



ECO CONTROLLER USER MANUAL

Draft version 1.6

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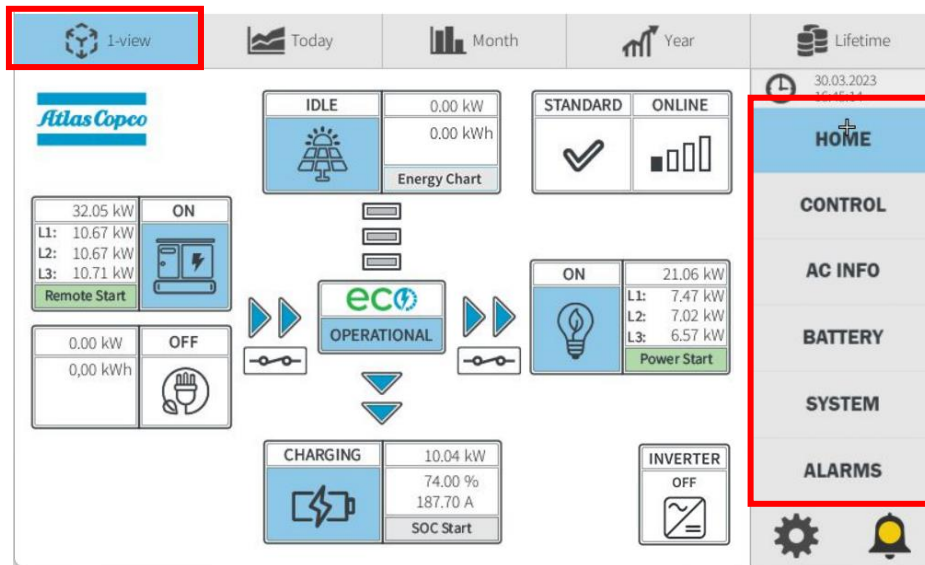
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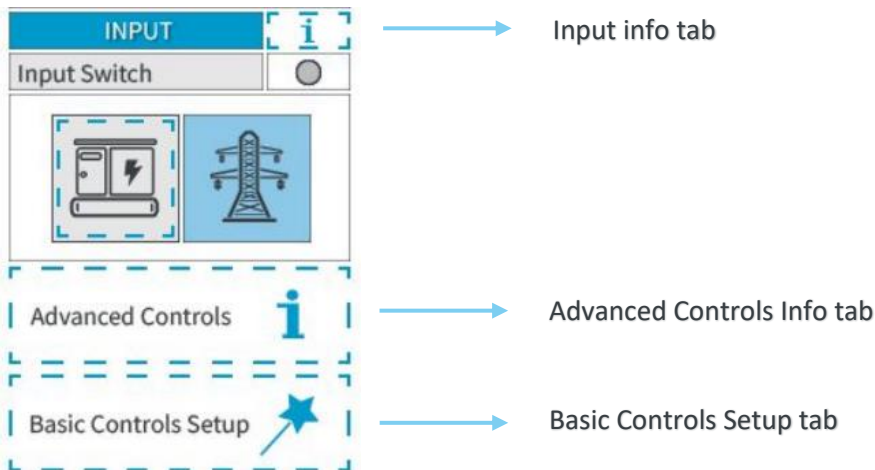
1. General

1.1. 1-View

Provide the access to main side tabs which contains data, controls and information of the ECO Controller User Interface.



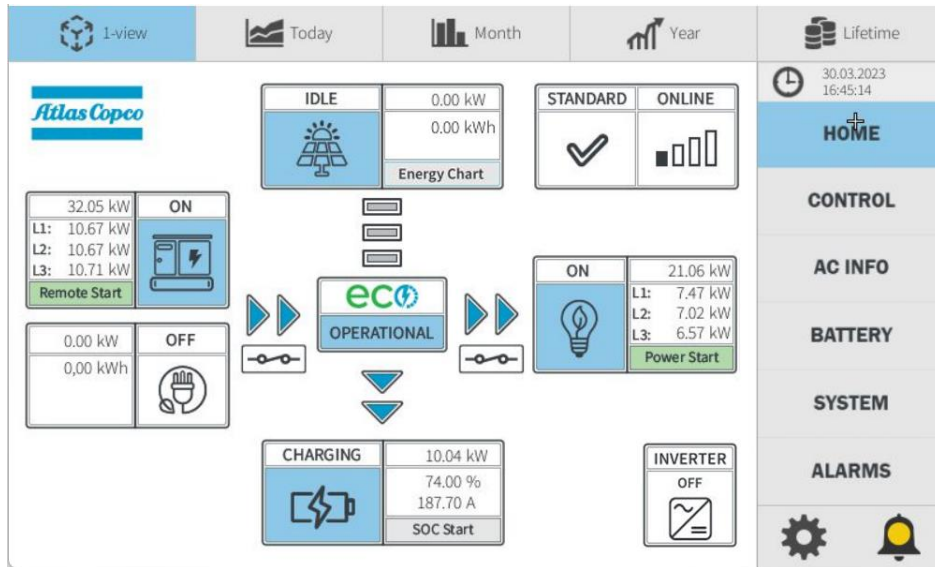
- Additional tabs are displayed with blue dotted rectangular marks that can be clicked on.



2. Main side tabs

2.1. Home

The home tab provides basic information of the overall performance and status of the ZBP and allows access to additional data when optional modes have been activated.



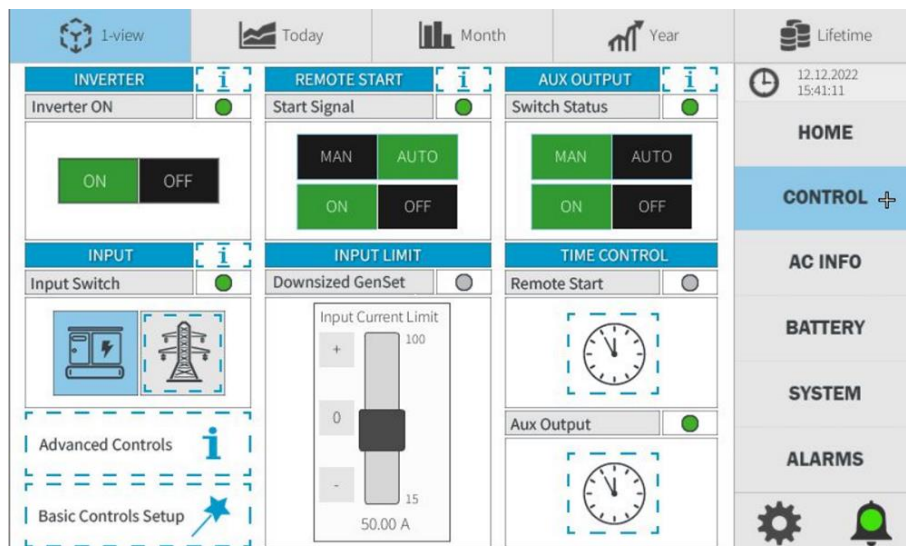
The home tab shows how real-time power is efficiently distributed and what is the state of the main key components such as available energy sources, battery and output. It contains following features:

- ECO Controller
 - Status: Operational, Parking, Stand-by & OFF ([see section 3.11.1](#)).
- AC Input Source (Generator or Mains)
 - Data: Instantaneous Total Power & Power per phase/leg.
 - Status: ON, Idle or OFF.
 - Indicators:
 - Manual mode: When Remote Start is in MAN mode allowing manual control of the Input Source.
 - Remote Start in Green: If Remote Start is in AUTO ON mode
 - Remote Start in Grey: If Remote Start is in AUTO OFF mode
 - Warm up: When ZBP is allowing the Generator to initially warm up.
 - Phase Rotation: Shown if this alarm is triggered ([see section 2.6](#))
 - Input Switch: Show if Input Switch is Open or Closed
- Parking Input Source
 - Data: Instantaneous Power and Daily Energy. Some ZBP models also show Voltage and Current.
 - Status: ON, Idle & OFF.
 - Indicators:
 - Reverse Polarity: Shown if this alarm is triggered ([see section 2.6](#))
- Solar
 - Data: Instantaneous DC Power, Daily Energy, Voltage and Current.
 - Status: ON, Idle & OFF.
 - Energy Charts: Access to Solar Energy values data and charts ([see section 3.16](#)). Available only if solar is included on the ZBP.
- Battery
 - Data: Instantaneous DC Power (+ charging / - discharging), State of Charge (SOC) & Daily Charging & Discharging Energy.
 - Status: Charging, Discharging, Idle & OFF
 - Indicators:

- **SOC Start** in **Green**: If Low SOC condition to activate AC Input Source is triggered ([see section 3.6](#)).
 - **SOC Start** in **Grey**: If Low SOC condition to activate AC Input Source is not triggered.
 - **Minimum Charge**: Related to Charge Soft Start ([see section 2.5](#)) that indicates the Charging is limited to avoid initial load impact on the GenSet.
 - **Output**
 - Instantaneous Total Consumed Power & Power per phase/leg.
 - Status: ON, Idle or OFF.
 - Indicators:
 - **Power Start** in **Green**: If high output power condition to activate AC Input Source is triggered ([see section 3.6](#)).
 - **Power Start** in **Grey**: If high output power condition to activate AC Input Source is not triggered.
 - **Output Switch**: Show if Output Switch is Open or Closed.
 - The arrows indicate the direction of the instantaneous power.
 - The widget on the top right corner shows the following info:
 - ZBP selected mode.
 - Standard
 - Series ([see section 4.2](#))
 - AC Coupled ([see section 4.3](#))
 - Internal communication issue alarm
 - Internet Signal Status
 - Series mode data access tab if activated.
 - External GenSet Controller data access tab if activated ([see section 4.1](#)).

2.2. Control

It contains the controls to setup and operate the ZBP whether connected to an AC Input Source and a Load on site or connected to a single-phase input on depot for a slow maintenance charge. In addition to multiple info tabs that can be accessed to help users understand how to use these controls and the advanced controls info tab that shows an overview of the internal settings and selected optional modes and functions, there is also a basic control setup to guide first time user to easily configure the controls for their installation.



- Additional tabs:
 - [Advanced Controls](#): Summary of the internal assigned settings ([see section 2.8](#)).
 - [Basic Controls Setup](#): Guide to easily setup the controls of the ZBP ([see section 3.13](#)).

2.2.1. Inverter

Virtual switch to control Inverter & Solar Charge Controller

- Switch
 - ON: Inverter and Solar Charge Controller are Active
 - OFF: Inverter and Solar Charge Controller are OFF
- Indicator
 - Inverter ON in **Green**: Inverter and Solar Charge Controller are ON
 - Inverter ON in **Grey**: Inverter and Solar Charge Controller are OFF
- Additional tab:
 - Inverter Info ([see section 3.5](#))

2.2.2. Input Selector

Allows to select whether the AC Input Source is a GenSet or Grid.

- GenSet as Input
If the user selects the GenSet as AC Input Source (GenSet icon in **blue**), GenSet alarms, Warm up function and Charge Soft Start function will be enabled.
- Mains as Input
If the user selects the Mains as AC Input Source (Mains icon in **blue**), Mains alarm will be enabled and Warm up function and Charge Soft Start function will be disabled.
Note that additional certifications and/or an external certified device might be required when connecting the ZBP to Mains. Please, check for current approvals.
- Indicator
 - Input Switch in **Green**: Input Switch is Closed ([see section 3.1.1](#))
 - Input Switch in **Grey**: Input Switch is Open
- Additional tab:
 - Input Info ([see section 3.1](#))

2.2.3. Remote Start

Control of the signal to Start/Stop the AC Input Source based on configurable management optimization algorithms.

- **MAN mode**. Status ON or OFF must be selected by user.
 - ON: Force signal ON (Start)
 - OFF: Force signal OFF (Stop)
- **AUTO mode**. ECO Controlling is automatically deciding the status ON or OFF according to following conditions:
 - **ON**: If one of below condition is Active
 - **OFF**: If all below conditions are OFF
 - Conditions ([see section 3.6](#)):
 - [Load Power Start](#)
 - Based on total output power

- Configurable Start / Stop Power Setpoints and Stop delay
- Inverter Power Start
 - Based on ZBP nominal power per phase
 - Configurable Start / Stop setpoints and Stop delay
- SOC Start
 - Based on Battery SOC (State of Charge)
 - Configurable Start / Stop setpoints and Stop delay
- Timer Start
 - Based on configurable timer by pressing the Clock Icon on Time Control
- Indicator
 - Start Signal in **Green**: Remote Start is ON
 - Start Signal in **Grey**: Remote Start is OFF
- Additional tab:
 - Remote Start Info ([see section 3.3](#))

2.2.4. Input Limit

This function allows the setting of the maximum current per phase that can input the ZBP. This setting may be used, for example, to prevent a low rated GenSet from overloading and thus avoid inverter disconnection due to GenSet voltage drop or to set the maximum power that the Mains supply can deliver.

- Downsized GenSet: Charging power is automatically reduced to avoid big load steps that cause a voltage / frequency drop in small generators that make the inverter consider it as unreliable source. This function is enabled when input current limit is <45A for 50Hz units or <90A for 60Hz units.

2.2.5. Auxiliary Output

Control of the Auxiliary single phase output status

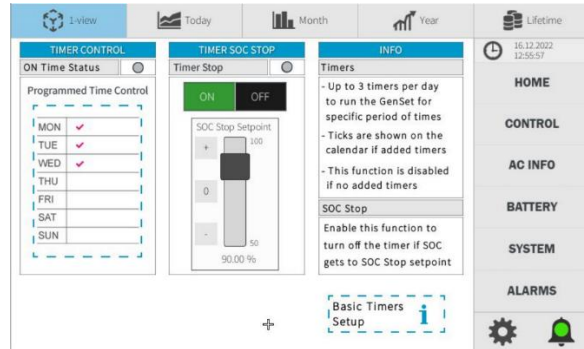
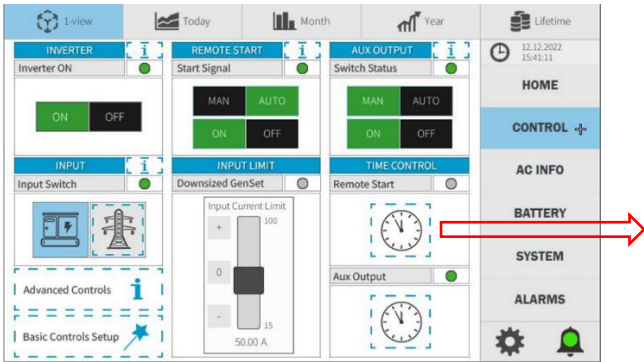
- **MAN mode.**
 - ON: Aux Output Enabled
 - OFF: Aux Output Disabled
- **AUTO mode.** Status ON or OFF based on configurable timer by pressing the Clock Icon on Time Control.
- Indicator
 - Switch Status in **Green**: Aux Output is Enabled
 - Switch Status in **Grey**: Aux Output is Disabled
- Additional tab:
 - Auxiliary Output Info ([see section 3.4](#))

2.2.6. Time Control

Function to add up to 3 timers per day every day of the week for controlling the Remote Start and Auxiliary Output at specific period of times in AUTO mode.

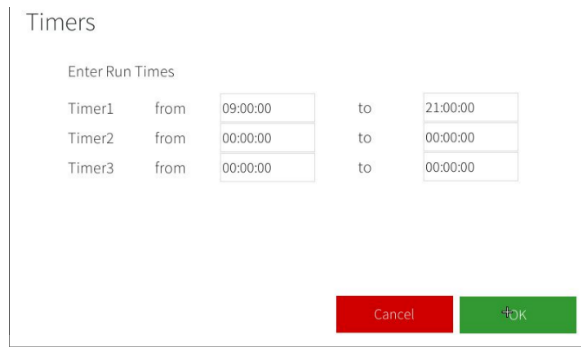
2.2.6.1. Remote Start Timer

Click on the clock widget to access the *Remote Start - Time Control* tab as shown below.



- Programmed Time Control

Click on the calendar widget to add timers as shown below. Time format period is 24h. A tick is displayed on the day that a timer has been added. If no timers are added, the Timer Start condition is OFF.

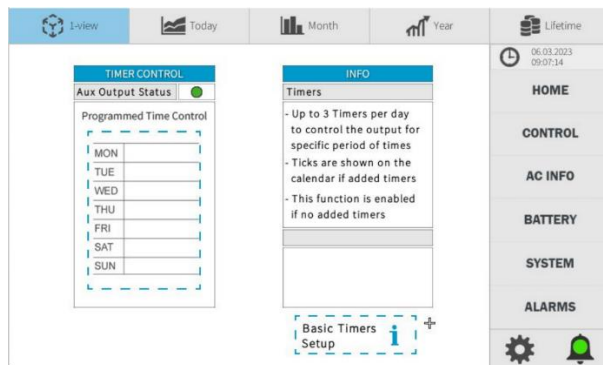
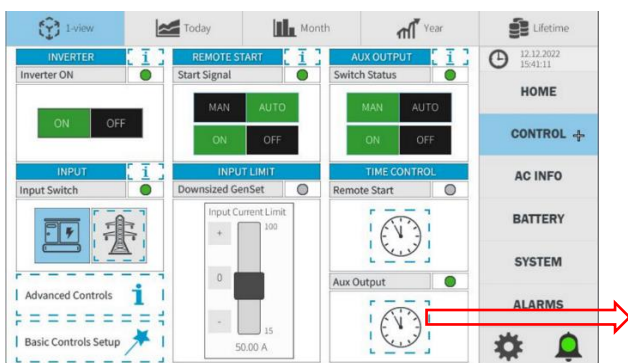


- Timer SOC Stop

Function that allows to add an extra condition to turn off the Remote Start signal if Battery SOC reached the SOC Stop Setpoint. Therefore, if this function is enabled, the Timer Start will turn OFF if time gets to defined end period as usual or if Battery gets to Stop setpoint.

2.2.6.2. Auxiliary Output Timer

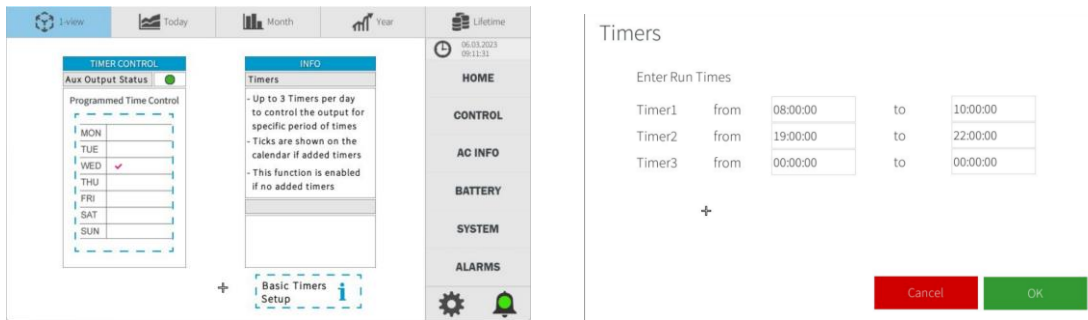
Click on the clock widget to access the *Auxiliary Output - Time Control* tab as shown below.



- Programmed Time Control

Same function as on Remote Control, where the calendar widget allows the user to add up to three times per day every day of the week. If timers are added, the Auxiliary Output will enable only during timer period, and will be disabled the rest of the time during that day. If no timers are added, the Auxiliary Output is Enabled.

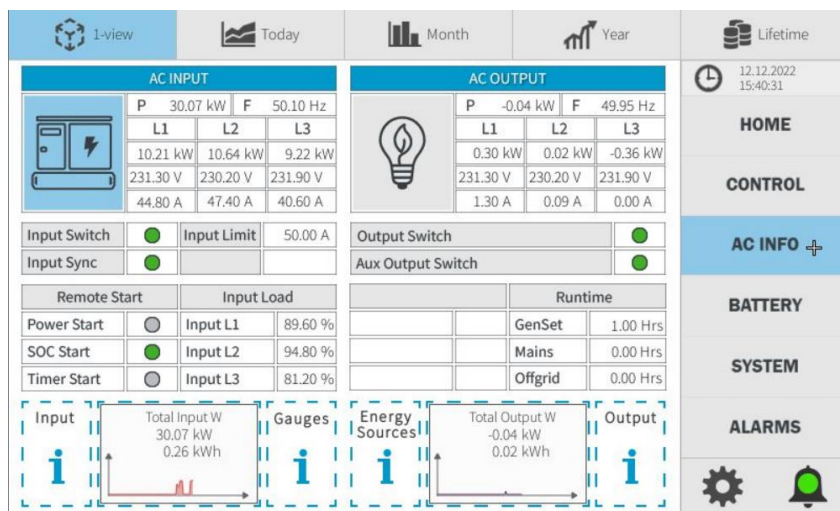
The following scenario shows 2x timers has been added on Wednesday, therefore the Auxiliary Output status will be as follows:



- Wednesday:
 - Output Enabled: From 8am to 10am & from 7pm to 10pm
 - Output Disabled: rest of that day
- Any other day of the week the output is enabled the entire day.

2.3. AC Info

Information recorded from the AC Input Source and the Output as well as related functions are displayed on this tab.



2.3.1. AC Input Info

- Data: Instantaneous Total Power, Frequency and Power, Voltage and Current per phase/leg.
- Input Switch Status:
 - Green: Input Switch is Closed ([see section 3.1.1](#)).
 - Grey: Input Switch is Open.
- Input Sync Status:
 - Green: ZBP is synchronized with the available AC Input Source
 - Grey: ZBP is not synchronized with the available AC Input Source
- Input Limit datapoint from Inverter which is set by selected setpoint on Control Tab ([see section 2.2.4](#)).

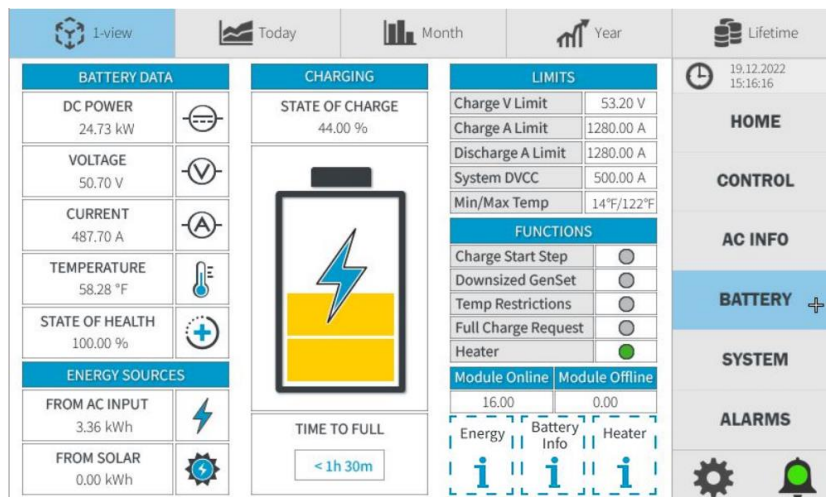
- Remote Start
 - **Power Start:** Auto condition to Start/Stop the AC Input Source based on Output Power.
 - **SOC Start:** Auto condition to Start/Stop the AC Input Source based on Battery SOC.
 - **Timer Start:** Auto condition to Start/Stop the AC Input Source based on timers.
- Input Load: Percentage of instant AC Input Power per phase determined by the selected Input Limit setpoint.
- Additional tabs:
 - Input Info ([see section 3.1](#)).
 - Total Input Power Chart ([see section 3.14](#)).
 - Gauges ([see section 3.7](#)).

2.3.2. AC Output Info

- Data: Instantaneous Total Power, Frequency and Power, Voltage and Current per phase/leg.
- Output Switch Status:
 - **Green:** Main Output Switch is Closed ([see section 3.4](#)).
 - **Grey:** Main Output Switch is Open.
- Auxiliary Output Switch Status:
 - **Green:** Auxiliary Output Switch is Closed ([see section 3.4](#)).
 - **Grey:** Auxiliary Output Switch is Open.
- Power Start
 - **Load Start:** Auto condition to Start/Stop the AC Input Source based on Total Output Power.
 - **Inverter Start:** Auto condition to Start/Stop the AC Input Source based on Nominal Power per phase.
- Runtime
 - **GenSet:** Daily runtime of the GenSet.
 - **Mains:** Daily runtime of the Mains.
 - **Offgrid:** Daily runtime of the Load when powered by battery and/or solar.
- Additional tabs:
 - Energy Sources ([see section 3.8](#)).
 - Total Output Power Chart ([see section 3.14](#)).
 - Output Info ([see section 3.4](#)).

2.4. Battery

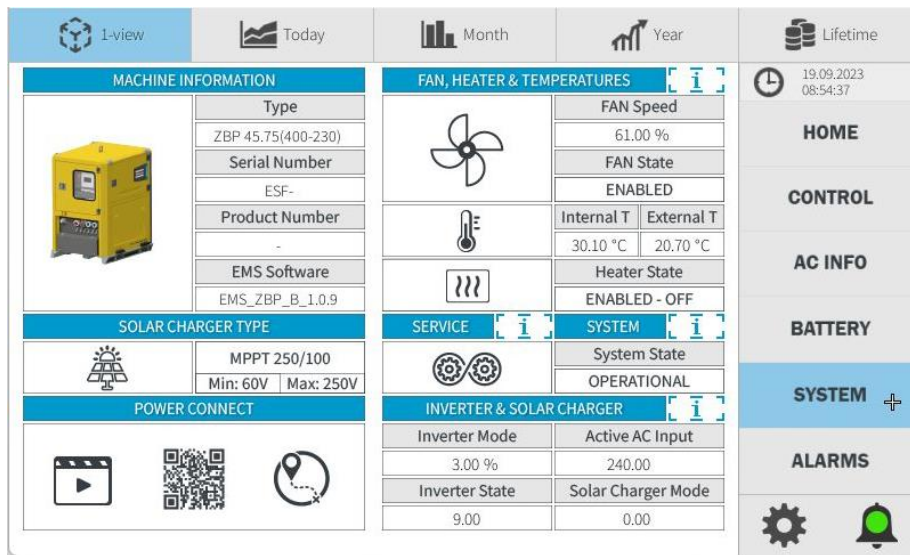
Historical and instantaneous information from the batteries is displayed on this tab



- Battery Data
 - DC Power (+ charging / - discharging)
 - Voltage: Battery DC bus voltage (V)
 - Current: Battery DC bus current (+ charging/- discharging)
 - Temperature: Average battery bank temperature (°C or °F).
 - State of Health: **It is a measurement that indicates the level of degradation and remaining capacity of the battery bank.**
- Energy Sources
 - From AC Input: Daily Energy used to charge the battery from the available AC Input Source.
 - From Solar: Daily Energy used to charge the battery produced by Solar.
- State of Charge: Available storage level of the battery.
- Time to Full: Approximated time to fully charge the battery at current charging power.
- Limits
 - Charge V Limit, Charge A Limit & Discharge A Limit: Protection parameters set by battery manufacturer.
 - System DVCC: Max Battery Charging in amps set at inverter and solar charge controller. This parameter is automatically adjusted by ECO Controller.
 - Min/Max Temp: Operating temperature range in °C or °F of the battery bank.
- Functions
 - Charge Soft-Start: It assists the GenSet in a smooth transition to full power by initially limiting the battery charge power for a short period. The delay can be customized ([see section 2.8.3.2](#)).
 - Manual Charge mode: Allows to select a fixed maximum charge current.
 - Full Charge Request: Improve calibration of SOC for optimal performance
 - Heater (optional): Heat the batteries when an AC Input source is connected to avoid power restrictions due to low temperature.
- Modules online/offline: Display the total number of battery modules contained in the ZBP and their connection status.
 - Online: number of modules that are communicating and available for charging or discharging.
 - Offline: number of modules with communication failure that could block charging or discharging. Alarms will be triggered if offline modules are detected, and charge or discharge is compromised ([see section 3.10](#)).
- Additional Tabs
 - Energy ([see section 3.15](#)).
 - Battery Info ([see section 3.9](#)).
 - Heater ([see section 3.12](#)).

2.5. System

The system tab displays general information for the ZBP with access to inverter reset & fan test functions, system mode descriptions and VEBus Error code meanings.



- Machine Information: Shows specific information of your ZBP unit.
- Service: Password protected tab for Atlas Copco service.
- Power Connect: QR code for easy access to repair parts after entering the serial number of the ZBP. <https://powerconnect.atlascopco.com>
- Fan:
 - Fan Speed
 - Fan Status: Enabled or disabled
- Temperatures: Internal & External Temperature sensors in °C or °F
- Heater State: Enabled (ON or OFF) or disabled
- System State: Operational, parking, stand-by or OFF.
- Inverter & Solar Charger
 - Inverter mode code number which can be Charger Only, Inverter Only, ON, OFF.
 - Inverter State code number
 - Inverter Active Input code number which is 2 when connected to an AC Input Source.
 - Solar Charger mode code number which can be OFF, Voltage/current limited, Active & Not Connected.
- Additional tabs:
 - Fan & Heater Test ([see section 3.12](#)).
 - System Info ([see section 3.11](#)).
 - Inverter Info ([see section 3.5](#)).

2.6. Alarms

This tab displays both warnings (yellow) and alarms (red) in real time, with access to troubleshooting guides that provide users with simple instructions on how to deactivate them.

1-view	Today	Month	Year	Lifetime
INPUT <ul style="list-style-type: none"> Genset Fail to Start <input type="radio"/> Genset Fail to Stop <input type="radio"/> Phase Rotation <input type="radio"/> Mains Power Failure <input type="radio"/> Input Limit Conflict <input type="radio"/> Reverse Polarity <input type="radio"/> 		INVERTER <ul style="list-style-type: none"> Inverter Offline <input checked="" type="radio"/> Gateway Offline <input checked="" type="radio"/> Inverter Fault <input type="radio"/> Inverter Overload <input type="radio"/> VeBus Error 0.00 <input type="radio"/> 		19.12.2022 17:15:30 HOME CONTROL AC INFO BATTERY SYSTEM ALARMS +
BATTERY <ul style="list-style-type: none"> BMS Offline <input checked="" type="radio"/> Battery Critically Low <input type="radio"/> Charge or Discharge Error <input type="radio"/> Unauthorised Battery <input type="radio"/> Extreme Cold Temp <input type="radio"/> Battery Low <input type="radio"/> Battery Module Offline <input type="radio"/> 		SYSTEM <ul style="list-style-type: none"> Emergency Stop <input checked="" type="radio"/> Smartbox Offline <input checked="" type="radio"/> Mode Error <input type="radio"/> Overdischarge Protection <input type="radio"/> RCD Trip <input type="radio"/> Limit Switch <input type="radio"/> Maintenance Required <input type="radio"/> 		⚙️ 🔔

- Input ([see section 3.2](#)).
- Battery ([see section 3.10](#)).
- Inverter ([see section 3.5](#)).
- System ([see section 3.11](#)).

2.7. Alarms log

Logging of real-time and historical information on internal events, warnings and alarms, where users can check when they were triggered and cleared. It can be accessed by pressing the bottom right belt icon.

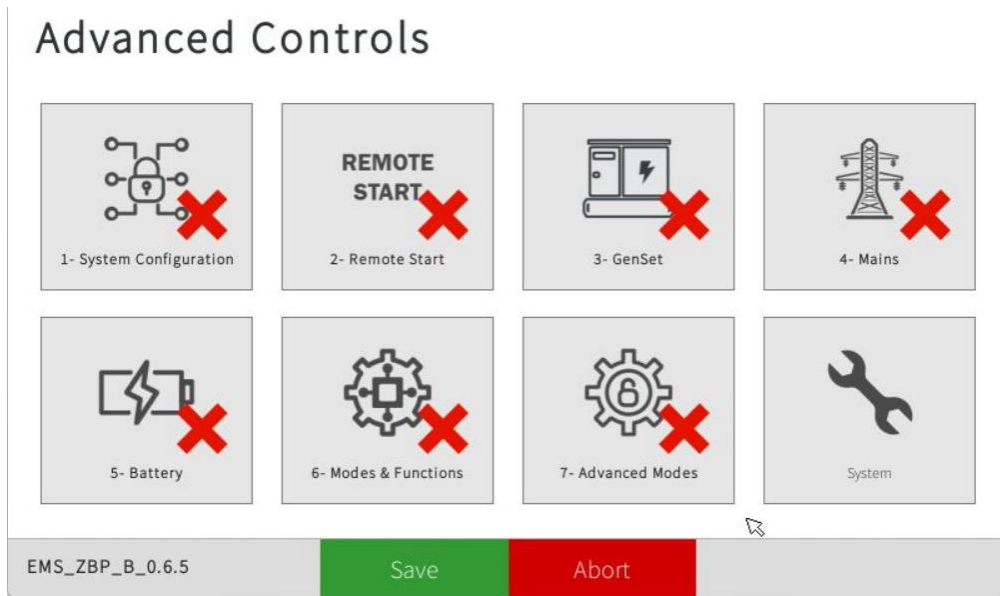
Time	Location	Element	Message
02.11.2022 09:52	Batterystorage	INV_192.168.1.100	VICTRON INV_192.168.1.100 Error:No Errors / Warnings (8015)
02.11.2022 09:52	Alerts	Battery Critically Low	Alert: Battery Critically Low (alert_165268966) (800)
02.11.2022 09:52	Alerts	Battery Low	Alert: Battery Low (alert_1652689766) (800)
02.11.2022 09:52	Alerts	Smartbox Offline	Alert: Smartbox Offline (alert_1653995964) (800)
02.11.2022 09:52	Alerts	Overdischarge Protection	Alert: Overdischarge Protection (alert_1652690580) (800)
02.11.2022 09:52	Alerts	Parking mode Disabled	Alert: Parking mode Disabled (alert_1652689585) (800)
02.11.2022 09:52	Batterystorage	INV_192.168.1.100	VICTRON INV_192.168.1.100 Error:Low Battery Warning -L1 Low Battery Warning -L2
02.11.2022 09:51	Batterystorage	INV_192.168.1.100	VICTRON INV_192.168.1.100 Error:No Errors / Warnings (8015)
02.11.2022 09:51	Batterystorage	INV_192.168.1.100	VICTRON INV_192.168.1.100 Status: Inverter-Status:0 - Battery-Status:0 - VE-Bus-Status:
02.11.2022 09:51	Alerts	Battery BMS Offline	Alert: Battery BMS Offline (alert_1652689963) (800)
02.11.2022 09:51	Batterystorage	INV_192.168.1.100	Inverter Error:Timeout (INV_192.168.1.100) (8001)
01.11.2022 00:33	Alerts	Battery Critically Low	Alert: Battery Critically Low (alert_165268966) (800)
31.10.2022 10:13	Alerts	Overdischarge Protection	Alert: Overdischarge Protection (alert_1652690580) (800)

2.8. Advanced Controls

This tab contains advanced functions to edit, enable or disable additional operating modes and internal settings that allow users to easily customize the ZBP to provide the best performance for the most demanding applications.

Note that the ECO Controller will reset itself to update the changes once the user clicks on SAVE button. Do not proceed if ZBP is in operation mode.

An overview of the assigned advanced controls settings of the ZBP is located on Advanced Control Info tab ([see section 3.6](#)).



2.8.1. How to Activate or Deactivate functions

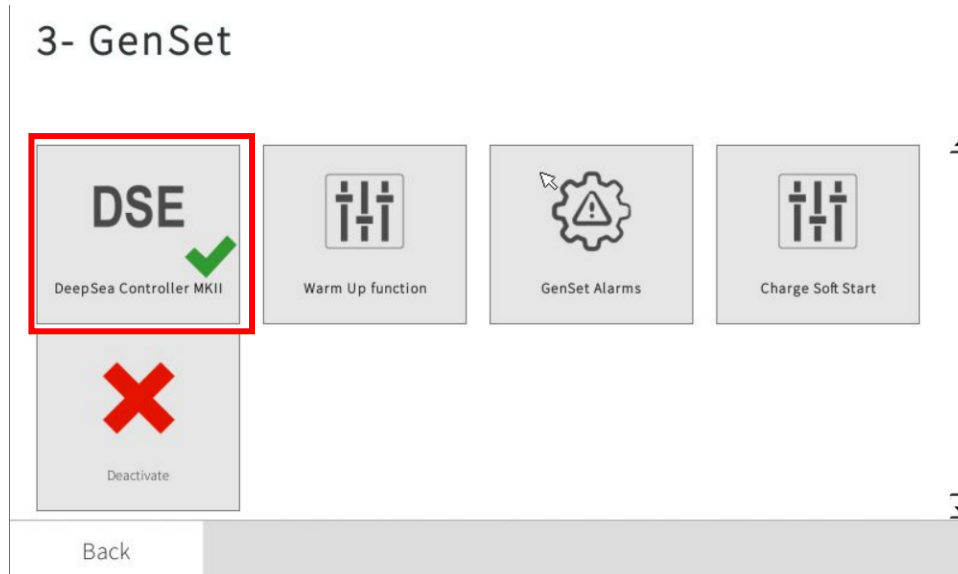
Each function of the Advanced Controls tab can be activated or deactivated to apply the new changes or restore the default settings.

2.8.1.1. Activate procedure

- Edit the settings of the function according to your requirements within the predefined range of max and min values.
- Click on “Activate” button



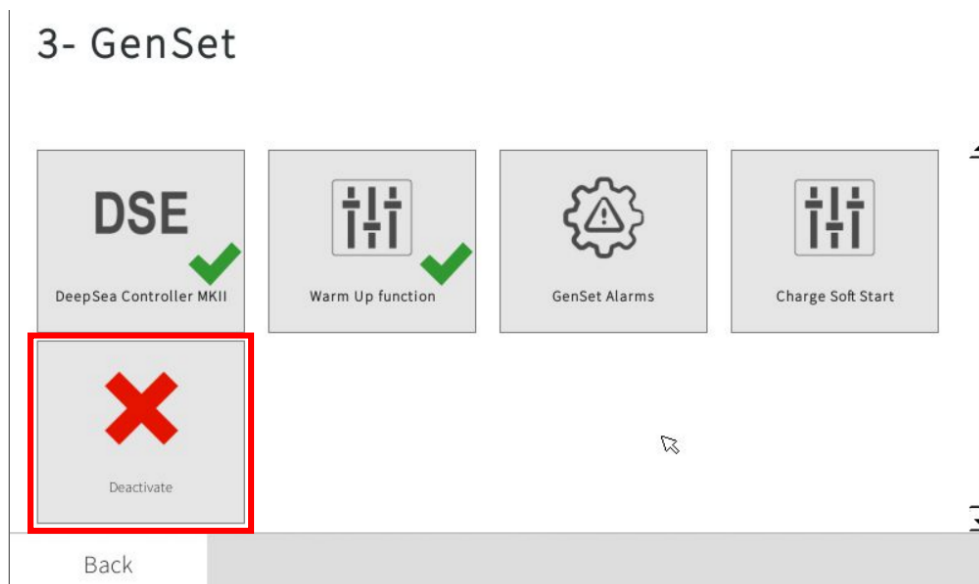
- Green check marks are shown if a function is activated.



- Click on SAVE button located on the Advanced Controls landing tab to reset the ECO Controller and apply the new settings.

2.8.1.2. Deactivate procedure

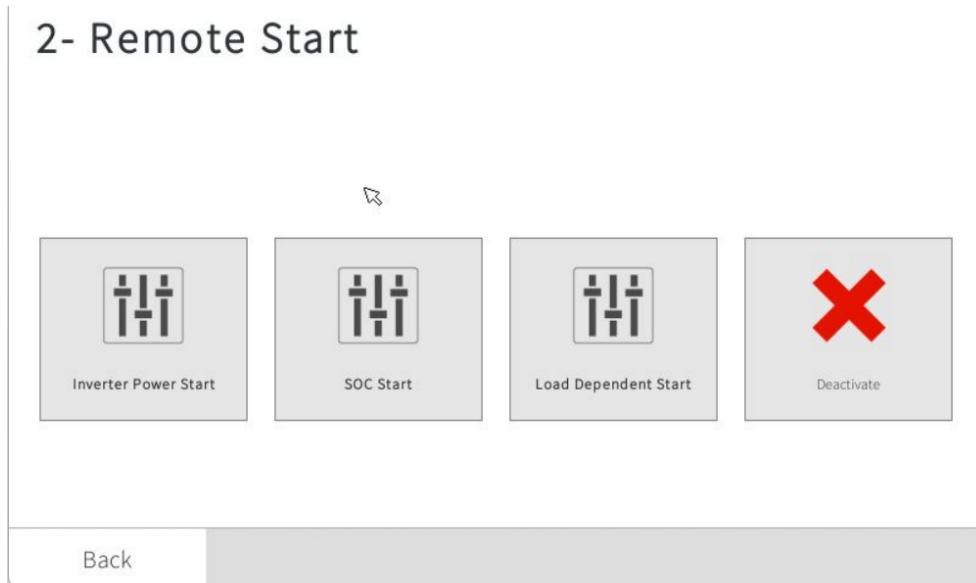
- Restore to default all functions from a specific module
 - Select the module and click on Deactivate.



- Click on SAVE button located in the Advanced Controls landing tab to reset the ECO Controller.

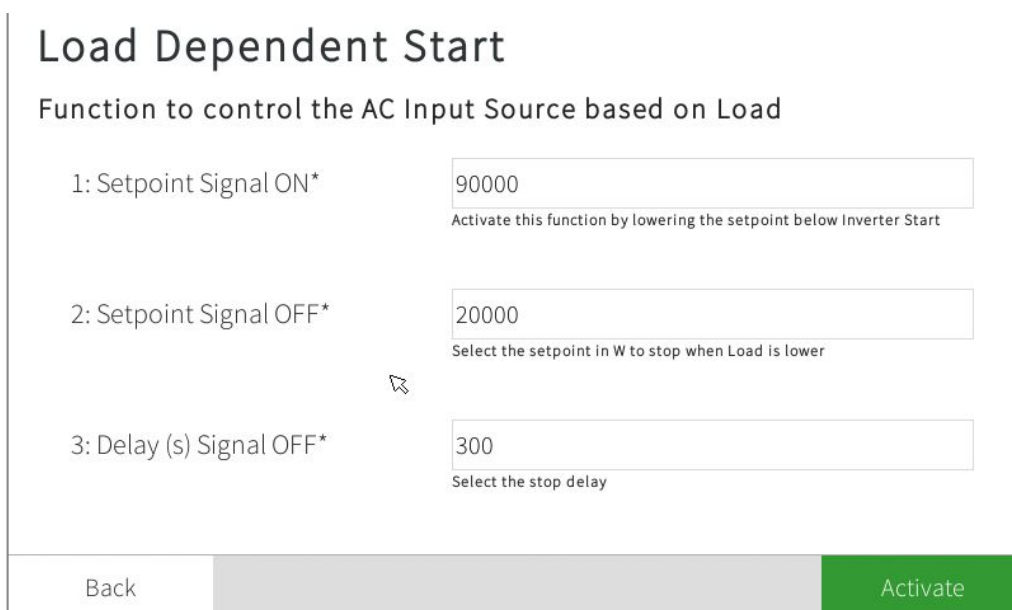
2.8.2. Remote Start

Provide the customizable settings when Remote Start is in Auto mode to control the signal to Start/Stop the AC Input Source.



2.8.2.1. Load Dependent Start

Function to customize the setpoints of the condition to control the Remote Start signal based on total output power. This function is disabled until the Setpoint Signal ON is lowered than Inverter Start Signal ON setpoint multiplies by number of phases of the ZBP. For instances, if Inverter Start Signal ON is 10,2kW and the ZBP is a 45kVA, then the Load Dependent Start Signal ON must be lowered than 30kW.



2.8.2.2. Inverter Power Start

Function to customize the setpoints of the condition to control the Remote Start signal based on ZBP nominal power per phase. Make sure to select the same delay in both **Stop – Delay Setpoint** & **Stop – Show Delay on UI**.

Inverter Power Start

Function to control the AC Input Source based on nominal power per phase

1: Start - Power Setpoint*	<input type="text" value="0.85"/>
	Select the Start Setpoint (Nominal W per phase*%)
2: Stop - Delay Setpoint*	<input type="text" value="300"/>
	Select the stop delay
2: Stop - Show Delay on UI*	<input type="text" value="300"/>
	Enter same delay value to update the UI

Back Activate

2.8.2.3. SOC Start

Function to customize the setpoints of the condition to control the Remote Start signal based on Battery SOC.

SOC Start

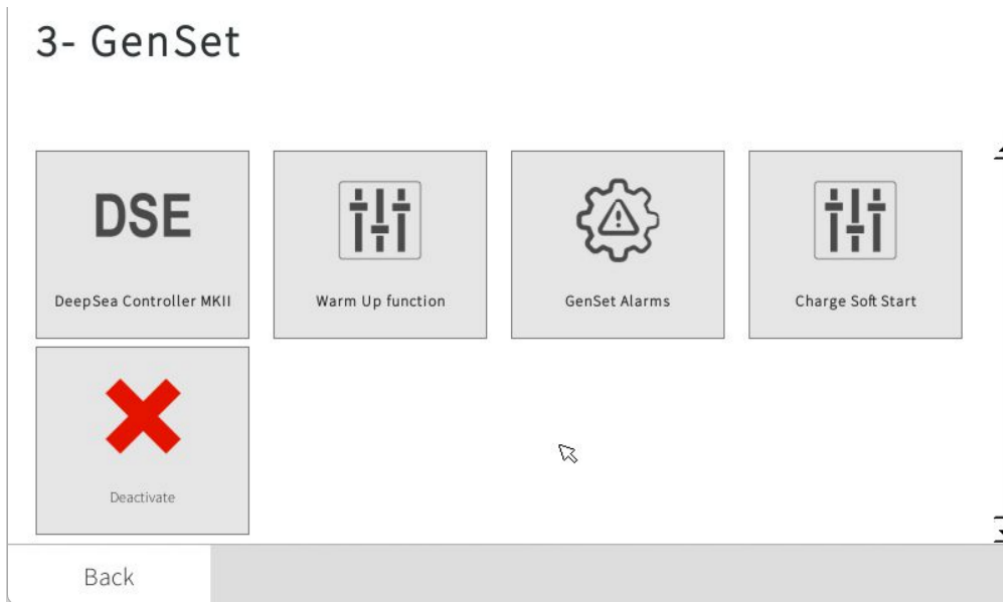
Condition to control the AC Input Source based on Battery SOC. Make sure Signal ON is lower than Signal OFF.

1: Signal ON - Setpoint*	<input type="text" value="10"/>
	Select the Start Setpoint (min= 10%, max= 90%)
2: Signal OFF - Setpoint*	<input type="text" value="100"/>
	Select the Stop Setpoint (min= 40%, max= 100%)
3: Signal OFF - Delay*	<input type="text" value="120"/>
	Select the stop delay (min= 60s, max= 1800s)

Back Activate

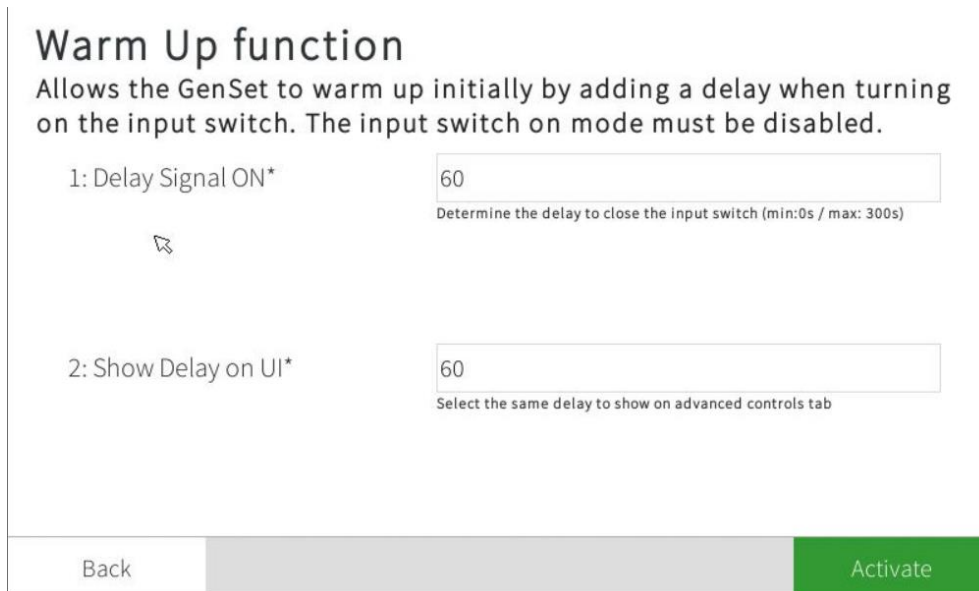
2.8.3. GenSet

Provide the customizable settings when GenSet is selected as main AC Input Source.



2.8.3.1. Warm Up function

The user can edit the delay to synchronize the ZBP with a running Generator to increase or decrease its warm-up time before supplying power to the ZBP. Modify these settings to suit the requirements of your Generator or application.



2.8.3.2. Charge Soft Start

Function to select how long the battery charging power is restricted to a minimum when starting the GenSet ([see section 2.5](#)).

Charge Soft Start

Charge battery at minimum power when starting the GenSet. Input switch on mode must be disabled.

Delay Setpoint*

Select the initial slow charge period (min: 0s, max: 600s)

Back Activate

2.8.3.3. Deepsea Controller MKII

Function to allow communication with a Deepsea Controller MKII connected to the ECO Controller via rs485. The user can also determine the setpoint to trigger an alarm based on the level of fuel recorded by the Deepsea controller.

A new tab is displayed with data and controls from the Deepsea device on the Home tab after activated ([see section 4.1.2](#)).

DeepSea Controller MKII

Enable communication with Deepsea controllers that support modbus rs485

Fuel Low - Alarm setpoint (%)*

Select the value to trigger the alarm when fuel level is below (0% / 50%)

Back Activate

2.8.3.4. GenSet Alarms

Function to customize the delays to trigger alarms related to GenSet.

Alarms

Active alarms when GenSet is selected as AC Input Source

GenSet Fail to Start - Delay*
Select the delay to trigger this alarm (min=60s, max 600s)



GenSet Fail to Stop - Delay*
Select the delay to trigger this alarm (min=60s, max 600s)

[Back](#) [Activate](#)

2.8.4. Mains

Provide the customizable settings when Mains is selected as main AC Input Source.

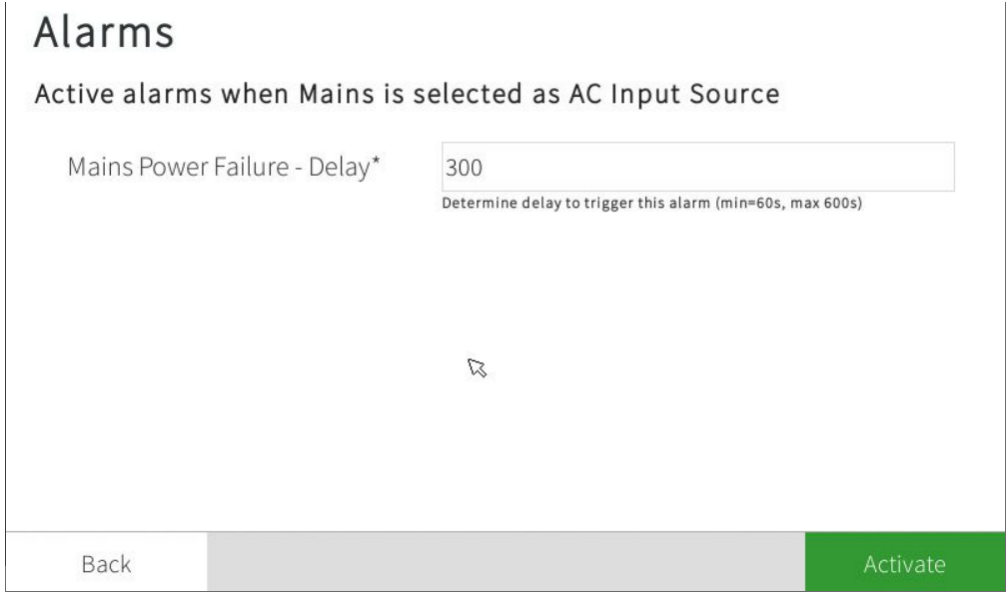
4- Mains

[Back](#)

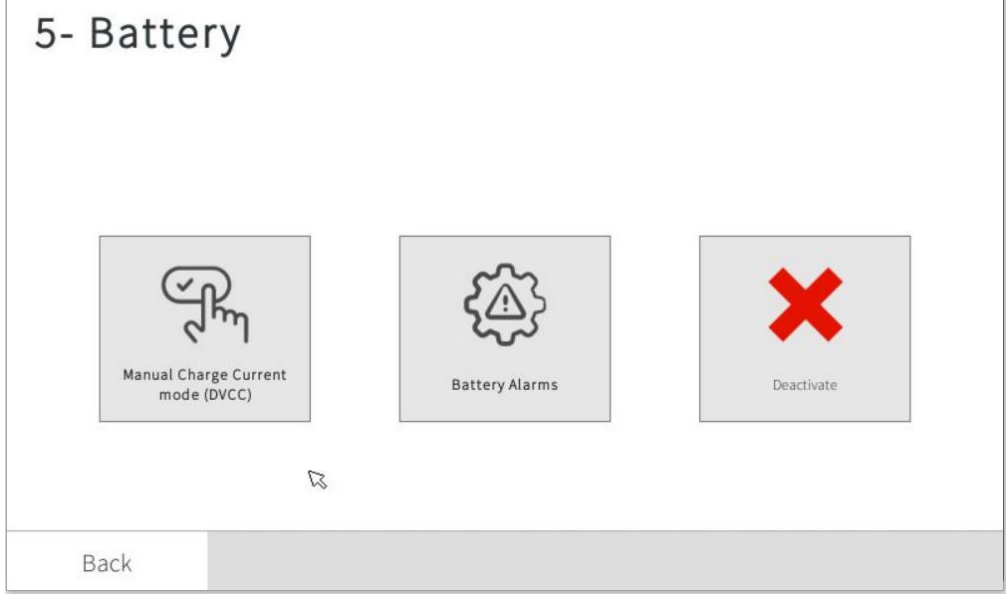
2.8.4.1. Mains Alarms

Function to customize the delays to trigger alarms related to Mains ([see section 3.2.5](#)).



2.8.5. Battery

Provide the customizable settings related to the battery of the ZBP.



2.8.5.1. Manual Charge Current mode (DVCC)

Function that allows the user to manually select a fixed maximum battery charge current and disable the automatically control of the charging power algorithm based on the size of the available GenSet. Therefore, Charge Soft Start and Downsized GenSet functions are deactivated if the Manual Charge Current mode is activated.

Manual Charge Current mode (DVCC)

Manually select a fixed battery max charge current. If enabled, Charge Start Step and Downsized GenSet functions are deactivated

Manual Setpoint*

Determine the setpoint to limit the max charge current

Back Activate

2.8.5.2. Battery Alarms

Function to customize the delays to trigger alarms related to Battery.

Battery Alarms

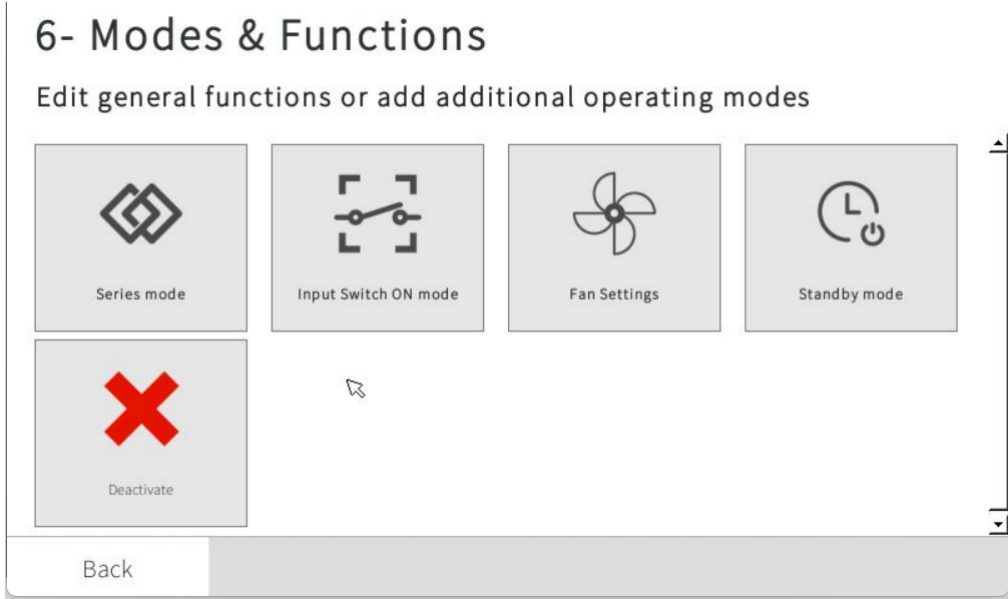
Battery Low - Setpoint*

Determine setpoint to trigger this alarm (min:9% / max: 60%)

Back Activate

2.8.6. Modes & Functions

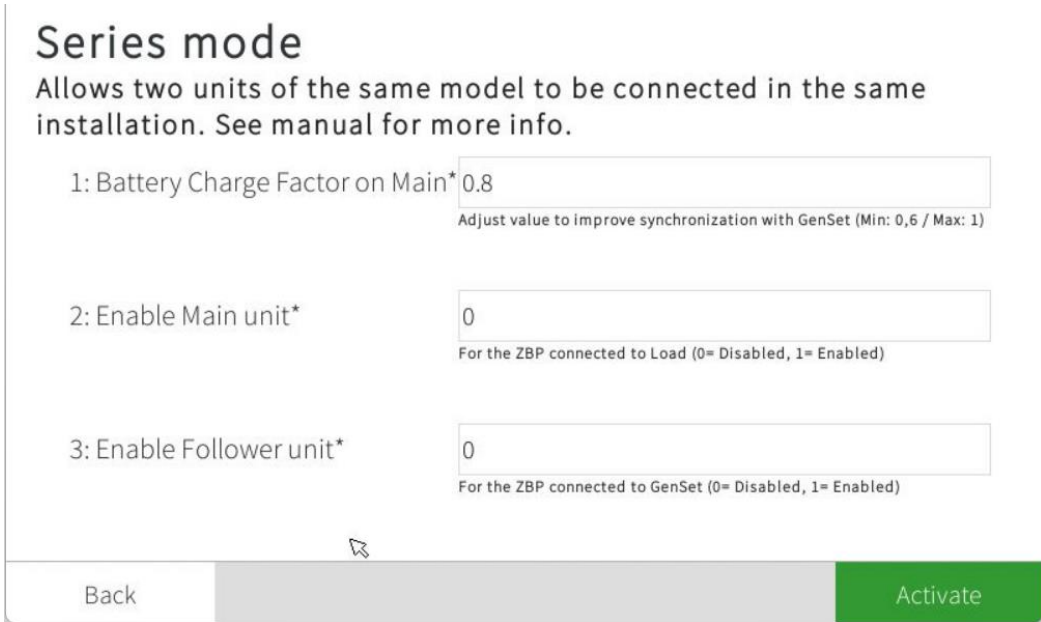
Allow to edit general functions and to activate and/or change settings of additional or existing operating modes of the ZBP.



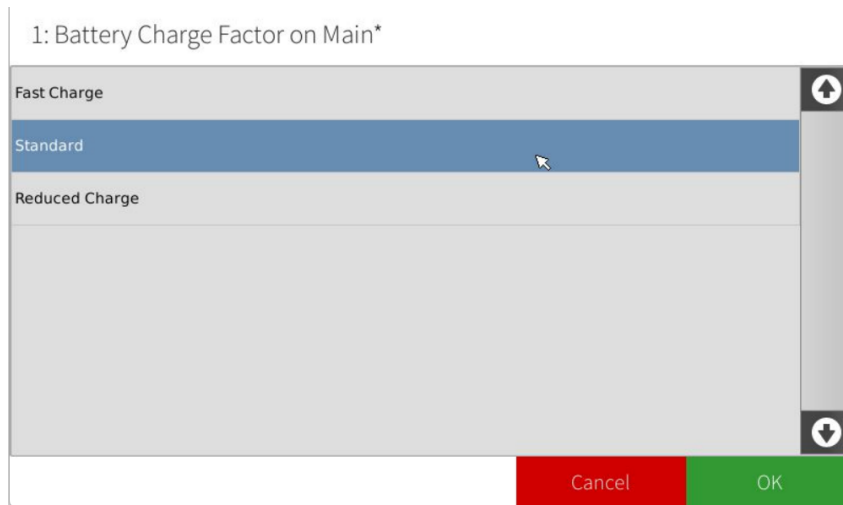
2.8.6.1. Series mode

Function to enable the ZBP to operate in series mode (2 units of the same models connected in series) where the user must select whether the unit is the Main (connected to the Load and controlling the GenSet) or the Follower (connected to the GenSet). Do not enable both modes in the same ZBP.

The series mode tab will be accessible on the Home tab as soon as it is activated ([see section 4.2.2](#)).



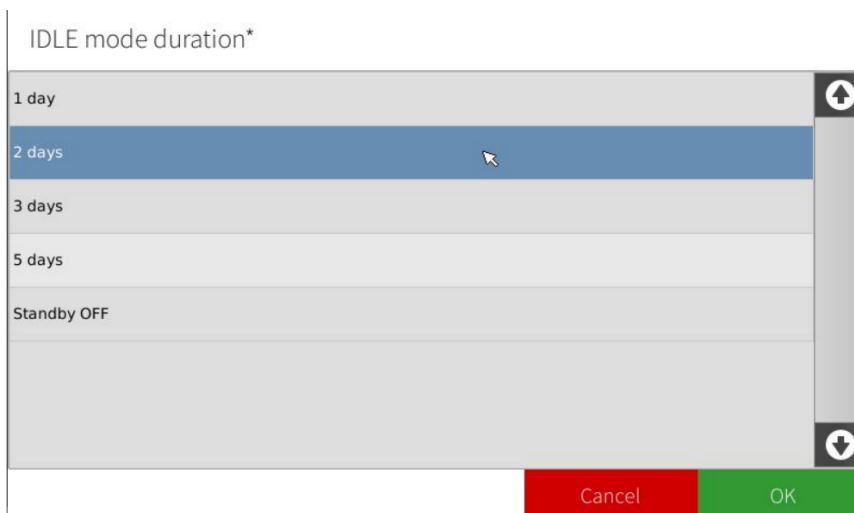
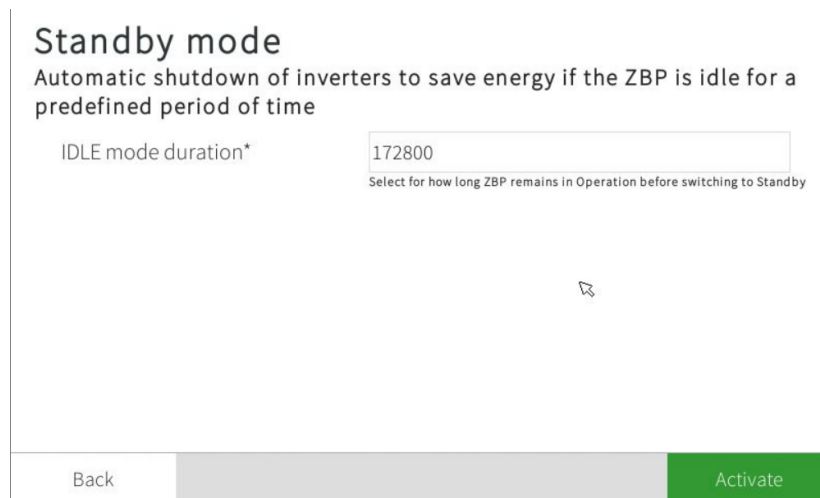
Battery Charge Factor on Main: It allows to increase or decrease the charge power of the Main unit when the generator is running. Lower this value in case the synchronization with generator is not stable or increase this value to speed up the battery charging time.



2.8.6.2. Standby mode

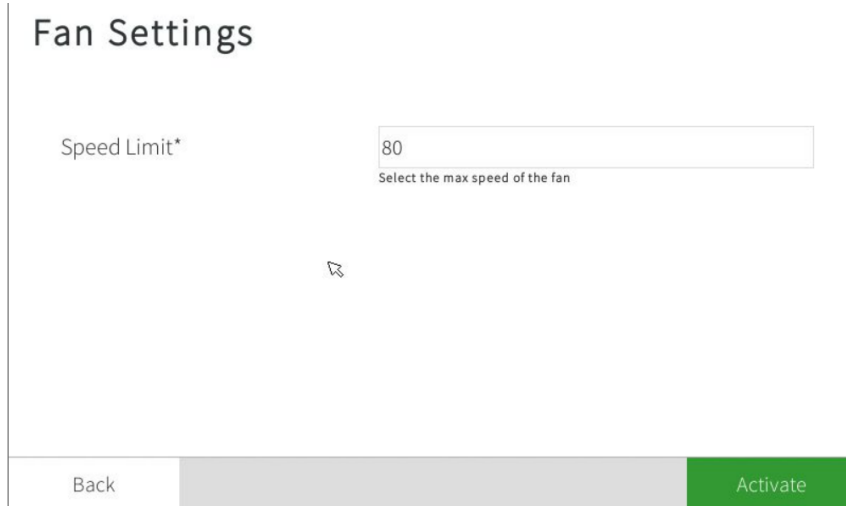
Function to select how long the inverters can remain on when the ZBP is idle before automatically shutting down the inverters.

Default period is 2 days.

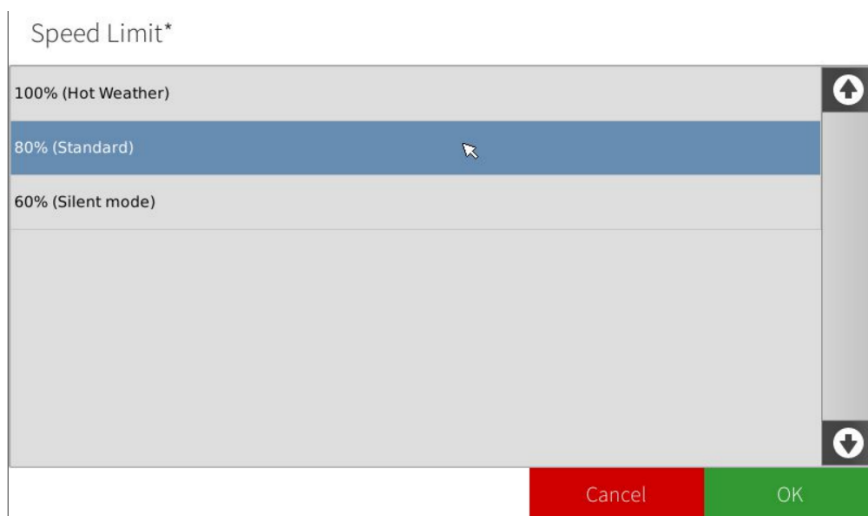


2.8.6.3. Fan Settings

Edit settings of the variable speed fan of the ZBP according to the site environment or sound requirements.



- Fan Limit: Following max speed limits can be selected:



The selected max speed is shown on the Fan and Heater Test tab ([see section 3.12](#)).

2.8.6.4. Input Switch ON mode

Function to force the input switch to be permanently closed and therefore the inverter will be ready to synchronize with an available AC Input Source as soon as it is operating regardless the status of the Remote Start signal.

Note that if this function is enabled, the GenSet Warm Up and Charge Soft Start functions will be deactivated.

- If Input Switch ON mode is deactivated:
 - Remote Start ON => Input Switch ON
 - Remote Start OFF => Input Switch OFF
 - GenSet Warm Up= Enabled
 - Charge Soft Start = Enabled
- If Input Switch ON mode is activated:

- Remote Start ON => Input Switch ON
- Remote Start OFF => Input Switch ON
- GenSet Warm Up= Disabled
- Charge Soft Start = Disabled

Input Switch ON mode

Force the Input Switch to be closed

Enable*

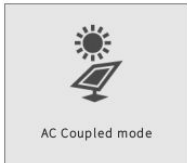
To enable this mode, select ON and click on Activate

Back
Activate

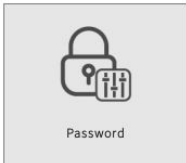
2.8.7. **Advanced modes**

7- Advanced Modes


Authorized users only



AC Coupled mode



Password



Deactivate

Back

2.8.7.1. **AC Coupled mode**

It allows the connection of a photovoltaic inverter to the ZBP output, protecting the AC Input Source and the batteries in case of reverted power from the PV inverter which can damage these components. Delays of the reverted power and duration can be customized by the user as well as the setpoint to stop the GenSet due to battery SOC.

If enabled, the Remote Start signal will always turned off when Battery SOC is above 90% to control the PV Inverter via frequency shifting, and to protect the AC Input Source from reverting power.

To make sure that the PV inverter works well with the ZBP Battery Inverter & Solar Charge Controller, both must be configured with the right 'frequency shift settings' ([see Annex AC Coupled mode](#)).

The AC Coupled mode has the following settings:

AC Coupled mode

Activate this mode if a PV inverter is connected to the output of the ZBP. Do not activate in Series mode. Require to change Inverter SW.

1- Input revert power delay*	<input type="text" value="0"/>
	<small>How long the unit accepts feed-in power (Min=0s, Max=10s)</small>
2- Duration*	<input type="text" value="300"/>
	<small>How long the Input Switch is open if reverted power</small>
3- GenSet SOC - Signal OFF*	<input type="text" value="89"/>
	<small>Condition to Stop GenSet when SOC is above (min=60%, max=90%)</small>

Back

Activate

- Input revert power delay

This function will open the input switch of the ZBP to avoid feeding power to AC Input Source when it is running. It is possible to add a delay up to 10s.

- Duration

How long the input switch is open if feed-in power to AC Input Source.

- GenSet SOC – Signal OFF

Function to stop the GenSet due to battery SOC to ensure the ZBP can regulate its output frequency to control the output of the PV Inverter.

2.8.7.2. Password

Access to the Advanced Control tab can be protected by entering a password. Click the Deactivate button in the advanced modes ([see section 2.8.7](#)) to remove an assigned password.

Password

Enter a password to access the Advanced Controls tab for all users of this unit.

Password*

Make sure to save the new password

Back

Activate






Password* <--

1	2	3	↩	5	6	7	8	9	0
q	w	e	r	t	y	u	i	o	p
a	s	d	f	g	h	j	k	l	\$
z	x	c	v	b	n	m	.	^	

2.9. System Settings

Edit some of the internal settings of the ECO Controller.

System Settings


 Language	 Network Settings	 Time Settings	 System Information
 Update			

Back

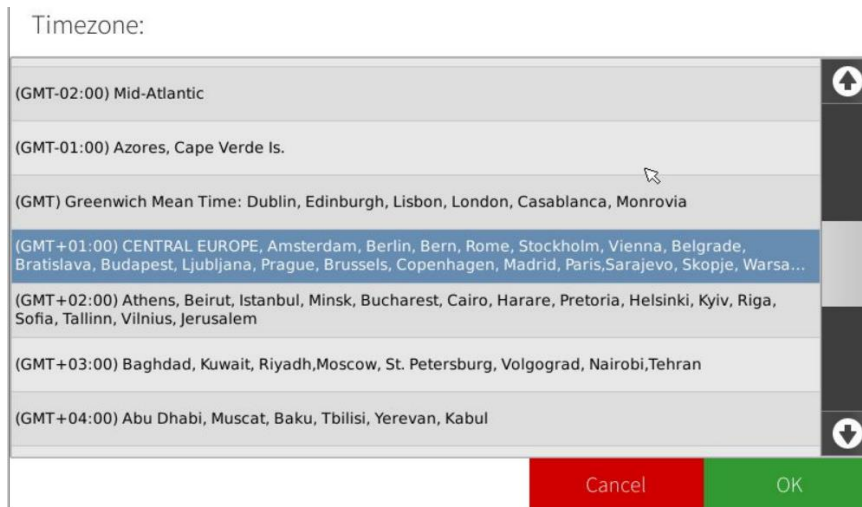
2.9.1. Time Settings

Modify the default time settings

Clock Settings

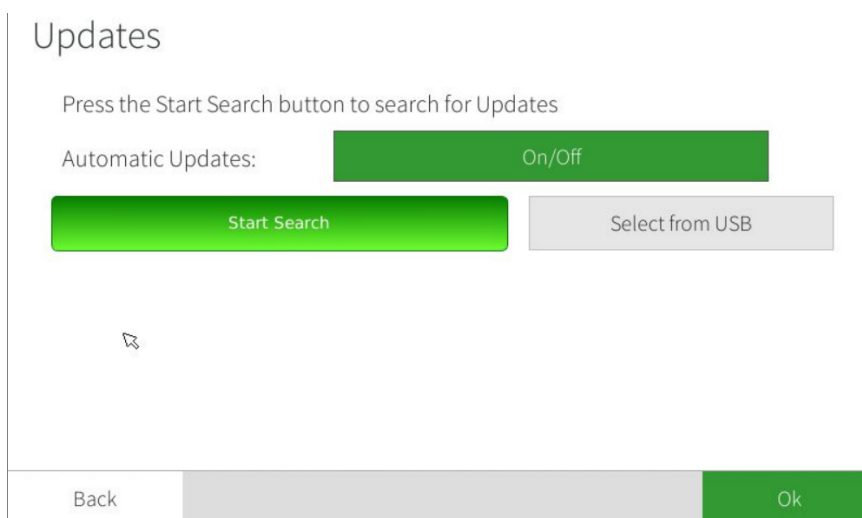
	Time Format:	<input type="button" value="12h"/> or <input type="button" value="24h"/>
	Timezone:	<input type="text" value="GMT+1"/>
	Current Time:	<input type="text" value="Tue 13.12.2022, 16:32:00"/>
	Daylight Saving:	<input type="button" value="Turn Off"/>
		<input type="button" value="Disable Internet Time"/>
	Currency:	<input type="text" value="€"/>

Back Next



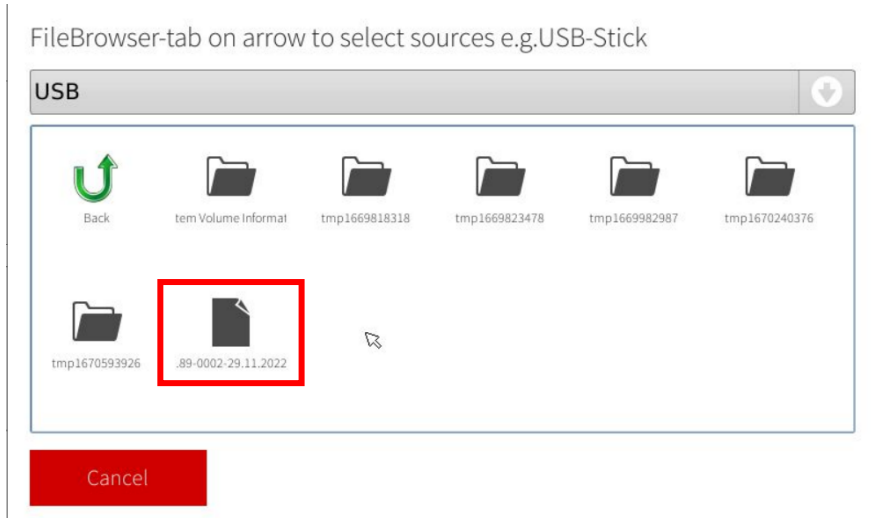
2.9.2. Update

Update the ECO Controller firmware.

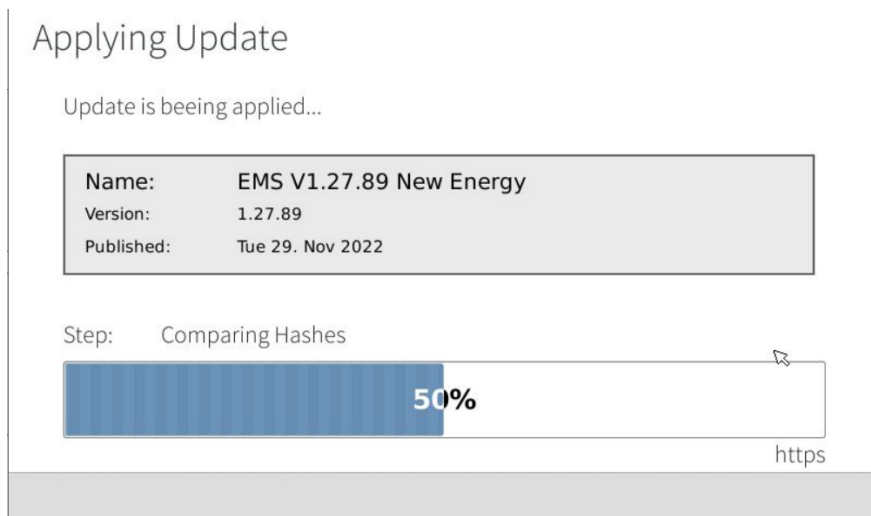
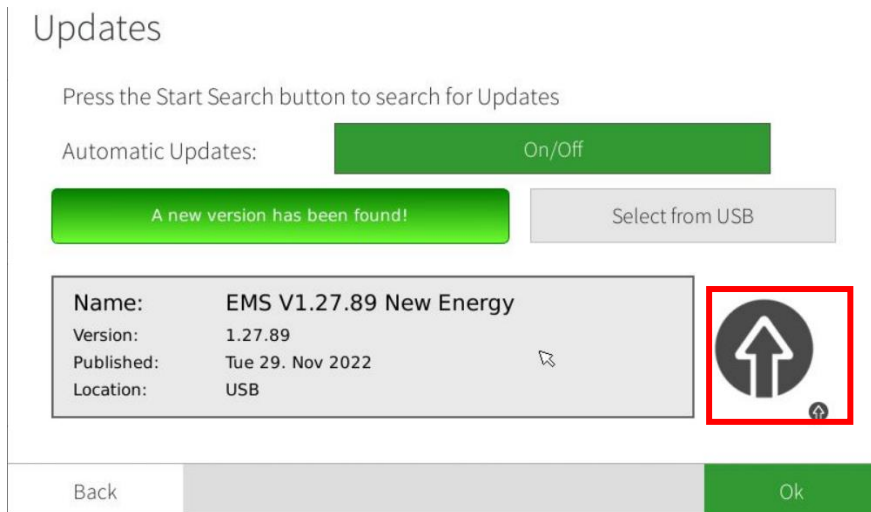


Procedure to update the Firmware:

- Save the file in a USB
- Insert the USB in one of the USB ports available in the back of the ECO Controller
- Go to Updated / Select from USB and select USB Folder
- Select the firmware file



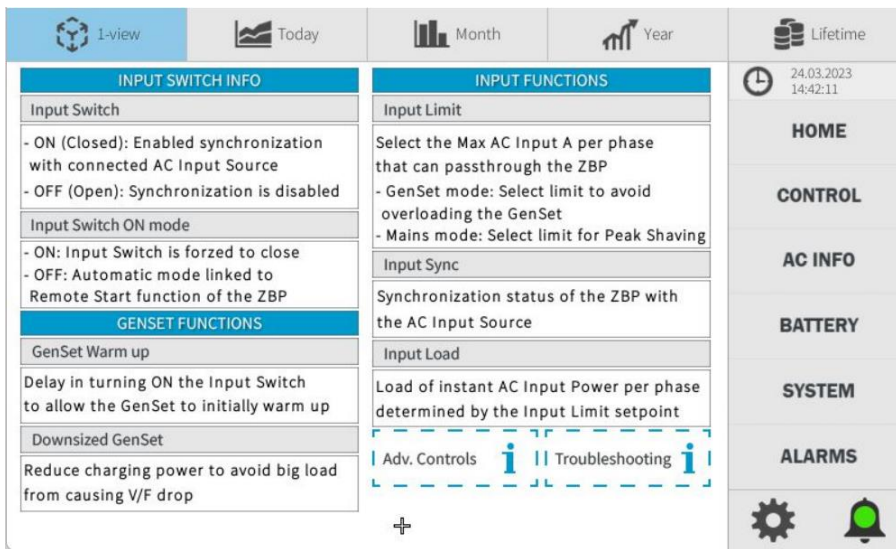
- Click on the arrow to apply the update. The ECO Controller will reset itself after the update is being applied.



3. Additional tabs

3.1. Input Info

Provide a description of the functions related to the input of the ZBP.



3.1.1. Input Switch Info

Internal switch located in the input of the inverter which is controllable by the ECO Controller. This switch must be closed to be able to synchronize the ZBP with an AC Input Source. The ZBP provides two modes to control the input switch:

- **Auto mode** (Input Switch ON mode=OFF): It is set as default where the Input Switch is linked to the status of the Remote Start signal, therefore if the signal is ON then Input Switch is closed and if the signal is OFF the input switch is open. If the Genset Warm Up function is activated, there will be a short delay to close the input switch.
- **Manual mode** (Input Switch ON mode=ON): The user can force the input switch to be permanently closed and therefore avoid following the Remote Start signal by activating this mode in the User Advance Controls / Modes / Input Switch On mode ([see section 2.8.6.4](#)).

3.1.2. GenSet Functions

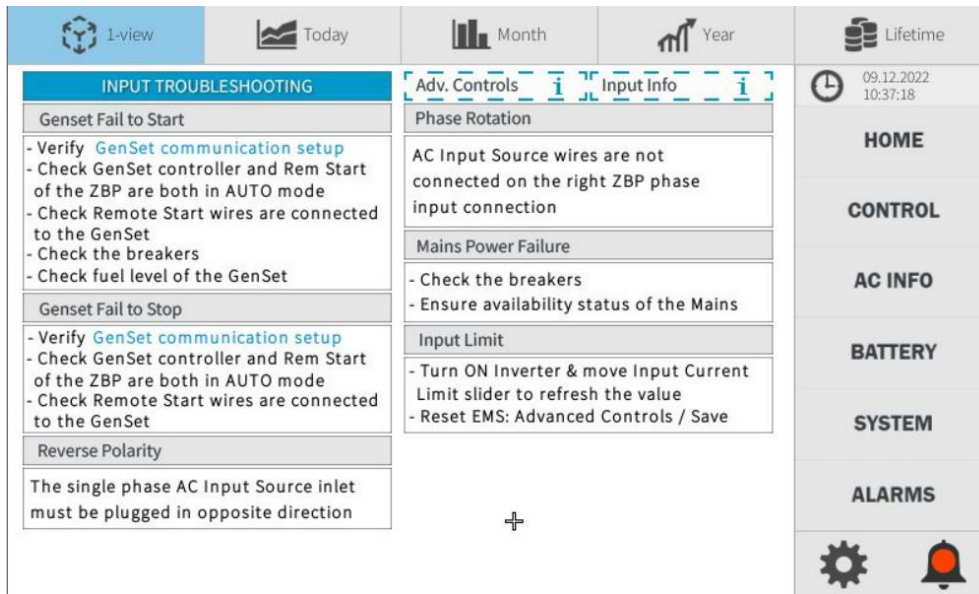
- **GenSet Warm up**: This function automatically adds a delay to close the input switch to help the GenSet to heat up before delivering power to the ZBP. The default delay is 1 minute but the user can edit the value of the delay from 0s to 5 minutes in the Advanced Controls tab ([see section 2.8.3.1](#)). The Genset Warm Up function is deactivated (no delay is added) if one of the following conditions is met:
 - Input Switch On mode is activated
 - Mains is selected as AC Input
 - Remote Start signal is ON due to Inverter Power Start
- **Downsized GenSet**: Automatically reduce the charging power to avoid bog load steps that cause a voltage / frequency drop in small generators that make the inverter consider it as unreliable source.

3.1.3. Input Functions

- Input Limit: [see section 2.2.4.](#)
- Input Sync and Input Load: [see section 2.3.1.](#)

3.2. Input Troubleshooting

Instructions to clear alarms related to the AC Input Source.



3.2.1. GenSet Fail to Start

Activated if GenSet is not synchronized with ZBP when Remote Start signal is ON after an assigned delay. It is disabled if Mains is selected as AC Input Source or Series mode is enabled. Default delay is 5 minutes.

Follow these steps to clear the alarm:

- Verify GenSet communication setup ([see section 3.3](#)).
- Check GenSet controller and Remote Start of ZBP are both in AUTO mode.
- Check Remote Start wires are connected to the GenSet.
- Check breakers in both GenSet and ZBP.
- Check fuel level in GenSet.

3.2.2. GenSet Fail to Stop

Activated if GenSet does not stop when Remote Start signal is OFF after an assigned delay. It is disabled if Mains is selected as AC Input Source or Series mode is enabled. Default delay is 5 minutes.

Follow these steps to clear the alarm:

- Verify GenSet communication setup ([see section 3.3](#)).
- Check GenSet controller and Remote Start of ZBP are both in AUTO mode.
- Check Remote Start wires are connected to the GenSet.

3.2.3. Reverse Polarity

Activated if a single-phase AC Input Source is connected with live and neutral reversed when using Parking mode. Switch the AC Source wires to their corresponding side. It is disabled on 60Hz models.

3.2.4. Phase Rotation

Activated if the AC Input Source wires are connected to the wrong ZBP phase input connection. Replace the phases to match the correct connections.

3.2.5. Mains Power Failure

Activated if Mains stop supplying power to the ZBP when Input Switch is ON after an assigned delay. It is disabled if GenSet is selected as AC Input Source or Series mode is enabled. Default delay is 5 minutes.

Follow these steps to clear the alarm:

- Check breaker in both Mains and ZBP.
- Ensure availability status of the Mains.

3.2.6. Input Limit Conflict

Activated if selected setpoint of Input Current Limit in Control tab which is the command to determine the size of the AC Input Source is not identical to the Input Limit on Ac Info tab which is the actual value set in the system as shown in the screenshots below. To avoid this scenario, make sure to set the value after turning on the inverter and check both values are identical.

Follow these steps to clear the alarm:

- Turn ON Inverter and move the Input Current Limit slider in Control tab to refresh the value.
- Reset EMS: Advanced Controls / Save.

3.3. Remote Start Info



Provide a description of the conditions that automatically turn ON and OFF the Remote Start signal in AUTO mode and describe the steps to verify the ZBP is correctly controlling the GenSet.

The screenshot displays the EMS interface with two main tabs: 'GENSET COMMUNICATION SETUP' and 'REMOTE START INFO'. The 'GENSET COMMUNICATION SETUP' tab contains a list of steps: 1. Connect Remote Start signal wires, 2. Set GenSet controller to AUTO mode, 3. Check manual control, and 4. Set Remote Start to AUTO mode. Below the list are three informational icons for 'Input Troubleshooting', 'Adv. Controls', and 'Basic Controls setup'. The 'REMOTE START INFO' tab shows the status of the remote start signal, including conditions for MAN ON/OFF, AUTO, Load Power Start, Inverter Power Start, SOC Start, and Timer Start. The right sidebar shows navigation options: HOME, CONTROL, AC INFO, BATTERY, SYSTEM, and ALARMS, along with a clock showing 16.12.2022 12:05:51 and a bell icon for alarms.

GENSET COMMUNICATION SETUP	REMOTE START INFO
1 Connect Remote Start signal wires	Status
2 Set GenSet controller to AUTO mode	- MAN ON: Force Start AC Input Source
3 Check manual control	- MAN OFF: Force Stop AC Input Source
- Turn ON GenSet => Rem Start MAN ON	- AUTO: ZBP controls AC Input Source
- Turn OFF GenSet => Rem Start MAN OFF	Load Power Start
4 Set Remote Start to AUTO mode	- ON/OFF based on Total Output Load
	Inverter Power Start
	- ON: If any output phase > ON setpoint
	- OFF: If ALL output phases
	SOC Start
	- ON: If Battery SOC is below Signal ON
	- OFF: If Battery SOC gets to Signal OFF
	Timer Start
	- ON: If Timer is ON
	- OFF: End of timer or Battery SOC gets to SOC Stop setpoint if enabled

3.4. Output Info

Provide a description of how the ZBP is automatically enabling or disabling the output and auxiliary output switches.

I-view		Today	Month	Year	Lifetime
OUTPUT INFO		AUXILIARY OUTPUT INFO			06.03.2023 12:35:45
Output switch		Auxiliary Output Switch			HOME
The ZBP automatically controls the output based on the following conditions:		The auxiliary single phase output can be controlled as following:			CONTROL
ON	- Inverter Button is ON - Below conditions are not met	MAN	- MAN ON = switch forced ON - MAN OFF = switch forced OFF	AC INFO	
OFF	- Overdischarge Protection is activated - Emergency Stop button is pushed - Inverter Button is OFF - ZBP is in Standby mode - Limit Switch alarm is activated	Auto	- Automatic control based on timers - AUTO mode is ON when no timers are added or when ZBP is within the assigned schedule	BATTERY	
Runtime - GenSet or Mains					SYSTEM
Running time of the Input. The time is reset when Inverter is switched off					ALARMS
Runtime - Offgrid					 
Running time of the Load powered by battery and/or Solar					

- Output Switch:

The main output switch of the Inverter is automatically controlled by the ECO Controller when switching the mode of the inverter based on dynamic functions to improve the lifetime of the batteries and the overall performance of the ZBP. For instances, the output switch is turned off when over discharge protection alarm is raised to protect the batteries or when ZBP is in Standby mode to save energy.

- Auxiliary Output Switch

The switch of the controllable single-phase output can be controlled by adding timers to enable it during specific periods of time ([see section 2.2.6.2](#)).

- Runtime – GenSet or Mains

Daily running time of the Input when powering a load and or charging the batteries.

- Runtime – Offgrid

Daily running time of the Load when powered by Battery and/or Solar.

3.5. Inverter Info & troubleshooting

Provide a description of the mode and state codes of the Inverter and Solar Charge Controller, as well as the steps to clear related alarms. The button to reset Inverters is also located on this tab.

1-view		Today	Month	Year	Lifetime	
INVERTER INFO			TROUBLESHOOTING		12.12.2022 15:46:54	
Inverter Mode		3.00 %	Gateway or Inverter Offline		HOME CONTROL AC INFO BATTERY SYSTEM ALARMS	
1 - Charger Only	3 - ON		- Reset Inverter			
2 - Inverter Only	4 - OFF		- Reset Gateway (unplug power wire)			
Inverter State		252.00	- Check comms cables			
0 - OFF	8 - Passthrough		- Ensure Inverter onboard Switch are ON			
1 - Low Power	9 - Inverting		Inverter Overloaded			
2 - Alarm	10 - PowerAssist		- Reset Inverter			
3,4,5,6 - Charging	252 - Bulk Protection		- Reset Gateway (unplug power wire)			
INVERTER RESET			VE.Bus Error			0.00
<input type="button" value="ON"/> <input type="button" value="OFF"/>			More info at Victron web: VE.Bus Error Code			
SOLAR CHARGER INFO			Inverter Fault			
Solar Charger Mode			- Reset Inverter & Gateway			
0 - OFF	2 - Active		- Contact service support			
1 - V/A Limited	255 - Not Available		Active AC Input			
			0 - Unknown	2 - AC IN Source Sync		
			1 - Not Connected	240 - Not Connected		

3.5.1. Inverter Mode, State & Active AC Input

Information of the mode and status of the Inverter as state below.

- Inverter Modes:
 - 1- Charger Only: Inverter only allow to charge and does not allow to discharge if no AC Voltage is detected at the input.
 - 2- Inverter Only: Inverter only allow to discharge and does not allow to charge.
 - 3- ON: Charge and discharge is allowed.
 - 4- OFF: Inverter is switched off.
- Inverter States:
 - 0- OFF
 - 1- Low Power
 - 2- Alarm
 - 3,4,5,6- Charging
 - 8- Passthrough
 - 9- Inverting
 - 10- PowerAssist
 - 252- Bulk Protection
- Active AC Input:
 - 0- Unknown
 - 1,240- Not Connected
 - 2- AC IN Source Synchronized

3.5.2. Solar Charger Info

Information of the Solar Charger Controller mode. It does not show any value in case the ZBP is not equipped with this device.

- Solar Charger Modes:
 - 0- OFF
 - 1-Voltage and or Current Limited
 - 2- Active
 - 255- Not available

3.5.3. Gateway or Inverter Offline

Activated if communication failure with Gateway or Inverter.

Follow these steps to clear the alarm:

- Proceed to reset the Inverter or Gateway device (Victron Cerbo GX) by manually unplugging its power terminal.
- Check JR45 communication cables:
 - Inverter L1A (master) to Gateway
 - Gateway to router or switch
 - ECO Controller to router or switch
- Ensure Inverter onboard switches located in the Inverter physical front panel are in ON position.

3.5.4. Inverter Overloaded

Activated if one or more phases of the ZBP are overloaded due to below situations. Number of overloaded phases is shown in the alarm log tab.

- Excessive high output power
- High output power and low battery voltage
- High output power and internal temperature

Follow these steps to clear the alarm:

- Proceed to reset the Inverter
- Proceed to reset the Gateway device (Victron Cerbo GX) by manually unplugging its power terminal.

3.5.5. VE.Bus Error

Activated if Inverter internal system displays an error code. Check the following website to know to know the issue and solution related to the error code.

https://www.victronenergy.com/live/ve.bus:ve.bus_error_codes

3.5.6. Inverter Fault

Activated if Inverter internal alarm is detected.

Follow these steps to clear the alarm:

- Proceed to reset the Inverter
- Proceed to reset the Gateway device (Victron Cerbo GX) by manually unplugging its power terminal.
- Contact Atlas Copco Service

3.6. Advanced Controls Info

Provide a summary of the configurable settings and additional modes set in the Advanced Controls tab according to the type of ZBP ([see section 2.8](#)).

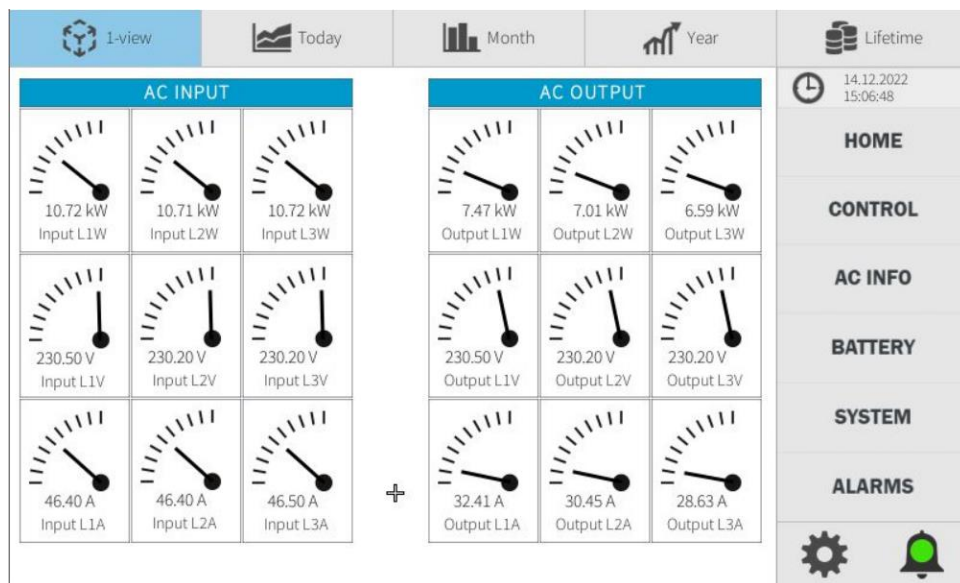
Questions such as what is the maximum power the ZBP can deliver before starting the AC Input Source or how long it will be charging the battery at minimum power can be easily answered on this tab.

It is highly advisable to check these settings any time the ZBP is required to be used to ensure the ECO Controller is configured according to site and user requirements before it is put into operational mode. It is recommended to use the default settings if the user is not familiar with the ECO Controller.



3.7. Gauges AC IN & OUT

Provide a gauge widget style to show instantaneous values of power, voltage and current per phase of the input and output. It can be accessed from the AC Info tab.



3.8. Energy Sources

This tab is accessible from the AC Info tab and contains data of the different sources used to charge the batteries in both text and graph. The power data displayed is instantaneous and the energy data is daily, meaning that they reset to zero at the end of the day.

Each individual energy source rectangular datapoint and the chart are clickable providing legacy data by using the top buttons ([see section 3.14](#)).



3.9. Battery Info

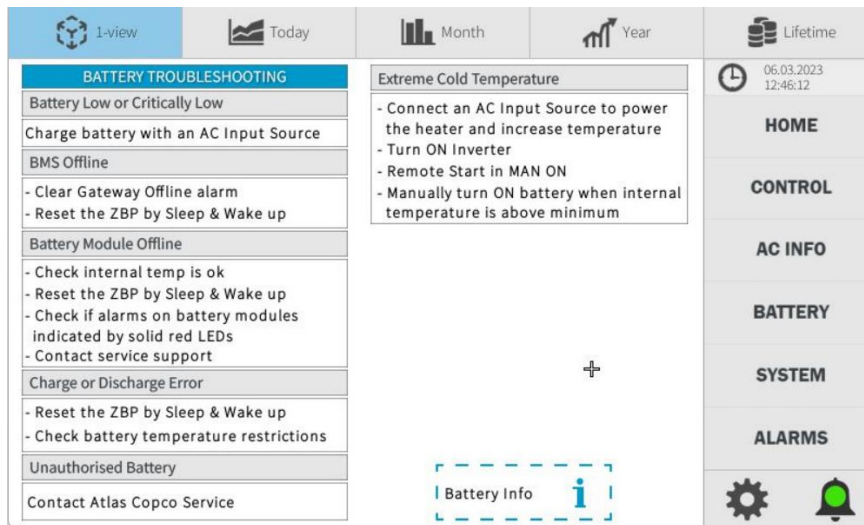
Status of the battery cells, description of the functions related to the Battery as well as other important information is displayed on this tab with direct access to advanced controls info tab to check internal settings of the battery functions and battery troubleshooting guide.

BATTERY FUNCTIONS INFO		BATTERY TEMPERATURE	
Charge Soft Start It assists the GenSet in a smooth transition to full power by initially limiting the battery charge power for a short period		Temperature Range Ideal 50°F / 113°F Hot 113°F / 122°F Cold 14°F / 50°F	Charge Restrictions C-rate: 0.8C @ 100% C-rate: 0.8C <-> 0.02C Charge: 100% <-> 2.5%
Manual Charge mode Fixed battery max charge current selected by the user Full Charge Request Improve calibration of SOC for optimal performance Heater Heat the battery when an AC Input source is connected to avoid power restrictions due to low temperature		Temperature Restrictions Automatic charge restrictions to protect the battery from high or low temp	
CELL DATA			
Min Voltage	3.21 V	Min Temperature	91.40 °F
Max Voltage	3.21 V	Max Temperature	100.40 °F

- **Battery functions info:** described on the image above as well as in [section 2.4](#).
- **Battery temperature:** charge restrictions based on battery temperature (°C or °F).
- **Cell Data:** displays the maximum and minimum voltage and temperature of the cells in the battery bank.
- **Additional tabs:** Advanced Controls [section 3.6](#) & Battery Troubleshooting [section 3.10](#).

3.10. Battery Troubleshooting

Instructions to clear alarms related to battery.



3.10.1. **Battery Low or Critically Low**

Activated if Battery SOC is below default or assigned setpoint ([see section 2.8.5.2](#)). Connect an AC Input Source to charge the battery.

3.10.2. **BMS Offline**

Activated if communication failure with Battery BMS.

Follow these steps to clear the alarm:

- Often activated if Gateway Offline alarm is triggered.
- Proceed to reset the ZBP by doing the sleep and wake procedures

3.10.3. **Battery Module Offline**

Activated if battery BMS detects a failure with the communication of one or more battery modules. The number of online and offline modules is shown in the Battery tab ([see section 2.4](#)).

Follow these steps to clear the alarm:

- In some situations, and in case the alarm “Restricted to Charge or Discharge” is not raised, the offline module is automatically reconnected when cycling the batteries (normally happens when voltage of online modules is close to the offline module).
- It might be triggered in case of low or high battery temperature, in this case the alarm will be cleared itself when temperature is within operating range.
- Proceed to reset the ZBP by doing the sleep and wake procedures.
- If after that the alarm is still triggered, open the bottom side doors and check for battery modules with red LEDs. After that, contact service support to report this issue.

3.10.4. **Charge or Discharge Error**

Activated if battery BMS detects a failure that prevents the batteries from charging and discharging. This error is caused when Battery Module Offline alarm is triggered, therefore clear the alarm of Battery Module Offline.

3.10.5. Unauthorized Battery

Activated if standard battery modules are replaced by unauthorized Atlas Copco modules which may damage the rest of modules and compromise the performance of the ZBP. For this reason, the ZBP is protected with management algorithms to prevent batteries from discharging until this alarm is no longer active.

Contact Atlas Copco Service in case this alarm is activated.

3.10.6. Extreme Cold Temperature

Activated when internal temperature of the ZBP is below operating conditions. At this stage, the battery bank may be in sleep mode, so it is not possible to wake up the batteries until temperature is within operating conditions ([see section 3.9](#)).

In case the ZBP contain heaters, connect an AC Input Source to power the heaters and accelerate the heating process of the batteries. Follow these steps:

- Connect an AC Input Source
- Turn On Inverters (Control tab / Inverter Switch ON)
- Remote Start must be in MAN ON to prevent the ECO from stopping the generator.
- Manually turn ON batteries when internal temperature is above minimum.

3.11. System info & troubleshooting

Description of the system statuses as well as the steps to clear related.

L-view	Today	Month	Year	Lifetime
SYSTEM STATE INFO		SYSTEM TROUBLESHOOTING		09.12.2022 13:03:56
Operational		Emergency Stop		HOME
Fully functional ZBP working alongside an AC Input source & Load		- Check safety conditions are met - Deactivate the E- Stop button		CONTROL
Parking		RCD Trip or Limit Switch		AC INFO
When a 1ph inlet is connected to slow charge or keep battery full		- Close the ZBP main Output breaker or - Close the bottom front door		BATTERY
Stand-by		Overdischarge Protection		SYSTEM
Inverter automatically switched off after a predefined period of inactivity		Connect an AC Input Source and turn on the Inverter button		ALARMS
OFF		Smartbox Offline		
Inverter in OFF mode. Used while the ZBP is in use, during transport or short-term storage, or to connect inputs & outputs		- Reset Smartbox (unplug power wire) - Check ethernet cable		
Maintenance Required		Mode Error		
Contact Atlas Copco Service		Do not enable Series & AC Couple mode at the same time		

3.11.1. System States

- **Operational:** Fully functional ZBP
- **Parking:** When a single-phase inlet is connected to slowly charge or maintain the batteries at full level.
- **Stand-by:** The ZBP automatically switches the inverter off after a specific time during idle to save energy.
- **OFF:** Inverter in OFF mode. Used while the ZBP is not used, during transport or short-term storage, or for wiring inputs & outputs.

3.11.2. Emergency Stop

Activated if communication the emergency stop button is pushed.

Follow these steps to clear the alarm:

- Ensure safety conditions are met.
- Release the emergency stop button.

3.11.3. RCD Trip or Limit Switch

Activated if communication one of these devices is triggered. RCD is only available in 50Hz models.

Follow these steps to clear the alarm:

- Close the ZBP main output breaker to clear the RCD trip alarm
- Close the ZBP bottom front door to clear the Limit Switch alarm

3.11.4. Overdischarge Protection

Additional battery protection which is activated to prevent battery from discharging when low SOC.

Follow these steps to clear the alarm:

- Connect an AC Input Source and ensure batteries can be charged.

3.11.5. Smartbox Offline

Activated if communication failure with the smartbox device.

Follow these steps to clear the alarm:

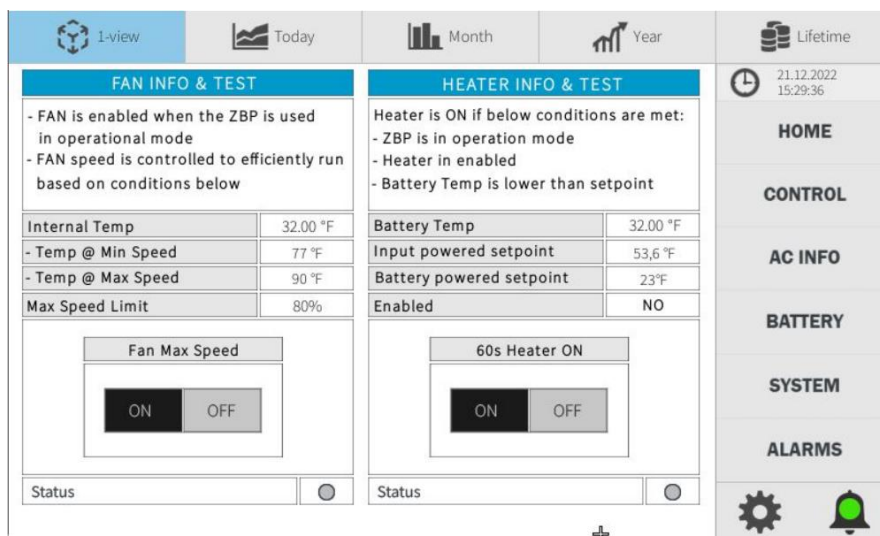
- Proceed to reset the smartbox by unplugging its power terminal.
- Check JR45 communication cables from Smartbox to router or switch.

3.11.6. Mode Error

Do not enable Series ad AC Couple mode at the same time.

3.12. Fan & Heater Test

Provide information and controls to test the Fan and Heaters of the ZBP.

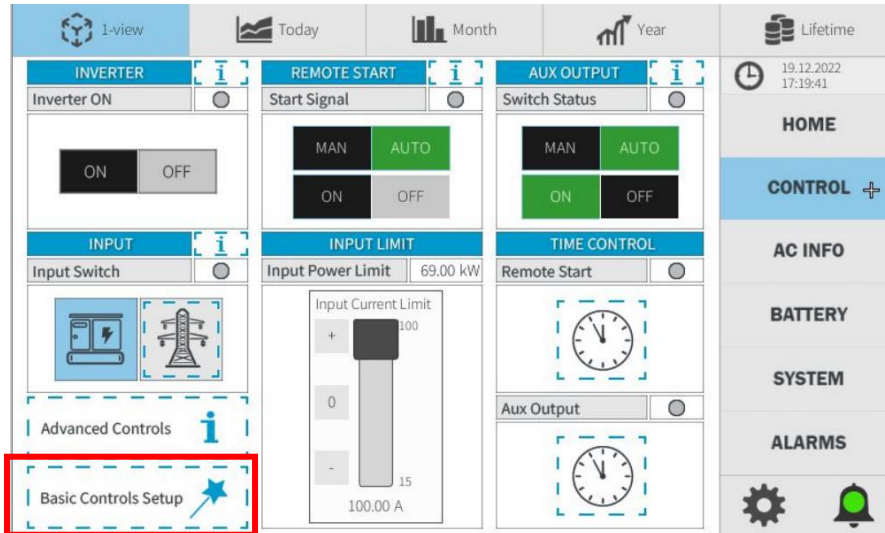


The screenshot displays the ZBP control interface with the following sections:

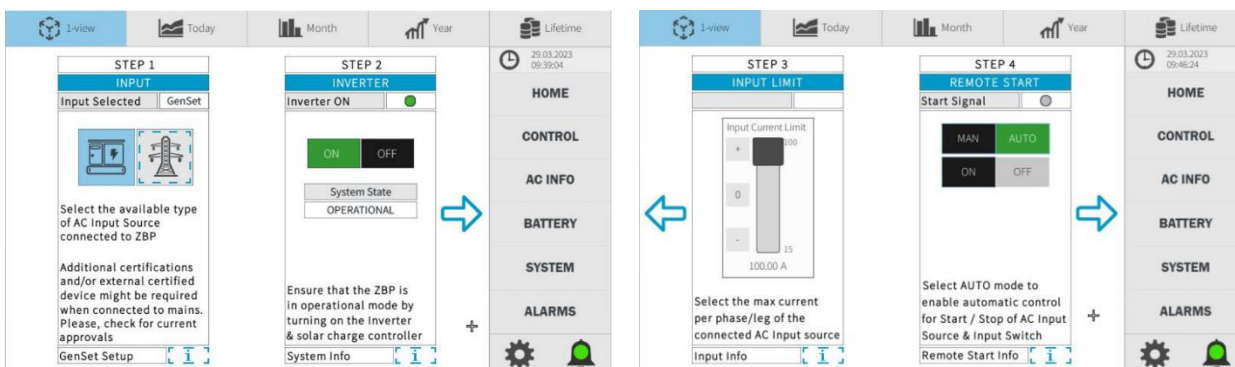
- Navigation:** 1-view, Today, Month, Year, Lifetime.
- Time:** 21.12.2022 15:29:36
- FAN INFO & TEST:**
 - FAN is enabled when the ZBP is used in operational mode
 - FAN speed is controlled to efficiently run based on conditions below
 - Internal Temp: 32.00 °F
 - Temp @ Min Speed: 77 °F
 - Temp @ Max Speed: 90 °F
 - Max Speed Limit: 80%
 - Fan Max Speed control: ON/OFF buttons
 - Status:
- HEATER INFO & TEST:**
 - Heater is ON if below conditions are met:
 - ZBP is in operation mode
 - Heater in enabled
 - Battery Temp is lower than setpoint
 - Battery Temp: 32.00 °F
 - Input powered setpoint: 53,6 °F
 - Battery powered setpoint: 23°F
 - Enabled: NO
 - 60s Heater ON control: ON/OFF buttons
 - Status:
- Right Sidebar:** HOME, CONTROL, AC INFO, BATTERY, SYSTEM, ALARMS.
- Bottom Right:** Settings gear icon, Alarm bell icon.

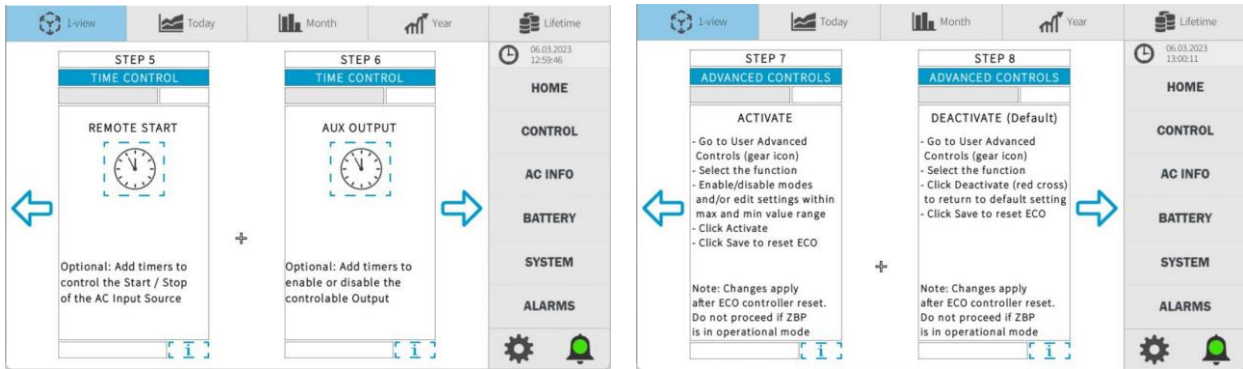
3.13. Basic Controls Setup

Instructions for first time users to easily setup the basic controls of the ZBP can be accessed through the Basic Controls Setup button located on the Control tab.



- **Step 1:** Select the available type of AC input Source connected to the ZBP.
Note that additional certifications and/or an external certified device might be required when connecting the ZBP to Mains. Please, check for current approvals.
- **Step 2:** Set the ZBP in operational mode by turning ON the Inverter & solar charge controller.
- **Step 3:** Select the size of the AC Input Source to avoid exceeding its maximum power. The selected size will be the maximum amperage per phase that ZBP will request to the Input source.
- **Step 4:** Select AUTO mode to enable the automatic control of the AC Input Source. It is recommended to check ZBP is successfully controlling the GenSet by following the instructions in the Remote Start info tab which is accessible from the info button located at the bottom of this table ([see section 3.3](#)).
- **Steps 5 & 6:** Adding timers to start/stop the AC Input source or enable/disable the Auxiliary Output if the application requires it.
- **Steps 7 & 8:** Briefly explanation of how to activate and deactivate advanced controls in case it is required.
- **After Step 8,** the user will jump to the summary of advanced controls to easily check if additional modes have been enabled or advanced settings have been modified.





3.14. Historical Data

There are four buttons at the top of the chart which provides access to historic data with graphs and values for some of the datapoints measured in the ZBP.

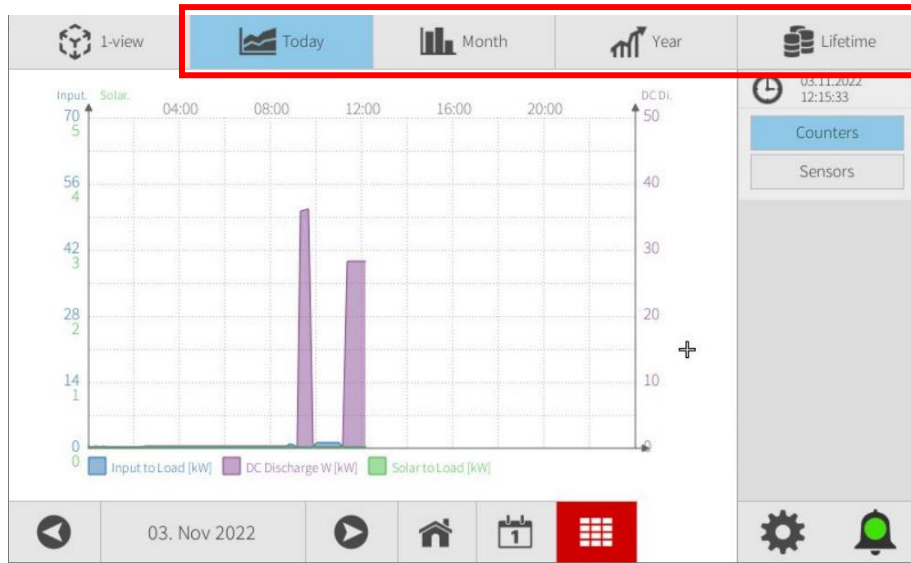
To access the top buttons, click on available datapoints located in the main side tabs which are displayed in a rectangular format or inside a chart. To return to side tabs, click on 1-View (top left corner) as shown on previous section.

For example, energy sources tab ([see section 3.8](#)) provides up to 3 datapoints which can be also displayed to view historical data on the top buttons.



Here the features of these buttons:

- Today button: Display daily power and energy data
- Month button: Display monthly energy data
- Year button: Display yearly energy data
- Lifetime: Display overall energy data



Use the buttons available at the bottom of the charts to do the following actions:

- Arrows (left & right): navigate to previous or next days, months and years.
- Home: back to current day, month or year.
- Calendar: Pop-up calendar to select a specific day, month or year.
- Grid: Opens up the data in CSV format as shown below.

Time	Input to Load [kW]	DC Discharge W [kW]	Solar to Load [kW]
02:00	0W	0W	0W
02:10	0W	0W	0W
02:20	0W	0W	0W
02:30	0W	284W	0W
02:40	0W	284W	0W
02:50	0W	284W	0W
03:00	0W	284W	0W
03:10	0W	284W	0W
03:20	0W	284W	0W
03:30	0W	284W	0W
03:40	0W	284W	0W
03:50	0W	284W	0W
04:00	0W	284W	0W
04:10	0W	284W	0W

3.15. Energy (Battery)

This tab is accessible from the Battery tab and displays both DC Charge and DC Discharge instantaneous power and daily stored energy with access to legacy data. The power data displayed is instantaneous and the energy data is daily, meaning that they reset to zero at the end of the day.

Each individual energy source rectangular datapoint and the chart are clickable providing legacy data by using the top buttons ([see section 3.14](#)).



3.16. Energy (Solar)

This tab is accessible from the Home tab when the unit contain a solar charge controller and displays solar data such as total production, how much solar power have been directly consumed on the load and how much have been stored in the batteries. The power data displayed is instantaneous and the energy data is daily, meaning that they reset to zero at the end of the day.

Each individual energy source rectangular datapoint and the chart are clickable providing legacy data by using the top buttons ([see section 3.14](#)).



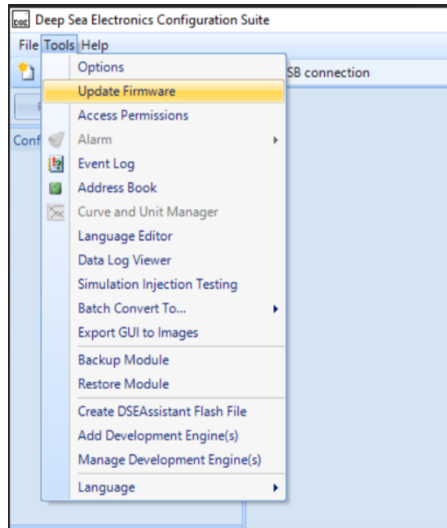
4. Additional working modes

4.1. External GenSet Controllers – Deepsea

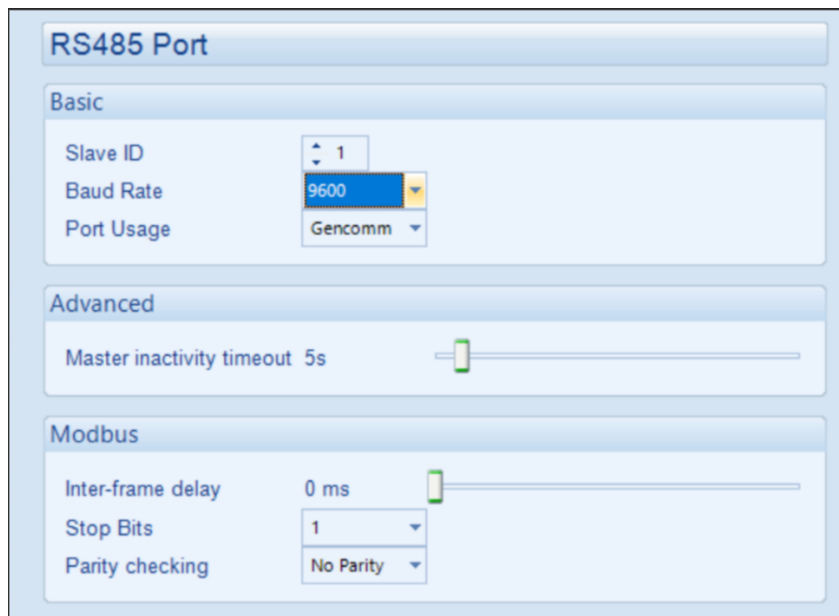
Communication with a Deepsea MKII controller via rs485 provides deeper control and information of the device from the ECO Controller.

4.1.1. Installation

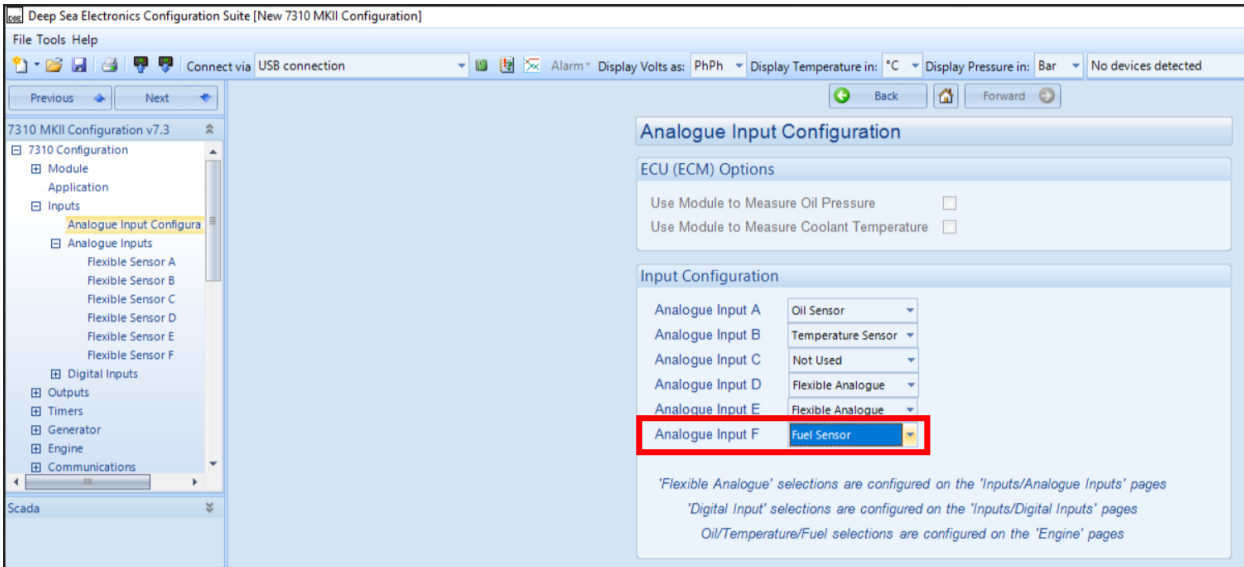
- The communication is only possible with Deepsea Controllers that provide rs485 interfaz such as the DSE7310 MKII or DSE7410 MKII.
- Ensure the Deepsea Controller is updated with latest firmware.



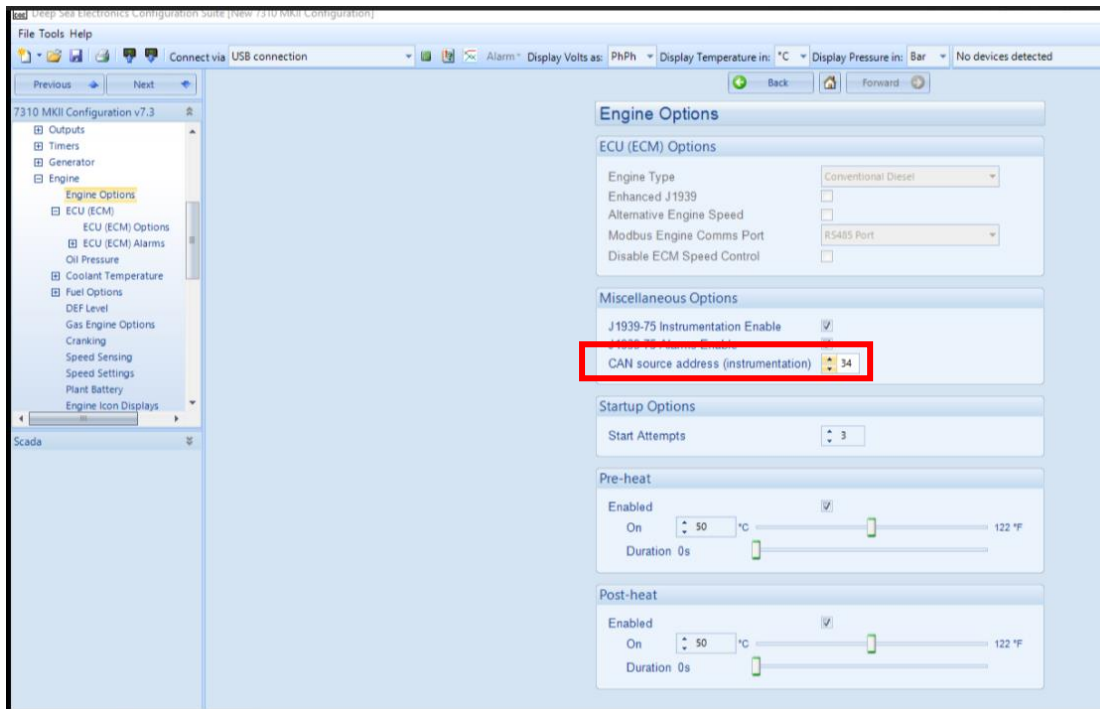
- Baud rate: 9600
- Slave ID: 1
- Stop Bits: 1
- Parity Checking: No Parity



- Select the Fuel Sensor to show the fuel level.



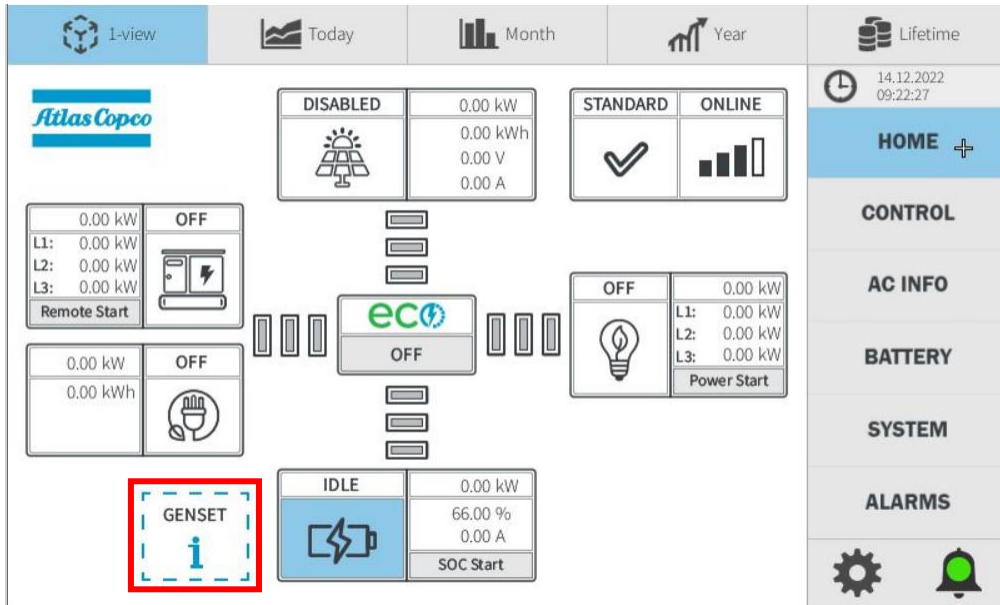
- Ensure the Deepsea Controller is communicating with the Engine via CAN by adding the corresponding address code



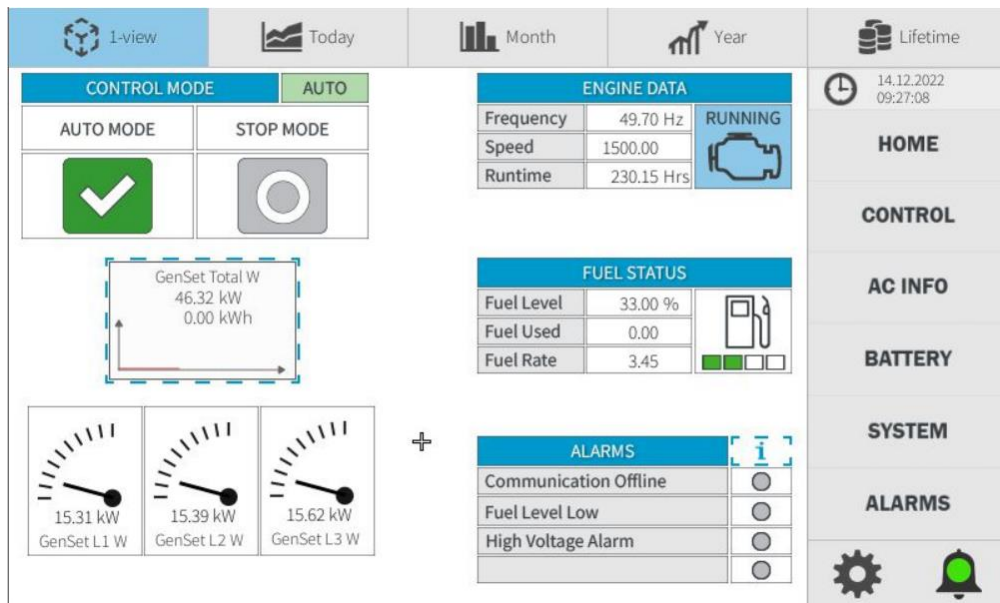
- Ensure the Remote Start of ZBP hurting connector is connected to the GenSet and the DeepSea Controller is wired up.
- Activate the Deepsea communication on the ECO Controller ([see section 2.8.3.3](#)).

4.1.2. DeepSea – Operation Info

The Deepsea tab is accessible from the Home tab after activating the communication with the Deepsea controller.



The Deepsea tab contains the following features:



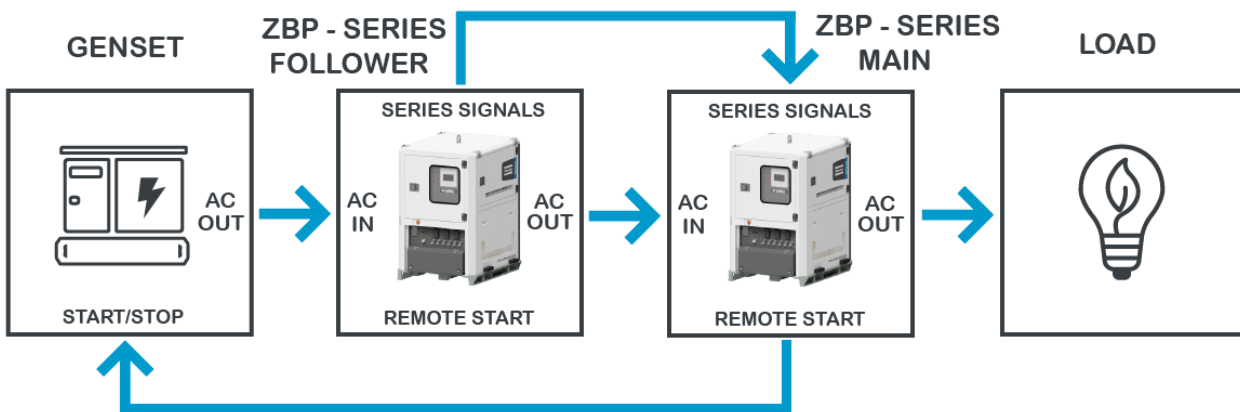
- **Control Mode:**
 - Current status of the Deepsea controller: Auto, Stop or Manual.
 - Auto mode button => ON (green) / OFF (grey)
 - Stop mode button => ON (red) / OFF (grey)
- **Engine Data**
 - Instantaneous frequency, speed and runtime of the engine.
 - Engine status: running, stop & communication error.
- **Fuel Status**
 - Instantaneous fuel level, fuel used and fuel rate.
- **Alarms**
 - Communication Offline: indicates a communication failure with the Deepsea Controller.

- Fuel Level Low: indicates fuel is lower than assigned value when activating Deepsea.
- High Voltage Alarm: indicates the GenSet provides out of range voltage that cannot be accepted by the ZBP. Only available for 60Hz models.

4.2. Series mode

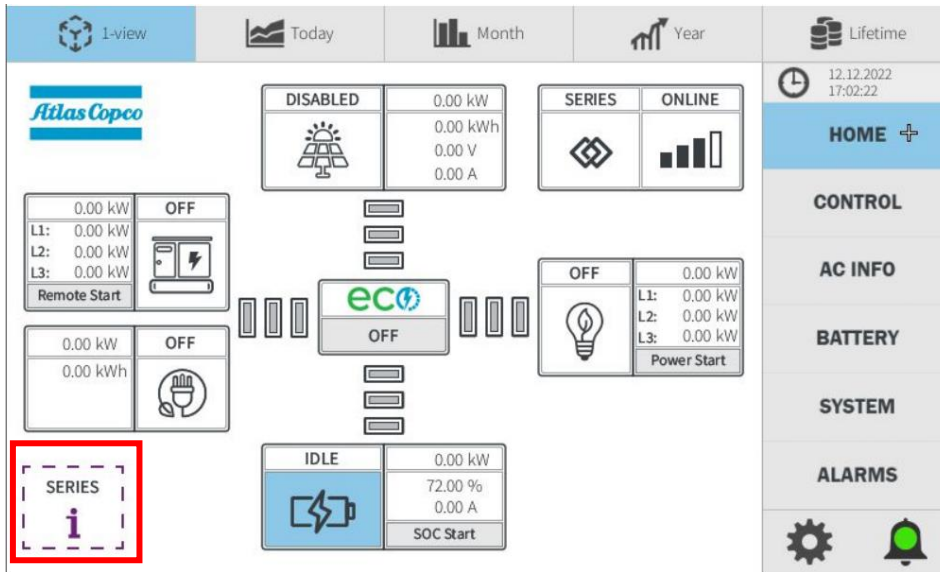
Enable this mode to connect two ZBP of same model type in series to provide greater autonomy on the same installation.

4.2.1. Installation

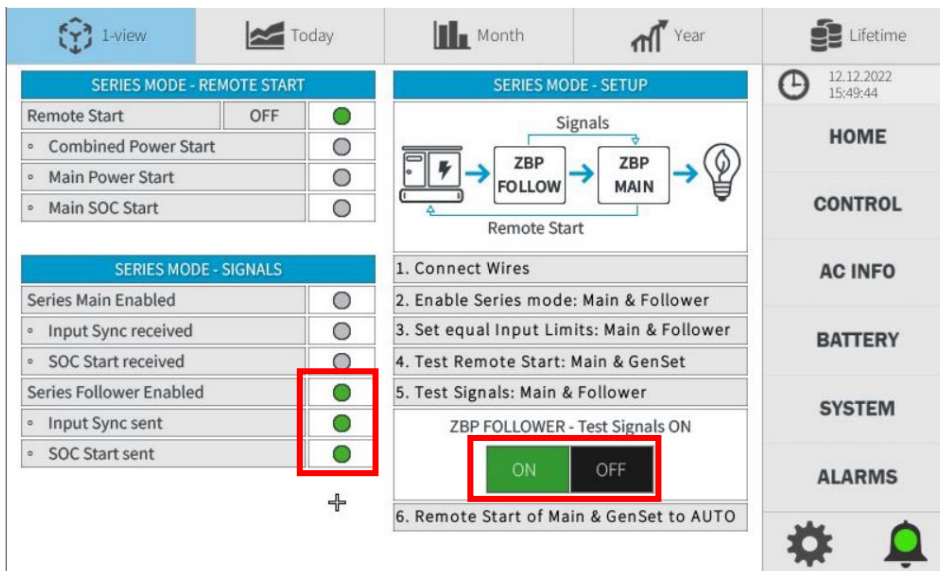


1. Ensure no more than two ZBP of same model type are available.
2. Select a suitable GenSet.
 - ZBP 15.60.230 ⇒ Recommended Size 24kVA
 - ZBP 30.30.400 ⇒ Recommended Size 112kVA
 - ZBP 30.60.208 & 30.75.208 ⇒ Recommended Size 112kVA
 - ZBP 40.60.208 & 40.75.240 ⇒ Recommended Size 72kVA
 - ZBP 45.60.400 & 45.75.400 ⇒ Recommended Size 112kVA
3. Connect Wires as shown above.
 - AC Wires: GenSet to Input of ZBP Follower
 - AC Wires: Output of ZBP Follower to Input of ZBP Main
 - AC Wires: Output of ZBP Main to Load
 - Signal Wires: Series mode signals from ZBP Follower to ZBP Main
 - Signal Wires: Remote Start of ZBP Main to GenSet
4. Enable Series mode in both ZBP ([see section 2.8.6.1](#)). Ensure no more modes are enabled.
 - ZBP connected to GenSet= Series Follower mode
 - ZBP connected to Load and controlling GenSet = Series Main mode

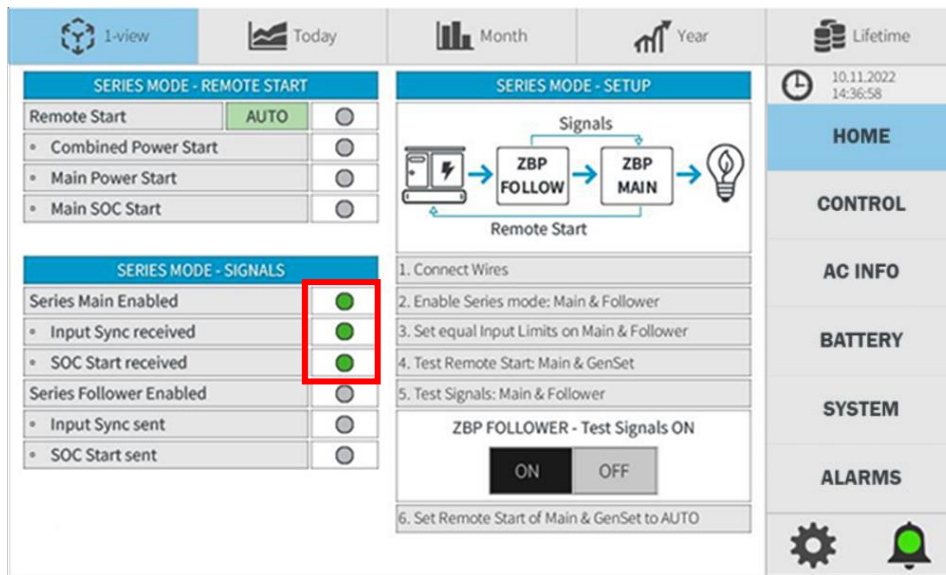
The Series mode tab is now displayed on the Home tab after series mode is enabled.



5. Turn ON Inverters and select the same Input Limit in both Main and Follower according to the GenSet Size. Check Input Limit alarm is not triggered after turning on Inverters in both units.
6. Test Remote Start in ZBP Main unit to ensure successful communication to control the GenSet
 - Remote Start MAN ON -> GenSet Start
 - Remote Start MAN OFF -> GenSet Stop
7. Access Series tab and test Series mode signals to ensure successful communication with the two units.
 - Go to ZBP in Series Follower mode and press the button "Test Signals ON" to force sending Input Sync & SOC Start signals to ZBP in Series Main mode. This button will be turned on for 60s after pressed.



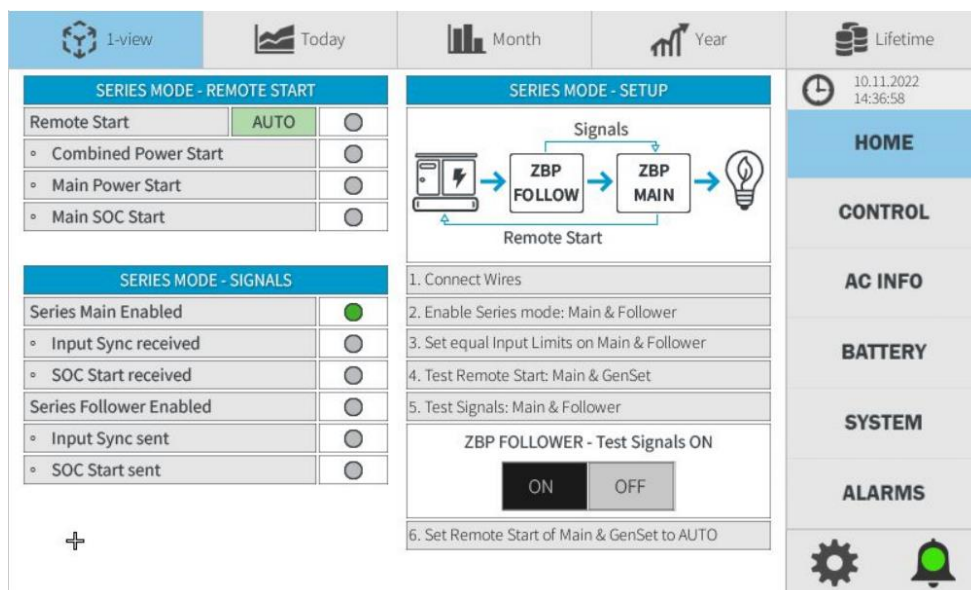
- Go to ZBP in Series Main mode and check the statuses of Input Sync and Start signals. If both are displayed as received, meaning the indicators are in green as shown below, the signals between both ZBPs are successfully connected.



8. Ensure the GenSet Controller and Remote Start of the ZBP in Series Main mode are both in AUTO.

4.2.2. Series mode - Operation Info

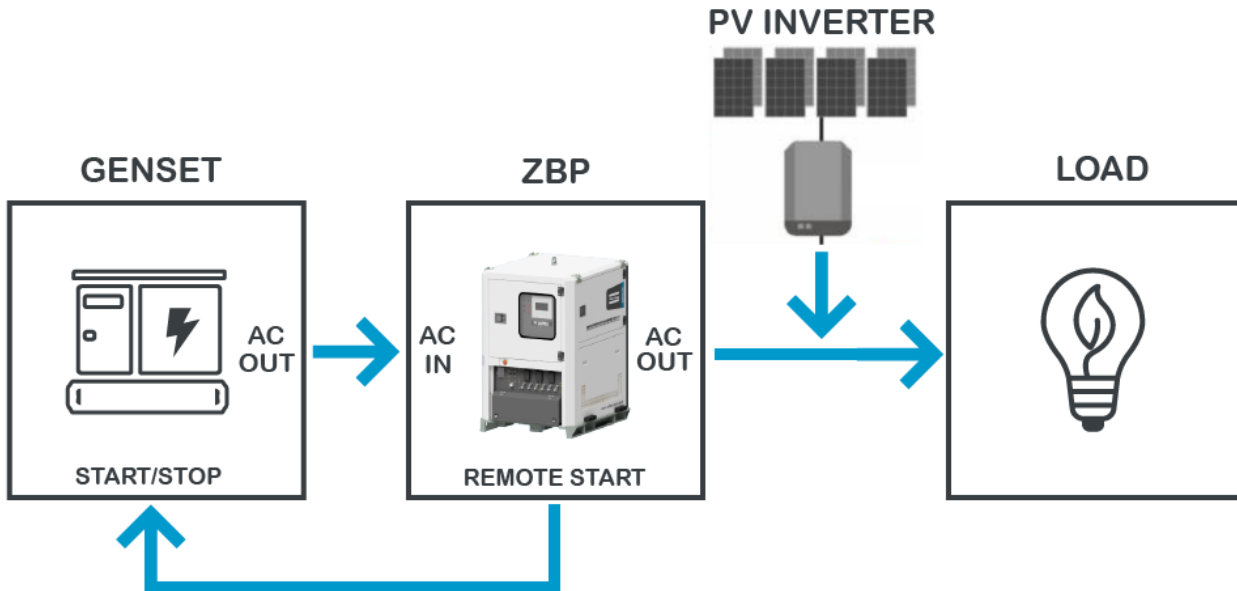
Once both units have been configured as explained in above section, the entire installation is controlled by the ZBP in Series Main mode which automatically will start/stop the GenSet according to the following conditions:



- **Combined Power Start:** condition based on total power output of ZBP Main (Load) which combines power from both the Main and Follower. Therefore, the system can use the power from both units if only ZBP Follower battery is not low.
- **Main Power Start:** this condition takes place when battery of ZBP Follower is low (SOC Start activated) therefore the ZBP Main is performing as single unit and it will start/stop the GenSet according to Power Inverter Start of ZBP Main ([see section 3.3](#)).
- **Main SOC Start:** same as main power start but according to SOC Start of ZBP Main.

4.3. AC Coupled mode

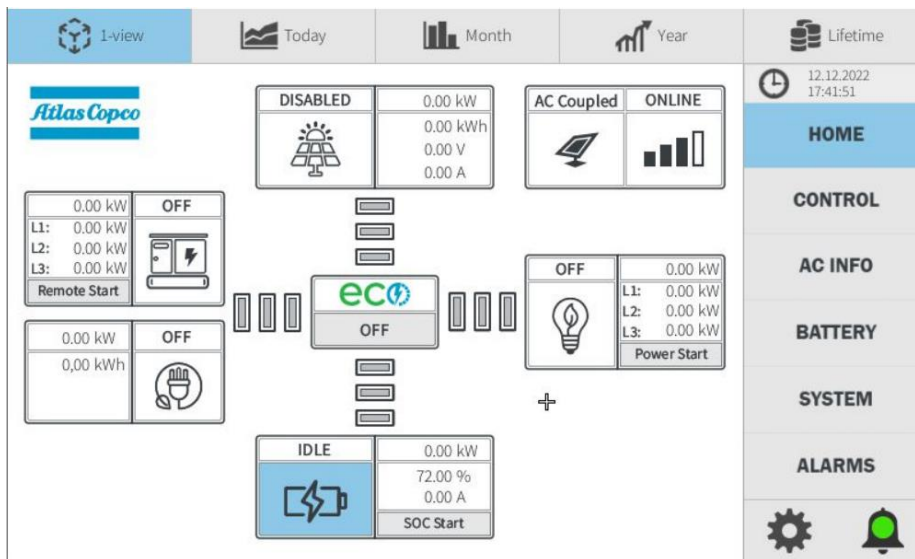
A PV Inverter can be connected to the output of the ZBP to create an AC Coupled system in combination with the AC Input Source connected to the input of the ZBP, to directly power the loads and charge the batteries.



4.3.1. Setup Instructions

- Most PV inverters brands can be used for these systems, they need to be setup to support frequency shifting, often called the island mode or micro grid mode ([see Annex AC Coupled](#)).
- Factor 1.0 rule: The max PV power must be equal or less than the power rating of the ZBP.
 - ZBP 15kVA => Max PV Inverter power is 15kVA
 - ZBP 30kVA => Max PV Inverter power is 30kVA
 - ZBP 40kVA => Max PV Inverter power is 40kVA
 - ZBP 45kVA => Max PV Inverter power is 45kVA
- Setup the Victron Configuration Software for enabling Frequency Shifting ([see Annex AC Coupled](#)): To regulate the charge process by limiting the output power of the PV inverter to properly manage the charge and to prevent overcharge of the batteries
- Activate the AC Coupled mode in the ECO Controller ([see section 2.8.7.1](#)): This mode will add extra conditions on the input switch and Remote Start functions to turn off the AC Input Source when battery SOC is high to be able to control the PV Inverter by reducing the output frequency.

4.3.2. AC Coupled mode - Operating info

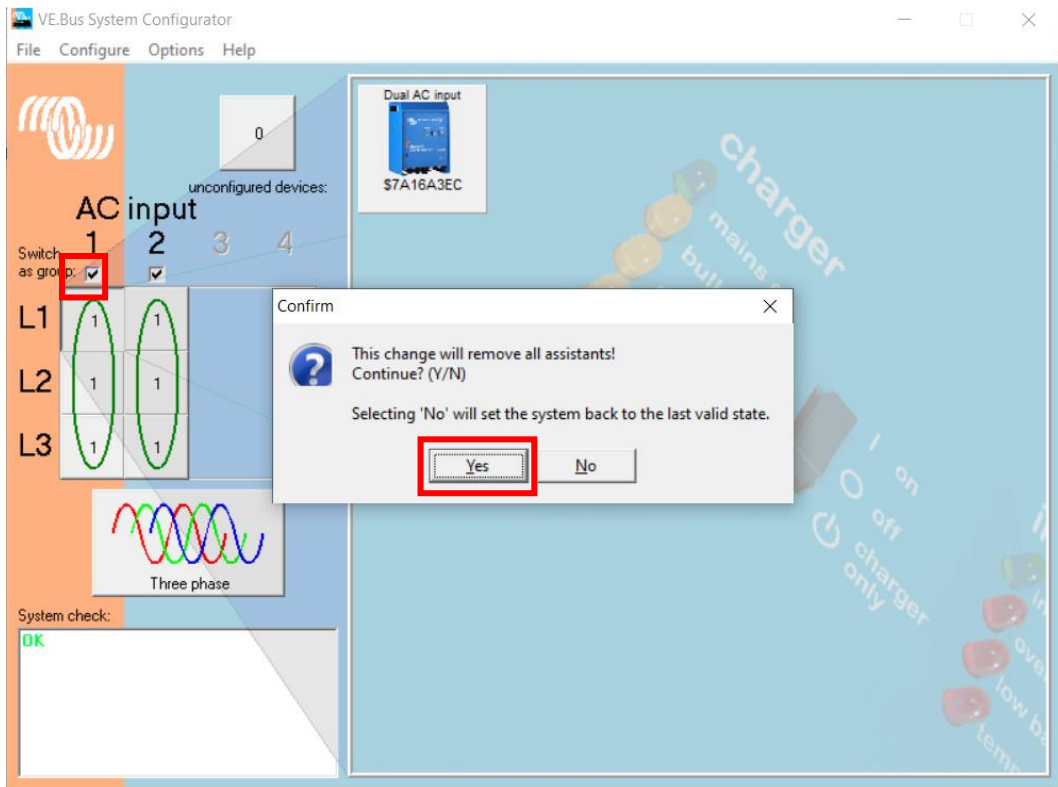


When the ZBP is operating with disconnected AC Input Source, the output power of the PV Inverter is controlled by changing the AC output frequency of the ZBP, to protect the batteries from overcharged.

When the AC Input source is running, the output frequency of the ZBP is fixed by the frequency of the AC Input Source so the ZBP cannot control the output power of the PV Inverter. During the time the AC Input is running, the ZBP is protecting the Input Source from reverted power and it will be always turned off when battery SOC is 90% to ensure the ZBP can then control the output power of the PV Inverter.

Annex. AC Coupled mode: ZBP Inverter Software & External PV Inverter Setup

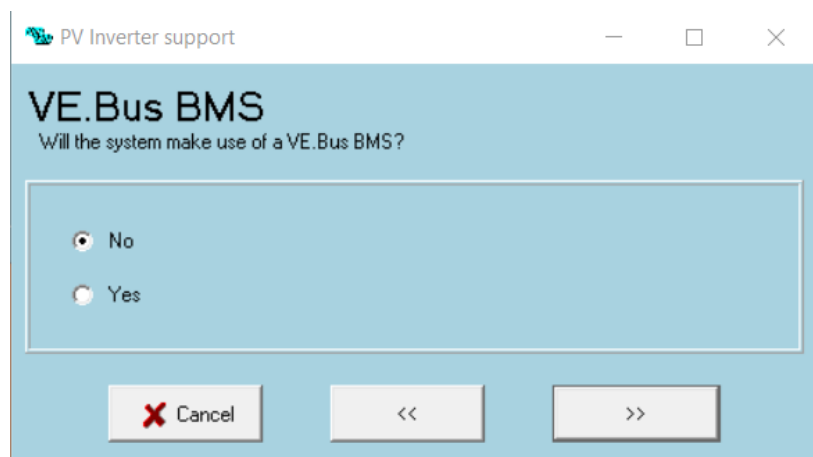
1. Setting up the ZBP inverter software for 50Hz units:
 - Connect the mk3 to main inverter and open the VE.Bus System Configurator
 - Click on switch as group in AC Input 2 and send configuration to inverters. This will remove all the assigned assistants as shown below.



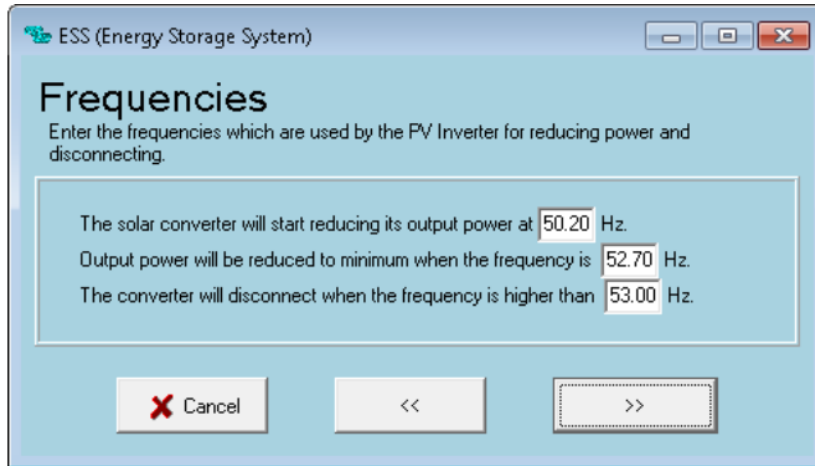
- Add the corresponding assistants on each inverter.
- Add the PV Inverter assistant

The assistant must be placed on the last position of the list and must be loaded in all inverters in the system. It will be indicated whether it is necessary in a specific inverter.

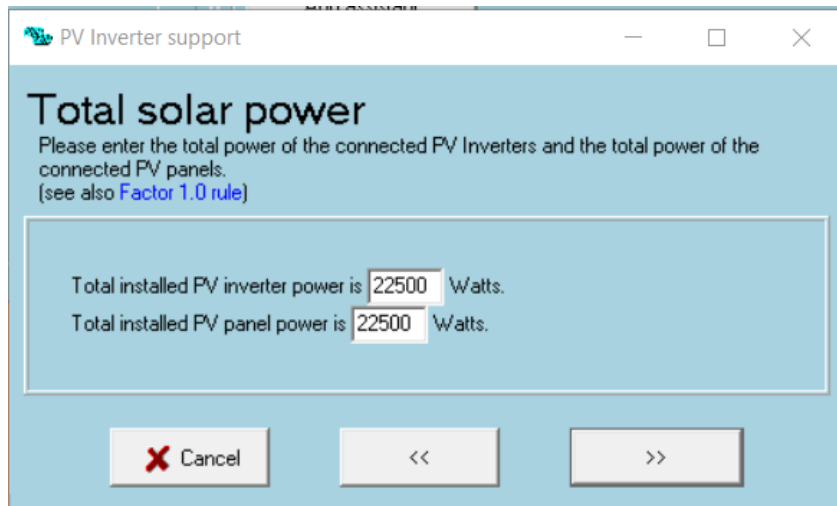
- No used in a Ve.Bus BMS



- Frequencies:
 1. Start time: 50.2 Hz
 2. Finish: 52.7 Hz
 3. Disconnect: 53 Hz



- Nominal power of the connected external PV inverter and the total power of the connected PV panels to the external PV inverter must be added on the PV inverter assistant.



2. Setting up Fronius

1.2 Fronius / Victron specifics

This is a very easy setup. The Fronius Setup Microgrid has been developed in close cooperation with Victron. During commissioning, set the PV Inverter to Setup MG50 (or Setup MG60 for 60 Hz systems). Everything is then pre-configured. The Setup MG settings match the default Victron Assistant settings.

Compatible ROW inverters (for "European type AC grid") are:

- Fronius Primo (1~, 3 kW up to 8.2 kW) → Software *fro27140.upd* or higher (see [FAQ Q5!](#))
- Fronius Symo (3~, 3 kW up to 20 kW) → Software *fro27140.upd* or higher (see [FAQ Q5!](#))
- Fronius Eco (3~, 25 kW or 27 kW) → Software *fro27140.upd* or higher (see [FAQ Q5!](#))
- Fronius Agilo (3~, 75 kW up to 100 kW) → Software *update19.tl* or higher
- Fronius IG Plus V (1~, 2~, 3~, 2.5 kW up to 12 kW) → from *IGF 5.0.66* on with settings according to the Victron recommendations

For new systems the Fronius Symo and Fronius Eco inverters are recommended for 3~ applications. The Fronius Primo inverters are recommended for 1~ applications. Please note that all these inverters are transformerless and therefore PV-Modules that require pole-grounding (on the Plus or Minus pole) cannot be connected.

The use of Fronius Galvo inverters is not recommended anymore for new applications - the Fronius Primo is the best substitute and offers higher efficiency, wider DC voltage range and two MPP trackers.

Compatible UL inverters (for "US type AC grid") are:

- Fronius Primo UL (1~, 3.8 kW up to 15 kW) → Software *fro27470.upd* or higher (see [FAQ Q5!](#))
- Fronius Symo 10-24 480V (3~, 10 kW up to 24 kW) → Software *fro27140.upd* or higher (see [FAQ Q5!](#))
- Fronius Symo 10-15 208-240V (3~, 10 up to 15 kW) → Software *fro27140.upd* or higher (see [FAQ Q5!](#))

For the UL inverters, some more Microgrid Setups are available (e.g. for connection with Neutral conductor or without). Also the UL inverters can be used in 60Hz as well as in 50Hz applications. More information can be found in the user manuals.

When setting up a system, always update both the Fronius and the Victron devices to their latest firmware versions. For the latest Fronius firmware and information how to update use this link: [Fronius firmware update](#)

1.3 Setting up the Fronius with Setup MG50/MG60

When not pre-ordered with a MicroGrid setup, follow these steps:

1. Make sure that the Fronius PV inverter is updated to at least the firmware version mentioned above. See Inverter list above.
2. After making the inverter operational according to the manual, select the language and after this the country specific setup.
3. Here choose MG50 or MG60 depending on the system frequency.
4. Ready to start up.