Ingeteam

INGECON SUN 1Play HF

Installation and Operation Manual

ABF2011IQE01_B
04/2015

INGECON SUN 1Play HF

Installation and Operation Manual

The conformity of the document content with the hardware described has been checked. However, discrepancies may exist. Liability will not be assumed for total concordance. The information contained in this document is regularly reviewed and it is possible that there may be changes in subsequent editions. Other functions may be available which are not covered by this document.

This document may be changed.

Important Safety Instructions

This section describes the safety warnings and the Personal Protective Equipment used in the unit.

Safety conditions

General warnings

The operations described in this manual may be performed only by qualified personnel.

The status of qualified personnel referred to in this manual will be, as a minimum, that which meets all the standards, regulations and laws regarding safety applicable to the tasks of installing and operating this unit.

You must comply with all applicable safety-related legislation for electrical work. Danger of electric shock.

Compliance with the safety instructions set out in this manual or in the suggested legislation does not imply exemption from other specific standards for the installation, place, country or other circumstances that affect the inverter.

Opening the door of the housing does not imply there is no voltage inside.

There is a risk of electric shock even after disconnecting all power sources from the system.

Only qualified personnel may open it, following the instructions in this manual.

When the solar array is exposed to light, it supplies a d.c. voltage to the inverter.

The entire manual must be read and understood in full prior to manipulating, installing or operating the unit.

Following is a list of the basic obligatory safety standards for each country:

- *RD 614/2001* in Spain.
- *CEI 11-27* in Italy.
- *DIN VDE 0105-100* and *DIN VDE 1000-10* in Germany.
- *UTE C18-510* in France.

Carry out all control and handling without voltage.

As a minimum security measure in this operation, you must always follow the so-called **5 golden rules**:

1. Disconnect.
2. Prevent any possible feedback.
3. Check there is no voltage.
4. Ground and short circuit.
5. Protect from live elements, if any, and put up safety signs around the work area.

Until you have completed these five steps, the work area cannot be considered voltage-free and any work performed will be considered to be work on live equipment.

Category III - 1000-Volt measuring instruments must be used for checking for the absence of voltage.

Ingeteam accepts no liability for any damages caused by improper use of the equipment. You must propose in advance to Ingeteam any work carried out on any equipment which implies a modification of the original electrical arrangements. These must be studied and approved by Ingeteam.

Potential hazards for people

The equipment may remain charged after disconnecting the renewable power supply.

Carefully follow the mandatory steps in the manual for removing the voltage.

Always follow the indications in the manual on moving and placing the unit.

The weight of this unit can cause injury if not handled correctly.

DANGER: High temperature.

The flow of outlet air can reach high temperatures which can cause injury to anybody exposed to it.

Potential hazards for the equipment

The unit requires impurity-free air flow while it is operating.

Keeping the inlets free of obstacles is essential for this air flow to refrigerate the unit.

After all duly authorized handling, check that the inverter is ready to start operation. Only after this can you connect it, following the instructions in the manual.

Do not touch boards or electronic components. The more sensitive components can be damaged or destroyed by static electricity.

Do not disconnect or connect any terminal while the unit is operating. Disconnect and check for absence of voltage first.

Personal Protective Equipment (PPE)

When working on the unit, use the following safety equipment recommended by Ingeteam as a minimum.

Name	Explanation
Safety footwear	In compliance with standard *UNE-EN-ISO 20345:2012*
Helmet with face shield	In compliance with standard *UNE-EN 397:1995,* provided there are elements with directly accessible voltage.
Working clothes	Close-fitting, non-flammable, 100% cotton
Dielectric gloves	In compliance with standard *EN 60903:2005*

Tools and / or equipment used in live work must have at least Category III-1000 Volts insulation.

Should the country's regulations demand another kind of personal protection, you should appropriately supplement the equipment recommended by Ingeteam.

Contents

1. About this manual

This manual describes the INGECON SUN 1Play HF units and provides information for their correct reception, installation, start-up, maintenance and operation.

1.1. Scope and nomenclature

This manual is applicable to the following units:

Complete name	Abbreviation
INGECON SUN 1Play 2.5HF	2.5HF
INGECON SUN 1Play 2.7HF	2.7HF
INGECON SUN 1Play 3HF	3HF
INGECON SUN 1Play 3.3HF	3.3HF
INGECON SUN 1Play 3.68HF	3.68HF
INGECON SUN 1Play 4.6HF	4.6HF
INGECON SUN 1Play 5HF	5HF
INGECON SUN 1Play 5.5HF	5.5HF
INGECON SUN 1Play 6HF	6HF

This document will refer to the various models by both their complete name and their abbreviation. Similarly, it will refer generically to any of the models in the INGECON SUN 1Play HF families with the terms *unit* or *inverter*.

1.2. Recipients

This document is intended for qualified personnel.

The status of qualified personnel referred to in this manual will be, as a minimum, that which meets all the standards, regulations and laws regarding safety applicable to the tasks of installing and operating this unit.

The responsibility for designating qualified personnel will always fall to the company to which the personnel belong. It is necessary to decide which workers are suitable or not for carrying out specific work to preserve their safety at the same time as complying with occupational safety legislation.

These companies are responsible for providing appropriate training in electrical equipment to their personnel and for familiarizing them with the contents of this manual.

1.3. Symbols

This manual uses various symbols to emphasize and highlight certain texts. The general meanings are explained below.


General warning.


Electrical danger.


Hot surface.


General information.


Read the section indicated in this manual.


Prohibition.

2. Unit description

2.1. Overview

The basic purpose of an inverter is to convert the direct current generated by the PV array into alternating current to feed into the electricity grid.

These units are single-phase PV inverters with a high frequency transformer, which therefore provide galvanic insulation between the panel and the electricity grid, grounding the PV panel at either positive or negative terminals. There are technology types for panels in which the manufacturer indicates that it is advisable to ground one pole of the panel to prolong its useful life. Likewise, the regulations of certain countries require galvanic insulation between the electricity grid and the PV array. This inverter is suitable for these conditions.

It includes a power conversion stage with a high frequency transformer, with which its weight and size decrease considerably compared to conventional transformers. At the same time, the use of a high frequency transformer substantially improves the performance of the unit.

As standard the inverter includes communication via USB, an SD card reader for updating the firmware, a potential-free relay for signaling and two digital inputs.

2.2. Optional accessories

These units may include the following accessories:

- Communications accessories.
- Digital input card.
- Self-consumption kit.

Communication accessories

As standard these units have local communication via USB. In addition there is the option of establishing connections using other technology types:

- RS-485.
- Ethernet (including communication via RS-485, for optional use).
- Ethernet TCP (including communication via RS-485, for optional use).
- GSM/GPRS (including communication via RS-485, for optional use).
- Bluetooth.
- Bluetooth (including communication via RS-485, for optional use).

The instructions for installing the communications accessories are indicated throughout this manual. For more information on their functioning, consult the corresponding communication accessories manual.

Digital input cards

In certain countries this card is necessary to comply with their regulations.

Self-consumption kit

These inverters are compatible with all the self-consumption options offered by Ingeteam.

2.3. Electrical safety

The design values for electrical safety can be found below.

2.3.1. Overvoltage category (OVC)

The design of the unit complies with the regulations *IEC 62109-1* and *IEC 62109-2*. The direct current circuits have been designed with an overvoltage category II (OVC II), and the alternating current circuits with an overvoltage category III (OVC III).

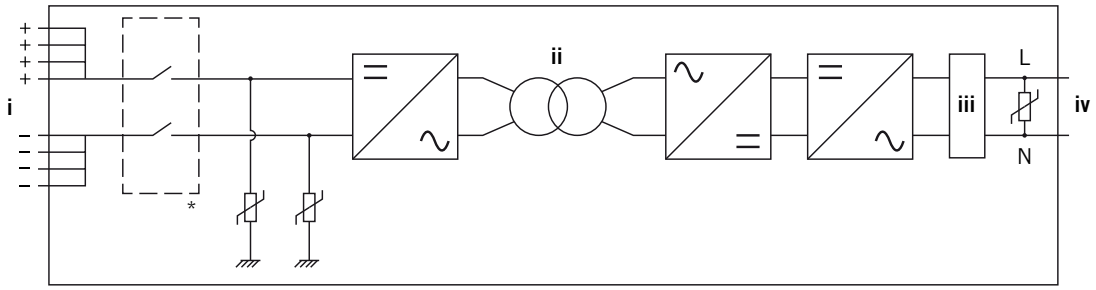
2.4. Contamination class

The units comply with pollution class 2, as required for this type of inverter.

2.5. Acoustic contamination

The unit produces a slight buzz when in operation. Do not place it in an occupied room, or on light supports which might amplify this buzz. The mounting surface must be firm and appropriate for the weight of the unit.

2.6. Electrical diagram of the system



* Optional.

i. Photovoltaic input.

ii. High-frequency transformer.

iii. Filter.

iv. AC output for connection to the grid.

2.7. Specifications tables

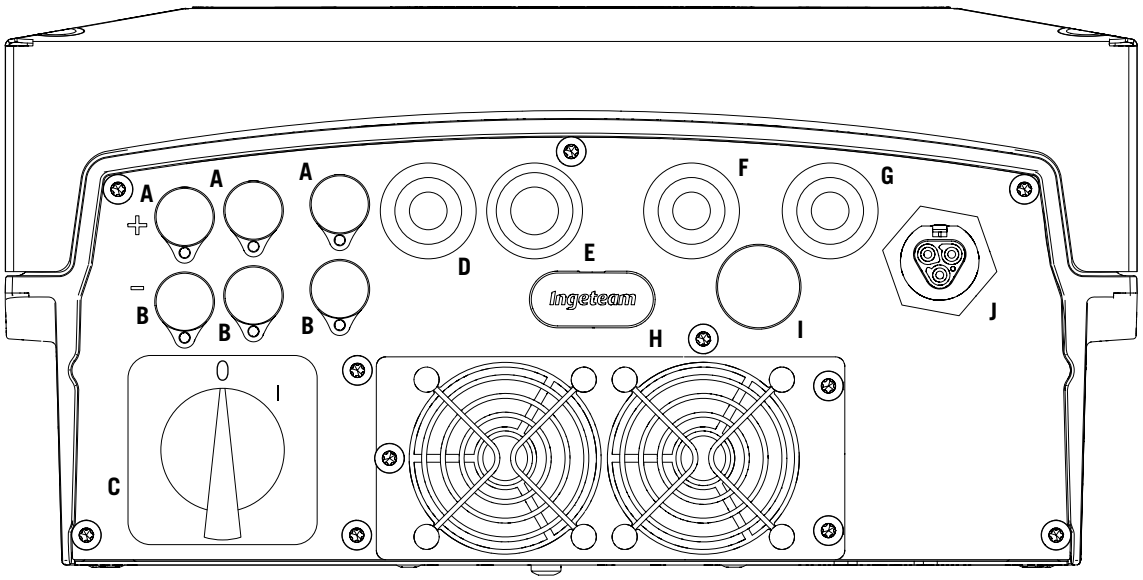
	2.5HF	2.7HF	3HF	3.3HF	3.68HF
DC inputs					
Recommended power range of PV array [1]	2.8 ~ 3.3 kWp	3 ~ 3.6 kWp	3.2 ~ 4 kWp	3.8 ~ 4.3 kWp	3.9 ~ 4.8 kWp
Maximum input voltage [2]	550 V	550 V	550 V	550 V	550 V
MPP Voltage range	125 ~ 500 V	125 ~ 500 V	125 ~ 500 V	125 ~ 500 V	125 ~ 500 V
Operating voltage range	125 ~ 550 V	125 ~ 550 V	125 ~ 550 V	125 ~ 550 V	125 ~ 550 V
Minimum voltage for Pnom	125 V	125 V	125 V	125 V	125 V
Maximum short circuit current	25 A	25 A	37 A	37 A	37 A
Maximum inverter backfeed current to the array	0 A rms	0 A rms	0 A rms	0 A rms	0 A rms
MPPT	1	1	1	1	1
Number of strings	2	2	3	3	3
Strings per MPP	2	2	3	3	3
Maximum input current	22 A	22 A	33 A	33 A	33 A
Maximum input current per string	17 A	17 A	17 A	17 A	17 A
AC output					
Nominal power (up to 45 ºC)	2.5 kW	2.7 kW	3 kW	3.3 kW	3.68 kW
Maximum continuous power	2.5 kW	2.7 kW	3 kW	3.3 kW	3.68 kW
Max. temperature for nominal power [3]	51 ºC	48 ºC	55 ºC	52 ºC	50 ºC
Maximum current	13.5 A	13.5 A	26.2 A	26.2 A	26.2 A
Maximum transient current	13.5 A	13.5 A	26.2 A	26.2 A	26.2 A
Maximum output fault current	< 16 A rms (60 ms)		< 30 A rms (60 ms)		
Maximum output overcurrent protection	16 A rms	16 A rms	30 A rms	30 A rms	30 A rms
Rated voltage	230 V	230 V	230 V	230 V	230 V
Voltage range	122 ~ 285 V	122 ~ 285 V	122 ~ 285 V	122 ~ 285 V	122 ~ 285 V
Nominal frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Cosine of Phi	1	1	1	1	1
Adjustable cosine of phi	Yes. Smax = 2.5 kVA	Yes. Smax = 2.7 kVA	Yes. Smax = 3 kVA	Yes. Smax = 3.3 kVA	Yes. Smax = 3.68 kVA
THD	< 3 %	< 3 %	< 3 %	< 3 %	< 3 %
Performance					
Maximum efficiency	95.6 %	95.6 %	95.8 %	95.8 %	95.8 %
Euroefficiency	95 %	95.1 %	95.2 %	95.2 %	95.1 %
General data					
Cooling system	Natural convection		Forced ventilation		
Air flow	-	-	90 m³/h	90 m³/h	90 m³/h
Weight	20 Kg	20 Kg	25 Kg	25 Kg	25 Kg
Measurements (height x width x depth)	470 x 360 x 180 mm				
Standby current [4]	< 10 W	< 10 W	< 10 W	< 10 W	< 10 W
Night consumption	0 W	0 W	0 W	0 W	0 W
Operating temperature	–25 ~ +65 ºC	–25 ~ +65 ºC	–25 ~ +65 ºC	–25 ~ +65 ºC	–25 ~ +65 ºC
Relative humidity (without condensation)	0 ~ 100 %	0 ~ 100 %	0 ~ 100 %	0 ~ 100 %	0 ~ 100 %
Maximum altitude of the installation	3000 m	3000 m	3000 m	3000 m	3000 m
Insulation level of the HF transformer	Basic	Basic	Basic	Basic	Basic
Protection class	IP65	IP65	IP65	IP65	IP65
Markings	CE				
EMC and safety regulations	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100				
Grid connection regulations	RD1699/2011, DIN V VDE V 0126-1-1, EN 50438, CEI 0-21, VDE-AR-N 4105:2011-08, G59/2, G83/2, P.O.12.3, AS4777.2, AS4777.3, IEC 62116, IEC 61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, South African Grid code, Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements				

[1] Depending on the type of installation and the geographic location. [2] Never exceed this value. Consider the voltage increase of the panels 'Voc' at low temperatures. [3] For each ºC of increase, the output power is reduced by 1.8 %. [4] Consumption from the PV array.

	4.6HF	5HF	5.5HF	6HF
DC inputs				
Recommended power range of PV array [1]	5.2 ~ 6 kWp	5.7 ~ 6.5 kWp	6 ~ 6.8 kWp	6.3 ~ 7 kWp
Maximum input voltage [2]	550 V	550 V	550 V	550 V
MPP Voltage range	125 ~ 500 V	125 ~ 500 V	125 ~ 500 V	125 ~ 500 V
Operating voltage range	125 ~ 550 V	125 ~ 550 V	125 ~ 550 V	125 ~ 550 V
Minimum voltage for Pnom	146 V	158 V	174 V	190 V
Maximum short circuit current	37 A	37 A	37 A	37 A
Maximum inverter backfeed current to the array	0 A rms	0 A rms	0 A rms	0 A rms
MPPT	1	1	1	1
Number of strings	3	3	3	3
Strings per MPP	3	3	3	3
Maximum input current	33 A	33 A	33 A	33 A
Maximum input current per string	17 A	17 A	17 A	17 A
AC output				
Nominal power (up to 45 ºC)	4.6 kW	5 kW	5.5 kW	6 kW
Maximum continuous power	4.6 kW	5 kW	5.5 kW	6 kW
Max. temperature for nominal power [3]	58 ºC	55 ºC	50 ºC	45 ºC
Maximum current	26.2 A	26.2 A	26.2 A	26.2 A
Maximum transient current	26.2 A	26.2 A	26.2 A	26.2 A
Maximum output fault current	< 30 A rms (60 ms)			
Maximum output overcurrent protection	30 A rms	30 A rms	30 A rms	30 A rms
Rated voltage	230 V	230 V	230 V	230 V
Voltage range	122 ~ 285 V	122 ~ 285 V	122 ~ 285 V	122 ~ 285 V
Nominal frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Cosine of Phi	1	1	1	1
Adjustable cosine of phi	Yes. Smax = 4.6 kVA	Yes. Smax = 5 kVA	Yes. Smax = 5.5 kVA	Yes. Smax = 6 kVA
THD	< 3 %	< 3 %	< 3 %	< 3 %
Performance				
Maximum efficiency	96 %	96 %	96 %	96 %
Euroefficiency	95.2 %	95.2 %	95.3 %	95.3 %
General data				
Cooling system	Forced ventilation			
Air flow	90 m³/h	90 m³/h	90 m³/h	90 m³/h
Weight	25 Kg	25 Kg	25 Kg	25 Kg
Measurements (height x width x depth)	470 x 360 x 180 mm			
Standby current [4]	< 10 W	< 10 W	< 10 W	< 10 W
Night consumption	0 W	0 W	0 W	0 W
Operating temperature	–25 ~ +65 ºC	–25 ~ +65 ºC	–25 ~ +65 ºC	–25 ~ +65 ºC
Relative humidity (without condensation)	0 ~ 100 %	0 ~ 100 %	0 ~ 100 %	0 ~ 100 %
Maximum altitude of the installation	3000 m	3000 m	3000 m	3000 m
Insulation level of the HF transformer	Basic	Basic	Basic	Basic
Protection class	IP65	IP65	IP65	IP65
Markings	CE			
EMC and safety regulations	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4, EN 61000-3-11, EN 61000-3-12, EN 62109-1, EN 62109-2, IEC62103, EN 50178, FCC Part 15, AS3100			
Grid connection regulations	RD1699/2011, DIN V VDE V 0126-1-1, EN 50438, CEI 0-21, VDE-AR-N 4105:2011-08, G59/2, P.O.12.3, AS4777.2, AS4777.3, IEC 62116, IEC 61727, UNE 206007-1, ABNT NBR 16149, ABNT NBR 16150, South African Grid code, Chilean Grid Code, Romanian Grid Code, Ecuadorian Grid Code, Peruvian Grid code, IEEE 929, Thailand MEA & PEA requirements			

[1] Depending on the type of installation and the geographic location. [2] Never exceed this value. Consider the voltage increase of the panels 'Voc' at low temperatures. [3] For each ºC of increase, the output power is reduced by 1.8 %. [4] Consumption from the PV array.

2.8. Description of cable inlets



A. DC + connection. Quick connector.

B. DC – connection. Quick connector.

C. DC switch.

D. Digital inputs. 16 mm cable grommets (accepted cable diameter 4 ~ 10 mm).

E. Communications. 20 mm cable grommets (accepted cable diameter 6 ~ 13 mm).

F. Communications. 16 mm cable grommets (accepted cable diameter 4 ~ 10 mm).

G. Potential-free relay. 16 mm cable grommets (accepted cable diameter 4 ~ 10 mm).

H. SD card reader.

I. USB Type-B input.

J. AC connection. Quick connector.

2.9. Insulation resistance of the PV array

The minimum insulation resistance of the PV array permitted for connection to the inverter grid will depend on applicable regulations. Where it is not specified, it will be 50 kOhm.

3. Receipt of the unit and storage

3.1. Reception

Keep the unit in its packaging until immediately before installation. Keep the unit in a **horizontal position** at all times.

3.2. Equipment identification

The serial number of the equipment is its unique identifier. You must quote this number in any communication with Ingeteam.

The unit's serial number is marked on the specifications plate.

3.3. Transport damage

If the unit has been damaged during transport, proceed as follows:

1. Do not proceed with the installation.
2. Notify the distributor immediately within five days of receipt of the unit.

If ultimately you must return the unit to the manufacturer, you must use the original packaging.

3.4. Storage

Failure to follow the instructions in this section may lead to damage to the unit.

Ingeteam accepts no liability for damage resulting from the failure to follow these instructions.

If the unit is not installed immediately after reception, take into account the following points in order to avoid damage:

- The unit must be stored in its original packaging.
- The package must be stored in the horizontal position.
- Keep the unit free of dirt (dust, shavings, grease, etc.) and away from rodents.
- Keep it away from water splashes, welding sparks, etc.
- Cover the unit with a breathable protective material in order to prevent condensation due to ambient humidity.
- Units in storage must not be subjected to weather conditions other than those indicated in Section *"2.7. Specifications tables"*.
- It is very important to protect the unit from chemical products which can cause corrosion, as well as from salty atmospheres.
- Do not store the unit outdoors.

3.5. Conservation

In order to permit correct conservation of the units, they must not be removed from their original packaging until it is time to install them.

In case of prolonged storage, the use of dry places avoiding, as far as possible, sharp changes in temperature is recommended.

Deterioration of the packaging (tears, holes, etc.) prevents the units from being kept in optimum conditions before installation. Ingeteam accepts no liability in the case of failing to observe this condition.

4. Transporting the equipment

You must protect the unit, during transport, from mechanical knocks, vibrations, water splashes (rain) and any other product or situation which may damage it or alter its behavior. Failure to observe these instructions may lead to loss of warranty on the product, for which Ingeteam is not responsible.

4.1. Transport

Transport using a pallet truck

You must observe at least the following requirements:

1. Place the packaged units centered with respect to the forks.
2. Try to locate them as close as possible to the part where the forks and the steering unit meet.
3. In all cases, observe the instructions in the pallet truck's user manual.

Transport using a forklift truck

You must observe at least the following requirements:

1. Place the packaged units centered with respect to the forks.
2. Try to locate them as close as possible to the part where the forks and the steering unit meet.
3. Ensure that the forks are perfectly level to avoid overturning the unit.
4. Observe the instructions in the forklift truck's user manual under all circumstances.

Once the unit has been transported to the place where it is to be located and only when it is to be installed, unpack the unit.

At this time, it can be transported vertically over a short distance without packaging. Follow the guidelines indicated in the following point.

Transport of the unpackaged unit

You must observe at least the following requirements:

1. Follow the necessary ergonomic advice for lifting weights.
2. Do not release the unit until it is perfectly secured or placed.
3. Ask someone else to guide the movements to be made.

4.2. Unpacking

Correct handling of the units is vitally important in order to:

- Prevent damage to the packaging which enables them to be kept in optimum condition from shipping until they are installed.
- Avoid knocks and/or falls which may harm the mechanical characteristics of the units, e.g. cause incorrect closure of doors, loss of IP rating, etc.
- Avoid, as far as possible, vibrations which may cause subsequent malfunction.

If you observe any anomaly, please contact Ingeteam immediately.

Separating the packaging

All the packaging can be delivered to a non-hazardous waste management company.

In any event, each part of the packaging may be recycled as follows:

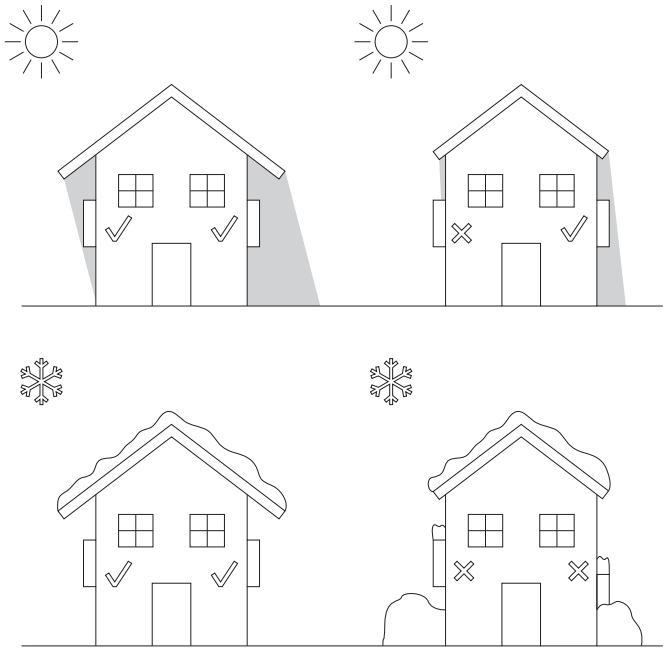
- Plastic (polystyrene, bag and bubble wrap): the appropriate container.
- Cardboard: the appropriate container.

5. Preparation for installing the unit

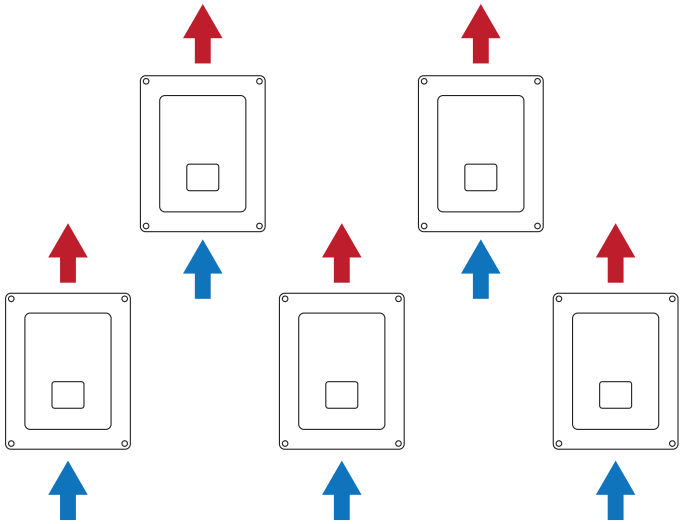
When deciding the location of the unit and planning your installation, you must follow a set of guidelines based on the specifications of the unit. These guidelines are summarized in this chapter.

5.1. Environment

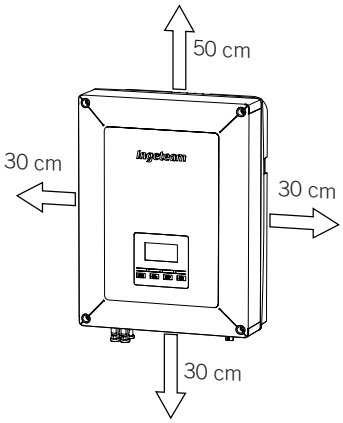
- These units can be installed indoors and outdoors.
- Place the units in a place which is accessible for installation and maintenance work and which permits use of the keyboard and the reading of the front indicator LEDs.
- Avoid corrosive environments that may affect the proper operation of the inverter.
- Never place any object on top of the unit.
- Do not expose the inverters to direct sunlight.
- Do not install the units in inhabited rooms. The inverter produces a slight buzz when in operation.



- If more than one inverter is installed, make sure the hot air extraction of one does not interfere with the correct ventilation of another.



- Keep the following distances free of obstacles.



5.2. Environmental conditions

Environmental operating conditions indicated in section *"2.7. Specifications tables"* must be taken into account when choosing the location of the unit.

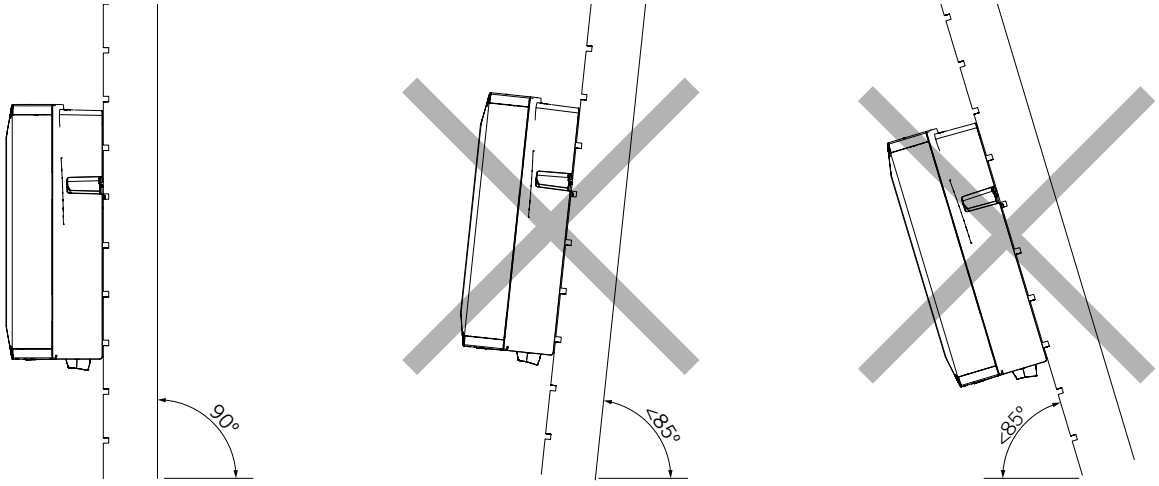
The surrounding atmosphere must be clean and at temperatures above 40 ºC, the relative humidity must be between 4% and 50%. Higher percentages of relative humidity up to 95% are tolerated at temperatures below 30 ºC.

Take into account that moderate condensation may occasionally occur as a consequence of temperature variations. For this reason, apart from the unit's own protection, it is necessary to monitor these units once they have been started up on sites where the conditions described above are not expected to be present.

In the event of condensation, never apply voltage to the unit.

5.3. Supporting Surface and Fastening

These inverters must be installed in accordance with the specifications in the following figure. The minimum positive or negative inclination permitted will be 85º in relation to horizontal.



Reserve a solid wall to which to attach the unit. It must be possible to drill the wall and fit suitable wall anchors and self-tapping screws to support the unit's weight.

5.4. Protection of the connection to the electricity grid

It is necessary to install protection elements in the connection between the inverter and the electricity grid.

Thermomagnetic circuit breaker

A thermomagnetic circuit breaker and/or fuse must be installed on the connection between the inverter and the electricity grid.

The following table provides the necessary data for the selection of these devices by the installer.

INGECON SUN 1Play HF	Maximum inverter current	Rated current for the type-B thermomagnetic circuit breaker
2.5HF	13.5 A	20 A
2.7HF	13.5 A	20 A
3HF	26.2 A	32 A
3.3HF	26.2 A	32 A
3.68HF	26.2 A	32 A
4.6HF	26.2 A	32 A
5HF	26.2 A	32 A
5.5HF	26.2 A	32 A
6HF	26.2 A	32 A

When selecting the protection in an installation you must take into account that its breaking capacity is greater than the short-circuit current of the mains connection point.

You must take into account when correctly selecting the protection that the ambient working temperature influences the maximum current permitted by these protections as indicated by the manufacturer.

Residual current device

You must comply with applicable regulations governing the protection of people in the electricity grid.

5.5. Cable length

The inverter measures the voltage in its connection terminals. For this reason, the installer must use an AC cable with a sufficiently low impedance so that increasing the voltage in the cable (between the distribution transformers and the unit) does not cause the unit to be disconnected due to high voltage.

6. Installing the unit

Before installing the unit, you must remove the packaging, taking special care not to damage the housing.

Check that there is no condensation inside the packaging. If there are signs of condensation, the unit must not be installed until you are sure it is completely dry.

All installation operations must comply with current regulations.

All operations involving moving heavy weights must be carried out by two people.

6.1. General requirements for installation

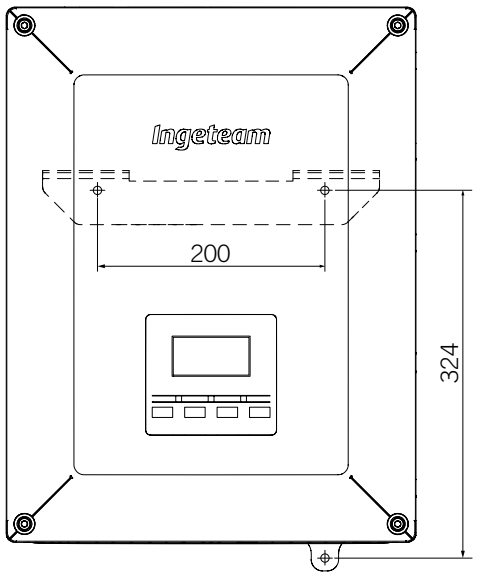
- The environment of the unit must be appropriate and meet the guidelines described in Chapter *"5. Preparation for installing the unit"*. Additionally, the parts used in the rest of the installation must be compatible with the unit and comply with the applicable legislation.
- Ventilation and the space for work must be suitable for maintenance tasks according to the applicable regulations in force.
- The external connection devices must be suitable and sufficiently close as set forth in current regulations.
- The feed cables must be of the appropriate gage for the maximum current.
- You must take special care to ensure that there are no external elements near the air inlets and outlets that obstruct proper cooling of the unit.

6.2. Attaching the unit to the wall

These units have a system for securing them to the wall using a plate. The steps for fixing the unit properly are as follows. The weight of the unit must be taken into account.

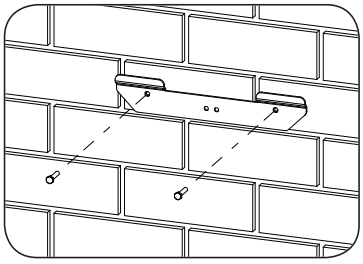
The top attachment plate for the unit supports the weight. The bottom point fixes the inverter to the wall and prevents vibrations.

1. Mark the fixing points for the plates on the wall.

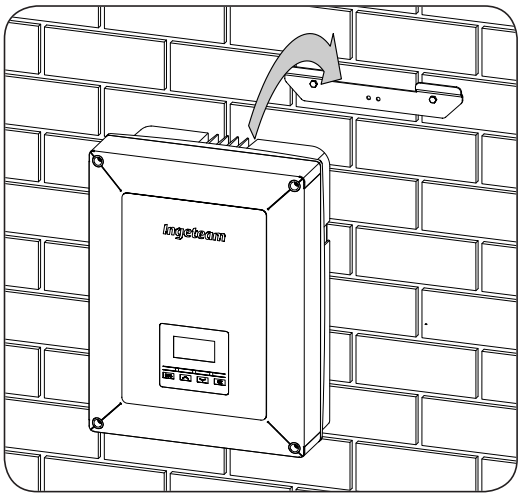


2. Drill holes in the wall with a suitable bit for the fastening elements to be used to secure the plate to the wall later.

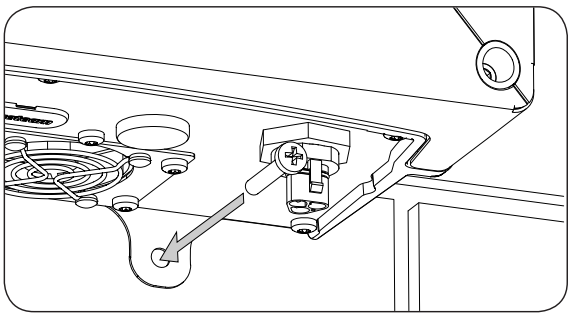
3. Fix the plate using fastening elements that are appropriate for the wall onto which it is to be installed. The diameter of the holes of the plate is 7.5 mm.



4. Suspend the unit from the plate by fitting the slats in the openings on the back of the unit.



5. Mark the lower attachment point, remove the unit and drill the hole in the wall. Install the unit again and fix the bottom attachment using a suitable fastening element. Said hole has a diameter of 7.5 mm.



6. Check that the unit is properly secured.

Once the unit has been installed correctly, the connection process will begin.

Make the connections in the following order:

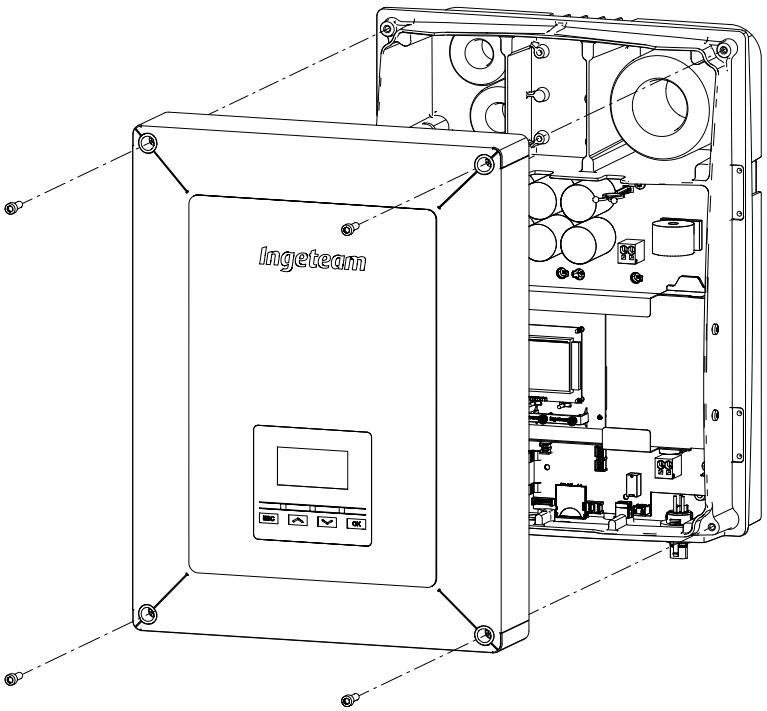
1. Connection of accessories (optional).
2. Connection of the ground connection (optional).
3. AC connection.
4. DC connection.

It is mandatory to follow the order described above. Do not switch on the power until you have made all the connections and closed the unit.

6.3. Opening and closing the housing

To install the equipment it is not necessary to open the housing unless you wish to modify the ground connection or install an accessory.

To access the inside of the unit open the cover of the housing by removing the four front screws.

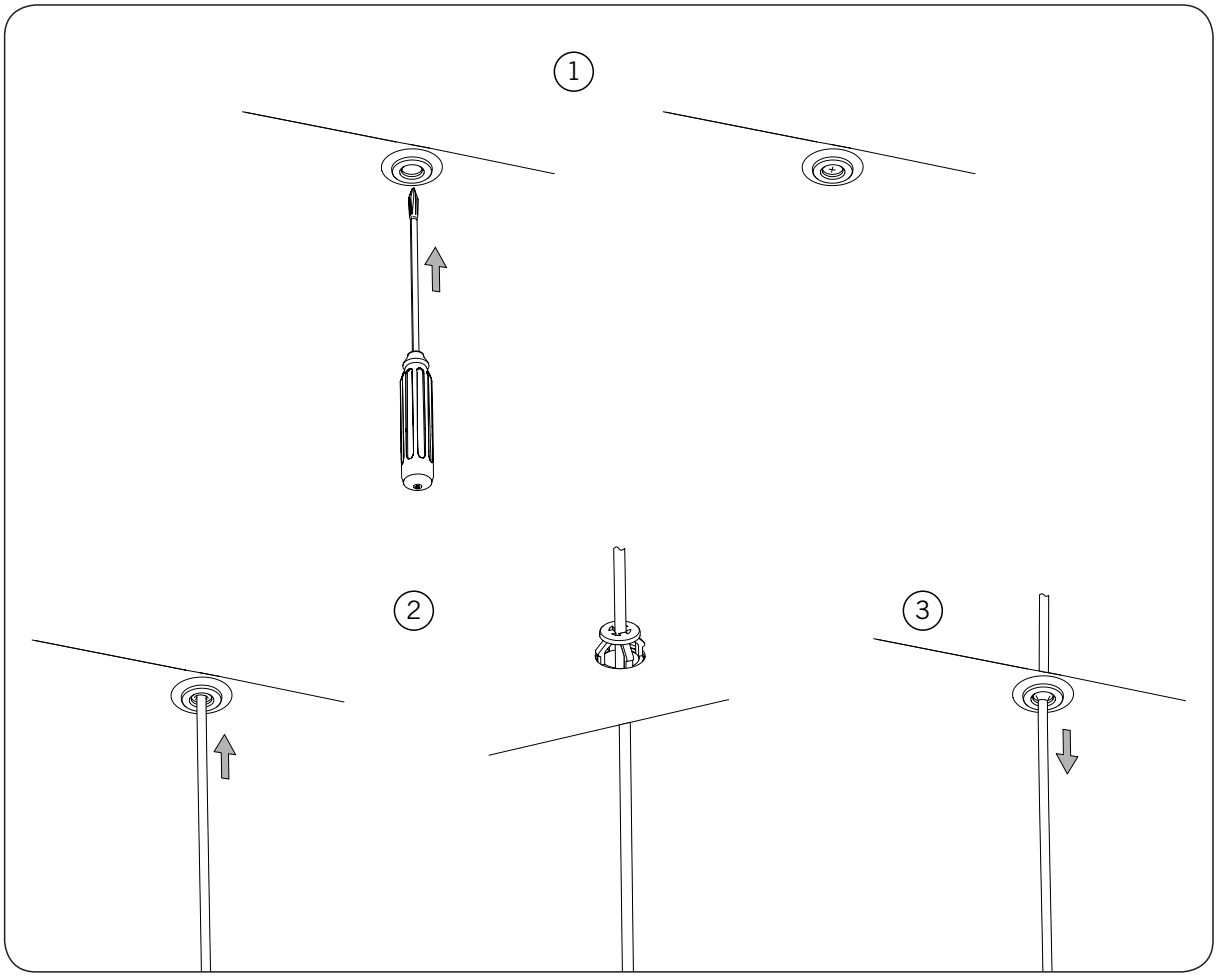


After making the different connections explained in the sections below, close the unit before starting it. To close the housing, tighten the aforementioned screws, applying a torque of 6 Nm.

Check that the unit is correctly closed before starting up the unit.

7. Use of cable grommets

There is a series of cable grommets to insert cables into the unit. Follow the instructions below for their correct use:



1. Make a hole in the cable grommet membrane using a screwdriver.
2. Insert the cables through the hole made. Make sure the cable passes through the rear structure of the cable grommet correctly.
3. Pull the cable gently outwards until resistance is felt so that the cable is correct secured and the membrane creates a seal.

Section *"2.8. Description of cable inlets"* indicates the range of cable diameters valid for each cable grommet.

8. Connection of accessories

Throughout this chapter, the process is explained for connecting the optional accessories in the unit, along with the potential-free relay and the digital input.

Optionally, a communication system can be installed in order to establish a connection with the unit to monitor and configure it, either locally or remotely, depending on the type of communication chosen and the needs of the installation.

As standard these units have local communication via USB. In addition there is the option of establishing connections using other technology types:

- RS-485.
- Ethernet (including communication via RS-485, for optional use).
- Ethernet TCP (including communication via RS-485, for optional use).
- GSM/GPRS (including communication via RS-485, for optional use).
- Bluetooth.
- Bluetooth (including communication via RS-485, for optional use).

See the corresponding communication accessories manual for further information.

Read carefully before starting the connection process.

8.1. Safety instructions for connecting accessories

Consult section *"Important Safety Instructions"* and the following instructions before working on the unit.

Make sure there is no voltage present on the unit before starting the connection.

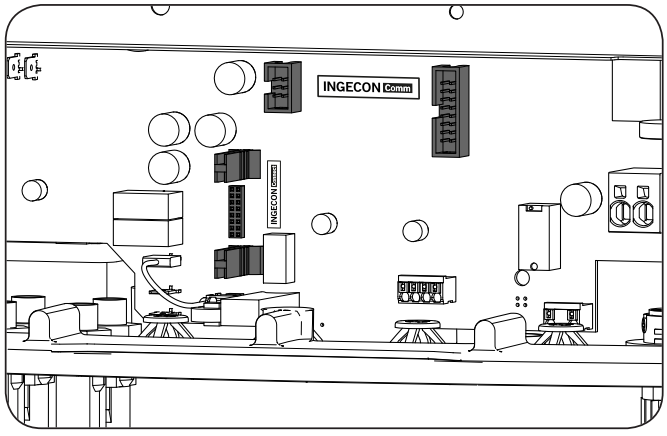
Do not switch on the power to the unit until you have successfully made the rest of the connections and the unit is closed.

Ingeteam accepts no liability for any damages caused by incorrect connection.

Use the personal protective equipment specified in the section *"Personal Protective Equipment (PPE)"*.

8.2. Optional accessories

Depending on the type of accessory to install you must use the connector INGECON Connect or those marked as INGECON Comm of the inverter power card.



If the accessory must be connected in the INGECON Connect, you must install the two vertical guides shown in the figure above on the electronic circuit board, and use them to insert the card of the accessory.

After connecting the card or the corresponding connectors, insert the cable necessary for its proper installation into the unit through the packing glands for the communication accessories.

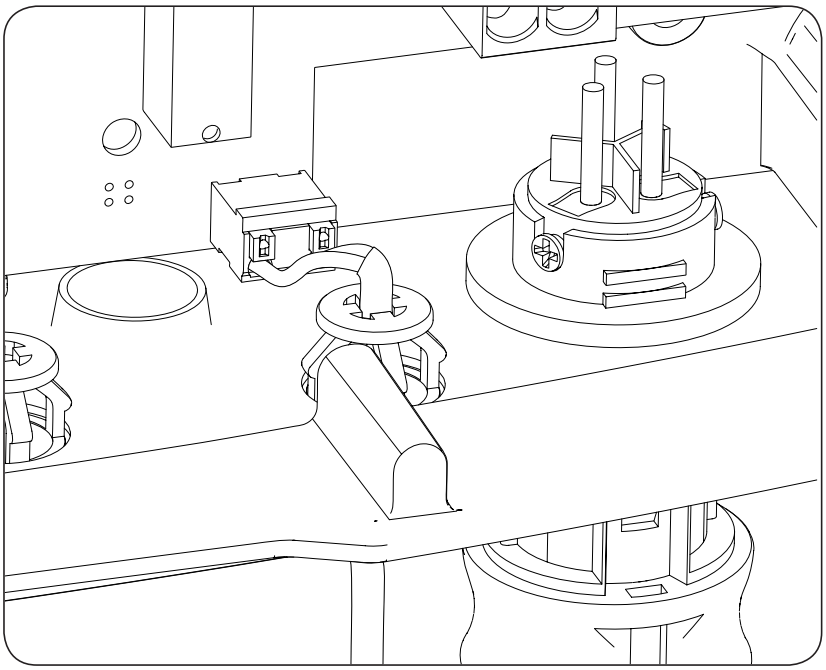
To ensure the protection class of the unit, the cables used must be of a diameter of between 4 and 10 mm if the 16 mm cable grommet is used, or between 6 and 13 mm if the 20 mm cable grommet is used.

8.3. Connecting the potential-free auxiliary relay

These inverters have a potential-free output which can have several functions:

- Closing the relay in the event of an insulation fault (default option).
- Closing the relay in the event of a grid, voltage or frequency out of range alarm.
- Closing the relay in the event of any alarm in the inverter.
- Closing the relay upon connection of the inverter to the grid.
- Closing the relay if the estimated power of the PV array exceeds the load power. When this mode is selected, the user will also have to enter another configuration parameter: the load power.

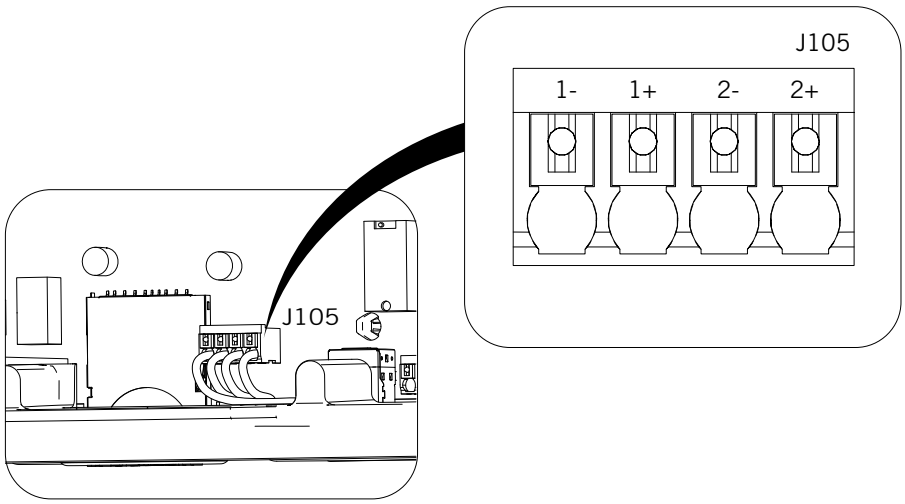
The gage of the cables used must be between 0.25 and 2.5 mm^2. This device is connected using a conduit with at least two poles.



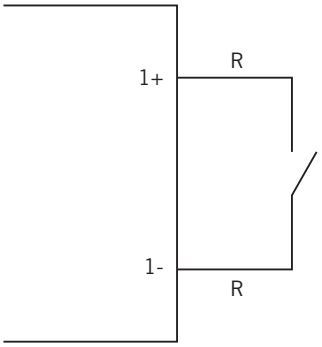
To insert the cable into the unit, use the cable grommet provided for this purpose. Connect the cable to the corresponding terminal. As it is a potential-free relay, there is no polarity.

8.4. Connecting the digital input

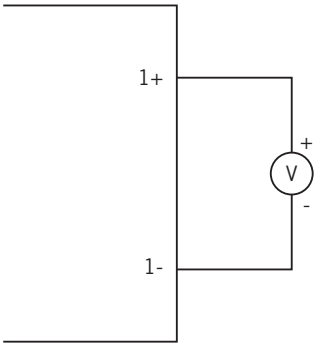
These inverters have a digital input.



The digital input can be used with a potential-free contact or with a power supply, both outside the unit.



External potential-free contact



External power supply

The truth table for said input is as follows.

Connector		CPU
Potential-free contact	**Voltage level**	
Open	5 V ~ 24 V	“0”
Closed (R < 100 Ohm)	0 V	“1”
Closed (R > 100 Ohm)	1 V ~ 5 V	X

9. Connection of the ground connection

These units offer the possibility of grounding the positive or negative pole of the PV array if desired.

This section explains the process for connecting the cabling to ground the unit.

Read carefully before starting the connection process.

9.1. Safety instructions for the ground connection

Consult section *"Important Safety Instructions"* and the following instructions before working on the unit.

Make sure there is no voltage present on the unit before starting the connection.

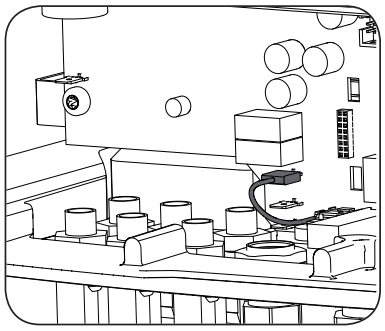
Do not switch on the power to the unit until you have successfully made the rest of the connections and the unit is closed.

Ingeteam accepts no liability for any damages caused by incorrect connection.

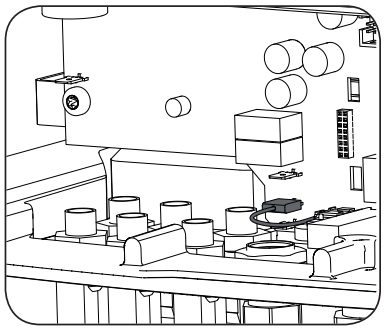
Use the personal protective equipment specified in the section *"Personal Protective Equipment (PPE)"*.

9.2. Wiring process for the ground connection

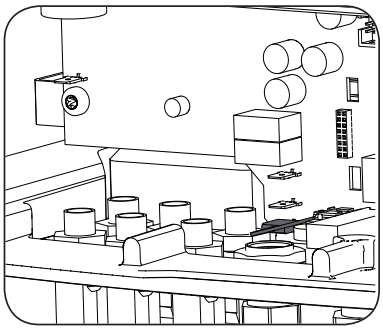
The unit comes from the factory without grounding. If you wish to ground one of the two poles, proceed as indicated in the following figures:



Without ground connection (J103, factory default status)



Ground connection of the positive pole (J8)



Ground connection of the negative pole (J5)

In addition to the connection described, you must configure the unit using the display (see section *"13.6.4. Settings"*).

10. AC connection

This chapter explains the requirements and process for wiring the AC wiring to the unit.

Read carefully before starting the connection process.

10.1. Safety instructions for the AC connection

Consult section *"Important Safety Instructions"* and the following instructions before working on the unit.

Make sure there is no voltage present on the unit before starting the connection.

Do not switch on the power to the unit until you have successfully made the rest of the connections and the unit is closed.

Ingeteam accepts no liability for any damages caused by incorrect connection.

Use the personal protective equipment specified in the section *"Personal Protective Equipment (PPE)"*.

10.2. Wiring requirements for the AC connection

The metal parts of the inverter (ground of the unit) are connected electrically to the grounding point of the quick connector for AC connection.

To guarantee the safety of persons, for the unit to function correctly and comply with the applicable standards, this point must be connected to the ground of the installation.

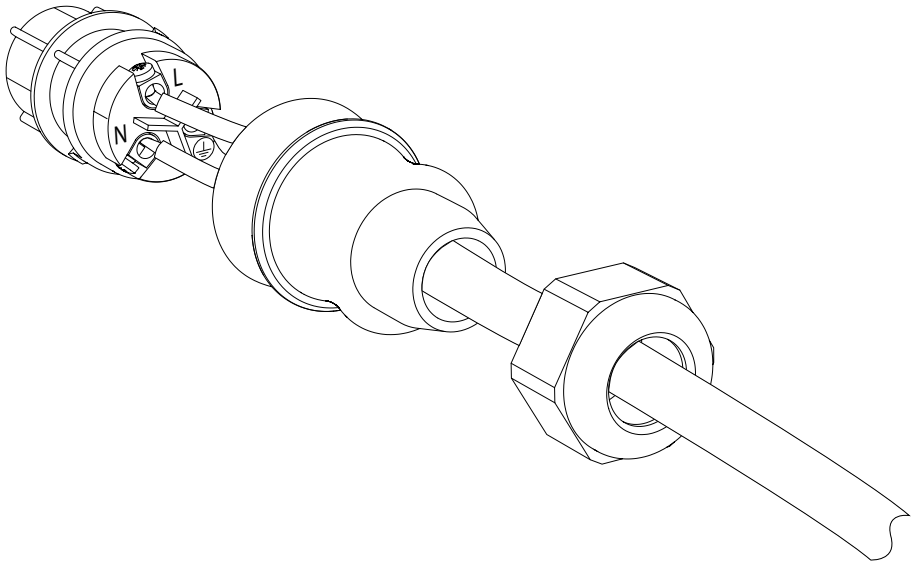
The ground and phase cables are connected from the grid to the inverter using a three-terminal connector.

The maximum diameter of the wiring conduit that can be used with the connector is 14 mm. The size of the ground cable will be the responsibility of the installer and must meet applicable regulatory requirements in the installation, with a minimum gage equal to that of phase and neutral.

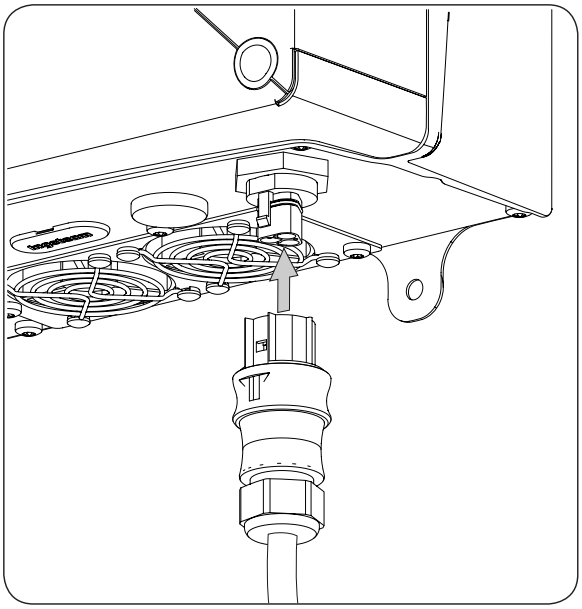
If the inverter and the grid connection point are far enough apart to require the use of cables with a larger gage, an external distribution box should be used close to the inverter to make this connection.

10.3. AC connection process

1. Wire the connector observing the instructions printed on it: line (L), neutral (N) and ground (ground symbol).



2. Insert the connector as shown in the following figure.



3. Ensure the connection is firm, checking that the safety tab is properly inserted. If you wish to remove the connector you must press this tab with a suitable instrument to release it.

11. DC connection

This chapter explains the requirements and process for wiring the DC wiring to the unit.

Read carefully before starting the connection process.

11.1. Safety instructions for the DC connection

Consult section *"Important Safety Instructions"* and the following instructions before working on the unit.

Make sure there is no voltage present on the unit before starting the connection.

Do not switch on the power to the unit until you have successfully made the rest of the connections and the unit is closed.

Ingeteam accepts no liability for any damages caused by incorrect connection.

Use the personal protective equipment specified in the section *"Personal Protective Equipment (PPE)"*.

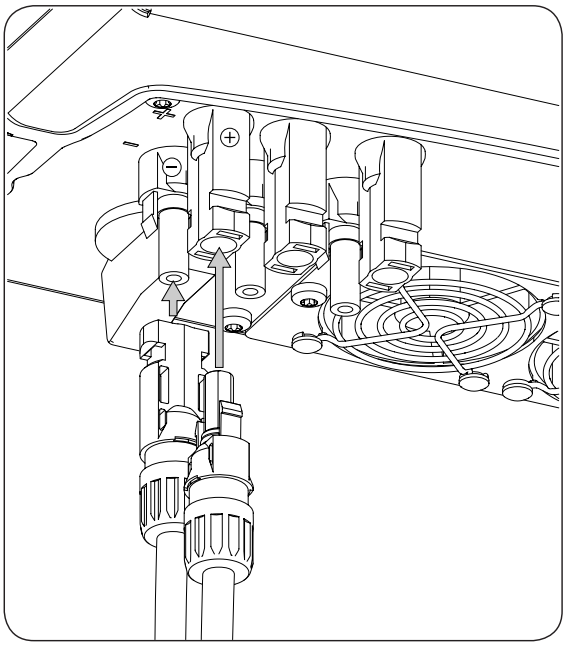
11.2. Wiring requirements for the DC connection

The wiring gage for the DC connection is specified in the following table:

	1Play
Recommended gage for DC cables	4 mm^2

11.3. DC connection process

1. Remove the caps from the connectors.
2. Insert the connectors respecting the polarities indicated on the lower connections plate of the unit.



3. Ensure the connections are firm. If you wish to remove the aerial connectors, use the specific tool to do so.

12. Start-up

This chapter details the process for the starting up the unit.

12.1. Equipment inspection

You must check the correct condition of the installation before start-up.

Each installation is different, depending on its characteristics, the country in which it is located or other special conditions which may apply. In all cases, before starting up, it is necessary to ensure that the installation complies with the applicable legislation and regulations and that at least the part to be started up is complete.

12.1.1. Inspection

Before inverter start-up, you must carry out a general inspection of the units involving mainly:

Wiring inspection

- Check that the cables are correctly joined to their connectors.
- Check that these cables are in a good condition and that there are no hazards in their environment which damage them, such as sources of intense heat, objects which could cut them or arrangements which put them at risk of impacts or pulling.
- Check the polarities of the DC and AC cables.

Check that the unit is properly secured

Check that the unit is secured firmly and is not at risk of falling.

12.1.2. Hermetic sealing of the unit

Ensure during installation operations that the unit's level of sealing has not been altered during connection of the unit.

Check the correct adjustment of the connectors and that any cable grommets are well sealed.

Check that a torque of 6 Nm has been applied to the housing closure screws.

12.2. Power-up

Once a general visual inspection, wiring check and sealing check have been carried out, connect power to the unit (DC and AC).

In the first inverter connection a number of screens appear in which you must select, in this order, language, country and applicable standards. After its configuration a feedback screen appears with the options selected.

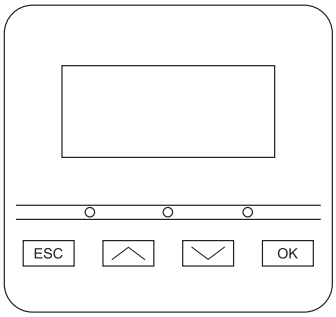
After this first configuration, select *Main menu > Start/Stop > Start*, thus starting the inverter.

13. Display control

These units incorporate a display and keypad unit to interface with the installer and the user.

This interface allows the display of the main internal parameters and the configuration of the entire system during installation.

Parameters, variables and commands are organized as menus and submenus.



13.1. Keypad and LEDs

The keypad has four keys:

ESC	To exit a parameter, leave a menu and return to the next level up in the structure to not confirm a change or not accept a suggestion.
^	With this key you can scroll up the list of parameters or folders within the same level or increase the value of an editable parameter by one base unit.
v	Scroll down the list of parameters or folders within the same level or decrease the value of an editable parameter by one base unit.
OK	Its purpose is to accept a parameter as valid, to enter a lower level menu in the structure, to confirm a change or accept a suggestion.

The panel consists of three LEDs, green orange and red:

Green LED

Off: inverter disconnected.

On: inverter connected to the grid.

Flashes once: the conditions are not valid for feeding the grid (low Vdc voltage or other alarm).

Flashes six times: the connection conditions are valid. The inverter is in the process of connecting to the mains.

Orange LED

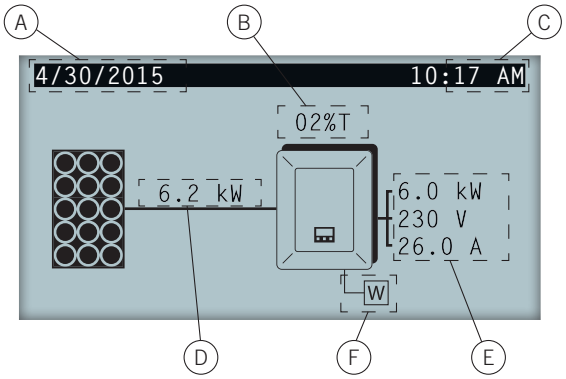
Consult section *"18. Troubleshooting"*.

Red LED

Consult section *"18. Troubleshooting"*.

13.2. Display

The main display shows different inverter data:



A. Current date, YYYY-MM-DD.

B. Power reduction percentage and reason for this reduction*.

C. Current time, hh:mm.

D. Voltage and power of the PV array. Both pieces of data are displayed alternately.

E. Power, voltage and current fed to the public grid.

F. Wattmeter for instantaneous self-consumption. This symbol is only shown if the inverter is configured to work in self-consumption mode. If it flashes, this is due to a communication failure with the wattmeter.

Pressing the key OK takes you to the main menu. Pressing the key ∧ displays the daily power graph. Pressing ∨ displays the energy graph for the last 24 days.

* The reasons for power reduction are as follows:

T: Temperature. The inverter is limiting the power due to internal overheating.

C: Communications. The inverter is limiting the power after having received a reduction setpoint through communications.

F: Grid frequency. The inverter is limiting the power due to the grid frequency variation.

V: Grid voltage. The inverter is limiting the power due to the grid voltage variation.

Q: Reactive priority. The inverter is limiting the power due to the injection of reactive power.

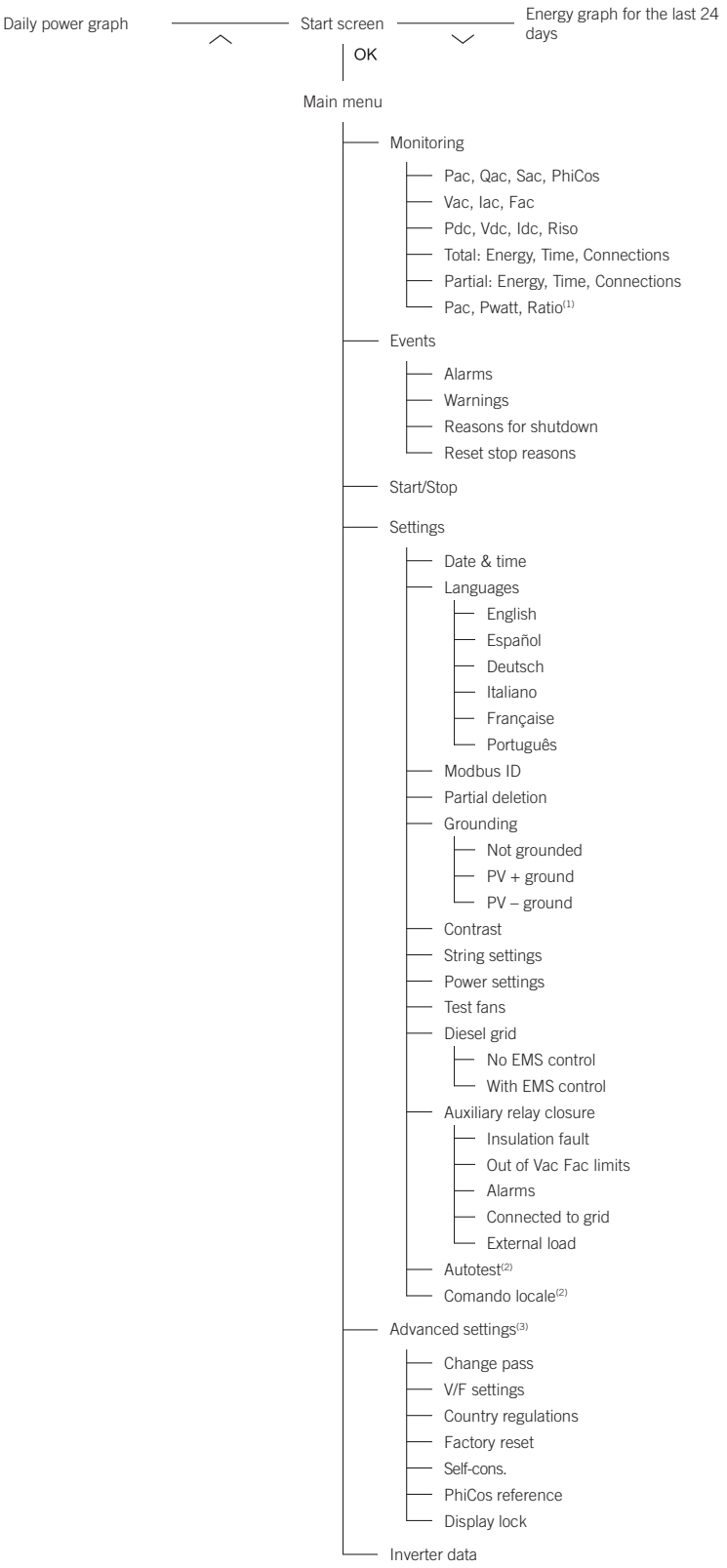
A: Configuration. The inverter is configured to limit its power.

R: Initial connection ramp. The inverter is limiting the power after a reconnection to the grid.

S: Self-consumption mode. The inverter is limiting the power due to functioning in self-consumption mode.

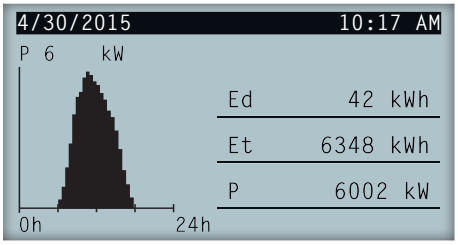
M: Reserved mode.

13.3. Menu structure



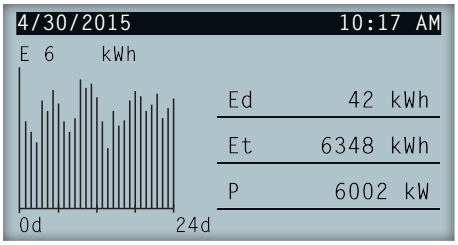
(1) This option is only available if you have selected *Self-consumption* mode.
(2) This option is only available if you have selected standard *CEI 0-21 SPI INTERNAL*.
(3) Menu intended for the installer and password-protected.

13.4. Daily power graph



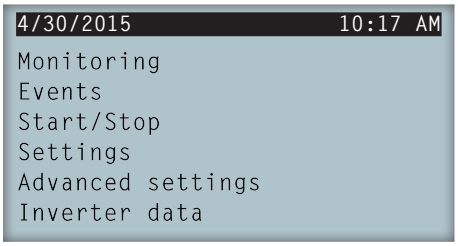
In this screen you can consult the daily power graph. The daily energy values (Ed), from the first connection of the day to the time of the query, the total accumulated energy (Et) and the power (P) are also listed.

13.5. Energy graph for the last 24 days



In this screen you can consult the energy graph for the last 24 days. The daily energy values (Ed), from the first connection of the day to the time of the query, the total accumulated energy (Et) and the power (P) are also listed.

13.6. Main menu



The main menu contains the following submenus:

Monitoring	This menu includes a series of screens which show the main variables being monitored. The right-hand screen shows the first one as an example.
Events	This shows the main events such as alarms, warnings and reasons for shutdown.
Start/Stop	Start up and shutdown the inverter manually.
Settings	Modify parameters to adapt the unit to different operational conditions.
Advanced settings	To carry out advanced settings in the inverter. Its access is restricted by the installer password. Is not user-accessible.
Inverter data	Key information referring to the inverter: serial number, firmware loaded, etc.

To access the various menus and submenus, the desired option must be highlighted over a black background using the ∧ and ∨ keys and press the OK key to access it.

13.6.1. Monitoring

This menu includes a series of screens which show the main variables being monitored. To move between the different screens use the keys ∧ and ∨.

The structure and interpretation of the variables of this menu are shown below:

Pac Inverter AC power, in watts.

Qac Inverter AC reactive power, in reactive volt-amperes.

Sac Inverter AC apparent power, in volt-amperes.

PhiCos Cosine of Phi. Cosine of the phase shift angle between the voltage and current supplied by the inverter.

Vac AC voltage of the inverter, in volts.

Iac AC current through the inverter, in amperes.

Fac Frequency generated by the inverter, in hertz.

Pdc Inverter DC power, in watts.

Vdc Inverter DC voltage, in volts.

Idc DC Current, in amperes.

Riso Insulation resistance of the PV array, in kiloohms.

Total

Energy Total energy fed through the inverter throughout its useful life.

Time Total time that the inverter has been feeding the grid.

Connections Total number of network connections.

Partial

Energy Partial energy fed by the inverter.

Time Partial time that the inverter has been connected to the grid.

Connections Partial number of network connections.

Pac AC power, in watts

Pwatt Power fed to the public grid in self-consumption mode, in watts.

Ratio Self-consumption ratio. Displays the consumption percentage of the loads being fed by the power generated by the inverter.

13.6.2. Events

This menu shows the events occurring in the inverter.

Alarms

The alarms indicate current events in the inverter that lead to its shut-down. In section *"18.1. Alarms. LED messages"* you can consult the list of alarms and their solution.

Warnings

The warnings are events that do not lead to the shut-down of the inverter but do need maintenance action. In section *"Warnings"* you can consult the list of warnings and their solution.

Reasons for shutdown

Log file that indicates the alarms that have triggered the inverter shutdown, indicating the date and time of the shutdown.

Reset stop reasons

This option resets the *Stop reasons* log file.

13.6.3. Start/Stop

The operation of the inverter can be stopped and started manually using this option.

13.6.4. Settings

In this menu you can make the following settings:

Date and time	To modify the date and time of the inverter.
Languages	Selection of the language for the text on the inverter display.
Modbus ID	Assignation of a number that identifies the inverter. In photovoltaic installations with more than one inverter, each one must be assigned a different number. Ingeteam recommends using correlative numbering.
Partial deletion	Deletes the partial meters.
Grounding	From this menu you can configure the PV array grounding. In addition to this configuration, you must make the connections indicated in section *"9. Connection of the ground connection"*.
Contrast	To adjust the screen contrast of the inverter.
String settings	Not applicable.
Power settings	Reduce the unit power.
Test fans	By accessing this option it is possible to run a test to check the inverter fans are working properly.
Diesel grid	Intended for hybrid installations whereby the grid is generated by a diesel generator. From this menu you can select whether or not the inverted is managed using the INGECON EMS Manager.
Factory reset	This returns the inverter to factory default status.
Auxiliary relay closure	Selection of the reason the auxiliary relay closes. The selectable reasons are: insulation fault, Vac and Fac out of range values, connected to grid or external load.
Autotest	This menu is only available when the standard selected is *CEI 0-21 SPI INTERNAL*. The autotest enables an automatic verification of the grid voltage and frequency limits, bringing these limits toward the real value of the measurement and ensuring that the unit disconnects in the set time when the measurement does not comply with the limit.
Local command	This menu is only available when the standard selected is *CEI 0-21 SPI INTERNAL*. From this menu you can change the bottom and top frequency limits. These limits must correspond to the selected standard.

13.6.5. Autotest

Autotest allows for the grid voltage and frequency limits to be tested automatically, checking that the unit disconnects correctly within the time set by standard. This menu is only available for some standards, such as *CEI 0-21 SPI INTERNAL*.

During autotest, the disconnection time of the following protections is tested:

Fmax (81>.S1)	Lowest upper limit of the frequency protection.
Fmin (81<.S1)	Highest lower limit of the frequency protection.
Fmax (81>.S2)	Highest upper limit of the frequency protection.
Fmin (81<.S2)	Lowest lower limit of the frequency protection.
Vmax (59.S1)	Lowest upper limit of the voltage protection.
Vmax (59.S2)	Highest upper limit of the voltage protection.
Vmin (27.S2)	Lower limit of the voltage protection.

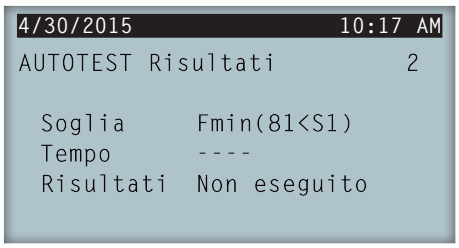
There are three different states:

Non eseguito	No autotest running and none has been performed during the time in which the inverter has been switched on.
Riconnessione	State awaiting reconnection for the next measurement after an Fmax, Fmin, Vmax or Vmin check.
Completato	A full autotest has been carried out during the time in which the inverter has been switched on.

Press OK on *Avviare Autotest* to start autotest. Access *Risultati* to consult the results of the different tests, observing whether the result is correct or incorrect. An autotest can be stopped when running by pressing OK on *Eseguire Autotest*.

The results screens for an autotest are then displayed if the test has been completed and a second case in which the test has not been completed:

Autotest complete, correct result



Autotest not complete, no result

13.6.6. Advanced settings

The settings included within this menu can only be modified by a qualified installer.

Ingeteam accepts no liability for incorrect use of the installer password nor the consequences that may arise from incorrect configuration of the unit by the user and / or the installer.

To modify the parameters of this menu the installer password will be requested.

The installer password is 3725.

Within this menu you can change the password, adjust the voltage and frequency values or modify the country and the regulations applicable to the inverter.

13.6.7. Inverter data

From this menu you can consult different data referring to the inverter.

14. Firmware update

See the firmware loading manual for details of the update process.

To download the manual, go to the Ingeteam website (www.ingeteam.com) and enter the download zone in the inverter model section. You will find a zipped file containing the manual and the latest firmware version.

15. Communication via USB

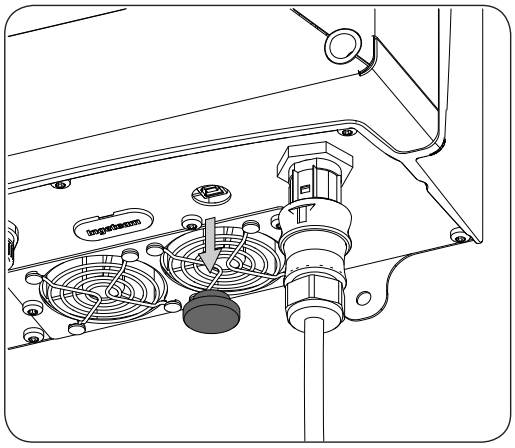
These units can communicate locally with a PC via USB using the plant management software INGECON SUN Manager, available on the Ingeteam website (www.ingeteam.com).

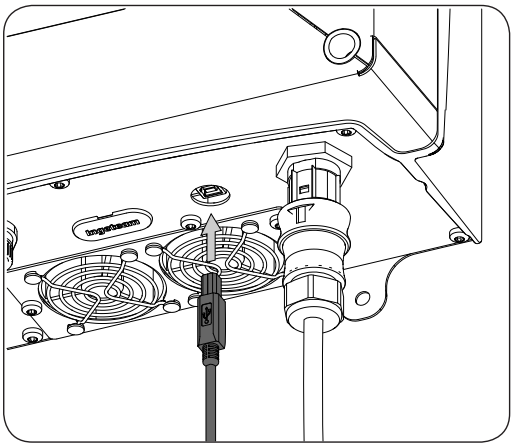
Consult the INGECON SUN Manager manual for more information.

The maximum length of the USB cable used to make the connection must not exceed 3 meters.

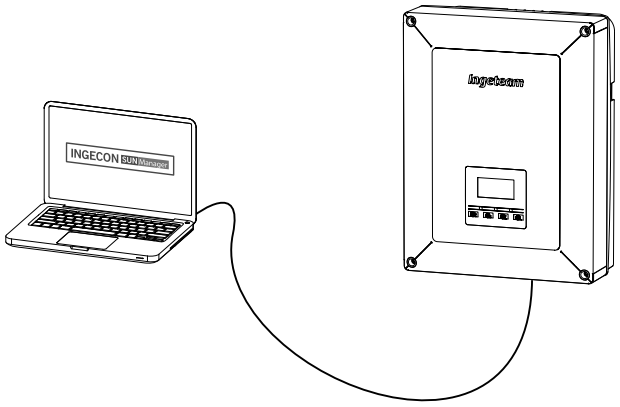
15.1. Wiring process

1. Remove the cover from the USB Type B connector. Connect the cable to the inverter (cable not supplied by Ingeteam).





2. Connect the Cable to a USB port of the PC.



3. The PC will recognize the device and install its driver. If it is necessary to install the driver manually, it can be downloaded from following link: *http://www.ftdichip.com/Support/Documents/InstallGuides.htm*.
4. Once the installation process has finished, open the device administrator from the control panel.
5. In the element Ports (COM & LPT) a new COMx port, related to the inverter, will be shown. This will be determined as USB Serial Port or FTDI USB Serial Port (this will depend on the version of the driver installed).
6. Run the INGECON SUN Manager software indicating the port number in the previous step.

To maintain the protection rating of the unit after this task you must always replace the cover over the USB connector.

While the inverter remains connected by USB the protection rating of the unit is lower than that specified throughout this document.

16. Shutting down the unit

This section describes the procedure to shut down the unit. If you wish to work inside the unit, you must carry out these instructions in the order shown here to remove the power.

16.1. Process of shutting down the unit

1. Proceed to stop mode from the inverter display.
2. Remove voltage from a means of disconnection outside the unit.
3. Wait 5 minutes for the internal capacitances to discharge, the hot parts which may cause burns to cool and the fan blades to stop turning.
4. Check that there is no voltage at the DC and AC inputs.
5. Signal cut-off point (Vac and Vdc) with a sign reading ¨*Caution no switching...*¨. If necessary, rope off the work area.

17. Preventive maintenance

The recommended preventive maintenance tasks must be carried out at least annually, except where otherwise stated.

17.1. Safety conditions

You must consider the set of conditions listed below as minimum requirements.

Before opening the unit, you must remove the power (see Section *"16. Shutting down the unit"*).

An open housing never implies an absence of voltage in the unit, so only qualified personnel may access the unit, following the safe operation guidelines stipulated in this document.

Ingeteam accepts no liability for any damages caused by improper use of the equipment. You must propose in advance to Ingeteam any work carried out on any equipment which implies a modification of the original electrical arrangements. These must be studied and approved by Ingeteam.

All the maintenance checks included here must be carried out with the machine stopped, under safe conditions for handling, including those specified by the client for these types of operation.

When carrying out maintenance work on the unit, you must wear the personal protective equipment specified in Section *"Personal Protective Equipment (PPE)"* of this document.

After completing the maintenance task, replace the front cover and secure it with the bolts supplied.

17.2. Condition of the housing

A visual check of the condition of the housing must be carried out, confirming the condition of the seals and the cover, as well as the fixing of the units to their anchor points on the wall. In addition, you must check the condition of the housing for dents or scratches that might degrade the housing or cause it to lose its protection classification. If these types of defect are noticed, the affected parts must be repaired or replaced.

Check that there is no moisture inside the housing. If moisture exists, dry it before making electrical connections.

Check the correct fixing of the housing components to their corresponding anchoring points.

Check the door seal of the unit is in good condition.

17.3. Condition of cables and terminals

- Check the correct path of the cables so they do not come into contact with live parts.
- Check the insulation deficiencies and hot spots by checking the color of the insulation and terminals.
- Check that the connections are properly adjusted.

17.4. Cooling system

- Check the status of exhaust fans, cleaning and replacing them if necessary.
- Clean the radiator fins and the cooling grids.

17.5. Environment

Check the environment to avoid amplifying or transmitting the buzzing sound.

18. Troubleshooting

This section provides a guide for troubleshooting problems that may arise in the installation and operation of the inverter.

Troubleshooting for the inverter must be performed by qualified personnel in compliance with the general safety instructions in this manual.

18.1. Alarms. LED messages

Alarm	LED Lighting*	Description	Solution
Vdc1 overvoltage	Orange, 6	Overvoltage in DC input number 1	Check the connections of the PV array, ensuring the series-parallel configuration of the panels is correct, and that the maximum voltage of the inverter has not been exceeded.
Vdc2 overvoltage	Orange, 6	Overvoltage in DC input number 2	
Idc1 overcurrent	Red, 1	Overcurrent in DC input number 1	Check the installation in the DC part. If the error persists, contact the Technical Service.
Idc2 overcurrent	Red, 1	Overcurrent in DC input number 2	
Overvoltage Vbus	Red, 2	Overvoltage in the bus	Check the connections of the PV array, ensuring the series-parallel configuration of the panels is correct, and that the maximum voltage of the inverter has not been exceeded.
Inst. Overcurr. Vac	Orange, 2	Instantaneous overvoltage at the AC output	Check the connections of the AC side. Check that the voltage of the electricity grid is within range.
Vac out of range	Orange, 2	AC output voltage out of the defined range	
Inst. Overcurr. Iac	Red, 1	Instantaneous overcurrent at the AC output	Check the installation in the AC part. If the error persists, contact the Technical Service.
Iac out of range	Red, 1	AC output current out of the defined range	
Fac out of range	Orange, 3	AC grid frequency out of the defined range	Check the connections of the AC side. Check that the frequency of the electricity grid is within range.
DC/DC pwm fault	Red, 3	Firmware fault in the DC/DC phase	Check the installation in the DC and AC part. If the error persists, contact the Technical Service.
DC/AC pwm fault	Red, 3	Firmware fault in the DC/AC conversion phase	
DC/DC hw fault	Red, 3	Hardware fault in the DC/DC phase	
DC/AC hw fault	Red, 3	HW fault in the DC/AC conversion phase	
Temperature alarm	Orange, 4	Temperature out of operating range	This may be normal if the room temperature exceeds the maximum of the unit. Check the functioning of the fans. Protect the inverter from direct exposure to sunlight. Cool the room where the inverter is installed.
Fatal error	Not applicable	Not applicable	Not applicable
Manual shutdown	Orange, constant	The inverter has been manually stopped.	Start the inverter by means of the display.
Hardware error	Red, 1	The inverter displays a hardware error	Disconnect the DC and AC inverter. Wait until the LEDs go off and re-connect. If the problem persists, contact the Technical Service.
Residual current	Orange, 5	Residual current out of range	Check that there are no insulation faults in the PV array. Check that the stray capacity of the PV array does not exceed the maximum permitted.
FW update	Orange, constant	Inverter shutdown due to firmware load	Normal shutdown due to inverter firmware update.

Alarm	LED Lighting*	Description	Solution
Grid consumption	Orange, 1	Grid consumption power out of the permitted range	This may be due to a low irradiance level. Otherwise, check the PV array.
Low pow. PV conn.	Orange, 1	The generated power in the PV array is not sufficient to connect to the AC grid	
Pow. supply fault	Not applicable	Not applicable	Not applicable
Idc grid injection	Not applicable	Not applicable	Not applicable
Config. change	Red, 1	Inverter setting change	Normal shut down due to a change in the inverter setting.
Isolation alarm	Orange, 5	Insulation resistance out of range	Check, on the display, that the PV array grounding is correctly configured. Search for an insulation fault in the PV array. If one of the poles is grounded, check the grounding fuse.
Satur. alarm Iac	Orange, 5	AC current saturation	Check the installation in the AC part. If the error persists, contact the Technical Service.
Low Vdc	Orange, 1	Low DC voltage	This may be due to a low irradiance level. Otherwise, check the PV array.
Shut-off due to burn-out	Not applicable	Not applicable	Not applicable
Electric arc detection	Orange, 8	Electric arc detected in the DC input	Not applicable

* The number of flashes is indicated.

Warnings

Alarm	LED Lighting*	Description	Solution
Blocked fan	Orange, 7	Possible fan blockage	Check the condition of the fan and that there are no elements that prevent it functioning properly.
High temperature	Orange, 7	Power regulation due to temperature above operating temperature	Check the room temperature does not exceed the specified maximum temperature and the inverter is not exposed to direct sunlight. Also check the functioning of the fans.
Low temperature	Orange, 7	Temperature below operating temperature	Check the room temperature is not below the specified minimum temperature.
High Vdc	Not applicable	Not applicable	Not applicable
String kit comm.	Not applicable	Not applicable	Not applicable
Self-cons. commun.	Orange, 7	Communication fault with the self-consumption devices (wattmeter or INGECON EMS Manager)	Check the connection of the different elements. If the error persists, contact the Technical Service.
Surge arrester error	Not applicable	Not applicable	Not applicable

* The number of flashes is indicated.

19. Waste handling

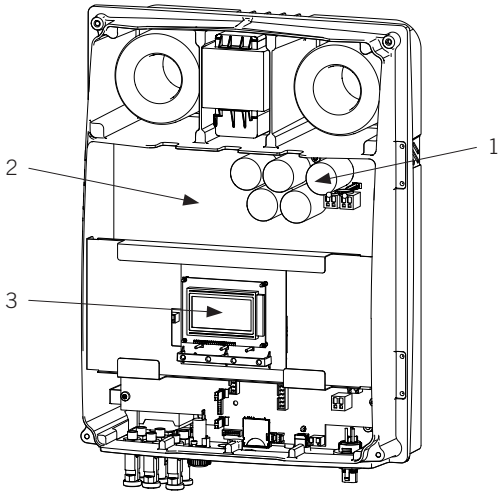
These units use components that are harmful to the environment (electronic cards, batteries or cells, etc.).

At the end of the unit's life, the waste must be correctly processed by an authorized hazardous waste management company.

Ingeteam, in accordance with its policy of respect for the environment, will inform the authorized manager, via this Section, of the location of components to be decontaminated.

The elements within the unit that must be handled individually are:

1. Electrolytic condensers or condensers containing PCB.
2. Printed circuit board cards.
3. Liquid crystal displays.



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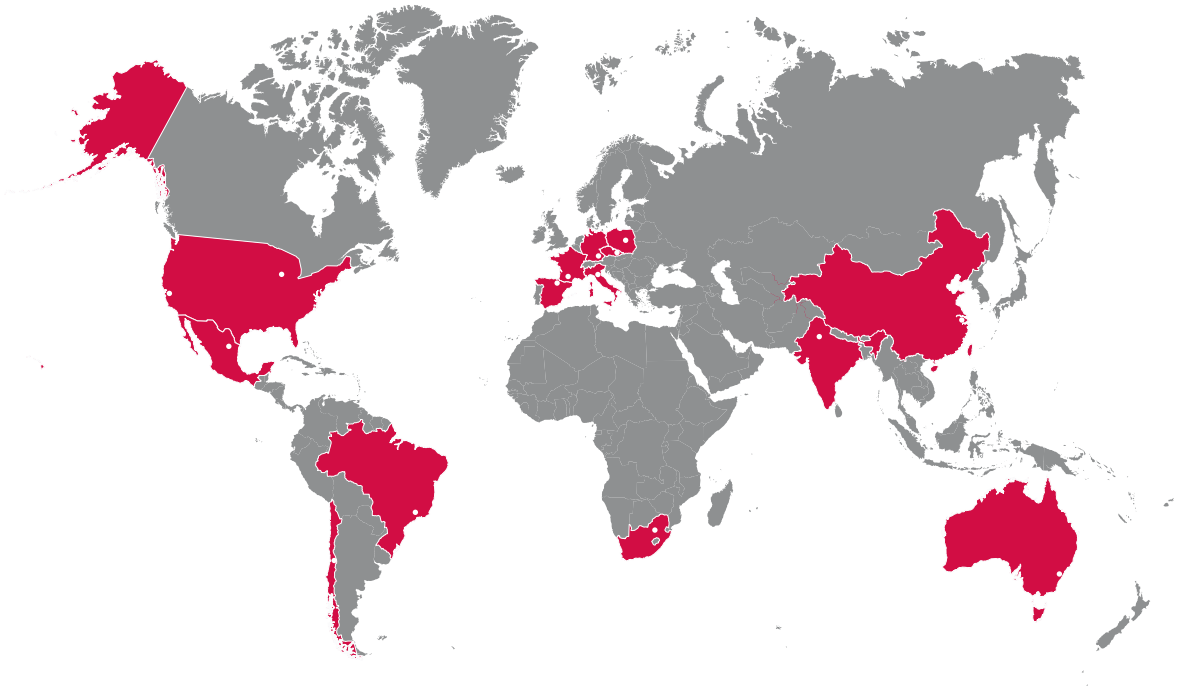

Europe

Ingeteam Power Technology, S.A.
Energy
Avda. Ciudad de la Innovación, 13
31621 SARRIGUREN (Navarra) - Spain
Tel: +34 948 28 80 00
Fax: +34 948 28 80 01
email: solar.energy@ingeteam.com

Ingeteam GmbH
Herzog-Heinrich-Str. 10
80336 MÜNCHEN - Germany
Tel: +49 89 99 65 38 0
Fax: +49 89 99 65 38 99
email: solar.de@ingeteam.com

Ingeteam SAS
Le Naurouze B - 140 Rue Carmin
31676 Toulouse Labège cedex - France
Tel: +33 (0)5 61 25 00 00
Fax: +33 (0)5 61 25 00 11
email: solar.energie@ingeteam.com

Ingeteam S.r.l.
Via Emilia Ponente, 232
48014 CASTEL BOLOGNESE (RA) - Italy
Tel: +39 0546 651 490
Fax: +39 054 665 5391
email: italia.energy@ingeteam.com

Ingeteam, a.s.
Technologická 371/1
70800 OSTRAVA - PUSTKOVEC
Czech Republic
Tel: +420 59 732 6800
Fax: +420 59 732 6899
email: czech@ingeteam.com

Ingeteam Sp. z o.o.
Ul. Koszykowa 60/62 m 39
00-673 Warszawa - Poland
Tel: +48 22 821 9930
Fax: +48 22 821 9931
email: polska@ingeteam.com

America

Ingeteam INC.
5201 Great American Parkway, Suite 320
SANTA CLARA, CA 95054 - USA
Tel: +1 (415) 450 1869
+1 (415) 450 1870
Fax: +1 (408) 824 1327
email: solar.us@ingeteam.com

Ingeteam INC.
3550 W. Canal St.
Milwaukee, WI 53208 - USA
Tel: +1 (414) 934 4100
Fax: +1 (414) 342 0736
email: solar.us@ingeteam.com

Ingeteam, S.A. de C.V.
Ave. Revolución, nº 643, Local 9
Colonia Jardín Español - MONTERREY
64820 - NUEVO LEÓN - México
Tel: +52 81 8311 4858
Fax: +52 81 8311 4859
email: northamerica@ingeteam.com

Ingeteam Ltda.
Estrada Duílio Beltramini, 6975
Chácara Sao Bento
13278-074 VALINHOS SP - Brazil
Tel: +55 19 3037 3773
Fax: +55 19 3037 3774
email: brazil@ingeteam.com

Ingeteam SpA
Bandera , 883 Piso 211
8340743 Santiago de Chile - Chile
Tel: +56 2 738 01 44
email: chile@ingeteam.com

Africa

Ingeteam Pty Ltd.
Unit 2 Alphen Square South
16th Road, Randjiespark,
Midrand 1682 - South Africa
Tel: +2711 314 3190
Fax: +2711 314 2420
email: kobie.dupper@ingeteam.com

Asia

Ingeteam Shanghai, Co. Ltd.
Shanghai Trade Square, 1105
188 Si Ping Road
200086 SHANGHAI - P.R. China
Tel: +86 21 65 07 76 36
Fax: +86 21 65 07 76 38
email: shanghai@ingeteam.com

Ingeteam Power Technology India Pvt. Ltd.
2nd floor, 431
Udyog Vihar, Phase III
122016 Gurgaon (Haryana) - India
Tel: +91 124 420 6491-5
Fax: +91 124 420 6493
email: india@ingeteam.com

Australia

Ingeteam Australia Pty Ltd.
Suite 112, Level 1, Mike Codd Building 232
Innovation Campus, Squires Way
NORTH WOLLONGONG, NSW 2500 - Australia
email: australia@ingeteam.com

ABF2011IQE01_B
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Ingeteam Power Technology, S.A.
www.ingeteam.com