INGECON SUN STORAGE 1PLAY

Frequently Asked Questions FAQ Guide

ABH2010IMC01_C

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1 Introduction and purpose

The present document is intended to be a guide to solve the most frequently asked questions that will appear to both, user and installer, during INGECON SUN STORAGE 1Play (hereinafter, ISS 1Play)start up, operation and maintenance actions.

As the device continues its development and continuous improvement, new questions will be added in order to keep it updated.

The most common doubts and problems have been summarized here and classified depending on its origin.

2 Definitions

2.1 ISS 1Play Internal Schema and Connections

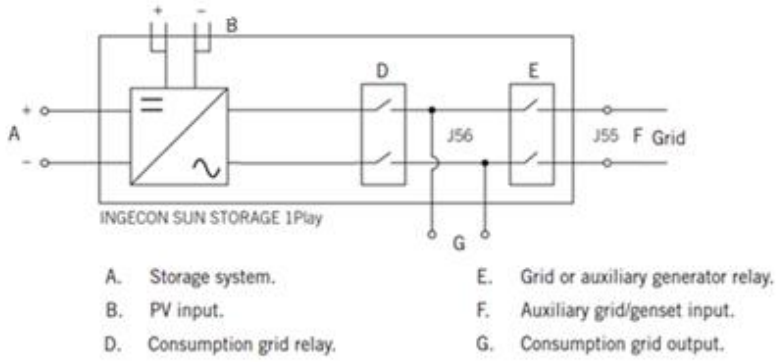


Figure 1: ISS 1Play Schema

A. Storage system: Connection point between the DC/DC converter and the batteries. The storage system is compound of a battery bank; the batteries in the bank can be of Lead-Acid or Li-ion.

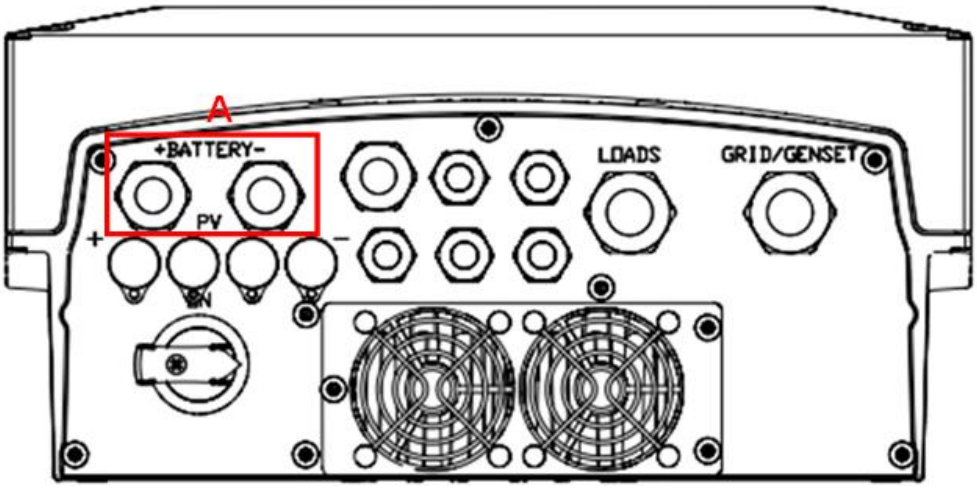


Figure 2: Storage system / battery input

B. PV input: Coupling point between the PV modules and the DC-bus.

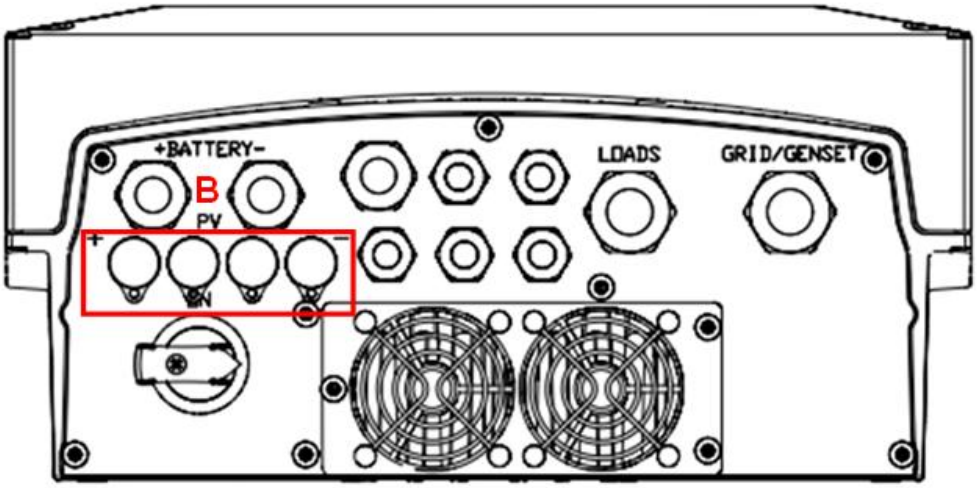


Figure 3: PV input

D. Consumption grid relay: Relays used to isolate the inverter from the grid or the loads. When closed, these relays connect the inverter to the loads.
E. Grid or auxiliary generator relay: Relays used to disconnect the grid from the ISS 1Play and the loads. When closed, these relays create a bypass joining grid and loads.
F. Auxiliary grid/genset input: Connection point between the ISS 1Play and the grid.
It is very important to know the configuration of the installation where the ISS 1Play will be connected to, including the electric power system type. More information about them is included in 2.2.

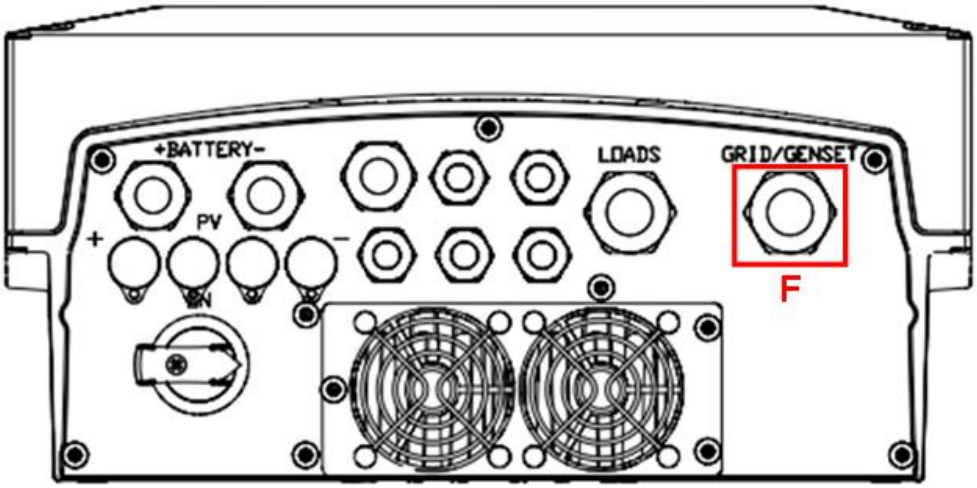


Figure 4: Grid / Genset input

G. Consumption grid output: Coupling point between the ISS 1Play and the loads.
As in the previous point, it is very important to know the type of the installation that will join the loads to the ISS 1Play. Further information is shown in 2.2.

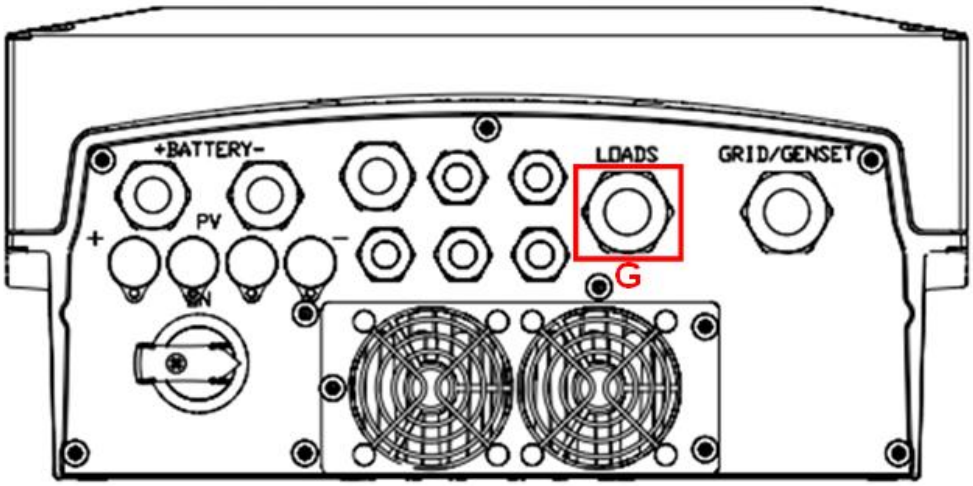


Figure 5: Loads input

2.2 Electric Power Systems (AC)

2.2.1 Number of Phases

Single phase electric power system: power system used for distribution of energy where there are a line and a neutral (in some systems earth acts as the neutral). The line carries the current which varies its amplitude in a 50/60 Hz frequency, feeds the load and finally returns to the source by the neutral. The available values for the ISS 1Play are between 200 and 250 Volts, they should fit to the grid depending on each country's standard too.

A simple single phase system is included in the figure below:

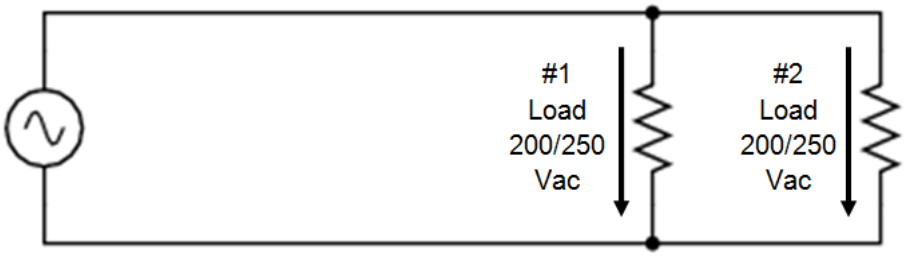


Figure 6: Single phase system

Three phase electric power system: Despite the fact that in the past there were sold some ISS 1PLAY to create a three phase power system, currently this solution has been discontinued.

2.2.2 Earthing or Grounding System

Earthing or grounding specific parts of an installation is common practice done in the low voltage distribution networks for safety and functional purposes. The safety ones are basically to protect a person against electric shocks.

There are several ways to do it, but International standard IEC 60364 distinguishes three families of earthing arrangements, using the two-letter codes **TN**, **TT**, and **IT**.

The first letter indicates the connection between earth and the power-supply equipment (generator or transformer):

"T" — Direct connection of a point with earth (Latin: terra)

"I" — No point is connected with earth (isolation), except perhaps through a high impedance.

The second letter indicates the connection between earth or network and the electrical device being supplied:

"T" — Earth connection is by a local direct connection to earth (Latin: terra), usually via a ground rod.

"N" — Earth connection is supplied by the electricity supply Network, either as a separate protective earth (PE) conductor or combined with the neutral conductor.

The network system used in your installation must be identified because the ISS 1Play can only work towards some network types.

TT Network

In a TT system, there is a connection to the earth in the grid distributor´s transformer, usually the star point of a three-phase system. However, it is provided a connection to the local earth electrode. As the fault loop impedance is usually high, those systems should always have a Residual Current Detector.

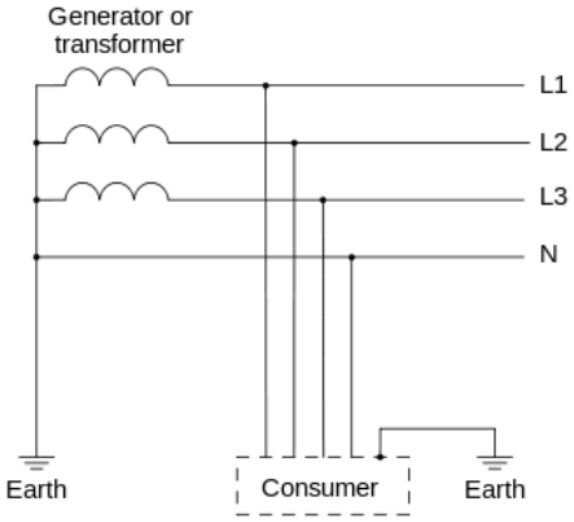
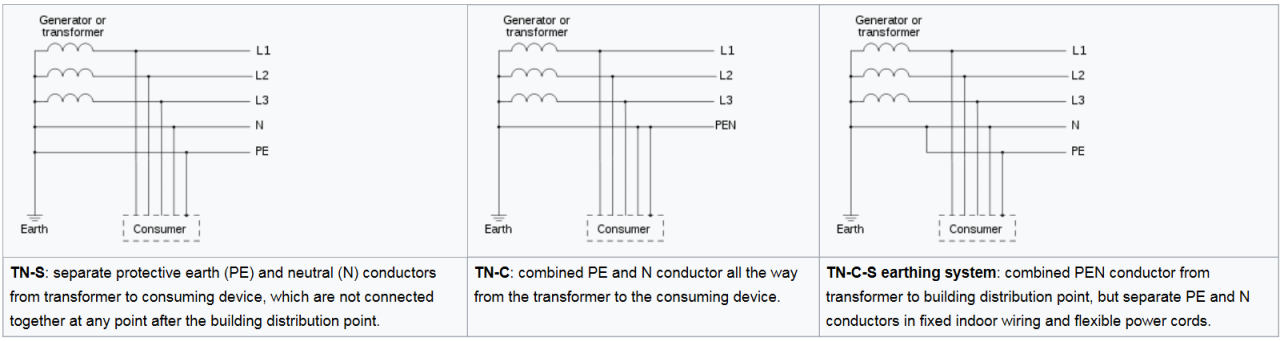


Figure 7: TT system

TN Network

In a TN system, as in TT systems, there is a connection in the grid generator´s transformer to Earth. However, the bodies of the electrical devices are connected to a so called Protective Earth wire. This wire is related to the Neutral wire, but depending on the connection point, three variants are distinguished:



TN-S: separate protective earth (PE) and neutral (N) conductors from transformer to consuming device, which are not connected together at any point after the building distribution point.	**TN-C**: combined PE and N conductor all the way from the transformer to the consuming device.	**TN-C-S earthing system**: combined PEN conductor from transformer to building distribution point, but separate PE and N conductors in fixed indoor wiring and flexible power cords.

TN-C Network

A combined conductor fulfills the functions of both PE and Neutral wires. This combined wire is called PEN.

TN-S Network

PE and N are separate wires from the distribution point.

TN-C-S Network

PE and N come combined from the distribution point, but they are separated (usually at the building distribution point) before getting to the consumer.

IT Network

In an IT network, there is no connection to earth at the distribution point, or there is a connection with very high impedance. So, it is isolated.

The bodies of the electrical devices are connected to the Local Earth Electrode.

3 Ingecon Sun Storage 1Play Installation

3.1 ISS 1Play/Inverter

3.1.1 Is it possible to connect several ISS 1Play units in parallel?

It is not possible; neither in stand-alone nor grid-tied mode, installing more than one ISS 1Play connected sharing the battery bank.

3.1.2 Is it possible to connect both, grid and a genset, to the grid/genset input? Could the ISS 1Play manage this connection in a grid fault?

No, it is not possible to connect both, a genset and grid, to the grid/genset input. ISS 1Play has only an input to connect grid or genset (F input / J55 connector).

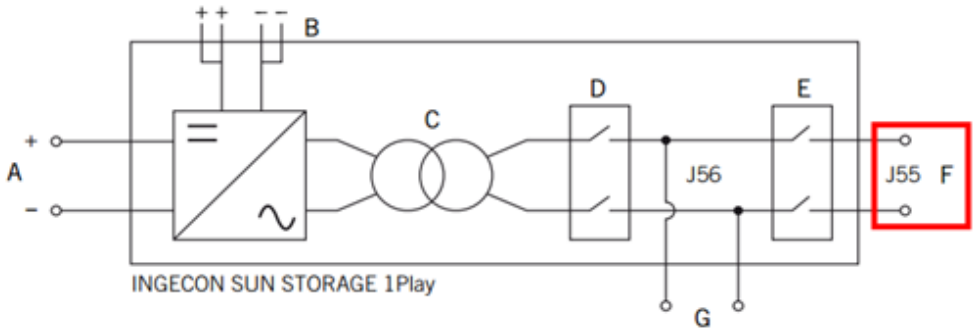


Figure 8: Grid or genset input (J55) in the ISS 1Play schema

In cases of events such as grid fault, the management of the connections must be carried out externally. Take into account that the type of grid must be changed in the inverter configuration as well.

3.1.3 In a stand-alone system, could the ISS 1Play work with other Ingeteam PV inverters?

Yes, it could be possible in a 2 to 1 power ratio, meaning that the sum of added PV inverters will not exceed the double of the ISS 1Play stated power.

Battery should be sized according to the autonomy time requirement, but we recommend a minimum size of: C10 (Ah) ≥ 5x P_{PV} /V_{BATT}. Where P_{PV} (W) is the photovoltaic power installed and V_{BATT} (V) is the nominal voltage of the battery bank.

For further information it is highly recommended to read the “ISS 1Play Installations Technical Guide”.

3.1.4 In a grid connection system, could the ISS 1Play work with other Ingeteam inverters?

Yes, it could be possible without power limitations.

For further information it is highly recommended to read the “ISS 1Play Installations Technical Guide”.

3.1.5 In a dual pitched roof installation, is it worthy to install two ISS 1Play to obtain the maximum efficiency?

Having a split solar installation in a dual-pitched orientation obviously leads to some little energy loses because of that particular situation.

Figure 9: Dual-pitched installation

Connecting the whole PV installation to the ISS 1Play will decrease the efficiency of the whole system, but anyway this solution will be more inexpensive rather than installing two ISS 1Play or an ISS 1Play and an additional Sun 1Play. The additional cost of a second inverter will not be taken by the power gain benefits.

3.1.6 In stand-alone operation mode, how is it possible to have grid alarms? (Alarms: 0x0002; 0x0004; 0x0006)

Stand-alone operation mode is intended to work completely away from grid, so grid alarms like 0x0002 (grid frequency out of range), 0x0004 (grid voltage out of range) or 0x0006 (grid frequency and voltage out of range) would have no meaning.

This is completely true while working with batteries on a higher SOC than SOCmin. When SOC reaches the value of SOCmin, the ISS 1Play will automatically start looking for a genset to take energy from it, during this process, if no genset is found, a grid related alarm will appear.

In case that there were no genset and a lower SOC than SOCmin, this alarm is completely normal and the device will not stop working while SOC>SOCdescx. It is important to know that not every alarm will stop the ISS 1Play.

3.2 Battery

3.2.1 As the minimum operation voltage is 40Vdc, is it possible to connect a 40Vdc battery?

It is highly not recommended due to the fact that during their discharge cycle batteries decrease their voltage, in case that the voltage was under 40Vdc the device will stop working. In conclusion, the battery bank shall be into proper voltage ranges (extended operating voltage, see “Installation and Operation Manual”).

The choice of the battery bank is one of the most important tasks to achieve a correct performance from the ISS 1Play. Ingeteam’s device has been designed to work with a minimum battery voltage of 40 volts, which means that if the battery during its discharging cycle goes under that voltage, the device will stop working.

It is completely necessary to set the battery bank properly to avoid the possibility of an under-40 volts situation. In Lead-Acid batteries for example the minimum nominal voltage needed will be 48Vdc. This value takes in consideration that the battery during its discharge cycle could reach the limit depending on the depth of the discharge.

3.2.2 If we have a battery voltage higher than the specified in the storage system voltage range, can we connect it to the ISS 1Play?

There are 2 different battery voltage ranges depending on whether the PV Input is being used or not. In any case the battery voltage range could exceed those ranges.

3.2.3 I have an AGM battery, how should I configure it?

AGM batteries are fully compatible with lead-acid configuration as they are a type of them. Unlike common lead-acid batteries that have their electrolyte flowing free inside the battery, the electrolyte in these AGM (Absorbent Glass Mat) batteries is held in fine glass mats, where its name comes from.

AGM batteries usually do not include an equalization value in their datasheet due to the fact that they are sealed, not allowing that phase. Only absorption and floating voltage values are considered.

Note: It is very important to verify, as done with all Lead-Acid batteries, that all the configuration values have been included correctly.

3.2.4 SOC parameter has suddenly jumped to 100%, is it possible?

SOC parameter is used to show the battery remaining charge. SOC value is estimated for Lead-Acid batteries using many factors, the most important are the discharge current capacity for 20 and 5 hours (C20h and C5h). The algorithm used to calculate the SOC value may produce jumps in the value due to its own computation process, so it could be perfectly normal seeing those big steps for example in EMS Tools graphs as shown in the next figure:

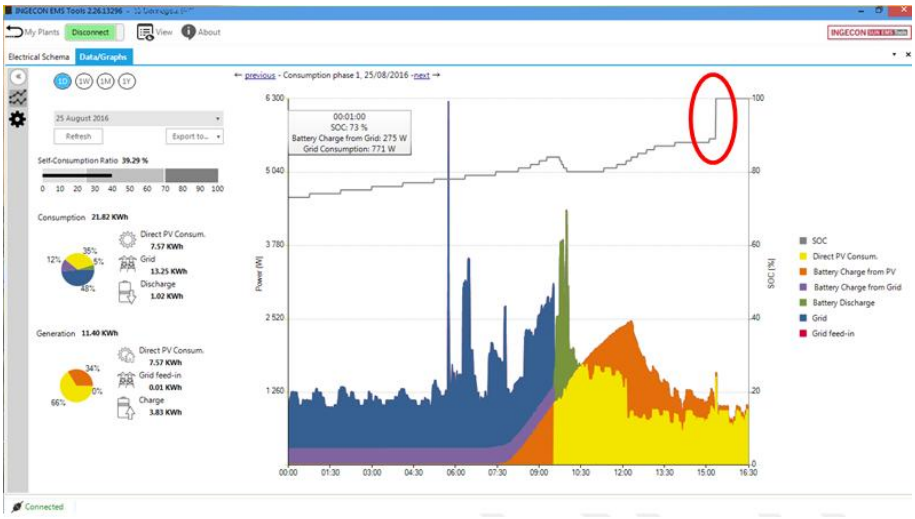


Figure 10: SOC step

During the SOC calculation process, the SOC parameter is set to certain specific values at two points:

1. 85%, when the charging current in the step 2 (absorption) decreases until the 1/3 of the configured charging current.
2. 100%, when the charging current in the step 2 (absorption) decreases to 1/8 of the configured charging current, in that instant the battery enters the floating phase, the charge process is finished and the SOC value is set to 100%.

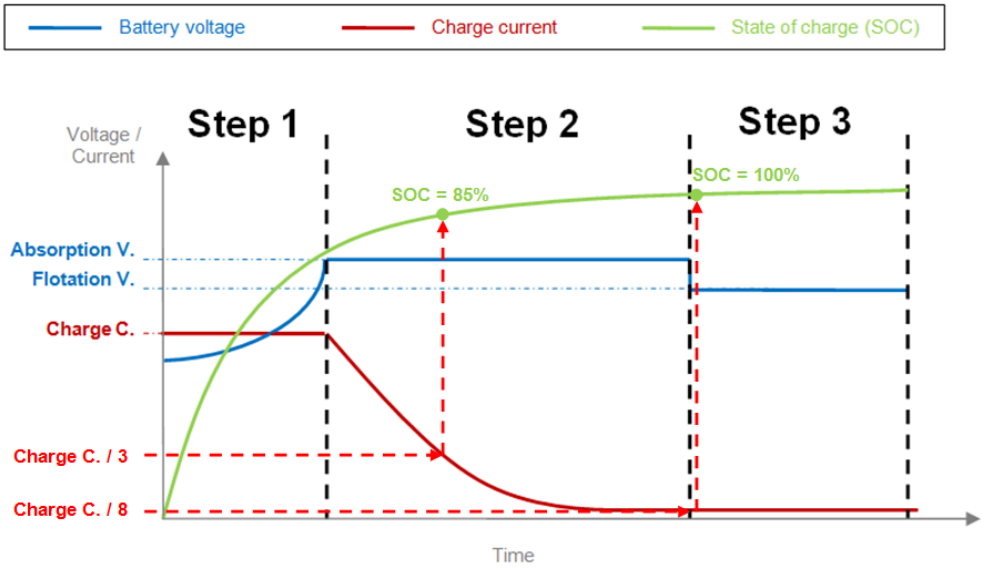


Figure 11: SOC during battery charge

3.2.5 While taking energy from the batteries, which are the main power limitations in the ISS 1Play?

To feed the loads it is important to take in consideration the current that the battery bank can provide, if it is limited to only deliver 30Amps and it has a voltage of 100Vdc, the total Power will be limited to 3kW from the bank.

Additionally, bear in mind that the Hardware of the ISS 1Play is limited on the DC side to take a maximum current of 50 A from batteries and on the AC side is limited to the Output (AC) Rated Power.

3.2.6 Can inverter measure mid-point voltage of battery bank?

The inverter doesn’t measure in a middle of the chain. The inverter measures the total voltage of the battery bank. So, the charge process of the lead-acid batteries (absorption, flotation and equalization) is controlled with the total voltage of the chain.

3.2.7 I have a Lithium battery, how should I configure it?

Lithium-ion batteries suitable for operation with the INGECON SUN STORAGE 1Play have their own advanced battery management, usually programmed by the manufacturer and built into the batteries (BMS). Ingeteam cannot influence in any way the operating mode of this advanced external battery management.

To configure and use the lithium battery, first it must be fully compatible with the INGECON SUN STORAGE 1Pay. For more information on compatible lithium batteries, refer to the "List of lithium batteries approved for INGECON SUN STORAGE 1Play" available on the Ingeteam website.

If the battery model is not listed consult Ingeteam.

3.3 PV modules

3.3.1 If the available energy of PV modules is greater than the load's need, where is extra energy going?

Even if the ISS 1Play is configured to not injecting to grid, it will not be any excess of energy because the inverter inside the ISS 1Play will automatically regulate itself changing the MPPT configuration and just taking the needed energy from PV modules.

It is important to know that this situation will only occur when batteries are fully charged, if they are not, extra energy will charge them in any strategy.

This is done by moving the operating point from the MPP point, which is the maximum available energy from modules, as it is shown in the next diagram:

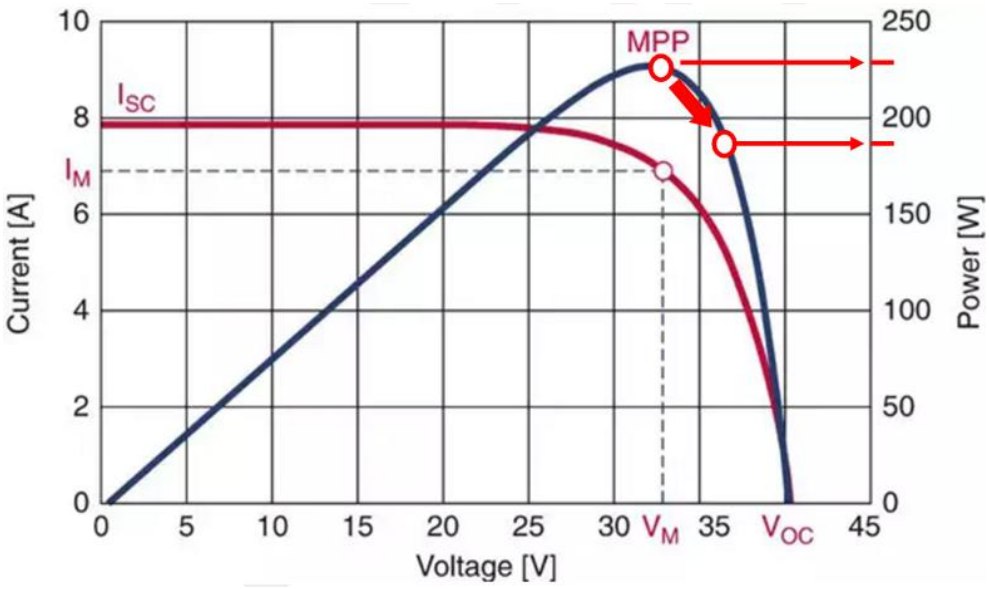


Figure 12: MPP regulation

3.3.2 The ISS 1Play 6TL has a PV array max power of 10 kWp and an output power of 6 kW. What happens to the 4 kW that exceeds? Is it used to power the batteries?

Yes, extra energy from PV modules is used to charge the battery bank. When the battery bank has reached the 100% charge level, the inverter will regulate its working mode as shown in 3.3.1.

3.3.3 Does the ISS 1Play have any surge arrestors to protect from PV over-voltages?

Yes, it does for protecting the ISS 1Play and due to the fact that most of the standards demand them as compulsory.

3.3.4 In a grid connection system, how is the extra PV inverter controlled?

First of all it shall be checked that the PV inverter is an Ingeteam device, as shown in 3.1.3 only Ingeteam inverters can be used to work in a common strategy and communication with the ISS 1Play.

In that case we will need an INGECON SUN EMS Board + wattmeter.

We will be able to control the full installation with the INGECON SUN EMS Board (installed into the Storage 1Play) and the wattmeter connected to the grid. The schema of the whole system will be as the one shown below:

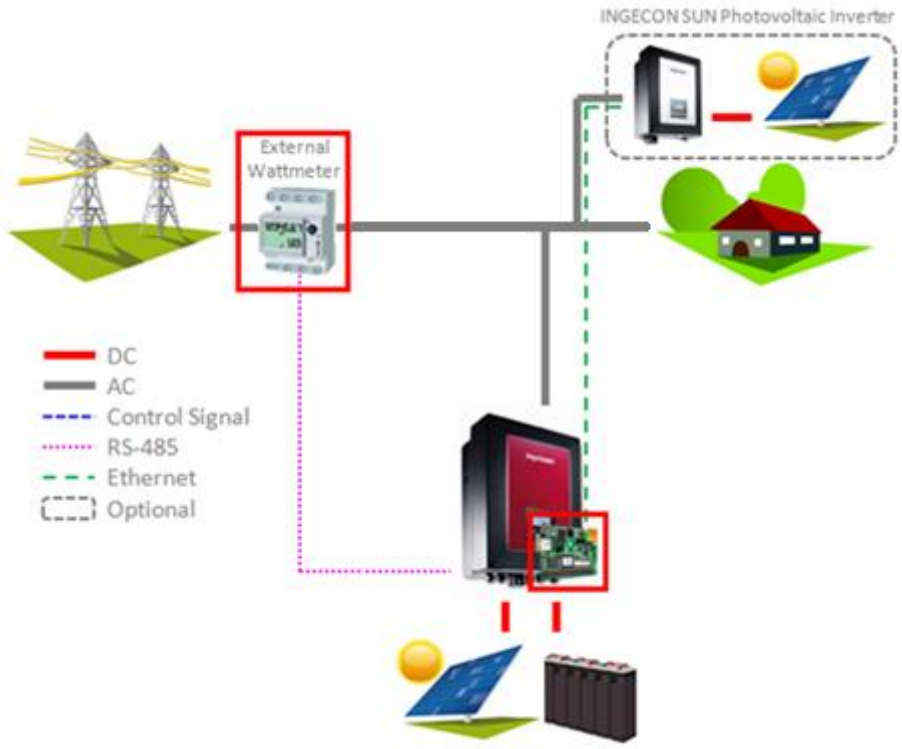


Figure 13: Grid connection system

The extra PV inverter will be considered as additional PV in the system and will supply only the needed power demanded from the loads (Battery or consumption). This information will be sent to the PV inverter from the EMS Board.

For further information it is highly recommended to read the “ISS 1Play Installations Technical Guide”.

3.3.5 In a stand-alone system, how is the extra PV inverter controlled?

In a stand-alone system the extra PV power that will come from other Ingeteam’s inverters, as shown in 3.1.3, will be automatically controlled by the ISS 1Play itself.

The ISS 1Play controls its generated voltage using an algorithm which is based on the grid´s frequency monitoring.

For further information it is highly recommended to read the “ISS 1Play Installations Technical Guide”.

3.4 AC Grid / Generator

3.4.1 Which types of grid are allowed?

It is important to remark that ISS 1Play is only able to be connected to a single phase installations, and the only Earthing or Grounding system is **TT** or **TN**.

For identifying the systems, see the definition section “2.2 - Electric Power Systems (AC)”.

For more information, see the “Installation and Operation Manual” of the Ingecon Sun Storage 1Play.

3.4.2 Does the ISS 1Play have any surge arrestors to protect from AC over-voltages?

The ISS1 Play does not have surge arrestors but it includes varistors in the AC side. Varistors are used as the surge arrestors to prevent the device from transient over-voltages.

3.4.3 In Stand Alone systems, how does the ISS 1Play starts up automatically a Genset?

The ON/OFF GENERATOR of the digital output configuration options is used to start up the genset in the following situations:

- Battery charge level (SOC): This allows the generator to be switched on once the SOC reaches the “SOC MIN” parameter and furthermore, if the batteries are lead-acid batteries, when the battery reaches the “V MINIMUM” parameter. The generator is switched off once the SOC reaches the “SOC GRID” parameter. This option is always activated by default and cannot be deactivated.
- Time Schedule: The Genset can be configured to be switched on daily at a specific hour (hh:mm) and to be switched off at another hour (hh:mm). The time schedule can´t be done for applying it in different days of the week, it must be done daily.
- Manually: 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.
- Overload: The Genset can be configured to be switched on/off according to the power consumed by the loads in a set time. For that, the loads should be connected in AC LOADS port of the inverter. If the power consumed by the loads is more than the inverter power capacity and the genset is not switched on at time, the inverter will stop.

Important: When any of the situations above wants to switch the genset on, it will be done. However, all of them must command to switch off the genset to do so.

For more information, see the “Installation and Operation Manual” of the Ingecon Sun Storage 1Play.

3.5 Loads

3.5.1 Having grid and loads of 10kW, is it possible to feed them with an ISS 1Play? How the installation should be?

Yes, it is possible because the both the AC Grid Port and the AC Loads Port are limited to 11.5 kW. However, the ISS 1Play will be able to provide the Output (AC) Rated Power from the Battery or/and PV Input. The remaining power would be provided by the utility grid or genset.

So, in this case is compulsory having the system connected to an utility grid or genset as long as ISS 1Play family´s biggest Rated Power is 6kW.

For further information it is highly recommended to read the “ISS 1Play Installations Technical Guide”.

3.6 Communications

3.6.1 Is Bluetooth available in ISS 1Play?

No, it is not. Bluetooth has been discontinued.

3.6.2 When having an alarm in the ISS 1Play, is it possible to receive notifications?

It is possible installing the INGECON SUN EMS Board.

3.6.3 Is it possible to control or monitor the INGECON SUN EMS Board with the Ingecon Sun Manager?

No it is not. The INGECON SUN EMS Board must be controlled and monitored with the INGECON SUN EMS Tools software.

3.6.4 I have a router connected to an inverter which has an Ethernet Card (AAX0004 or AAX0054), can I remotely access to the inverter through that router?

No, it is necessary to have a Ethernet-TCP board. To access remotely to the inverter it is needed to accomplish with the manual requirements and to configure the device properly (IP address, netmask, gateway…).

3.7 Display, data monitoring and datalogger

3.7.1 How long can the ISS 1Play store data using the Datalogger?

The whole amount of data stored in the ISS 1Play depends on the “Monitoring Time of Datalogger (Min)” value, setting it to 15 minutes will lead to a 4 week period of saved data. Once reached the data limit, the oldest data will be overwritten with new data in a cyclical way, keeping always at least the last three weeks of stored data.

3.7.2 Measured PV voltage is over 0Vdc at night or even without PV modules' connection, how is it possible?

This happens because PV input is directly connected to the DC-bus. When there is not enough voltage from PV modules to generate the desired AC voltage, the voltage value shown on the display will be the DC-bus voltage and it is the only PV voltage sensor.

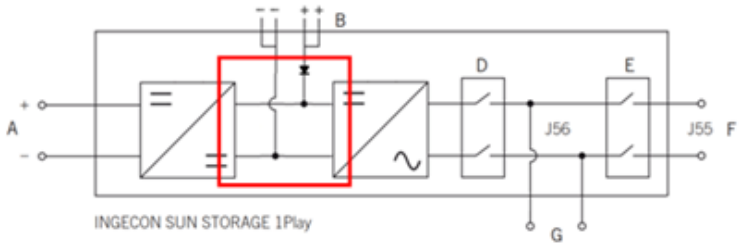


Figure 14: DC-bus

DC-bus joins battery DC/DC converter and PV modules input with the rectified AC voltage (equal to Vgrid*√2) so the voltage shown will be the highest among them.

3.7.3 Is it possible to set the SOC strategy parameters using the display?

Yes, it is only necessary to follow the instructions below:

Main menu > Configuration > Enter Password > 0 3 3 2 and press the OK button.

After this process a star will appear after configuration (CONFIGURATION✷) to confirm that the password has been detected and now the configuration is free to be changed.

MAIN MENU > CONFIGURATION > OPERATION MODE > select the desired operating mode > SOC parameters.

After following this route all SOC parameters will be available. SOC parameters are included in the "Installation and Operation Manual".

It is possible to configure SOC strategy parameters using INGECON SUN Manager too.

Important note: wrong configured SOC parameters may cause problems, alarms or even damages to the device or the battery bank. They shall only be modified by qualified personal.

3.7.4 Is there a procedure to check the status of digital inputs or outputs (I/O)?

The status (on/off) of inputs and outputs is available in the display in the MAIN MENU > MONITORING > MONITORING I/O.

They can be checked using the INGECON SUN Manager as well, in the "Online Data" tab.

4 Operation mode

4.1 General

4.1.1 Which parameter is used to inject extra PV power to the grid?

The parameter to configure is GRID POWER. To let the ISS 1Play inject the extra PV energy to the grid, “GRID POWER” should be set to a value greater than 0 in the operation mode. This value will determine the maximum power that will flow to the grid from the PV modules.

MAIN MENU > CONFIGURATION > OPERATION MODE > POWER INJECTED GRID = desired value > 0 for injection to grid.

Important: For installations under the RD900/2015 “Self Consumption in Spain” this parameter must be set to 0 W, because the grid injection is not allowed.

4.2 Stand-alone

4.2.1 In stand-alone mode, is it possible to set ISS 1 Play parameters to charge batteries only with PV energy? Energy from genset will not be used.

Yes, it is possible. It is only needed to access the configuration menu and set the “Charging Power” parameter equal to 0 W.

MAIN MENU > CONFIGURATION > OPERATION MODE > STAND-ALONE > CHARGING POWER = 0.

This way, all the battery charging will be done from the PV Input.

4.3 Backup

4.3.1 In backup mode, is it possible to inject extra power (from PV modules extra energy) to grid?

Yes, it is possible. It is only needed to access the configuration menu and set the “Grid Power” parameter bigger than 0 W.

MAIN MENU > CONFIGURATION > OPERATION MODE > POWER INJECTED GRID = desired value > 0 for injection to grid.

4.4 Grid support

4.4.1 In Grid support mode, what parameters are necessary configure?

Grid support mode is used for self-consumption installation managed by INGECON SUN EMS Board + wattmeter. For further information it is highly recommended to read the “ISS 1Play Installations Technical Guide”.

The parameters that are necessary configure are:

- SOCmax: Maximum SOC to charge the batteries from PV energy. It is recommended to set this value to 100%.
- SOCgrid: This parameter is not used in “Grid Support” mode. Anyway, it is recommended to set this value to 100%.
- SOCmin: to limit the discharge of the battery. It is recommended a 60% for lead-acid batteries. For lithium batteries, consult the manufacturer.
- SOCdescx: This parameter is not used in “Grid Support” mode. Anyway, it is recommended to set this value to the same value set in SOCmin.
- SOCrecx: This parameter is not used in “Grid Support” mode. Anyway, it is recommended to set this value to the same value set in SOCmin.

- Charging Power: This parameter is not used in “Grid Support” mode. Anyway, it is recommended to set this value to 0 W.

5 Configuration

5.1 Battery

5.1.1 In a Lead-Acid battery configuration, how shall be calculated the V NOMINAL value?

V NOMINAL value refers to the whole battery bank nominal voltage. Most batteries datasheets contain information about the voltage of each battery but the whole battery bank voltage is needed.

The following example has been done using 12Vdc batteries and 8 batteries in series.

V NOMINAL = Nominal Voltage x NS = 12 x 8 = 96 V

Where:

- Nominal Voltage (V): nominal voltage per battery value taken from the datasheet.
- NS (batteries): number of batteries in the bank connected in series.

Important note: A wrong configuration of this parameter may cause damage to the battery bank and the ISS 1Play. Ingeteam will not accept any responsibility of any wrong configuration.

5.1.2 In a Lead-Acid battery configuration, how shall be calculated the CAPACITY (C20H) and CAPACITY (C5H) values?

CAPACITY value refers to the amount of current available from the battery for a certain period. C20H includes the current values that can be taken from the battery for 20 hours while C5H indicates the current to take for 5 hours. Both parameters are critically important to the SOC accuracy.

The following example has been done using 10 batteries in parallel.

CAPACITY (C20H) = Nominal Capacity (20 hours discharge) x NP = 7.2 x 10 = 72 Ah

CAPACITY (C5H) = Nominal Capacity (5 hours discharge) x NP = 5,9 x 10 = 59Ah

Where:

- Nominal Capacity (Ah): nominal capacity for a 20 hour discharge period, it is given per battery and taken from the datasheet.
- NP (batteries): number of batteries in the bank connected in parallel.

Important note: A wrong configuration of this parameter may cause damage to the battery bank and to the ISS 1Play. Ingeteam will not accept any responsibility of any wrong configuration.

5.1.3 In a Lead-Acid battery configuration, how shall be calculated I CHARGE and I DISCHARGE values?

I CHARGE makes reference to the maximum current that can be put into the battery while it is in its charging process.

The following example has been done using 8 batteries in series and each one has 35 A of charging current. The batteries are not set in parallel, so the whole battery bank´s current is the same of one single battery.

I CHARGE whole battery bank = 35 A

I DISCHARGE makes reference to the maximum current that can be taken from the battery while it is in its discharging process. The same example is valid for discharging current.

Important note: if the charge/discharge current is not specified in the datasheet, the value shall be asked to the manufacturer in order to get a suitable current. A wrong configuration of this parameter may cause damage to the battery bank and to the ISS 1Play. Ingeteam will not accept any responsibility of any wrong configuration.

5.2 Inverter

5.2.1 How should be configured the nominal voltage and frequency values?

AC Voltage and Frequency parameters have different purpose for on-grid or off-grid situations:

- In grid-connection systems: Those values must be the nominal values of the utility grid.
- In stand-alone systems: These values will be used to fed the AC Loads Port.

5.3 Grid/Genset

5.3.1 When is the Manual connection function used?

It is used to manually connect the inverter to the grid/genset. In the case of Stand-alone operation mode, it could be useful when the user/installer wants to connect the inverter to the genset in order to charge the batteries and supply the loads from it, even if the SOC hasn't reached the SOCmin (activation of the genset)

This function is located at Main menu > Configuration > Grid/Genset > Manual connection

5.4 Digital I/O

5.4.1 In the ISS 1Play, how are digital outputs used?

The ISS 1Play is provided with two voltage-free digital outputs. Each output is independent and managed by a relay that can operate until 230Vac and 6A. These digital outputs have been included for several functions in the ISS 1Play depending on their configuration. All the functions are included in "Installation and Operation Manual".

The following figures include the behavior of the digital output depending on its state. It has been included a normally open relay which is handled by the digital output, the performance of a normally closed relay will be the opposite. The source used to provide the voltage and the current shall comply with ISS 1Play digital output and with the external contactor requirements.

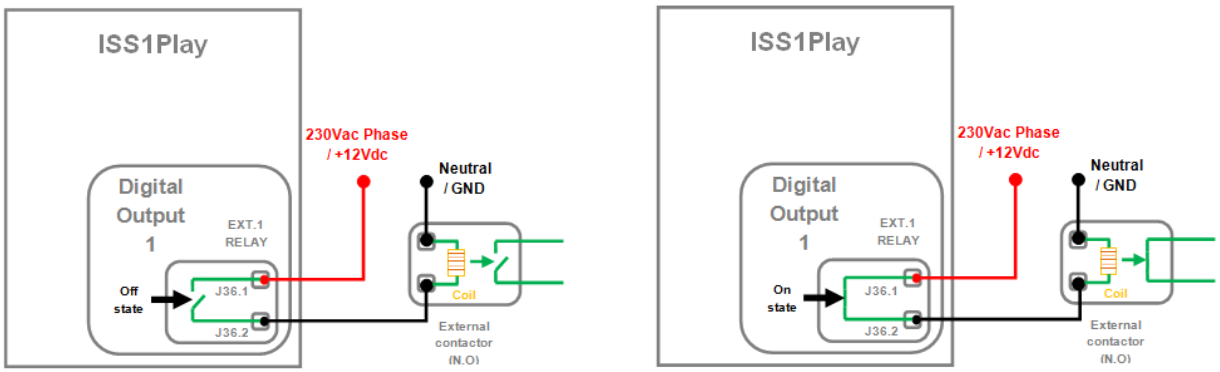


Figure 15: ISS 1Play digital output configuration

5.4.2 In the ISS 1Play, how are digital inputs used?

The ISS 1Play includes digital inputs to be used in different purposes, all the functions related to this input are defined in "Installation and Operation Manual". The inputs are isolated and can operate with one dry contact or a DC voltage from 0 to 24V.

The following images include the state of the digital input depending on an external contactor. It includes a normally open relay and a switch to manage it, using a normally closed relay will take the opposite behavior.

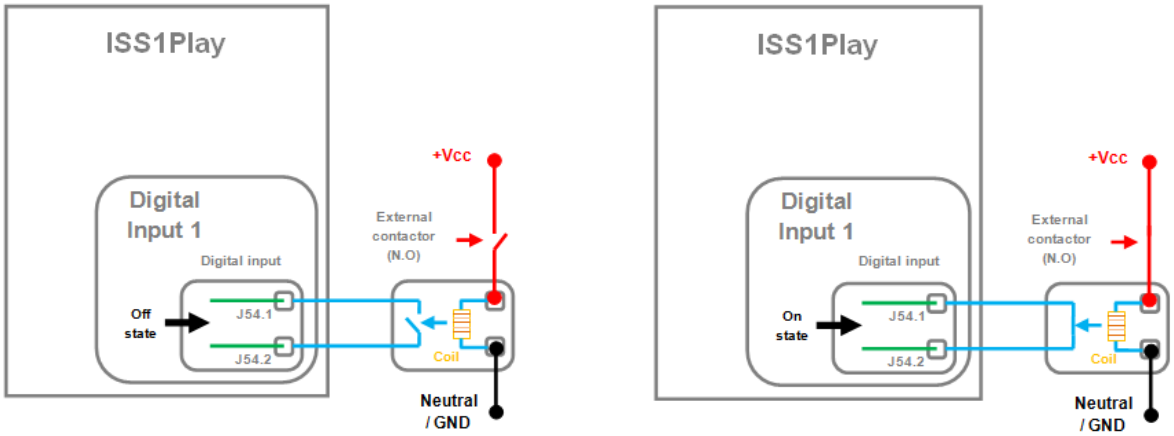


Figure 16: ISS 1Play digital input configuration

6 More Options

6.1 Emergency charge from an external PV Inverter

6.1.1 There is no grid/genset but I have an additional PV inverter, is it possible to charge the batteries with the ISS 1Play from the PV inverter?

When the ISS 1Play has reached the SOCdescx or the minimum voltage (Alarm=0x0001 and Code2=0x0080) stops.

If the system has no grid/genset and the ISS 1Play has not a PV Input to start charging batteries, it will remain stopped indefinitely.

However, in case that the installation has an additional PV inverter it is possible to start the ISS 1Play to charge the battery from the PV inverter.

First of all it is needed to verify that the additional PV inverter has enough PV energy to start its production. After that, it will be necessary to access:

MAIN MENU > MORE OPTIONS > EMERGENCY CHARGE

“Emergency charge” function has been developed to start the ISS 1Play voltage generation for a short period of time (5 minutes). This time should be enough for the additional PV inverter to detect this grid and to start the current injection into it. Finally, once the system is correctly fed, the battery charge will run automatically.

Important note: ISS 1Play finds out automatically grid/genset or internal PV production in its input to charge the batteries according to its configuration. The “Emergency charge” routine must be followed only when there is no other option to start charging batteries from the ISS 1Play.

6.2 Manual equalization

6.2.1 I have a lead-acid battery and it has decreased its capacity, is there any option to recover some capacity?

Not all lead-acid batteries support the equalization process. So first of all, check this point with the battery manufacturer.

If it is allowed, there is a “Manual equalization” function to prevent the premature failure of individual battery cells and extend the service life of the battery. It is located in the display in the following path:

MAIN MENU > MORE OPTIONS > MANUAL EQUALIZATION

This function launches a routine that will charge the battery in a certain moment following the steps below:

- Step1: Battery charges at constant current until it reaches the equalization voltage level.
- Equalization step: The equalization process maintains the battery voltage to the “Equalization Voltage” parameter during a “Equalization Time” parameter to recover batteries capacity.
  Both parameters shall be configured in the ISS 1Play Battery Settings.
- Step2: Once that the equalization time is finished, the battery voltage keeps charging with the “Absorption Voltage” parameter while the current starts to decrease. This step finishes when the current is 1/8 of the configured “Charge Current” parameter.
- Step 3: The battery enters the floating phase, the charge process is finished and the SOC value is set to 100%. It will remain there until the battery starts to discharge.

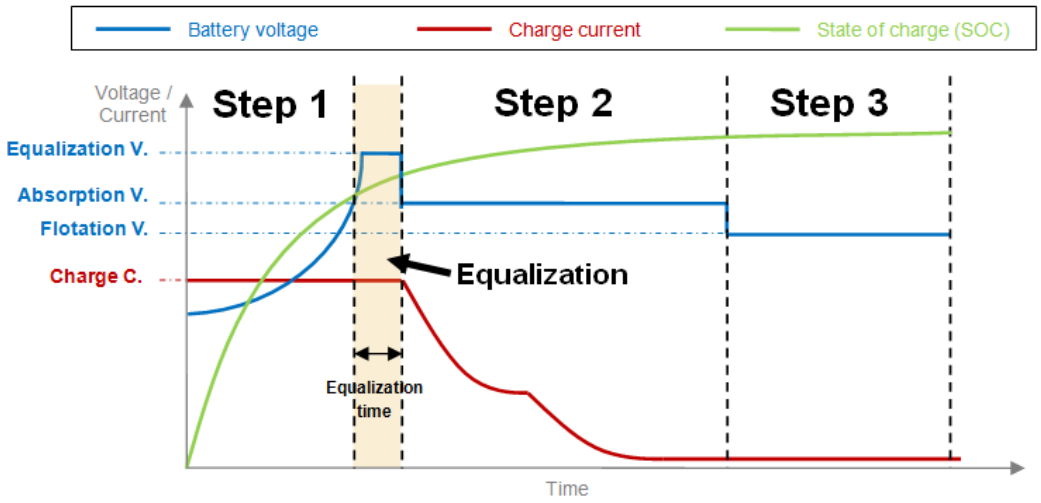


Figure 17: Equalization process

Important note: As seen on the graph, the battery will be exposed to a higher voltage than usual, so it is very important to ensure before using the “Manual equalization” that the battery is fully compatible with this option.

During the equalization charge, the battery must be kept cool and under close observation for unusual heat rise and excessive venting. Some venting is normal and the hydrogen emitted is highly flammable. The battery room must have good ventilation as the hydrogen gas becomes explosive.

6.3 Start/Stop Lithium Battery

6.3.1 When do I use this functionality?

Start/Stop lithium battery functionality is only used to switch on/off the Dow-Kokam manufacturer´s Lithium Battery. This battery management system (BMS) needs to receive an external signal to wake-up the battery system from the ISS 1Play Digital Output.

Don´t use this functionality for any other battery manufacturers.

6.4 Test Fans

6.4.1 Is it possible to do a fan test with the ISS 1Play?

Yes, it is possible. It is located in the display in the following path:

MAIN MENU > MORE OPTIONS > TEST FANS

This function has been developed to launch the internal and external fans for a short period of time (30 seconds).