SUNSYS H30-H30i

Installations- und bedienungsanleitung DE
Manual de instalación y uso ES
Manuel d'installation et d'utilisation FR
Installation and operating manual GB
Manuale di installazione e uso IT

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1. SAFETY INSTRUCTIONS

1.1. ABOUT THIS MANUAL

This manual provides detailed information on photovoltaic inverter specifications, installation procedures, functions and settings. Installation technicians must be well-trained and qualified, and must observe all the safety instructions and installation procedures.

1.2. SAFETY SYMBOLS AND INSTRUCTIONS

WARNING!
Serious injury and even death may occur if safety standards are not observed.

WARNING: RISK OF BURNS
The outer casing temperature can reach 70°C.
Hot surfaces may constitute a hazard.

WARNING! RISK OF ELECTRIC SHOCK!
The inverter may only be opened by authorised personnel for technical assistance purposes.
Risk of electrocution due to the energy stored in the condensers; wait 5 minutes before removing the cover and make sure no hazardous voltage is present.

WARNING!
Device with several power supply sources.
In the event of system maintenance, carry out the following steps beforehand:
- Open the AC switch.
- Open the DC switch.
- Make sure the system cannot be restarted.
- Make sure the electricity supply has been disconnected.

1.3. STANDARDS AND GUIDELINES

When carrying out electrical installation, all standards specified by the IEC and the electricity supplier must be observed.

Certificate of compliance

The inverter complies with all technical and construction-related requirements from a safety perspective, with the electromagnetic compatibility directive (2004/108/EC) and the low voltage directive (2006/95/EC).

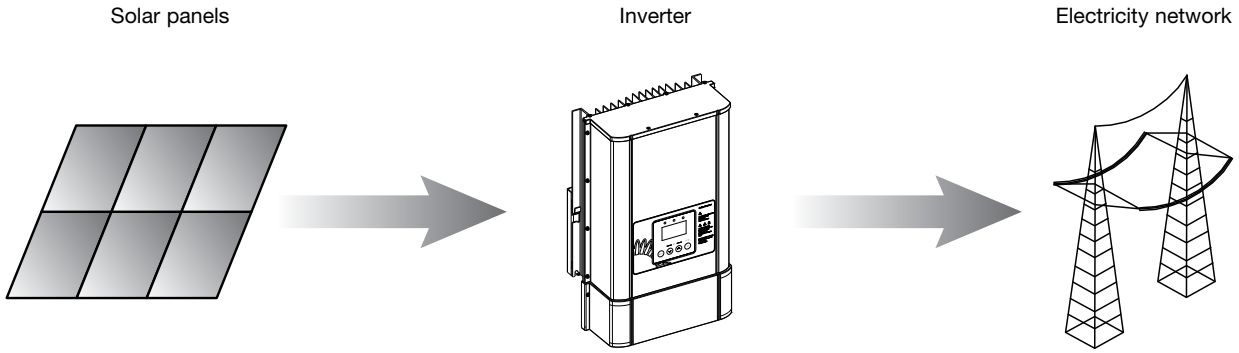
The inverter also complies with the following standards and directives:

- IEC 62109-1: 2010-12 Safety of power converters for use in photovoltaic power systems - Part 1: General requirements.
- IEC 62109-2: 2011 Safety of Power converters for use in photovoltaic power systems - Part 2: Particular requirements for inverters.
- EN 61000-6-3: 2007-01 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial enviroments.
- EN 61000-3-2: 2006-04 Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current < = 16 A per phase).
- EN 61000-3-3: 2008-09 Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current < = 16 A per phase and not subject to conditional connection.
- EN 61000-6-2; 2006-03 Electromagnetic Compatibility (EMC) - Part 6-2: Generic standards - Immunity for Industrial Environments.
- CEI 0-21: 2012-06 Reference technical rules for the connection of active and passive users to the LV electrical utilities (Italy).
- CEI Guide 82-25: Guide to the production of photovoltaic generation systems connected to medium and low voltage electricity networks.
- DIN V VDE V 0126-1-1: 2006-02 Automatic disconnection device between a generator and a public low voltage grid (France).
- UTE C 15-712-1 (Practical Guide): 2010-07 Low-Voltage electrical installations - Photovoltaic installations connected to the public distribution network (France).
- VDE-AR-N 4105: 2011-08 Power generation systems connected to the low-voltage distribution network-Technical minimum requirements for the connection to and parallel operation with low-voltage distribution networks (Germany).

2. PRODUCT DESCRIPTION

The inverter is a photovoltaic inverter for conversion of direct current into alternating current in line with the mains network. In accordance with local and national regulations, in the event that excess energy is produced it can be sold to the local electricity supply company or credited in anticipation of future consumption; if not much energy is obtained from the photovoltaic system, it will be drawn from the mains network instead, to ensure that household utilities continue to run normally. The operating principle is illustrated in figure 2.1.

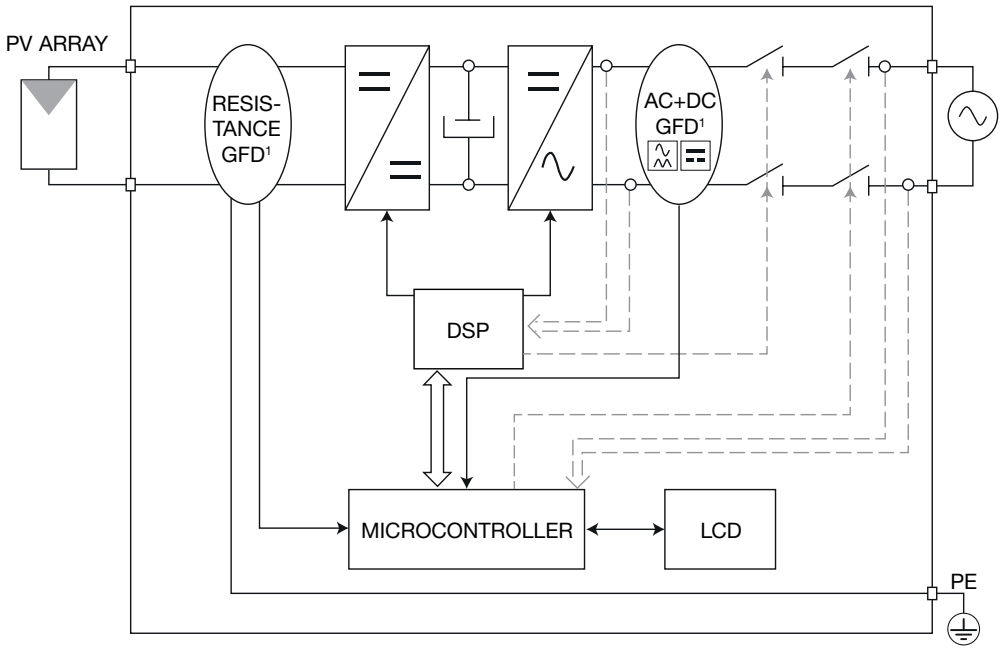
2-1 Operating principle of a photovoltaic system



2.1. TECHNICAL DESCRIPTION

Figure 2.1-1 is a block diagram of the inverter.

2.1-1 Block diagram of the inverter



¹ GFD = Ground Fault Detection

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This version of the inverter does not have a transformer, i.e. there is no galvanic insulation between the input and output; it must therefore be used with panels which do not have an earth connection conforming to standard IEC61730, class A. Large capacity photovoltaic modules may only be used if the coupling capacitance to ground is lower than 100 nF/kWp. The earth leakage current (whose value depends on the type of module-mounting structure used as well as the prevalent meteorological conditions) should not exceed 150 mA.

The application of cutting-edge technology allows a large electrical and thermal operating interval. The advanced MPPT control system, the high efficiency levels, the wide voltage range of the PV field and the ability to manage transitory power peaks greater than the rated power supply, all help to provide maximum photovoltaic energy in every condition. Plus, thanks to its high IP class and innovative temperature control, the inverter can be placed outdoors. To achieve the best performance levels, the recommendations provided in this manual should always be observed.

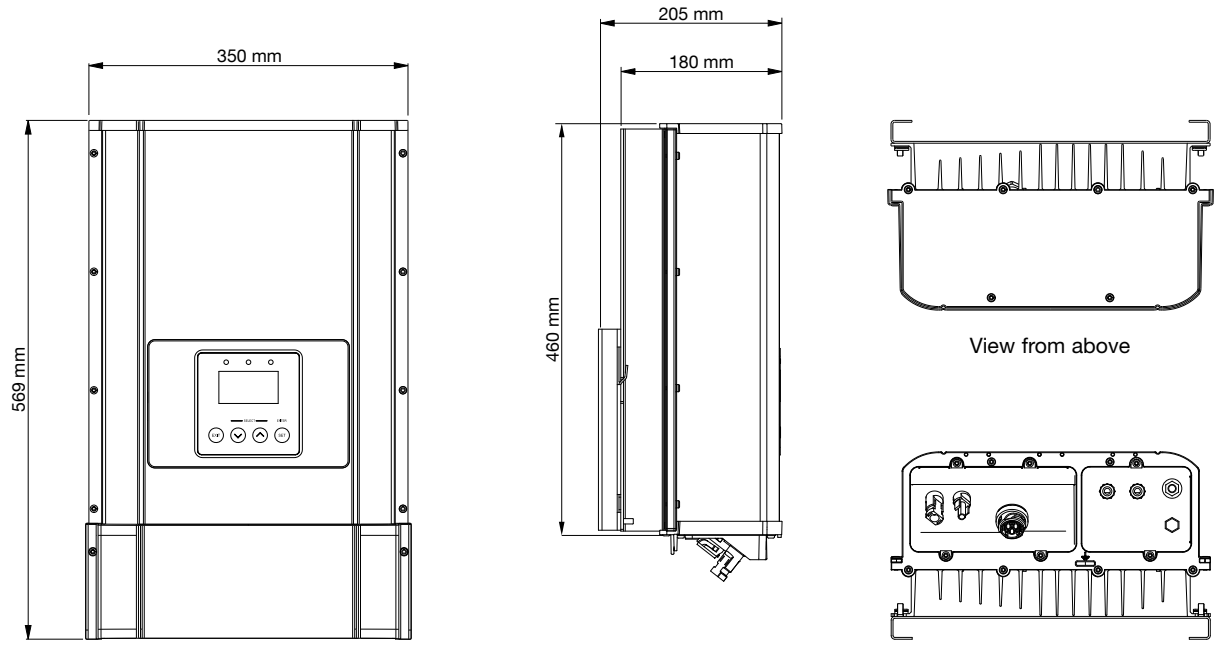
The inverter has additional functions to satisfy current regulations and to help stabilise the mains distribution network to which it is connected.

These functions include:

- Reactive power management.
- Power adjustment in accordance with network parameters.
- Non-sensitivity to voltage drops (LVFRT capability).

2.2. DIMENSIONS

2.2-1 Dimensions and overall size of the inverter



Front view with guard cover[1]

Side view without guard cover[1]

View from above

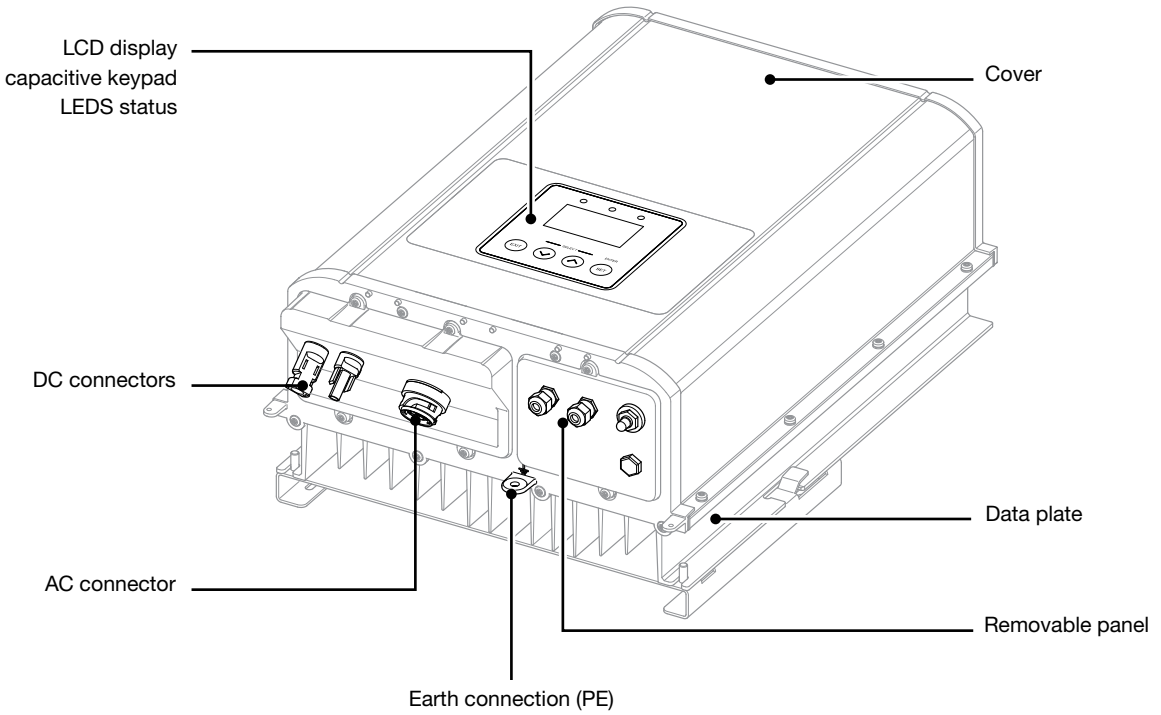
View from below

[1] Dimensions in mm

2.3. INTRODUCTION TO OPERATION

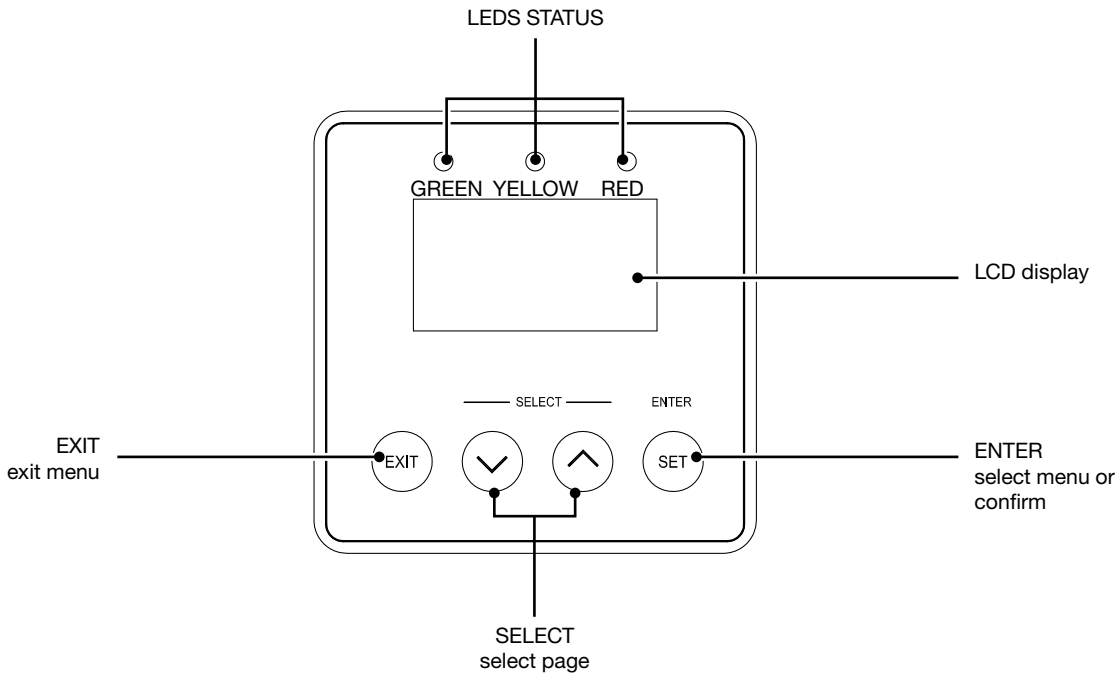
The external features of the inverter are illustrated in figure 2.3-1 and the corresponding detailed description is provided in sub-paragraphs 2.3-1 to 2.3-2.

2.3-1 External inverter features



2.3.1. LCD display and buttons

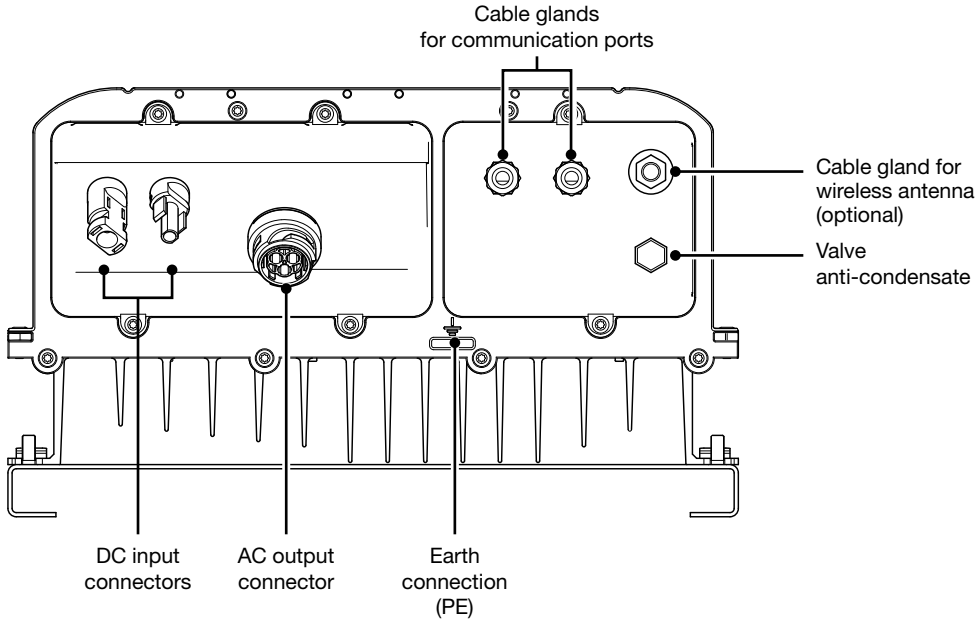
2.3.1-1 System status information



2.3.2. Inverter input/output interfaces

WARNING!
The external earth connection terminal (PE) must be connected to the earth wire before the power supply is connected

2.3.2-1 Inverter input/output interfaces



3. INSTALLATION

3.1. BEFORE INSTALLATION

Due to the variety of potential user installation environments, reading this chapter carefully before installation is strongly recommended. All installation and start-up procedures must be undertaken by qualified and well-trained technicians.

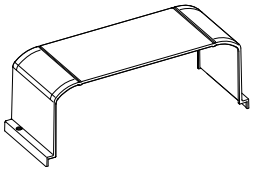
3.2. CHECKING THE PACKAGING

Unforeseen events may occur during transportation. Make sure the packaging is not damaged. Once the packaging has been opened, proceed as follows:

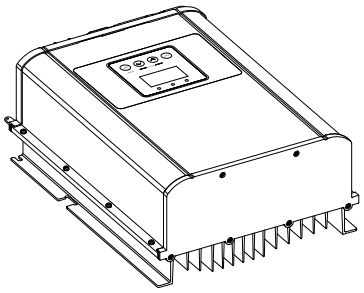
1. Make sure the inverter model and specifications match those requested.
2. Make sure the inverter is not damaged.
3. Make sure all the accessories have been included; accessories supplied as standard are listed in the table below.

3.2-1

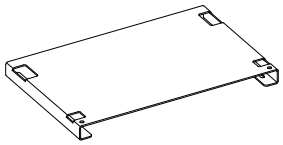
Cover



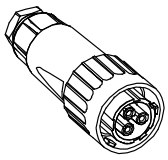
Photovoltaic inverter



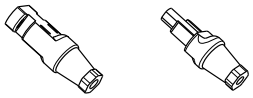
Bracket



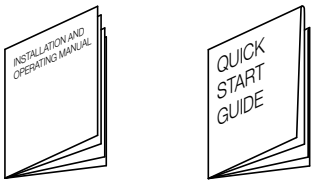
AC connector



Connectors DC- and DC+



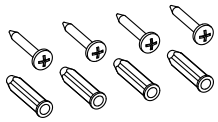
Documentation



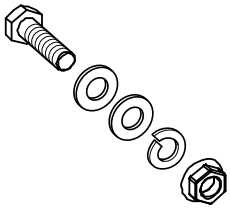
Screws M4 (to fasten cover)

Nuts M6
(to fasten inverter to bracket)

Dowels and screws
(to fasten bracket)



Screw, nut, washers M6
(to fasten ground cable)



WARNING!
If any external or internal inverter damage is detected, or if any of the packaged accessories are damaged or missing, please contact your inverter supplier.

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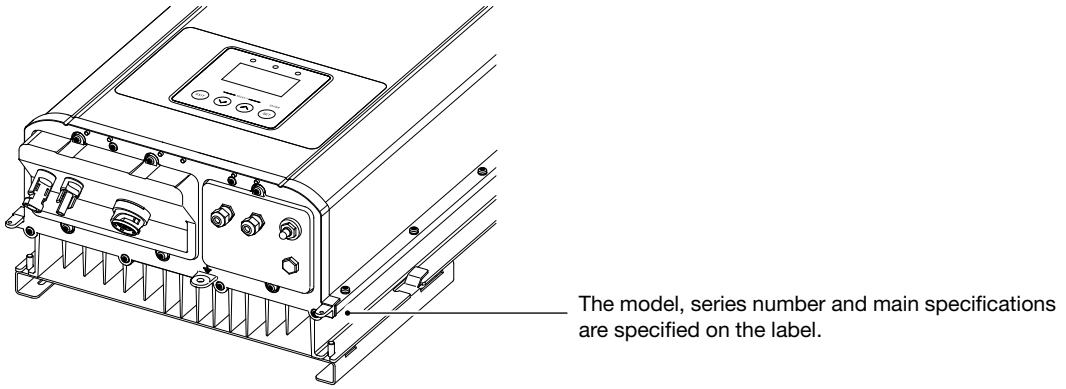
3.3. IDENTIFYING THE INVERTER

The inverter can be identified using its data plate, located on the right-hand side of the radiator (see figure 3.3-1).

3.3-1 ID label



3.4. CHOOSING THE INSTALLATION SITE

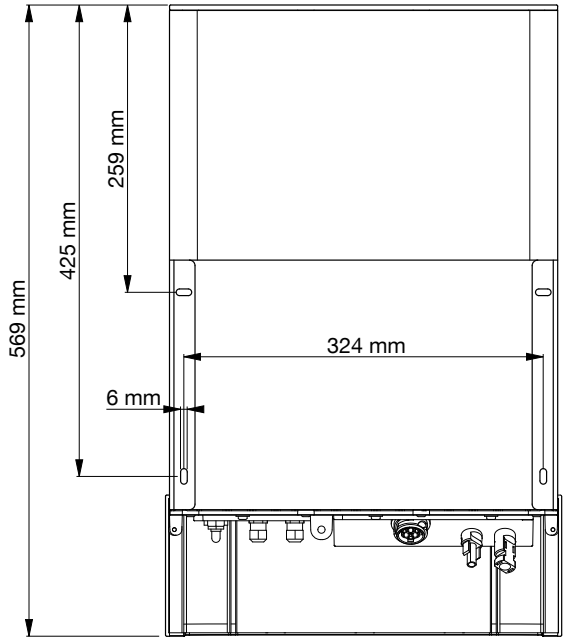
The inverter installation site must be chosen on the basis of the following criteria:

- The inverter must be positioned at a height which allows easy viewing of the display and the LEDS status.
- Install the unit in well-ventilated areas and away from direct sunlight.
- Do not install the unit next to or above flammable objects.
- Do not install the unit in particularly busy areas, or where people can come into contact with the equipment easily.
- Mount the unit by fixing it securely to a solid wall.
- The protective panel underneath the right-hand part of the guard cover must be removed in order to replace the clock battery, access the communication port and update the software as necessary.
  Enough space must therefore be left underneath the inverter so that this side and the connections can be accessed easily.

3.5. WALL-MOUNTING

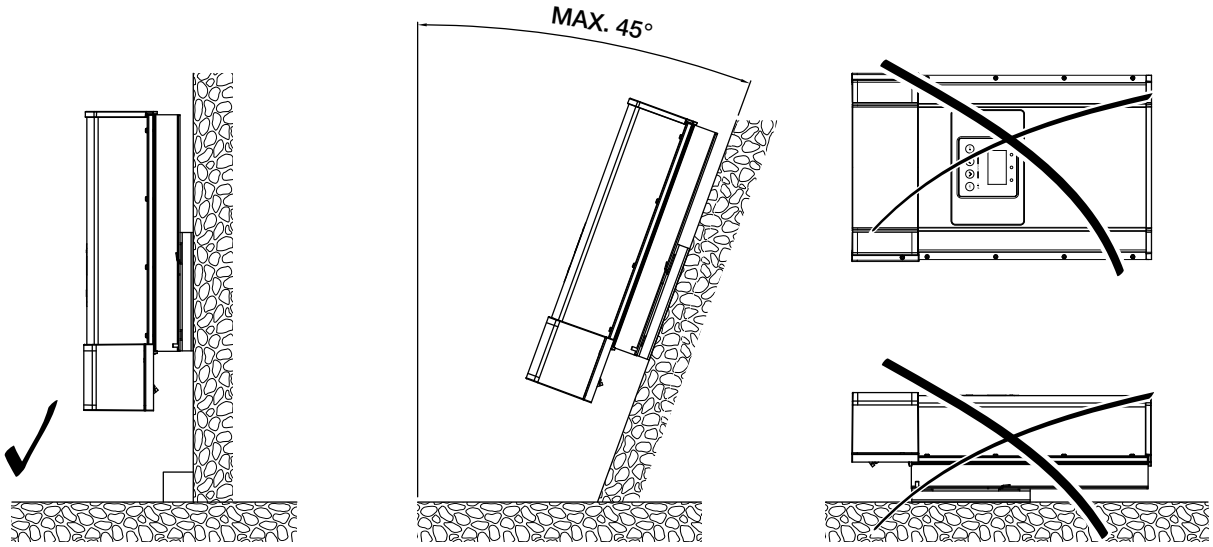
This inverter is designed for mounting on masonry walls. If the walls are made using different materials, the installer must use suitable mounting supports. The mounting bracket dimensions are indicated in the figure below. Fix the bracket (supplied) securely to the wall before hanging the inverter on it.

3.5-1 Securing the mounting bracket with screws



WARNING!
Mount it vertically or at a maximum angle of 45° (see figure 3.5-2). Be careful, as in this case a drop in performance (derating) may occur due to the deterioration of heat dispersal.

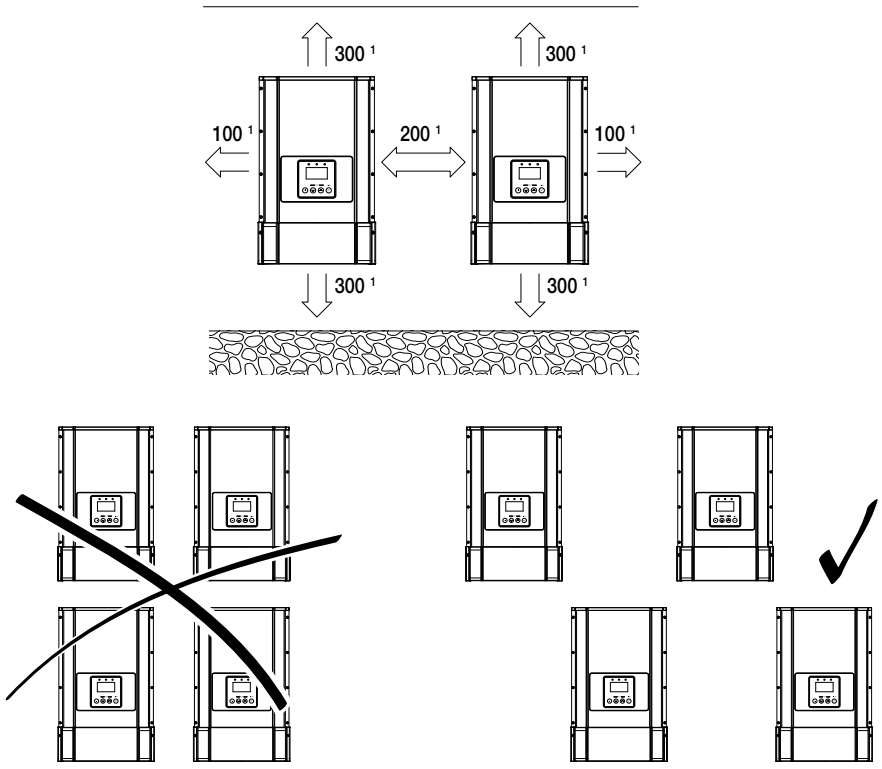
3.5-2 Correct and incorrect installation examples



Install the inverter in a space which is large enough to allow good ventilation and facilitate installation or any necessary removal of the product. The minimum distances are indicated in figure 3.5-3.

WARNING!
- Leave a suitable distance when installing one or more photovoltaic inverter systems.
- Install the photovoltaic inverter in a clean, cool room, away from direct sunlight.

3.5-3 Suitable installation distances



[1] Dimensions in mm

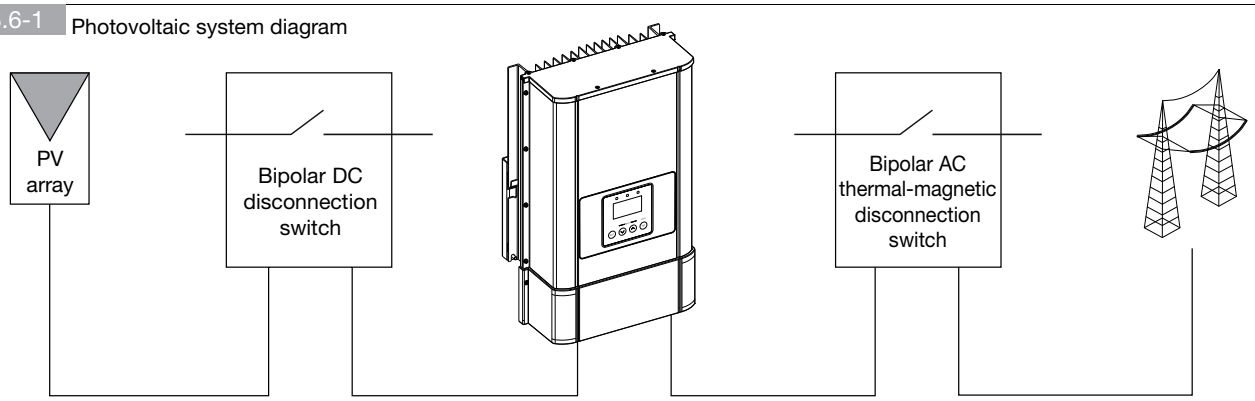
WARNING!
Make sure the electrical installation and the system comply with relevant national regulations.

The diagram of a typical inverter installation is illustrated in figure 3.6-1.

DANGER!
Risk of electric shocks from live device parts!
The inverter can be connected to two separate power sources:
- DC cable – Power from the photovoltaic generator
- AC cable – Power from the mains network, supplied by the electricity company

Before carrying out any work, make sure the electricity sources have been disconnected.

3.6-1 Photovoltaic system diagram



3.5.1. Network disconnection

A protection and disconnection system for the AC network should be installed on the fixed switchboard.

For correct installation, we recommend using a C curve 16 A thermal-magnetic switch.

3.5.2. Photovoltaic field disconnection

WARNING!
Before carrying out any photovoltaic field connection procedures, make sure the DC power switch is disconnected.

To prevent risks to operators and systems resulting from incorrect handling (opening of the switch when charged), we recommend the use of DC switches capable of opening the circuit at the maximum specified PV field short-circuit current and voltage levels (check the values in the technical data table).

3.5.3. Protection against fault currents

The inverter is fitted with a unit which monitors and detects fault currents; this is sensitive to all types of ground fault current.

We recommend the application of an external type A 30 mA differential protection device with low sensitivity (S).

The differential protection device to be used may depend on the photovoltaic field installed, that is the equivalent parasitic capacity of the photovoltaic modules in relation to earth. In fact, during operation, a current is created and discharged to earth; its value depends on the type of module mounting used (structure, expanse, type of panels) and the meteorological conditions (rain, snow, humidity...). If the equivalent parasitic capacity between the modules and earth is high (in general, over 200 nF) it may be necessary to use a differential device which triggers at fault currents over 100 mA.

3.5.4. Protection against transitory over-voltages

The inverter is designed for transitory over-voltages in category II installations for AC terminals. If the inverter may be subjected to transitory over-voltages in category III installations, protective SPD dischargers must be provided for the AC power supply network.

If the photovoltaic panels are more than 10 metres away from the inverter, we recommend SPD dischargers are also installed on the DC side.

4. WIRING

WARNING!
The inverter must only be connected to the mains electricity network by qualified operators after the appliance has been securely fixed to the wall.

Before carrying out any electrical connection or system maintenance procedures, the following checks must be performed:
- Make sure that both disconnection switches (DC and AC) are open (OFF).
- Make sure the photovoltaic system cannot be restarted.
- Cover the panels with radiation blocking material (preferably black in colour).
- Make sure there is not electrical voltage being supplied from the mains network or the photovoltaic field.

Any non-conforming procedure could place the operator in a hazardous situation and may damage the equipment.

WARNING!
Always observe the rated voltage and current values specified in the design phase of your system. It is especially important to observe the maximum voltage and current values for the photovoltaic field (see "Technical data" chapter).

4.1. EARTH WIRE CONNECTION

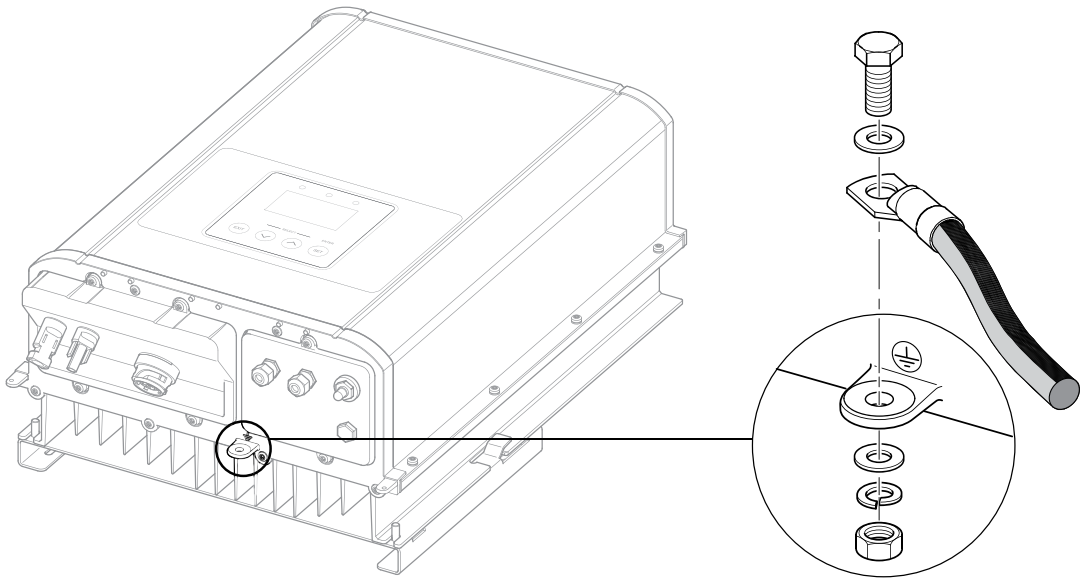
DANGER!
Risk of electric shocks from live device parts!
The inverter can be connected to two separate power sources:
- DC cable – Power from the photovoltaic generator
- AC cable – Power from the mains network, supplied by the electricity company

Before carrying out any work, make sure the electricity sources have been disconnected.

Before connecting to the mains network and photovoltaic field, the inverter should be earthed using the connection point on the casing. The wire must have a cross-section which is at least equal to that of the phase wire in order to guarantee optimal conductivity.

Correct connection is illustrated in figure 4.1-1.

4.1-1 Earth wire connection illustration



For safety reasons, the equipment must always possess an earth connection, which in any case must also be the last connection to be disconnected.

4.2. MAINS CONNECTION (AC)

DANGER! Risk of serious injury and even death.
Before carrying out any AC mains network connection procedures, make sure the AC power is disconnected.

Size the cross-section of the wires in the AC cable so that line losses are minimised at rated power (see maximum AC current in the "Technical data" table). We recommend using wires of at least 2.5 mm^2. The AC connector supplied allows wires up to 14 mm^2, with an external insulation diameter not exceeding 12 mm.

4.2.1. Connection procedure

Take care to perform wiring correctly, observing the polarities.

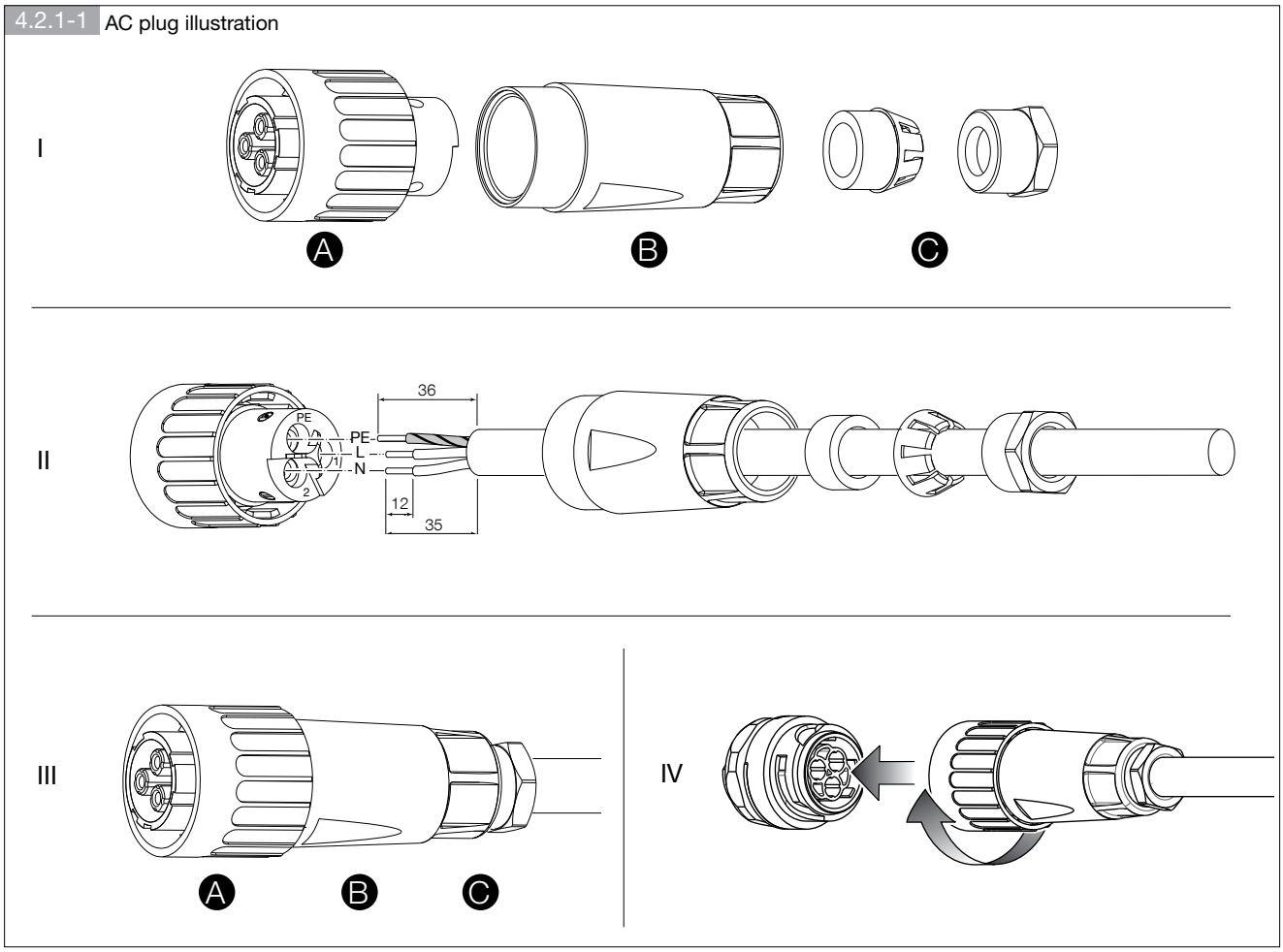
I - Unscrew the connector in three parts: Ⓐ, Ⓑ and Ⓒ (Fig. 4.2.1-1).

II - Run the cable through Ⓑ and Ⓒ.
Strip the wires
Secure the wires as indicated below, taking care to observe the polarities:
- Insert the earth wire (PE) corresponding to the relevant symbol
- Insert the phase wire (L) corresponding to terminal 1
- Insert the neutral wire (N) corresponding to terminal 2

III - Screw the plug together in the order indicated: Ⓐ with Ⓑ and Ⓑ with Ⓒ.

IV - Plug the connector into the appropriate AC input on the inverter.

4.2.1-1 AC plug illustration



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4.3. PHOTOVOLTAIC FIELD CONNECTION (DC)

DANGER!
- Risk of serious injury and even death!
- Before carrying out any photovoltaic field connection procedures, make sure the DC power switch is disconnected.

Use suitable cables for connection to the photovoltaic field. Size the cross-section of the wires in accordance with the maximum photovoltaic field short-circuit current and so as to minimise cable conduction losses. The DC connectors supplied allow PV1-F cables with a maximum cross-section of 6 mm^2.

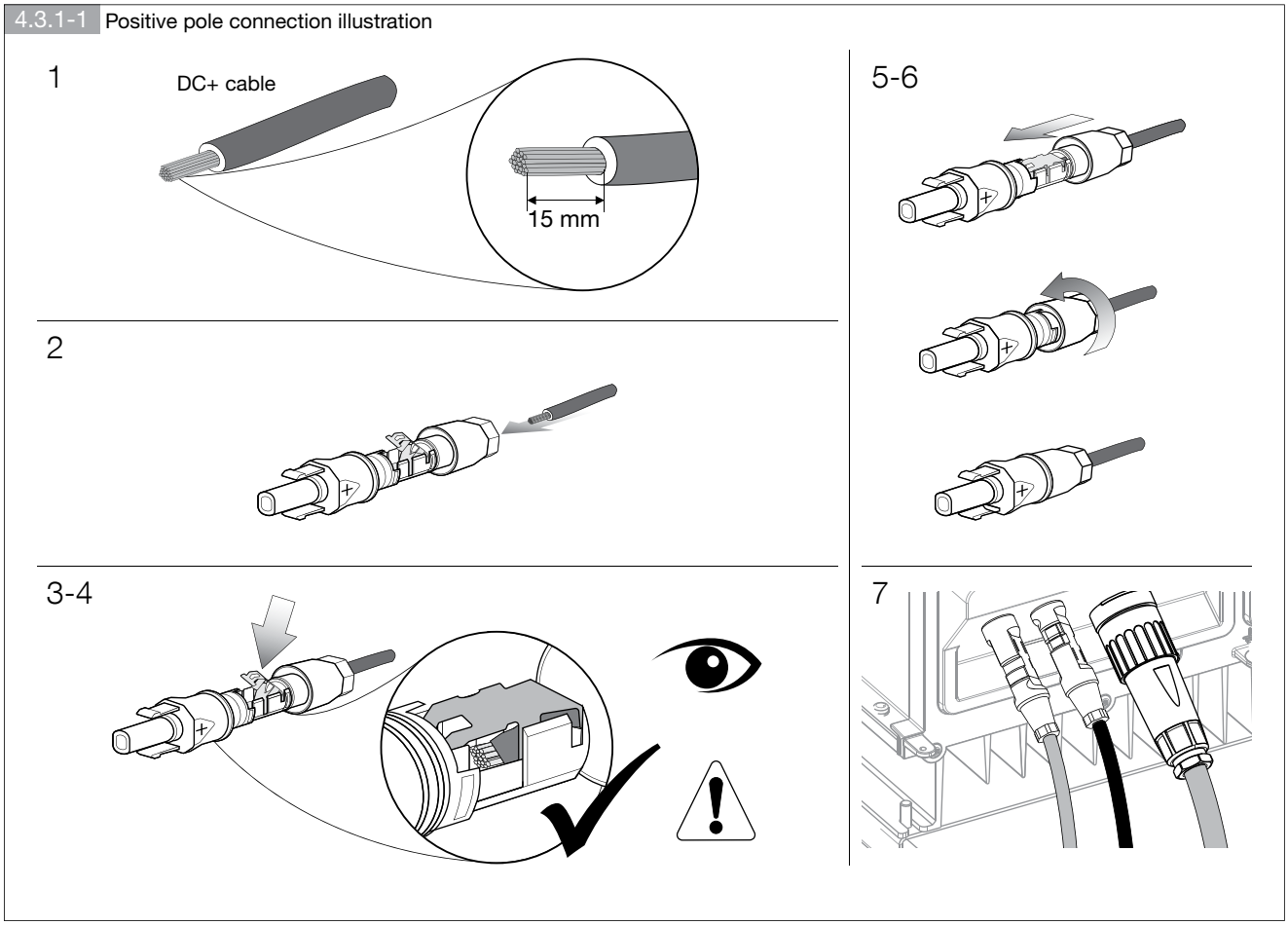
WARNING!
The DC connectors are polarised. Take care to perform wiring correctly, observing the polarities.

Figure 4.3.1-1 illustrates how to connect the positive pole of the photovoltaic field to the corresponding DC+ connector. The negative pole can be connected in the same way.

4.3.1. Connection procedure

1. Unscrew the cable gland for the relevant DC connector and run the cable (which should have been stripped at the end by approx. 15 mm) through it.
2. Insert the cable into the connector as far as it will go.
3. Press the terminal downwards until it clicks into position.
4. Make sure the cable is fixed in position securely. The cable is properly secured if the wires can be seen inside the terminal chamber.
5. Push the screw connection onto the threading.
6. Screw on the cable gland.
7. Plug the connectors into the appropriate DC inputs on the inverter.

4.3.1-1 Positive pole connection illustration



4.3.2. DC connector opening procedure

1. To unlock the plug-in connector, insert a screwdriver into the side connection.
2. Unfasten it carefully.
3. Loosen the terminal using a screwdriver with a 3.5 mm wide tip.
4. Remove the cable.

4.4. COMMUNICATION PORT CONNECTION

WARNING!
For authorised service personnel only.

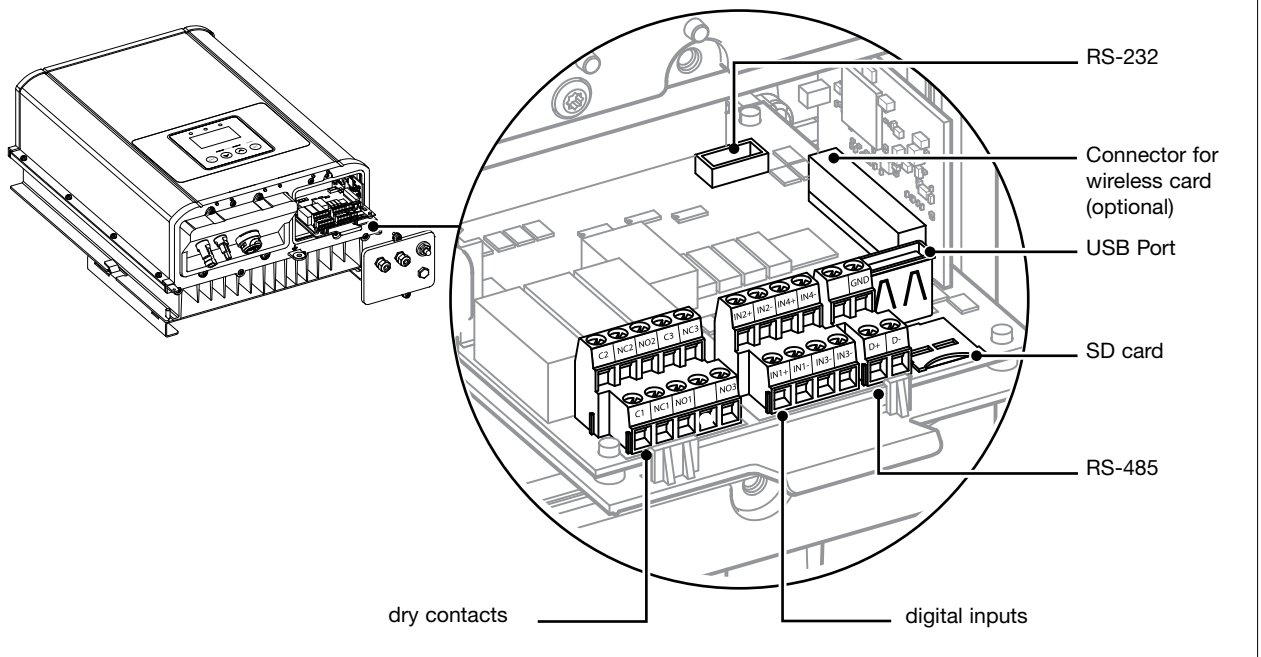
To access the communication ports, take off the removable panel underneath the casing on the right-hand side (as illustrated in figure 4.4-1). A pull-out compartment offers easy access to the interface card which supports the man-machine communication functions described in the table below:

Communication port description			
Communication ports	**Quantity**	**Connection type**	**Function**
RS-485	1	Terminal block: D+, D-, GND	Serial communication interface
Micro SD card [1]	1	Micro SD card connector	Archiving of past events and statistics [2]
USB [1]	1	A-type USB connector	Firmware updating
Dry contacts	3	Terminal block: C1, NC1, NO1; C2, NC2, NO2; C3, NC3, NO3	For alarm or machine status indication
Digital inputs	4	Terminal block: IN1+, IN1-; IN2+, IN2-; IN3+, IN3-; IN4+, IN4-	Setting signals transmitted by the distributor according to standard CEI EN 61850 series protocol
RS-232	1	2x5 pin header SMD connector	Service communication port
Wireless (IEEE 802.11 g/n)	1	Male 2x14 pin SMD connector	Connector for wireless communication kit (optional)

1. FAT32 formatting required.

2. Micro SD card not included. Before removing the SD card, select the removal command on the display via the COMMANDS menu.

4.4-1 Communication port illustration



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The accessible communication ports on the interface card terminal block are:
- Digital inputs: input ports for external inverter control
- Dry contacts: output ports for external signalling of inverter status
- RS-485: port for communication between inverter and external interface device

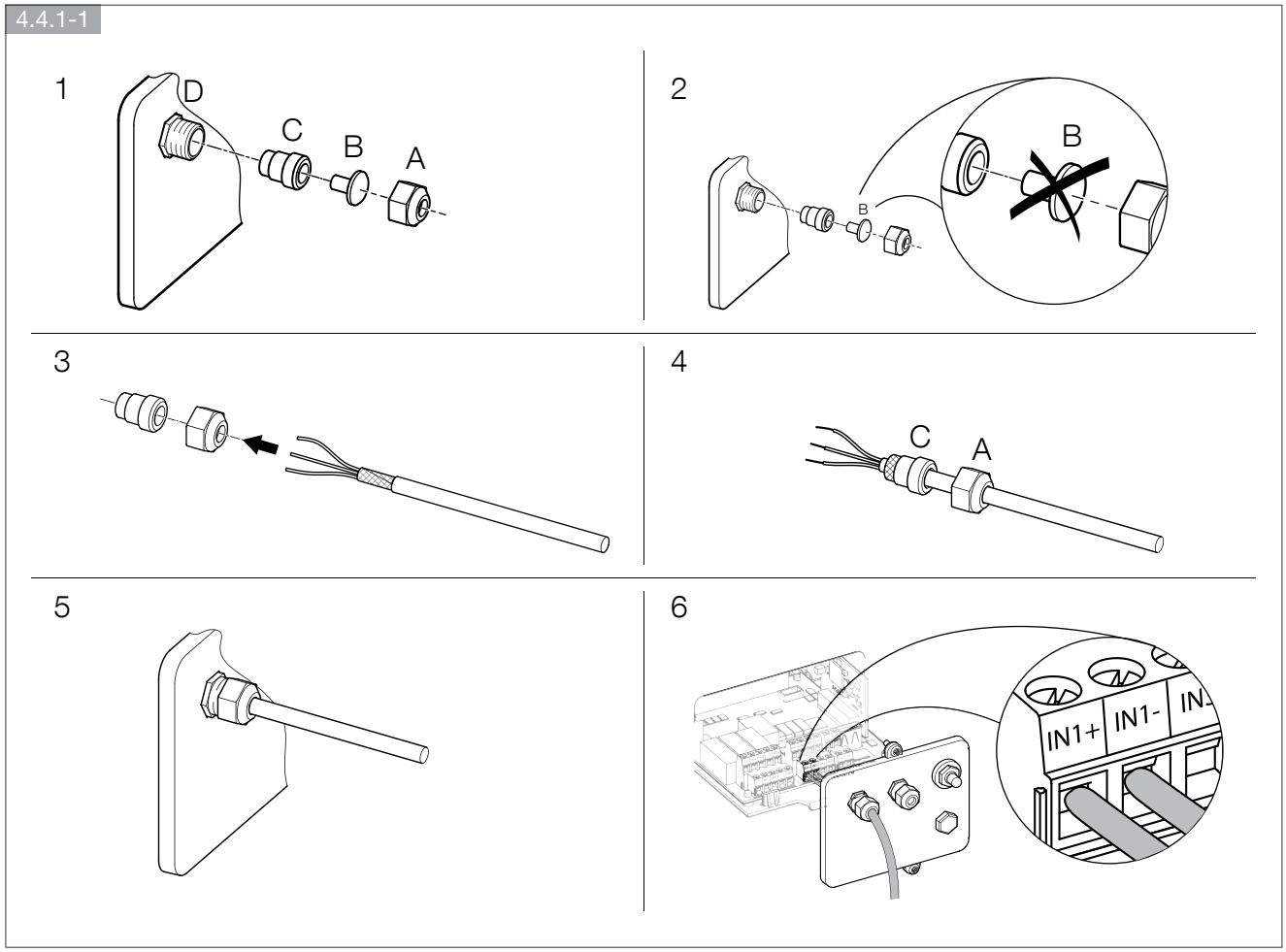
The next few paragraphs describe how to connect and set up the communication ports.

4.4.1. Terminal block connection procedure

WARNING!
Communication port connection cables must be shielded and guarantee protection of at least 600 V.
Use shielded multi-pole cables with an external diameter between 4.5 and 6 mm.
The communication cable sleeve should be connected to the inverter earth, following the procedure illustrated in figure 4.4.1-1;

1. Unscrew the cable gland
2. Remove the protective plug B
3. Run the cable through A and C
4. Strip the cables and fold the sleeve back over the metal part of C
5. Screw cable gland A+C+D on securely to guarantee the IP class and make sure of a good connection between the sleeve and metal cable gland
6. Perform terminal block connection
7. Close the removable panel

4.4.1-1



4.4.2. Digital inputs

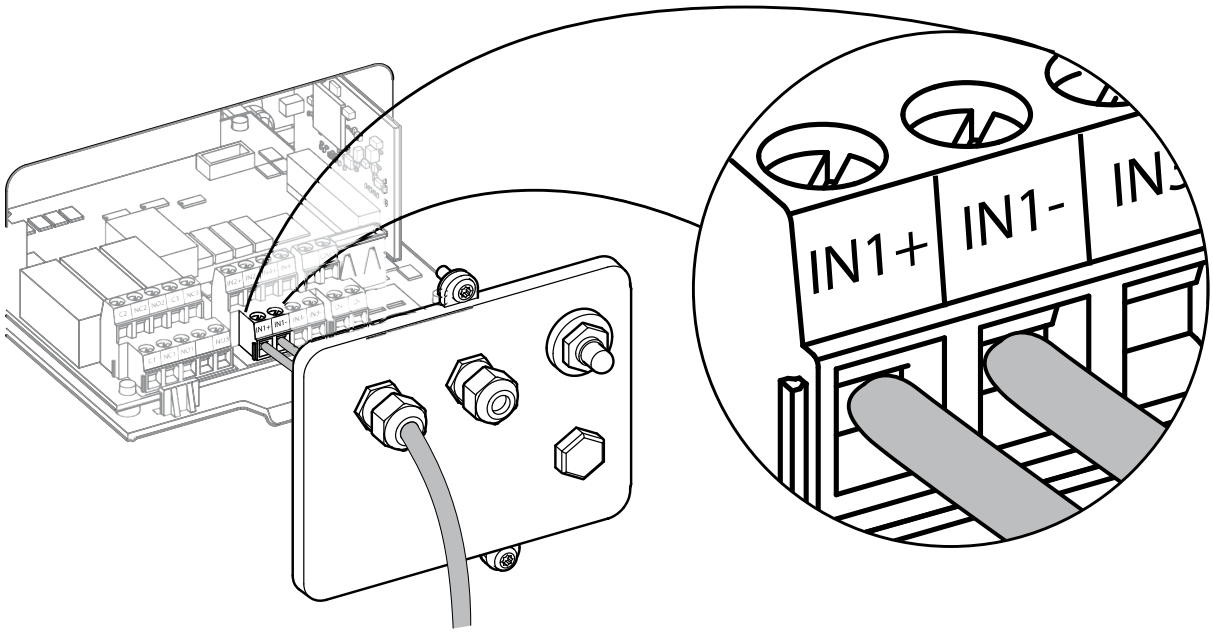
The inverter has 4 optically coupled digital inputs which can be accessed from the communication terminal block. Each digital input consists of 2 terminals: INi+ and INi- (i = digital input identification number).

The digital input should be controlled using a contact between the INi+ and INi- terminals. Closure of the external contact activates the digital input.

If the communication ports are activated during the startup wizard, the functions listed in the table will be associated with the input ports.

Port	Function	Signal on display when command active
IN1	Monitoring of external over-voltage dischargers (SPD)	W07: EXTERNAL SPD FAULT
IN2	Remote power off	A01: EXTERNAL SHUTDOWN ACTIVATED
IN3	Programmable	
IN4	Programmable	

4.4.2-1 Connection example for the contact signalling external discharger intervention



Access the display menu **SETTINGS > CONNECTIVITY > DIGITAL INPUT** to check or modify the functions assigned to the programmable digital inputs.

4.4.3. Dry contacts

The inverter has 3 programmable digital inputs for external signalling of its own status.

The digital inputs are supplied as dry contacts on the communication terminal block. Each dry contact consists of a relay with 3 available terminals on the terminal block: Ci, NCi, NOi (i = digital output identification number).

Digital output activation causes the contact between the Ci and NOi terminals to close. If this is not the case, the dry contact keeps the Ci and NCi terminals short-circuited.

The current and rated voltage permitted by the NCi and NOi contacts is: 2 A, 250 VAC.

The desired function can be assigned to dry contacts via the display menu **SETTINGS > CONNECTIVITY > DIGITAL OUTPUT.**

For example, to monitor systems status, it may be useful to set a remote general alarm for the inverter.

4.4.4. RS-485 serial port

The RS-485 serial port uses a cable with 3 wires: two for the differential communication signal (D+ and D-) and a third for the voltage reference (GND) in line with the RS-485 standard.

If using RS-485 communication, activate the communication ports during the startup wizard.

However, the RS-485 communication parameters can always be set via the display menu **SETTINGS > CONNECTIVITY > RS485 PORT.**

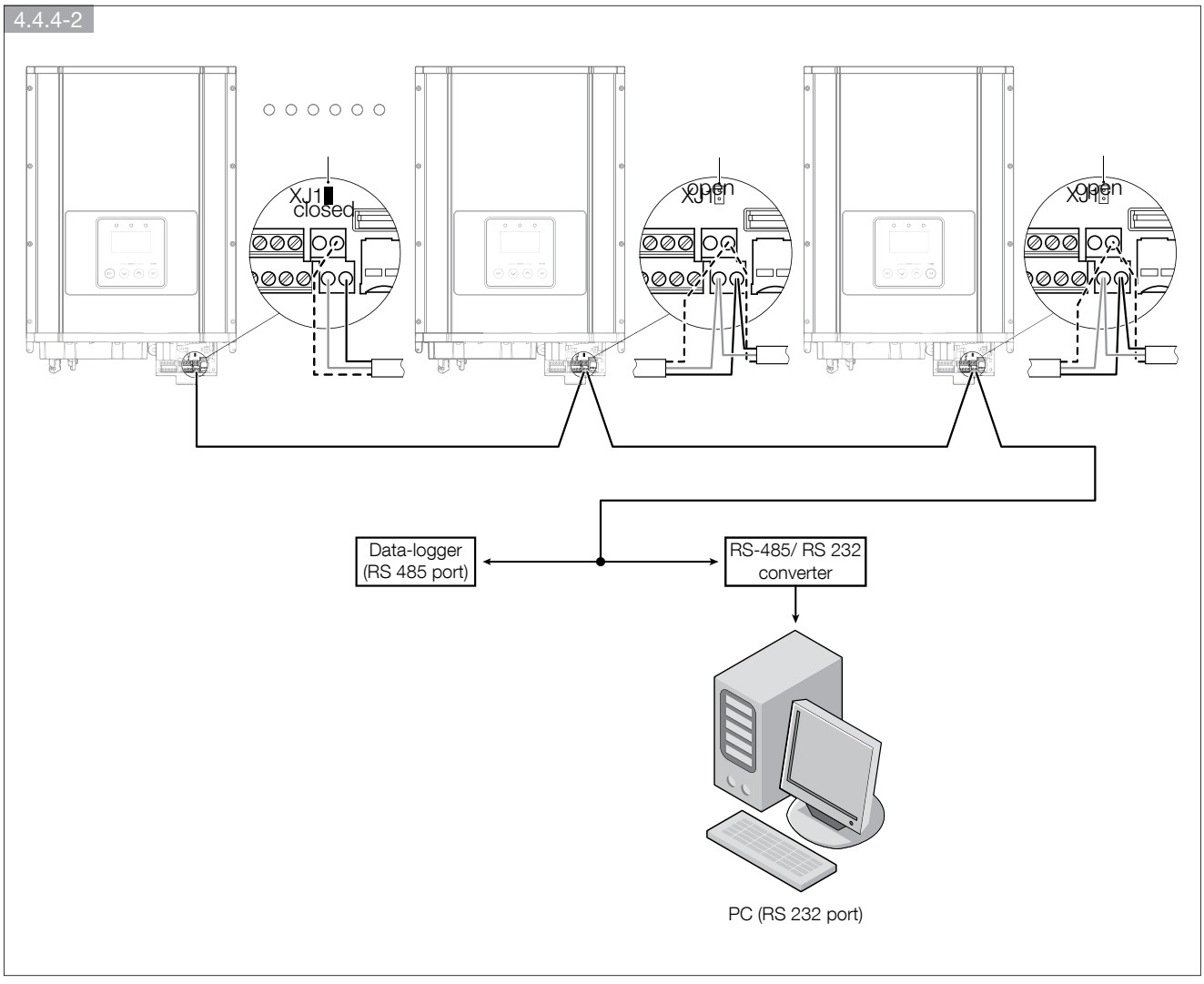
The communication terminal block allows connection to one or more inverter units.

If multiple connection of several inverters is carried out, each unit must be assigned a different node number via the display menu **SETTINGS > CONNECTIVITY > RS485 PORT.**

Moreover, only the last inverter in the chain must have line termination. To disable the termination resistors for the other inverters, simply remove the jumper on the interface card.

The following diagram shows an example for connecting several inverters to a PC or data-logger.

4.4.4-2



5. COMMISSIONING

WARNING!
Do not place objects of any kind on top of the inverter during operation.

DANGER: RISK OF BURNS
The outer casing temperature can reach 70°C during normal operation. Danger may occur owing to hot surface.

After installation, make sure the AC, DC, and communication connections have been carried out correctly. When there is enough radiation, the device begins to work automatically. Please refer to the LCD display and the control panel, illustrated in figure 2.3.1-1. The display includes an LCD screen and inverter LEDs status. The LEDs turn different colours to represent the various inverter operating statuses. Refer to table 7.2-1 for further information on the LEDs.

5.1. STARTUP PROCEDURE

Follow the step-by-step procedure below to commission the inverter.

5.1.1. Checking the direct current (DC) and alternating current (AC) voltage

To check the DC voltage of the photovoltaic field:

1. Uncover the panels and expose them to direct sunlight. The sunlight must be intense enough to produce the required output voltage.
2. Measure the no-load DC voltage of the photovoltaic panels, between the positive (+) and negative (-) poles. This voltage must be between 300 and 550 V in direct current (DC).

To check the AC mains network voltage:

3. Close the switch on the main switchboard.
4. Use an AC voltmeter to measure the no-load mains network AC voltage between L and N. Make sure the voltage is close to the rated value.

5.1.2. Starting up the inverter

5. Set the DC and AC disconnection switches to ON[1].
6. Check the inverter LCD display. The first time the inverter is switched on, you must follow the startup wizard (see chapter 5.2 "Configuration").
7. Once this startup wizard is complete, the inverter performs an autotest and begins running, with the steadily lit green LED signalling correct operation. This means that there is enough solar radiation to release energy into the network.
8. If the checks have not yielded positive results, the unit will repeat the procedure so that all parameters fall within the range. The green LED flashes during this phase.

1. The two devices may be closed in any order, there is no priority.

5.2. CONFIGURATION

5.2.1. Startup wizard

The first time the inverter is switched on, the guided procedure designed to help the installer set up the main functions correctly will appear on the display.

The main parameters to be set during the guided procedure are:

- General settings (date, time, language...).
- Country: select the country in which the inverter is installed; this loads all the connection parameters and activates the default functions required by the relevant national regulations.
- Power Photovoltaic System: insert the total amount of power of all generators present in the plant
- Voc: enter the typical Open Circuit Voltage of the photovoltaic string to which the inverter is connected. Make sure the maximum photovoltaic field voltage always falls within the range quoted in the specifications paragraph "DC operating voltage range".
- Connection parameters: refer to the technical connection regulations corresponding to the selected country of installation.

If the country setting is not requested the first time it is switched on, check on the front panel whether the country set is the one in which it is installed. If it is not, or if you want to set the country again, contact the technical support centre.

The startup wizard is used to set system parameters, load connection parameters and activate the functions required by the national regulations corresponding to the selected country.

5.2.2. General settings

The menu **SETTINGS > GENERAL PREFERENCES** can be used to customise:

- Language
- Date and time
- Display: Brightness and light timeout
- Password: can only be changed by authorised personnel

5.2.3. Keypad lock/unlock

After a period of inactivity on the display, the keypad locks automatically. To unlock it, simply slide your thumb across all 4 keys from right to left (from ENTER to EXIT).

5.2.4. Setting connection parameters

The connection parameters are loaded automatically when the country of installation is selected during the startup wizard.

The default parameters for the regulation of protection systems and inverter control systems cannot be modified by the user.

Only authorised personnel, on request of the electricity supplier, can adjust the set values in accordance with the requirements of the energy supplier via the menu **SETTINGS > INVERTER SETTINGS**.

For information on the various settings, please refer to the technical connection regulations corresponding to the selected country of installation.

5.3. PROTECTION AUTOTEST PROCEDURE

The user can make sure the Interface Protection System is working properly by activating the autotest via the menu **COMMANDS > AUTOTEST**.

Moreover, this menu can be used to check whether the inverter has been disconnected properly in the event of a discharge to earth (GFCI Autotest), in the same way as the test for a differential switch.

Before activating the desired test, make sure that the inverter is switched on and supplying power.

You can check whether the following devices have intervened correctly:

Protection	Description
V>	Maximum network voltage limit intervention test (restrictive threshold)
V<	Minimum network voltage limit intervention test (restrictive threshold)
V>>	Maximum network voltage limit intervention test (permissive threshold)
V<<	Minimum network voltage limit intervention test (permissive threshold)
f>	Maximum network frequency limit intervention test (restrictive threshold)
f<	Minimum network frequency limit intervention test (restrictive threshold)
f>>	Maximum network frequency limit intervention test (permissive threshold)
f<<	Minimum network frequency limit intervention test (permissive threshold)
GFCI	Differential current to earth exceeded intervention test

6. MAINTENANCE

WARNING!
In the event of a fault, the system must not be restarted. Inverter maintenance or repairs must be performed by qualified personnel, or by personnel from an authorised support centre.

WARNING!
Device with several power supply sources.
In the event of system maintenance, carry out the following steps beforehand:
- Open the AC switch.
- Open the DC switch.
- Make sure the system cannot be restarted.
- Make sure the electricity supply has been disconnected.

5 min

WARNING!
The inverter may only be opened by authorised personnel for technical assistance purposes. Risk of electric shocks due to the energy stored in the condensers; wait 5 minutes before removing the cover and make sure no hazardous voltage is present.

The inverter runs automatically and does not require special controls. If the inverter requires maintenance or repair, follow the correct switching off procedure as outlined in paragraph 6.1.

6.1. SWITCHING OFF THE INVERTER

WARNING!
To disconnect the inverter, always open the AC disconnection switch before opening the DC disconnection switch.

DANGER!
Risk of electric shocks from live device parts!
The inverter can be connected to two separate power sources:
• DC cable – Power from the photovoltaic generator
• AC cable – Power from the mains network, supplied by the electricity company
Before carrying out any work, make sure the electricity sources have been disconnected.

How to switch off the inverter:

• Set the AC output disconnection switch to OFF.

• Set the DC input disconnection switch to OFF.

6.2. BATTERY REPLACEMENT

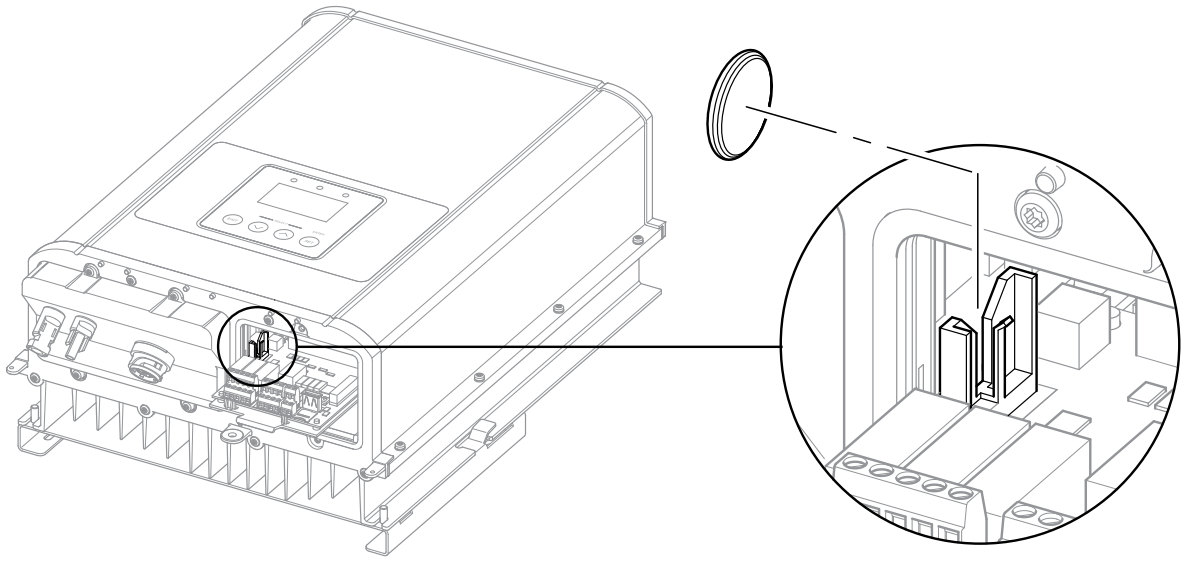
WARNING!
Battery replacement can only be carried out by qualified personnel. If the battery needs to be changed, it should be replaced with a product which meets the manufacturer's specifications.

WARNING!
The battery must be replaced while the inverter is switched off. See chapter 6.1, "Switching off the inverter".

There is a CR2032 lithium battery inside the device, which enables viewing of the date and time on the LCD display. When it is no longer able to operate independently, the date and time will disappear from the LCD display. The average life of this component is 10 years.

The battery can be found on the left-hand side of the interface card. The clock battery can be replaced easily by removing the compartment (see figure 6.2.1-1). After replacing the battery, set the date and time via the **SETTINGS > GENERAL PREFERENCES** menu.

6.2.1-1 Battery inside the inverter



6.3. DISPOSING OF THE INVERTER

At the end of its working life, the inverter must be disposed of in accordance with local regulations for the disposal of electronic components applicable to the installation site at the moment of disposal.

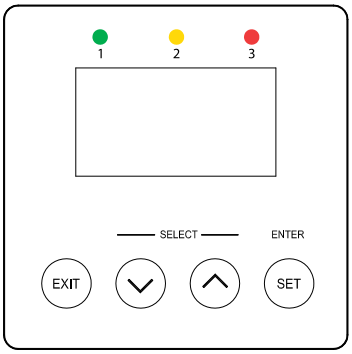
7. MONITORING

The standard operating cycle of the inverter follows the progress of the solar radiation: switching on in the morning, as soon as the solar radiation offers enough power to be supplied in the network, and switching off in the evening (Sleep Mode), as soon as the solar radiation is no longer sufficient.

During the Sleep Mode phase, the inverter enters Energy Saving mode: the LEDs and the display are switched off. To reactivate the display, navigate the menus or consult the statistics, simply press any of the four buttons. At this stage it will also be possible to communicate with the inverter using a device with RS485 serial port or WiFi connectivity (optional wireless kit required). Otherwise, in the absence of a network, the inverter switches off.

7.1. LEDS STATUS

The indicator lights represent the inverter status in accordance with the logic described in the " LEDs status description" table. Unlike the display, which switches off following a period of inactivity, the LEDs are always active during all inverter operating phases, with the exception of Sleep Mode, during which (in the absence of alarms or warnings) all LEDs are switched off.



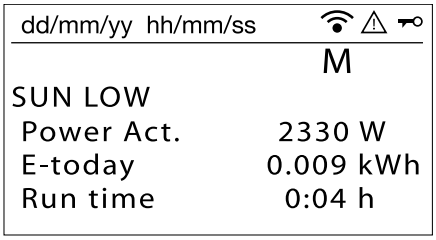
LEDs status description		
LEDs status		**Description**
1	Green flashing	Inverter in startup phase
	Green	Inverter ON
2	Yellow flashing	Warning indication present - inverter ON
	Yellow	Warning indication present - inverter OFF
3	Red flashing	A least one alarm present - inverter OFF
	Red	Inverter switched off due to alarm - inverter OFF

7.2. DISPLAYED INFORMATION

During normal operation (see paragraph 8.5 “Operation modes“) the following sentences alternate on the display:

- main screen, with measurements such as instant power supplied, daily energy produced and operating time;
- graph of energy produced throughout the day.

The main screen displays several messages associated with the various inverter operating phases; the following service icons may also appear:



M Maintenance Mode (service icon)

Wireless communication enabled (optional card)

⚠ Active Alarm (flashing icon)

Keypad Locked

During navigation the following icons may appear:

- Parameters marked with the symbol are password-protected and can only be changed by authorised personnel, not the user.
- Password entered correctly. Parameter can be changed.
- Parameters marked with the ⊘ symbol are read-only (they cannot be changed).

ENGLISH

The 4 capacitive keys can be used to navigate the menus on the display:

SET SET/ENTER key: confirms selection and allows progression to the next selection screen.

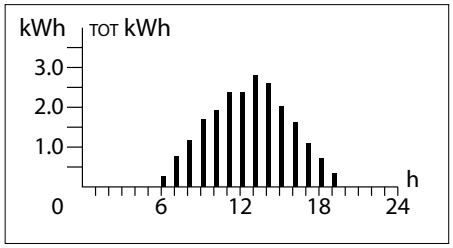
EXIT EXIT key: cancels selection / can be used to return to the previous selection screen.

UP/DOWN SELECT keys: adjust selection.

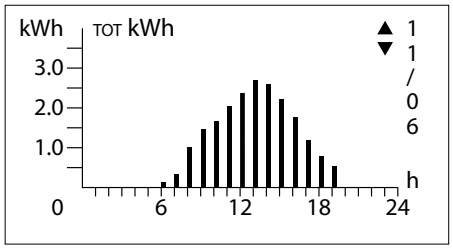
7.2.1. Statistics

Graphs showing the energy produced over a specified period can be accessed via the **MEASUREMENTS > GRAPHICS** menu. The figure below provides some examples:

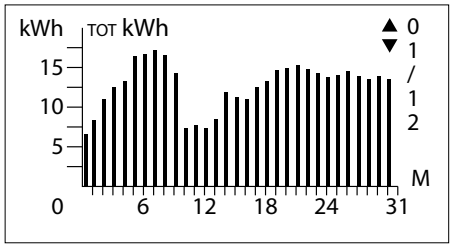
7.2.1-1 Hourly progress of energy produced over the course of the day



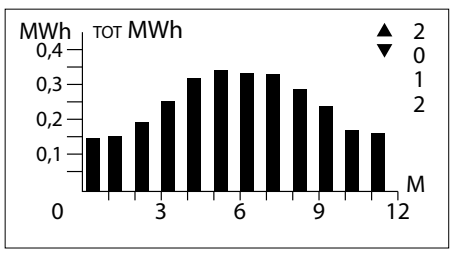
7.2.1-2 Hourly progress of energy produced over the last 7 days [1]



7.2.1-3 Daily progress of energy produced over the last 12 months [1]



7.2.1-4 Monthly progress of energy produced over the last 30 years [1]



1. There are several pages of graphics. Use the UP/DOWN and SELECT keys to view these pages.

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7.3. MENU TREE

FIRST LEVEL	SECOND LEVEL	THIRD LEVEL
MEASUREMENTS	STATISTICS	TODAY'S STATISTICS
		TOTAL STATISTICS
	GRAPHICS	TODAY'S GRAPH
		LAST WEEK'S GRAPHICS
		LAST YEAR'S GRAPHICS
		ALL YEARS GRAPHICS
	GENERAL MEASURES	
	INVERTER POWER	
ALARMS/WARNINGS	ALARMS	
	WARNINGS	
COMMANDS	REMOVE SD CARD	
	AUTOTEST	
	LED BAR TEST	
	MAIL TEST	
	ALARMS RESET	
	INVERTER PROCEDURES	
	STATISTICS RESET	
	LOAD DEFAULT PARAM.	
SETTINGS	GENERAL PREFERENCES	LANGUAGE
		DATE AND TIME
		DISPLAY
		PASSWORD
	INVERTER SETTINGS	COUNTRY
		CONNECTION PARAMETERS
	PHOTOVOLTAIC PLANT	
	CONNECTIVITY	WIRELESS OPTION *
		RS485 PORT
		DIGITAL INPUT
		DIGITAL OUTPUT
HISTORY	HISTORY LOG	
	V/f FAILURE REPORT	
SERVICE	INVERTER INFO	
	FIRMWARE VERSION	
	UPGRADE FIRMWARE	

** Only if the option is available.*

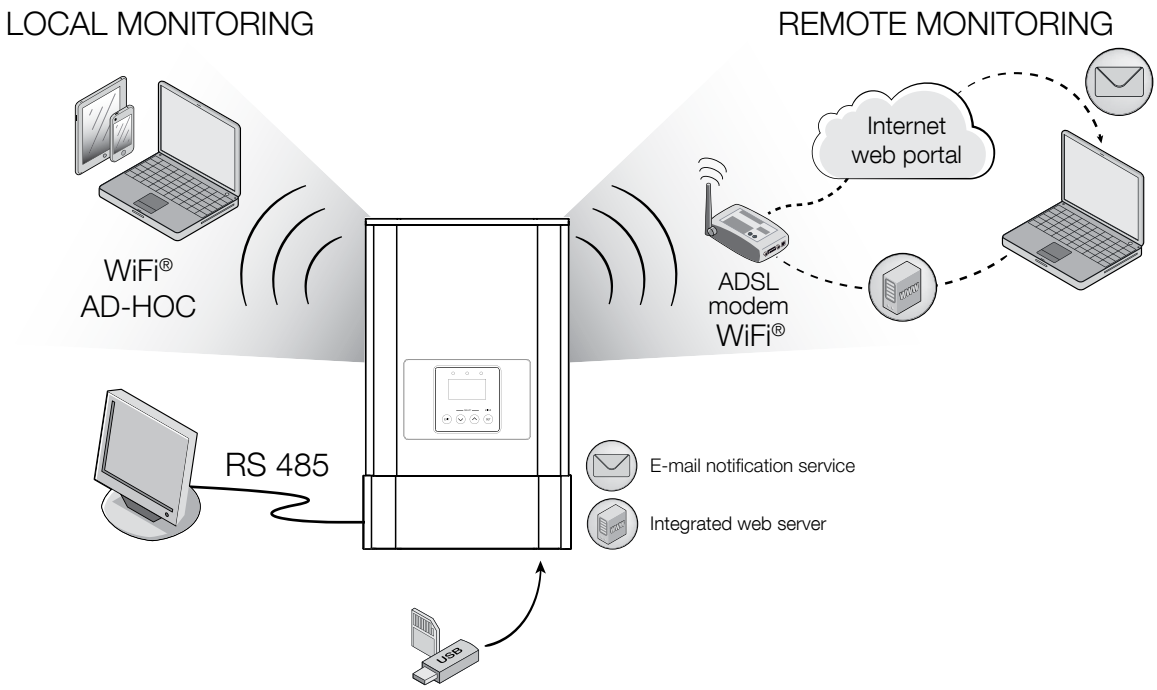
7.4. LOCAL AND REMOTE MONITORING

The inverter can communicate with the outside world and provide information on its operation, even in the absence of solar radiation.

Data exchange can take place with the following devices:

- MicroSD card: statistics and past data are continuously saved by the inverter. They are therefore always available and can be recalled at any time;
- RS-485 serial port: data can be collected by a PC or data-logger;
- Wireless: the inverter may have a wireless communication interface (in an optional kit) which complies with standard IEEE 802.11 g/n and can communicate with devices which have WiFi connectivity, allowing simple remote monitoring.

7.4-1



8. TROUBLESHOOTING AND DIAGNOSTICS

The display indicates the system status, making it possible to instantly diagnose faults, malfunctions and breakdowns of the inverter or the photovoltaic system.

The following events are indicated:

- **Warnings**: Non-serious fault which will not necessarily cause the inverter to stop running. The warning disappears from view as soon as normal conditions are restored.
- **Alarms**: Potential breakdowns of the inverter or system which cause the inverter to stop running. The indication is removed as soon as the causes of the malfunction are diminished, except in the case of serious problems which require the intervention of qualified personnel before normal operation can be restored.

Alarms and warnings are divided into two categories:

- **System Alarms/Warnings**: these affect the parts outside the inverter, such as the mains power network, the photovoltaic field and the ambient temperature. Corrective actions can, in general, be performed by the user (system installer or operator).
- **Inverter Alarms/Warnings**: indications regarding the inverter itself. Corrective actions are, in general, performed by the Support Service.

When running, the current inverter status appears on the display to inform the user as to the procedure in progress.

The standard statuses, however, are only outlined within the menu **HISTORY**.

The following tables summarise the indications which may appear on the display.

8.1. INVERTER WARNING

INVERTER WARNING		
Code	**Warning**	**Description**
W65	DERATING	The inverter is reducing the power supplied to the mains network due to voltage/frequency outside the range, or due to settings made via remote control commands.
W69	AC VOLTAGE OUT OF TOLERANCE	AC mains network voltage outside the tolerance range, the inverter waits for the parameter to return to a value within the limits set. If the warning persists and the mains network voltage is within the tolerance range, contact the Support Service.
W70	AC FREQUENCY OUT OF TOLLERANCE	AC mains network frequency outside the tolerance range, the inverter waits for the parameter to return to a value within the limits set. If the warning persists and the mains network frequency is within the tolerance range, contact the Support Service.
W74	CLOCK BATTERY DISCHARGED	Clock battery discharged or not working. Replace the battery.
W75	SDCARD WRITE ERROR	The data could not be saved to the SD memory. Make sure the memory card is inserted properly, has enough free space available, and has been formatted correctly.
W76	MAIL SERVER NOT AVAILABLE	From the **SETTINGS > CONNECTIVITY > WIRELESS OPTION > E-MAIL ACCOUNT** menu, check that the correct IP and SMTP Server Port settings have been selected. Warning 76 may also appear if the SMTP Server is busy; in this case another attempt will be made to send the mail after 10 minutes. If the problem persists try using an alternative SMTP Server.
W77	MAIL SERVER AUTHENTICATION FAILED	From the **SETTINGS > CONNECTIVITY > WIRELESS OPTION > E-MAIL ACCOUNT** menu check that the User Account and Password are correct.
W78	WIRELESS NETWORK NOT AVAILABLE	From the **SETTINGS > CONNECTIVITY > WIRELESS OPTION > WIRELESS MODE** menu check that the name of the SSID network has been entered correctly, or try moving the Wireless Access Point closer to the inverter.
W79	WIRELESS NETWORK AUTHENTICATION FAILED	From the **SETTINGS > CONNECTIVITY > WIRELESS OPTION > WIRELESS MODE** menu check that the authentication type and Password are correct.
W80	WIRELESS BOARD FAILURE	If a malfunction in the optional wireless card is detected contact the retailer.

8.2. SYSTEM WARNING

SYSTEM WARNING		
Code	**Warning**	**Description**
W01	OVER-TEMPERATURE DERATING	Limited power supplied to avoid appliance overheating. Make sure the inverter is located in a cool, well-ventilated room.
W02	UNDER-TEMPERATURE DERATING	Limited power supplied due to low temperature. Wait for the inverter to reach the proper temperature. Make sure the inverter is located in a sheltered environment with a suitable operating temperature range.
W05	SUN LOW	The inverter is waiting for the photovoltaic energy level to become sufficient for supplying to the network.
W07	EXTERNAL SPD FAULT	One or more external over-voltage dischargers (SPDs) is/are faulty. Replace it/them.
W56	IN1 EXTERNAL WARNING	Warning indication associated with digital input IN1.
W57	IN2 EXTERNAL WARNING	Warning indication associated with digital input IN2.
W58	IN3 EXTERNAL WARNING	Warning indication associated with digital input IN3.
W59	IN4 EXTERNAL WARNING	Warning indication associated with digital input IN4.

8.3. INVERTER ALARMS

INVERTER ALARMS		
Code	**Alarm**	**Description**
A01	EXTERNAL SHUTDOWN ACTIVATED	Inverter switched off by means of a remote tripping command. Remote tripping enabled. Check whether the remote tripping command is enabled.
A03	GFCI FAULT	Fault in the system measuring current to earth (GFCI sensor). Contact the Support Service.
A07	AC CONNECTION SYSTEM FAULT	Fault in the AC output connection system. If the contactors are not working properly, the inverter will not connect to the mains network for safety reasons. If the alarm persists, contact the Support Service.
A14	DIGITAL SYSTEM FAULT	Internal error. If the fault occurs frequently, contact the Support Service.
A70	MAINTENANCE MODE	The inverter is in maintenance mode. Contact the Support Service.
A72	INVERTER FAULT	The internal check has detected a hardware malfunction. If the fault persists or occurs frequently, contact the Support Service.
A78	AUTOTEST FAILED	Fault in the interface protection system. Contact the Support Service.
A79	DC CURRENT INJECTION	The direct current injected into the network has exceeded the permitted limit. If the fault occurs frequently, contact the Support Service.

8.4. SYSTEM ALARMS

SYSTEM ALARMS		
Code	**Alarm**	**Description**
A02	GFCI ALARM	Dangerous change in differential current or high discharge to earth. Integrated monitoring of the differential current is important for the protection of individuals. If the alarm persists for no reason, make sure the parasitic capacity of the photovoltaic system is under 100 nF/kWp.
A04	INSULATION ALARM	The insulation resistance (Riso) of the photovoltaic system to earth is insufficient. Make sure there is no discharge to earth from the photovoltaic system, and that the parasitic capacity of the photovoltaic system to earth is under 100 nF/kWp.
A56	IN1 EXTERNAL ALARM	Alarm indication associated with digital input IN1.
A57	IN2 EXTERNAL ALARM	Alarm indication associated with digital input IN2.
A58	IN3 EXTERNAL ALARM	Alarm indication associated with digital input IN3.
A59	IN4 EXTERNAL ALARM	Alarm indication associated with digital input IN4.
A68	HIGH TEMPERATURE ALARM	Inverter temperature over the maximum operating limit. Make sure the inverter is located in a cool, well-ventilated room.
A73	DC OVER-VOLTAGE	Disconnect the photovoltaic field to avoid damaging the appliance. Check the system configuration and make sure the maximum photovoltaic field voltage falls within the acceptable range before reconnecting the inverter.
A76	LOW TEMPERATURE ALARM	Ambient temperature below the minimum operating limit. Make sure the inverter is located in a sheltered environment with a suitable operating temperature range.
A80	DC OVER-CURRENT	Measured DC current above the operating range. Check the system configuration and make sure the maximum photovoltaic field current falls within the acceptable range before reconnecting the inverter. Contact the Support Centre if necessary.
A81	ANOMALIA RETE AC	AC voltage with high distortion detected, or repeated micro-interruptions in the service. Make sure the mains voltage falls within the acceptable range. Call the service centre if the problem persists.
A82	AGGIORNAMENTO FIRMWARE IN CORSO	Inverter locked due to updating procedure

8.5. OPERATING STATUSES

Operating phases	
Status	**Description**
Maintenance Mode	Maintenance mode enabled.
Standby	Inverter in standby due to remote Stop command or manual setting on the display.
Sleep Mode	Sleep mode, insufficient radiation. If Sleep Mode remains on during the day when there is plenty of radiation, check the photovoltaic panel exposure, the photovoltaic system wiring and the polarity of the DC connections to the inverter. Otherwise, contact the Support Service.
Low Radiation	Insufficient radiation for connection to the mains network.
AC Network Check	Check electricity mains network parameters fall within the range.
Insulation Check	Check insulation resistance to earth.
Startup Conditions Check	Check for sufficient energy originating from the photovoltaic field.
Check in progress	Check GFCI and test AC output contactors.
Inverter ON	Inverter working properly.
Inverter OFF due to alarm	Inverter stopped due an alarm being detected.

Standard statuses		
Code	**Status**	**Description**
S66	AC Network OK	AC voltage and frequency within the range of tolerance.
S67	Inverter ON	Inverter working properly.
S80	Reactive Compensation	The inverter is managing reactive power in accordance with national standards.

9. TECHNICAL CHARACTERISTICS

DC input	
Max. DC input power	3600 W
Rated DC voltage	360 Vdc
Max. absolute DC voltage	630 Vdc
DC operating voltage range	150-600 Vdc
MPP range (at rated power)	260-500 Vdc
MPPT no.	1
Max. DC current	12 A
Max. DC short-circuit current	13 A
AC output	
Rated power	3000 W / 3000 VA
Max. power (30 minutes)	3300 W / 3300 VA
Rated AC voltage	230 Vrms [1]
Rated AC current	13 Arms
Max. AC current	16 Arms
Distortion factor	< 5%
Power factor	[0.9÷1] [2]
Efficiency and consumption	
Sleep-mode consumption	3 W
Maximum efficiency	97.1%
European efficiency	96.7%
Californian efficiency	96.8%
Environmental specifications	
Operating temperature range	From -20 °C to +60 °C (from 40 °C to 60 °C with possible downgrading)
Transportation temperature range	From -25 °C to +85 °C
Relative humidity	5% - 95 % without condensation
Audible noise	< 36 dB at a distance of 1 m from the machine
Altitude	0-2000 m (0-6666 ft)
Environmental category in accordance with EN 62109-1	External
Mechanical specifications	
Protection class in accordance with EN 60529	IP 65
Dimensions (unit) (W x D x H)	350 x 569 x 205 mm
Dimensions (packaging) (W x D x H)	400 x 600 x 260 mm
Net weight	16 kg
Gross weight	18 kg

1. The accepted tolerance depends on the country of installation and the standards in force.

2. Can be set in accordance with the requirements of the electricity supply company.

HEAD OFFICE

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