

# HMI STORAGE SYSTEM

USER

socomec  
Innovative Power Solutions

08/07/2022 16:10

HOME

COMMANDS

STATES

WARNINGS

ALARMS

MEASURES

GRAPHS

SOLENBAT  
Version: 3.0.1

FR

UK

RETURN

EVENTS

PARAMETERS

| PMS   | BATTERY   | PCS   | DIGIWARE  | PV  |
|---|---|---|---|---|
| <div style="width: 100%; height: 10px; background-color: green;"></div> | <div style="width: 100%; height: 10px; background-color: green;"></div> | <div style="width: 100%; height: 10px; background-color: green;"></div> | <div style="width: 100%; height: 10px; background-color: green;"></div> | <div style="width: 100%; height: 10px; background-color: green;"></div> |
| <div style="width: 20%; height: 10px; background-color: yellow;"></div> |   |   |   |   |

|      |      |
|------|------|
| 12°C | 123% |
| 12°C | 123% |

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*The aim of this notice is to show the user how to use the Human-Machine Interface on the Socomec storage system and to configure the system in an optimum way to suit the client installation. Details of each screen are provided below.*

# 1. Screen 1: HOME

Homepage on the storage system where you can choose the system language and view the version of software installed on the automatic unit.

The scroll bar at the side provides access to different screens. Pressing one of the buttons enables the operator to switch from one screen to another. The selected screen remains green, as the image below illustrates. The different screens are displayed in the order shown in this notice.

The top bar shows the profile of the user currently identified together with the present date and time <sup>(1)</sup>. To stop being identified, the MMI needs to remain inactive for 3 minutes.

The bottom bar provides a quick view of the different states of components comprising the storage system, including PMS, BATTERY, PCS, DIGIWARE, PV, depending on the installation configured. In addition, the PMS, BATTERIE, PCS and PV icons are shortcuts to the pages obtained from the « States » screen. The DIGIWARE is a shortcut to the page obtained from the « Measurements » screen.

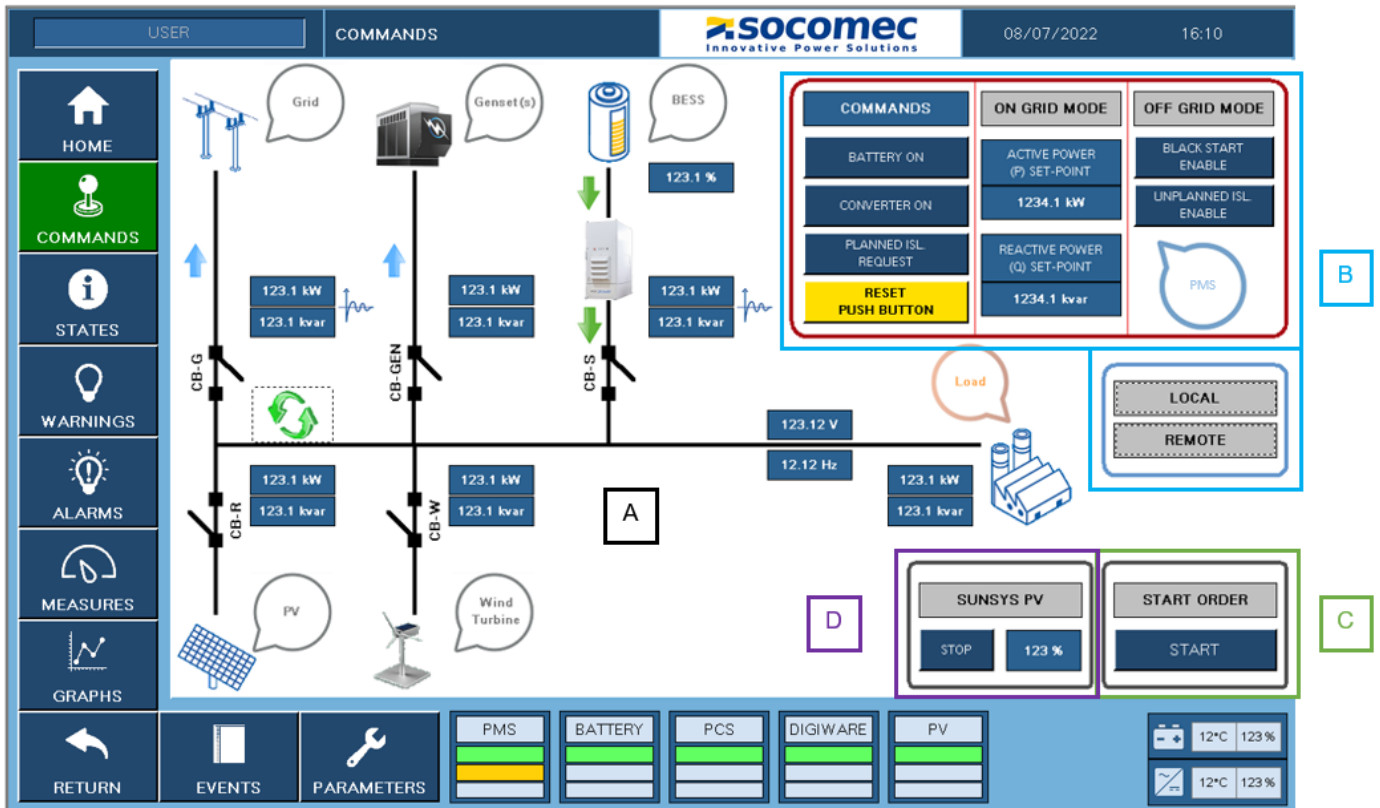
The Return key enables you to return to the most recent pages viewed.

(1) The identifiers and password are provided in the Parameters chapter.



## 2. Screen 2: COMMANDS

This screen provides an overview of the different sources and of the load present on the installation. It also makes it possible to view the exchanges of active and reactive power in real time associated with Digiware (if present) and provides information about system states.



This screen comprises 4 distinct parts (displayed or not depending on the function of the installation):

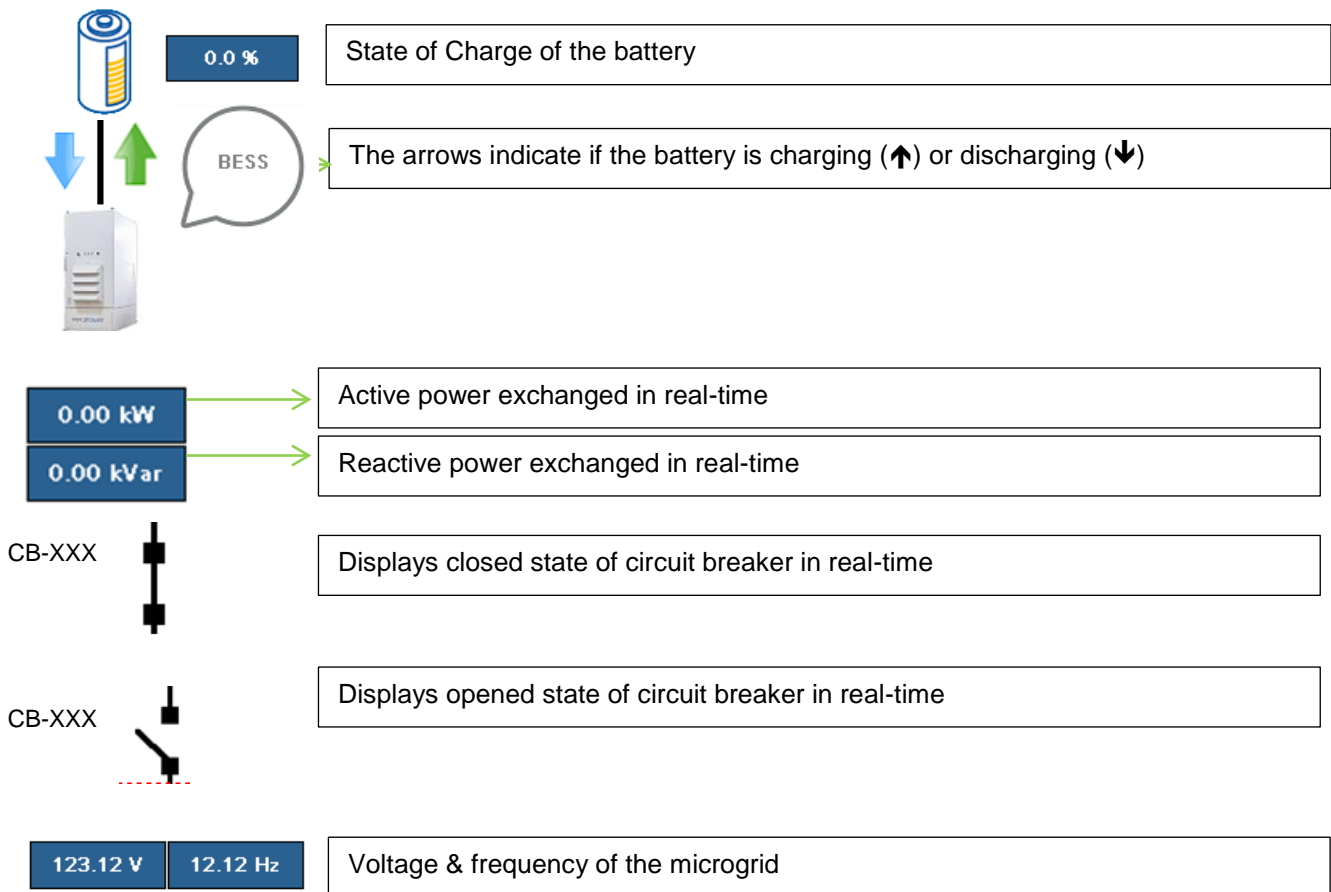
- A) The control panel for the installation
- B) Operation of the installation
- C) Starting up
- D) Starting up the gensets

### A) The control panel for the installation

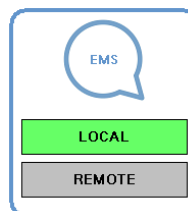
Designation of the circuit-breakers:

- CB-G: Circuit Breaker Grid. This enables the grid to connect to the microgrid.
- CB-R: Circuit Breaker Renewable. This enables the photovoltaic installation to connect to the microgrid.
- CB-GEN: Circuit Breaker Genset. This enables the genset to connect to the microgrid.
- CB-S: Circuit Breaker Storage. This enables the storage system to connect to the microgrid.
- CB-W: Circuit Breaker Wind Turbine. This enables the wind turbine to connect to the microgrid.

Details of the symbols:

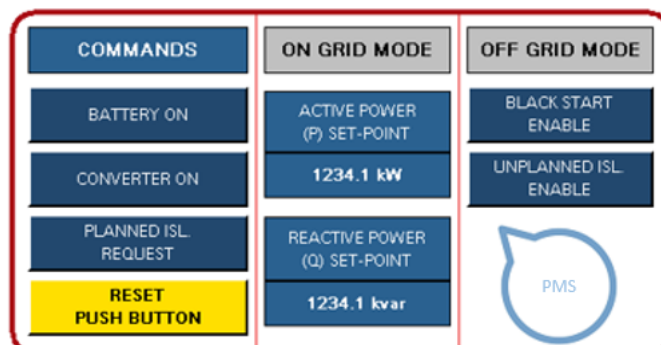


**B) Operation of the installation**



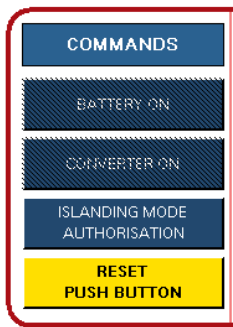
This symbol shows how the PMS is operated: either in LOCAL mode via the HMI (COMMANDS screen) or in DISTANT mode by an external EMS (Energy Management System). The active state is displayed in green.

In LOCAL operating mode, it is possible to access the functions of the window shown below. In DISTANT operating mode, the boxes are locked (they are greyed out) and operation is performed by an EMS.



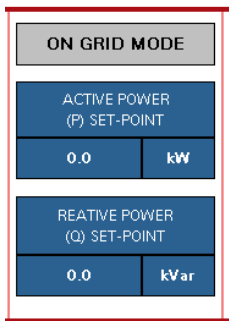
This window enables the affected elements to be operated in MANUAL mode. Pressing the buttons confirms the action and the box turns green.

### 1. COMMANDS



| Designations                 | Description of the active state of the buttons  |
|------------------------------|---|
| Battery on                   | Connection of battery to PCS on DC side: closure of battery contactor   |
| Converter on                 | Connection of PCS converters to microgrid: closing of CB-S  |
| Islanding mode authorisation | In On-Grid mode (connected to grid): proceed to 'programmed' islanding. The storage system disconnects from the grid to return to Off-Grid mode (disconnected from grid): opening of CB-G |
| Reset push button            | Enables the PMS to reinitialise in the event of warnings or alarms, after correcting the alarm or the warning   |

### 2. ON GRID MODE

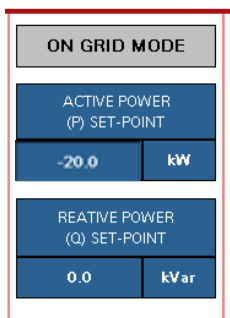


In On-Grid mode (connected to grid) it is possible to inject or to absorb active and/or reactive power using instructions. A positive instruction will inject power into the microgrid and will discharge the battery while a negative instruction will absorb power from the microgrid and will charge the battery. To do this, you need to press the numerals for the instruction, causing a second screen to open in which the desired instruction can be written, cf. below.



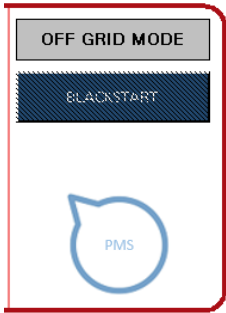
Use the +/- to configure the charge or the discharge. Enter the desired instruction. Confirm with « Enter ».

The applicable Min – Max power level is calculated automatically by the PMS in accordance with the installation (No. of PCS). In the event of a data input error, this cannot be confirmed and the value turns red.



After validation, the PMS takes account of the instruction

### 3. OFF GRID MODE



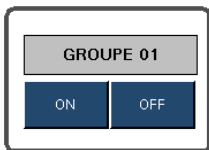
| Designations                       | Description of the active state of the buttons   |
|------------------------------------|--|
| BlackStart                         | This button enables the BlackStart to operate in the event of loss of, or disconnection from, the grid (opening of CB-G). A BlackStart enables the storage system to be started in Off-Grid mode, and to supply the charge without any support from the grid |
| Unforeseen islanding authorisation | This button enables a loss of grid to be detected and disconnection (opening of CB-G) of the grid if so.   |

#### C) Starting up



The START AUTH function enables the PMS to be started in AUTO mode (on condition that it is also in LOCAL mode). This function then proceeds automatically to connection of the storage system to the microgrid in On-Grid or Off-Grid mode if the ISLANDING MODE AUTHORISATION (see the above COMMANDS screen) is active.

#### D) The starting of gensets (only if the installation includes a genset)



The PMS also makes it possible to manage one or several gensets while the adjacent function enables genset 1 to be started if management is enabled.

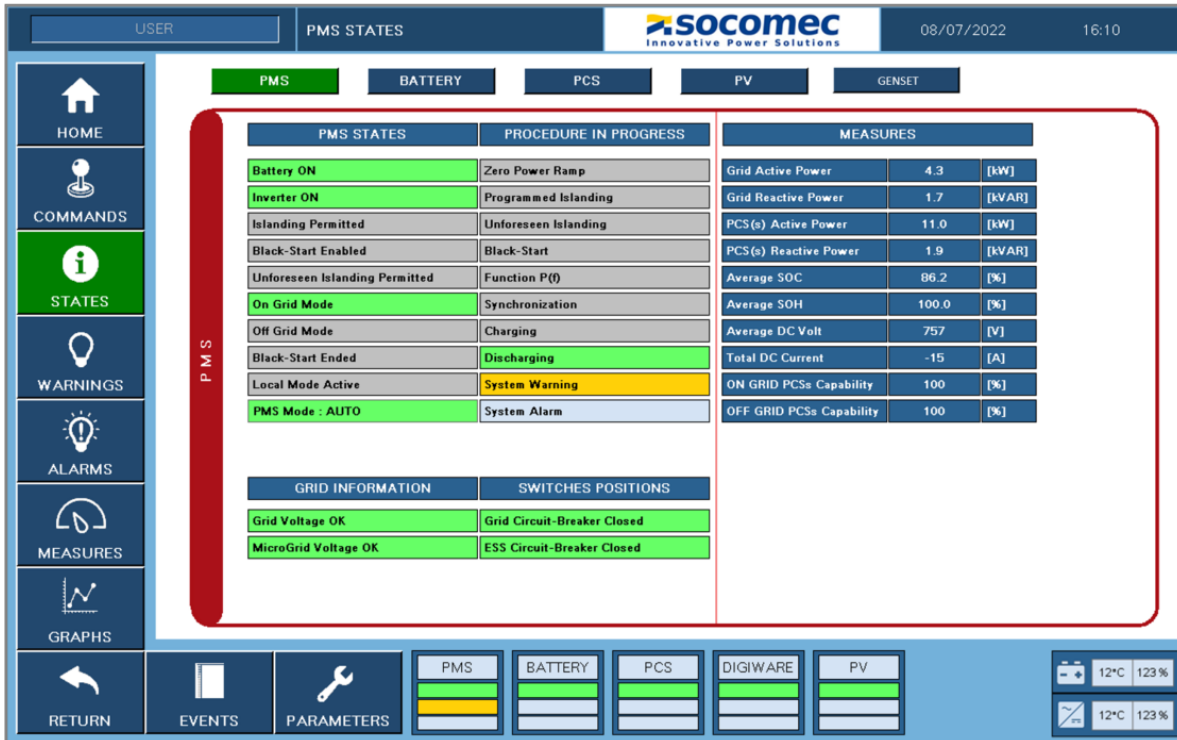
### 3. Screen 3: STATES

This page provides a real-time view of states and measurements of the PMS, BATTERY, PCS, PV and GENSET(s).

Colour codes:

- Green: indicates an active state.
- Orange: indicates an alert.

Red: indicates an alarm.



| PMS STATE                      |  |
|--------------------------------|--|
| Designation                    | Description of the active state of the buttons   |
| Battery ON                     | The batteries are connected correctly, the connection procedure has therefore taken place correctly.   |
| Inverter ON                    | At least one of the PCS is ready for operation.  |
| Islanding permitted            | Image of Islanding Mode Operation present on the COMMANDS screen.  |
| Black-Start Enabled            | Image of the BlackStart command present on the COMMANDS screen.  |
| Unforeseen Islanding Permitted | Image of the Unforeseen Islanding Authorisation present on the COMMANDS screen.  |
| On Grid Mode                   | This state is enabled whenever the microgrid is connected to the grid. It can only be enabled if the converters are connected.   |
| Off Grid Mode                  | This state is enabled whenever the microgrid is disconnected from the grid, it then operates in islanding mode. It can only be enabled if the converters are connected.                    |
| Black-Start Ended              | This state is enabled after a BlackStart.  |
| Local Mode Active              | This mode is enabled if Local Mode has been selected on the COMMANDS screen. The PMS is then managed locally, at which point any orders from an EMS are then not taken into consideration. |

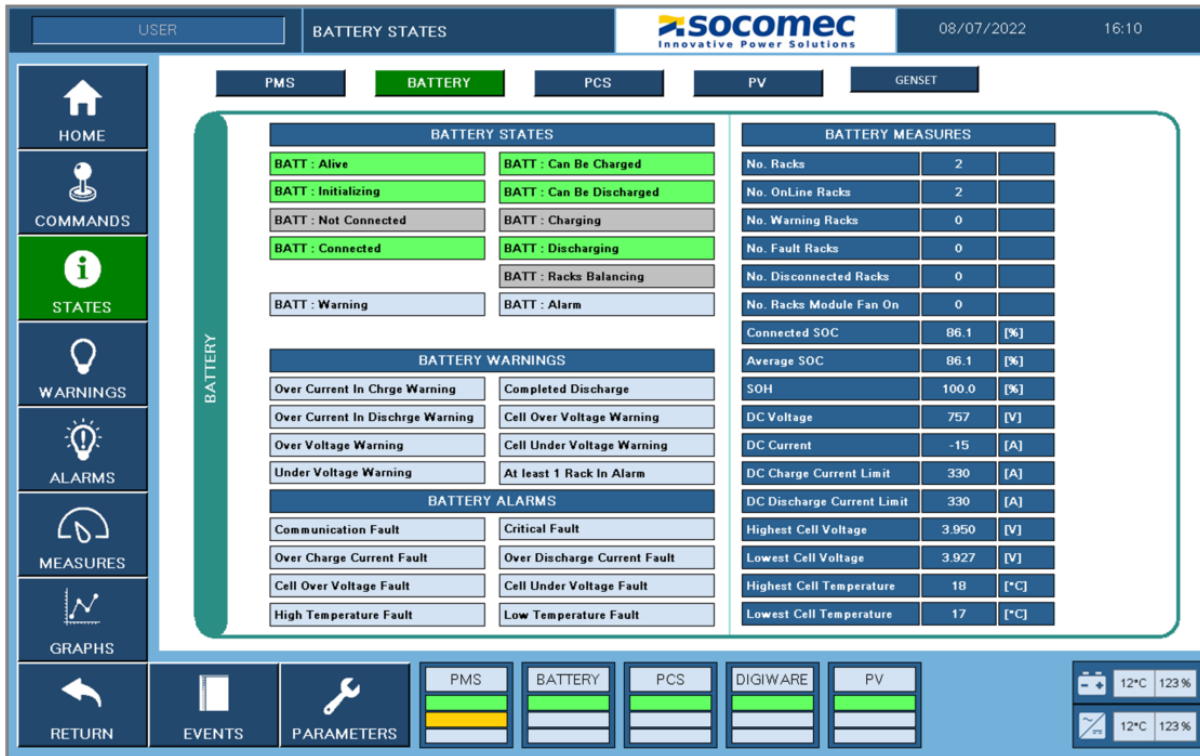


| PROCEDURE IN PROGRESS |  |
|-----------------------|--|
| Designation           | Description of the active state of the buttons   |
| Zero Power Ramp       | The PMS progressively increases the power of the stocker until a power rating of zero is present at the exchange point with the grid. This happens before to do a planned transition from On-Grid mode to Off-Grid mode. |
| Programmed Islanding  | A programmed islanding of the microgrid is in progress. The Islanding Mode Authorisation is enabled (COMMANDS screen).   |
| Unforeseen Islanding  | An unforeseen islanding of the microgrid is in progress: BlackStart or Unforeseen Islanding Authorisation (COMMANDS screen) is enabled.  |
| Black-Start           | A BlackStart is in progress.   |
| Function P(f)         | In Off-Grid mode, the microgrid frequency is modified to activate function P(f) on the PV inverters to reduce the power they produce.  |
| Synchronization       | When the grid comes back on line, the microgrid synchronises to it before performing a transition from Off-Grid mode to On-Grid mode.  |
| Charging              | The batteries are being charged.   |
| Discharging           | The batteries are being discharged.  |
| System Warning        | One or more warnings are active.   |
| System Alarm          | One or more alarms are active.   |

| MEASURES                 |   |
|--------------------------|---|
| Designation              | Description of the active state of the buttons                        |
| Grid Active Power        | Active power measured upstream (grid side) of circuit-breaker CB-G.   |
| Grid Reactive Power      | Reactive power measured upstream (grid side) of circuit-breaker CB-G. |
| PCS(s) Active Power      | Active power measured upstream (PCS side) of circuit-breaker CB-S.    |
| PCS(s) Reactive Power    | Reactive power measured upstream (PCS side) of circuit-breaker CB-S.  |
| Average SOC              | Average level of charge of the battery racks                          |
| Average SOH              | Average level of health of the battery racks                          |
| Average DC Volt          | Voltage measured at the link between batteries and the PCS units.     |
| Total DC current         | Current measured at the link between batteries and the PCS units.     |
| ON Grid PCSs Capability  | Total available power of PCS units in On Grid mode                    |
| Off Grid PCSs Capability | Total available power of PCS units in Off Grid mode                   |

| GRID INFORMATION     |  |
|----------------------|--|
| Designation          | Description of the active state of the buttons                                   |
| Grid voltage OK      | The grid voltage is within the tolerances defined on the PARAMETERS screen.      |
| MicroGrid voltage OK | The microgrid voltage is within the tolerances defined on the PARAMETERS screen. |

| SWITCHES POSITIONS          |  |
|-----------------------------|--|
| Designation                 | Description of the active state of the buttons |
| Grid Circuit-Breaker Closed | The CB-G circuit-breaker is closed.            |
| ESS Circuit-Breaker Closed  | The CB-S circuit-breaker is closed.            |



| <b>BATTERY STATES</b>   |   |
|-------------------------|---|
| Designations            | Descriptions of the active state of buttons   |
| BATT: Alive             | Battery communication is operational.   |
| BATT : Not connected    | The battery connection procedure has not been implemented.  |
| BATT: Connected         | At least one of the batteries is connected to the PCS, and the connection procedure has taken place.                      |
| BATT: Warning           | There is at least one warning in progress on one of the batteries.  |
| BATT: Can Be Charged    | Since the high threshold of the SoC and the limit of battery current have not been reached, the batteries can be charged. |
| BATT: Can Be Discharged | Since the low threshold of the SoC for batteries has not been reached, the batteries can be discharged.                   |
| BATT: Charging          | The batteries are in the process of being charged.  |
| BATT: Discharge         | The batteries are in the process of being discharged.   |
| BATT: Alarm             | There is at least one alarm in progress on one of the batteries.  |

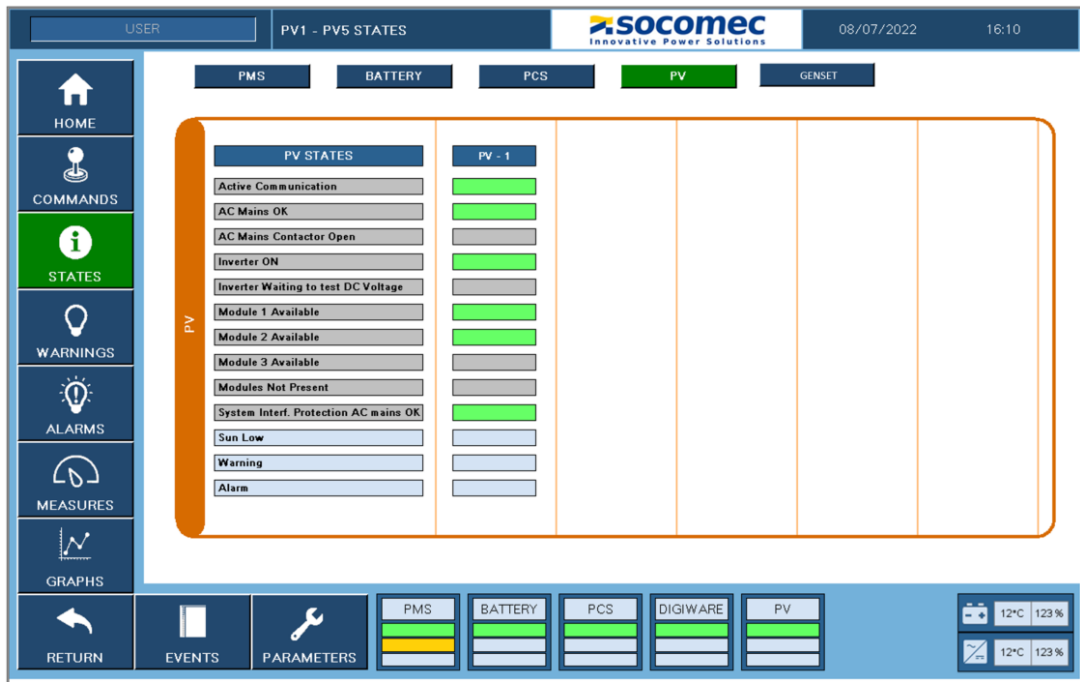
| <b>BATTERY WARNINGS</b>           |   |
|-----------------------------------|---|
| Designations                      | Descriptions of the active state of buttons   |
| Over Current In Charge Warning    | The current level of the batteries is too high while charging.  |
| Over Current In Discharge Warning | The current level of the batteries is too high while discharging.   |
| Over Voltage Warning              | The battery voltage is too high   |
| Under Voltage Warning             | The battery voltage is too low  |
| Completed Discharge               | The battery is totally discharged, and a recharge is necessary.   |
| Cell Over Voltage Warning         | The voltage of at least one of the battery cells is too high.   |
| Cell Under Voltage Warning        | The voltage of at least one of the battery cells is too low.  |
| One Rack in Alarm                 | An alarm is active on at least one of the battery racks, but at least one battery rack is still able to function. |

| <b>BATTERY ALARMS</b>            |  |
|----------------------------------|--|
| Designations                     | Descriptions of the active state of buttons  |
| Communication Fault              | A communication problem exists between the PMS and the battery.                    |
| Over Charge Current Fault        | The current level of the batteries while charging has reached a critical value.    |
| Over Charge Power Limit Fault    | The voltage in at least one of the battery cells has reached a critical value.     |
| High Temperature Fault           | The battery temperature is too high.   |
| Over Offline Rack Count Fault    | An alarm is active on at least one of the batteries.                               |
| Over Discharge Current Fault     | The current level of the batteries while discharging has reached a critical value. |
| Over Discharge Power Limit Fault | The voltage in at least one of the battery cells has reached a critical value.     |
| Low Temperature Fault            | The battery temperature is too low.  |

| <b>BATTERY MEASURES</b>    |   |
|----------------------------|---|
| Designations               | Descriptions of the active state of buttons                       |
| No. Racks                  | Total number of racks in the installation                         |
| No. Online Racks           | Number of racks in the installation that are connected to the PCS |
| No. Warning Racks          | Number of racks in the installation that have an active warning   |
| No. Fault Racks            | Number of racks in the installation that have an active alarm     |
| Connected SOC              | Average level of charge of the connected racks of batteries       |
| Average SOC                | Average level of charge of the battery racks                      |
| SOH                        | Average level of health of the battery racks                      |
| DC Voltage                 | Voltage measured at the link between batteries and PCS.           |
| DC Current                 | Current measured at the link between batteries and PCS.           |
| DC Charge Current Limit    | Maximum battery charging current                                  |
| DC Discharge Current Limit | Maximum battery discharging current                               |
| Highest Cell Voltage       | Maximum voltage in at least one battery cell                      |
| Lowest Cell Voltage        | Minimum voltage in at least one battery cell                      |
| Highest Cell Temperature   | Maximum temperature in at least one battery cell                  |
| Lowest Cell Temperature    | Minimum voltage in at least one battery cell                      |



| Designations         | Description of the active state of the buttons                                   |
|----------------------|--|
| Active Communication | PCS communication is operational.  |
| Inverter ON          | At least one of the PCS units is ready for operation.                            |
| On Grid Mode         | The microgrid is connected to the grid   |
| Off Grid Mode        | The microgrid is disconnected from the grid, it then operates in islanding mode. |
| Charging             | The PCS operates in battery charging mode.                                       |
| Discharging          | The PCS operates in battery discharging mode.                                    |
| PCS Warning          | There is at least one warning in progress on one of the PCS units.               |
| PCS Alarm            | There is at least one alarm in progress on one of the PCS units.                 |



|                 |   |
|-----------------|---|
| <b>PV STATE</b> | Only for Socomec Solar Inverter : Sunsys Park |
|-----------------|---|



| <b>GENSET STATES</b> |  |
|----------------------|--|
| Designations         | Description of the active state of the buttons           |
| Active Communication | Genset communication is operational.                     |
| Out Of Order Mode    | The genset is in decommissioning mode.                   |
| Alarms Synthesis     | There is at least one warning in progress on the genset. |
| Warning Synthesis    | There is at least one alert in progress on the genset.   |
| Init                 | The genset is in Init mode.                              |
| GCB Opened           | The genset connection circuit-breaker CB-GEN is open     |

| <b>ORDERS</b>     |  |
|-------------------|--|
| Designations      | Description of the active state of the buttons |
| Start Order       | Active start order                             |
| Stop Order        | Genset stop order                              |
| GCB Closing       | Closure of CB-GEN circuit-breaker              |
| GCB Opening       | Opening of CB-GEN circuit-breaker              |
| P Set-Point       | Value of genset P instruction                  |
| Cos Phi Set-Point | Value of genset Cos Phi instruction            |

| <b>MEASURES</b> |  |
|-----------------|--|
| Designations    | Description of the active state of the buttons       |
| Speed           | Rotation speed of the genset                         |
| Oil pressure    | Oil pressure level in the genset                     |
| Water Temp.     | Temperature of water that cools the genset           |
| Fuel level      | Level of fuel remaining available in the genset tank |
| P               | Active power delivered by the genset                 |
| Q               | Reactive power delivered by the genset               |
| Vbatt           | Voltage of the genset starter motor's battery        |

## 4. Screen 4: WARNINGS

This screen provides access to the active alerts in the storage system. These alerts are linked to the date and time of the system and disappear automatically once the problem ceases to be present. An alert only gives rise to a warning. In both cases, this is signalled on the screen in the HMI and in Modbus for the EMS.

The screenshot displays the 'WARNINGS' screen in the Socomec HMI. The top header shows 'USER', 'WARNINGS', the Socomec logo, and the date/time '08/07/2022 16:10'. The main area contains a table of active warnings:

| DATE       | TIME     | Warning Message  |
|------------|----------|--|
| 10/08/2022 | 08:05:21 | [PMS-W008] : Battery SOC is over "SOC High" threshold. |
| 10/08/2022 | 08:05:21 | [PMS-W000] : General Warning                           |

The left sidebar includes navigation buttons: HOME, COMMANDS, STATES, WARNINGS (active), ALARMS, MEASURES, and GRAPHS. The bottom status bar shows indicators for PMS, BATTERY, PCS, DIGIWARE, and PV, along with temperature and percentage readouts.

## 5. Screen 5: ALARMS

This screen provides access to the active alarms in the storage system. These alarms are linked to the date and time of the system.

It is possible to reinitialise them using the ALARM RESET button. An alarm cuts off the storage system. It is also possible to scroll the page using the arrow keys on the right side of the page.

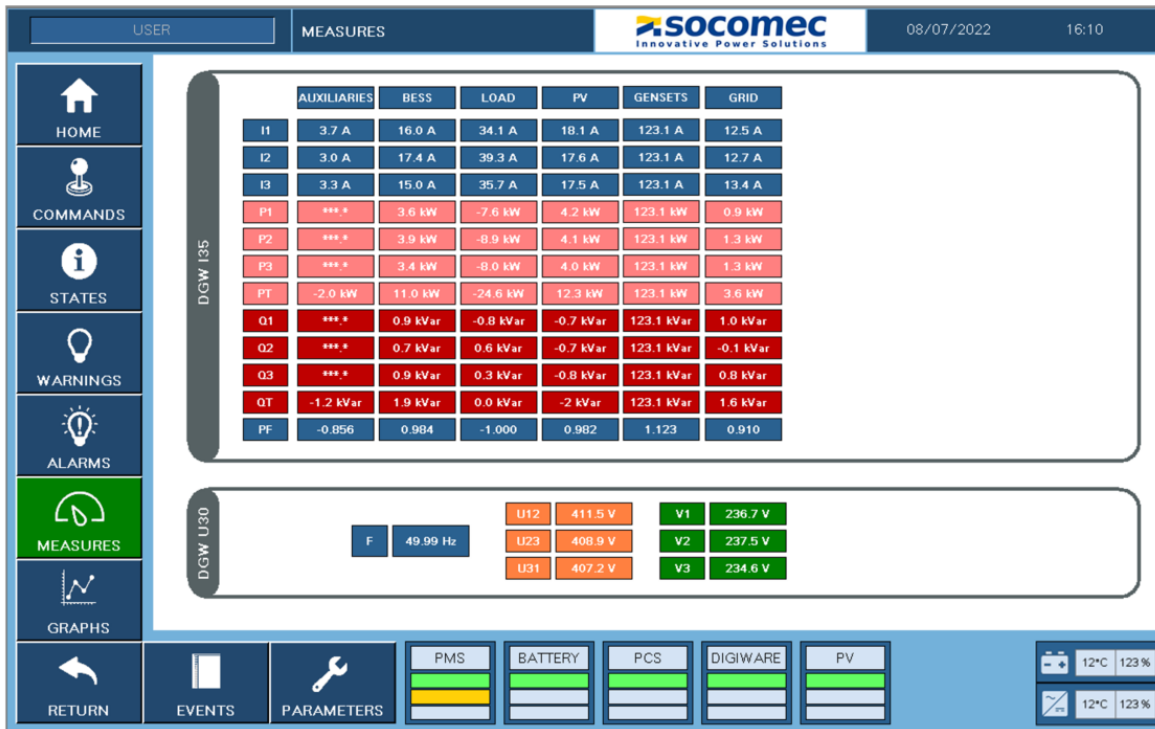
The screenshot displays the 'ALARMS' screen of the Socomec storage system. The interface includes a top header with 'USER', 'ALARMS', the Socomec logo, and the date/time '08/07/2022 16:10'. A yellow 'ALARM RESET' button is positioned above a table with two columns: 'DATE' and 'TIME'. The table is currently empty. On the left, a vertical sidebar contains navigation icons for HOME, COMMANDS, STATES, WARNINGS, ALARMS (highlighted in green), MEASURES, and GRAPHS. At the bottom, there are several status indicators: 'RETURN', 'EVENTS', 'PARAMETERS', and five component status boxes labeled PMS, BATTERY, PCS, DIGIWARE, and PV. Each box shows a colored bar (green or yellow) and a numerical value. On the far right, there are two temperature and percentage readouts, each showing '12°C' and '123%'.

## 6. Screen 6: MEASURES

This screen provides access to important measures provided by the Digiware on the various Digiware modules present in this installation.

The DGW I35 modules provide an overview of the levels of current & power of the microgrid.

The DGW U30 module provides an overview of the phase-neutral and phase-phase voltages and of the frequency of the microgrid.



The measures presented on the above screen have been implemented:

**Auxiliaries:** This relates to the consumption levels of equipment items in the storage installation (HMI, PMS, PCS, Batt)

**BESS:** These measures are implemented upstream (on the PCS side) of the CB-S circuit breaker

**Load:** These measures are implemented on the microgrid upstream of the charge

**PV:** These measures are implemented upstream (on the PV inverter side) of the CB-R circuit-breaker.

**Genset:** These measures are implemented upstream (on the genset side) of the CB-Gen circuit-breaker.

**Grid:** These measures are implemented upstream (on the grid side) of the CB-G circuit-breaker.

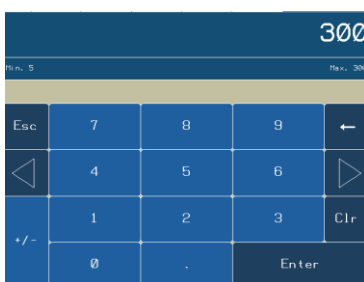
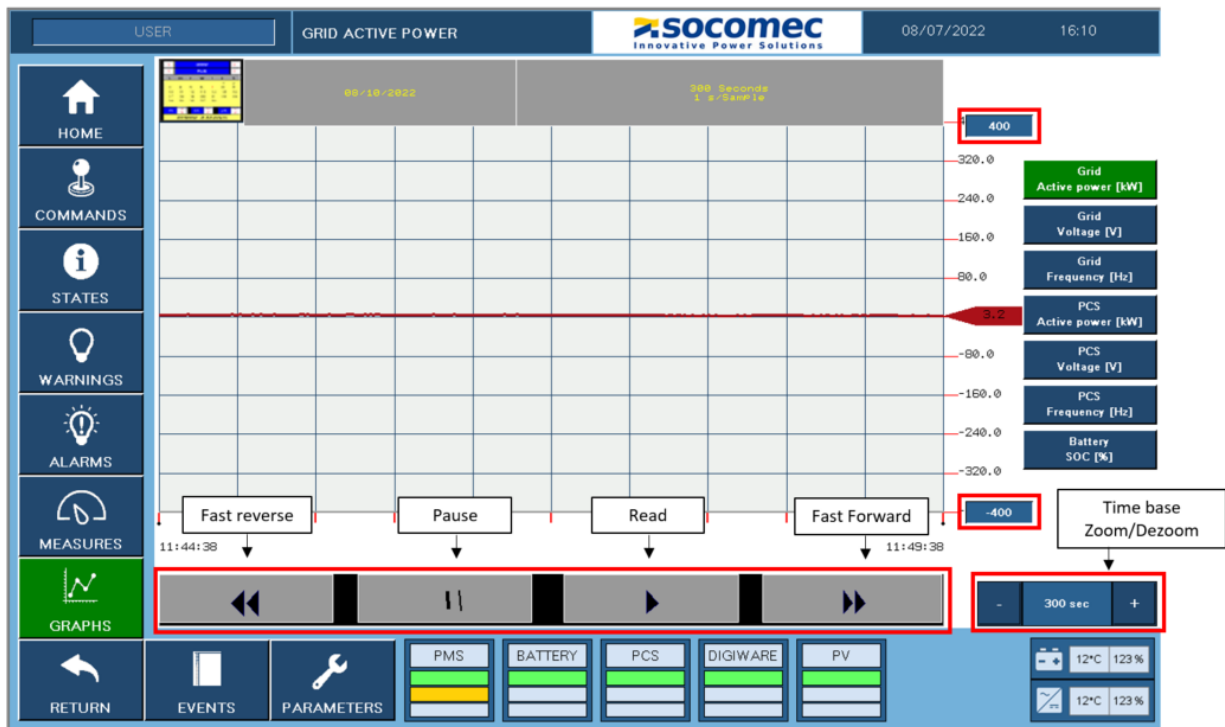
**DGW U30:** These measures are implemented on the microgrid



## 7. Screen 7: GRAPHS

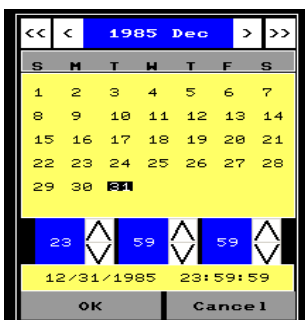
This screen provides a real-time display of the following elements:

- If the grid is present
  - o Grid active power
  - o Grid voltage
  - o Grid frequency
- PCS active power (Microgrid)
- PCS voltage (Microgrid)
- PCS frequency (Microgrid)
- Level of battery charge (SOC)



The scale can be defined using min/max values and the time value shown on the right side of the square matrix. There too, simply press the existing value to open the selection window, then validate by pressing « Enter »

The PMS also keeps a history of graphs that can be accessed using the calendar located in the top left corner of the square matrix.



Pressing the calendar gives you access to the date and time of the desired event. The << and >> arrows enable you to select the year. The < and > arrows enable you to select the month. The ^ and v arrows enable you to select the time.

## 8. Screen 8: EVENTS

This page provides a history of all the STATES, WARNINGS & ALARMS of the storage system. To access this, simply press the different buttons at the top of the screen

The screenshot shows the 'STATES LOG' screen in the Socomec storage system. The interface is divided into several sections:

- Top Bar:** Contains 'USER', 'STATES LOG', the Socomec logo, and the date '08/07/2022' at '16:10'.
- Navigation Tabs:** 'STATES' (highlighted in green and red), 'WARNINGS', and 'ALARMS'.
- Table:** A log of events with columns for 'DATE' and 'TIME'. The log entries are as follows:
 

| DATE       | TIME     | Event                               |
|------------|----------|-------------------------------------|
| 10/08/2022 | 11:00:03 | [PMS-S070] : Battery Discharging    |
| 10/08/2022 | 11:00:01 | [PMS-S010] : Discharging            |
| 10/08/2022 | 11:00:01 | [PMS-S009] : Charging               |
| 10/08/2022 | 10:51:58 | [PMS-S010] : Discharging            |
| 10/08/2022 | 10:51:58 | [PMS-S009] : Charging               |
| 10/08/2022 | 09:35:53 | [PMS-S014] : Battery Can Be Charged |
| 10/08/2022 | 09:18:08 | [PMS-S010] : Discharging            |
| 10/08/2022 | 09:18:08 | [PMS-S009] : Charging               |
| 10/08/2022 | 09:18:06 | [PMS-S014] : Battery Can Be Charged |
| 10/08/2022 | 09:15:07 | [PMS-S069] : Battery Charging       |
| 10/08/2022 | 08:05:21 | [PMS-S013] : General Warning        |
| 10/08/2022 | 00:44:11 | [PMS-S013] : General Warning        |
- Left Menu:** Includes icons for HOME, COMMANDS, STATES, WARNINGS, ALARMS, MEASURES, and GRAPHS.
- Bottom Bar:** Contains buttons for RETURN, EVENTS (highlighted in green), and PARAMETERS, along with status indicators for PMS, BATTERY, PCS, DIGIWARE, and PV, and temperature/percentage readouts.

## 9. Screen 9: PARAMETERS

These pages enable different customer installation parameters to be configured in accordance with the following elements:

- Number and power rating of the SUNSYS PCS<sup>2</sup> or SUNSYS PCS<sup>2</sup> IM inverters
- Type, number & power rating of batteries

They also make it possible, if necessary, to refine the following settings:

- Voltage and frequency thresholds for connecting the PCS to the grid in On-Grid mode
- Voltage and frequency thresholds for synchronisation of the microgrid to the grid when moving from Off-Grid to On-Grid mode
- Different thresholds for Off-Grid mode
- Power and SoC thresholds for function P(f)

Modifications are made via the 3 pages of parameters that can be accessed here and are always based on the same principle with the additional window that opens while the parameter is being modified. However, to enable the new parameters to be taken into account by the PMS, it must be validated a second time using the VALIDATION button until it changes to green.

Only some parameters are accessible to the end user, with the following identifier:

Login: USER

Password: user

Socomec installs the other parameters during commissioning of the storage system.

The SAVE AS DEFAULT button is reserved for Socomec to save the correct customer's parameters in the PMS.

The LOAD ALL DEFAULTS button can be accessed in USER mode to reload the parameters recorded when the unit originally was commissioned.

The screenshot shows the Socomec PMS PARAMETERS screen. The top navigation bar includes 'USER', 'PMS PARAMETERS', the Socomec logo, and the date/time '08/07/2022 16:10'. Below the navigation bar are buttons for 'VALIDATION', 'SAVE INITIAL CONFIG', and 'INITIAL CONFIG RESTORE'. The main content area is titled 'SOC CONFIG' and contains a table for 'Batteries SOC Management'.

|                          |                        | SOC [%]   |            |         |  |
|--------------------------|------------------------|-----------|------------|---------|--|
|                          |                        | Threshold | Hysteresis | ON GRID | OFF GRID   |
| Batteries SOC Management | Maximum Battery SOC    | 100       | -          | Alarm   | Max SOC Battery ALARM, ESS stopped                           |
|                          | Max. SOC for Islanding | 93        | -          | Warning | SOC out of range WARNING<br>Switch to OFF GRID not allowed   |
|                          | SOC Very High          | 95        | 2          | Warning | Very High SOC WARNING<br>ESS stops to charge the batteries   |
|                          | SOC High               | 85        | 2          | Warning | High SOC WARNING   |
|                          |                        |           |            |         |  |
|                          | SOC Low                | 15        | 2          | Warning | Low SOC WARNING  |
|                          | SOC Very Low           | 10        | 2          | Warning | Very Low SOC WARNING<br>ESS stops to discharge the batteries |
|                          | Min. SOC for Islanding | 7         | -          | Warning | SOC out of range WARNING<br>Switch to OFF GRID not allowed   |
|                          | Minimum Battery SOC    | 5         | -          | Alarm   | Min SOC Battery ALARM, ESS stopped                           |
|                          |                        |           |            |         |  |

At the bottom of the screen, there are buttons for 'PMS', 'BATTERY', 'PCS', 'DIGIWARE', and 'PV', along with a 'PARAMETERS' button and a status bar showing '12°C 123%'.

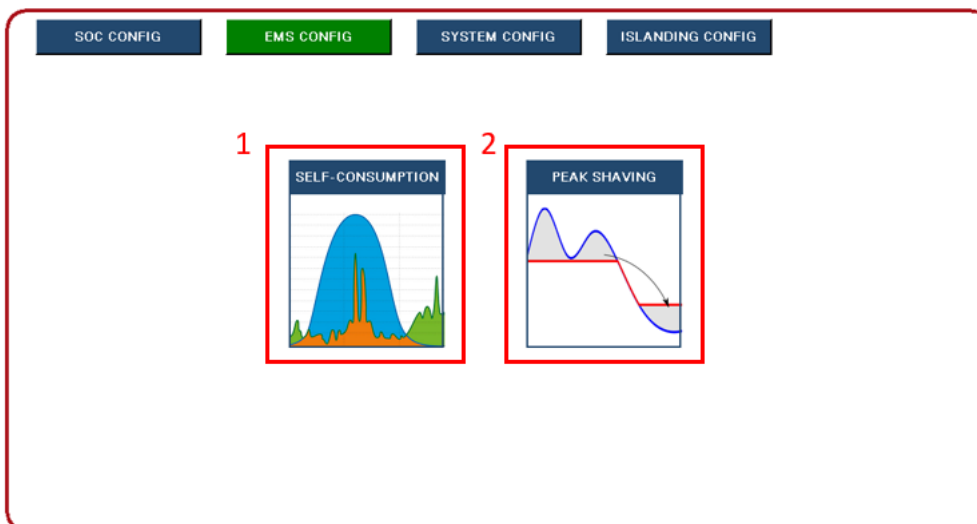
## PAGE 1: SOC CONFIG

The thresholds of the different SOC levels (Battery charge level) react to the control laws integrated into the PMS

|                              |                       | SOC [%] |            |        | ON GRID   | OFF GRID  |
|------------------------------|-----------------------|---------|------------|--------|---|---|
|                              |                       | Seuil   | Hystérésis |        |   |   |
| Gestion du SOC des batteries | SOC Maximum Batterie  | 95      | -          | Alarme | ALARME SOC Maximum Batterie, arrêt ESS                      |   |
|                              | Max. SOC pour flotage | 90      | -          | Alerte | ALERTE SOC hors plage<br>Passage en OFF GRID impossible     | ALERTE SOC hors plage<br>Retour en ON GRID                |
|                              | SOC Très Haut         | 85      | 2          | Alerte | ALERTE SOC Très Haut<br>ESS stoppe la charge des batteries  | ALERTE SOC Très Haut<br>ESS stoppe le PV (ouverture CB-R) |
|                              | SOC Haut              | 80      | 2          | Alerte | ALERTE SOC Haut   | ALERTE SOC Haut<br>Limitation PV (pour les Sunsys Park)   |
|                              |                       |         |            |        |   |   |
|                              | SOC Bas               | 20      | 2          | Alerte | ALERTE SOC Bas  |   |
|                              | SOC Très Bas          | 15      | 2          | Alerte | ALERTE SOC Très Bas<br>ESS stoppe la décharge des batteries | ALERTE SOC Très Bas                                       |
|                              | Min. SOC pour flotage | 10      | -          | Alerte | ALERTE SOC hors plage<br>Passage en OFF GRID impossible     | ALERTE SOC hors plage<br>Retour en ON GRID                |
|                              | SOC Minimum Batterie  | 5       | -          | Alarme | ALARME SOC Minimum Batterie, arrêt ESS                      |   |

The Maximum and Minimum Battery SOC parameters depend on the battery used and can only be configured by Socomec.

## PAGE 2: EMS CONFIG

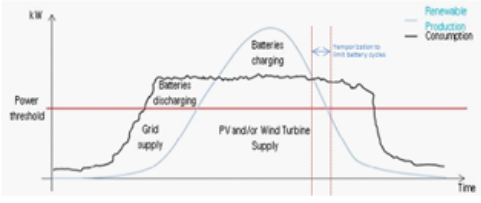


# 1. Self-Consumption

SOC CONFIG
EMS CONFIG
SYSTEM CONFIG
ISLANDING CONFIG

SELF-CONSUMPTION

|                               |         |
|-------------------------------|---------|
| Activation                    | Enabled |
| Power threshold [kW]          | 11.0    |
| Time before discharging [min] | 0       |



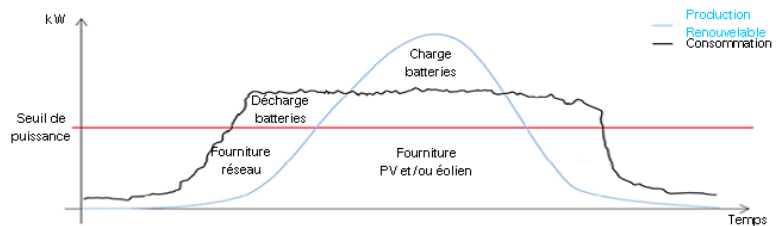
Discharge inhibition : when SOC < SOC min. discharge will not be permitted on selected time slot

|    | 0H | 1H | 2H | 3H | 4H | 5H | 6H | 7H | 8H | 9H | 10H | 11H | 12H | 13H | 14H | 15H | 16H | 17H | 18H | 19H | 20H | 21H | 22H | 23H | SOC min. |     |
|----|----|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|-----|
| P1 |    |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 100 %    |     |
| P2 |    |    |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |          | *** |

Self-consumption function – only used in On-Grid mode:

It allows to optimize the self-consumption of the renewable energy production (photovoltaic or wind energy) by automatically adapting the battery charging or discharging instructions according to the production/consumption ratio of the installation.

| Autoconsommation        |            |
|-------------------------|------------|
| Activation              | Désactivée |
| Seuil de puissance [kW] | 0          |



This function is managed by the PMS and the user can play with the various settings to best optimize his system. These parameters are accessible in USER mode.

| Designations    | Description  | Value Ranges             |
|-----------------|--|--------------------------|
| Activation      | Allows to activate or not this function                            | Activated or deactivated |
| Power threshold | Power heel provided either by the network or by the generating set | <b>0 à 100 kW</b>        |

## 2. Peak Shaving

SOC CONFIG
EMS CONFIG
SYSTEM CONFIG
ISLANDING CONFIG

PEAK SHAVING

|                            |          |
|----------------------------|----------|
| Activation                 | Disabled |
| High Power threshold [kW]  | 11.0     |
| Low Power threshold [kW]   | 10.0     |
| Time before charging [min] | 0        |

| Designations         | Description   | Value Ranges             |
|----------------------|---|--------------------------|
| Activation           | Allows to activate or not this function   | Activated or deactivated |
| High power threshold | Network level clipping threshold. The batteries discharge to limit the power supplied by the network to this threshold. | 0 à 100 kW               |
| Low power threshold  | Power threshold supplied by the network below which the batteries can be recharged                                      | 0 à 100 kW               |
| Time before charging | Delay before authorizing battery charging to avoid micro-cycles.  | min                      |

| SOC CONFIG                      | EMS CONFIG | SYSTEM CONFIG                    | ISLANDING CONFIG              |
|---------------------------------|------------|----------------------------------|-------------------------------|
| <b>CONNECTION</b>               |            | <b>PCSs</b>                      | <b>BATTERY</b>                |
| Minimum Voltage [% Vnom]        | 80         | PCS Type                         | PCS IM OffGrid                |
| Maximum Voltage [% Vnom]        | 120        | Number of PCSs                   | 1                             |
| Min. Frequency [Hz]             | 47.00      | Nominal Power of Single PCS [kW] | 66                            |
| Max. Frequency [Hz]             | 53.00      | System Nominal Power [kW]        | 66                            |
| Null Voltage Threshold [% Vnom] | 30         |                                  |                               |
| Null Frequency Threshold [Hz]   | 30.00      |                                  |                               |
| Out Of Freq Timeout [ms]        | 2000       |                                  |                               |
| Out Of Volt Timeout [ms]        | 2000       |                                  |                               |
| Lost Mains Timeout [ms]         | 3000       |                                  |                               |
|                                 |            |                                  | Battery Type                  |
|                                 |            |                                  | Samsung Mega v2.4             |
|                                 |            |                                  | No Rack                       |
|                                 |            |                                  | 2                             |
|                                 |            |                                  | No Cells per Module           |
|                                 |            |                                  | 16                            |
|                                 |            |                                  | No Modules per Rack           |
|                                 |            |                                  | 12                            |
|                                 |            |                                  | No Racks per BMS              |
|                                 |            |                                  | 1                             |
|                                 |            |                                  | Maximum Cell Voltage [V]      |
|                                 |            |                                  | 4.180                         |
|                                 |            |                                  | Minimum Cell Voltage [V]      |
|                                 |            |                                  | 2.700                         |
|                                 |            |                                  | Timer Between Connections [s] |
|                                 |            |                                  | 40                            |

Connections

| CONNECTION                      |       |
|---------------------------------|-------|
| Minimum Voltage [% Vnom]        | 80    |
| Maximum Voltage [% Vnom]        | 120   |
| Min. Frequency [Hz]             | 47.00 |
| Max. Frequency [Hz]             | 53.00 |
| Null Voltage Threshold [% Vnom] | 30    |
| Null Frequency Threshold [Hz]   | 30.00 |
| Out Of Freq Timeout [ms]        | 2000  |
| Out Of Volt Timeout [ms]        | 2000  |
| Lost Mains Timeout [ms]         | 3000  |

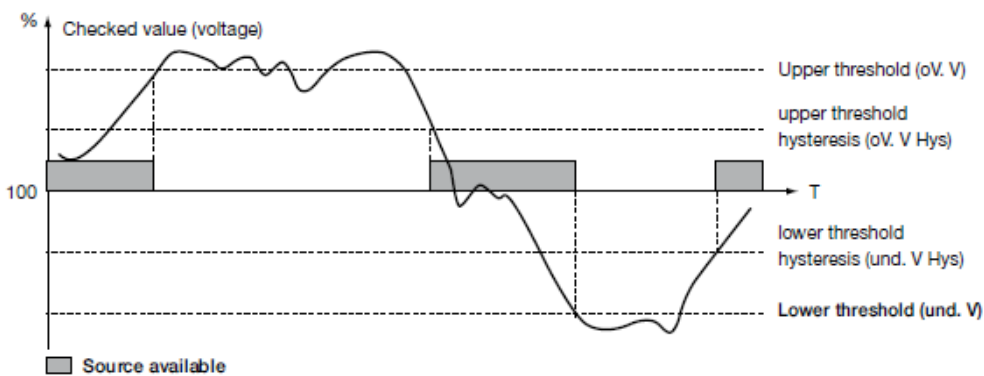
The shaded values are not accessible, except by Socomec.

| Designations    | Descriptions   | Value ranges |
|-----------------|--|--------------|
| Minimum Voltage | Definition of the under voltage threshold of the microgrid and the grid. | 0 to 100%    |
| Maximum Voltage | Definition of the overvoltage threshold of the microgrid and the grid.   | 0 to 100%    |

|                     |  |           |
|---------------------|--|-----------|
| Min. Frequency      | Definition of the under-frequency threshold of the microgrid and the grid.   | 0 to 100% |
| Max. Frequency      | Definition of the over-frequency threshold of the microgrid and the grid.  | 0 to 100% |
| Out Of Freq Timeout | The timer is started whenever the frequency is outside fixed tolerances. If at the end of the timer, the frequency has not returned within its tolerances, a warning (in On-Grid mode) or an alarm (in Off-Grid mode) will be triggered. | 0 to 5000 |
| Out Of Volt Timeout | The timer is started whenever the voltage is outside fixed tolerances. If at the end of the timer, the voltage has not returned within its tolerances, a warning (in On-Grid mode) or an alarm (in Off-Grid mode) will be triggered.     | 0 to 5000 |

The thresholds and hystereses are defined as percentages of nominal voltage.

The hystereses define return to normal levels following an under-voltage or over-voltage.



## PCSs

These parameters can only be accessed by Socomec when the system is commissioned. They enable the customer's installation to be configured on the basis of the type and number of PCS units.

## Battery

These parameters, except for SoC Maximum and SoC Minimum, can only be accessed by Socomec when the system is commissioned. They enable the customer's installation to be configured on the basis of the type and number of batteries.

| Designations      | Descriptions                    | Value ranges |
|-------------------|---------------------------------|--------------|
| Maximum SOC Value | Maximum level of battery charge | 0 to 100%    |
| Minimum SOC Value | Minimum level of battery charge | 0 to 100%    |



| SOC CONFIG  | EMS CONFIG | SYSTEM CONFIG  | ISLANDING CONFIG |
|---|------------|--|------------------|
| <b>SYNCHRONIZATION</b><br>Delta Voltage in Synchro [V] 5<br>Delta Freq. in Synchro [1/100Hz] 0.50<br>Delta Phase in Synchro [°] 5<br>Post Synchro Time before close [s] 3<br>Max. Time to Synchro [s] 180<br>Adjust Of Phase During Synchronization [°] 0 |            | <b>ISLANDING</b><br>Max. Time Of Zero Power Ramp [s] 30<br>Threshold of Zero Power Ramp [kW] 5<br>Min. Capability for Islanding [%] 10<br>BlackStart Mode [50 V - 230 V] 50 V      |                  |
| <b>VOLTAGE ADJUSTMENT</b><br>Nominal Voltage Islanding Controller [V] 0<br>Voltage Transformer Ratio 0.00   |            | <b>P(f)</b><br>Power Threshold to Active P(f) [% Pnom] 100<br>SOC Threshold to Active P(f) [%] 85<br>Initial P(f) Step of Freq. [mHz] 200<br>P(f) Max Deviation of Freq. [mHz] 600 |                  |

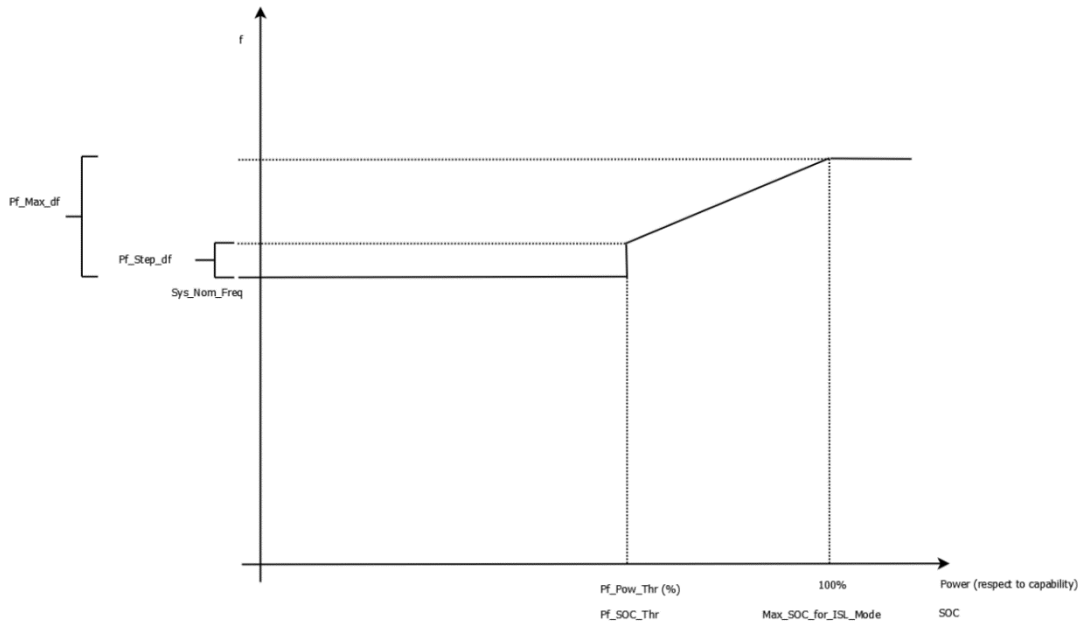
  

Islanding

| Designations                  | Descriptions   | Value ranges |
|-------------------------------|--|--------------|
| Max. Time Of Zero Power Ramp  | Total time for the power ramp of the storage system before the Off-Grid mode. Whenever the PMS moves to Off-Grid mode, it increases the power of the storage unit until the power level is zero at the point of exchange with the grid.  | 000 to 600s  |
| Threshold Of Zero Power Ramp  | Power level at which the system will disconnect from the grid when moving to Off-Grid mode.  | 1 to 50kW    |
| Max. SOC For Islanding        | If the SoC is greater than this value, it is no longer acceptable to move to Off-Grid mode. If the system is already in Off-Grid mode and if the grid is present, it will move into On-Grid mode. Set the value -1 to disable this function.   | 0 to 100%    |
| Min. SOC For Islanding        | If the SoC is lower than this value, it is no longer acceptable to move to Off-Grid mode. If the system is already in Off-Grid mode and if the grid is present, it will move into On-Grid mode. Set the value -1 to disable this function.   | 0 to 100%    |
| Min. Capability for Islanding | Minimum capacity of the PCS in % of nominal power to move into Off-Grid mode.  | 0 to 100%    |
| BlackStart Mode               | Voltage threshold for closing the CBS circuit breaker that provides power to the microgrid in simple voltage (Ph-N).<br>50V (=87 Vac Ph-Ph): CBS is closed when this value is reached and a ramp up to 230 Vac is done. Is useful when charging while making a strong call for current, e.g. transformer, motor...<br>230V (=400 Vac Ph-Ph): CBS is closed up to this value. | 50 or 230    |

**P (F) function** – Only used in Off-Grid mode:

This enables the amount of power being injected into the microgrid by sources like PV or wind turbines to be limited in cases of overproduction. This is characterised by a curve that increases frequency in response to power or SOC thresholds. See below:



This function is managed by the PMS and the user can play with the different settings to optimise his system to best advantage. These parameters can be accessed in USER mode.

| Designations                   | Descriptions   | Value ranges                     |
|--------------------------------|--|----------------------------------|
| Power Threshold to Active P(f) | Activation threshold for function P(f) expressed by the power injected into the battery                    | 0 to Max power, PCS installation |
| SOC Threshold to Active P(f)   | Activation threshold for function P(f) expressed by the SOC (level of battery charge)                      | 0 to 100%                        |
| Initial P(f) Step or Freq.     | 1 <sup>st</sup> frequency step when function P(f) starts up  | 0000 to 2000 mHz                 |
| P(f) Max Deviation of freq.    | Maximum variation in frequency of function P(f) achieved for maximum power or for SOC Max in Off-Grid mode | 0000 to 5000 mHz                 |

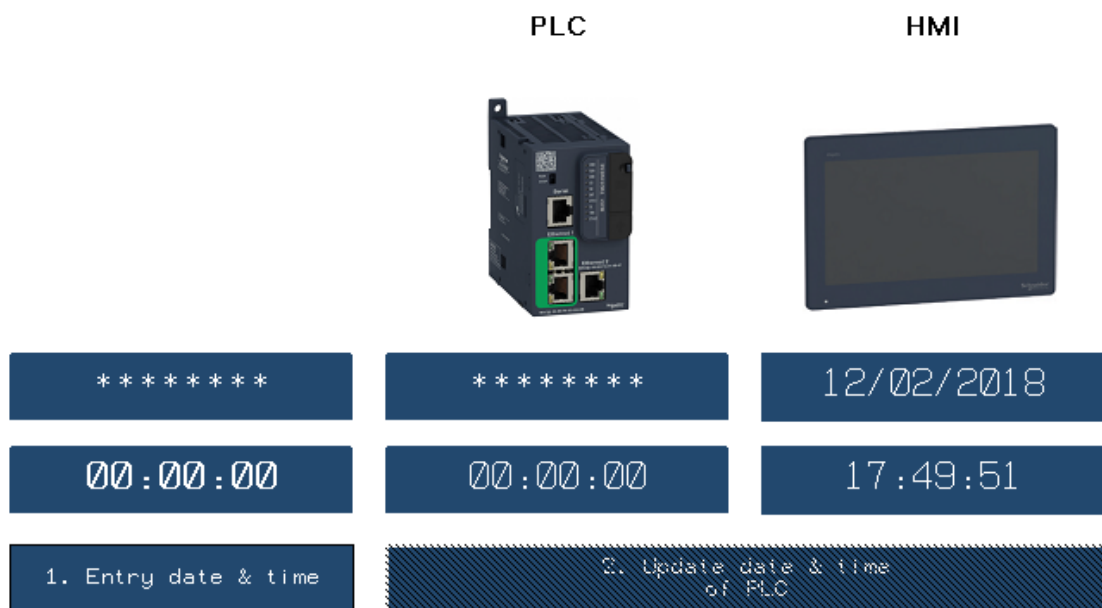
## 10. Screen 10: SETTINGS

The screen to set date and time, shown below, appears when you click on the date or time in the above part of the screen.



Stage 1: Set the desired date and time by pressing the buttons above (in red boxes) and by filling in details in the new window. Confirm your data input by pressing « Enter ».

Stage 2: Push the button “Update date & time of PLC” => data is automatically updated in the PLC and the HMI



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