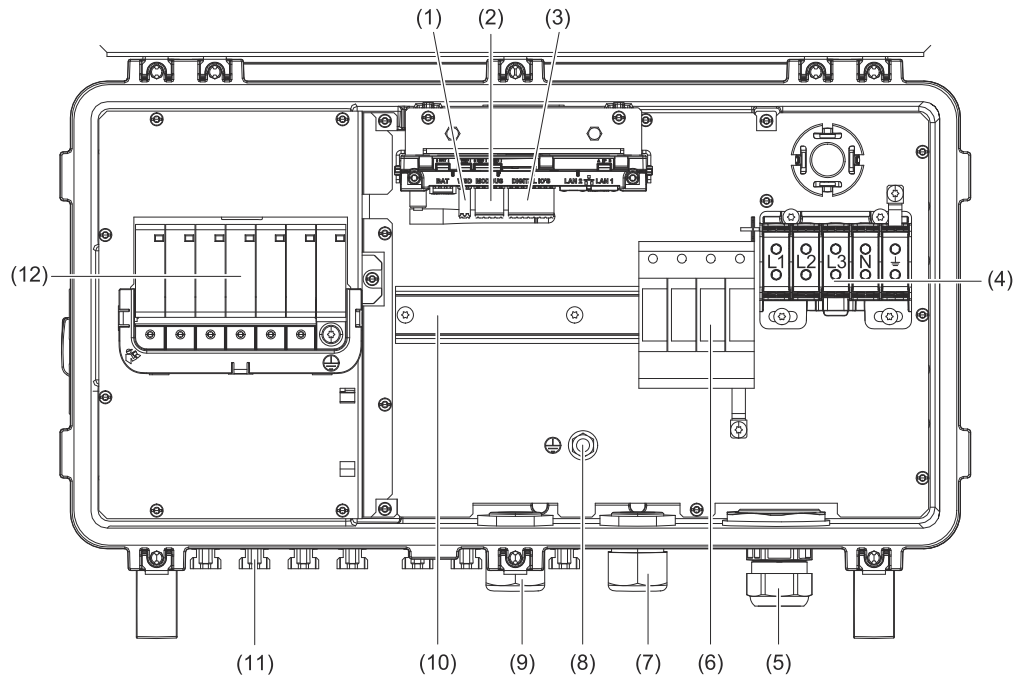
(1)   Push-in WSD (wired shutdown) terminal
(2)   Push-in terminals in the data communication area (Modbus)
(3)   Push-in terminals in the data communication area (digital inputs and out-
       puts)
(4)   5-pin AC terminal
       ⏚ = ⏚
(5)   Cable bushing/cable gland AC
(6)   AC SPD (surge protection device)
(7)   Optional cable bushing
(8)   Grounding 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 protection device)

PV connections

| 1.1- | 1.2- | 2.1- | 2.2- | 3.1- | 3.2- | 4.1- | 4.2- |

| 1.1+ | 1.2+ | 2.1+ | 2.2+ | 3.1+ | 3.2+ | 4.1+ | 4.2+ |

MPP 1
PV1

MPP 2
PV2

MPP 3
PV3

MPP 4
PV4

Ground electrode bolt

M8 / 10 Nm
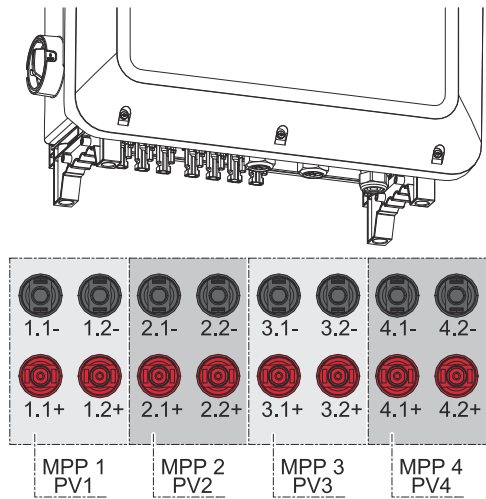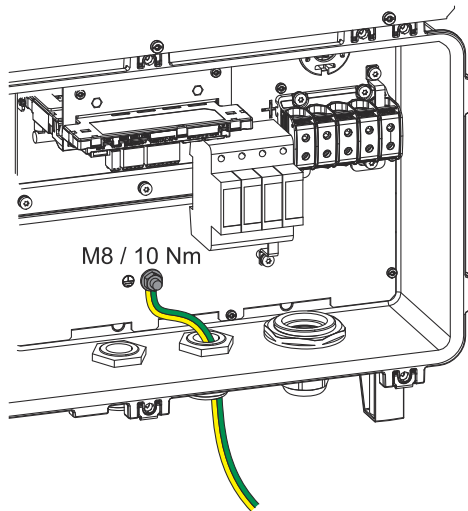
The ground electrode bolt ⏚ allows additional components to be grounded, such as:

- AC cable
- Module mounting system
- Ground rod

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

Mounting option for third-party components

-40° C - +70° C
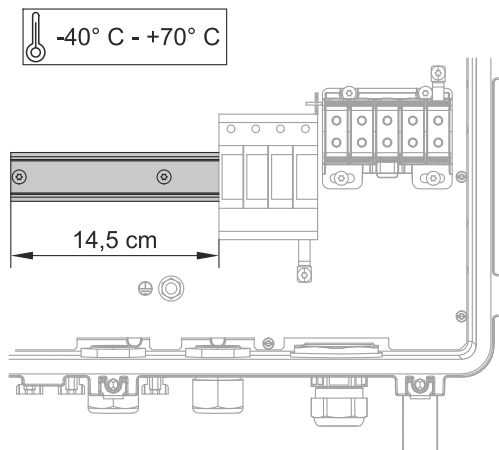
14,5 cm

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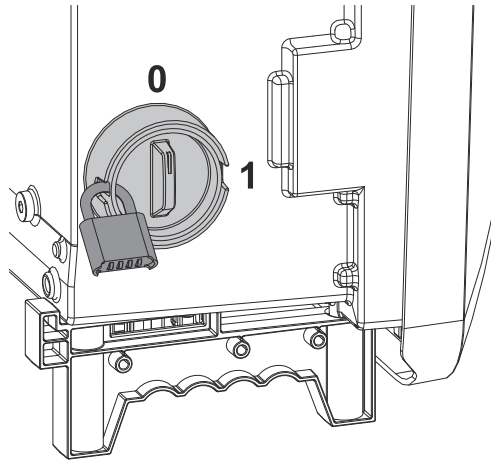
The DC disconnector has 2 switch settings: On / Off.

IMPORTANT!
When the switch is in the 'Off' 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.

Padlock minimum requirement:
- Shackle diameter min. 6 mm
- Housing size min. 40 mm

Data communication area

Technical Data (WLAN)
Frequency band: channel 1-14 (2412-2462 MHz)
Radio-frequency power: <100 mW (<20 dBm)
IP WLAN: 192.168.250.181
IP LAN 1: 169.254.0.180

I/Os ➔ Load Management, Demand Respone Mode (DRM)*, Back-up power, IO control, ...

* Demand Response Mode (DRM)
IO4 = RG0 (Ref GEN/0)
IO5 = CL0 (COM LOAD/0)
IN6 = 1/5
IN7 = 2/6
IN8 = 3/7
IN9 = 4/8
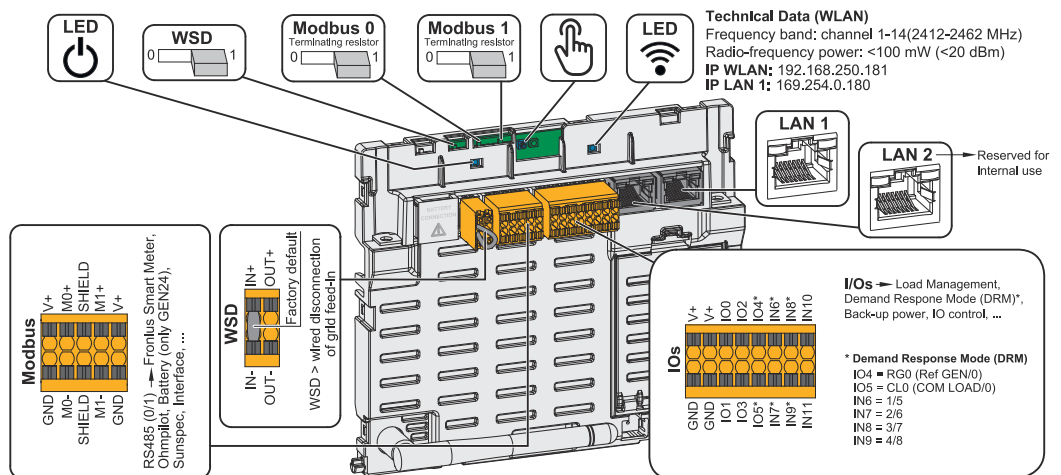
⏻ **Operating status LED**	Indicates the inverter operating status.
WSD (wired shutdown) switch	Defines the inverter as a WSD primary device or WSD secondary device. **Position 1:** WSD primary device **Position 0:** WSD secondary device
Modbus 0 (MB0) switch	Switches the terminating resistor for Modbus 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 (RG0, CL0, 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. **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
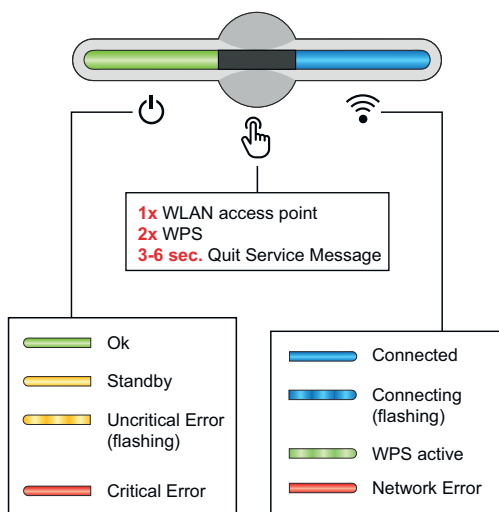
The status of the inverter is shown via the operating status LED. In the event of faults, carry out the individual steps in the Fronius Solar.web live app.

🖑 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.
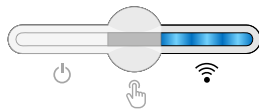
Sensor functions	
	1x 🖑 = WLAN access point (AP) is opened. 📶 Flashing blue
	2x 🖑 = WLAN Protected Setup (WPS) is activated. 📶 Flashing green
	3 seconds 🖑 (max. 6 seconds) = the service message is acknowledged. 🖑 Flashing white (rapidly)
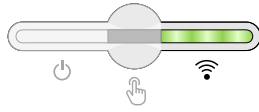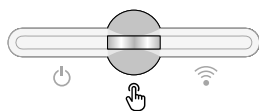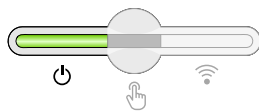
LED status indicator	
	The inverter is operating correctly. ⏻ Lights up green
	The inverter starts. ⏻ Flashing green
	The inverter is in standby, is not operational (e.g., no feed-in at night), or is not configured. ⏻ Lights up yellow
	The inverter indicates a non-critical status. ⏻ Flashing yellow
	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
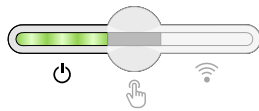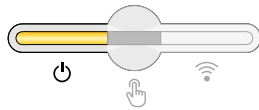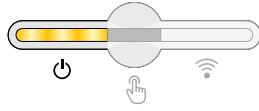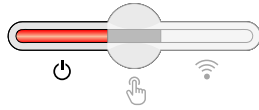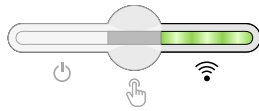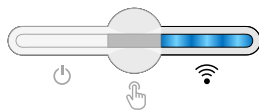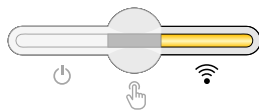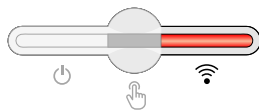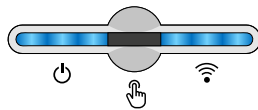
LED status indicator	
⏻ 👆 ᯤ (flashing blue bar)	The inverter is performing an update. ⏻ / ᯤ Flashing blue
⏻ 👆 ᯤ (white bar)	There is a service message. 👆 Lights up white
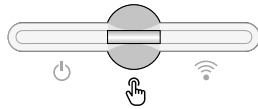
Schematic internal wiring of IOs

The V+/GND pin provides the possibility of feeding in a voltage in the range of 12.5 to 24 V (+ max. 20%) using an external power supply unit. Outputs IO 0 - 5 can then be operated using the external voltage that has been fed in. A maximum of 1 A may be drawn per output, whereby a total of max. 3 A is permitted. The fuse protection must take place externally.

⚠ **CAUTION!**

Danger from polarity reversal at the terminals due to improper connection of external power supply units.
This may result in severe damage to the inverter.
▶ Check the polarity of the external power supply unit with a suitable measuring device before connecting it.
▶ Connect the cables to the V+/GND outputs while ensuring the correct polarity.

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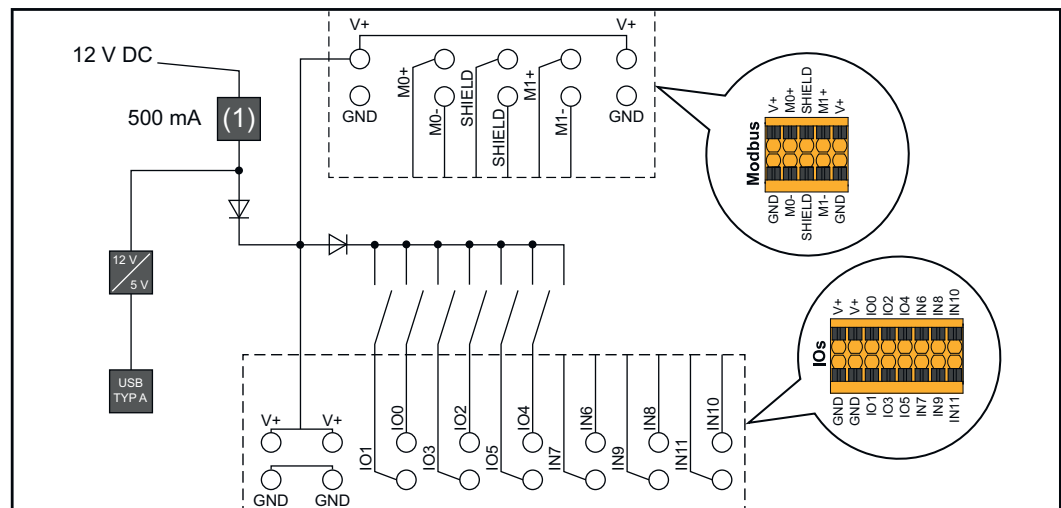
(1)   Current limitation

Surge protection device (SPD)

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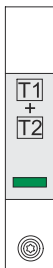
The surge protection device (SPD) protects against temporary over-voltages and dissipates surge currents (e.g., lightning strike). Building on an overall lightning protection concept, the SPD helps to protect your PV system components.

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

A tripped SPD must be replaced immediately by an authorized 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 protection device is interrupted or damaged.

Installation

General

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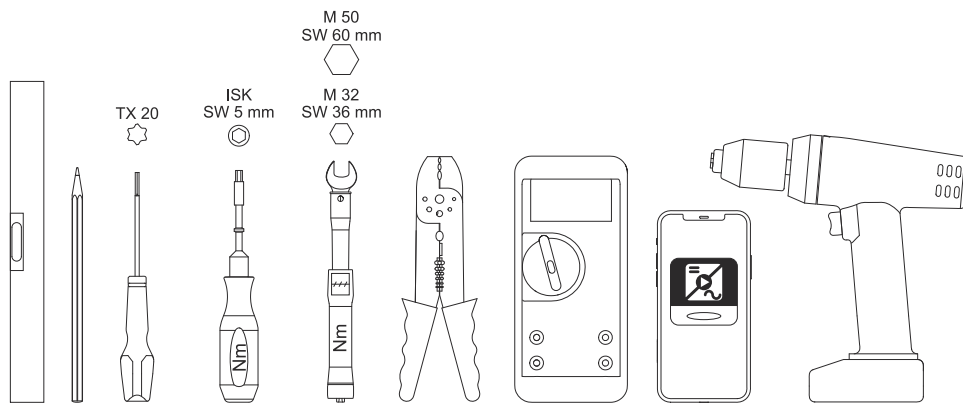
- Spirit level
- Pencil
- TX20 screwdriver
- Hex socket torque wrench 5 mm
- Torque wrench M32, M50
- Wire stripper for cables and wires
- Multimeter for measuring voltage
- Smartphone, tablet, or PC for setting up the inverter
- Drill driver

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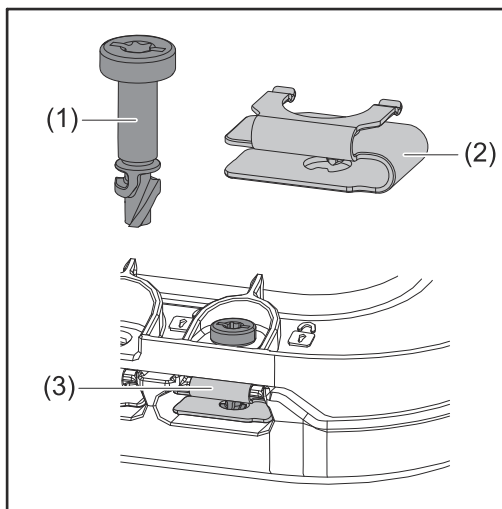
A quick-fastener system (3) is used to mount the connection area cover and front cover. The system is opened and closed with a half-rotation (180°) of the captive screw (1) into the quick-fastener spring (2).

The system is independent of torque.

NOTE!

Danger when using a drill driver.
This may result in the destruction of the quick-fastener system due to over-torque.
▶ Use a screwdriver (TX20).
▶ Do not turn the screws more than 180°.

System component compatibility

All components installed 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:
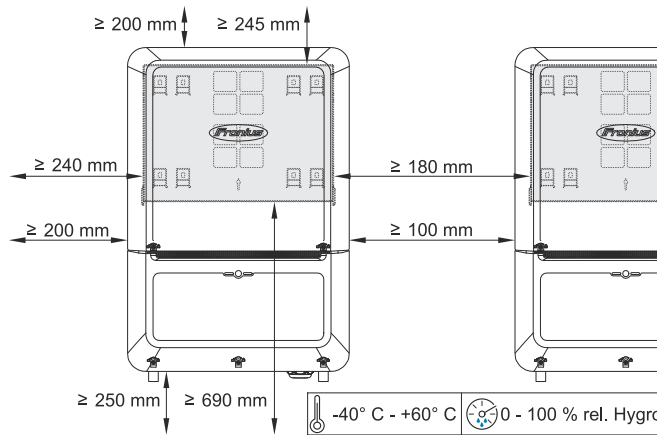
	Only install on a solid, non-flammable surface.
	Max. ambient temperatures: -40 °C - +60 °C
	Relative humidity: 0-100%

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 inverter may be installed on the following:
- Walls (corrugated metal walls [mounting rails], brick walls, concrete walls, or other non-flammable surfaces sufficiently capable of bearing the load)
- 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 adheres to the fire protection requirements and are thus not easily flammable. Ensure compliance with the national provisions)
- Covered parking lot 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 minimize 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.
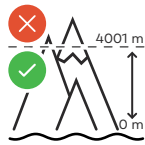
The inverter must not be installed or used at altitudes above 4,000 m.

The voltage U_{DCmax} must not exceed the following values:
- Between 0 and 3,000 m: 1,000 V
- Between 3,001 and 3,500 m: 945 V
- Between 3,501 and 4,000 m: 909 V
- Over 4,001: not permitted

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

The inverter may produce a slight noise during certain operating phases. 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 essentially 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 against installing the inverter 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
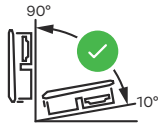
The inverter is suitable for a horizontal installation position or for installation on a sloping surface.

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

Installing the mounting bracket and attaching the inverter

Selecting the mounting 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 right type of fixing.

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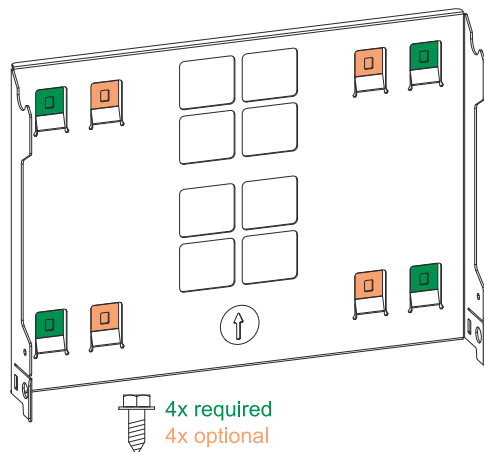
The mounting bracket (illustration) can also be used as a guide.

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 four inner tabs (marked in orange) can be used in addition if required.

4x required
4x optional

Do not deform the mounting bracket

NOTE!
When attaching the mounting bracket to the wall or to a column, make sure that the mounting bracket is not 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.

1 min. 4x
max. 9 mm
6 - 8 mm
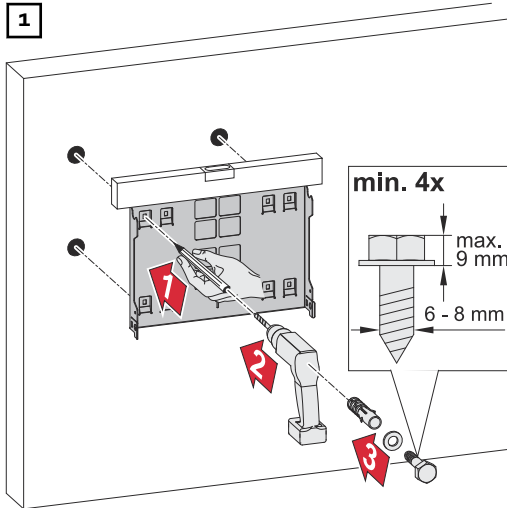
Attaching the inverter to the mounting bracket

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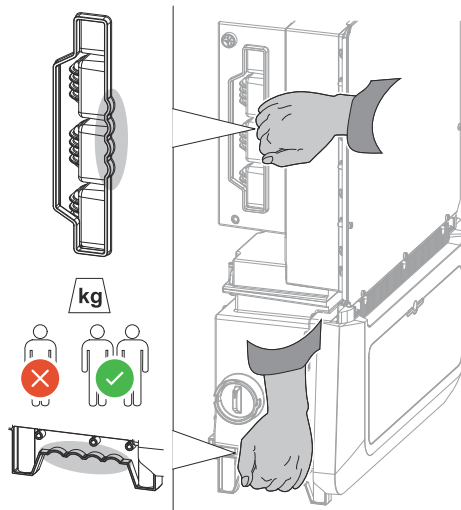
There are integrated grips on the side of the inverter which facilitate lifting/attaching.

1
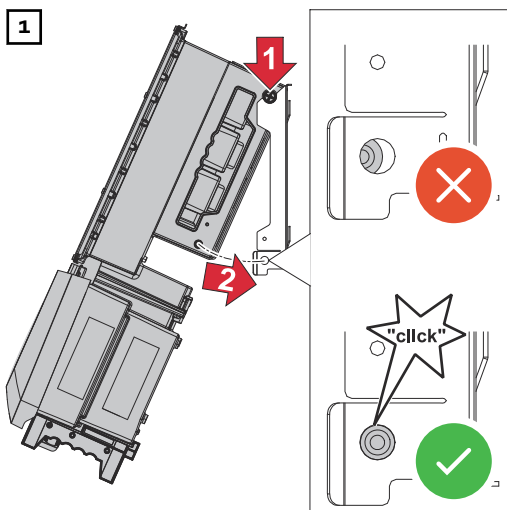
"click"

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.

Requirements for connecting the inverter

Connecting aluminum cables
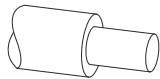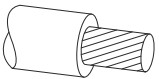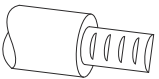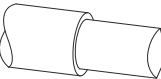
Aluminum cables can be connected to the grid connections.

> **NOTE!**
>
> **When connecting aluminum cables:**
> ▶ Observe national and international guidelines regarding the connection of aluminum cables
> ▶ To protect the aluminum strands from oxidation, grease them with a suitable grease
> ▶ Follow the instructions of the cable manufacturer
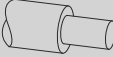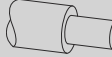
Different cable types

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 aluminum wires with a cross section of 4 to 35 mm^2 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		Aluminum	
35 mm^2	10 Nm	10 Nm	14 Nm	14 Nm
25 mm^2	8 Nm	8 Nm	12 Nm	10 Nm
16 mm^2			10 Nm	
10 mm^2	6 Nm	6 Nm	⊗	⊗
6 mm^2				
4 mm^2	⊗			

The grounding must be carried out with at least a 10 mm^2 copper or 16 mm^2 aluminum conductor.
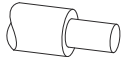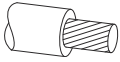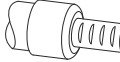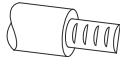
Permissible cables for the data communication connection
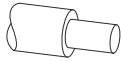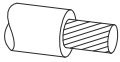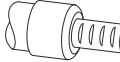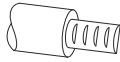
Cables with the following design can be connected to the terminals of the inverter:
- Copper: round, solid
- Copper: round, fine-stranded
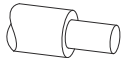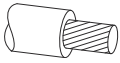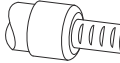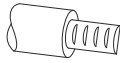
IMPORTANT!
Connect the individual conductors to an appropriate ferrule if several individual conductors are connected to one input of the push-in terminals.

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

National Standards

RCD

✓   ✗

Type A

Allowed: $I_{\Delta N} \geq 30$ mA
Recommended: $I_{\Delta N} \geq 100$ mA ✓
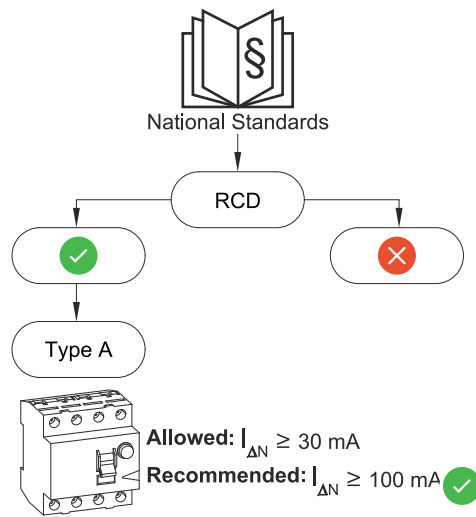
NOTE!

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 from incorrect operation and work that is not carried out properly.**
> This can result in severe personal injury and damage to property.
> ▶ Read the Installation Instructions and Operating Instructions before installing and commissioning the equipment.
> ▶ Only qualified personnel are authorized to commission the inverter and only within the scope of the respective technical regulations.

> ⚠️ **WARNING!**
>
> **Danger from grid voltage and DC voltage from PV modules that are exposed to light.**
> An electric shock can be fatal.
> ▶ Prior to any connection work, ensure that the inverter is de-energized on the AC side and the DC side.
> ▶ Only an authorized electrical engineer is permitted to connect this equipment to the public grid.

> ⚠️ **WARNING!**
>
> **Danger from damaged and/or contaminated terminals.**
> This can result in severe personal injury and damage to property.
> ▶ Prior to connection work, check the terminals for damage and contamination.
> ▶ Remove any contamination while the equipment is de-energized.
> ▶ Have defective terminals replaced by an authorized specialist.

Connecting the inverter to the public grid (AC side)

It is not possible to operate the inverter in ungrounded 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

AC~
OFF

max. 63 A

OFF

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

2

TX20 x 25 mm

6x

180°

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

CU-Wire min:
75° C / 167° F

16 mm

4 - 35 mm²

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

5 mm
min. 22 mm

ISK M10
5x 6 Nm

6

36 mm

M32
1x 4 Nm
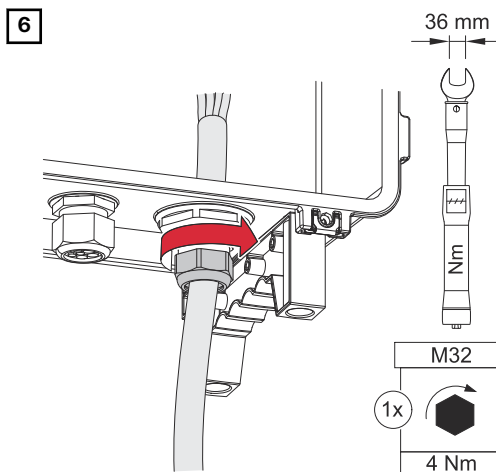
Fasten the union nut of the cable gland with a torque of 6-7 Nm.

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

It is not possible to operate the inverter in ungrounded 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

AC~
OFF

max. 63 A

OFF

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

2

TX20 x 25 mm

6x

180°

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

CU-Wire min:
75° C / 167° F

16 mm

4 - 35 mm²

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

5 mm
min. 22 mm

ISK M10
5x
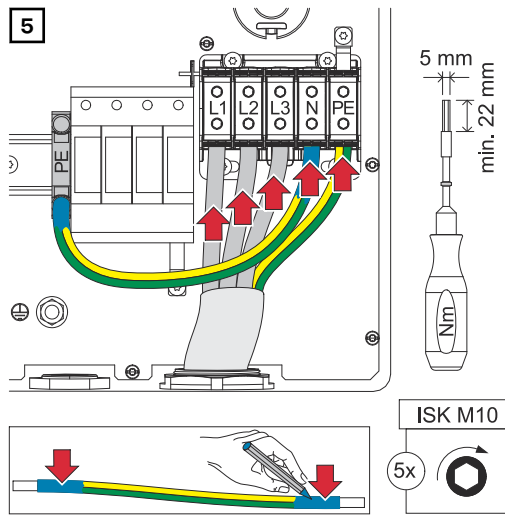
PEN-conductor - version: Terminal on DIN rail

6

5 mm
min. 22 mm

ISK M10
5x
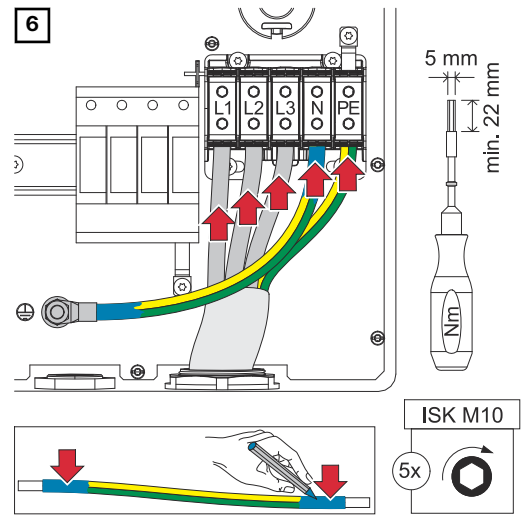
PEN-conductor - version: Grounding stud
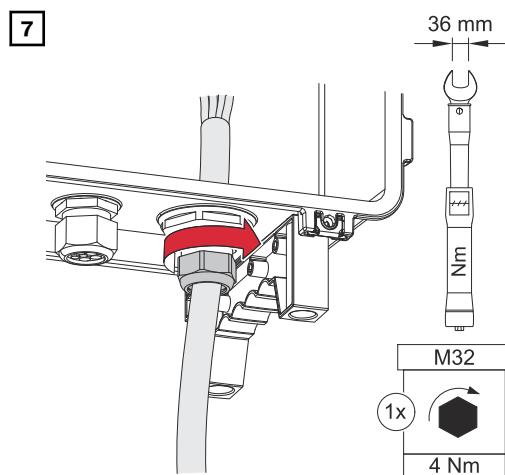
7

36 mm

Nm

M32
1x
4 Nm

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

39

Replacing the PG gland

M32

M50:
42,1500,0602

60 mm

Nm

M50

1x

10 Nm
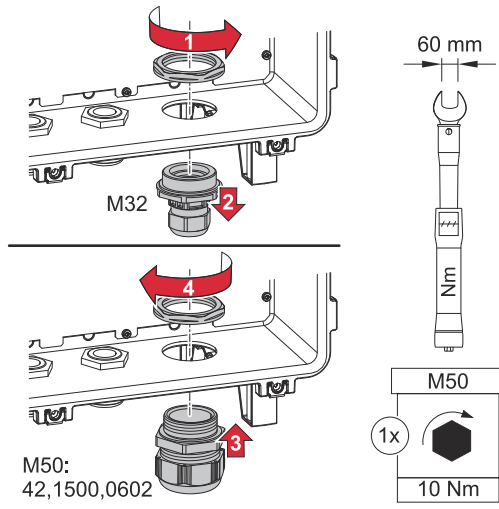
Connecting solar module strings to the inverter

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.

DC Voltage

IMPORTANT!
The PV modules connected to the inverter must comply with the IEC 61730 Class A standard.
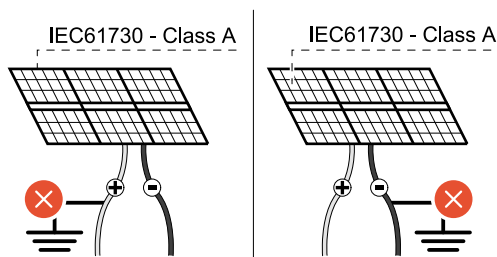
IMPORTANT!
Solar module strings must not be earthed.

IEC61730 - Class A   IEC61730 - Class A

max. 1000 V_{DC}

Safety

⚠ **WARNING!**

Danger from incorrect operation and work that is not carried out properly.
This can result in severe personal injury and damage to property.
▶ The commissioning, maintenance, and service work in the inverter's power stage set may only be carried out by Fronius-trained service personnel in accordance with the technical specifications.
▶ Read the Installation Instructions and Operating Instructions before installing and commissioning the equipment.

⚠ **WARNING!**

Danger from grid voltage and DC voltage from PV modules that are exposed to light.
This can result in severe personal injury and damage to property.
▶ All connection, maintenance, and service work should only be carried out when the AC and DC sides have been disconnected from the inverter and are de-energized.
▶ Only an authorized electrical engineer is permitted to connect this equipment to the public grid.

⚠ **WARNING!**

Danger from damaged and/or contaminated terminals.
This can result in severe personal injury and damage to property.
▶ Prior to connection work, check the terminals for damage and contamination.
▶ Remove any contamination while the equipment is de-energized.
▶ Have defective terminals replaced by an authorized 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

DC Voltage

+ / -

max. 1000 V$_{DC}$

42

2

check each string!

max. 1000 V$_{DC}$

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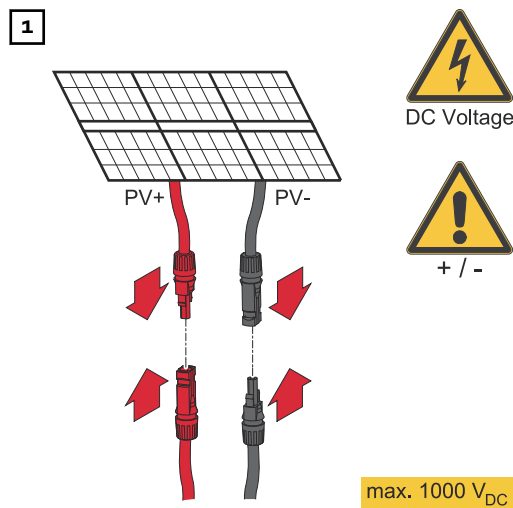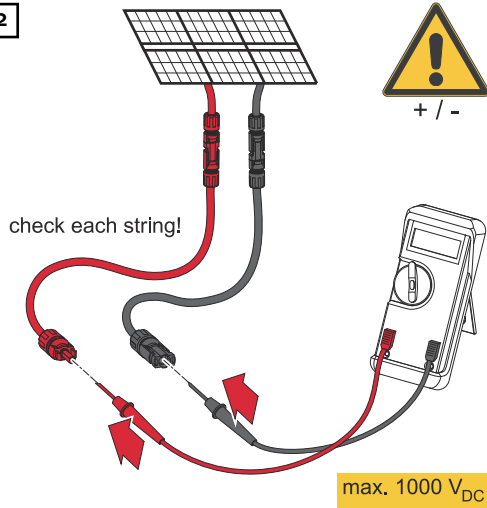
Use a suitable measuring instrument to check the voltage and polarity of the DC cabling.

⚠ **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

PV-KST4
-S2/2,5

PV-KBT4
-S2/2,5
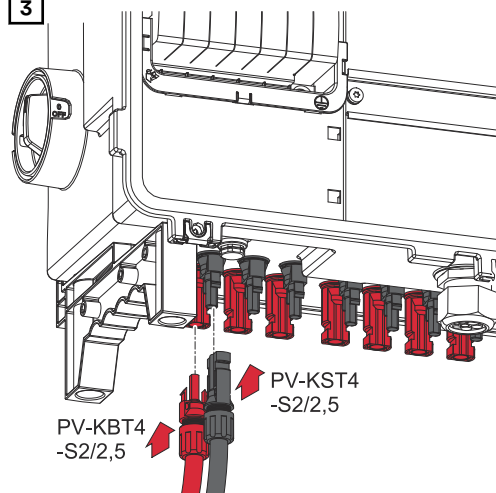
Connect the PV cables from the solar modules to the MC4 connectors as labeled.

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

Connecting the data communication cables

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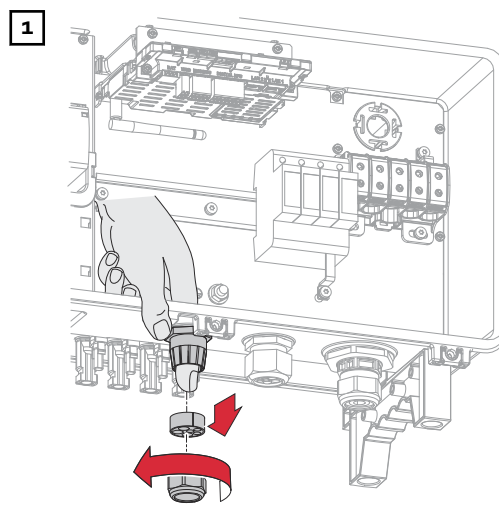
1 Undo the cable gland union nut and push out the sealing ring and the blanking plug from the inside of the device.

3x Ø4,9-5,5mm (0.19-0.22inch)
3x Ø6,7-8,5mm (0.26-0.33inch)
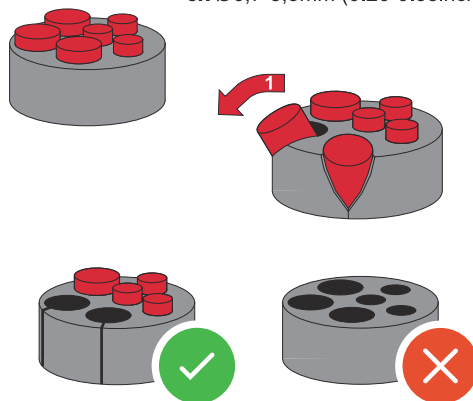
2 Open up the sealing ring at the location where the blanking plug is to be removed.

* Liberate the blanking plug by moving it sideways.
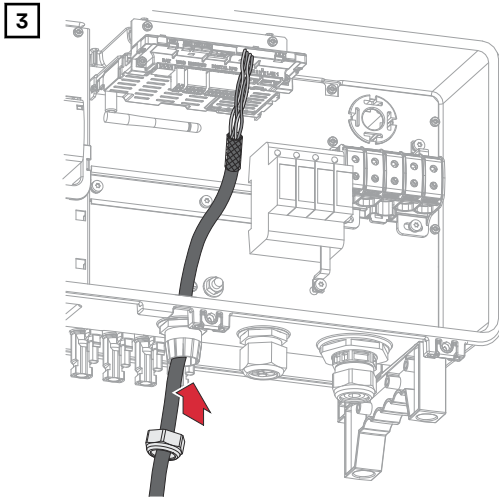
3 Guide the data cables first through the cable gland union nut and then through the housing opening.
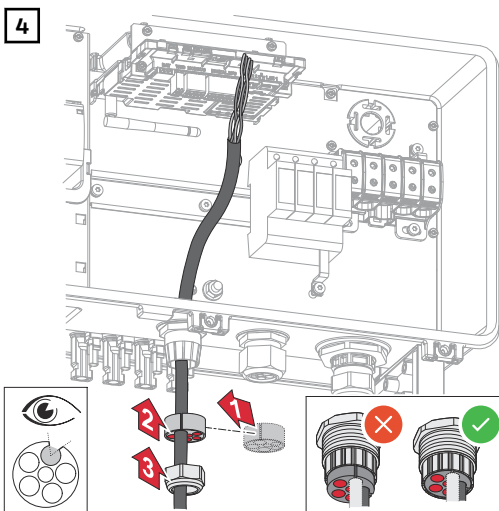
4 Insert the sealing ring between the union nut and the housing opening. Press the data cables into the seal's cable guide. Then press in the seal until it reaches the underside of the cable gland.
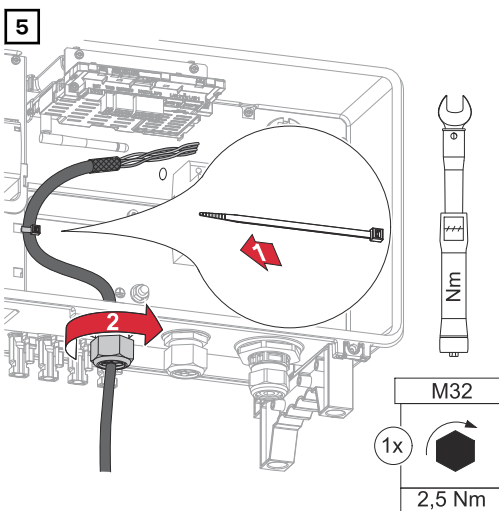
5 Secure the data cable to the protective cover of the DC SPD surge protection device with a cable tie. Tighten the union nut for the cable gland to a torque of min. 2.5 to max. 4 Nm.

M32

1x 2,5 Nm

Installing the WSD (wired shutdown)

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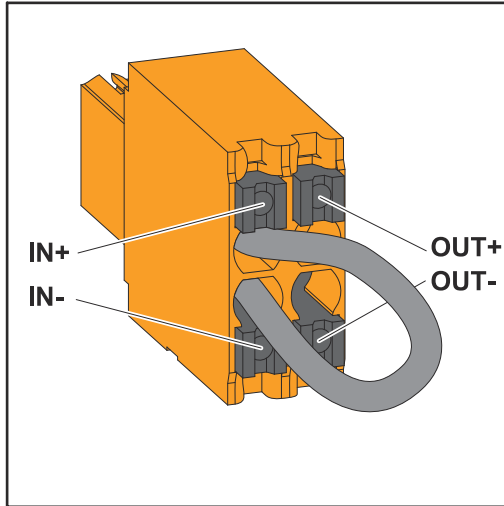
IMPORTANT!
The push-in WSD terminal in the inverter's connection area is delivered with a bypass ex works as standard. The bypass must be removed when installing a trigger device or a WSD chain.

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

CAT 5/6/7
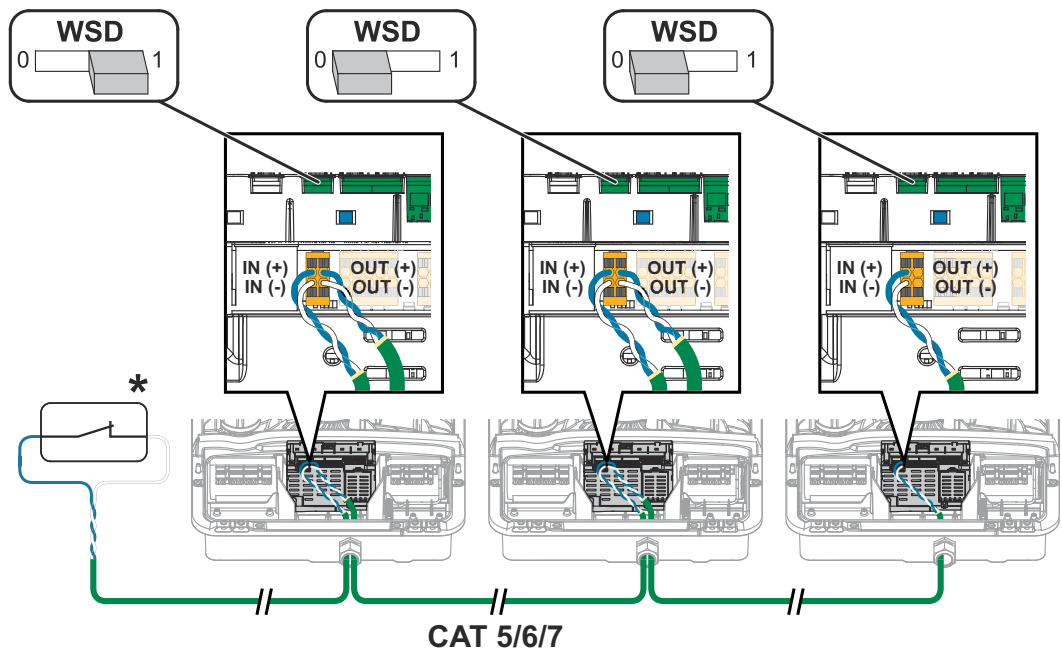
* Floating contact of the trigger device (e.g., central grid and system protection). If several floating contacts are used in a WSD chain, they must be connected in series.

Closing and commissioning the inverter

Closing the inverter's connection area/housing cover, and commissioning
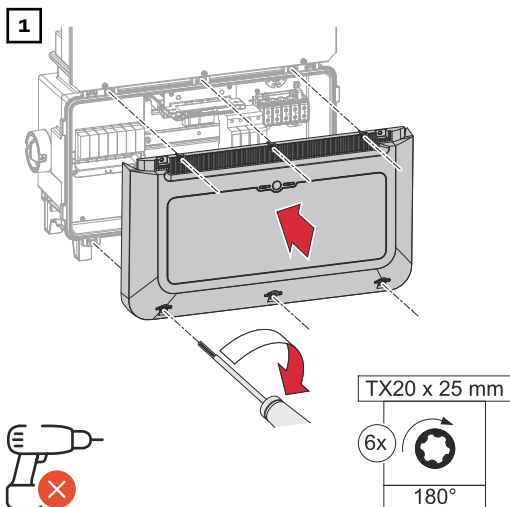
Place the cover on the connection area. Tighten the six screws by rotating them 180° to the right using a screwdriver (TX20).

TX20 x 25 mm
6x
180°
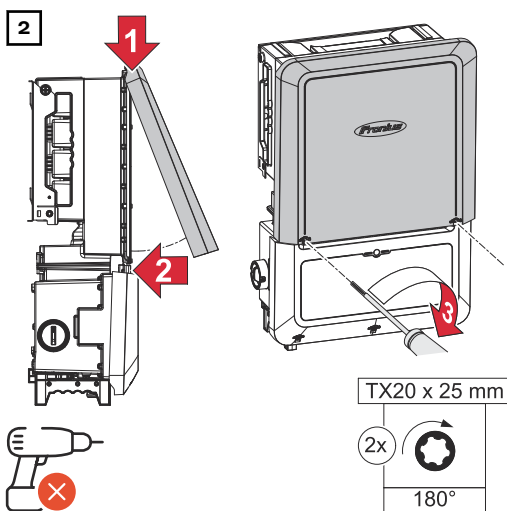
Clip the housing cover onto the inverter from above.
Press on the lower part of the housing cover and tighten the two screws by rotating them 180° to the right using a screwdriver (TX20).

TX20 x 25 mm
2x
180°

AC~
ON

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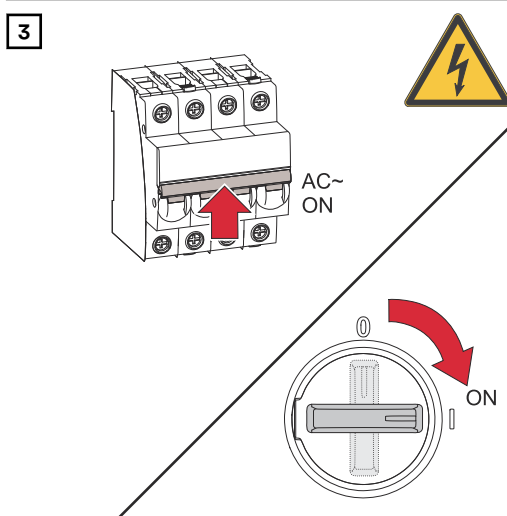
Turn the DC disconnector to the "On" switch position. Switch on the automatic circuit breaker.

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 is canceled before completion, the input data is not saved and the start screen with the installation wizard is shown once again. The data is saved in the event of an interruption, e.g., a power failure. Commissioning is continued at the point at which the interruption occurred after the power supply is 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, contact your installer/technical support.

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.

Fronius Solar.start
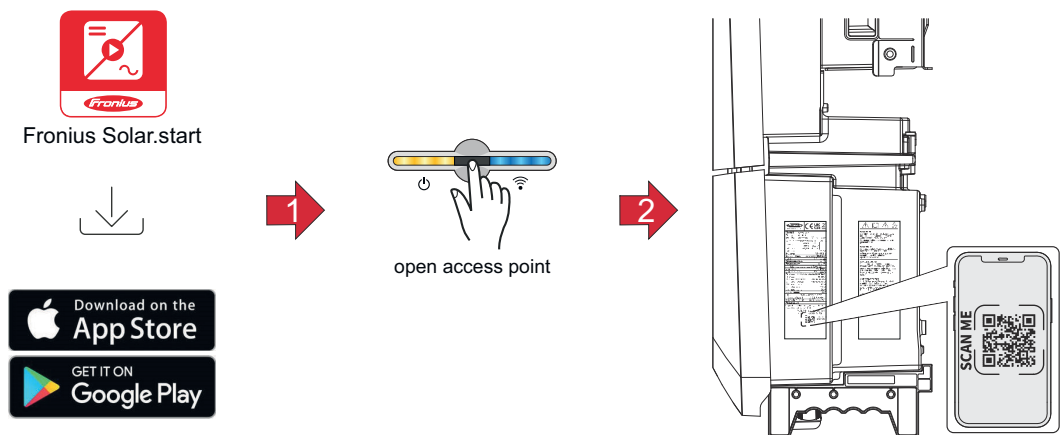
open access point

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:

open access point

FRONIUS_Serialnumber
Secured
Password:
XXXXXXXX

Rating plate
Access point password:
XXXXXXXX

192.168.250.181
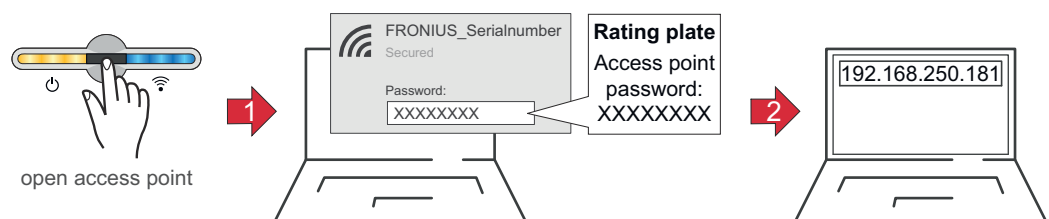
1 Open the access point by touching the sensor 👆

✓ *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 the system components in Fronius 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 Fronius Solar.web installation wizard.

Ethernet:
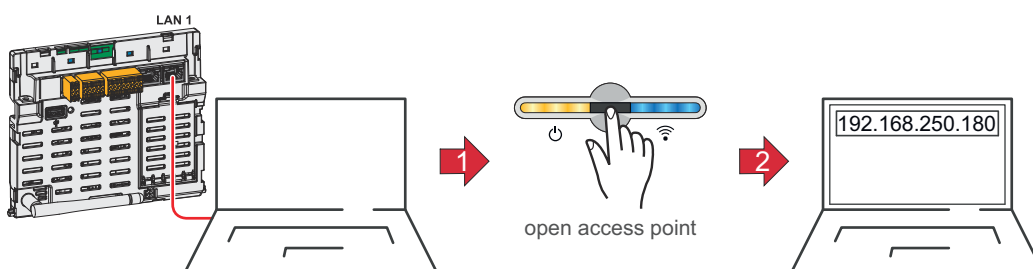
open access point

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 IP address 169.254.0.180 and confirm. The installation wizard is opened.

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

5 Add the system components in Fronius 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 Fronius Solar.web installation wizard.

De-energizing the inverter and switching it back on

De-energizing the inverter and switching it on again
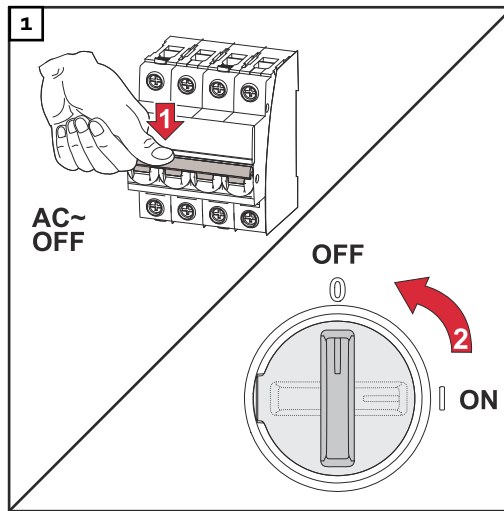
1. Turn off the automatic circuit breaker.
2. Turn the DC disconnector to the "Off" switch position.

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 the browser.

2 In the menu field **"Log In"**, log in with username and password, or, in the menu field **"User"**, click on the **"User login"** button and log in with username and password.

IMPORTANT!
Depending on the authorization of the user, settings can be made in the individual menu fields.

Selecting languages

1 In the menu field **"User"**, click 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 behavior 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} ≤ 0% without disconnection from the grid	Currently not supported	DRM 1/5	IN6
DRM2	Import P_{nom} ≤ 50%	Currently not supported	DRM 2/6	IN7
DRM3	Import P_{nom} ≤ 75% & $+Q_{rel}{}^*$ ≥ 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 optimization 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 Enter the name of the system in the input field **"System name"** (max. 30 characters).

2 Activate **"Synchronize time automatically"** → select "Timezone Region" and "Timezone Location". The date and time are taken over from the time zone entered.

2 Deactivate **"Synchronize time automatically"** → enter or select "Date", "Time", "Timezone Region", and "Timezone Location".

3 Click **"Save"**.

Update

All available updates are provided on the product page and in the "Download Search" area at **www.fronius.com** .

Updating the firmware

1 Drag the firmware file into the "drop file here" field, or select via "Select file".

Update is started.

Setup wizard

The guided setup wizard can be accessed here.

Restoring factory settings

All settings
Resets all configuration data, apart from the country setup. Changes to the country setup may only be made by authorized personnel.

All settings without network
Resets all configuration data, apart from the country setup and the network settings. Changes to the country setup may only be made by authorized personnel.

Event log

Current messages All current events of the linked system components are displayed here.

IMPORTANT!
Depending on the type of event, this must be confirmed via the "tick" button so that it can be further processed.

History
All events of the linked system components that are no longer present are displayed here.

Information

All information regarding the system and the current settings is displayed in this menu area.

Saving as PDF

1 Click the "Save as PDF" button.

2 Select the information individually by ticking the check boxes beside the information or by ticking "Select all".

3 Enter the file name into the input field and click the "Save" button.

The PDF is created and shown.

License Manager   The license file contains the performance data and the scope of functions of the inverter. When replacing the inverter or data communication area, the license 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 and conditions of use and Network settings menu items by clicking on **"Next"**.

The license activation starts.

Licensing - offline:
There must be no Internet connection for this. When licensing offline with an established Internet connection, the license file is automatically uploaded to the inverter. Therefore, when uploading the license file, the following error occurs: "The license 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 license file onto the end device using the **"Download license file"** button.

9 Go to the user interface of the inverter and drag the license file into the "Drag & drop license file here" field, or select it via "Choose license file".

The license activation starts.

Support

Activating the support user

| 1 | Click the **"Activate support user"** button.

The support user is activated.

IMPORTANT!
The support user exclusively enables Fronius Technical Support to configure settings on the inverter via a secure connection. Access is deactivated by clicking the **"End support user access"** button.

Creating support info (for Fronius Support team)

| 1 | Click the **"Create support info"** button.

| 2 | The sdp.cry file is downloaded automatically. For manual download, click the **"Download support info"** button.

The sdp.cry file is saved in the downloads.

Activating remote maintenance

| 1 | Click the **"Activate remote maintenance"** button.

Remote maintenance access for the Fronius Support team is activated.

IMPORTANT!
The remote maintenance access exclusively enables Fronius Technical Support to access the inverter via a secure connection. In this case, diagnostics data is transmitted which is used for troubleshooting. The remote maintenance access can be activated only upon request by 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**).

Selecting and connecting the 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 speed of the transmission between the individual components connected in the system. When selecting the baud rate, it should be ensured that this is the same on the transmit and receive side.

Parity
The parity bit can be used for parity checks. This is used to identify transmission errors. In this case, a parity bit can ensure a specified number of bits. The value (0 or 1) of the parity bit must be calculated at the transmitter, and is checked at the receiver using the same calculation. The calculation of the parity bit can be carried out for even or odd parity.

SunSpec Model Type
There are two different settings, depending on the SunSpec model.

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, which 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, which 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 **Slave as Modbus TCP** function is activated, the following input fields are available:

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

SunSpec Model Type
There are two different settings, depending on the SunSpec model.

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, which 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, which can be found on the user interface of the inverter in the **Communication** → **Modbus** menu.
Factory setting: This value is defined as 1 and cannot be changed.

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
- Setting a constant power factor (cos phi)
- Setting a constant reactive power
- Battery control settings with battery

Limit Control
Here you can enter an IP address that is the only one allowed to control the inverter.

Remote control

Remote control and **Profiles**

The grid operator/energy supplier can influence the output power of the inverter via remote control. This requires the inverter to have an active Internet connection.

Parameter	Value range	Description
Remote control	Off	The remote control of the inverter is deactivated.
	On	The remote control of the inverter is activated.
Allow remote control for regulation purposes (technician)	Deactivated/ Activated	The **Allow remote control for regulation purposes** function 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 regulation purposes** function is activated (technician access required), the **Allow remote control for virtual power plants** function is automatically activated and cannot be deactivated. *)

*) Cloud control

A virtual power plant is an interconnection of multiple generators to form a group. This group can be controlled by means of the cloud control via the Internet. An active inverter Internet connection is a prerequisite for this. System data is transferred.

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.

Activating 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

Information regarding connections and the current connection status is displayed in this menu. If there are problems with the connection, a short description of the error is displayed.

Safety and grid requirements

Country setup

<div style="background:orange">⚠ **WARNING!**</div>

Danger due to unauthorized 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 authorized specialist companies in accordance with national standards and guidelines.

NOTE!

Risk due to unauthorized access.
Incorrectly set parameters can negatively influence the public grid and/or the inverter grid power feed operation, and lead to a loss of conformity with the standard.
▶ The parameters may only be adjusted by installers/service technicians from authorized specialist companies.
▶ Do not give the access code to third parties and/or unauthorized 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 authorized specialist companies.
▶ The parameters may only be adjusted if the utility permits or requires this.
▶ Only adjust the parameters taking into account the nationally applicable standards and/or directives and the specifications of the utility.

The "Country Setup" menu area is intended exclusively for installers/service technicians from authorized 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 utility, 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 authorized 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 Click on the drop-down menu at the top right ⛉

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 and conditions 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 from the drop-down menu at the top right under **Show inverter codes** |

> ⚠ **CAUTION!**
>
> **Risk due to unauthorized access.**
> Incorrectly set parameters can negatively influence the public grid and/or the inverter grid power feed operation, and lead to a loss of conformity with the standard.
>
> ▶ The parameters may only be adjusted by installers/service technicians from authorized specialist companies.
> ▶ Do not give the access code to third parties and/or unauthorized 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

Example 1: "Limit per phase - weakest phase" (setting value: 1,000 W) - symmetrical				
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	9000
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 regulates down to the set value.

"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 considering 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 utility 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 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 = gray (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 signaling 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 con-

nected at one end to the push-in terminal of the data communication area
(SHIELD).
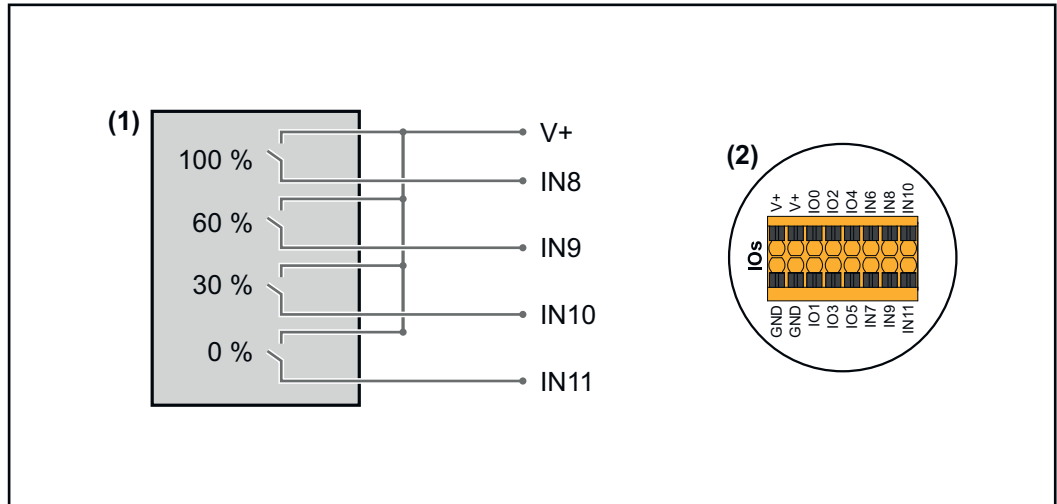
(1)   Ripple control signal receiver with 4 relays, for effective power limiting.
(2)   I/Os of the data communication area.

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.
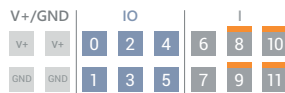
I/O Power Management

V+/GND		IO			I		
V+	V+	0	2	4	6	8	10
GND	GND	1	3	5	7	9	11

DNO Feedback

not used ▾

DNO Rules ⊕

0	None
1	None
2	None
3	None
4	None
5	None
6	None
7	None
● 8	**IO control**
● 9	**IO control**
● 10	**IO control**
● 11	**IO control**

Rule 1

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
100

Power Factor (cos φ)
1   cap ▾

DNO Feedback

Rule 2

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
60

Power Factor (cos φ)
1   cap ▾

DNO Feedback

Rule 3

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
30

Power Factor (cos φ)
1   cap ▾

DNO Feedback

Rule 4

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
0

Power Factor (cos φ)
1   cap ▾

DNO Feedback

⬆ IMPORT   ⬇ EXPORT

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).
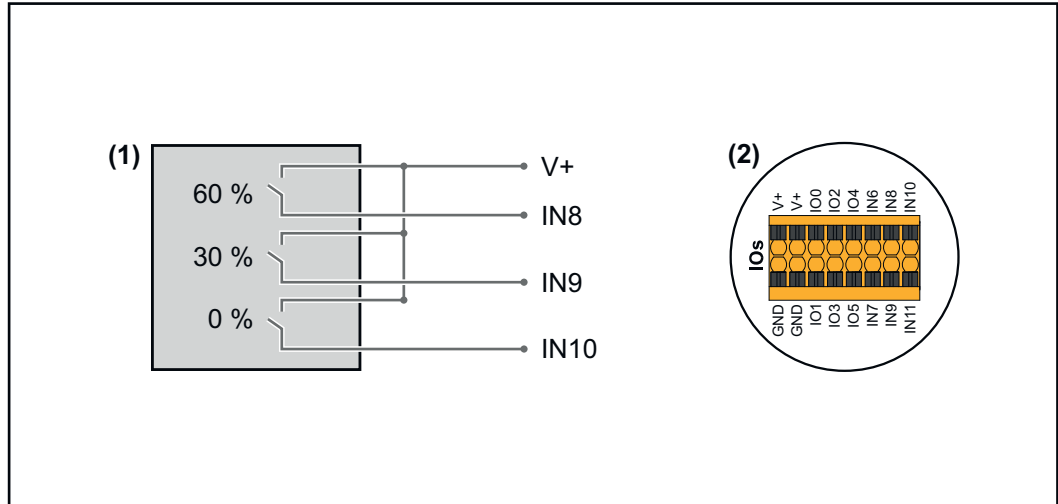
(1)   Ripple control signal receiver with 3 relays, for effective power limiting.

(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

	V+/GND		IO			I		
	V+	V+	0	2	4	6	8	10
	GND	GND	1	3	5	7	9	11

DNO Feedback
not used

DNO Rules ⊕

0	None
1	None
2	None
3	None
4	None
5	None
6	None
7	None
8	**IO control**
9	**IO control**
10	**IO control**
11	None

Rule 1

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
100

Power Factor (cos φ)
1   cap

DNO Feedback

Rule 2

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
60

Power Factor (cos φ)
1   cap

DNO Feedback

Rule 3

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
30

Power Factor (cos φ)
1   cap

DNO Feedback

Rule 4

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
0

Power Factor (cos φ)
1   cap

DNO Feedback

⬆ IMPORT   ⬇ EXPORT

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).

Relay 1	Relay 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

	V+/GND		IO				I		
V+	V+	0	2	4	6	8	10		
GND	GND	1	3	5	7	9	11		

0	*None*
1	*None*
2	*None*
3	*None*
4	*None*
5	*None*
6	*None*
7	*None*
● 8	**IO control**
● 9	**IO control**
10	*None*
11	*None*

DNO Feedback
not used

DNO Rules

Rule 1

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
100

Power Factor (cos φ)
1   cap

DNO Feedback

Rule 2

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
60

Power Factor (cos φ)
1   cap

DNO Feedback

Rule 3

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
30

Power Factor (cos φ)
1   cap

DNO Feedback

Rule 4

0	2	4	6	8	10
1	3	5	7	9	11

Active Power
0

Power Factor (cos φ)
1   cap

DNO Feedback

⬆ IMPORT   ⬇ EXPORT

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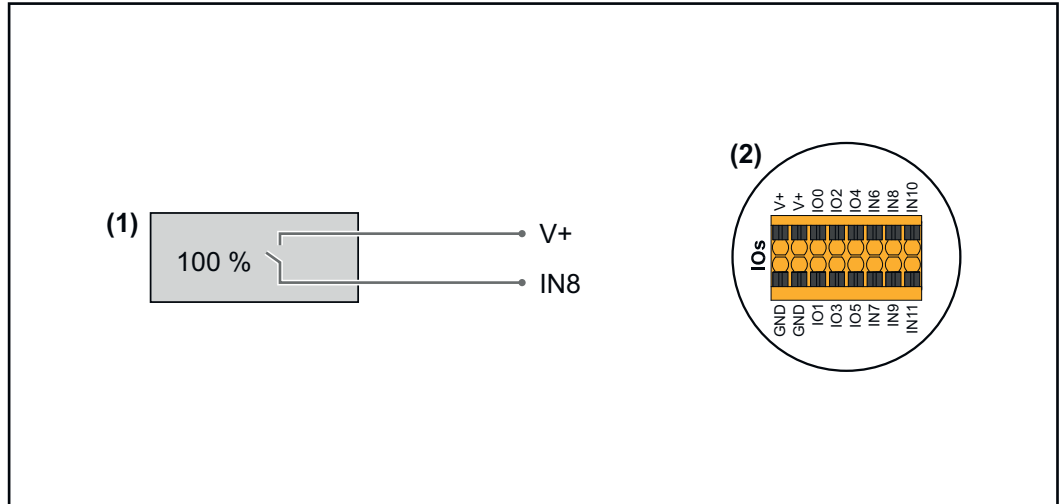
(1)   Ripple control signal receiver with 1 relay, for effective power limiting.
(2)   I/Os of the data communication area.

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

I/O Power Management

|	V+/GND		IO						
	V+	V+	0	2	4	6	8	10	
	GND	GND	1	3	5	7	9	11	

DNO Feedback
not used ▾

DNO Rules ⊕

Rule 1 🗑 ⬤ ⌃

| 0 | 2 | 4 | 6 | 8 | 10 |
| 1 | 3 | 5 | 7 | 9 | 11 |

Active Power
⬤ 100

Power Factor (cos φ)
○ 1 | cap ▾

⬤ DNO Feedback

Rule 2 🗑 ⬤ ⌃

| 0 | 2 | 4 | 6 | 8 | 10 |
| 1 | 3 | 5 | 7 | 9 | 11 |

Active Power
⬤ 0

Power Factor (cos φ)
○ 1 | cap ▾

⬤ DNO Feedback

0	None
1	None
2	None
3	None
4	None
5	None
6	None
7	None
8	**IO control**
9	None
10	None
11	None

⬆ IMPORT   ⬇ EXPORT

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, grid power feed operation 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

Service, maintenance and disposal

General

The inverter is designed so that it does not require additional maintenance work. Nevertheless, a few points must be considered during operation to ensure that the inverter works perfectly.

Maintenance

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

Cleaning

Wipe the inverter, if necessary, with a damp cloth.
Do not use cleaning agents, scouring agents, solvents, or similar products to clean the inverter.

Safety

⚠️ **WARNING!**

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

Disposal

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. Used equipment must be returned to the distributor or through a local authorized collection and disposal system. Proper disposal of the used device promotes sustainable recycling of resources and prevents negative effects on health and the environment.

Packaging materials
- Collect separately
- Observe local regulations
- Crush cardboard boxes

Warranty provisions

**Fronius manu-
facturer's war-
ranty**

Detailed, country-specific warranty conditions are available at **www.fronius.com/
solar/warranty.**

To obtain the full warranty period for your newly installed Fronius product,
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 (operating LED: flashes red)

Cause:	A device that is connected in the WSD chain has interrupted the signal line (e.g., surge protection device) or the bypass installed ex works as standard has been removed and no trigger device has been installed.
Remedy:	If the SPD surge protection device has tripped, the inverter must be repaired by an authorized specialist.
OR:	Install the bypass installed ex works as standard or a trigger device.
OR:	Turn the WSD (wired shutdown) switch to position 1 (WSD master).

> ⚠️ **WARNING!**
>
> **Danger from work that is not carried out properly.**
> This can result in severe personal injury and damage to property.
> ▶ The installation and connection of an SPD surge protection device may only be carried out by Fronius-trained service personnel in accordance with the technical specifications.
> ▶ Observe 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
Rated 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 / 29.4 ms

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
Rated 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
Rated 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
Rated 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
Rated 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 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 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

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

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
Rated 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

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	
Rated 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 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

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 (1Mbps DBPSK, 2Mbps DQPSK, 5.5/11Mbps CCK) 802.11g: OFDM (6/9Mbps BPSK, 12/18Mbps QPSK, 24/36Mbps 16-QAM, 48/54Mbps 64-QAM) 802.11n: OFDM (6.5 BPSK, QPSK, 16-QAM, 64-QAM)

Surge protection 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 (l_{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 protection 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 protection 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 protection 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 (I_{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 A.
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	
Utilization category and/or PV utilization category	according to IEC/EN 60947-3 utilization category DC-PV2
Rated short-time withstand current (I_{cw})	Rated short-time withstand current (I_{cw}): 1000 A
Rated short-circuit capacity (I_{cm})	Rated short-circuit 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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