INGECON SUN STORAGE 1PLAY

Technical guide for installations with

INGECON SUN STORAGE 1Play

ABH2010IMC04_H

Table of contents

1 INGECON SUN STORAGE 1Play 3
2 Accessories 4
2.1 INGECON SUN EMS Board 4
2.2 Wi-Fi communications kit 5
2.3 ETHERNET communications kit 5
2.4 Summary of specifications 5
3 Types of installation 6
3.1 Stand-alone installations 6
3.2 UPS (back-up) installations 8
3.3 Self-consumption installations 11
3.3.1 Self-consumption installations managed by INGECON SUN EMS Board 11
3.3.2 Self-consumption installations managed by INGECON SUN STORAGE 1Play 14
4 Attachment I. References 16

1 INGECON SUN STORAGE 1Play

The INGECON SUN STORAGE 1Play (hereinafter, ISS 1Play) is a dual DC input (photovoltaic and battery) single-phase inverter capable of working in stand-alone or grid-connected mode. This equipment can be used in the following type of installations:

- Stand-alone installations
- UPS (back-up) installations
- Self-consumption installations

This document shows the recommended diagrams for these installations, as well as explanations related to each one.

The ISS 1Play inverter doesn´t allow for active poles (positive or negative) to be grounded in panels or batteries.

The ISS 1Play is only compatible with TT and TN single phase installations.

Figure 1: INGECON SUN STORAGE 1Play TL

Installations with ISS 1Play can be monitored using the free INGECON SUN EMS Tools software and its Smartphone app (available for iOS and Android).

Figure 2: INGECON SUN EMS Tools

2 Accessories

2.1 INGECON SUN EMS Board

The INGECON SUN EMS Board is a control and communications device that could be connected to the ISS 1Play (EMS – Energy Management System).

Figure 3: INGECON SUN EMS Board

This manages the energy flows of the installation based on the reading of a wattmeter located at the connection point, which sends operating orders to the different inverters.

The configuration of the device through the INGECON SUN EMS Tools software allows for the control strategy to be selected and for the different installation elements to be configured.

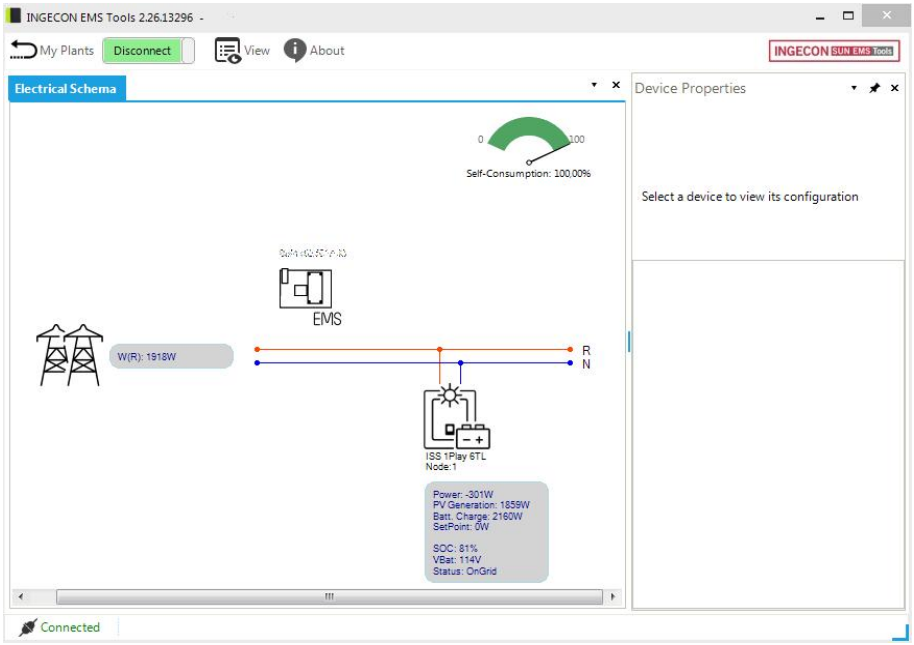


Figure 4: Installation management via INGECON SUN EMS Tools

The INGECON SUN EMS Board is connected to the installation equipment via its Ethernet or Wi-Fi interface (both standard) and can be monitored using the INGECON SUN EMS Tools software. In addition, it includes an RS-485 port for communications with the external wattmeter.

See commercial reference in Attachment I. References.

2.2 Wi-Fi communications kit

The Wi-Fi communications board is a device that could be connected to the ISS 1Play or in additional INGECON SUN photovoltaic inverters connected to the installation to provide a wireless network interface.

Figure 5: Wi-Fi Board

See commercial reference in Attachment I. References.

2.3 ETHERNET communications kit

The Ethernet TCP communications board is a device that could be connected to the ISS 1Play or in additional INGECON SUN photovoltaic inverters connected to the installation to provide an Ethernet network interface.

Figure 6: Ethernet-TCP Board

It includes an RS-485 interface that allows for additional inverters to be added to a given network board.

See commercial reference in Attachment I. References.

2.4 Summary of specifications

Product	Energy management	Monitoring with EMS Tools or communications between inverters		RS-485 for wattmeter	RS-485 for communications between inverters
		Wi-Fi	Ethernet		
INGECON SUN EMS BOARD	●	●	●	●	
Wi-Fi COMMUNICATIONS BAORD		●			
ETHERNET COMMUNICATIONS BOARD			●		●

3 Types of installation

3.1 Stand-alone installations

A stand-alone installation is a system disconnected from the public grid that provides AC. energy to a set of loads.

Installation components:

- Photovoltaic panels.
- Battery bank.
- ISS 1Play inverter.
- Support diesel genset (optional) that is connected in the case of an energy deficit.
- Manual bypass switch (optional). In the event of an ISS 1Play fault or maintenance, this allows for the loads to be powered from the diesel genset. It is formed by 2 independent interlocking manual switches that connect alternately.
- INGECON SUN photovoltaic inverter (optional). To increase the photovoltaic power of the installation.

To monitor this installation, an additional kit for Ethernet or Wi-Fi communications is required.

Although the INGECON SUN STORAGE 1Play provides an extra current during load connection transients such as motors, INGETEAM recommends the use of frequency drives with this type of load to avoid transient voltage drops (2-3 seconds) during their connection.

Technical notes:

- The power of the loads must under no circumstances be above the rated power of the ISS 1Play.
- The battery capacity must be at least C10 ≥ 5x P_{PV}/U_{batt} to ensure stable operation of the system.
- The power of additional INGECON SUN photovoltaic inverters must under no circumstances be above the double of the rated power of the ISS 1Play.

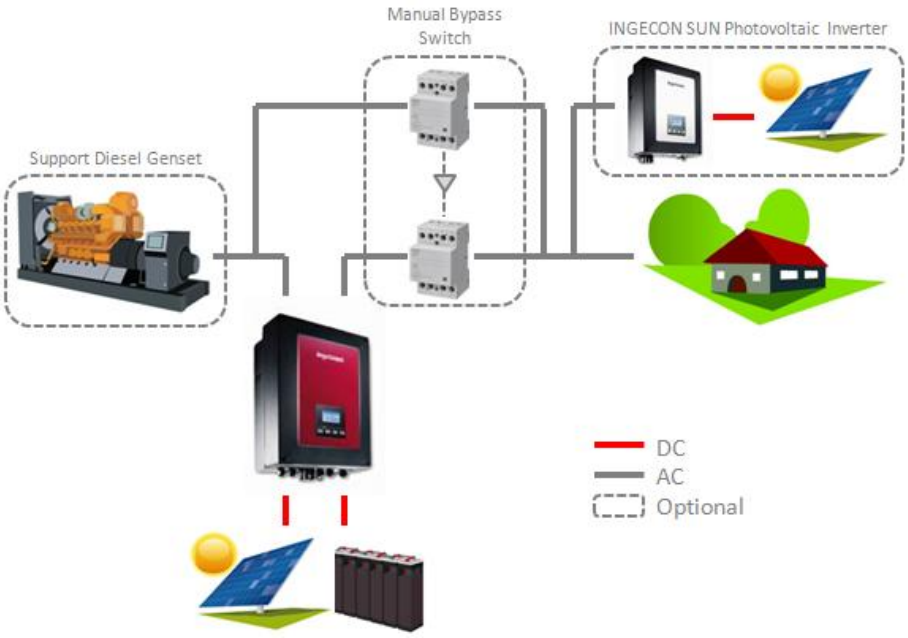
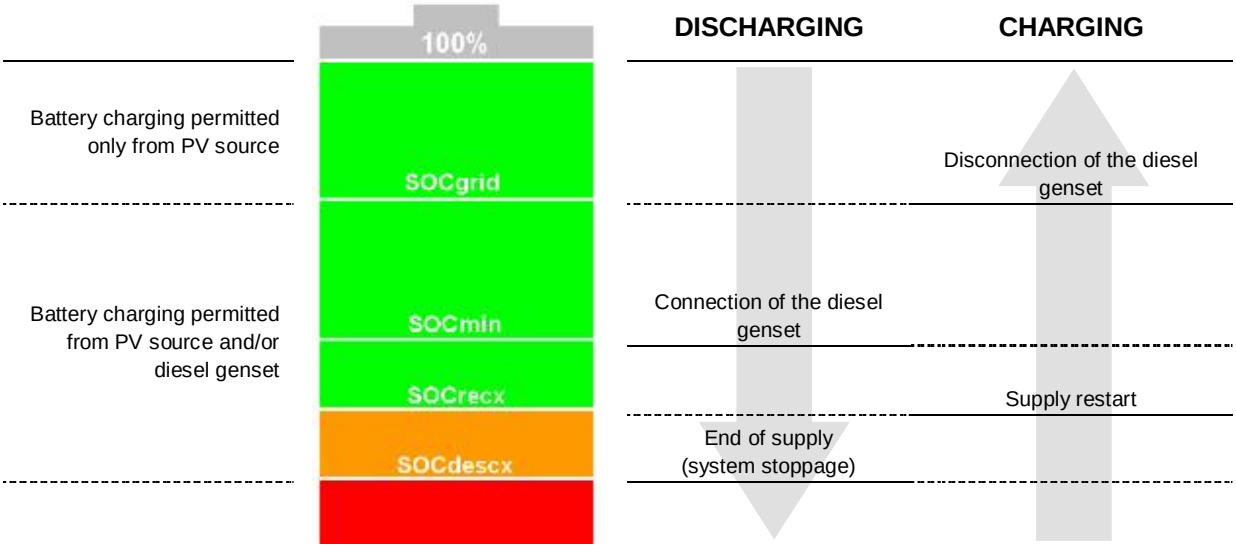


Figure 7: Stand-alone single-phase installation

Operating mode

The ISS 1Play manages the energy flows in the installation in line with the following principles:

- Photovoltaic energy is used as a priority to supply loads and to charge the battery.
- If the photovoltaic energy is insufficient to power loads, the battery provides the remainder.
- If the state of charge (SOC) of the battery reaches a minimum value established by the user (SOCmin), the diesel genset will be connected. If it is not operational, the ISS 1Play powers loads until the battery is completely flat (SOCdescx).



Links

The instructions for configuration and commissioning, detailed wiring diagram and further information about the operation mode can be downloaded at the following link:

http://www.ingeconsuntraining.info/?page_id=10534

3.2 UPS (back-up) installations

A UPS (Uninterruptible Power Supply) installation is a system connected to the public grid that is used as back up in the event of a power cut. In this case, the installation acts in a similar manner to an uninterrupted power supply system.

This type of installation is typical in grids that present frequent interruptions or in the case of critical loads for which the power supply cannot be interrupted.

In the case of a power cut, the ISS 1Play inverter internally disconnects the installation from the grid and provides the necessary power for the loads from the batteries. To do so, the batteries remain charged while grid electricity is available and the photovoltaic energy is used to supply the loads, reducing energy consumption from the grid. Grid supply of photovoltaic surplus is user configurable.

The response time of the system to a power cut is 12ms, which means that a power cut is imperceptible for most loads.

Installation components:

- Photovoltaic panels (optional).
- Battery bank.
- ISS 1Play inverter.
- Contactor for connection of neutral to ground for TT installations. In the event of a power cut, the ISS 1Play disconnects from the grid and activates this contactor to reference the neutral of the installation to ground. In case of TN installations, this contactor is not necessary.
- Manual bypass switch (optional). In the event of an ISS 1Play fault or maintenance, this allows for the loads to be powered from the grid. It is formed by 2 independent interlocking manual switches that connect alternately.
- Non-critical loads. These are loads that, in the event of a power cut, do not need an uninterrupted power supply. These loads are connected upstream from the ISS 1Play. Hence, in the event of a power cut, they are disconnected to increase the number of hours of autonomy. Even with photovoltaic surplus and charged batteries, these loads will not be powered by the ISS 1Play. In installations where the power of the loads is lower than that of the ISS 1Play, the non-critical load installation is optional. In installations where the power of the loads is higher than that of the ISS 1Play, non-critical loads must be disconnected until the remaining loads are below the power of the ISS 1Play.

To monitor this installation, an additional kit for Ethernet or Wi-Fi communications is required.

Although the INGECON SUN STORAGE 1Play provides an extra current during load connection transients such as motors, INGETEAM recommends the use of frequency drives with this type of load for the installation to work properly in UPS mode.

Technical notes:

- The battery capacity must be at least C10 ≥ 5x P_{PV}/U_{batt} to ensure stable operation of the system.

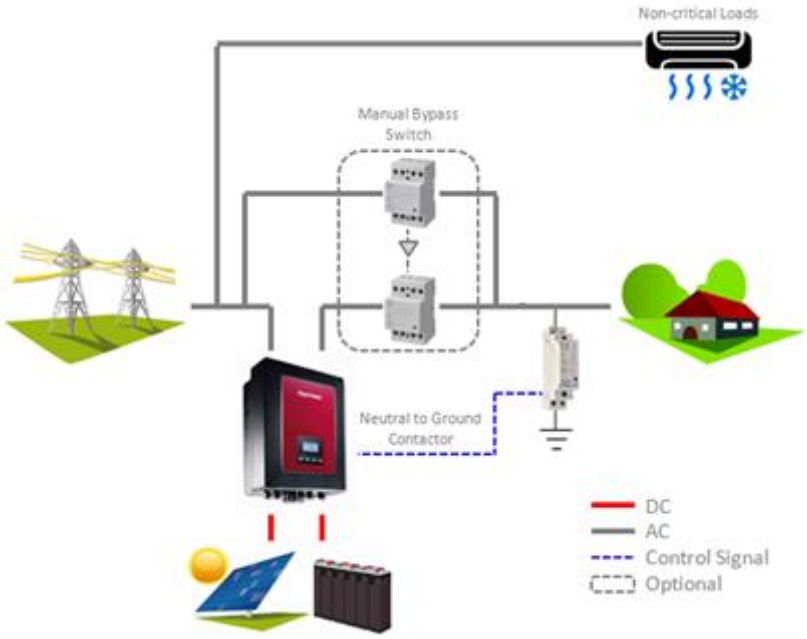
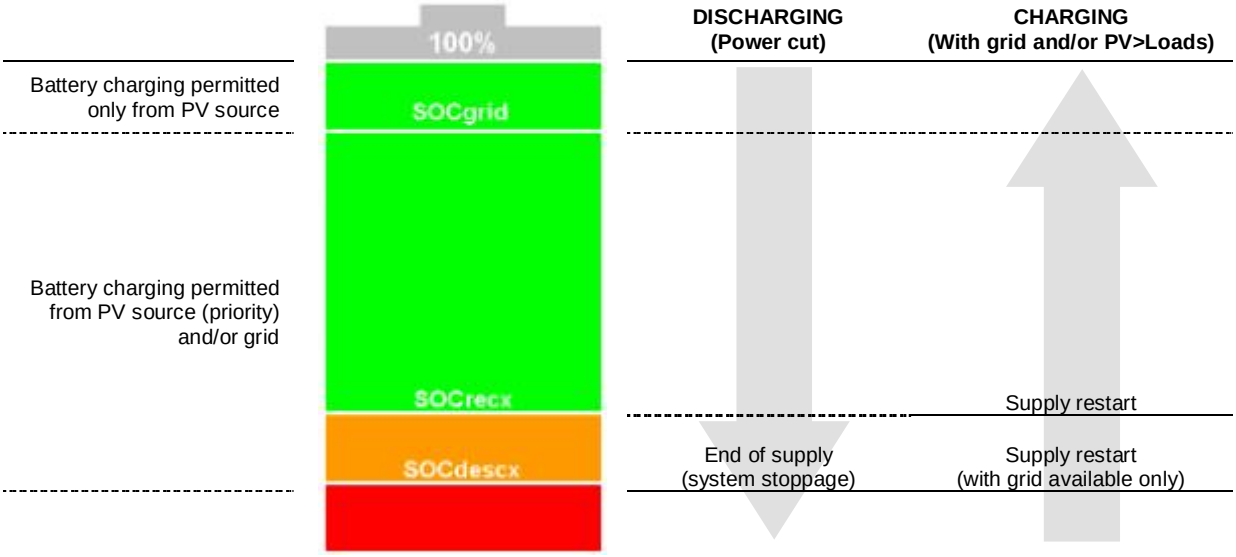


Figure 8: Single-phase UPS (back-up) installation.

Operating mode

The ISS 1Play manages the energy flows in the installation in line with the following principles:

- When the grid is operational, the priority is to keep the batteries fully charged so that they can be used as back-up when required. Loads and the battery, if it must be charged, are supplied with photovoltaic energy as a priority.
    - When photovoltaic energy is used to supply the loads or charge the batteries, there is a reduction in grid consumption.
    - In the event of surplus photovoltaic energy, the user can decide whether to supply the grid or limit photovoltaic production through the configuration.
- If the grid is out of service, the ISS 1Play disconnects the installation from the grid and provides energy to the loads from the batteries until they get discharged.



Case study

Location: Namibia
Installer: PROINSO/Ellies
Average daily consumption: 40 kWh
Inverters used: 1 x ISS 1Play 6TL
PV power installed: 6120 W
Battery bank: 144 Vdc, 230 Ah Pb-Gel
Autonomy: 10 hours

Links

The instructions for configuration and commissioning, detailed wiring diagram and further information about the operation mode can be downloaded at the following link:

http://www.ingeconsuntraining.info/?page_id=10545

3.3 Self-consumption installations

3.3.1 Self-consumption installations managed by INGECON SUN EMS Board

A self-consumption installation is a system connected to the grid that seeks to minimize grid consumption and to increase self-supply. To do so, it is fitted with photovoltaic generation and storage components.

An additional Back-up function can be activated in this type of installation. With this function, in the event of a power cut, only the ISS 1Play inverter disconnects the grid and feeds energy required for critical loads from the batteries, operating in a similar manner to a UPS. The IS 1Play photovoltaic inverter is disconnected to the grid and it doesn't supply energy. The non-critical loads are not fed.

Installation components:

- Photovoltaic panels.
- Battery bank.
- ISS 1Play inverter.
- External wattmeter and INGECON SUN EMS Board. The INGECON SUN EMS Board is installed inside the ISS 1Play unit and is used to manage energy and monitor the installation.
- INGECON SUN photovoltaic inverter (optional). To increase the photovoltaic power of the installation. To control the grid supply and monitor its production, additional inverters must be connected to the EMS Board.
- Contactor for connection of neutral to ground for TT installations. In the event of a power cut, the ISS 1Play disconnects from the grid and activates this contactor to reference the neutral of the critical loads to ground. In case of TN installations, this contactor is not necessary.

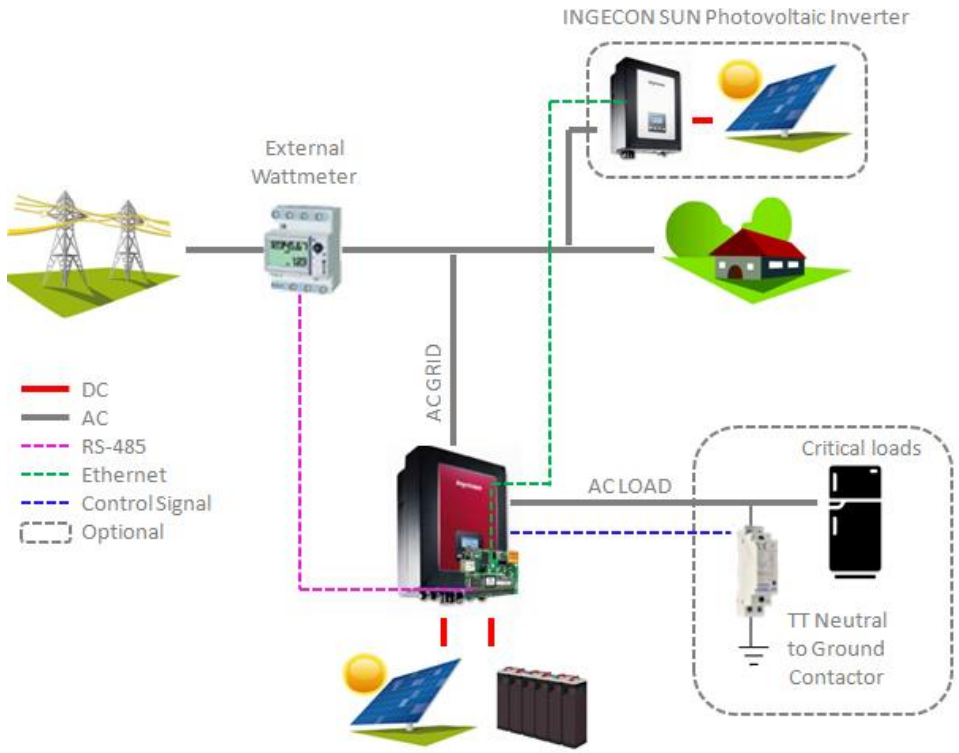
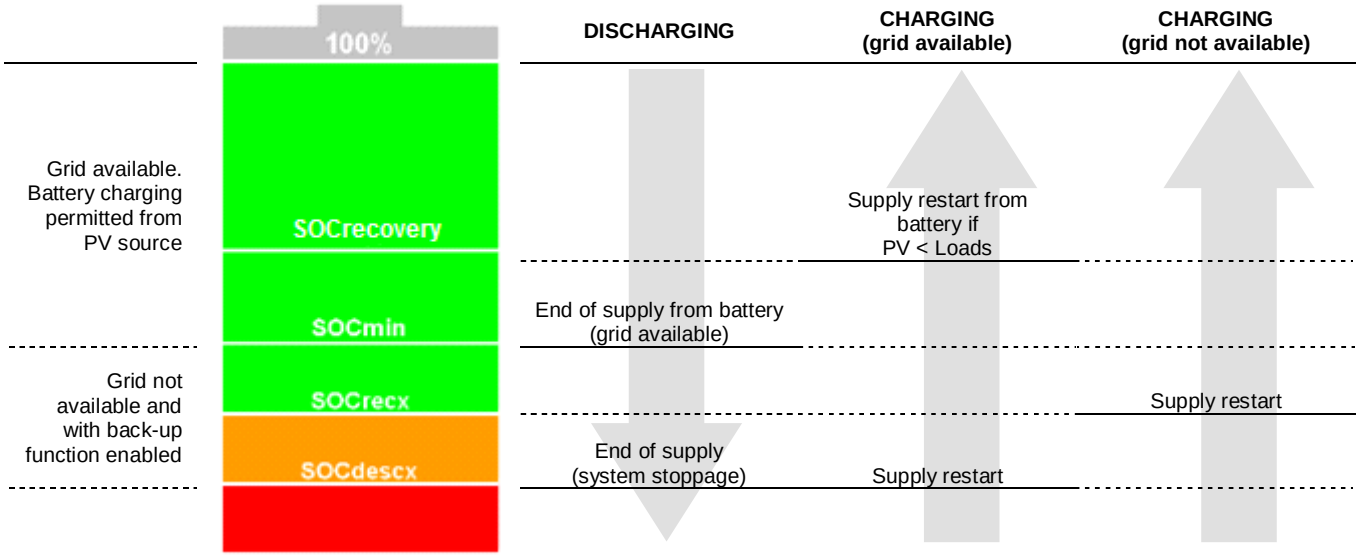


Figure 9: Single-phase self-consumption installation

Operating mode

The INGECON SUN EMS Board manages the energy flows in the installation in line with the following principles:

- If the grid is available, it operates in the same manner as a self-consumption installation:
  - Photovoltaic energy is used as a priority to supply loads and to charge the battery. Grid supply of photovoltaic surplus is user configurable.
  - If the photovoltaic energy is insufficient to power loads, the battery provides the remainder.
  - If the sum of photovoltaic and battery energy is not enough to power the loads, the grid provides the remaining power.
  - Once the SOCmin value set by the user has been reached, the energy supply from the battery is not restarted until SOCrecovery is reached. This prevents excessive battery cycling, extending their working life.
- If the grid is not operational and the Back-up function is activated, only the ISS 1Play powers the critical loads until the battery is completely flat (SOCdescx). At this point, the critical loads are no longer powered until the grid is available once again of until SOCrecx is reached using photovoltaic energy of the ISS 1Play. The IS 1Play photovoltaic inverter is disconnected to the grid and it doesn't supply energy.



Case study

Location: Zizur, Spain. Detached home
Installer: ISF instalaciones
Average daily consumption: 10kWh
Inverters used: 1 x ISS 1Play 3TL
PV power installed: 3.3kWp
Battery bank: LG RESU LV 6.5kWh

Links

The instructions for configuration and commissioning, detailed wiring diagram and further information about the operation mode can be downloaded at the following link:

http://www.ingeconsuntraining.info/?page_id=10550

3.3.2 Self-consumption installations managed by INGECON SUN STORAGE 1Play

A self-consumption installation is a system connected to the grid that seeks to minimize grid consumption and to increase self-supply. To do so, it is fitted with photovoltaic generation and storage components.

An additional Back-up function can be activated in this type of installation. With this function, the ISS 1Play inverter disconnects the installation from the grid in the event of a power cut and the energy required for loads is provided from the batteries, operating in a similar manner to a UPS.

In this type of installation cannot installed IS 1Play photovoltaic inverters.

Installation components:

- Photovoltaic panels.
- Battery bank.
- ISS 1Play inverter.
- Manual bypass switch (optional). In the event of an ISS 1Play fault or maintenance, this allows for the loads to be powered from the grid. It is formed by 2 independent interlocking manual switches that connect alternately.
- Contactor for connection of neutral to ground for TT installations (optional). In case of activate the Back-up function, in the event of a power cut, the ISS 1Play disconnects from the grid and activates this contactor to reference the neutral of the installation to ground. In case of TN installations, this contactor is not necessary.

To monitor this installation, an additional kit for Ethernet or Wi-Fi communications is required.

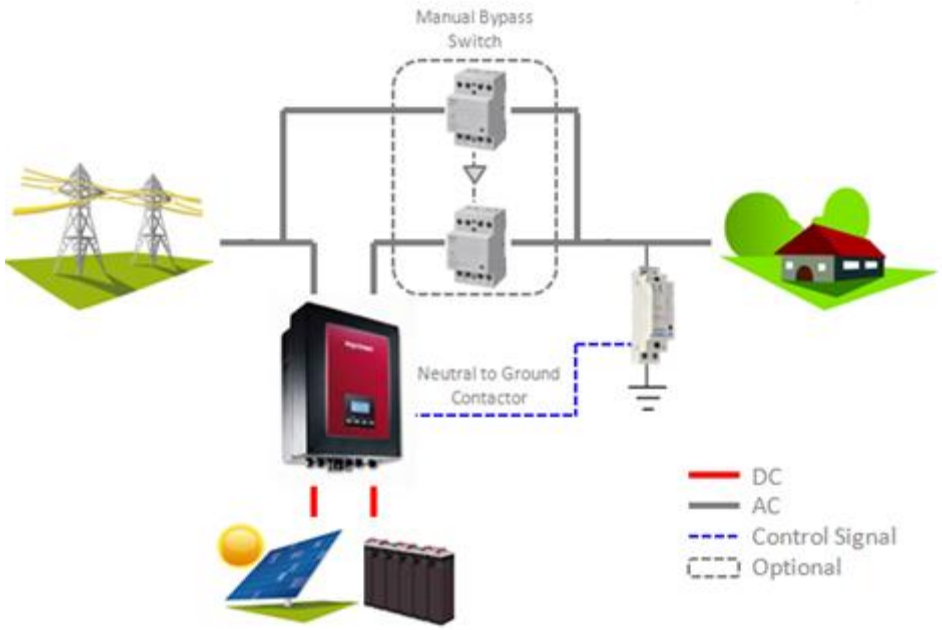
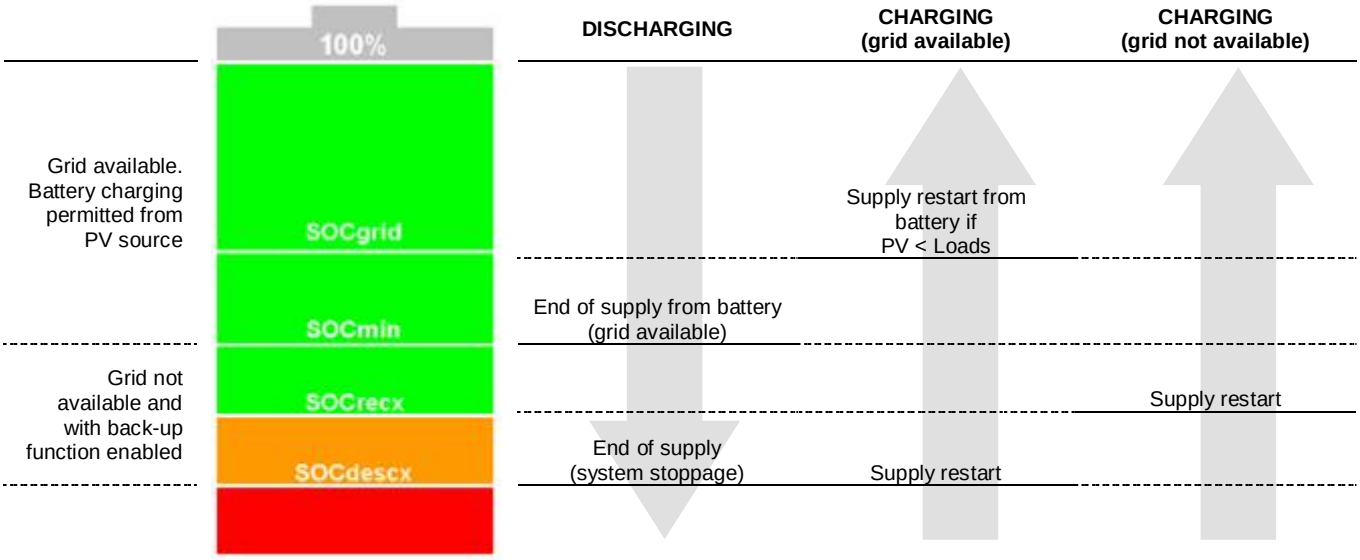


Figure 10: Single-phase self-consumption installation

Operating mode

The ISS 1Play manages the energy flows in the installation in line with the following principles:

- If the grid is available, it operates in the same manner as a self-consumption installation:
  - Photovoltaic energy is used as a priority to supply loads and to charge the battery. Grid supply of photovoltaic surplus is user configurable.
  - If the photovoltaic energy is insufficient to power loads, the battery provides the remainder.
  - If the sum of photovoltaic and battery energy is not enough to power the loads, the grid provides the remaining power.
  - Once the SOCmin value set by the user has been reached, the energy supply from the battery is not restarted until SOCgrid is reached. This prevents excessive battery cycling, extending their working life.
- If the grid is not operational, the ISS 1Play powers the loads until the battery is completely flat (SOCdescx). At this point, the loads are no longer powered until the grid is available once again of until SOCrecx is reached using photovoltaic energy.



Links

The instructions for configuration and commissioning, detailed wiring diagram and further information about the operation mode can be downloaded at the following link:

http://www.ingeconsuntraining.info/?page_id=13044

4 Attachment I. References

Commercial codes for the products indicated:

- EMS Board + Direct metering wattmeter (up to 65 A per phase) self-consumption KIT AAX5015
- Wi-Fi card KIT AAX7070
- Ethernet TCP card KIT for INGECON SUN 1PLAY & 3PLAY AAX7054
- Ethernet TCP card KIT for INGECON SUN STORAGE 1PLAY AAX7058