

**INGECON SUN**



**Solar PV**  
**Self-consumption solutions**

***Ingeteam***

# SOLAR PV SELF-CONSUMPTION



## SOLUTIONS TO REDUCE THE ELECTRICITY BILL THANKS TO A CLEAN ENERGY SOURCE

Photovoltaic self-consumption installations are grid-tied systems that generate energy from the sun and consume it on site.

Energy self-consumption systems usually seek two main goals: minimising the consumption of energy coming from the grid and maximising the one coming from the PV modules. Thus, self-consumption installations always allows for reducing the electricity bill and saving money.

Self-consumption systems are specially profitable when energy generation and consumption happen at the same time, as the energy produced can be consumed immediately, without storing it. For this reason, this document focuses on solar PV self-consumption systems without batteries. To get information about Ingeteam's technological solutions for solar self-consumption installations with energy storage systems, please contact Ingeteam's solar sales department at:

[solar.energy@ingetteam.com](mailto:solar.energy@ingetteam.com)



## The fast and easy-to-use monitoring solution

Smartphone application to monitor every self-consumption system

It is now available for iOS and Android the smartphone application INGECON® SUN Monitor to monitor self-consumption installations with or without energy storage systems in order to store the energy excess produced.

### Real time information

Thanks to this application, users can have immediate access to all the data regarding energy generation, con-

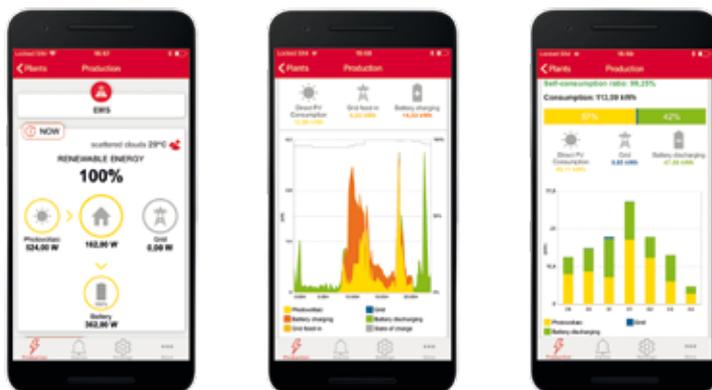
sumption and storage. For instance, the user can see real-time graphics showing the percentage of energy consumed from the grid and from the solar modules.

### Accessible data

The application stores all the data de generation, storage and consumption, and allows for accessing this information related to any day from the past.

### Maximise your savings

The app also provides with information about the accumulated money savings on the electricity bill. The user can know how much he/she is saving and calculate the estimated return on investment for his/her self-consumption system.



# INGECON SUN EMS Board



## The most efficient energy management for self-consumption

The INGECON® SUN EMS energy management system developed by Ingeteam is directed at optimizing energy consumption in domestic, commercial and industrial markets alike. The EMS is designed to increase the amount of energy generated from renewable sources, to match on-site consumption requirements.

### The smart energy manager

The INGECON® SUN EMS Board uses readings from a wattmeter at the point of connection to manage the system energy flows, by sending operating setpoints to the various inverters. This control and communication device is mounted inside the inverter, simplifying and lowering the cost of the system as a whole.

### Advanced connectivity

The INGECON® SUN EMS Board can be connected to the devices and equipment forming part of the system either through its Ethernet or Wi-Fi interface (built-in as standard) and can be monitored with the INGECON® SUN EMS Tools software. This software is also used to configure the EMS Board manager control strategy. Additionally, this device features an RS-485 port for communication with the external wattmeter.

### Maximum control of the energy consumed

The system energy manager constantly controls the amount of energy exchanged with the public grid. This information is transferred in real time from the INGECON® SUN EMS Board wattmeter and is available for viewing through the INGECON® SUN EMS Tools software. Furthermore, in the event of a power grid outage, operation in stand-alone mode is possible if there is a storage system coupled to the installation.

### Designed to operate in a whole range of systems

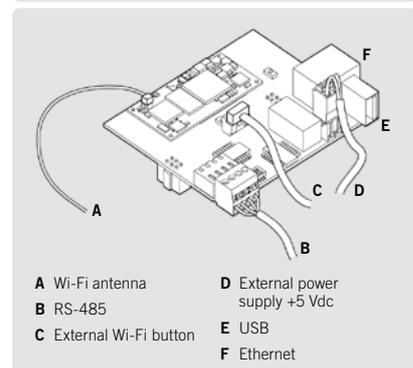
Many different types of systems can be controlled by an INGECON® SUN EMS Board:

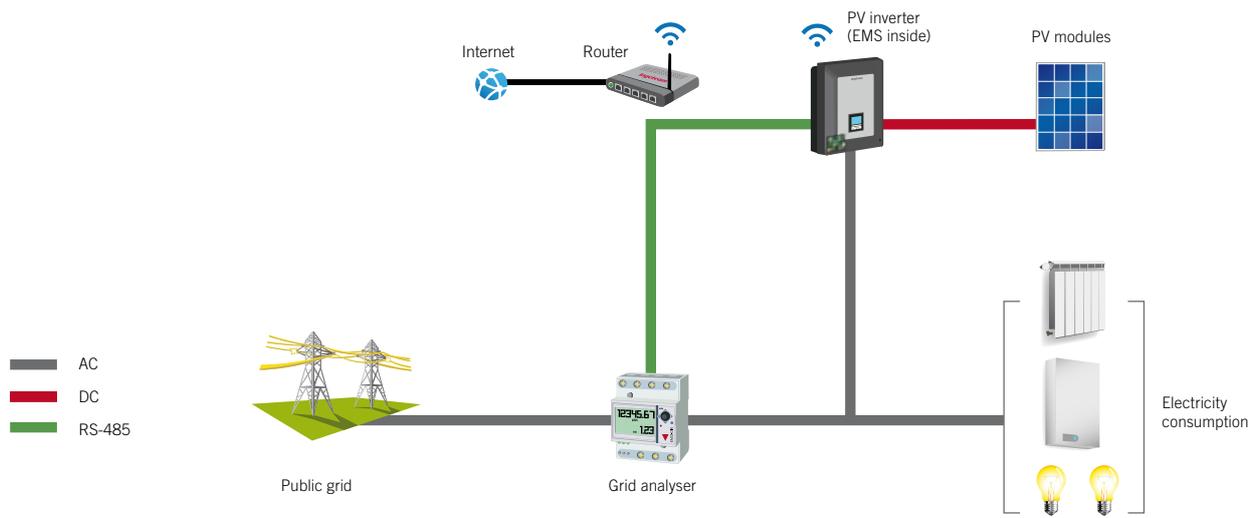
- Self-consumption with PV generation.
- Self-consumption with storage.
- PV-diesel hybrid systems.
- Public grid-PV-diesel hybrid systems.
- Monitoring.

### Standard 3 year warranty

	EMS Board
<b>Power supply</b>	
Input voltage	100 - 240 Vac
Nominal frequency	50 / 60 Hz
Power consumption	5 - 8 W
Optional external AC power supply	+5 V (min. 2 W)
<b>Connectivity</b>	
Wi-Fi	✓
Ethernet	1
RS-485	1
USB for firmware updates	✓
Advanced EMS strategies	✓
Compatible with IS Manager	✓
Compatible with IS EMS Tools	✓
<b>Communication interface with other equipment</b>	
Ingeteam inverters	RS-485, Ethernet, Wi-Fi
Monitoring systems	Ethernet, Wi-Fi, 3G <sup>(*)</sup>
Wattmeter	RS-485

<sup>(\*)</sup> An external 3G modem can be connected using the Ethernet or Wi-Fi connection on the IS EMS Board device.





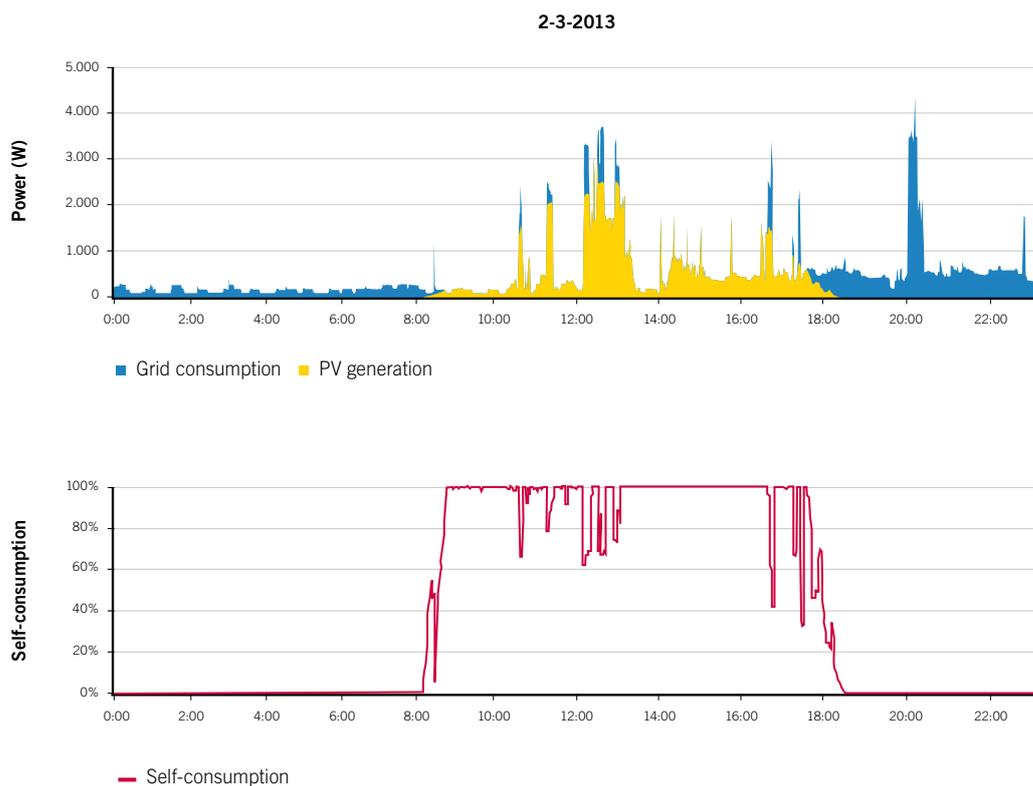
These two graphs represent the energy consumption profile of a real 3.3 kW solar self-consumption installation managed by an INGECON® SUN EMS Board with zero-export configuration.

### Smart energy manager

For those places where it is not permitted to inject the energy surplus to the grid, the EMS Board can be configured to do so. It will adjust the solar generation to match the installation's energy demand.

### The maximum energy control

The system constantly measures the two-way power flow exchanged between the public grid and the internal network. The EMS Board will always pursue to minimise the consumption from the grid, allowing for an electricity bill reduction and a faster return on investment.



## Three-phase systems with a three-phase inverter

In this kind of systems, the EMS Board sends the same command to the three phases, taking as a reference the phase with the lowest amperage in order to guarantee that no power is injected to the grid.

### Communication

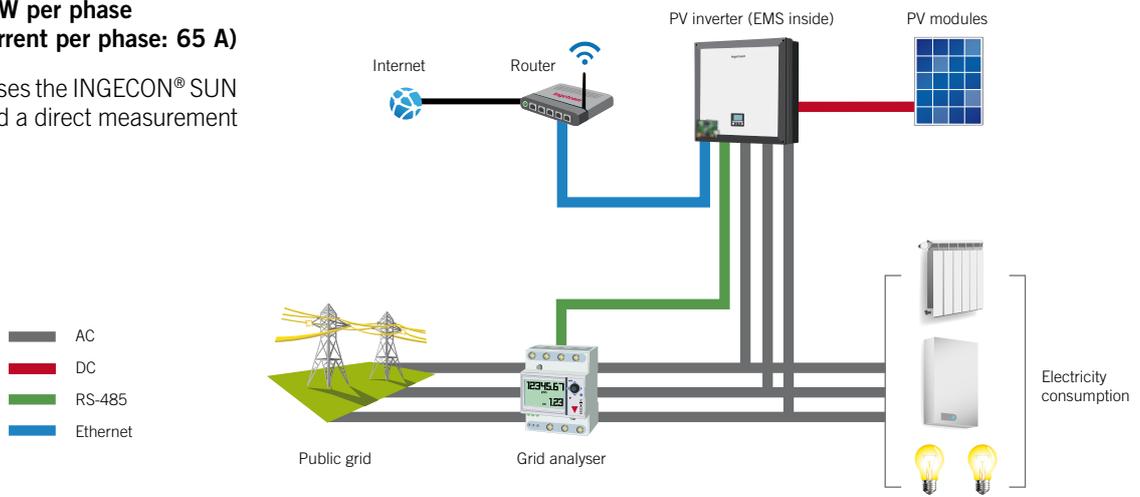
The inter-inverter communication could be wireless (Wi-Fi) or with wires (Ethernet or RS-485), and so could be the communication with the 3G router that has an Internet access for a remote monitoring.

### Two configurations

Ingeteam proposes two self-consumption kits depending on the total power of the installation (not the inverter's output power).

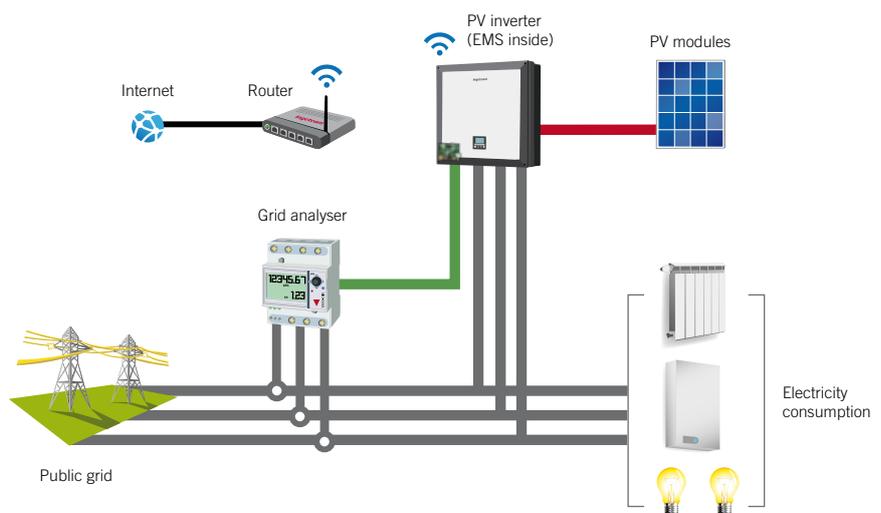
### Three-phase self-consumption kit up to 15 kW per phase (maximum current per phase: 65 A)

This kit comprises the INGECON® SUN EMS Board and a direct measurement wattmeter.



### Three-phase self-consumption kit with more than 15 kW per phase (maximum current greater than 65 A per phase)

This kit comprises the INGECON® SUN EMS Board and an indirect measurement wattmeter. In this particular case, current transformers(\*) also need to be installed.



(\*) Ingeteam does not supply the current transformers

## Three-phase systems with three or more single-phase inverters

In this kind of systems, the EMS Board can send independent commands to each phase. This could be very important for imbalanced systems.

### Communication

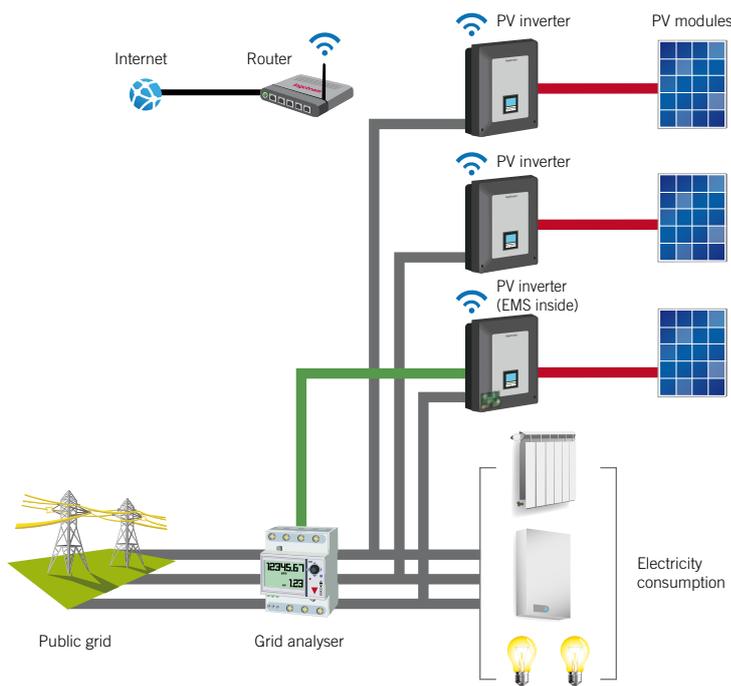
The inter-inverter communication could be wireless (Wi-Fi) or with wires (Ethernet or RS-485), and so could be the communication with the 3G router that has an Internet access for a remote monitoring.

### Two configurations

Ingeteam proposes two self-consumption kits depending on the total power of the installation (not the inverter's output power).

### Self-consumption kit up to 15 kW per phase (maximum current per phase: 65 A)

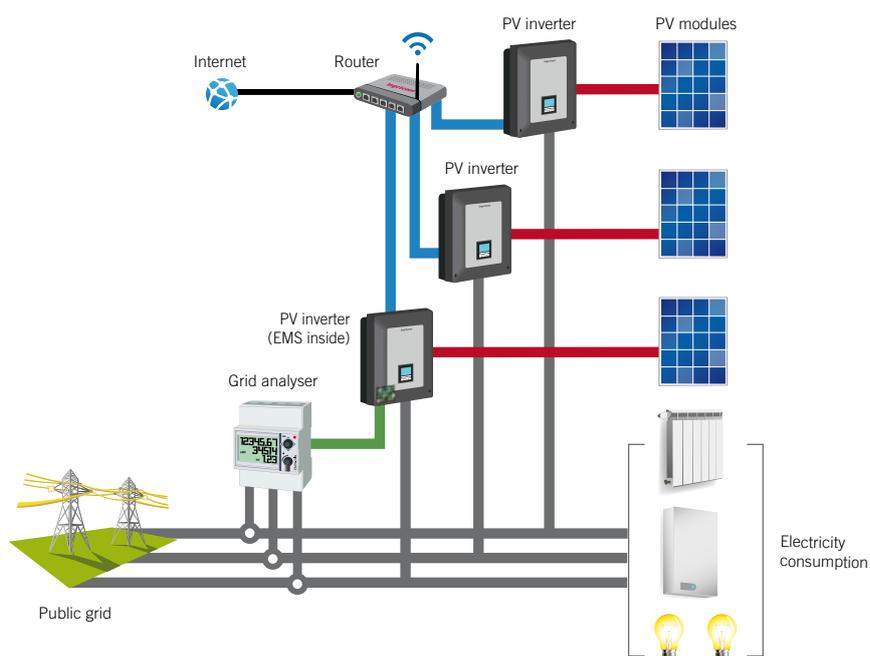
This kit comprises the INGECON® SUN EMS Board and a direct measurement wattmeter.



### Self-consumption kit with more than 15 kW per phase (maximum current greater than 65 A per phase)

This kit comprises the INGECON® SUN EMS Board and an indirect measurement wattmeter. In this particular case, current transformers(\*) also need to be installed.

The PV inverters connected to the same phase communicate with each other via RS-485.



(\*) Ingeteam does not supply the current transformers

# INGECON SUN Monitor



## Web portal and smartphone application for self-consumption systems and PV plant monitoring

The INGECON® SUN Monitor application allows for accessing all the data of any PV plant or self-consumption system from a computer, tablet or smartphone with Internet connection ([www.ingeconsunmonitor.com](http://www.ingeconsunmonitor.com)). Its ease of access facilitates owner, installer or promoter plant control.

### Maximum control of the system's status

This software provides information on the PV plant status and real-time production, either in list and graphic format or through an e-mailed production report. This software has been designed to facilitate owner, installer or promoter plant control, providing information on the PV plant status in the form of lists and graphs, whilst there is also the possibility of receiving an emailed production and alarms report. Data are recorded and stored throughout the useful life of the inverter.

### Also available as a Smartphone app

Thanks to the Smartphone application, any solar PV plant owner or any user having a self-consumption installation -with or without batteries-, can access all the real-time data for generation, consumption and energy storage if applicable on a daily, weekly, monthly or yearly basis. Moreover, the application also provides with information about the accumulated money savings on the electricity bill.



Ingeteam Smart Industry



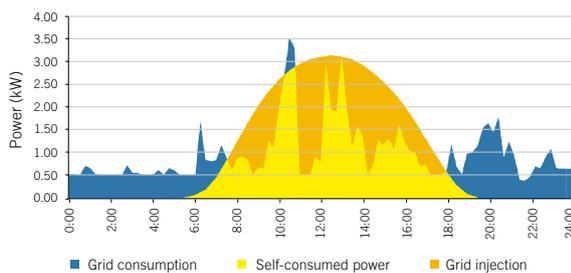
## Direct Self-consumption

Self-consumption systems are much more attractive when energy generation and consumption happen at the same time, as the energy produced can be immediately consumed, without storing it. For this reason, work places are usually considered as some of the best locations for these kind of installations, although households can also match very well depending on each consumption profile.

### Direct self-consumption (without batteries)

*Ingeteam Smart Industry* is a direct self-consumption solution, which means that the energy self-consumed has not been stored. This is valid for those places where the injection of energy surplus to the grid is not permitted and also for those countries that have approved net-metering schemes.

For the first case, Ingeteam has developed an operating mode for its string inverters that enables the inverter to limit its own power production by matching it to the instantaneous power demanded by the loads. Thus, there is no energy surplus and there is no risk of injecting power to the grid.



## REFERENCES



**1. Industrial PV system.**  
**Madrid (Spain)**  
100 kW (12 INGECON® SUN 5TL,  
6 INGECON® SUN 4,6TL,  
2 INGECON® SUN EMS Manager)

**2. Industrial PV system.**  
**Navarre (Spain)**  
50 kW (2 INGECON® SUN 3Play,  
1 INGECON® SUN EMS Board)

**3. Residential PV+storage installation.**  
**Navarre (Spain)**  
3.3 kW PV + 10 kWh batteries  
(1 INGECON® SUN 3.3TL, 1 INGECON® SUN STORAGE 3TL,  
1 INGECON® SUN EMS Manager)



3



5



4



6

4. 40 residential PV systems.  
 Martinique Island (France)  
 200 kW (40 INGECON® SUN 1Play,  
 40 INGECON® SUN EMS Board)

5. Industrial self-consumption installation  
 Villena (Spain)  
 2,000 kW (20 INGECON® SUN 3Play)

6. Residential PV system.  
 Guipuzcoa (Spain)  
 3,3 kW (1 INGECON® SUN 1Play,  
 1 INGECON® SUN EMS Board)



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