

Operating manual

HMA



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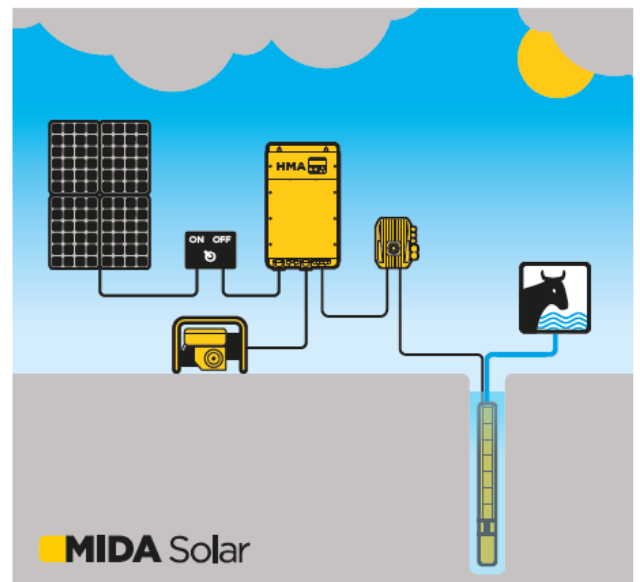
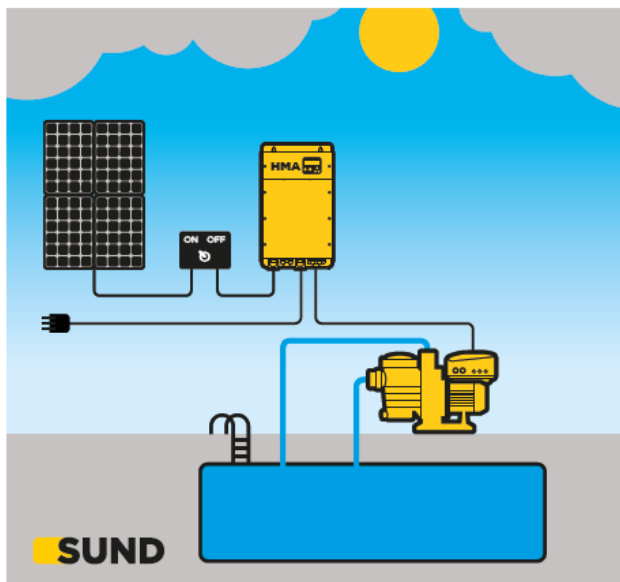
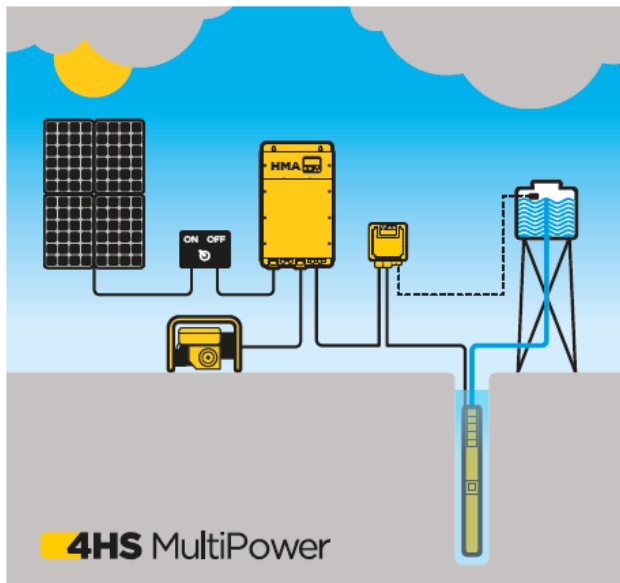
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1. Introduction to HMA

HMA is an electronic device for switching between power sources that integrates multiple functions:



- Automatic power source management: HMA, combined with any MultiPower “HMA ready” device, switches between AC power (mains or generator) and DC power (photovoltaic panels) completely automatically, based on the programmed logic.
- Mechanical disconnection of the two power supplies: Two interlocked contactors guarantee the uniqueness of the power supply and ensure separation in order to ensure maximum electrical safety.
- Control of auxiliary generator: When the AC power is provided by a generator, HMA is able to start or stop it according to need. HMA also monitors any signs of failure or running out of fuel.

Five programmable switching logics can meet any application requirement.



2. Safety Instructions

The manufacturer strongly suggests carefully reading this operation manual before using and installing its products. Any operation (installation, maintenance and repair) must be carried out by trained, skilled, and qualified personnel. Failure to observe and follow the instructions in this manual may result in dangerous and potentially lethal electric shock. Pay attention to all standard safety and accident prevention regulations.

	<p>The device must be connected to both power supply (DC: photovoltaic panels and AC: grid or generator) via a switch to ensure the complete disconnection from the supply before any operation on the HMA and on the connected load.</p>
	<p>Do not remove, for any reason, the cover and the cable plate without having first disconnected the device from the power supply and having waited at least 5 minutes.</p>
	<p>The system must be grounded properly before operation.</p>
	<p>Install safety devices on both DC and AC side.</p>


Avoid any shock or significant impact during transport.

Check the product immediately upon delivery and check for damage and/or missing parts. If either occurs, immediately notify the supplier.

Damages due to transport, incorrect installation, or improper use of the device will null and void the warranty.

Tampering or disassembly of any component will automatically void the warranty.

The manufacturer cannot be held responsible for any damages to people and/or property due to improper use of its products.

	<p>Devices marked with this symbol cannot be disposed of in household waste but must be disposed of at appropriate waste drop-off centres. It is recommended to contact the Waste Electrical and Electronic Equipment drop-off centres (WEEE) in the area. If not disposed of properly, the product can have potential harmful effects on the environment and on human health due to certain substances present within. Illegal or incorrect disposal of the product is subject to serious administrative and/or criminal penalties.</p>
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3. Technical Characteristics

Model	VDC	VAC	I max	Compatibility
HMA 218	90-400	1x90-265	18 A	4HS MP SUND MIDA Solar 203-207 MP VS 218 MP
HMA 430	190-850	3x190-520	30 A	VS 212 MP VS 409-430 MP
HMA 485	190-850	3x190-520	85 A	VS 438-485 MP

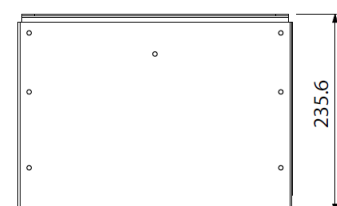
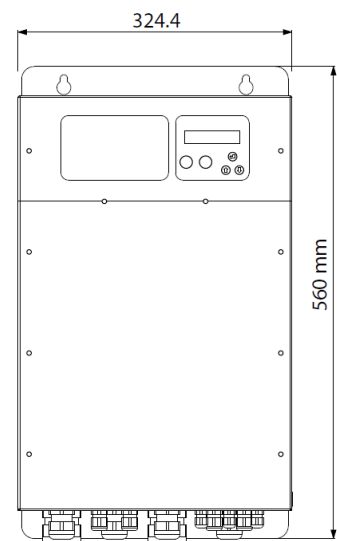
- Ambient temperature at rated current: da -10 a 50°C
- Max altitude at rated current: 1000 m.
- Grade of protection: IP54 (NEMA 12)*
- Connettivity: MODBUS RTU RS485, Bluetooth® SMART (4.0)

* avoid direct exposition to solar rays.

3.1 Weight and dimensions

Model	Weight *	Size
	[Kg]	
HMA 218	XX.X	3
HMA 430	XX.X	3
HMA 485	XX.X	3

* Weight without packaging.



4. Electric wiring

HMA 218

AC input P.E., T1, T2	DC input +, -, P.E. It is necessary to respect the polarity.	AC/DC output F1+, F2-, P.E. It is necessary to respect the polarity.
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HMA 430

AC input P.E., T1, T2, T3	DC input +, -, P.E. It is necessary to respect the polarity.	AC/DC output F1+, F2-, F3, P.E. It is necessary to respect the polarity.
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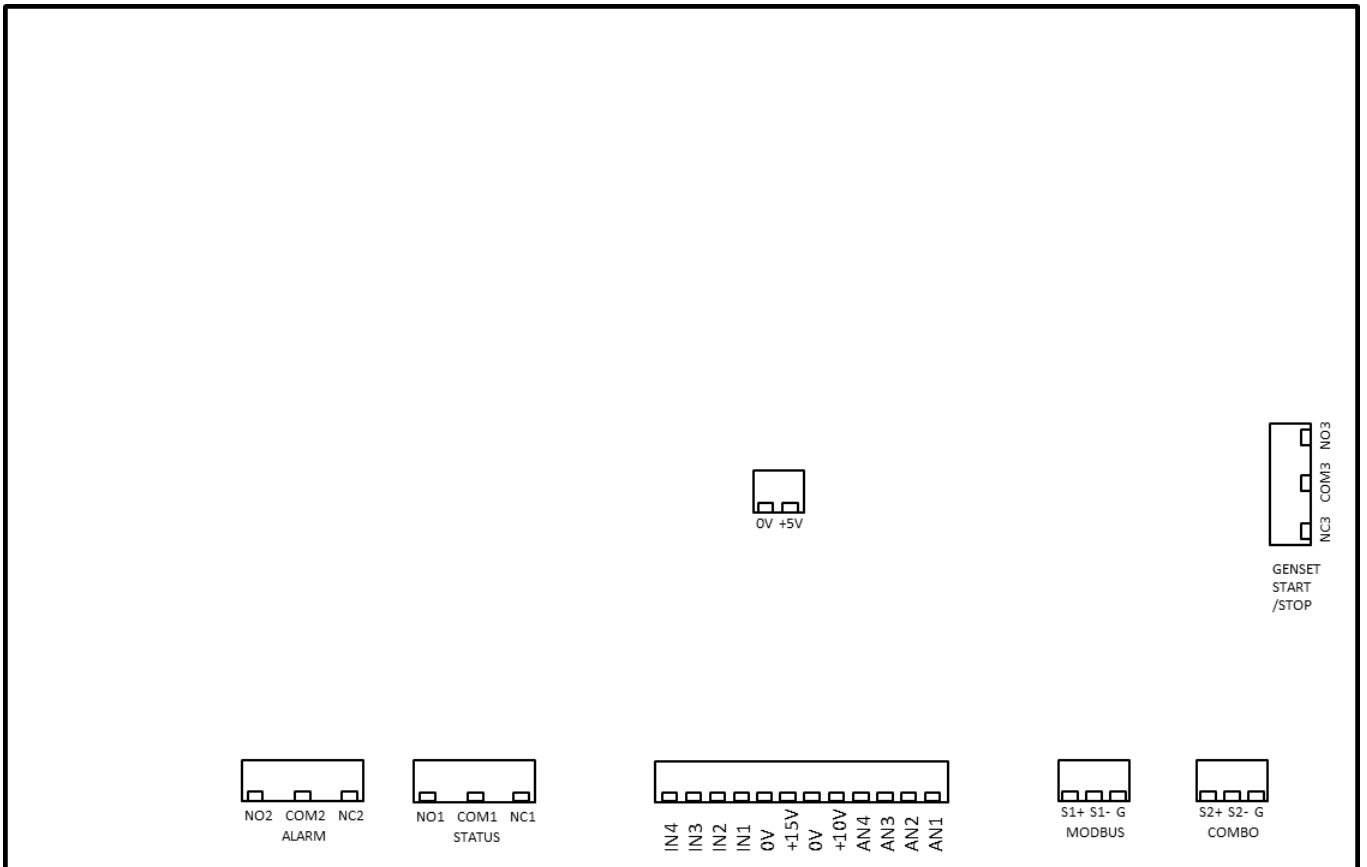
HMA 485

AC input P.E., T1, T2, T3	DC input +, -, P.E. It is necessary to respect the polarity.	AC output F1, F2, F3, P.E.	DC output +, -, P.E. It is necessary to respect the polarity.
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It is recommended to use cable lugs.

Control board

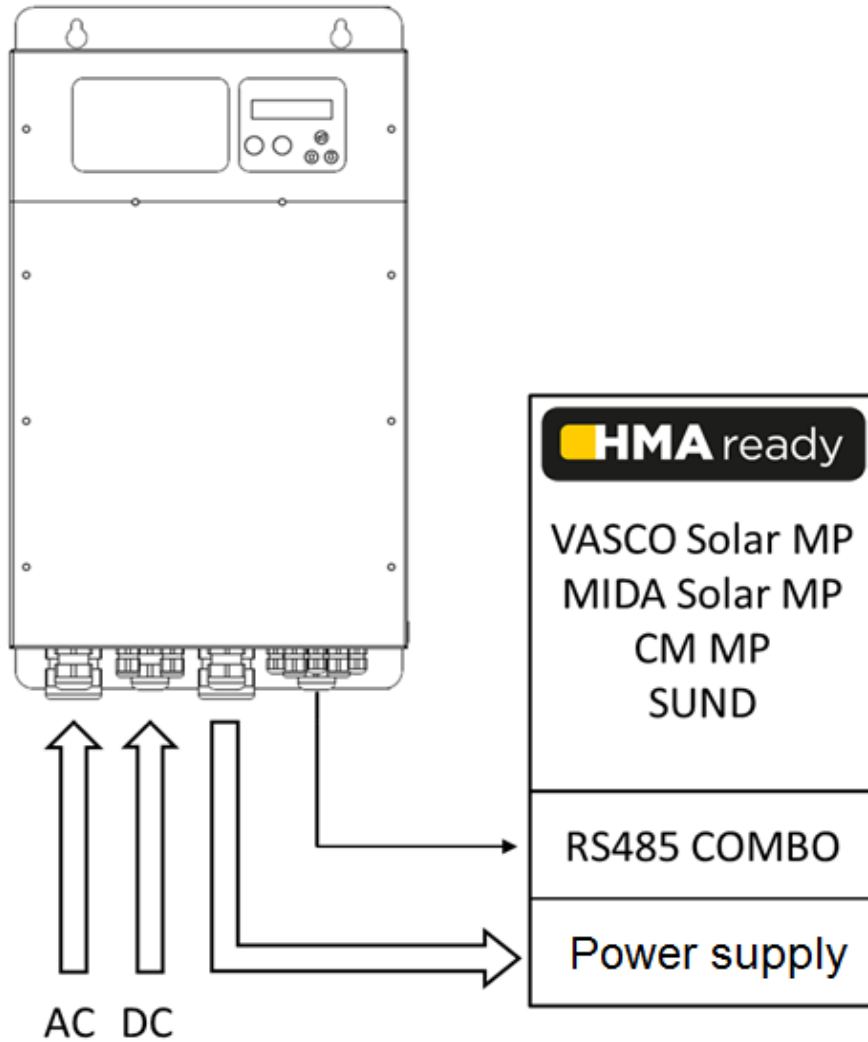


<p>Analog inputs (10 or 15 Vdc):</p> <ol style="list-style-type: none"> 1. AN1: 4-20 mA 2. AN2: 4-20 mA 3. AN3: 4-20 mA / 0 - 10 Vdc (settable by jumper C.C.) 4. AN4: 4-20 mA / 0 - 10 Vdc (settable by C.C.) 	<p>Digital outputs:</p> <p>Power source signal relay: NO1, COM1: closed contact with AC power supply NC1, COM1: closed contact with DC power supply</p> <p>Alarm Relay: NO2, COM2: contact closed without alarm. NC2, COM2: contact closed with alarm or without power supply.</p> <p>Generator start / stop relay: NO3, COM3: contact closed for generator start. NC3, COM3: contact open for generator start.</p> <p>The digital output relays are non-voltage contacts. The maximum voltage applicable to the contacts is 250 V AC, max 5 A.</p>	<p>RS485 for COMBO with device to be controlled:</p> <ul style="list-style-type: none"> • S1+ • S1- • G <p>It is recommended to respect the polarity linking devices.</p>
<p>Digital inputs:</p> <ul style="list-style-type: none"> • IN1 : float or pressure switch for pump start and stop • IN2: AC / DC switch • IN3: genset alarm • IN4 : genset lack of fuel • 0V <p>We recommend using only no voltage contacts.</p>	<p>5V power supply (max 1 A):</p> <ul style="list-style-type: none"> • 0V • + 5V 	<p>RS485 for MODBUS:</p> <ul style="list-style-type: none"> • S2+ • S2- • G <p>It is recommended to respect the polarity.</p>

Communication with HMA Ready device

The communication between the HMA and the HMA ready device that is intended to be powered is made via serial port RS485 COMBO.

It is enough to use a three wire cable with a minimum section of 0.5 mm² connected to the terminals S1 +, S1-,G.



4.1 Protections

The protections required upstream HMA depend on the type of installation, and local regulations.

Safety protections on both AC and DC side must be used.

For DC side we recommend to use 1000 VDC circuit breaker and, if possible, 1000 VDC surge protection.

For AC side we recommend to use overload protection with the characteristic curve of type C and type B circuit breaker, sensitive to both AC and DC current.

4.2 Electromagnetic compliance

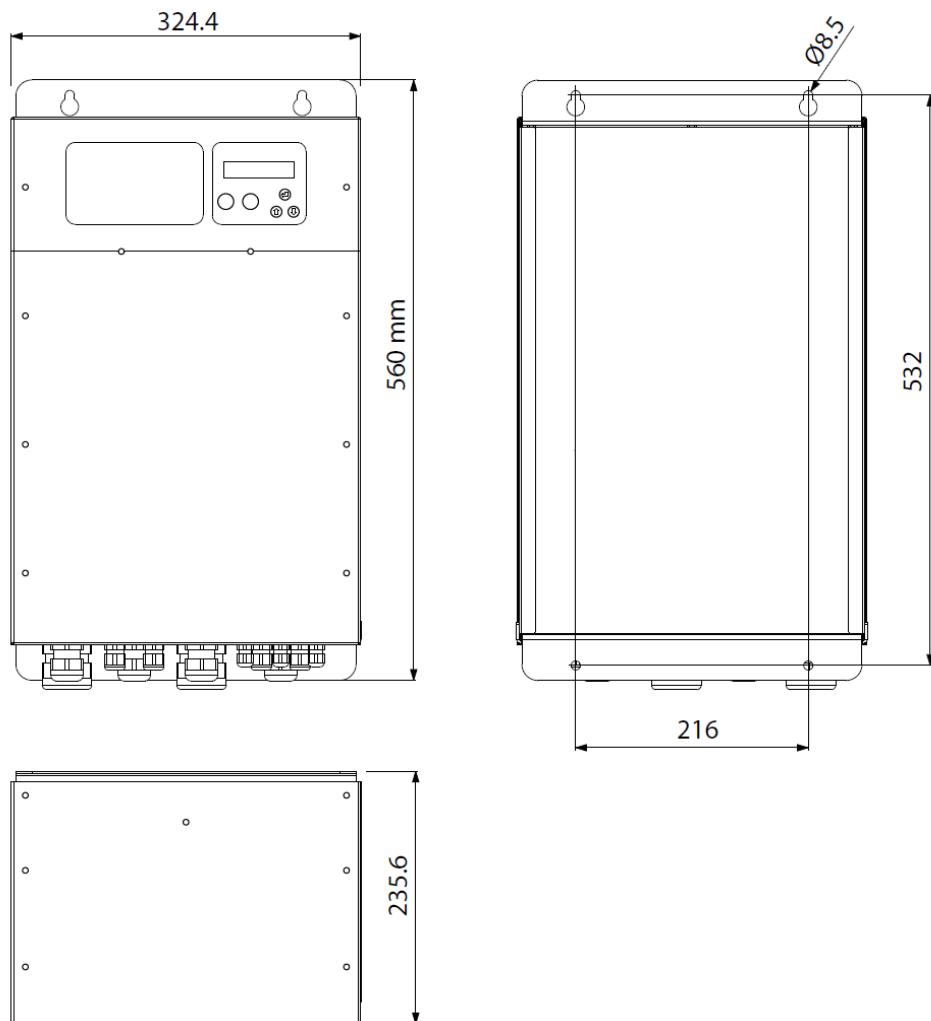
To ensure electromagnetic compatibility (EMC) of the system, it is necessary to apply the following measures:

- Always connect the device to ground
- Use shielded signal cables by placing the screen at one end.
- Use motor cable as short as possible (<1 m / <3 ft). For longer lengths, it is recommended to use shielded cables connecting the screen at both ends.
- Separate signal, motor, and power supply cables.

5. HMA installation

HMA can be installed on the wall following the holes shown in the drawing.

The IP54 protection degree (NEMA 12) allows installation even in humid and dusty environments. However, it is recommended to avoid direct exposure to atmospheric agents and sunlight.



6. HMA Use and Programming

HMA software is extremely simple to use, but allows a wide variety of parameters to be set for ideal system calibration. Setting Parameters is protected by password:

1: **Installer level (MENU' CONTROL PARAMETERS, MENU' IN/OUT PARAMETERS, MENU' CONNECTIVITY PARAM.)**

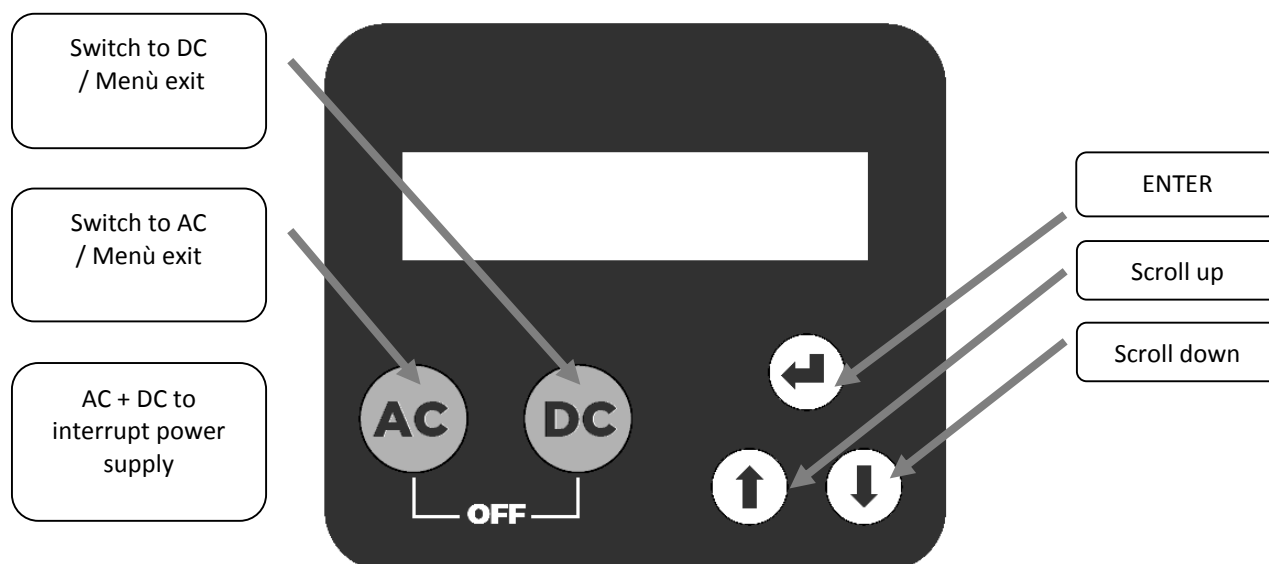
A password is required for this level; these parameters are adjustable by trained professionals

Default password: **001**

From the menu a different password can be set up.

Installer level can be entered only with the correct password; otherwise, it is impossible to set up and/or modify any parameters (they can be only displayed).

6.1 HMA display



It is a backlit display with 2 rows of 16 characters.

An acoustic signal accompanies the user in use and provides a quick indication in case of an alarm.

6.2 Initial configuration

When HMA is switched on for the first time, the initial setting menu is displayed for the initial setting of parameters to configure the system. If the initial setting procedure is not completed properly, it is impossible to run the system. Initial setting procedure can be repeated if necessary.

A brief description of parameters and their allowable ranges are listed below:

Parameter	Default	Description
Language XXXXX	XXXXX	End user communication language

Current Time XX h : XX m	XXXXX	Time setting.
BTLE Connection ON/OFF	ON	Bluetooth communication enabling.
INITIAL SETUP COMPLETED		Once the Setting procedure is completed you will get this indication on the display; setting parameters are recorded. These parameters can be set up individually in the menu.

6.3 Initial view

In: AC/DC Inv: ON/OFF XXX [V]	In provides an indication of the power supply available at the HMA input (DC, AC or DC + AC). Inv provides information on the status of the device connected to the HMA. During the transition phases from one power source to the other, the Inv indication flashes. The VDC and VAC voltage is also displayed.
In: AC/DC Inv: ON/OFF XX : XX	Display of current time. In switch mode time or flow with AC start time, the exchange time from one power source to the other is also indicated.
In: AC/DC Inv: ON/OFF XXXXXXXXXX Total hours XXXXX h : XX m AC hours XXXXX h : XX m DC hours XXXXX h : XX m ALL. XXXXXXXXXXXXXXX XXXXX h : XX m	Status display: <ul style="list-style-type: none"> • INV SUPPLY:OFF: both power sources are disabled (by simultaneously pressing the AC and DC buttons). • INV SUPPLY: DC: DC power supply. • INV SUPPLY: AC: AC power supply. • DC Wait: waiting for the DC supply to stabilize for 5 minutes before attempting to switch to DC. • AC Wait: waiting for the AC supply to stabilize before attempting to switch to AC. • Low PV Energy: Not enough energy to follow the switching in DC. <p>In case of alarm the corresponding alarm is indicated.</p> <p>By pressing the ENTER key it is possible to access the diagnostic menu which shows:</p> <ul style="list-style-type: none"> • Total hours of AC or DC power supply of the HMA. • AC power hours. • DC power hours. • History of the last 8 alarms referred to Total Hours. <p>The daily flow rate which is automatically reset every day at dawn is indicated in flow exchange mode.</p> <p>Pressing the ENTER key again exits the diagnostic menu.</p>
Menù ENT to access	Pressing the ENTER key accesses the menu.

6.4 Menu view

Pressing the ENTER key in correspondence with [MENU ' / ENT to access] in the initial display accesses the menu. To exit the menu display and return to the initial display, press one of AC or DC buttons.

	MENU' Control. param.		Installer password required to enter level 1 (default 001)
	MENU' IN/OUT. param.		Installer password required to enter level 1 (default 001)
	MENU' Connect. param.		Installer password required to enter level 1 (default 001)
	MENU' Change init.set.		Installer password required to enter level 1 (default 001)

6.5 Control parameters

Parameter	Default	Description	Manual	Auto	Flow	Time	Ext. Input
Switch Mode: <ul style="list-style-type: none"> • Manual • Auto • Flow • Time • Ext. Input 	MPPT	It is possible to choose between: <ul style="list-style-type: none"> • Manual: using the keyboard it is possible to switch from one power supply to another or even interrupt the power supply. • Auto: if the radiation falls below a certain value or the power generated by the panels is not sufficient to operate the pump, the HMA starts the generator, if present, and exchanges with AC power. When the irradiation returns above the minimum threshold, the generator is switched off and the pump is restarted with DC power. In the absence of a solarimeter, the HMA exchanges to AC if the DC supply is no longer sufficient to guarantee pump operation at minimum frequency. • Flow: the exchange from DC to AC power supply is made automatically to satisfy the desired daily flow rate. It is also possible to set a time after which to allow the transition to AC. • Time: the transition from the photovoltaic power source to the mains supply (or generator) and vice versa occurs at a time set by the user. • Ext. Input: The exchange is controlled by the opening or closing of digital input 2. 					
Current Time XX h : XX m	XXXXX	Time setting.	✓	✓	✓	✓	✓

Parameter	Default	Description	Manual	Auto	Flow	Time	Ext. Input
DC Start Thresh. XXXX [W/m ²]	0	Irradiation value for the exchange from AC to DC supply.		✓	✓		
DC Start Delay XX [min]	05	Without a solarimeter installed, the HMA will attempt to restart in DC based on this parameter, doubling the time for each restart attempt up to a maximum of 60 minutes.		✓	✓		
Daily Flow V = XXX.X [m ³]	XX	It is the daily flow value to be satisfied with a possible transition from DC to AC supply.			✓		
AC Starting Mode Auto/Timed	Auto	In Switch Mode: Flow, the Auto AC Starting Mode provides for immediate transition to AC as soon as the DC is not sufficient. In Timed AC Starting Mode the exchange takes place at a set time.			✓		
AC Starting Time XX h : XX m	XX	Set time for the passage from DC to AC.			✓	✓	
DC Starting Time XX h : XX m	XX	Set time for the passage from AC to DC.				✓	
Change PASSWORD ENT		By pressing the ENT key it is possible to change the installer level password (level 1) (default 001).	✓	✓	✓	✓	✓

6.6 IN/OUT parameters

Parameter	Default	Description
Digital input 1 N.O. / N.C.	N.O.	Digital input 1 is used to parallelize the signal coming from a float or pressure switch connected to the digital input 1 of the HMA ready device powered by HMA. N.O. (Normally Open) or N.C. (Normally Closed) must be the same on both devices. The polarity in the connection must be respected.
Digital input 2 N.O. / N.C.	N.O.	Digital input 2 is used to exchange the two power sources when the selected Switch Mode is Ext. Input

Parameter	Default	Description
Digital input 3 N.O. / N.C.	N.O.	Digital input 3 can be connected to the alarm signal of the generator.
Digital input 4 N.O. / N.C.	N.O.	Digital input 4 can be connected to the signal of lack of fuel of the generator.
Dig.In.1/2 delay [s]	1	Digital input 1 and 2 delay. The digital input has a fixed delay of 1 sec.
Change PASSWORD ENT		By pressing the ENT key it is possible to change the installer level password (level 1) (default 001).

6.7 Connectivity parameters

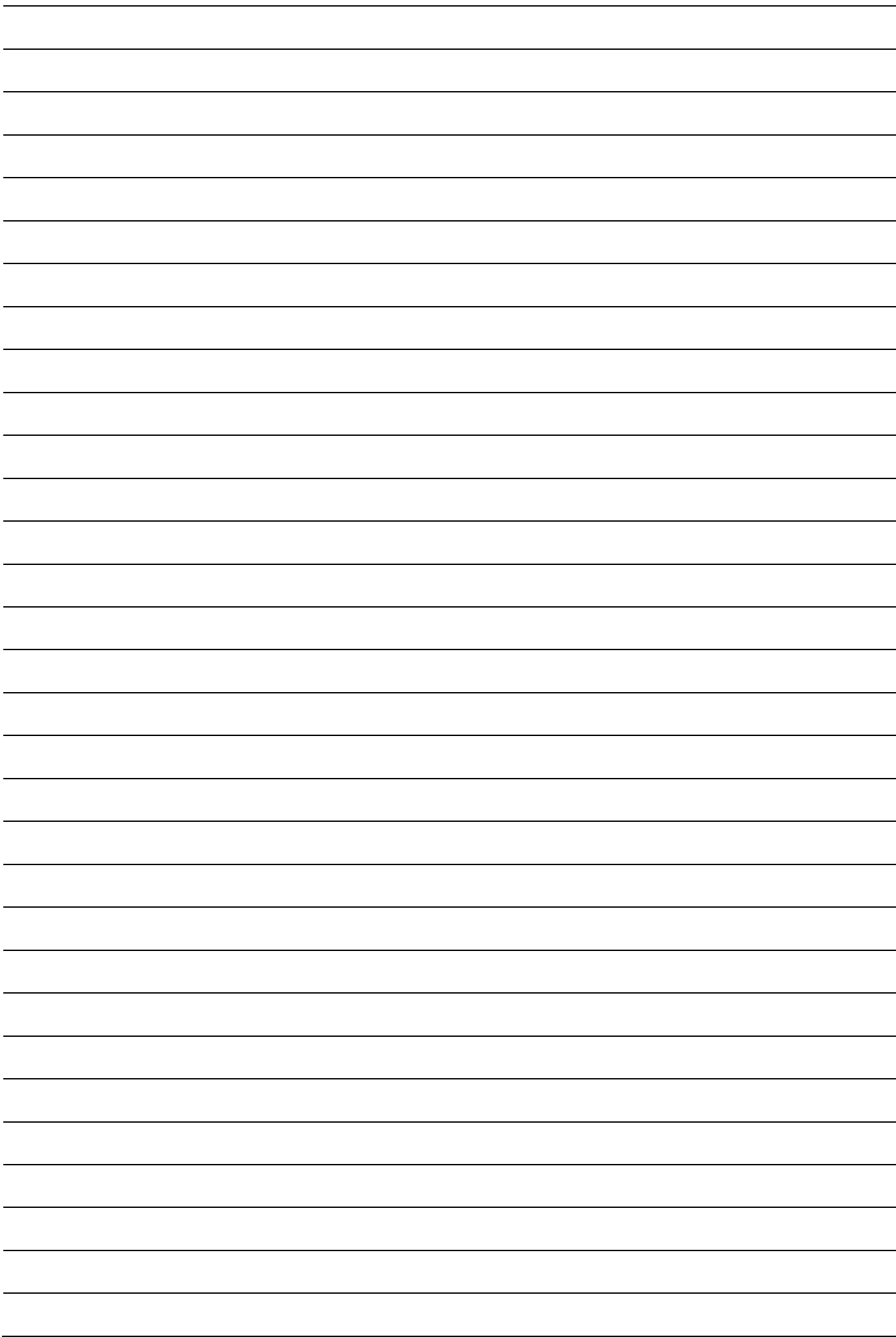
Parameters	Default	Description
Language XXXXX	XXXXX	End user communication language
MODBUS address XXX	1	MODBUS address from 1 to 247
MODBUS baudrate XXXXX [bps]	9600	MODBUS baudrate from 1200 bps to 57600 bps
MODBUS data format XXXXX	RTU N81	MODBUS data format: RTU N81, RTU N82, RTU E81, ETU O81
BTLE Connection ON/OFF	ON	Bluetooth communication enabling.
Change PASSWORD ENT		By pressing the ENT key it is possible to change the installer level password (level 1) (default 001).

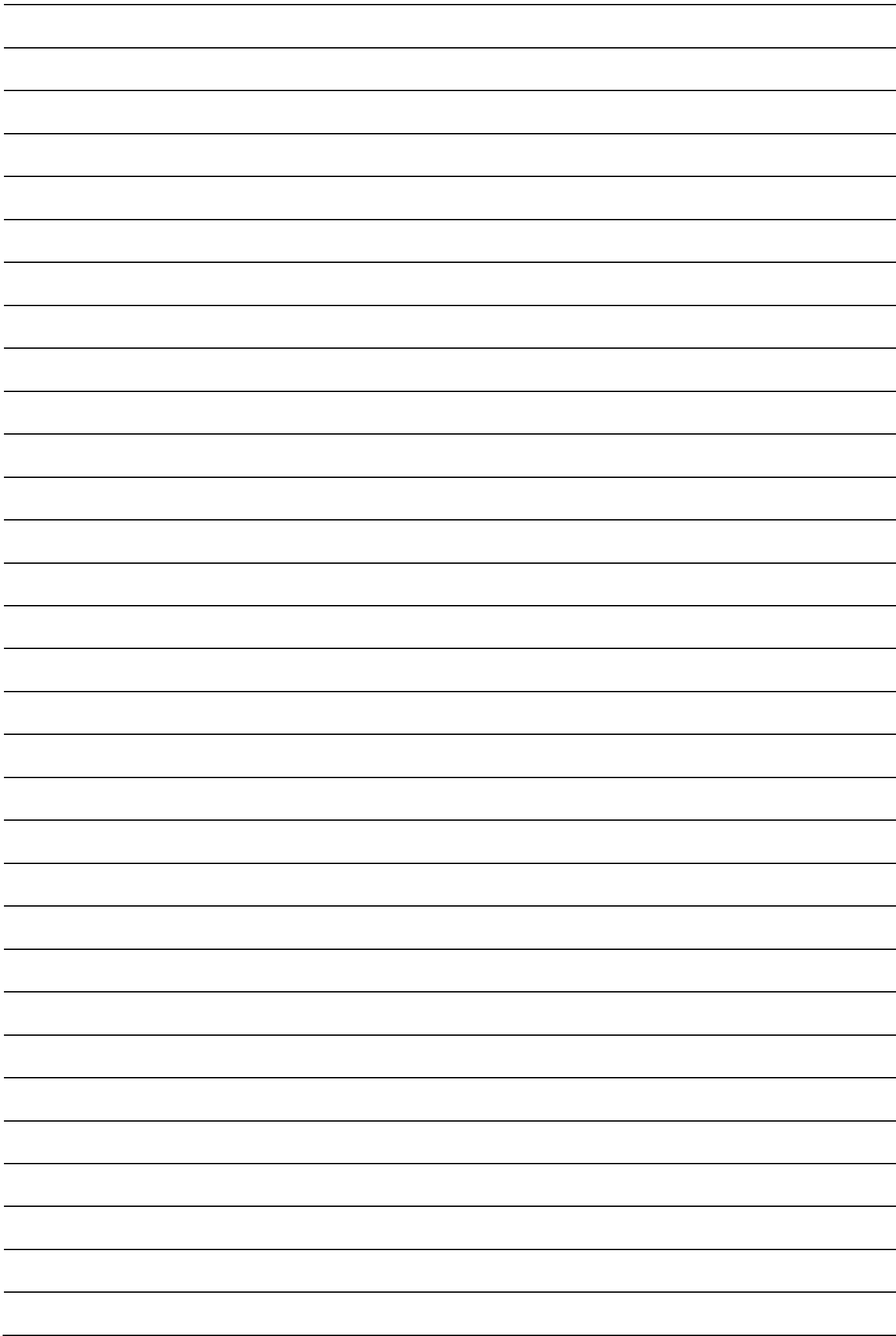
7. Protections and alarms

Anytime a protection occurs a blinking message is displayed together with an audible alarm; on STATUS in the initial view, the protection is displayed; by pressing AC or DC button, only from this position (STATUS) in the initial view, is it possible to try to reset the alarm; if HMA does not reset the alarm it is displayed again together with an audible sound.

Alarm message	Alarm description	Possible solutions
LOW BATTERY	The internal battery voltage is lower than the minimum allowed threshold.	Keep the HMA powered by one of the two power sources for at least two hours and if the alarm persists, contact the technical service.
5V OVER CURRENT	5V power supply overload (greater than 1 A).	Remove the load connected to the 5V supply and check the causes of excessive absorption.
OVER TEMP. PCB	Overtemperature of the electronic board.	Check that the ambient temperature is below the maximum allowed.
OVER VOLTAGE	Overvoltage in DC power supply.	Check the causes of overvoltage.
AC CLOSING FAULT	Failure to detect closure of the AC contactor.	Check the wiring of contactor. Check the function of the contactor.
DC CLOSING FAULT	Failure to detect closing of the DC contactor.	Check the wiring of contactor. Check the function of the contactor.
AC OPEN. FAULT	Failure to detect opening of AC contactor.	Check the wiring of contactor. Check the function of the contactor.
DC OPEN. FAULT	Failure to detect opening of DC contactor.	Check the wiring of contactor. Check the function of the contactor.
GENERATOR FAULT	Opening or closing of digital input 3 detected.	Check the correct configuration of the digital input 3. Check the wiring to the digital input 3. Check the generator.
GEN. FUEL. LACK	Opening or closing of the digital input 4 detected.	Check the correct configuration of the digital input 4. Check the wiring to the digital input 4. Check the fuel level in the generator.
NO COMM.INVERTER	Lack of communication between the HMA and the device powered by it.	Check if the device is powered. Check the COMBO serial wiring. Check the device power supply wiring.

KEYBOARD FAULT	A keyboard button has been pressed for more than 120 seconds	Check that the push-button panel is not accidentally pressed Call the assistance service
GENERAT. TIMEOUT	Failure to detect AC power within 30 seconds of starting the generator.	Check the generator start signal wiring. Check the AC power supply wiring. Check the correct functioning of the generator.
INV SUPPLY:OFF	Deactivation of both AC and DC contactors following the simultaneous pressing of both the AC and DC buttons.	Select a power source using the corresponding button.
INV SUPPLY: DC	Closing the DC contactor	
INV SUPPLY: AC	Closing the AC contactor	
AC Wait	Waiting for the AC power supply (generator) following a request.	
DC Wait	Waiting for the DC supply to stabilize for 5 minutes before attempting to switch to DC.	
Charging Battery	Battery charging in progress.	
Low PV Energy	Insufficient energy to switch to DC.	
Daily Flow OK	Daily flow rate reached.	





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