

*Ingeteam*



## **INGECON SUN STORAGE 1Play**

Installation and Operation Manual

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# **INGECON SUN STORAGE 1Play**

## Installation and Operation Manual

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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

#### **DANGER**

Opening the enclosure does not imply there is no voltage inside.

The risk of electric shock exists even after disconnecting from the grid, the PV array and the auxiliary supply.

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

It is strictly forbidden to gain access to the inside of the electrical panel through any other point than the access cover provided for this purpose. Always gain access when the unit is voltage-free.

#### **CAUTION**

These inverters are not approved to the standard *AS4777.2 2020* and cannot connect to the grid (neither via input or output ports) as part of an inverter energy system in accordance with the requirements of *AS/NZS 4777.1*.

The operations described in the 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.

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.

All applicable safety-related legislation for electrical work must be complied with. 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.

You must consider the set of conditions listed throughout this document as minimum requirements. It is always preferable to shut off the main power supply. There may be faults in the installation that cause the unwanted return of voltage. Danger of electric shock.

According to basic safety standards, the complete unit must be suitable to protect exposed workers against the risk of direct and indirect contact. In any case the electrical parts of the work equipment must comply with the provisions of the corresponding specific regulations.

According to basic safety standards, the electrical installation shall not entail a fire or explosion risk. Workers must be duly protected against the risk of accidents caused by direct or indirect contact. The electrical installation and protection devices must take into account the voltage, the external conditions and the competence of persons who have access to parts of the installation.

Category III - 1000-Volt measuring instruments must be used for checking for the absence of voltage. Category IV - 1500-Volt measuring instruments must be used for checking for the absence of voltage.

The space for the installation of the storage system must be properly ventilated.

The storage system must be installed in such a way that any accidental short-circuits are avoidable.

**i INFO**

These instructions must be easily accessible close to the unit and located within reach of all users.

Before installation and start-up, please read these safety instructions and warnings carefully as well as all the warning notices located on the unit. Ensure that all the warnings signs are perfectly legible and that those which are damaged or have disappeared are restored.

Protection against direct contact is by means of the enclosure.

The unit has been tested according to the applicable regulations to comply with the safety requirements, the values for insulation clearances and leakage paths for the voltages used.

**Potential hazards for people**

**⚠ DANGER**

Electric shock.  
The equipment may remain charged after disconnecting the PV array, grid power and auxiliary power.  
The equipment may remain charged after disconnecting the storage system, grid power and auxiliary power.  
Carefully follow the mandatory steps in the manual for removing the voltage.

Explosion.  
There is a very low risk of explosion in very specific cases of malfunction.  
The casing will protect people and property from the explosion only if it is correctly closed.

Crushing and joint injuries.  
Always follow the indications in the manual on moving and placing the unit.  
The weight of this unit can cause serious injury and even death if not handled correctly.

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**

**⚠ DANGER**

Cooling.  
The unit requires particle-free air flow while it is operating.  
Keeping the unit in the upright position and the inlets free of obstacles is essential for this air flow to reach the inside.

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.

With the aim of avoiding premature wear of the screwed joints on the unit's housing panels, removal and installation of the screws must be done manually.

## Personal Protective Equipment (PPE)

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

Name	Description
Safety footwear	In compliance with standard <i>UNE-EN-ISO 20345:2012</i>
Helmet	In compliance with standard <i>EN 397:2012 + A1:2012</i>
Helmet with face shield	In compliance with Standard <i>UNE-EN 166:2002</i> , wherever there are directly accessible live parts.
Safety goggles	In compliance with standard <i>UNE-EN 166:2002</i>
Working clothes	Close-fitting, non-flammable, 100% cotton
Dielectric gloves	In compliance with standard <i>EN 60903:2005</i>

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.

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# 1. About this manual

The purpose of this manual is to describe the INGECON SUN STORAGE 1Play units and to provide appropriate 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 STORAGE 1Play 3TL	1Play 3TL
INGECON SUN STORAGE 1Play 6TL	1Play 6TL

This document will refer to the various models by both their complete name and their abbreviation. It will also refer generically to any of the models from the INGECON SUN STORAGE 1Play family using the terms *unit*, *inverter* or *inverter/charger*.

## 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.

Ingeteam recommends this unit to be installed by a professional installer.

## 1.3. Warnings

Throughout this manual we include warnings to highlight certain information. Relative to the nature of the text, there are three types of warnings:



**DANGER**

This indicates a hazard to personnel or the inverter.



**CAUTION**

Indicates importance.



**INFO**

Additional information or references to other parts of the document or documents.

## 2. Unit description

The INGECON SUN STORAGE 1Play is a dual input DC (photovoltaic and battery) single-phase inverter capable of working in off-grid mode. This equipment is used in stand-alone installations.

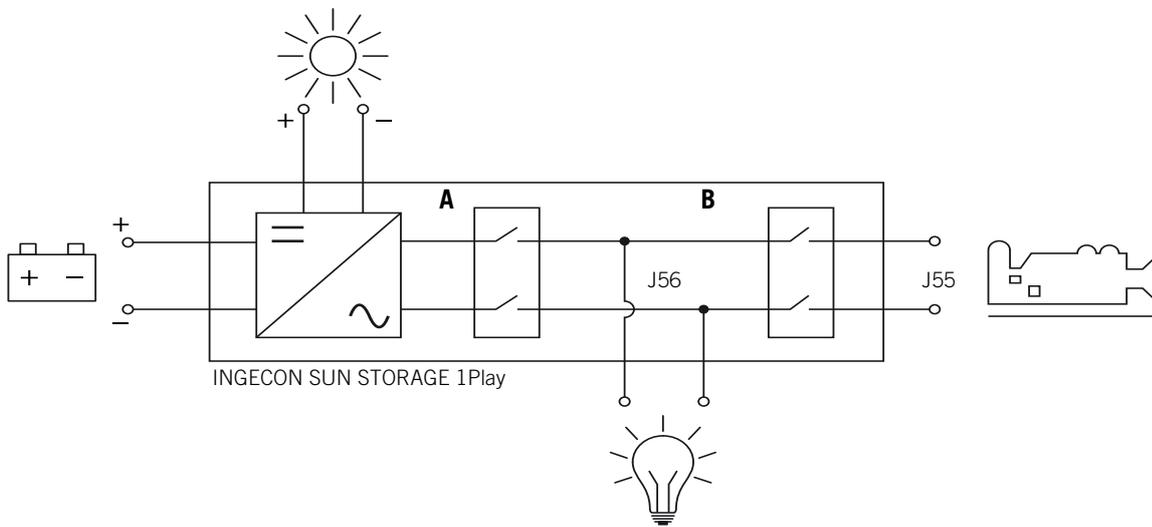
### Stand-alone installations

A stand-alone installation is a system disconnected from the distribution grid that provides AC power to a set of consumers.

**INFO**

For more information about this type of installation, see the "Technical guide for installations with INGECON SUN STORAGE 1Play" available on the Ingeteam website.

### 2.1. Electrical diagram of the system



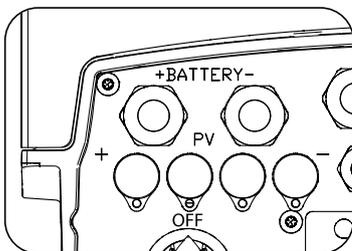
A. Consumption grid relay.

B. Auxiliary generator relay.

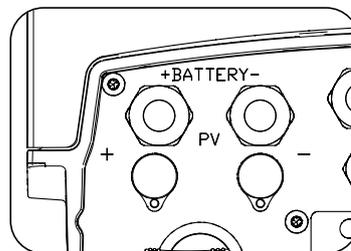
### 2.2. Types of hardware

In the INGECON SUN STORAGE 1Play there are two distinct types of hardware, type A and type B. Both have the same functionalities, but the type of hardware must be identified in order to perform the connections.

An easy way of identifying it is checking the number of PV array inlets in the cabling entrances in the lower part of the unit. Hardware type A has two pairs of inlets, and hardware type B has one pair.



Hardware type A, two pairs of inlets



Hardware type B, one pairs of inlets

## 2.3. Optional accessories

These units may include the following accessories:

- Communication card.
- INGECON SUN EMS Board.

### Communication cards

There are different options for communicating the units. For more information consult the corresponding communication accessories manual available at [www.ingeteam.com](http://www.ingeteam.com).

There are several ways to achieve this communication with these units:

- RS-485.
- Ethernet TCP.
- Wi-Fi TCP.

### INGECON SUN EMS Board

The INGECON SUN EMS Board is a control and communication device used to manage the energy flows within self consumption installations. This device is integrated inside the inverter.

## 2.4. EMC requirements

INGECON SUN STORAGE 1Play units are equipped with the necessary filtering elements to comply with EMC requirements for domestic applications in order to prevent disturbances in other equipment outside the installation.

## 2.5. Acoustic contamination

The unit produces a slight buzz when in operation.

Do not place it on light supports which might amplify this buzz. The mounting surface must be firm and appropriate for the weight of the unit.

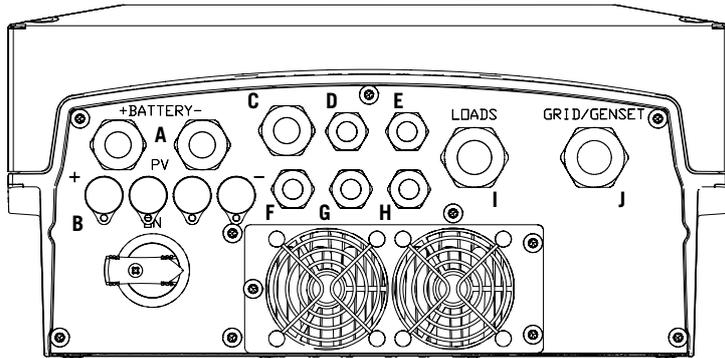
## 2.6. Specification table

	3TL	6TL
Nominal power (up to 40 °C)	3 kVA	6 kVA
Max. temperature for rated power	40 °C	
Maximum output fault current	< 26 A rms (60 ms)	< 40 A rms (60 ms)
Maximum output overcurrent protection	26 A rms	40 A rms
<b>Storage system input (DC)</b>		
Voltage range with photovoltaic installed <sup>(1)</sup>	40 ~ 300 V	
Voltage range without photovoltaic installed <sup>(1)</sup>	40 ~ 450 V	
Maximum charge/discharge current	50 A	
Battery type	Lead-Acid, Li-Ion <sup>(2)</sup>	
Communication with Li-Ion batteries	CAN Bus 2.0	
<b>PV array input (DC)</b>		
PV array maximum power	7.5 kWp	11.5 kWp
MPP Voltage range <sup>(3)</sup>	330 <sup>(3)</sup> ~ 480 V	
Maximum input voltage <sup>(4)</sup>	550 V	
Maximum input current	20 A	30 A
Maximum short circuit current	22 A	33 A
Maximum inverter backfeed current to the array	0 A rms	
MPPT	1	
Number of strings	2	
<b>Auxiliary genset input (AC)</b>		
Rated voltage	230 V	
Voltage range	172 ~ 264 V	

	3TL	6TL
Nominal frequency	50 / 60 Hz	
Frequency range	40 ~ 70 Hz	
Maximum power	11,500 VA	
Maximum current	50 A rms	
Cosine of Phi	0 ~ 1	
<b>Consumption grid output (AC)</b>		
<b>Stand-alone mode</b>		
Power (25 °C) 30 min, 2 min, 3s <sup>(5)</sup>	3,500 / 3,900 / 5,080 W	6,400 / 6,900 / 7,900 W
Maximum current	13 A rms	26 A rms
Rated voltage <sup>(6)</sup>	220 ~ 240 V	
Nominal frequency <sup>(6)</sup>	50 / 60 Hz	
Cosine of Phi	-0.8 ~ 1 ~ 0.8	
<b>Performance</b>		
Maximum efficiency	95.5 %	96 %
Euroefficiency	95.1 %	95.2 %
<b>General data</b>		
Cooling system	Forced ventilation	
Air flow	27 m <sup>3</sup> /h	45 m <sup>3</sup> /h
Weight	24.4 kg	26 kg
Dimensions (height x width x depth)	470 x 360 x 180 mm	
Stand-by consumption	< 10 W	
Operating temperature	-20 ~ +65 °C	
Relative humidity (without condensation)	4 ~ 100 %	
Protection class	IP65	
Pollution degree	2	
Maximum altitude	2,000 m	
Overvoltage category	Category III (AC) / Category II (DC)	
Insulation class	Class I	
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, EN 50178, IEC62103, AS62040.1, FCC Part 15	
Distribution grid connection regulations	AS4777.2:2020	

<sup>(1)</sup> The maximum power of the inverter is a calculation of the battery voltage multiplied by the maximum discharge current (50 A). <sup>(2)</sup> See the list of compatible Li-Ion batteries. <sup>(3)</sup> In On-grid mode  $V_{MPPmin} = 1.44 \times V_{AC}$  (distribution grid voltage). In Off-grid mode  $V_{MPPmin} = 1.44 \times V_{AC}$  (rated voltage configured for the consumption grid). <sup>(4)</sup> Never exceed this value. Consider the voltage increase of the panels 'Voc' at low temperatures. <sup>(5)</sup> This power will be available if the battery voltage multiplied by the maximum discharge current reaches said value. <sup>(6)</sup> This parameter can be set on the display.

## 2.7. Description of cable inlets



- A. Storage system. M20 cable gland
- B. PV array (in hardware type B there is one photovoltaic inlet instead of two). PV MC4 quick connectors
- C. Wi-Fi antenna or Ethernet cabling. M20 cable gland
- D. CAN communication for Li-Ion batteries with BMS. M16 cable gland
- E. Installation of Wi-Fi reset button. M16 cable gland
- F. PT-100 temperature sensor for Lead-Acid batteries. M16 cable gland
- G. Digital inputs. M16 cable gland
- H. Digital outputs. M16 cable gland
- I. Consumption grid. M25 cable gland
- J. Auxiliary genset. M25 cable gland

Cable gland size	Admitted diameter range
M16	4.5 mm ~ 10 mm
M20	7 mm ~ 13 mm
M25	9 mm ~ 17 mm

## 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. Unit identification

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

The unit's serial number is also marked on the nameplate.

### 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 5 days of receipt of the unit.

If ultimately the unit has to be returned to the manufacturer, the original packaging must be used.

### 3.4. Storage

#### CAUTION

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, the following points should be taken into account in order to avoid damage:

- 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 "2.6. Specification table".
- 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, use dry places, avoiding, as far as possible, sharp changes in temperature.

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. Equipment transport

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

At least the following requirements should be observed:

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

At least the following requirements should be observed:

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. In any case, observe the instructions in the forklift truck's user manual.

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 section.

#### Transport of the unpackaged unit

At least the following requirements should be observed:

1. Use the two side holes to grasp the unit with both hands.
2. Follow the necessary ergonomic advice for lifting weights.
3. Do not release the unit until it is perfectly secured or placed.
4. 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 features 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

You can deliver all the packaging to an authorized non-hazardous waste management company.

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

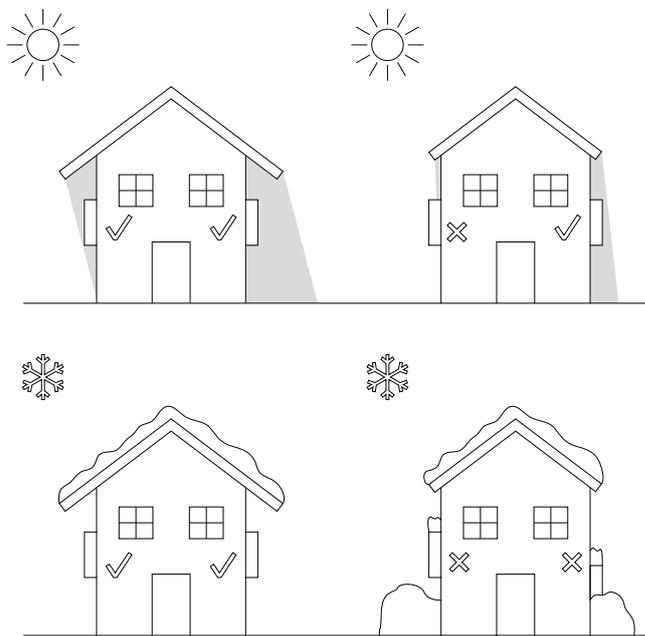
- Plastic (polystyrene, bag and bubble wrap): the appropriate container.
- Cardboard: the appropriate container.

## 5. Preparation for installing the unit

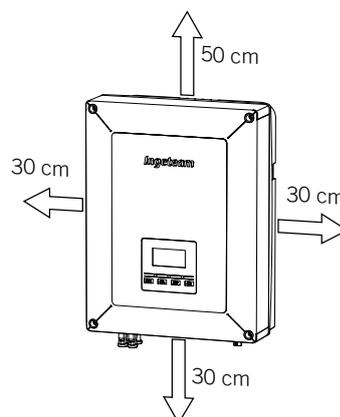
When deciding the location of the unit and planning your installation, you must follow a set of guidelines based on the specifications of the unit. This chapter summarizes the guidelines and details the external elements needed for correct operation of the unit.

### 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.



- Keep the following distances free of obstacles:



### 5.2. Environmental conditions

Environmental operating conditions indicated in the specifications table must be taken into account when choosing the location of the unit.

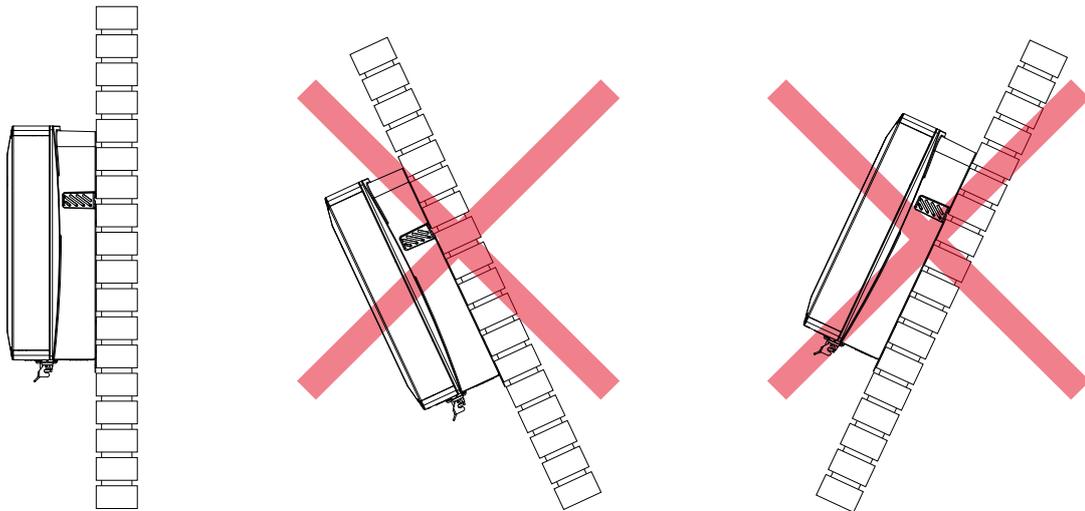
The surrounding atmosphere must be clean and at temperatures above 40 °C, the relative humidity must be between 4% and 50%. Higher percentages of relative humidity up to 95% are tolerated at temperatures below 30 °C.

It should be borne in mind 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

To guarantee good heat evacuation and promote sealing, the units must be placed on a perfectly vertical wall or, failing this, with a slight slope of a maximum of +80° or -80°.



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 consumption grid

#### Thermomagnetic circuit breaker

A thermomagnetic circuit breaker must be installed on the connection between the inverter and the consumption grid.

The following table provides the necessary data for the installer.

Installations with the inverter disconnected to the distribution grid		
INGECON SUN STORAGE 1PLAY	Maximum current for the consumption grid	Rated current for the thermomagnetic circuit breaker
3TL	13 Arms	20 Arms
6TL	26 Arms	32 Arms

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

### 5.5. Protection of the connection to the auxiliary genset

#### Thermomagnetic circuit breaker

A thermomagnetic circuit breaker must be installed on the connection from the inverter to the auxiliary genset.

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

INGECON SUN STORAGE 1PLAY	Maximum auxiliary genset current	Rated current for the thermomagnetic circuit breaker
3TL	50 Arms	63 Arms
6TL	50 Arms	63 Arms

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 auxiliary connection point.

You must also take into account that the working temperature influences the maximum current permitted by these protections as indicated by the manufacturer.

**Residual current device**

These inverters are equipped with a residual current monitoring device that disconnects the unit if it detects a residual fault current according to electrical safety standard IEC 62109.

This protection does not detect residual currents produced upstream of the inverter. If it is necessary to install a residual current device upstream of the inverter, it must have a residual current lower than the maximum effective current that can be generated in the photovoltaic installation in any of its operating conditions.

The grounding capacity of the photovoltaic modules varies depending on the technology they are manufactured with. During the grid injection, a diverted current is produced from the cells to earth, whose value depends on the assembly of the modules and environmental conditions (rain, snow, etc.).

**5.6. Storage system connection protection**

It is mandatory to install a continuous current switch between the inverter and the battery bank. It must have appropriate dimensions to open the battery bank, taking into account the maximum charge and discharge current.

These inverters do not admit grounding of the batteries. Therefore, the battery bank terminals must be isolated from ground. Otherwise the inverter will give an insulation fault.

**5.7. Battery cabling length**

The inverter measures the battery voltage in its connection terminals. For this reason, the installer must use a DC cable with a sufficiently low impedance to prevent the battery charge/discharge process from causing the unit to disconnect due to high or low battery voltage (see section “8.2. Wiring requirements for connecting the storage system”).

**5.8. Auxiliary genset cabling length**

The inverter measures the genset voltage in its connection terminals. For this reason, the installer must use an AC cable with a sufficiently low impedance to prevent the current absorption/injection from causing the unit to disconnect due to high or low grid voltage (see section “10.2. Wiring requirements for connecting the auxiliary genset”).

**5.9. Protection of the connection to the PV plant**

It is mandatory to install a DC switch on the connection between the inverter and the PV plant. It must be dimensioned to open the PV array.

In Australia, the unit is supplied without a DC switch. The installer will have to install an external DC switch that complies with Australian regulations, especially the AS 60947.3:2018 standard.

This DC switch will have the following nominal values:

Maximum input voltage	Maximum input current
550 V	30 A

## 6. Installing the unit

Before installing the unit, the packaging must be removed, 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.

### ⚠ CAUTION

All installation operations must comply with current regulations.

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

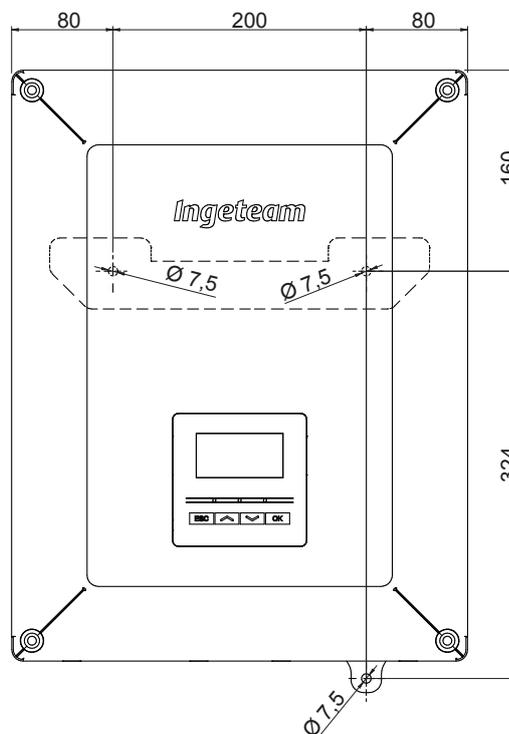
### 6.1. General requirements for installation

- 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.
- The ventilation and workspace must be suitable for maintenance tasks according to the applicable regulations in force.
- The external connection devices, which 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.
- Special care must be taken to ensure that there are no external elements near the air inlets and outlets that obstruct proper cooling of the unit.

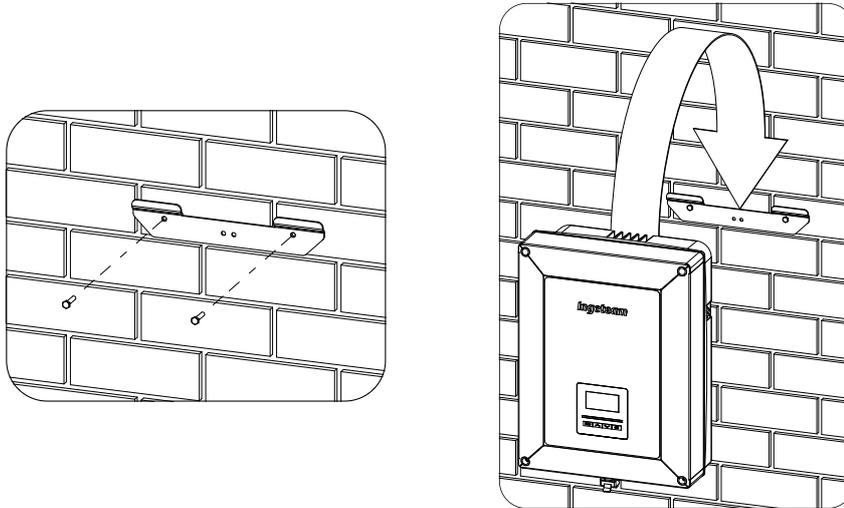
### 6.2. Attaching the unit to the wall

INGECON SUN STORAGE 1Play 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.

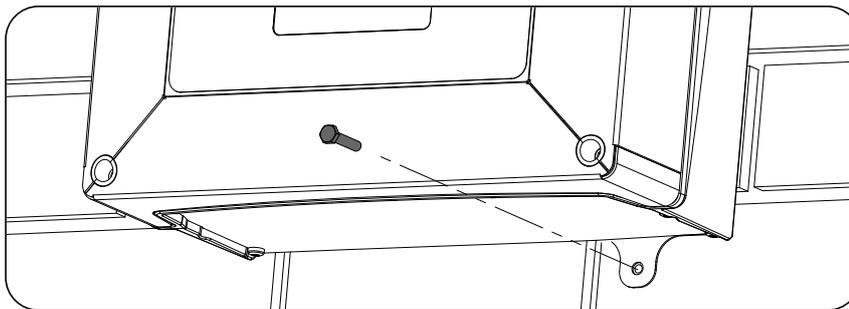
1. Mark the fixing points for the plates on the wall and drill holes with a suitable bit for the screws to be used to secure the plate to the wall later.



2. Fix the plate using stainless steel fittings to prevent corrosion. Suspend the unit from the plate by fitting the two slats in the openings on the back of the unit. Use the two side holes to grasp the unit with both hands.



3. Screw on the bottom attachment.



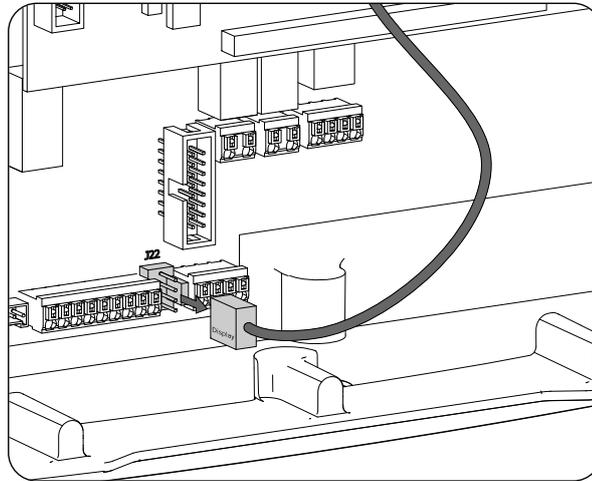
4. Check that the unit properly secured.

### 6.3. Opening the housing

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

**CAUTION**

Make sure to disconnect the cable that joins the cover display to the electronic card when taking of the cover (see figure).



The electronic card connector is shown as *Display*. Reconnect the connector wiring when the cover is put back in to place.

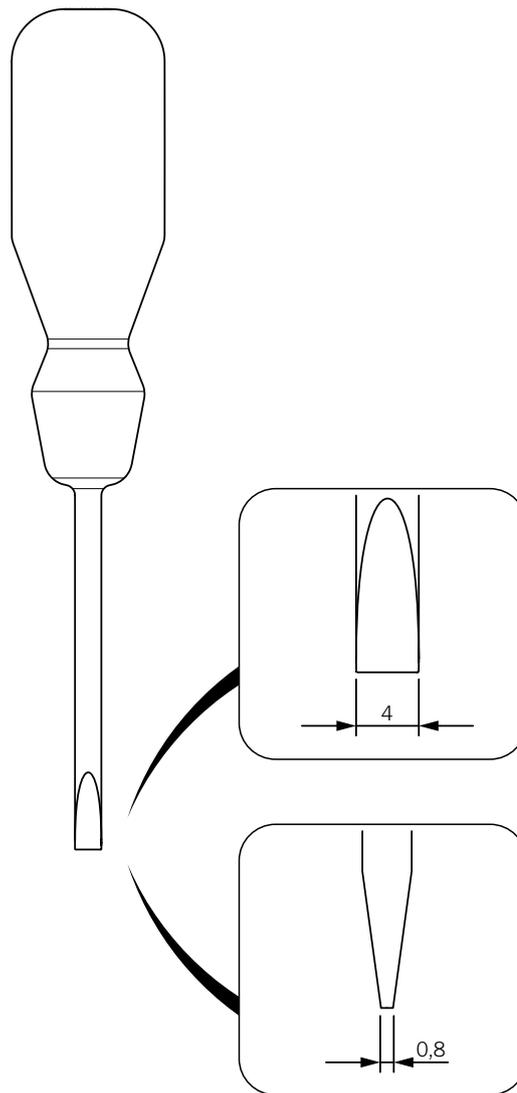
## 7. Connection/disconnection of wiring in push-in type terminals

The connection of the storage system, the consumption grid and the auxiliary genset is performed using push-in type terminals.

This section describes the connection and disconnection process of the wiring in these terminals, as well as the tool to use.

### Required tool

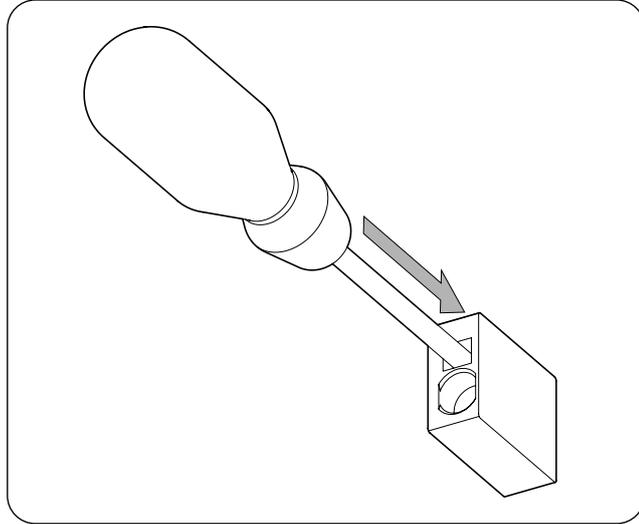
To operate on these terminals, use a flat-head screwdriver with the maximum dimensions specified in the following figure.



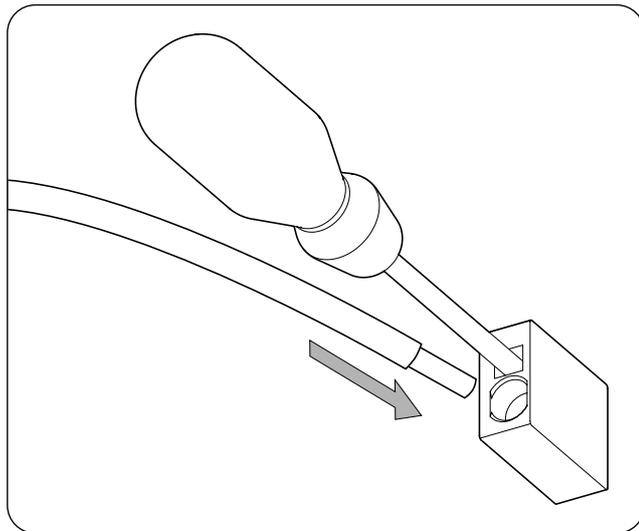
**Wiring connection**

Follow the steps below to connect the wiring to these terminals:

1. Insert the flat-head screwdriver in the specified slot.



2. Insert the wiring.

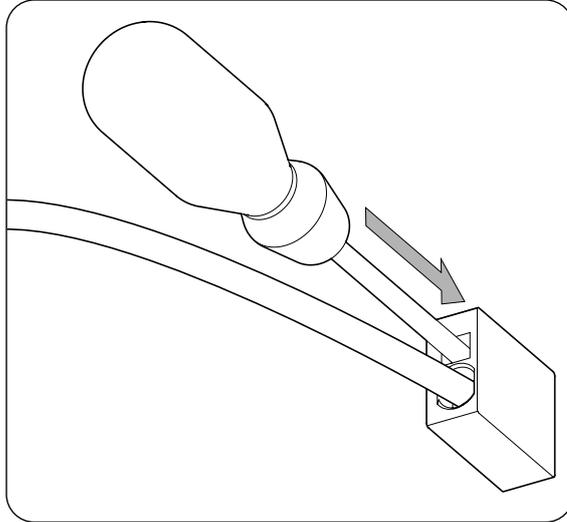


3. Remove the screwdriver.
4. Check that the connection is tight.

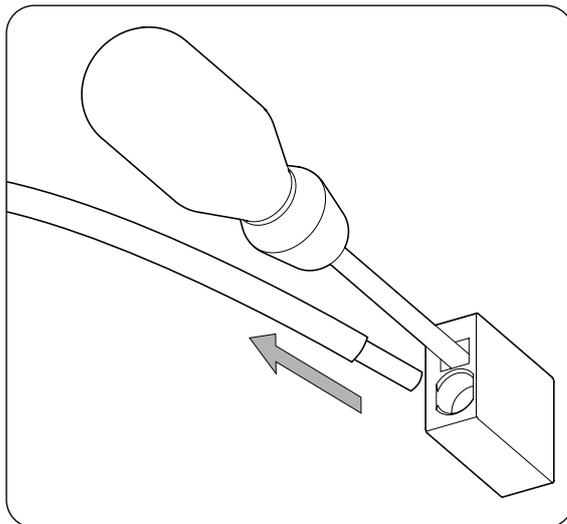
**Disconnecting the wiring**

Follow the steps below to disconnect the wiring from these terminals:

1. Insert the flat-head screwdriver in the specified slot.



2. Remove the wiring.



3. Remove the screwdriver.

## 8. Connection of the storage system

This chapter explains the requirements and process for connecting the storage system wiring to the unit. Read carefully before starting the connection process.

### 8.1. Safety instructions for connecting the storage system

**CAUTION**

Before you start to make the connections, make sure there is no voltage in the inverter. Verify that the AC protection of the auxiliary genset and the DC protection of the storage system are open, as well as the PV array and the consumption grid.

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

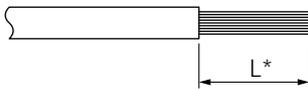
When carrying out the connections, respect the polarities marked on the electronic card. If the connection is performed incorrectly the inverter could be damaged

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

### 8.2. Wiring requirements for connecting the storage system

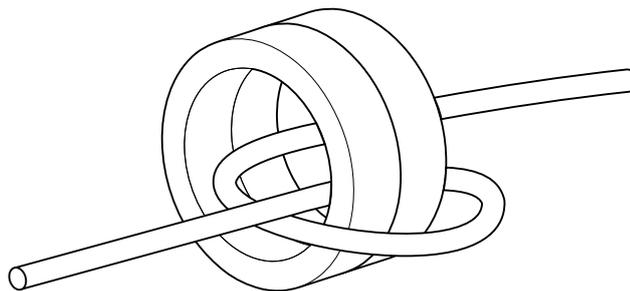
The wiring gauge for connecting the storage system is specified in the following table:

	INGECON SUN STORAGE 1Play		
	Up to 32 A	Up to 40 A	Up to 50 A
Wiring gauge	4 mm <sup>2</sup>	6 mm <sup>2</sup>	10 mm <sup>2</sup>
Wiring diameter	9 ~ 13 mm		
Wiring stripping length (L*)	18 mm		



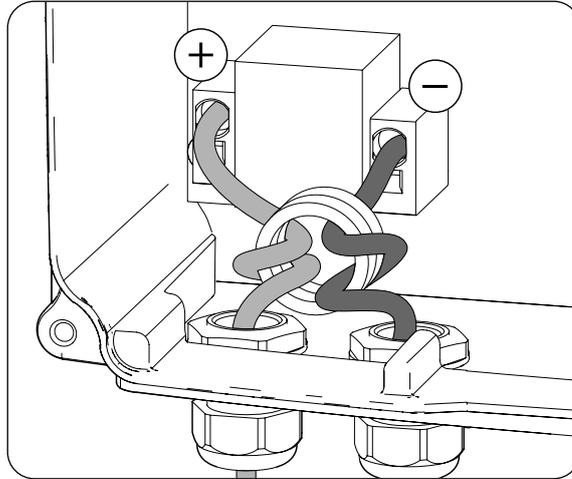
### 8.3. Use of ferrite cores

Two of the ferrite cores supplied must be used to connect the storage system. Turn each wire around twice, as indicated in the following figure.



## 8.4. Storage system connection process

To connect the storage system:



1. Loosen the cable glands indicated with *BATTERY+* and *BATTERY-* and insert the storage system wiring, respecting the polarities.
2. Use two of the ferrite cores supplied with the unit and make two turns with the positive and negative wires of the storage system.
3. Connect the wiring to the *push-in* type terminals marked as *J50 BATTERY +* and *J51 BATTERY -*, respecting the polarities. The operation of this type of terminal is described in “7. Connection/ disconnection of wiring in push-in type terminals”.
4. Correctly tighten the packing glands to prevent losses to the protection class, verifying that the wiring is not taut.

## 9. Connecting the consumption grid

This chapter explains the requirements and process for connecting the consumption grid wiring to the unit. Read carefully before starting the connection process.

### 9.1. Safety instructions for connecting to the consumption grid

#### ⚠ CAUTION

Before you start to make the connections, make sure there is no voltage in the inverter. Verify that the AC protection of the auxiliary genset and the DC protection of the storage system are open, as well as the PV array and the consumption grid.

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

When carrying out the connections, respect the polarities marked on the electronic card.

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

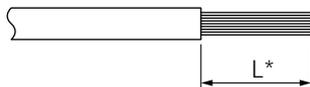
#### i INFO

The consumption grid neutral is not internally connected to ground.

### 9.2. Wiring requirements for connecting to the consumption grid

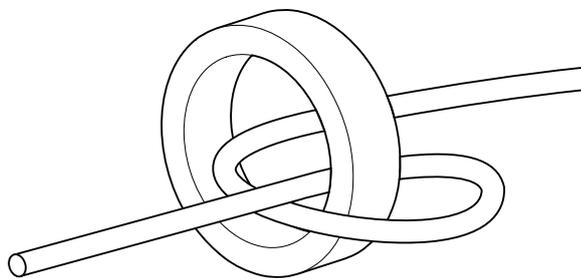
The wiring gauge for connecting the consumption grid is specified in the following table:

	INGECON SUN STORAGE 1Play		
	Up to 32 A	Up to 40 A	Up to 50 A
Wiring gauge	4 mm <sup>2</sup>	6 mm <sup>2</sup>	10 mm <sup>2</sup>
Cable diameter	9 ~ 17 mm		
Wiring stripping length (L*)	18 mm		



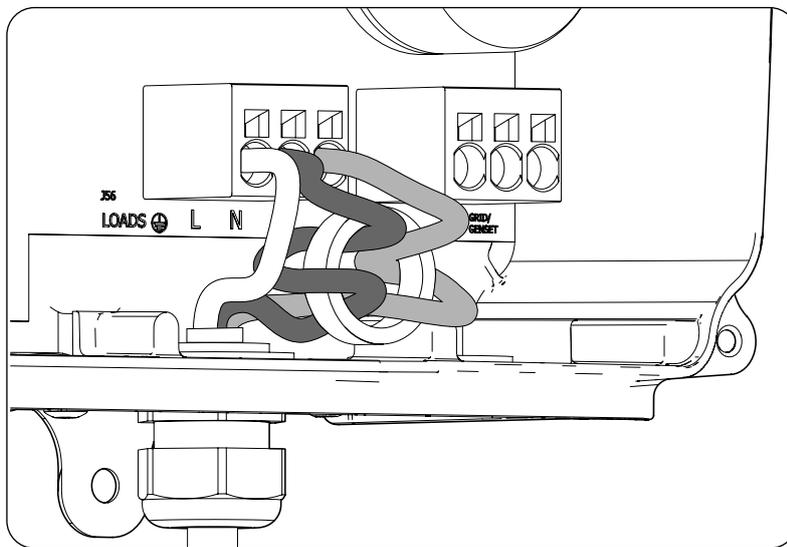
### 9.3. Use of ferrite cores

In order to connect the consumption grid, one of the ferrite cores supplied must be used for the line and neutral wiring. Turn each wire around twice, as indicated in the following figure.



## 9.4. Consumption grid connection process

To connect the consumption grid:



L Line  
 N Neutral  
 Ground

1. Loosen the packing gland marked *LOADS* (see section “2.7. Description of cable inlets”), remove the cap and pass the consumption grid cable through it.
2. Use two of the ferrite cores supplied with the unit and make two turns with the *L* and *N* wiring from the storage system.
3. Connect the *push-in* type terminals marked as *J56 LOADS*, respecting the polarities. The operation of this type of terminal is described in “7. Connection/disconnection of wiring in push-in type terminals”.
4. Correctly tighten the cable gland to prevent losses to the protection class, verifying that the wiring is not taut.

## 10. Auxiliary genset connection

This chapter explains the requirements and process for connecting the auxiliary genset to the unit.

### **⚠ DANGER**

Identify the correct type of hardware before carrying out the connection to the grid (see “2.2. Types of hardware”). Danger of electrocution due to an incorrect connection of the neutral conductor.

### **i INFO**

In both types of hardware it is possible to use the TT and TN grounding systems. For inverters with hardware type A with a TN connection, please contact Ingeteam for more information.

If the neutral conductor is connected incorrectly, the consumption grid ground connection will not work. In TT systems, the internal transfer relay must disconnect the neutral conductor between the consumption grid and the auxiliary genset when the inverter is not connected to the auxiliary genset. However, in TN systems the neutral conductor must be the same one between the consumption grid and the auxiliary genset, therefore it cannot be disconnected.

### 10.1. Safety instructions for connecting the auxiliary genset

#### **⚠ CAUTION**

Before you start to make the connections, make sure there is no voltage in the inverter. Verify that the AC protection of the auxiliary genset and the DC protection of the storage system are open, as well as the PV array and the consumption grid.

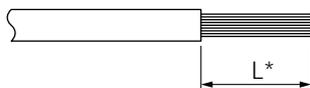
**Do not switch on the power** to the unit until you have successfully made the rest of the connections and the unit is closed.

When carrying out the connections, respect the polarities marked on the electronic card.

### 10.2. Wiring requirements for connecting the auxiliary genset

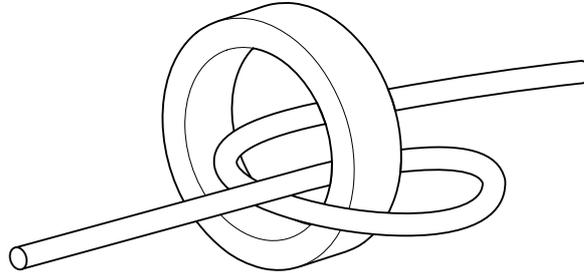
The wiring gauge for connecting the auxiliary genset is specified in the following table:

	INGECON SUN STORAGE 1Play		
	Up to 32 A	Up to 40 A	Up to 50 A
Wiring gauge	4 mm <sup>2</sup>	6 mm <sup>2</sup>	10 mm <sup>2</sup>
Cable diameter	9 ~ 17 mm		
Wiring stripping length (L*)	18 mm		



### 10.3. Use of ferrite cores

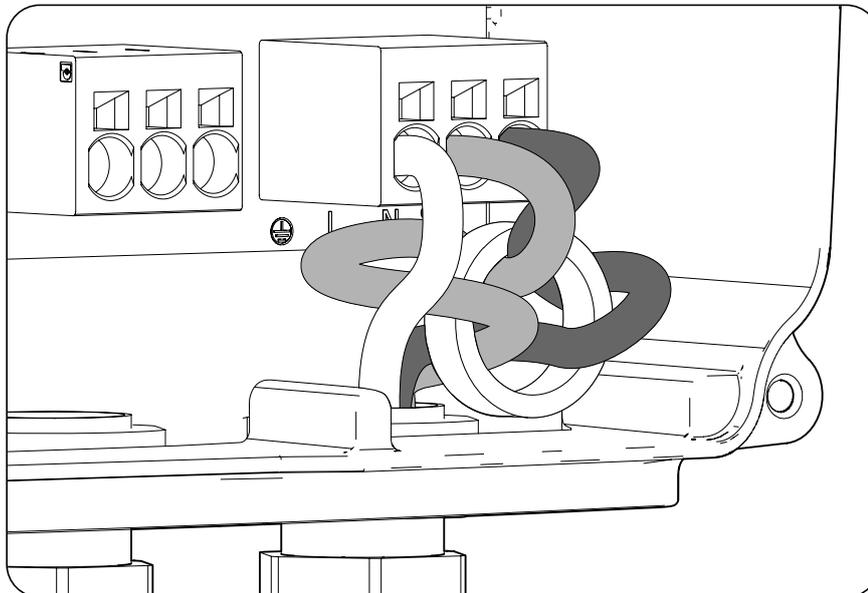
In order to connect the genset, one of the ferrite cores supplied must be used for the line and neutral wiring. Turn each wire around twice, as indicated in the following figure.



### 10.4. Auxiliary genset connection process

Follow the steps below according to the inverter hardware type.

#### Hardware type A: TT system

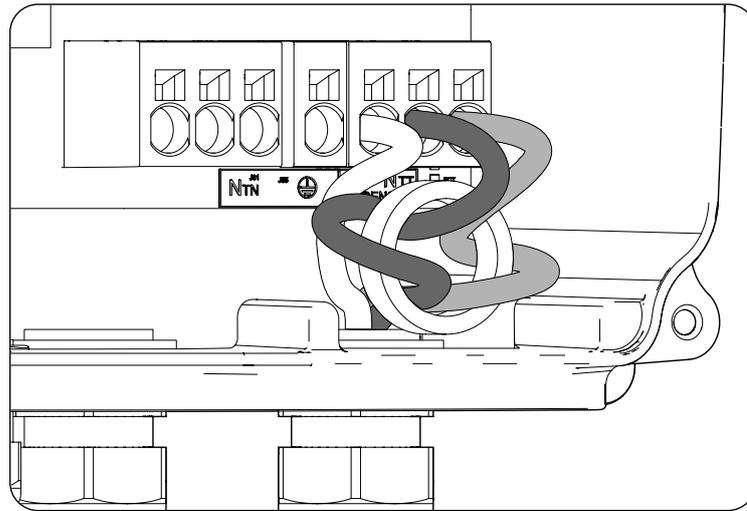


1. Loosen the cable gland marked *Genset*, remove the protective cap and pass the cable through it.
2. Install the ferrite core supplied by Ingeteam, turning the line and neutral wires around it twice.
3. Insert the respective wires in the *J55 Genset* push-in type terminals, respecting the polarity. The operation of this type of terminal is described in “7. Connection/disconnection of wiring in push-in type terminals”.
4. Correctly tighten the packing glands to prevent losses to the protection class, verifying that the wiring is not taut.

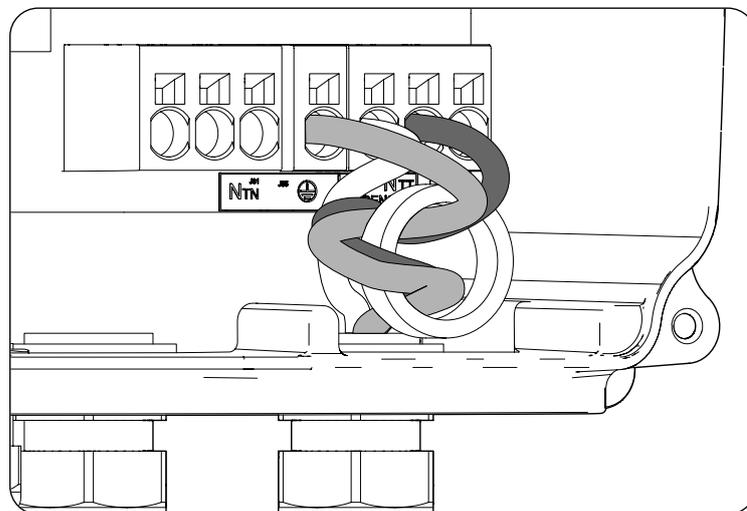
#### Hardware type A: TN system

##### **i** INFO

Contact Ingeteam for more information.

**Hardware type B: TT system**

1. Loosen the cable gland marked *GENSET*, remove the protective cap and pass the cable through it.
2. Install the ferrite core supplied by Ingeteam, turning the line and neutral wires around it twice.
3. Insert the respective wires in the *J55 GENSET* push-in type terminals, respecting the polarity. The neutral connector must be connected to the *J55 N<sub>TT</sub>* terminal. The operation of this type of terminal is described in “7. Connection/disconnection of wiring in push-in type terminals”.
4. Correctly tighten the packing glands to prevent losses to the protection class, verifying that the wiring is not taut.

**Hardware type B: TN system**

1. Loosen the cable gland marked *GENSET*, remove the protective cap and pass the cable through it.
2. Install the ferrite core supplied by Ingeteam, turning the line and neutral wires around it twice.
3. Insert the respective wires in the *J55 GENSET* push-in type terminals, respecting the polarity. The neutral connector must be connected to the *J55 N<sub>TN</sub>* terminal.
4. Check that the push-in spring connection is tight.
5. Correctly tighten the packing glands to prevent losses to the protection class, verifying that the wiring is not taut. Check that the connection is tight.

# 11. Connecting the PV array

These units can be connected to a PV array.

This chapter explains the requirements and process for connecting the PV array wiring to the unit. Read carefully before starting the connection process.

**CAUTION**

The PV array cannot be grounded, so its terminals must be isolated from ground.

**INFO**

The inverter will only start if the ground impedance of the PV array is higher than 18.3 kOhms.

## 11.1. Safety instructions for connecting the PV array

**CAUTION**

Before you start to make the connections, make sure there is no voltage in the inverter. Verify that the AC protection of the auxiliary genset and the DC protection of the storage system are open, as well as the PV array and the consumption grid.

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

When carrying out the connections, respect the polarities marked on the unit.

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

## 11.2. Wiring requirements for connecting the PV array

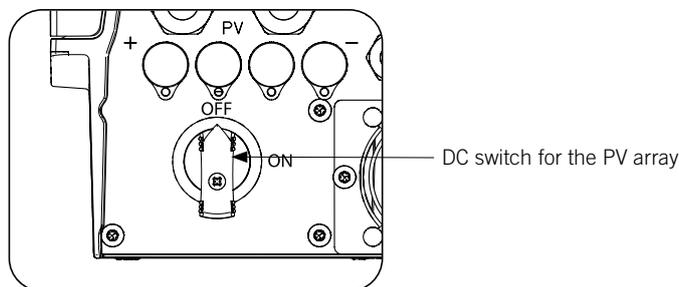
The wiring gauge for connecting the PV array is specified in the following table:

INGECON SUN STORAGE 1Play	
Wiring gauge	4 ~ 6 mm <sup>2</sup>
Connector type	MC4

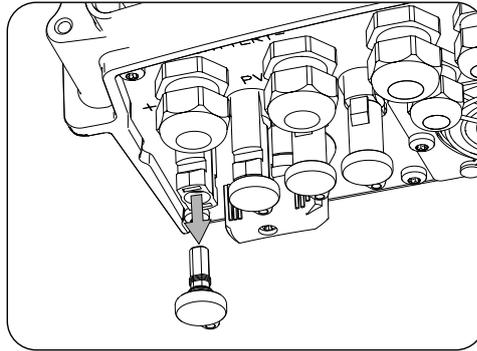
## 11.3. PV array connection process

To carry out the connection of the PV array, follow the steps below:

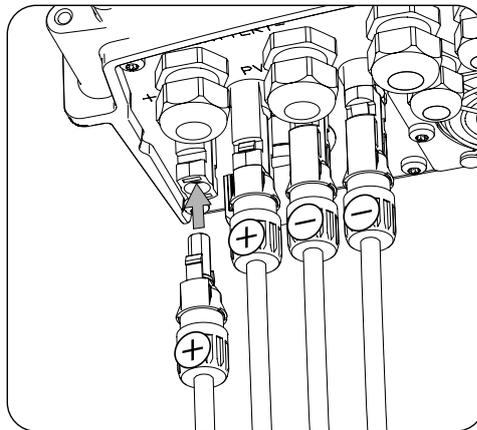
1. Ensure that the DC switch for the PV array, which is located in the lower part of the unit, is OFF.



2. Remove the caps from the quick connectors.

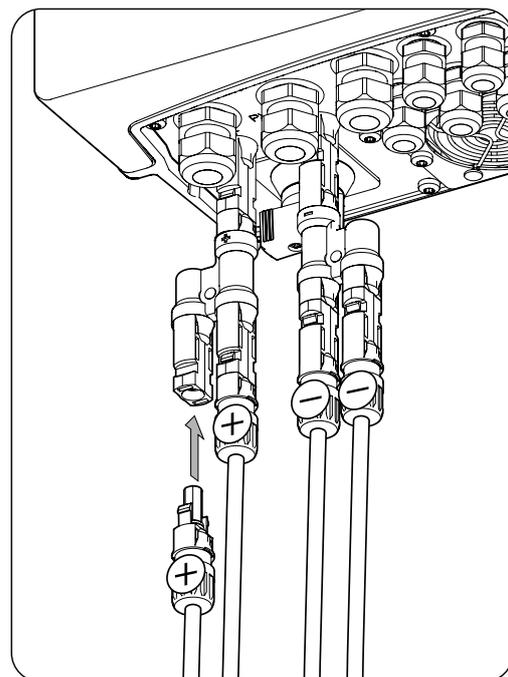
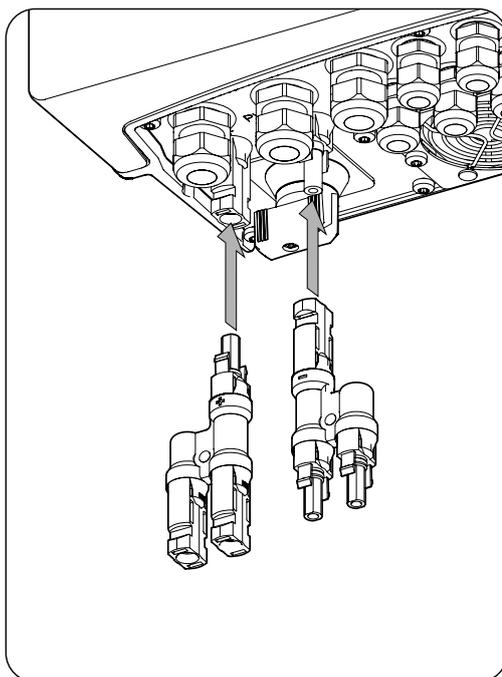


3. Insert the connectors respecting the polarities indicated on the lower connections plate of the unit.



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

If you wish to connect two pairs of inputs in the type B hardware, use the diverters supplied with the unit, as indicated in the following figures.



## 12. Connecting the storage system temperature sensor

Installing the storage system temperature sensor enables optimum charging to be carried out and extends the lead-acid battery life.

This chapter explains the requirements and process for connecting the storage system temperature sensor to the unit. Read carefully before starting the connection process.

**i INFO**

Ingeteam recommends locating the sensor on a battery located in the central area of the storage system. It should be placed approximately at the center, vertically, of the cell selected, and suitably fixed in accordance with the installation specifications.

Use a 3-wire PT-100 temperature sensor.

### 12.1. Safety instructions for connecting the storage system temperature sensor

**⚠ CAUTION**

Before you start to make the connections, make sure there is no voltage in the inverter. Verify that the AC protection of the auxiliary genset and the DC protection of the storage system are open, as well as the PV array and the consumption grid.

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

When carrying out the connections, respect the polarities marked on the electronic card.

### 12.2. Wiring requirements for connecting the storage system temperature sensor

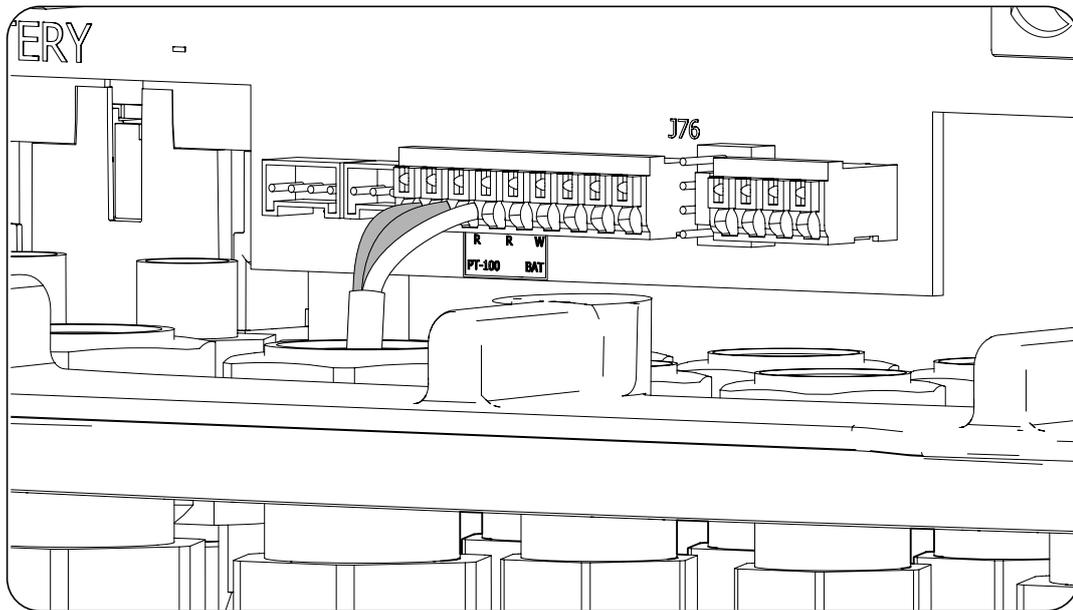
The wiring gauge for connecting the storage system temperature sensor is specified in the following table:

INGECON SUN STORAGE 1Play	
Wiring gauge	0.25 mm <sup>2</sup> ~ 1.5 mm <sup>2</sup>
Cable diameter	4.5 ~ 10 mm
Wiring stripping length (L*)	8 mm



## 12.3. Storage system temperature sensor connection process

To connect the temperature sensor:



1. Loosen the corresponding packing gland (see Section “2.7. Description of cable inlets”), remove the cap and pass the sensor cable through it.
2. Connect the wiring to terminal *J76 PT-100 BAT*, as indicated in the above figure, respecting the wiring colors. The colors of the wires to connect to each terminal appear on the screen-printed electronic card (R: red, R: red, W: white).
3. Correctly tighten the packing glands to prevent losses to the protection class, verifying that the wiring is not taut. Check that the connection is tight.

## 13. Connection of the CAN communication for Li-Ion batteries with BMS

Installing the CAN communication enables the inverter to control the Li-Ion batteries with BMS (*Battery Management System*).

This chapter explains the requirements and process for connecting the CAN communication wiring for Li-Ion batteries with BMS to the unit. Read carefully before starting the connection process.

### 13.1. Safety instructions for connecting the CAN communication for Li-Ion batteries with BMS

**CAUTION**

Before you start to make the connections, make sure there is no voltage in the inverter. Verify that the AC protection of the auxiliary genset and the DC switch of the Li-Ion battery are open, as well as the PV array and the consumption grid.

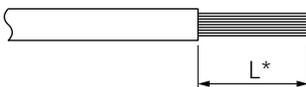
**Do not switch on the power** to the unit until you have successfully made the rest of the connections and the unit is closed.

When carrying out the connections, respect the polarities marked on the electronic card.

### 13.2. Wiring requirements for connecting the CAN communication for Li-Ion batteries with BMS

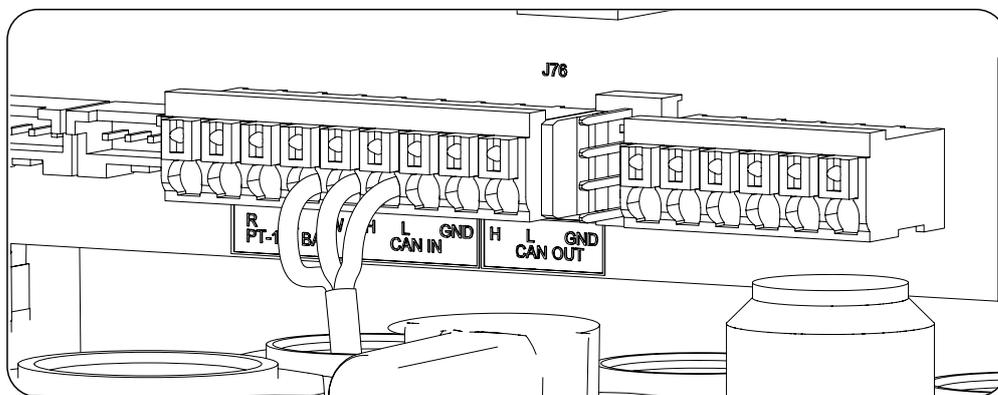
The wiring gauge for connecting the CAN communication of the storage system management system is specified in the following table:

INGECON SUN STORAGE 1Play	
Wiring gauge	0.25 mm <sup>2</sup> ~ 1.5 mm <sup>2</sup>
Cable diameter	4.5 ~ 10 mm
Wiring stripping length (L*)	8 mm



### 13.3. Connection process for the CAN communication for Li-Ion batteries with BMS

To connect the CAN communication:



1. Loosen the corresponding packing gland (see Section “2.7. Description of cable inlets”), remove the cap and pass the cable through it.
2. Connect the wiring to terminal *J76 CAN IN* as shown in the previous figure, respecting the printed instructions on the screen-printed electronic card (H: high, L: low, GND: GND). Correctly tighten the packing glands to prevent losses to the protection class, verifying that the wiring is not taut. Check that the connection is tight.

## 14. Connecting the digital outputs

These units are equipped with two voltage-free contacts. Both digital outputs have a Normally Open (NO) contact with 5 A 250 Vac and one Normally Closed (NC) contact with 2 A 250 Vac. They can be configured for different uses using the display.

This chapter explains the requirements and process for connecting the digital output wiring to the unit. Read carefully before starting the connection process.

### 14.1. Safety instructions for connecting the digital outputs

**CAUTION**

Before you start to make the connections, make sure there is no voltage in the inverter. Verify that the AC protection of the auxiliary genset and the DC protection of the storage system are open, as well as the PV array and the consumption grid.

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

When carrying out the connections, respect the polarities marked on the electronic card.

### 14.2. Wiring requirements for connecting the digital outputs

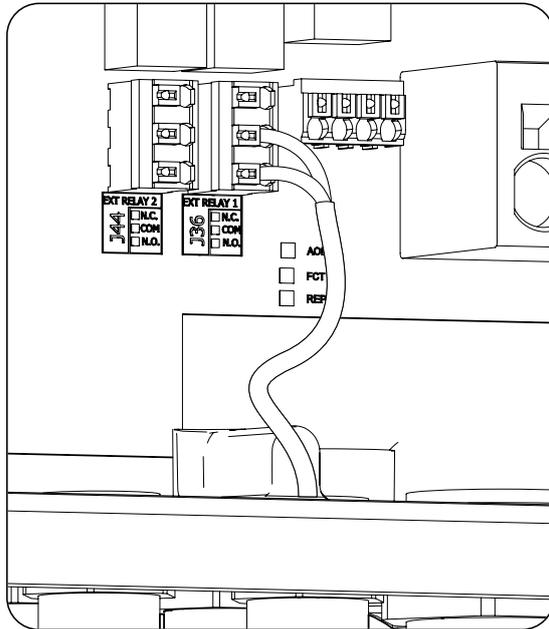
The wiring gauge for connecting the digital outputs is specified in the following table:

INGECON SUN STORAGE 1Play	
Wiring gauge	0.25 mm <sup>2</sup> ~ 1.5 mm <sup>2</sup>
Cable diameter	4.5 ~ 10 mm
Wiring stripping length (L*)	8 mm

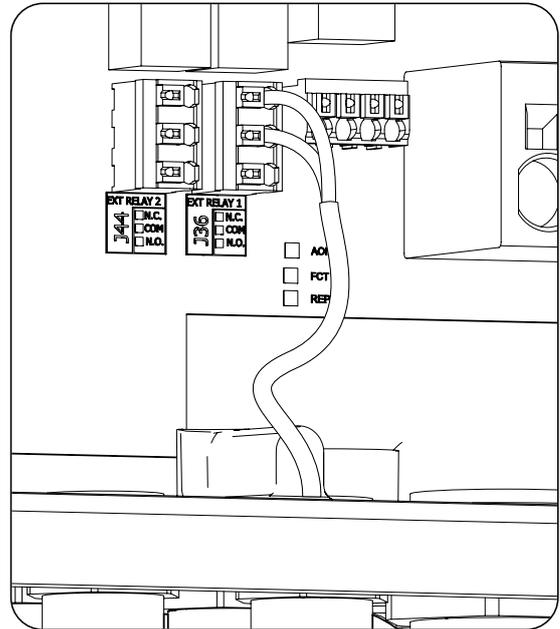


### 14.3. Connection process of the digital outputs

Follow the instructions below to connect the digital outputs:



Normally open (NO)



Normally closed (NC)

Digital output 1	J36 EXT RELAY 1
Digital output 2	J44 EXT RELAY 2

1. Loosen the corresponding cable gland "2.7. Description of cable inlets", remove the cap and pass the cable through it.
2. If you wish to use the Normally Open contact, connect the wiring in the NO and COM positions in the J36 EXT terminals. 1 RELAY and/or J44 EXT. 2 RELAY as shown in the previous figure.
3. If you wish to use the Normally Closed contact, connect the wiring in the NC and COM positions in the J36 EXT terminals. 1 RELAY and/or J44 EXT. 2 RELAY as shown in the previous figure.
4. Correctly tighten the packing glands to prevent losses to the protection class, verifying that the wiring is not taut. Check that the connection is tight.

## 15. Connecting the digital inputs

The management of the digital inputs varies depending on the inverter hardware type.

This chapter explains the requirements and process for connecting the digital input wiring to the unit. Read carefully before starting the connection process.

### 15.1. Safety instructions for connecting the digital input

**⚠ CAUTION**

Before you start to make the connections, make sure there is no voltage in the inverter. Verify that the AC protection of the auxiliary genset and the DC protection of the storage system are open, as well as the PV array and the consumption grid.

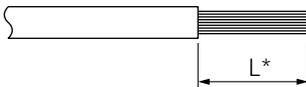
**Do not switch on the power** to the unit until you have successfully made the rest of the connections and the unit is closed.

When carrying out the connections, respect the polarities marked on the electronic card.

### 15.2. Wiring requirements for connecting the digital input

The wiring gauge for connecting the digital inputs is specified in the following table:

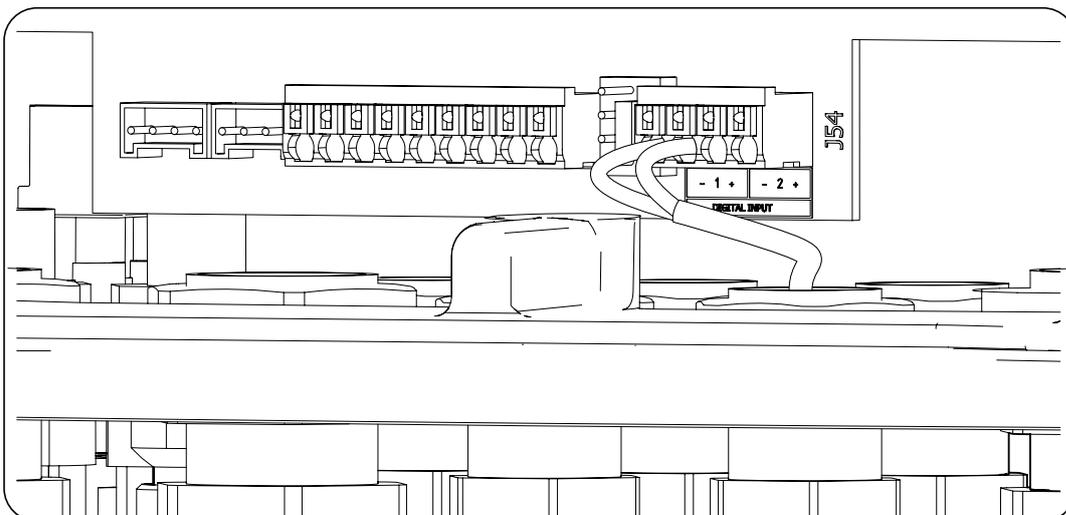
INGECON SUN STORAGE 1Play	
Wiring gauge	0.25 mm <sup>2</sup> ~ 1.5 mm <sup>2</sup>
Cable diameter	4.5 ~ 10 mm
Wiring stripping length (L*)	8 mm



### 15.3. Specifications for the digital inputs depending on the inverter hardware

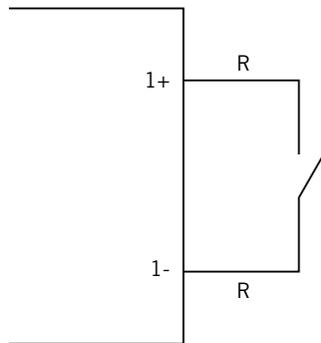
The distribution of the digital inputs varies depending on the inverter hardware type (A or B).

#### Hardware type A

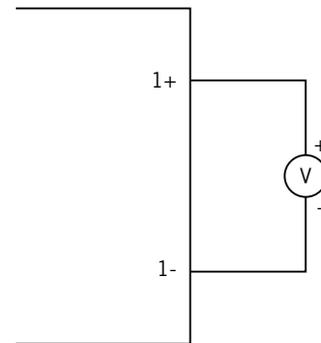


Hardware type A	
Digital Input 1	J54 DIGITAL INPUT 1
Digital Input 2	J54 DIGITAL INPUT 2

These digital inputs can be configured for different purposes (see “18.13. Configuring the digital inputs”) and used with a potential-free contact or with a power supply, both outside the unit.



External potential-free contact

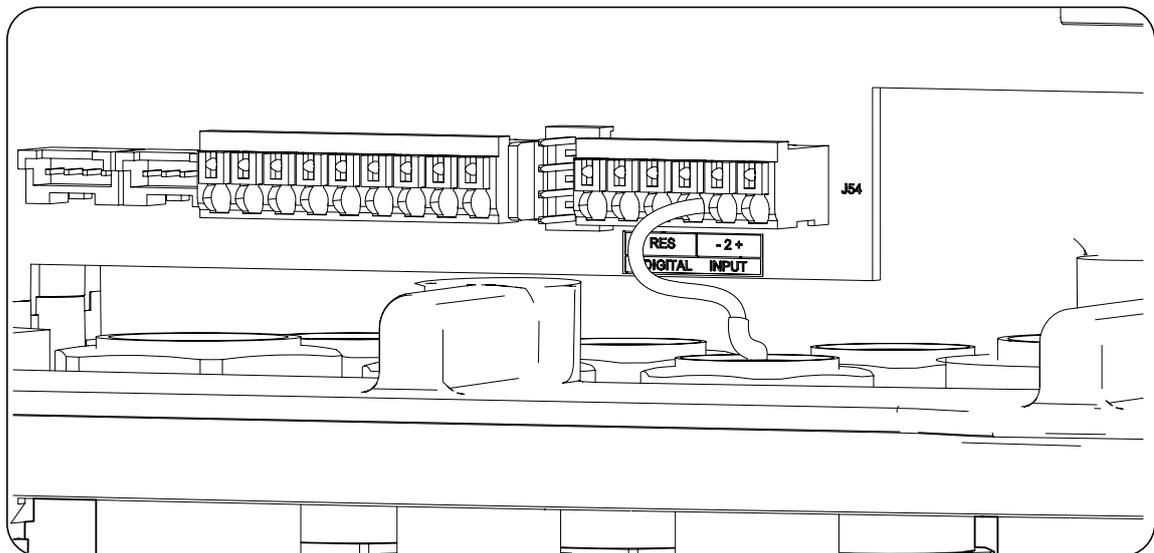


External power supply

The truth table for these inputs is as follows.

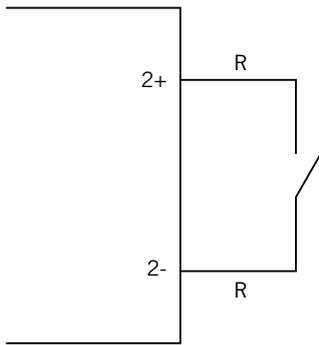
Connector		CPU
Potential-free contact	Voltage level	
Open	5 V ~ 24 V	“0”
Closed (R < 100 Ohm)	0 V	“1”
Closed (R > 100 Ohm)	1 V ~ 5 V	X

**Hardware type B**

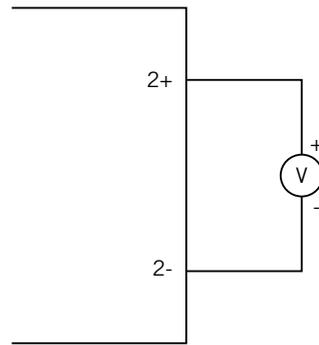


Hardware type B	
Digital Input 2	J54 DIGITAL INPUT 2

Input 2 can be configured for different purposes (see “18.13. Configuring the digital inputs”) and 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 these inputs 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

## 15.4. Digital input connection process

The digital inputs are connected in the following order:

1. Loosen the corresponding packing gland (see Section "2.7. Description of cable inlets"), remove the cap and pass the cable through it.
2. Connect the wiring to terminal J54 DIGITAL INPUT as shown in the previous figures, respecting the polarities printed on the electronic card.
3. Correctly tighten the packing glands to prevent losses to the protection class, verifying that the wiring is not taut. Check that the connection is tight.

## 16. Connecting optional accessories

This chapter explains the process for wiring the optional accessories to the unit:

- Communication card.
- INGECON SUN EMS Board energy manager.

### 16.1. Safety instructions for connecting the optional accessories

#### **CAUTION**

Before you start to make the connections, make sure there is no voltage in the inverter. Verify that the AC protection of the auxiliary genset and the DC protection of the storage system are open, as well as the PV array and the consumption grid.

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

### 16.2. Connecting the communication cards

Optionally, it is possible to install the cards required to establish communication with the inverter. There are several ways establish communication:

- RS-485.
- Ethernet TCP.
- Wi-Fi TCP.

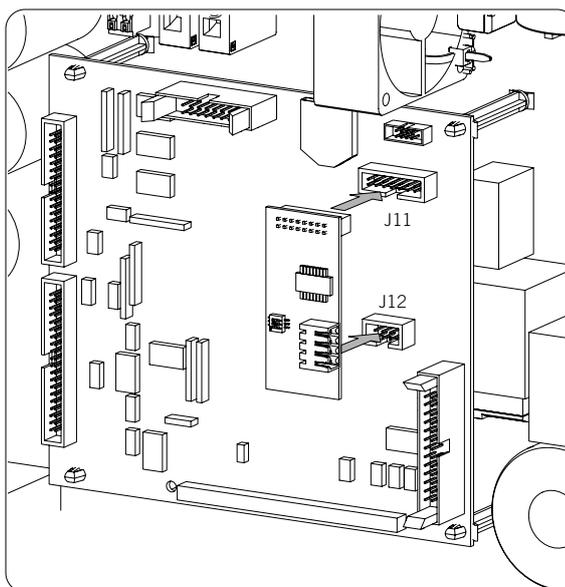
#### **INFO**

See the corresponding communication accessories manual for further information.

#### 16.2.1. RS-485 communication card

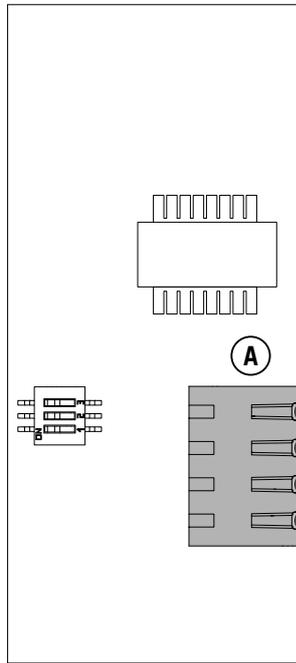
The RS-485 communication card is installed inside the unit. Follow the steps below to connect the communications card:

1. Connect the communication card in the J11 and J12 connectors of the control card.



2. Insert the wiring to the unit through the cable inlets provided in the lower part of the inverter (see "2.7. Description of cable inlets").

3. Connect the RS-485 (A) cabling to the communication card.



*RS-485 communication card*

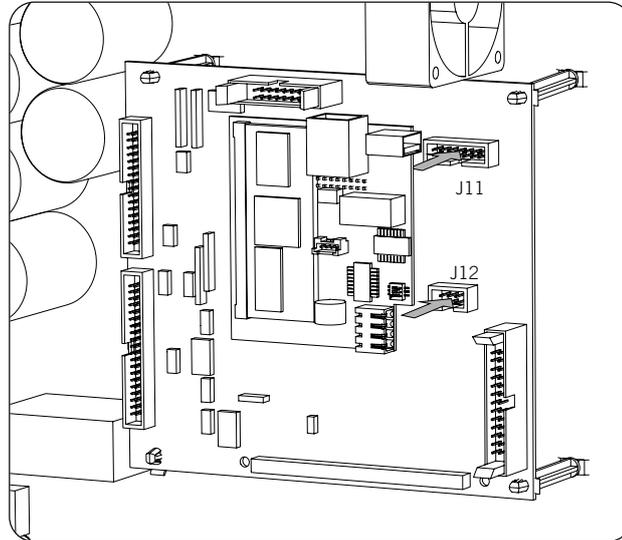
Pin	Signal
1	RS-485 B(+)
2	RS-485 A(-)
3	Protective mesh
4	GND

## 16.2.2. Ethernet TCP communication card

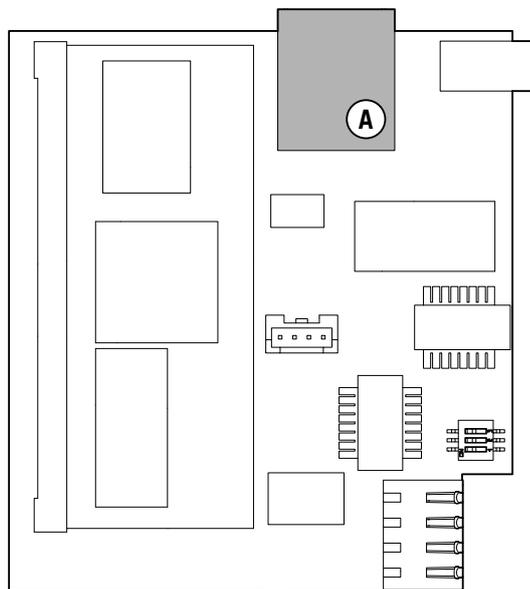
The Ethernet TCP communication card is installed inside the unit to provide an Ethernet network interface.

Follow the steps below to connect the communications card:

1. Connect the communication card in the J11 and J12 connectors of the control card.



2. Insert the wiring to the unit through the cable inlets provided in the lower part of the inverter (see "2.7. Description of cable inlets").
3. Connect the Ethernet (A) cabling to the communication card.



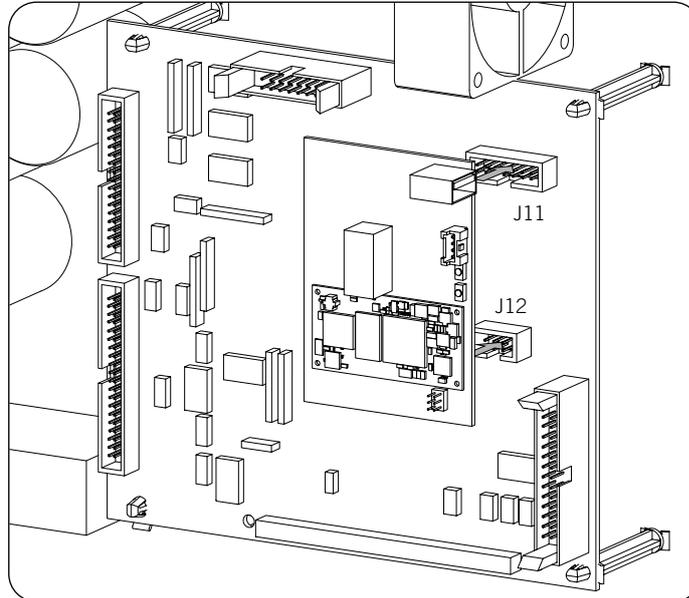
*Ethernet TCP communication card*

### 16.2.3. Wi-Fi TCP communication card

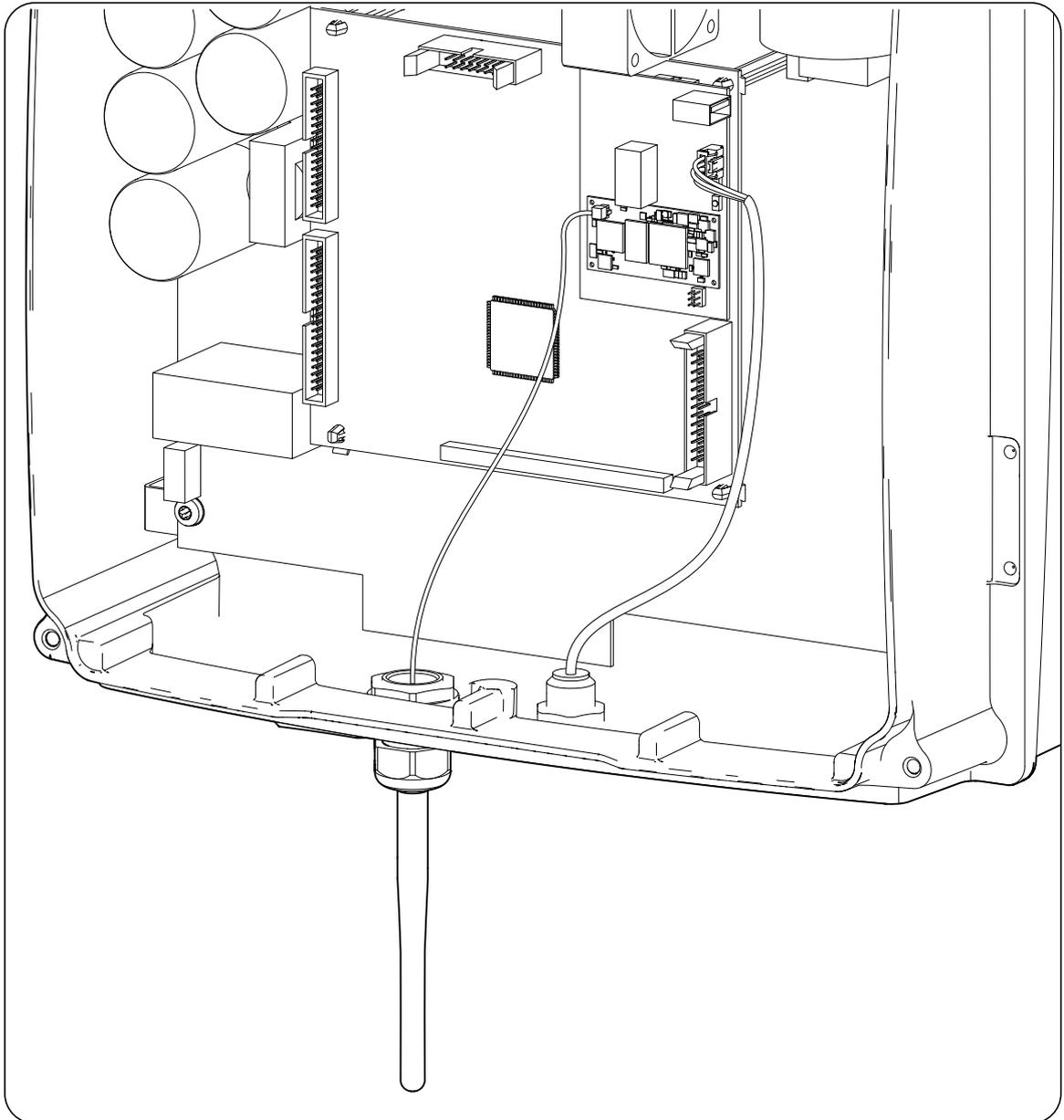
The Wi-Fi TCP communication card is installed inside the unit to provide a wireless network interface.

Follow the steps below to connect the communications card:

1. Connect the communication card in the J11 and J12 connectors of the control card.



2. In the lower part of the inverter, remove the cable gland for the Reset button and install said button (see "2.7. Description of cable inlets").
3. Install the antenna in the dedicated cable gland (see "2.7. Description of cable inlets").
4. Connect the Reset button and the antenna to the communication card. Use the provided extension cable for the Reset button.

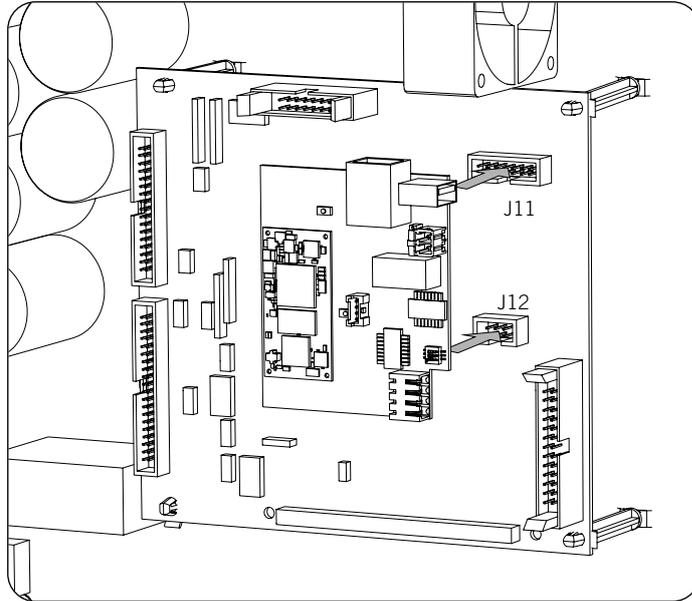


### 16.3. INGECON SUN EMS Board connection

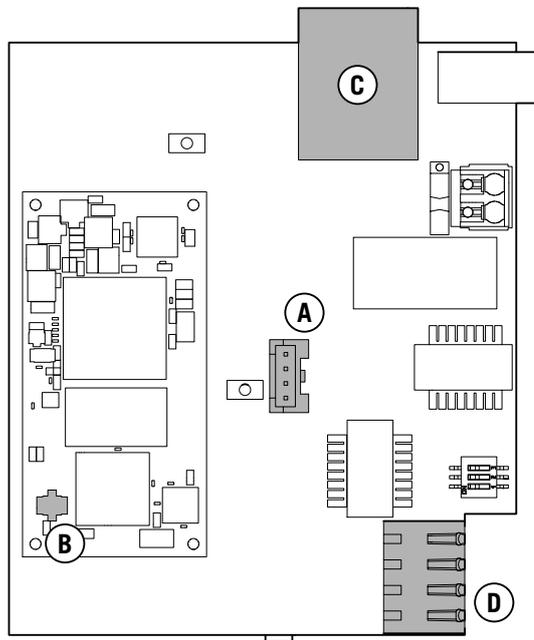
The INGECON SUN EMS Board is a control and communication device used with an external wattmeter to manage the energy flows within self consumption photovoltaic installations with batteries. This device is integrated inside the inverter.

To connect the INGECON SUN EMS Board follow these steps:

1. Connect the EMS Board to connectors J11 and J12 of the control card as shown in the figure below.



2. If you wish to establish Wi-Fi communication with the router, you must install the Wi-Fi antenna and the Reset button. Follow the instructions in section “16.2.3. Wi-Fi TCP communication card”.
3. If you wish to use Ethernet communication with the router, insert the communication cabling through the dedicated PG20 cable gland (see “2.7. Description of cable inlets”).
4. In the case of using the Wi-Fi connection, connect the Reset button together with the extension cable provided (A) and the antenna (B) to the EMS Board. To use the Ethernet connection, connect the cabling to the EMS Board (C).



INGECON SUN EMS Board

5. Connect the RS-485 cabling (D) for communication with the external wattmeter.

Pin	Signal
1	RS-485 B(+)

Pin	Signal
2	RS-485 A(-)
3	Protective mesh
4	GND

## 17. Commissioning

This chapter details the process for commissioning the unit.

### 17.1. Unit 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.

#### 17.1.1. 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 connected to their connectors at the bottom of the housing.
- 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 that the unit is properly secured

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

#### 17.1.2. 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 glands are well sealed.

##### Display cable

If the front cover has been opened at any time, ensure that the cable to the front display remains firmly connected.

##### Cover

If the front cover has been opened at any time, attach it to the unit using its four bolts as follows:

1. Ensure that the cover is correctly aligned with the housing. This can be confirmed easily by checking that the holes in the cover and the housing mate.
2. Lubricate the screws. Whenever the unit is opened, it is mandatory to lubricate the screws before putting them back in to prevent them seizing.
3. Manually insert the four screws into their threaded holes, starting at the top right, followed by the bottom left and finally the other two.
4. Tighten the screws until a maximum torque of 5 Nm is applied to each of them with a calibrated tool.
5. Check that the sealing is conserved.

The guarantee does not cover damage caused by inadequate sealing of the unit.

### 17.2. Power-up

#### CAUTION

You must carry out the tasks outlined for this step with the unit door always closed, thus avoiding possible contact with live parts.

Once a general visual inspection, wiring check and sealing check have been carried out, power up the unit from the battery bank and/or the PV array.

Make sure that the DC switch for the PV array is ON.

If after several seconds the inverter does not show any activity on the display, verify that the specified polarities have been followed for the connection of the batteries and/or the PV array.

### 17.2.1. Configuring the unit for the first time

The first time that the inverter is powered from the batteries or the PV array, it must be configured to operate correctly.

These units can be used in different types of installations. The configuration of the unit is different depending on the type of installation where the inverter is to be used.

#### INFO



For the first configuration and start up of the unit, visit [www.ingeconsuntraining.info/?page\\_id=13069](http://www.ingeconsuntraining.info/?page_id=13069).

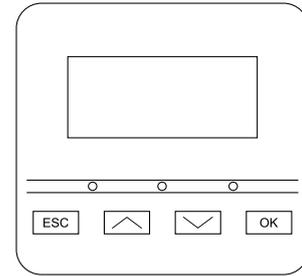
In the *APPLICATIONS* section, enter the type of installation and download the corresponding installation and configuration document. For a correct start-up of the unit, follow the instructions given in this document.

# 18. Display control

INGECON SUN STORAGE 1PLAY inverters/chargers incorporate a display, keypad and LED unit to interface with the installer or 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.



## 18.1. 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.
- ^ Scroll up the list of parameters or folders within the same level or increase the value of an editable parameter by one base unit.

**INFO**

To increase the value of a parameter by intervals of 10 use the combination ^ + OK. To increase the value of a parameter by intervals of 100 use the combination ^ + ESC.

- ∨ Scroll down the list of parameters or folders within the same level or decrease the value of an editable parameter by one base unit.

**INFO**

To reduce the value of a parameter by intervals of 10 use the combination ∨ + OK. To reduce the value of a parameter by intervals of 100 use the combination ∨ + ESC.

- 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 front panel has three LEDs:

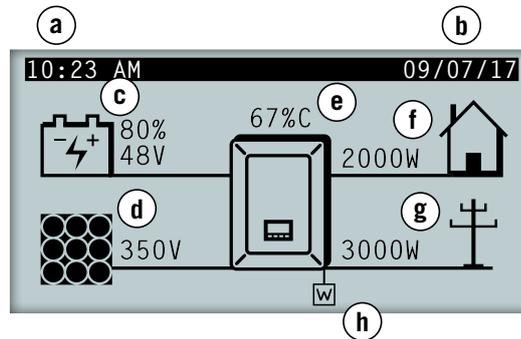
- Green LED**
  - Flashing every 0.2 seconds: the storage system does not have enough energy to start. The inverter is in the battery emergency charge process from the PV array.
  - Flashing every 1 second: inverter checking the storage system and starting up.
  - On: inverter generating voltage in the consumption grid or connected to the auxiliary genset.
  - Off: the inverter is disconnected or without firmware.

- Orange LED**
  - Three flashes: the external fan is not working correctly.
  - Flashing every 1 second: the internal fan is not running correctly.
  - Flashing every 3 seconds: the inverter is limiting power due to high temperature.
  - On: presence of alarm.

- Red LED**
  - On: manual stop.

## 18.2. Display

The following figure shows the main screen of the inverter and the meaning of each field.



- a. Current time, hh:mm.
- b. Current date, dd/mm/yy.
- c. Storage system data. The voltage in volts, current in amps and state of charge are displayed alternately. If COM is shown in place of these values, there is no communication with the BMS for the Li-Ion battery.
- d. PV array data. The voltage in volts and current in amps of the PV array is shown alternately. If the PV array is not available but the inverter has started, the voltage of the DC bus is displayed in volts.
- e. Percentage of nominal power and reason for power reduction, if present <sup>(1)</sup>
- f. Consumption grid output data. The power in Watts and the voltage in volts is shown alternately.
- g. Auxiliary genset input data. The power in Watts and the voltage in volts of the auxiliary genset is shown alternately.
- h. This indicates that the system is operating under the communication setting in grid support mode. If the symbol flashes, this means that communications with the INGECON SUN EMS Board have been lost. As a result, the display will switch to standby.

<sup>(1)</sup> In the event that the inverter is connected to a grid or auxiliary generator and there is a power reduction, the current power percentage and the most restrictive reason for the limitation are shown. If there is not power limitation this percentage will not display. The different reasons for a power limitation are explained below, indicated both with the letter viewed on the display and the code set by communications.

Reasons for the power limitation		
Letter viewed on the display	Code sent by communications	Description
B	9	Batteries. Limitation due to the storage system state of charge or configuration.
C	1	Limitation caused by a setting sent through communications o by the self consumption mode managed by the INGECON SUN EMS Board.
D	10	Power available Battery charge limitation from the genset due to the power available. This power is calculated with the rated power in the case of the generator, or the contracted power in the case of the grid, minus the power consumed by the charges.
F	4	N/A
G	5	N/A
H	12	DC bus. Limitation due to high voltage in the internal DC bus.
L	13	N/A
M	6	Configuration. Battery charge limitation from the genset, defined by a user setting.
N	15	N/A
P	16	N/A
R	14	Apparent power. Limitation due to rated apparent power in the unit.
S	7	Self consumption mode. Limitation due to the operation of the self consumption mode managed by INGECON SUN STORAGE 1Play.

Reasons for the power limitation		
Letter viewed on the display	Code sent by communications	Description
T	2, 3	Temperature. Limitation due to high temperature in the unit.
V	8	N/A

### 18.3. Menu structure

START SCREEN				
MAIN MENU	START/STOP	SWITCH TO START		
		SWITCH TO STOP		
	MONITORING	BATTERY		
		BMS <sup>(1)</sup>	BMS ALARMS	
			BMS WARNINGS	
		PHOTOVOLTAIC		
		INVERTER		
		GRID		
		DIGITAL I/O		
		ALARM		
		FIRMWARE		
		DATA		
	CONFIGURATION <sup>(2)</sup>	ENTER PASSWORD		
		BATTERY	LEAD-ACID	PARAMETERS
				PT100 BATTERY SENSOR
			LI-ION	
			NO CONFIGURATION	
		INVERTER	RMS VOLTAGE	
			FREQUENCY	
		GENSET	TYPE OF GRID	GENERATOR
			MAN. CONNECTION	
			SCHEDULING	
			OVERLOAD	
		OPERATION MODE	MODE	STAND-ALONE
			BACK-UP FUNCTION	
			LOW PV POWER DISCONNECTION	
			GRID INJECTION POWER	
	DIGITAL I/O	DIGITAL OUTPUT 1		
DIGITAL OUTPUT 2				
DIGITAL INPUT 1				
DIGITAL INPUT 2				
CHANGE TIME/DATE				
CHANGE MODBUS NODE				
LANGUAGE				
FURTHER OPTIONS	EMERGENCY CHARGE			
	PARTIAL DATA RESET			
	MANUAL EQUALIZATION			
	BATTERY START/STOP <sup>(4)</sup>			
	TEST FANS			
	RESTART INVERTER			

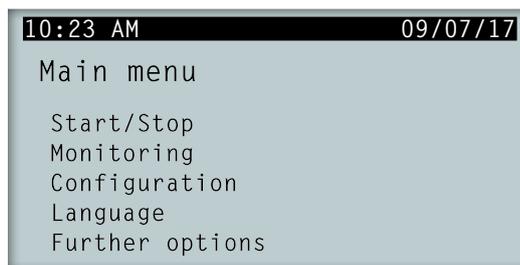
<sup>(1)</sup> Option only available if the Li-Ion battery has been selected.

<sup>(2)</sup> Menu intended for the installer and password-protected.

<sup>(3)</sup> This option is only available if you have selected standard *CEI 0-21 Interno*.

<sup>(4)</sup> Option only available if the Forsee Li-Ion battery has been selected.

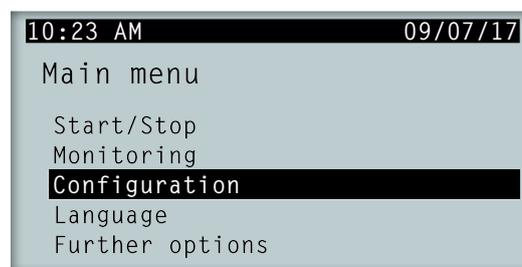
## 18.4. Main menu



The main menu contains the following submenus:

<b>START/STOP</b>	Manual start-up and stopping of the inverter.
<b>MONITORING</b>	Displays the main monitoring variables.
<b>CONFIGURATION</b>	Modifies parameters to adapt the unit to different operational conditions. Access restricted by password.
<b>LANGUAGE</b>	Selects the display language.
<b>FURTHER OPTIONS</b>	Shows further available options.

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



### **i** INFO

Access to the *CONFIGURATION* menu is password restricted. Access to this menu is only allowed to installers (qualified personnel). The installer password is 0332.

Ingeteam accepts no liability for incorrect use of the installer password.

## 18.5. Monitoring inverter variables

You may want to find out certain parameters of the unit. This facilitates the monitoring of the unit.

To consult the monitoring access *MAIN MENU > MONITORING*. A series of screens enable you to consult the parameters in the following groups:

*BATTERY*  
*BMS BATTERY MANAGER* (only Li-Ion batteries)  
*PHOTOVOLTAIC*  
*INVERTER*  
*GENSET*  
*DIGITAL I/O*  
*ALARM*  
*FIRMWARE*  
*DATA*

**Battery**

Setting	Description
VBAT	Voltage (V) in the battery bank measured by the inverter.
IBAT	Current (A) in the battery bank measured by the inverter. Positive for discharge, negative for charge.
SOC	Estimation of the lead-acid battery bank state of charge (%). For Li-Ion batteries it will display the data received by the BMS.
STATUS	Status of the battery bank. The following states may be shown: Stand-by, Discharge, Charge, Absorption, Flotation or Equalization.
TEMP	Battery bank temperature (°C). In the case of the lead-acid batteries, a PT-100 sensor must be installed.

**BMS battery manager**

Setting	Description
VBAT	Voltage (V) of the Li-Ion battery.
IBAT	Current (A) of the Li-Ion battery. Negative for discharge, positive for charge.
SOC	State of charge of the Li-Ion battery (%).
I MAX CHARGE	Maximum charge current (A) of the Li-Ion battery.
I MAX DISCHARGE	Maximum discharge current (A) of the Li-Ion battery.
VBAT CHARGE	Charge voltage (V) of the Li-Ion battery.
VBAT DISCHARGE	Discharge voltage (V) of the Li-Ion battery.
SOH	Health status (%) of the Li-Ion battery.
TEMPERATURE	Internal temperature (°C) of the Li-Ion battery.
COMM STATUS	CAN communication status with the Li-Ion battery. The following states may be shown: OK or ERROR.

**Photovoltaic**

Setting	Description
VDC	Voltage (V) of the PV array. If the PV array is not available but the inverter has started, the voltage (V) of the internal DC bus is displayed.
IDC	Current (A) of the PV array.
PDC	Power (W) of the PV array.

**Inverter**

Setting	Description
VAC	Voltage generated by the inverter (V).
IAC	Current through the inverter (A).
FAC	Frequency generated by the inverter (Hz).
PAC	Active power through the inverter (W).
STATUS	Inverter status. The following states may be shown: Disconnected, Connected, or Waiting the connection with the genset (waiting time according to selected regulations).

**Genset**

Setting	Description
VAC	Auxiliary genset voltage (V).
IAC	Auxiliary genset current (A).

Setting	Description
FAC	Auxiliary genset frequency (Hz).
PAC	Auxiliary genset active power (w).
COSPHI	Cosine of phi. Cosine of the phase shift angle between the grid voltage and current. The cosine of phi can be positive or negative: <ul style="list-style-type: none"> <li>Positive: the inverter injects positive reactive energy. The current is ahead with respect to the voltage.</li> <li>Negative: the inverter injects negative reactive energy. The current is delayed with respect to the voltage.</li> </ul>

### Digital I/O

Setting	Description
OUTPUT 1	Status of digital output 1. The following states may be shown: On, Off.
OUTPUT 2	Status of digital output 2. The following states may be shown: On, Off.
INPUT 1	Status of digital input 1. The following states may be shown: On, Off.
INPUT 2	Status of digital input 2. The following states may be shown: On, Off.

### Alarm

Setting	Description
ALARM	Status of inverter alarms in hexadecimal format.
CODE1	Operating code of the unit in hexadecimal format.
CODE2	Operating code of the unit in hexadecimal format.

### Firmware

Setting	Description
FW VER.	Unit firmware version.
DFW VER.	Unit display firmware version.
D. BOOT	Unit display boot version.
SVN FW	Unit firmware revision.
SVN D.	Display firmware revision.

### Data

Setting	Description
N/S	Unit serial number.
COMM. NODE	Number assigned to the inverter to identify it in a Modbus grid.
TEMP. RAD.	Unit radiator temperature.
TEMP. CI	Unit internal temperature.
TEMP. PT-100	PT-100 temperature sensor.

## 18.6. Configuring the battery type

### CAUTION

The battery type selection in the configuration process must be done with caution. The battery manufacturer does not offer any warranty if the battery type is configured incorrectly in the inverter.

For example, if a lead-acid battery is selected in the inverter when the battery is actually Li-Ion, it may be damaged.

These inverters can work with lead-acid batteries and with Li-Ion batteries.

To select the desired battery type, open *MAIN MENU > CONFIGURATION > BATTERY*.

The > symbol points to the type of battery currently selected. To select a different battery, highlight it using the UP or DOWN keys and press OK.

**Lead-Acid batteries**

For the lead-acid batteries to work properly and to safely prevent overcharges and complete discharges, several settings related to the battery model installed must be configured. To do this, open *MAIN MENU > CONFIGURATION > BATTERY > LEAD-ACID > SETTINGS*.

**⚠ CAUTION**

An incorrect configuration of these settings can reduce the battery life. Ingeteam accepts no liability for the consequences that may arise from incorrect configuration of the unit by the user and/or the installer.

Setting	Description
RATED V	Rated voltage of the battery bank (V).
MINIMUM V	Minimum voltage of the battery bank to avoid complete discharges, even stopping the supply from the batteries to the consumers (V).
CAPACITY 20H	C20 capacity specified by the battery manufacturer (Ah). This setting is used to precisely determine the battery state of charge (SOC).
CAPACITY 5H	C5 capacity specified by the battery manufacturer (Ah). This setting is used to precisely determine the battery state of charge (SOC).
I CHARGE	Maximum charge current of the battery bank (A).
I DISCHARGE	Maximum discharge current of the battery bank (A).
V ABSORPTION	Absorption voltage of the battery bank (V).
V FLOTATION	Flotation voltage of the battery bank (V).
V EQUALIZATION	Equalization voltage of the battery bank (V).
T EQUALIZATION	Duration of equalization charge. Time for which the battery bank must be maintained at the equalization voltage (minutes).

In addition, to prevent overcharging and incomplete charging of the lead-acid batteries, these inverters allow to constantly monitor the battery temperature through a PT100 sensor. This allows to adapt the charge voltage to the current temperature of the battery at any time.

To activate the automatic temperature compensation, open *MAIN MENU > CONFIGURATION > BATTERY > LEAD-ACID > PT100 BATTERY SENSOR*.

At temperatures equal to or higher than 20 °C the inverter reduces the battery charge voltage. At temperatures below 20 °C the inverter increases the battery charge voltage. To modify the compensation constant in V/°C/Cell, open *MAIN MENU > CONFIGURATION > BATTERY > LEAD-ACID > SETTINGS*.

Setting	Description
COMP. TEMP.	Compensation temperature in a cell, in -mV/°C/Cell. See the battery datasheet. The default value is -4mV/°C/Cell.

**Li-Ion batteries**

The Li-Ion batteries suitable for the INGECON SUN STORAGE 1Play have their own advanced battery management, which is usually programmed by the manufacturer and integrated in the batteries (BMS). Ingeteam cannot in any way change the operation of this external advanced battery management.

**i INFO**

For more information about the compatible Li-Ion batteries, see the "List of Li-Ion batteries approved for the INGECON SUN STORAGE 1Play" available on the Ingeteam website.

If the battery model is not in the list, contact Ingeteam.

## 18.7. Configuring the inverter to work only with the PV array, without batteries

These inverters can work only from the photovoltaic input, without using the battery input.

### INFO

To set up the inverter in this operation mode, see the document “Use and Settings of the ISS 1Play working only with PV” available at [www.ingeconsuntraining.info](http://www.ingeconsuntraining.info).

## 18.8. Configuring the SOC settings

Setting	Description
SOCMAX	Maximum state of charge for charging the batteries from the photovoltaic energy (%).
SOCRED	Maximum state of charge for disconnecting the auxiliary generator (%).
SOCMIN	Minimum state of charge for starting the auxiliary generator (%).
SOCRECX	Reboot state of charge of supply to the consumers using photovoltaic energy (no diesel generator available) (%).
SOCDESCX	Minimum state of charge to fully discharge the batteries, stopping the supply to the consumers (%).

## 18.9. Configuring the maximum battery charge power from the auxiliary genset

This option allows to set the maximum power for charging the batteries from the generator.

To configure this parameter, open *MAIN MENU > CONFIGURATION > OPERATION MODE > MODE > open the selected mode > CHARGING POWER* and specify the maximum power in watts.

When the inverter is connected to the grid or generator, the batteries are charged from the AC source when the state of charge (SOC) is lower than the set SOC MIN (see “18.8. Configuring the SOC settings”).

## 18.10. Configuring the AC voltage and rated frequency of the loads in stand-alone installations

In stand-alone installations these units allow to power the consumption grid with configurable AC voltage and frequency.

To configure the AC voltage and rated frequency, open the *MAIN MENU > CONFIGURATION > INVERTER*.

Setting	Description
RMS VOLTAGE	Rated voltage supplying the AC consumers (V).
FREQUENCY	Rated frequency of the consumer output (Hz).

## 18.11. Configuring the auxiliary generator in stand-alone installations

In stand-alone installations these inverters can operate with an auxiliary generator that is connected in the event of a power deficit.

To configure the generator settings, open *MAIN MENU > CONFIGURATION > GENSET > GRID TYPE > GENERATOR* and enter the generator settings.

Setting	Description
RATED POWER	Rated power of the diesel generator set (w). With this parameter, the INGECON SUN STORAGE 1Play estimates the power available for loading the batteries, considering the consumption of the installation from the diesel generator.
VAC MIN	Minimum AC voltage generated by the diesel generator set (V):

Setting	Description
VAC MAX	Maximum AC voltage generated by the diesel generator set (V):
FAC MIN	Minimum frequency generated by the diesel generator set (Hz):
FAC MAX	Maximum frequency generated by the diesel generator set (Hz):

The generator can start automatically using a command through a digital output in the inverter. For this, the digital output must be configured as “Generator ON/OFF” (see “18.12. Configuring the digital outputs”). The options available for starting the auxiliary generator through the inverter are:

Options	Description
Battery state of charge (SOC)	This allows the generator to be switched on once the state of charge reaches the <i>SOC MIN</i> parameter and, if the batteries are lead-acid, when the battery reaches the <i>V MIN</i> parameter. The generator is switched off once the state of charge reaches the <i>SOC RED</i> parameter. This option is always activated by default and cannot be deactivated.
Scheduling	When this function is activated, the generator will be switched on/off every day during a range of defined hours.
Consumption grid overload	When this function is activated, the generator is switched on/off according to the power consumed by the loads in a set time.
Manual	This allows you to switch the generator on/off manually and immediately. The generator will continue to run until the shut-down is ordered by the same method.

## 18.12. Configuring the digital outputs

These inverters have several voltage-free outputs which can have the following functionalities:

Options	Description	State of the normally open (NO) voltage-free contact
NO CONFIGURATION	No task assigned (default option)	OPEN
GENERATOR ON/OFF	Auxiliary generator activation signal	Turn off the generator: OPEN Turn on the generator: CLOSED
LOW BAT. VOLTAGE	Signal used to indicate that the battery voltage is lower than the minimum voltage configured. After selecting this option the minimum voltage must be set.	Voltage above the limit: OPEN Voltage below the limit: CLOSED
HIGH BAT. VOLTAGE	Signal used to indicate that the battery voltage is higher than the maximum voltage configured. After selecting this option the maximum voltage must be set.	Voltage above the limit: OPEN Voltage below the limit: CLOSED
NEUTRAL GROUND	Neutral grounding of the consumers using a normally open external contactor. In the event of a TT (Off-grid) grid outage, the contactor will be activated.	TT neutral to ground in On-grid: OPEN TT neutral to ground in Off-grid: CLOSED
ON/OFF BY COM.	Digital output control via communications.	Off: OPEN On: CLOSED

To configure the digital outputs, open *MAIN MENU > CONFIGURATION > DIGITAL I/O*.

## 18.13. Configuring the digital inputs

These inverters have several digital inputs which can have the following functionalities:

Options	Description	State of the voltage-free contactor / Voltage level
NO CONFIGURATION	No task assigned (default option)	OPEN / High level
INVERTER START/STOP	Starts or stops the inverter	Start: OPEN / High level Stop: CLOSED / Low level

To configure the digital outputs, open *MAIN MENU > CONFIGURATION > DIGITAL I/O*.

## 18.14. Configuring the Modbus ID

The Modbus ID is the inverter's identification number within the communications bus.

To configure the Modbus number, open *MAIN MENU > CONFIGURATION > CHANGE MODBUS NODE*.

## 18.15. Place the inverter in operating mode

To start the inverter in operating mode, open *MAIN MENU > START/STOP*. This screen displays the inverter's current status and allows changing the status using the OK key. If the current status is stopped, press OK to change it to operational.

## 18.16. Place the inverter in stop mode

To start the inverter in stopped mode, open *MAIN MENU > START/STOP*. This screen displays the inverter's current status and allows changing the status using the OK key. If the current status is operating, press OK to change it to stopped.

## 18.17. Change date and time

To change the inverter's date and time, open *MAIN MENU > CONFIGURATION > CHANGE TIME/DATE*.

## 18.18. Change display language

To change the display language, open *MAIN MENU > LANGUAGE*

## 18.19. Viewing alarms and stop reasons

During the operation of the unit, alarms and stop reasons may be generated.

To view the alarms in real time, open *MAIN MENU > MONITORING > ALARM MONIT*.

In addition to alarms, various unit operation codes can be viewed on this display. These codes provide information next to the alarm in order to solve the problem.

## 18.20. Performing an emergency charge of the battery

An emergency charge must be performed when the installation is stopped due to a total battery discharge.

This function allows to charge the batteries up to a certain level in order to have enough energy to restore the system again.

For the unit to carry out an emergency charge, the batteries must be in one of the following states:

- Low charge level,  $SOC \leq SOCdescx$ . (Alarm 0x0001 + Code2 0x0080)
- Low voltage,  $Vbat \leq Vmin$ . (Alarm 0x0001 + Code2 0x0080)

The inverters can charge the batteries from different energy sources. Depending on the energy source available, this emergency charge will be automatically activated by the inverter or must be activated manually by the user.

Available energy source	Emergency charge	Description
Photovoltaic input in the INGECON SUN STORAGE 1Play	Automatic	The inverter detects the PV array and automatically starts charging the batteries. The installation will be restored when the batteries reach the configured SOCrecx state of charge (see "18.8. Configuring the SOC settings").
Auxiliary genset	Automatic	The inverter detects the voltage and frequency in the AC grid input and connects to it automatically. The installation is restored immediately and starts charging the batteries from the AC grid input (see "18.9. Configuring the maximum battery charge power from the auxiliary genset").

Available energy source	Emergency charge	Description
External photovoltaic inverter INGECON SUN 1Play	Manual	Manually activate the emergency charge to charge the batteries from the external photovoltaic inverter. Open Main menu > More options > Emergency charge. It is recommended to disconnect all the consumers from the installation so that all the photovoltaic energy is used for charging the batteries. Once the batteries reach the configured SOCCrecx state of charge the consumers can be connected again.

### 18.21. Performing a ventilation test

Occasionally it is necessary to test the proper performance of the unit's external and internal fans. These units have the option of performing a ventilation test.

To perform the ventilation test open *MAIN MENU > CONFIGURATION > TEST FANS*. Press OK to start the test. The unit's fans will start to turn for approximately 15 seconds. After this time, the test will automatically deactivate. If one or several of the fans do not turn, a ventilation fault is displayed:

- Code1 0x0008 “fault in internal fan”
- Code1 0x0010 “fault in external fan”

If all ventilators turn, the test's result is positive.

**i INFO**

The ventilation test only checks the turning of the fans. A positive ventilation test alone does not indicate that the system's ventilation status is correct. To assure proper performance of the ventilation system, also check that there are no elements obstructing air passage and that the fans are properly installed.

### 18.22. Performing an equalization charge of the batteries

For certain lead-acid battery models the manufacturer recommends performing a periodic equalization charge.

During the equalization charge the inverter equalizes the state of charge of the cells and compensates the electrolyte stratification. This prevents a premature failure of the individual cells and extends the service life of the battery. This process produces gasification, so a proper ventilation of the batteries is necessary.

Before performing a manual equalization charge, consult the battery manufacturer for the charge voltage and duration.

**⚠ CAUTION**

An incorrect configuration of these settings can reduce the battery life. Ingeteam accepts no liability for the consequences that may arise from incorrect configuration of the unit by the user and/or the installer.

To configure the parameters in the unit, open *MAIN MENU > CONFIGURATION > BATTERY > LEAD-ACID > SETTINGS*.

Setting	Description
V EQUALIZATION	Equalization charge voltage of the battery bank, specified by the battery manufacturer (V).
T EQUALIZATION	Duration of the equalization charge of the battery bank, specified by the battery manufacturer (minutes).

The equalization charge must be manually activated via the display. To do this, open *MAIN MENU > MORE OPTIONS > MANUAL EQUALIZATION*.

### 18.23. Grounding fault detection and alarm

These inverters comply with clause 13.9 of the *IEC 62109-2* standard for monitoring grounding fault alarms.

If a grounding fault alarm occurs, the fault code will be shown on the inverter screen and the orange LED indicator will light up:

Alarm 20 + Code1 0x0004 “Insulation failure to positive or negative PV or Battery terminals”

 **INFO**

For more information, see the *Alarm Interpretation and Troubleshooting Guide* which describes the alarms and troubleshooting for the installation and operation of the INGECON SUN STORAGE 1Play. To download the guide, go to the INGECON SUN Training website ([www.ingeconsuntraining.info](http://www.ingeconsuntraining.info)).

## 19. Troubleshooting

### INFO

See the Alarm Interpretation and Troubleshooting Guide which describes the alarms and troubleshooting for the installation and operation of the INGECON SUN STORAGE 1Play. To download the guide, go to the INGECON SUN Training website ([www.ingeconsuntraining.info](http://www.ingeconsuntraining.info)).

## 20. Shutting down the unit

This section describes the procedure to shut down the unit.

### CAUTION

If you wish to work inside the unit, you must carry out these instructions in the order shown here to remove the power.

### 20.1. Unit disconnection process

1. Manually stop the inverter, using the *START/STOP* option in the display menu.
2. Remove both the direct voltage (Vdc) and the alternating voltage (Vac) arriving at the unit.
3. Wait 10 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 there is no voltage.
5. Signal cut-off point (Vac and Vdc) with a sign reading "*Caution no switching...*". If necessary, rope off the work area.

### 20.2. Disconnecting the wiring in push-in type terminals

#### INFO

The connection of the storage system, the consumption grid and the auxiliary genset is performed using push-in type terminals.

Section "*7. Connection/disconnection of wiring in push-in type terminals*" describes the process for disconnecting the wiring from this type of terminal.

## 21. Preventive maintenance

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

### 21.1. Safety conditions



Before opening the unit, you must remove the power (see section “20. Shutting down the unit”).
You must consider the set of conditions listed below as minimum requirements.
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.

### 21.2. 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, both at the wall and on the transformer if this exists. 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.

### 21.3. 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.

### 21.4. Cooling system

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

### 21.5. Environment

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

## 22. Waste handling

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



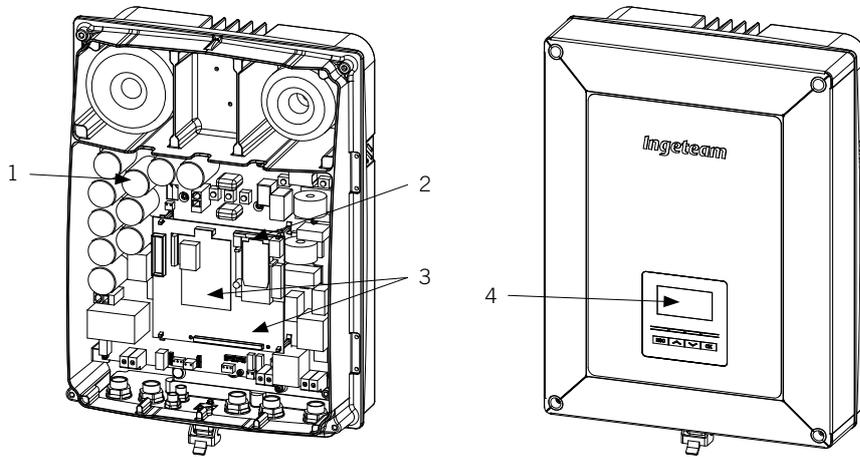
At the end of the unit's life, the waste must be correctly processed by an authorized hazardous waste management company.

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.

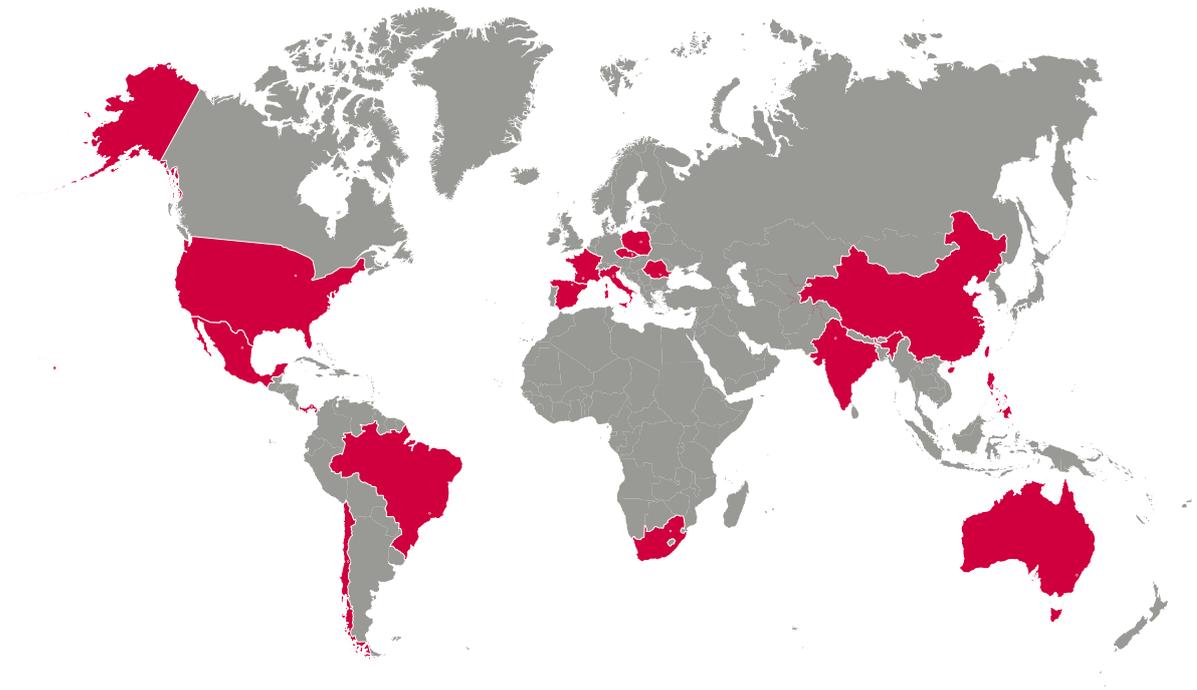
The elements within the unit that must be handled individually are:

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

Their location is shown in the following illustrations.







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