ECGSOLAX

Hybrid solar inverter

ECGSOLAX HVM 3.6k W 24 V inverter

Model **ECG-HVM3.6K**

User manual

Installation, operation, settings, troubleshooting



Manufacturer’s original manual, English translation. Structure, tables and illustrations are kept as in the original.

SUPPORT. If you have technical questions not answered in this manual, contact the seller.

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1. About this manual

1.1 Scope

This manual applies to the following devices:

- Solar inverter

1.2 Manual contents

The manual describes assembly, installation, operation and troubleshooting of this unit. Read it carefully before installation and use.

1.3 Intended audience

The document is intended for qualified persons and end users. Tasks that need no special qualification may also be done by end users. A qualified person must have the following skills:

- Knowledge of how an inverter works and is operated.
- Training in dealing with hazards and risks when installing and using electrical devices and installations.

- Training in installing and commissioning electrical devices and installations.
- Knowledge of applicable standards and directives.
- Knowledge of this document and observance of all safety instructions.

1.4 Symbols used

To ensure the user's personal safety, the inverter and the manual carry markings and symbols that warn of hazards. Read the list of symbols below carefully.

Markings on the inverter

Symbol	Value
	**CAUTION!** Do not disconnect under load!
	**Danger: high voltage! Electric shock hazard!**
	Start servicing the inverter at least 5 minutes after disconnecting it from all external power sources.
	Read the manual carefully before any work on the inverter.
	Grounding: for operator safety the system must be securely grounded.

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Markings in the documentation

Symbol	Value
⚠ **WARNING!**	High level of potential hazard which, if not avoided, could result in death or serious injury.
⚠ **CAUTION!**	Medium or low level of potential hazard which, if not avoided, could result in moderate or minor injury. In adverse circumstances it may result in death or serious injury.

1.5 Safety instructions

> ⚠ **WARNING**
> This section contains important safety and operating instructions. Read the manual and keep it for future reference.

1. Be clear which system you are building: with a lithium or a lead-acid battery. If you choose the wrong system, the energy storage system will not work properly.
2. Before use, read all instructions and warning labels on the unit, the batteries and in the relevant sections of this manual. If the unit is not installed per this manual and is damaged as a result, the manufacturer may refuse warranty.
3. All installation and connection work must be done by a professional electrical or mechanical engineer.
4. All wiring must comply with local electrical safety codes.
5. If you mount PV modules in daylight, cover them with an opaque material: in the sun their terminals carry high voltage, which is dangerous.
6. CAUTION: to reduce the risk of injury, charge only deep-cycle lead-acid and lithium batteries. Other battery types may burst and cause injury and damage.
7. Do not disassemble the unit. For service or repair, go to a qualified service centre. Incorrect reassembly may cause electric shock or fire.
8. To reduce the risk of electric shock, disconnect all wiring before any maintenance or cleaning. Switching the unit off with the button does not remove this risk.
9. NEVER charge a frozen battery.

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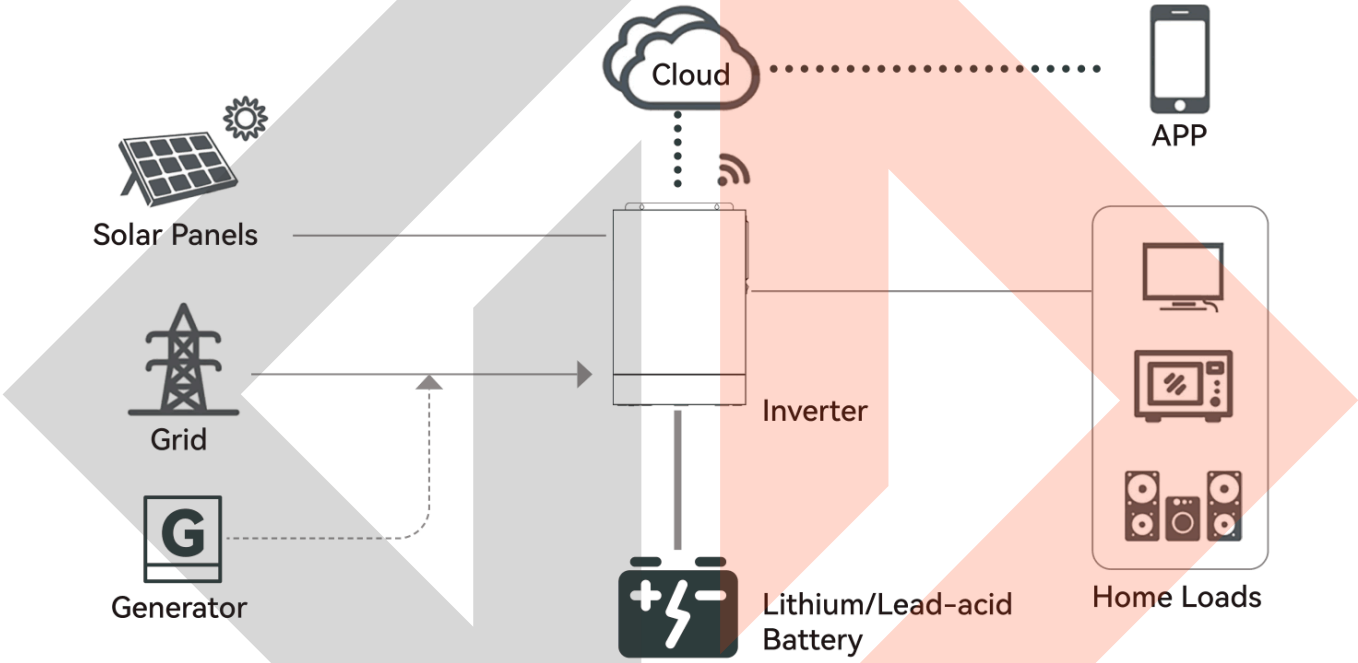
10. For optimal inverter operation, choose cable sizes as required. This is very important for correct inverter operation.
11. Be very careful when working with metal tools on or near batteries: a tool may fall, spark or short the battery or other electrical parts and cause an explosion.

12. When disconnecting AC or DC terminals, strictly follow the installation order. See the “Installation” section of this manual for details.
13. GROUNDING INSTRUCTIONS: the inverter must be connected to a permanent grounded wiring system. Follow local requirements and codes when installing the inverter.
14. NEVER short-circuit the AC output and DC input. Do NOT connect the grid if the DC input is shorted.

15. Before operation, make sure the inverter is fully assembled.

2. Introduction



Solar energy storage system. Solar Panels · Grid · Generator · Cloud · APP · Inverter · Lithium/Lead-acid Battery · Home Loads

This is a multifunction solar inverter: one case combines an MPPT solar charge controller, a high-frequency pure sine wave inverter and a UPS module. It is ideal for off-grid backup power and solar self-consumption. The inverter can work with or without batteries.

A complete system also needs other devices: PV modules, a generator or the grid. For other possible system layouts for your needs, consult a system designer.

The WiFi module is a plug-and-play monitoring device that fits on the inverter, or a built-in module. With it you can monitor the PV system anytime, anywhere from a mobile phone or website.

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3. Installation

3.1 Unpacking and inspection

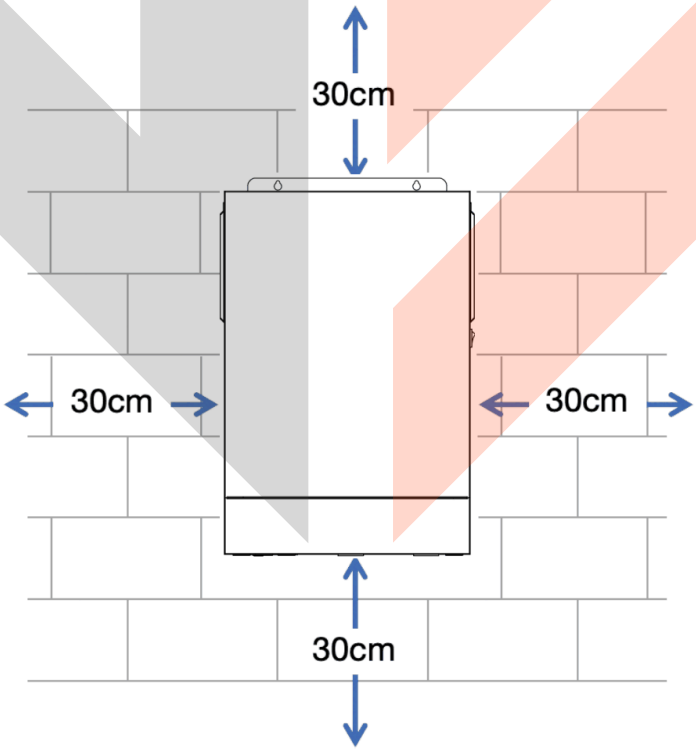
3.1.1 Inspection on opening the box

Products are carefully checked before leaving the factory. Sign for delivery only after inspection. If the product is damaged, contact the seller. Open the box and check that the outer packaging is intact and the equipment inside is not damaged.

3.1.2 Installation tools

Multimeter	Protective gloves	Insulated safety-toe shoes
Safety goggles	Antistatic wrist strap	Hammer drill
Electric screwdriver	Phillips screwdriver	Rubber mallet
Spirit level	Cutters / wire stripper	Lug crimper

3.2 Mounting



Clearance to nearby objects: 30 cm above, below, left and right

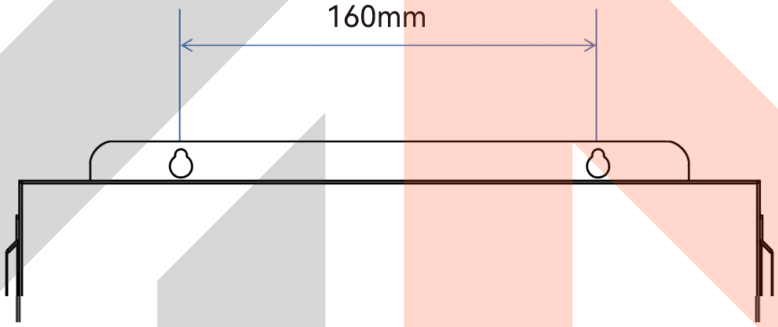
Before choosing where to install, consider:

- Do not mount the inverter on flammable building materials.
- Mount on a solid surface.
- Install the inverter at eye level so the LCD is always easy to read.
- For optimal operation, ambient temperature should be between −10 °C and 60 °C.
- Recommended position: vertical on a wall.
- Keep the distances to other objects and surfaces shown in the figure above for adequate cooling and room for wiring.

WARNING
The inverter may only be mounted on concrete or another non-combustible surface.

Installation procedure:

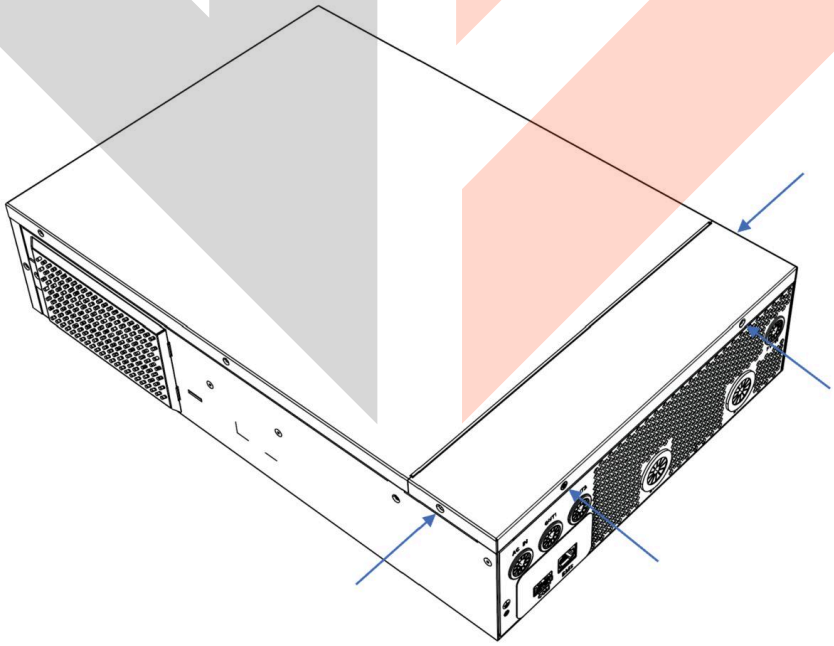
1. Using a ϕ8 drill bit, drill holes 160 mm apart in the mounting surface. Insert the expansion screws (M6 recommended).



Hole spacing 160 mm

2. Lift the inverter upright and line up its upper mounting holes with the screws already in the wall. Hang the inverter on the screws.

Before wiring, remove the bottom cover by undoing four screws as shown below:



Arrows show the bottom cover screws

3.3 External protective earth

DANGER

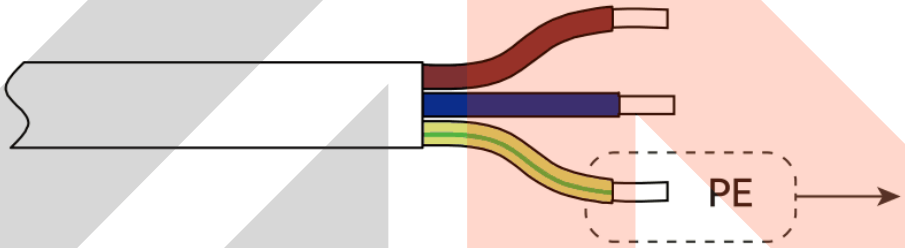
Make sure the grounding wire is securely connected to prevent electric shock.

WARNING

- The external protective earth point provides reliable grounding.
- Do not use unsuitable grounding conductors: this may damage the product or cause injury.
- If you are not sure about the grounding connection, consult a professional.

The external grounding cable is supplied by the customer. It must be yellow-green. OT lugs with insulating sleeve are included.

1. Strip the required length of insulation from the cable ends.

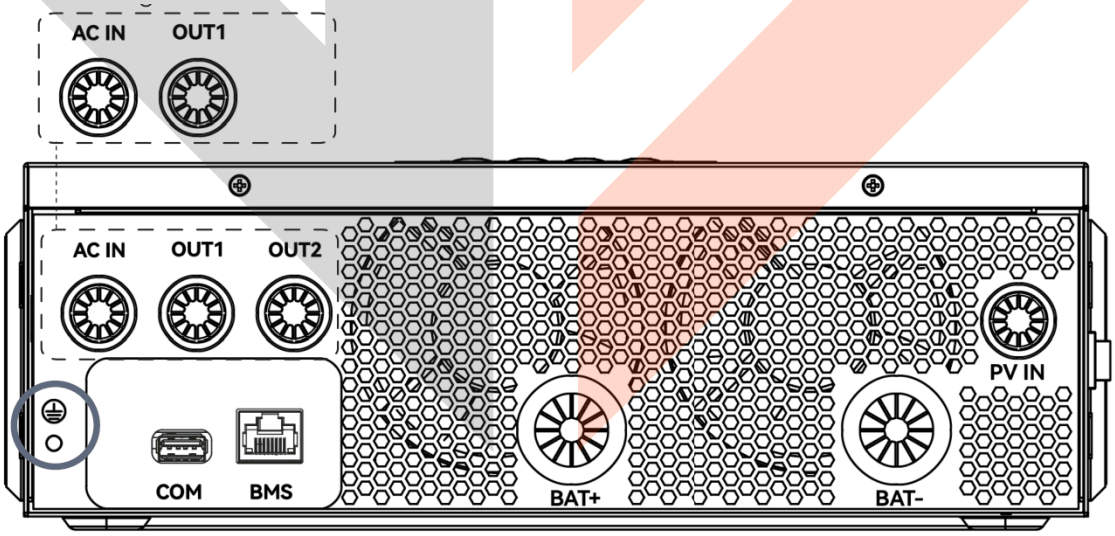


Use the PE core of the AC IN input cable as the grounding cable

2. Crimp the lug firmly onto the cable with an OT lug crimper.



3. Attach the grounding cable with an M4 screw.



The ground point is circled bottom left. AC IN: AC input · OUT1, OUT2: AC outputs · COM: comms module port · BMS: BMS comms port · BAT+, BAT-: battery terminals · PV IN: PV input. Top left: single-output version. Some models have only 1 AC output, see the datasheet.

3.4 AC input and output connection

CAUTION
Before connecting to the AC supply, install a separate AC circuit breaker between the inverter and the supply. This lets you safely disconnect the inverter for service and fully protects it from overcurrent on the AC input. Recommended AC breaker rating: **25 A.**

CAUTION
There are two terminal blocks marked “AC IN” and “AC OUT”. Do NOT mix up input and output connections.

CAUTION
Connect the AC cables with correct polarity. Swapping L and N may damage the inverter. The input and output neutrals (N) must not be connected together: this may damage the inverter.

WARNING
All wiring must be done by qualified personnel.

WARNING
For system safety and efficient operation, using a suitable AC input cable is very important. To reduce the risk of injury, use the recommended cable size below.

Recommended AC input cable

Gauge	Section, mm²
14 AWG	2.075

WARNING
For system safety and efficient operation, using a suitable cable for the dual AC output is very important. To reduce the risk of injury, use the recommended cable size below.

Recommended AC output cable

Gauge	Section, mm²
14 AWG	2.075

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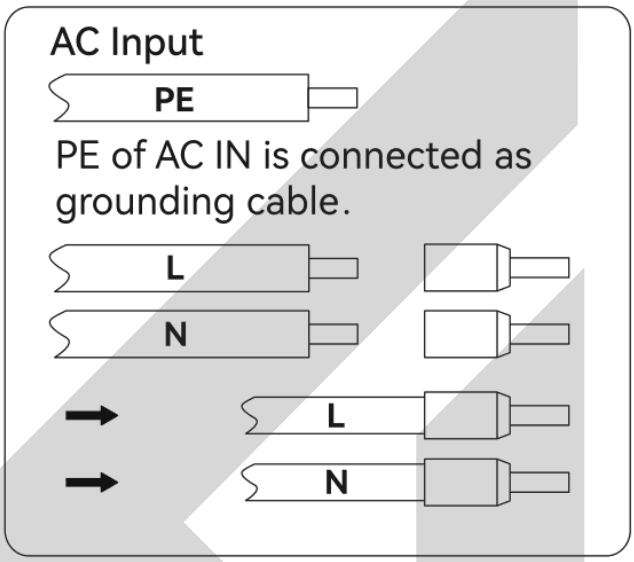
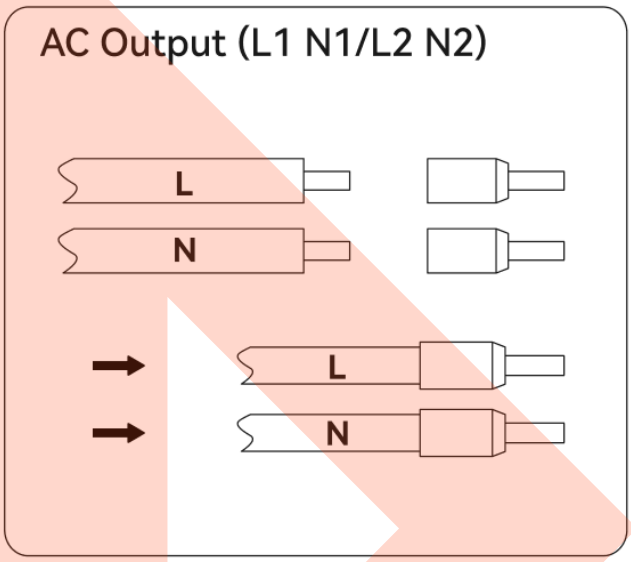
WARNING
Before connecting the AC cable to the unit, make sure AC power is off. All electrical connection work and cable and component specs must comply with local laws and codes. Cable colours below are examples.

AC input and output connection procedure:

1. Before AC connection, be sure to switch off the AC circuit breaker.
2. Strip 12 mm of insulation from the cable ends and trim the bare part to 10 mm. Insert the cable into a ferrule and crimp it firmly.

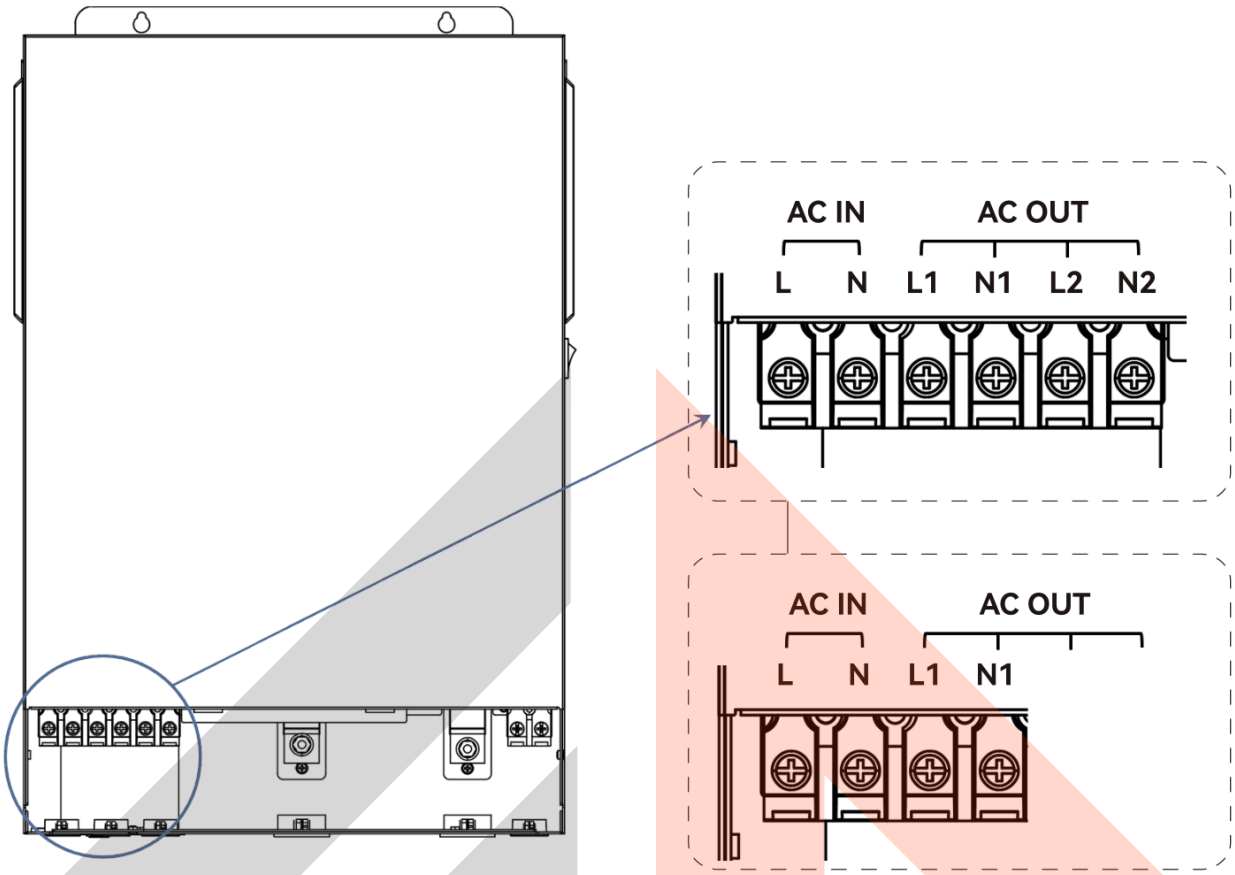


AC input: the PE of AC IN is connected as grounding cable



AC output (L1 N1 / L2 N2)

3. Insert the AC input and output cables according to the polarity marked on the terminal block and tighten the terminal screws. Always connect the protective conductor PE first.
   - PE → protective earth (yellow-green) L → line (brown or black)
   - N → neutral (blue)
   -



AC terminal block (circled). Top: 6-terminal version (AC IN: L, N; AC OUT: L1, N1, L2, N2). Bottom: 4-terminal version (AC IN: L, N; AC OUT: L1, N1). Some models have only 1 AC output, see the datasheet.

4. Make sure the cables are secure.

CAUTION

Appliances such as air conditioners need at least 2–3 minutes to restart so that refrigerant pressure can equalise. If power drops and returns quickly, connected appliances may be damaged. To avoid this, check with the air conditioner maker before installation whether it has a start delay function. Otherwise this solar inverter will detect an overload and cut the output to protect the appliance, but this can still cause internal damage to the air conditioner.

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3.5 PV connection

CAUTION
Before connecting to the PV modules, install a separate DC circuit breaker between the inverter and the PV modules.
Recommended DC breaker: **25 A,** with max. operating voltage above **500 V DC.**

WARNING
Do not ground the positive or negative terminals of the PV modules: this can seriously damage the inverter.

WARNING
In sunlight, PV strings can generate lethal high voltage, so strictly follow the safety measures in the PV string documentation and related documents.

WARNING
Connect the PV terminals to the matching inverter terminals: reversed polarity may damage the inverter.

WARNING
All wiring must be done by qualified personnel.

WARNING
For system safety and efficient operation, using a suitable PV module cable is very important. To reduce the risk of injury, use the recommended cable size below. Cable colours are examples.

Gauge	Section, mm²
14 AWG	2.075

Choosing PV modules

When choosing PV modules, be sure to consider these parameters:

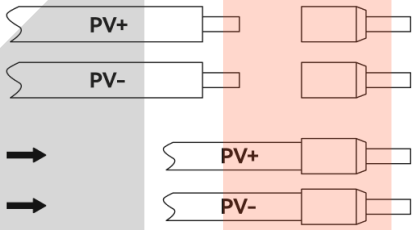
1. The open-circuit voltage (Voc) of the PV modules must not exceed the inverter's maximum PV array open-circuit voltage.
2. The open-circuit voltage (Voc) of the PV modules must be higher than the start voltage.

Parameter	Value
Max. PV array open-circuit voltage	500 V DC
Start voltage	60 V DC
PV array MPPT voltage range	40–450 V DC

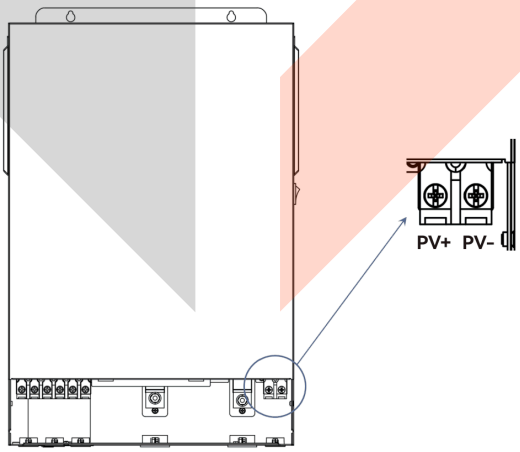
WARNING
Do not switch on any DC switches or AC/DC breakers until all electrical connections are complete.

PV module connection procedure:

1. Before PV connection, be sure to switch off the DC circuit breaker.
2. Strip 12 mm of insulation from the cable ends and trim the bare part to 10 mm. Insert the cable into a ferrule and crimp it firmly.



3. Check polarity with a multimeter.
4. Insert the PV cables according to the polarity marked on the terminal block and tighten the terminal screws.
   - + → PV+ (red) – → PV–
   - (black)



PV+ / PV– terminal block (circled)

5. Make sure the cables are secure.

3.6 Battery connection

3.6.1 Connecting a lead-acid battery

A lead-acid battery of suitable capacity with 24 V rated voltage can be used. The battery type must be set to “AGM” or “FLD” (flooded).

CAUTION
For safe operation and compliance, install a separate DC overcurrent protector or disconnect between the battery and inverter. In some applications a disconnect may not be needed, but overcurrent protection is mandatory. Recommended protector or disconnect rating:

175 A.

WARNING
All wiring must be done by a qualified person.

WARNING
For system safety and efficient operation, using a suitable battery cable is very important. To reduce the risk of injury, use the recommended cable and lugs below. Cable colours are examples.

WARNING
Before connecting, make sure AC power is off.
All electrical connection work and cable and component specs must comply with local laws and codes. Cable colours are examples.

Recommended battery cable and lugs

Gauge	Section, mm²
2 AWG	25

Note: for a lead-acid battery the recommended charge current is 0.3C (C is battery capacity).

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Battery connection procedure:

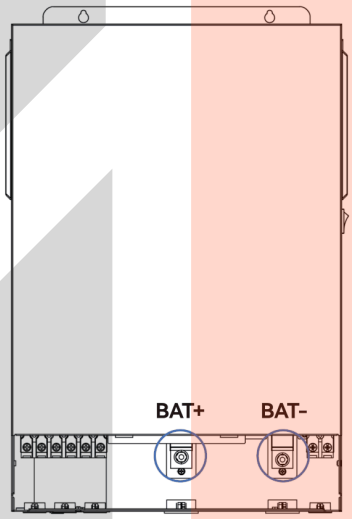
1. Undo the pre-fitted screws on the battery posts. Prepare 2 DT lugs (for AWG2 cable).

2. Strip 12 mm of insulation from the cable ends and trim the bare part to 10 mm. Insert the cable into the DT lug and crimp it firmly.



Positive: positive cable · Negative: negative cable

3. Route the battery cable through the battery cable hole in the bottom of the case and tighten the terminal screws. Make sure polarity is correct on both the battery and the inverter and the DT lugs are screwed tightly to the battery terminals.



Battery terminals BAT+ and BAT−

4. Connect all battery packs as the unit requires. A battery of at least 200 Ah is recommended.

WARNING · Electric shock hazard
Work carefully: series-connected batteries carry high voltage.

CAUTION
Do not put anything between the flat part of the inverter terminal and the DT lug, or overheating may occur.

CAUTION
Do not apply anti-oxidant to the terminals until they are tightened firmly.

CAUTION
Before the final DC connection or switching on the DC breaker / disconnect, make sure positive (+) goes to positive (+) and negative (−) to negative (−).

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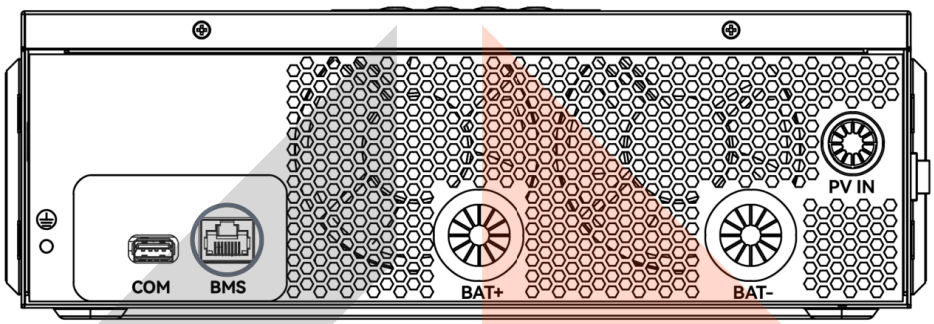
3.6.2 Connecting a lithium battery

If a lithium battery is chosen for the inverter, first check protocol compatibility. A lithium battery has two connections: the RJ45 BMS port and the power cable.

Lithium battery connection procedure:

1. Connect the power cable as described in section 3.6.1.
2. Plug the RJ45 connector of the battery comms cable into the inverter's BMS comms port. The comms protocol must be RS485 or CAN.



COM: comms module port · BMS: RJ45 BMS comms port · BAT+, BAT−: battery terminals · PV IN: PV input

3. Plug the other end of the comms cable (RJ45) into the lithium battery's comms port.

> **NOTE**
> If a lithium battery is chosen, be sure to connect the BMS comms cable between the battery and inverter. In the inverter settings, choose battery type "lithium".

Lithium battery comms and setup. For the inverter to exchange data with the battery BMS, in section 4.2.2, program 17, set battery type "LIb" or "FEL". Make sure the lithium battery's BMS port is connected to the inverter pin to pin. Inverter BMS port pin assignment:

Pin	BMS port
1	RS485B
2	RS485A
3	—
4	CANH
5	CANL
6	—
7	—
8	—

3.7 Final assembly

After all wiring is connected, refit the bottom cover with the four screws mentioned in section 3.2.

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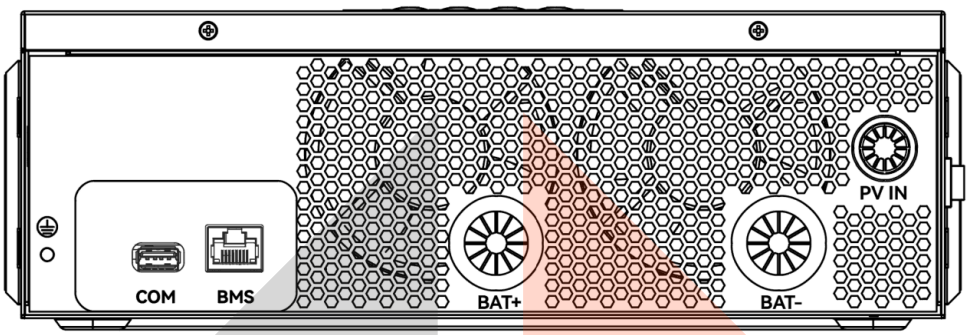
3.8 Connecting the comms module (option)

The comms module (smart communication stick) connects to the cloud platform. Plug it directly into the COM port.

Some models have built-in WiFi monitoring; see the solar app quick setup guide.

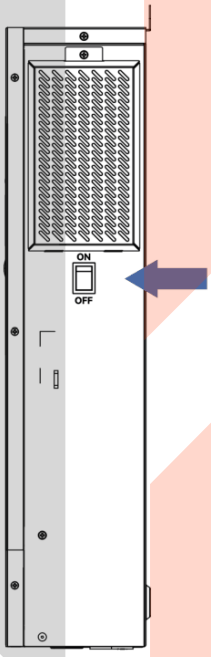


COM port bottom left

4. Operation

4.1 Power on and off

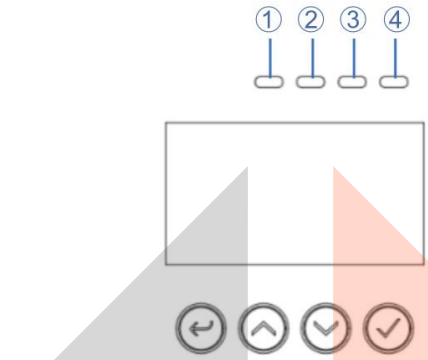
Once the unit is properly installed and the batteries are securely connected, simply press the ON/OFF switch (on the side of the case) to switch the unit on.



ON/OFF switch

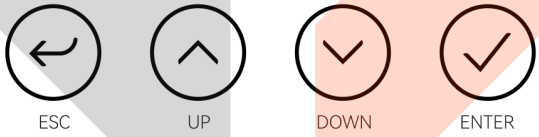
4.2 Control and display panel

The control and display panel shown below is on the front of the inverter. It has four indicators, four function keys and an LCD showing the operating status and input/output power data.



①–④ indicators · LCD · ESC, UP, DOWN, ENTER keys

Indicator		State	Value
① AC	Status indicator (green)	Steady	Grid normal, inverter running on grid.
		Flashing	Grid normal, but inverter has not yet switched to grid.
		Off	Grid abnormal.
② Inverter	Inverting indicator (yellow)	Steady	In battery mode, output fed from battery or PV.
		Off	Other states.
③ Charging	Charge indicator (yellow)	Steady	Battery in float charge.
		Flashing	Battery charging at constant voltage.
		Off	Other states.
④ Fault	Fault indicator (red)	Steady	A fault has occurred in the inverter.
		Flashing	A warning has occurred in the inverter.
		Off	Inverter working normally.



Function keys

Button	Purpose
ESC	Exit settings mode
UP	Go to previous item
DOWN	Go to next item
ENTER	Confirm a selection in settings mode or enter settings mode

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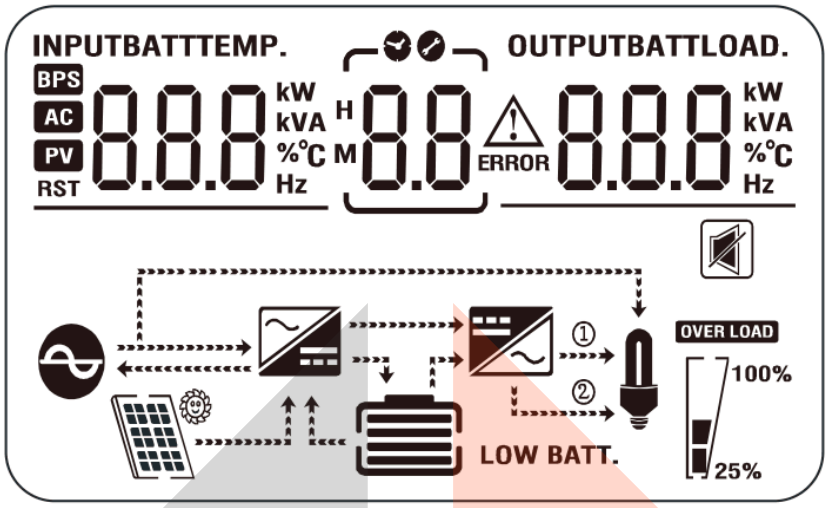
4.2.1 LCD icons



Icon	Description
AC input	
	AC input icon.
	AC input power, voltage, frequency and current.
PV input	
	PV input icon.
	PV power, voltage, current, etc.
Output	
	Inverter icon.
	Output voltage, current, frequency, inverter temperature.
Load	
	Load icon.
	Load power, load percentage.
OVER LOAD	Overload occurred.
Battery	
	Battery level 0–24 %, 25–49 %, 50–74 % and 75–100 % in battery mode, and charge status in grid mode.
	Battery voltage, charge percentage, battery current.
Other	
	Warning code or fault code.
ERROR	A fault has occurred.
	Warning beep muted.

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For a lead-acid battery the battery icon means the following. In battery mode the icon shows the battery level:

Load	Battery voltage	Icon
Load >50 %	< 22.292 V	
	22.292–23.37 V	
	23.37–24.448 V	
	> 24.448 V	
50 % > load > 20 %	< 23.59 V	
	23.59–24.668 V	
	24.668–25.746 V	
	> 25.746 V	
Load < 20 %	< 24.24 V	
	24.24–25.318 V	
	25.318–26.395 V	
	> 26.395 V	

4.2.2 LCD settings

Press and hold ENTER for 2 seconds to enter settings mode. Use UP or DOWN to choose a setting program. Then press ENTER to confirm, or ESC to exit.

Setting programs:

№	Program	LCD display	Description and options
01	Output voltage	**`0PU 01`**	230 V (default). Options: 208 V, 220 V, 230 V, 240 V.
02	Output frequency	**`0PF 02`**	50 Hz (default). Options: 50 Hz, 60 Hz.
03	Output source priority	**`0PP 03 PU`**	**Solar first.** Solar powers the load first. If there is enough solar, the battery charges from solar. If solar is not enough for the whole load, the grid supplies at the same time. If there is no grid and not enough solar, solar and battery power the load. If there is no grid and solar plus battery are not enough, the inverter goes to standby and charges the battery.
		`0PP 03 Grd`	**Grid first (default).** The grid powers the load first. Solar charges the battery. If solar is not enough to charge, the grid also charges the battery. If there is no grid and enough solar, solar powers the load. If there is no grid and not enough solar, solar and battery power the load. If there is no grid and solar plus battery are not enough, the inverter goes to standby and charges the battery.

№	Program	LCD display	Description and options
		OPP 03 PbG	**PBG priority.** Solar powers the load first. If there is enough solar, solar charges the battery. If solar is not enough, the battery adds power. If solar and battery are not enough, the grid powers the load and solar charges the battery. When the battery is charged enough, solar and battery power the load again instead of the grid. If there is no grid and solar plus battery are not enough, the inverter goes to standby and charges the battery.
04	Output mode	**nOd 04 APP**	**APP: appliances (default).** For household appliances.
		nOd 04 UPS	**UPS.** For computers and other devices. Typical transfer time 10 ms.
		nOd 04 GEN	**GEN.** For a generator connected via the grid input.
05	Charging source priority	**CHP 05 PNG**	**PNG: PV and grid (default).** Charging from PV and grid at the same time.
		CHP 05 OPV	**OPV: PV only.** Charging from PV only (display “OPu”).
		CHP 05 GRD	**GRD: grid first.** Grid charging has priority (display “Grd”).
		CHP 05 PV	**PV: PV first.** PV charging has priority (display “Pu”).
06	Grid charging current	**ACC 06**	40 A (default). Setting range [2, 100 A].
07	Max. charge current	**nCC 07**	Total charge current from the solar and grid chargers. Default 60 A. Options: 2/10/20/30/40/50/60/70/80/90/100 A.
08	Return to first page	**ndF 08**	ON: if a page other than the first is open and nothing is pressed for 1 minute, the display returns to the first page. OFF: the display stays on the current page.
09	Auto restart after overload		Default ON.
10	Auto restart after overheating		Default ON.
11	Input loss warning	**nIP 11**	Turns the grid or PV loss beep on/off. Default ON: if the input is lost, the buzzer sounds for 3 seconds. OFF: the buzzer stays silent after input loss.
12	Power saving mode	**PuS 12**	Default OFF. ON: on battery, if the load is below 25 W, the system stops output for a while, then resumes. If the load stays below 25 W, the “stop — resume” cycle repeats. If the load exceeds 35 W, the system resumes continuous normal output.
13	Switch to bypass on overload	**OLG 13**	Default OFF. ON: in PBG output priority, on overload the system immediately switches to bypass (output fed from the grid).
14	Silent mode	**nUt 14**	Buzzer on/off. Default OFF. ON: the buzzer never sounds in any situation, including warnings and faults. Applies in all modes.

№	Program	LCD display	Description and options
15	Back-to-grid voltage	**btG 15**	Type CUS (user-defined): range [22, 26 V]. AGM (lead-acid) or FLD (flooded): default 23 V, range [22, 26 V]. LIB (lithium NMC): default 23.8 V, range [20, 25 V]. FEL (lithium iron phosphate): default 24.8 V, range [20, 25 V].
16	Back-to-battery voltage	**btb 16**	After a low-voltage shutdown, the battery must reach a certain voltage for the inverter to return to battery mode. Set FUL or a battery voltage. FUL: return to battery mode only after a full charge. CUS: default 26 V, range [24, 29 V]. AGM or FLD: default 26 V, range [24, 29 V]. LIB: default 27.2 V, range [23, 29 V]. FEL: default 26.6 V, range [23, 29 V].
17	Battery type	**bAt 17 AGn**	AGM (default)
		bAt 17 FLd	Flooded
		bAt 17 LIb	Lithium NMC
		bAt 17 FEL	Lithium iron phosphate (LiFePO4)
		bAt 17 CUS	User-defined
18	Battery low voltage	**bAL 18**	Not adjustable for AGM and FLD, initial value 21.6 V. CUS: range [21, 27 V]. LIB: default 23.8 V, range [20.6, 25 V]. FEL: default 24 V, range [20.6, 25 V].
19	Battery cut-off voltage	**bAU 19**	Not adjustable for AGM and FLD, default 21 V. CUS: default 21 V, range [20, 24 V]. LIB: default 23 V, range [20, 24 V]. FEL: default 23.2 V, range [20, 24 V].
20	Constant voltage (CV) charge voltage	**bCV 20**	Not adjustable for AGM and FLD: default AGM 28.2 V, FLD 29 V. CUS: range [24, 29 V]. LIB: default 28.2 V, range [25, 29 V]. FEL: default 27.6 V, range [25, 29 V]. The constant voltage charge voltage must be higher than float voltage.
21	Float charge voltage	**bFL 21**	Not adjustable for AGM and FLD, default 27 V. CUS: range [26.6, 27.8 V]. LIB or FEL: default 27.6 V, range [24, 28 V]. The constant voltage charge voltage must always be higher than float voltage.
22	Grid voltage lower limit	**LLV 22**	APP/GEN output mode: range 90 V to 154 V, default 154 V. UPS output mode: range 170 V to 200 V, default 185 V.
23	Grid voltage upper limit	**LHV 23**	APP/GEN output mode: range 264 V to 280 V, default 264 V. UPS output mode: fixed 264 V.

№	Program	LCD display	Description and options
24	Discharge time at low load	Lud 24	Long unlimited discharge at low load in battery mode can drain the battery and shorten its life. When the set time is reached, the low-voltage cut-off threshold rises to 22 V. Default 8 (8 hours), range [1, 8]. In inverter (battery) mode, low-load discharge time: default 8 (8 hours), range [1, 8]. If continuous discharge on battery lasts over 8 hours without reaching the cut-off, the voltage cut-off changes to 22 V; when the battery discharges to 22 V, the system warns for 1 minute and shuts down. When battery voltage stays above 26.4 V for more than 30 s, the discharge timer resets.
25	Inverter soft start	StE 25	Default OFF. ON: inverter output voltage ramps smoothly from 0 to the target value. OFF: output voltage jumps from 0 to the target at once. Set only in single-inverter mode.
26	Reset to factory settings	Std 26	Restores all settings to factory values. Shows OFF before setting; ON: the system restores factory settings, then shows OFF again. Applies at once in grid and standby modes; not adjustable in battery mode.
27	Parallel operation mode	PAn 27 SIG	Not applicable to this model.
28	Battery disconnect warning	SbA 28	Turns the battery disconnect warning on/off. Default OFF: with the battery disconnected there are no disconnect, low voltage or battery undervoltage warnings.
29	Equalising charge mode	EQn 29	Turns equalisation charge on/off. Default OFF. ON: the controller enters equalisation when, during float charge, the set equalisation interval arrives or equalisation is started immediately.
30	Equalising voltage	EQu 30	Default 29.2 V, range [25, 31.5 V].
31	Equalisation time	EQt 31	In the equalisation stage the controller charges the battery at maximum until voltage rises to the equalisation voltage, then holds it constant. The battery stays in equalisation until the set time ends. Default 60 minutes, range [5, 900], step 5 minutes.
32	Equalisation delay	EQO 32	If the equalisation time has passed but the voltage has not reached the equalisation voltage, the controller extends equalisation until it does. If after the delay the voltage is still lower, the controller stops equalisation and returns to float charge. Default 120 minutes, range [5, 900], step 5 minutes.
33	Equalising interval	EQI 33	When equalisation is enabled and a battery is detected in the float stage, the controller enters equalisation after the set interval. Default 30 days, range [1, 90], step 1 day.
34	Start equalisation now	EQn 34	Default OFF (function disabled). ON: in the float stage with equalisation enabled and a battery detected, equalisation charge starts immediately and the controller enters the equalisation stage.

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№	Program	LCD display	Description and options
35	Grid-tie function (grid export)	**GtI 35**	Sets whether the inverter exports energy to the grid in grid mode with PV or PBG priority. Default OFF (function disabled). ON: the inverter tracks the maximum power point and surplus energy is exported to the grid. After enabling, if comms fail, warning 56 is raised and the inverter no longer sets its logic from BMS data (as printed in the original).
36	Second output cut-off voltage	**dbV 36**	The inverter's second output is on by default. On battery, when battery voltage drops below the set value, the second output turns off. When it rises above the set value plus 1 V per extra battery cell, the second output turns on. Default 24 V, range [22, 32] V. If the set value is above CV charge voltage minus 1 V per cell, the recovery voltage becomes the CV charge voltage.
37	Second output run time	**dbt 37**	The inverter's second output is on by default. On battery, when the discharge time reaches the set value, the second output turns off. Default OFF (function disabled). Range [5, 890] minutes. FUL: second output run time is unlimited.
38	BMS communication	**bnS 38**	Default OFF (function disabled). If a specific BMS protocol is chosen, the inverter exchanges data with the lithium battery BMS via the main control board and receives battery information. If comms fail after enabling, warning 56 is raised and the inverter does not set its logic from BMS data. Options: **PYL:** PYLON protocol (485/CAN); **GRO:** GROWATT protocol (485); **VOL:** VOLTRONIC protocol (485); **IRO:** China Tower protocol (485).
39	Low-SOC cut-off	**bSU 39**	Inverter shutdown at low battery SOC. Default 20 %, range [5, 50]. When on battery the lithium battery SOC reaches the set value, the inverter shuts down and raises warning 68. Warning 68 clears when SOC returns to the set value + 5 %. In standby the inverter can switch to battery only at SOC no lower than the set value + 10 %; otherwise warning 69 is raised. With the function on, warning 69 appears when SOC reaches the set value + 5 % and clears on return to the set value + 10 %. OFF can be set: the inverter then does not shut down, start or warn based on SOC. If comms fail after enabling, the inverter stops acting on SOC and clears related warnings.
40	High SOC: switch to battery	**Stb 40**	SOC at which the inverter switches to battery mode. Default 95 %, range [10, 100]. In PBG priority, when in normal grid mode the lithium battery SOC reaches the set value, the inverter switches to battery. Once enabled, the inverter switches to battery only when SOC is above the set value and battery voltage is above the back-to-battery voltage. OFF can be set: the inverter then does not switch from grid to battery based on SOC. If comms fail after enabling, the inverter stops acting on SOC and clears related warnings.

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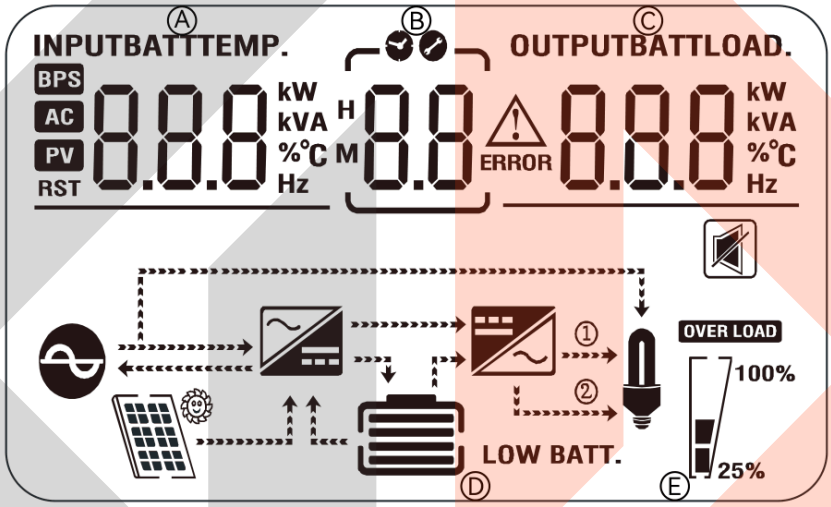
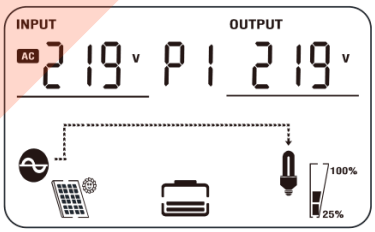
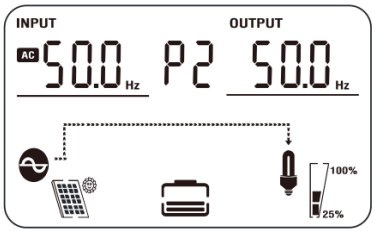
№	Program	LCD display	Description and options
41	Low SOC: switch to grid	StG 41	SOC at which the inverter switches to grid mode. Default 50 %, range [10, 90]. In PBG priority, when on battery the lithium battery SOC reaches the set value, the inverter switches to grid mode. Once enabled, it switches to grid when SOC is below the set value or battery voltage is below the back-to-grid voltage. OFF can be set: the inverter then does not switch from battery to grid based on SOC. If comms fail after enabling, the inverter stops acting on SOC and clears related warnings. If this value is above STB, STB and STG no longer apply after the next power-on.

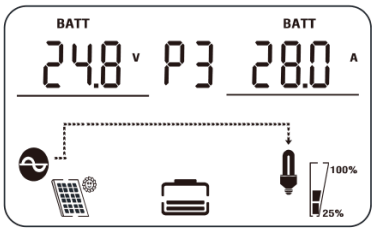
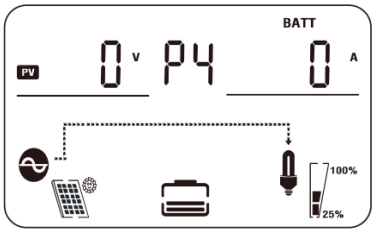
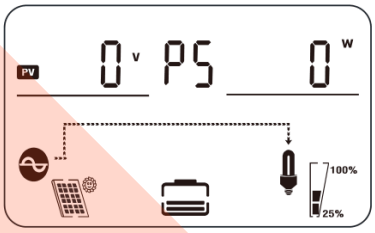
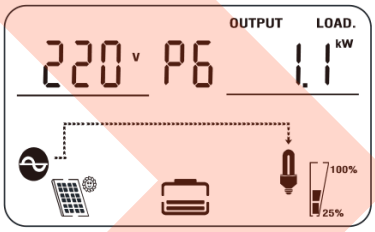
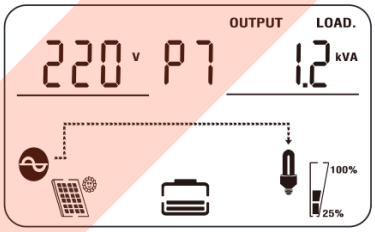
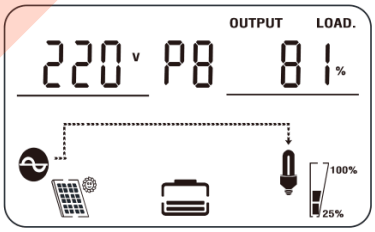
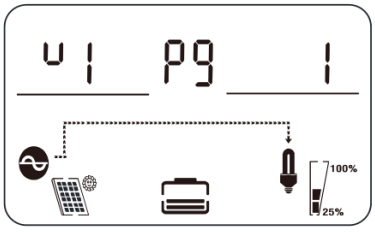
4.3 Display information

Information on the LCD cycles with UP or DOWN. Order: voltage, frequency, current, power, software version.



Display areas Ⓐ–Ⓔ

Information	LCD display
Ⓐ AC input voltage; Ⓑ page number; Ⓒ output voltage; Ⓓ battery level; Ⓔ load percentage	
Ⓐ AC input frequency; Ⓑ page number; Ⓒ output frequency; Ⓓ battery level; Ⓔ load percentage	

Information	LCD display
Ⓐ Battery voltage; Ⓑ page number; Ⓒ output current; Ⓓ battery level; Ⓔ load percentage	
Ⓐ PV voltage; Ⓑ page number; Ⓒ PV charge current; Ⓓ battery level; Ⓔ load percentage	
Ⓐ PV voltage; Ⓑ page number; Ⓒ PV power; Ⓓ battery level; Ⓔ load percentage	
Ⓐ Output voltage; Ⓑ page number; Ⓒ active output power; Ⓓ battery level; Ⓔ load percentage	
Ⓐ Output voltage; Ⓑ page number; Ⓒ apparent output power; Ⓓ battery level; Ⓔ load percentage	
Ⓐ Output voltage; Ⓑ page number; Ⓒ load percentage; Ⓓ battery level; Ⓔ load percentage	
Software version	

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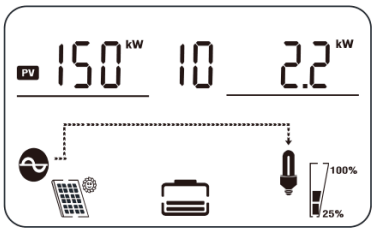
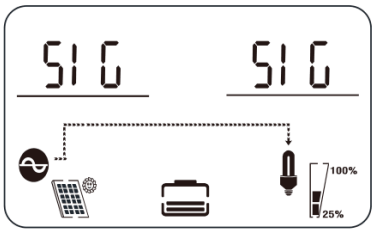
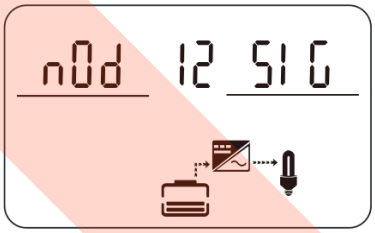
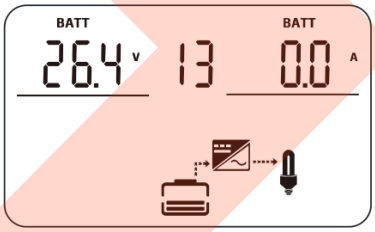
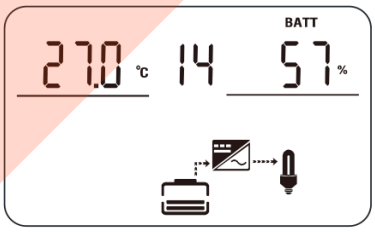
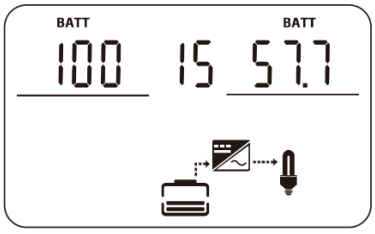
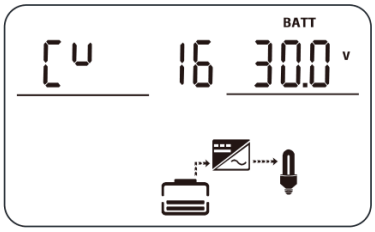
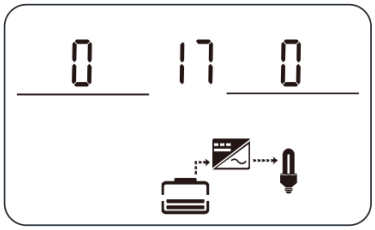
Information	LCD display
Ⓐ Total energy generated; Ⓑ page number; Ⓒ energy generated per day; Ⓓ battery level; Ⓔ load percentage	
Parallel operation status	

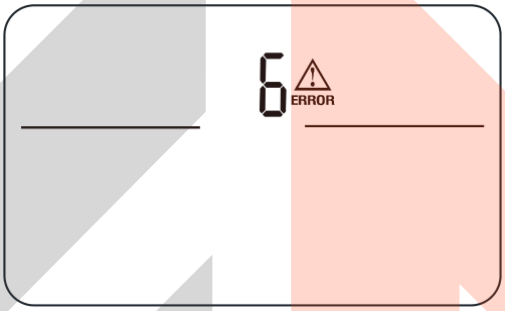
Once BMS comms are on, the following pages are available

Information	LCD display
Lithium battery network status. If SIG is shown steadily top right, the battery runs as one group; if PAR is shown steadily, the batteries run as several groups in series-parallel; if PAR flashes, the batteries are setting up the series-parallel configuration.	
Lithium battery voltage and current. Top left: battery voltage from the BMS; top right: battery current from the BMS. If BMS comms fail, ERR flashes top left and top right.	
Lithium battery temperature and SOC. Top left: temperature from the BMS; top right: SOC from the BMS. If BMS comms fail, ERR flashes top left and top right.	
Lithium battery capacity. Top left: rated capacity; top right: current capacity. If BMS comms fail, ERR flashes top left and top right.	
Lithium battery constant voltage charge point. Top left: fixed letters CV; top right: CV charge voltage from the BMS. If BMS comms fail, ERR flashes top right.	

Information	LCD display
Lithium battery warnings and faults. Top left: BMS warning info; top right: BMS fault info. If BMS comms fail, ERR flashes top left and top right.	

5. Fault codes

Fault display:



Example: fault code 6 with the ERROR icon

How it works. On a warning, the fault LED flashes and the buzzer sounds every second for 1 minute, then stops. On a fault, the fault LED stays on, the buzzer sounds for 10 seconds and stops. The system automatically tries to restart. If the unit does not work after six restarts, the unit and LCD stay in fault state. Switch the power off completely (until the screen goes dark) or wait 30 minutes to restart the unit. The fault display is shown above. In fault mode the fault icon is lit; in warning state the warning icon flashes. To resolve the problem using the fault information, contact the seller.

Fault: the inverter enters fault mode, the red LED is steady on, and the LCD shows the fault code.

Fault code table

Code	Value	Action	Trigger condition	Recovery condition
1	Bus boost soft start failure	Enters fault mode	During soft start, bus voltage does not reach the set value.	Not recoverable.
2	Bus high voltage	Enters fault mode	Bus voltage above the protection threshold.	Not recoverable.
3	Bus low voltage	Enters fault mode	Bus voltage below the undervoltage protection threshold.	Not recoverable.
4	Battery overcurrent	Enters fault mode	A momentary battery overcurrent above the set value trips the protection.	Not recoverable.
5	Overheating	Enters fault mode	PFC temperature above the protection threshold. Fan locked for more than 5 minutes.	Six restart attempts; if unsuccessful, not recoverable.
6	Battery high voltage	Enters fault mode	Battery voltage above the set value.	Recovers when voltage is below the set value.

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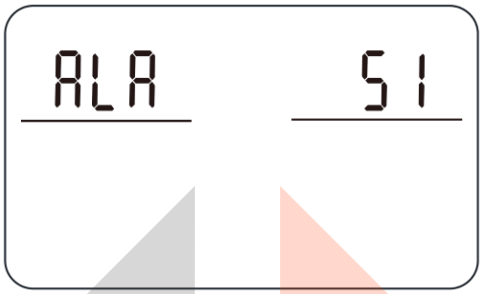
Code	Value	Action	Trigger condition	Recovery condition
7	Bus soft start failure	Enters fault mode	Soft start finished but bus voltage did not reach the set value.	Not recoverable.
8	Bus short circuit	Enters fault mode	Bus voltage below the threshold when the inverter or PFC switches on.	Not recoverable.
9	Inverter soft start failure	Enters fault mode	After soft start, the inverter cannot reach rated output voltage within a certain time.	Not recoverable.
10	Inverter overvoltage	Enters fault mode	In battery mode, inverter voltage exceeds the set value.	Not recoverable.
11	Inverter undervoltage	Enters fault mode	In battery mode, inverter voltage below the set value.	Not recoverable.
12	Inverter short circuit	Enters fault mode	Inverter voltage drops below the set value or current is above the set value.	Six restart attempts; if unsuccessful, not recoverable.
13	Reverse power protection	Enters fault mode	Inverter power stays below the set value for some time.	Not recoverable.
14	Overload	Enters fault mode	Overload exceeds the limit (see specifications).	Six restart attempts; if unsuccessful, not recoverable.
15	Model error	Enters fault mode	No matching model found during model detection.	Not recoverable.
16	No boot loader	Enters fault mode	No boot loader.	Not recoverable.
17	Flash write failure	Enters fault mode	Program being written.	Recovers when writing finishes.
26	BMS fault	Enters fault mode	Error code in the BMS message.	Disable BMS comms or wait until the BMS fault clears.
28	NTC fault	Enters fault mode	NTC sensor open circuit.	Not recoverable.
29	Inverter overcurrent	Enters fault mode	Momentary inverter current above the set value.	Six restart attempts; if unsuccessful, not recoverable.

6. Warning codes

Warning: the inverter does not enter fault mode, the red LED flashes, and the LCD shows the warning code.



Example: ALA 51

Warning code table

Code	Value	Action	Trigger condition	Recovery condition
50	Battery disconnected	Warning, battery not charging.	Battery voltage below the set value.	Recovers when battery voltage recovers.
51	Low battery voltage shutdown	Warning, low battery voltage shutdown or cannot switch on.	Battery voltage below the set value.	Recovers when battery voltage recovers.
52	Low battery voltage	Warning	Battery voltage below the BAL value (program 18).	Recovers when battery voltage recovers.
55	Battery overcharge	Warning, battery not charging.	Battery voltage above the set value.	Recoverable.
56	Lost link with BMS	Warning, locked in standby.	BMS comms failure (BMS function on).	Recovers when comms recover.
57	Overheating	Warning, battery not charging.	PFC or INV temperature above the set value.	Recovers when temperature is below the set value.
58	Fan failure	Warning: one fan has failed, the other runs at full speed.	No fan speed signal detected.	Recoverable.
59	EEPROM error	Warning	EEPROM read/write failure.	Not recoverable.
60	Overload	Warning, battery not charging.	Load above 102 %.	Recovers when the load returns to normal.
61	Abnormal generator waveform	Warning, long run in battery mode.	Generator voltage waveform check gave an abnormal result.	Recoverable.
62	Weak PV energy	Warning, output and PV charging off.	Battery not connected, bus voltage below the set value.	Recovers after 10 minutes.
68	SOC below threshold	Warning, goes to standby.	Lithium battery SOC below the set value.	Recovers after the low-SOC shutdown or BMS comms function is disabled, or when SOC returns to the set value + 5 %.

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Code	Value	Action	Trigger condition	Recovery condition
69	Low SOC	Warning; if the inverter is in standby, it stays in standby and does not start.	Lithium battery SOC below the set value + 5 % (grid or battery mode), below the set value + 10 % (standby).	Recovers after the low-SOC shutdown or BMS comms function is disabled, or when SOC returns to the set value + 10 %.
70	No source at battery terminals	Warning, goes to standby.	Battery not connected and voltage at the battery terminals below the set value.	Recovers when a battery is detected or the battery terminal voltage stays above the set value for 1 minute.

7. Battery equalisation charge

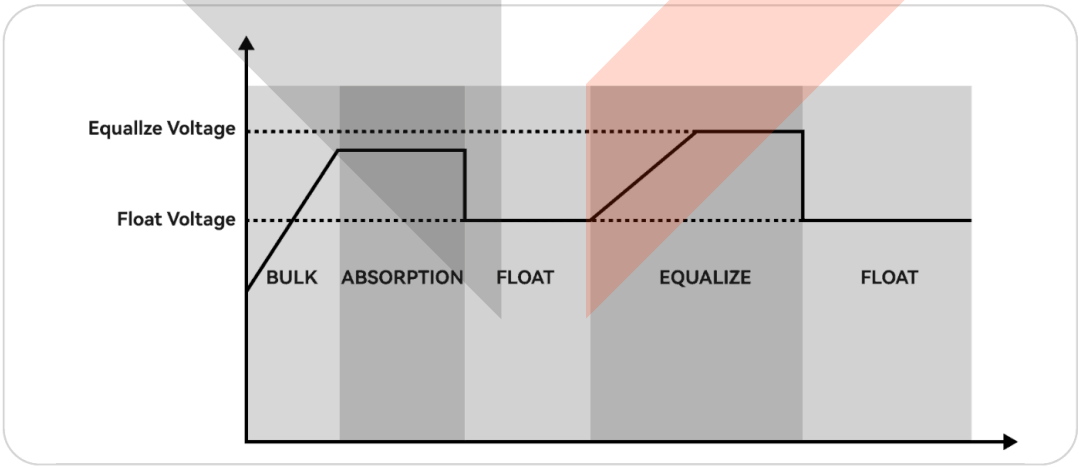
The charge controller has an equalisation charge function. It reverses the build-up of negative chemical effects such as stratification, where acid concentration is higher at the bottom of the battery than at the top. Equalisation also helps remove sulphate crystals that may have formed on the plates. Left unchecked, sulphation will reduce the overall battery capacity. Periodic equalisation is therefore recommended.

> ⚠ **NOTE**
> Do not enable this mode if you use lithium batteries.

How to use equalisation. First enable equalisation charge in program 29 of the LCD settings. Then set it as follows:

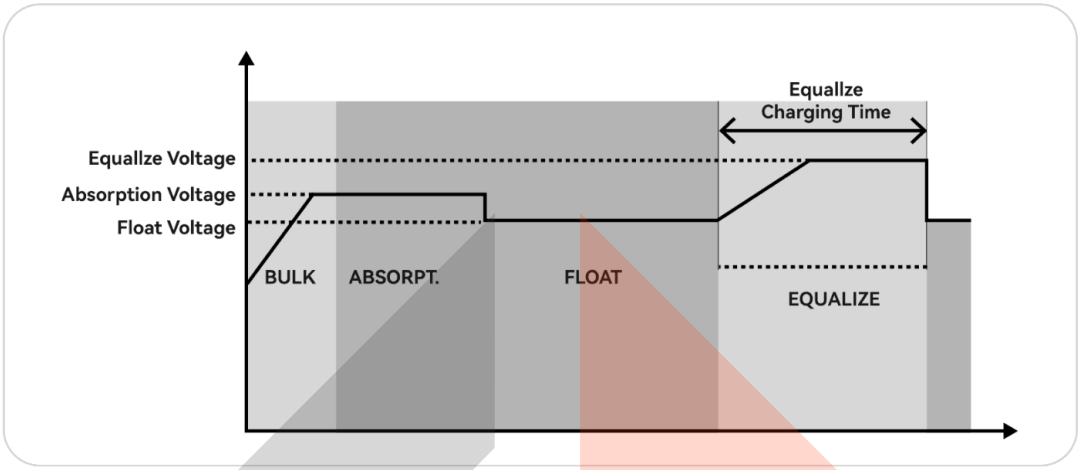
1. Equalisation mode: program 29.
2. Equalisation voltage: program 30.
3. Equalisation time: program 31.
4. Equalisation delay: program 32.
5. Equalisation interval: program 33.
6. Start equalisation now: program 34.

When equalisation runs. In the float stage, when the set equalisation interval arrives or equalisation is started immediately, the controller enters the equalisation stage.



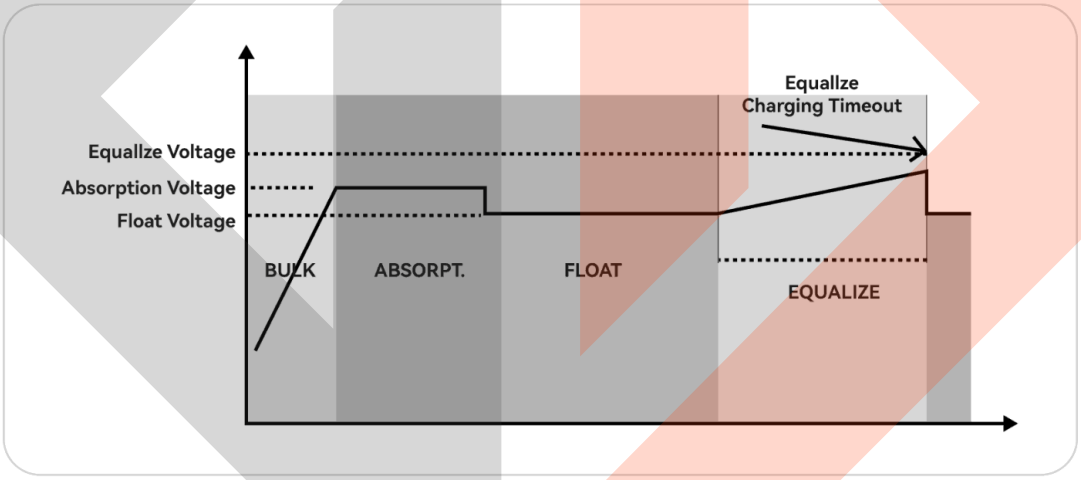
Equalize Voltage: equalisation voltage · Float Voltage: float charge voltage · BULK: bulk charge · ABSORPTION: constant voltage charge · FLOAT: float charge · EQUALIZE: equalisation

Equalisation time and timeout. In the equalisation stage, the controller charges the battery at the highest possible current until voltage rises to the equalisation voltage. Voltage is then held constant at that level. The battery stays in equalisation until the set equalisation time ends.



Absorption Voltage: constant voltage charge voltage · Equalize Charging Time: equalisation time

However, if the equalisation time has passed and the battery has not reached the equalisation voltage, the controller extends equalisation until it does. If after the equalisation timeout the battery voltage is still below the equalisation voltage, the controller stops equalisation and returns to float charge.



Equalize Charging Timeout: equalisation timeout

8. Troubleshooting

Problem	Event	Checking procedure	Solution
Fault code 2	Bus high voltage	1. Check whether the total PV string voltage exceeds the inverter's max. PV open-circuit voltage.	If so, reduce the number of PV modules.
		2. In parallel operation, check that both inverters have the same output voltage setting.	If they differ, set them again.
Fault code 3	Bus low voltage	1. Disconnect the load from the inverter and restart it to see whether operation resumes.	If it resumes, too many high inrush loads are connected; disconnect some of them from the inverter.
Fault code 5	Overheating	1. After cooling, switch on the inverter output and check that the fan turns.	If the fan does not turn, the fan or its wiring may be faulty.
		2. Check whether the dust filter is too dirty.	If there is too much dust, clean the filter.
		3. Check that there is more than 30 cm of free space around the unit.	If there is not enough room, reinstall the unit per the manual.
		4. Check whether ambient temperature is too high (above 45 °C).	For example, avoid direct sun.
		5. Check whether the paper air duct has come unstuck.	Fix the loose part with the maker's plastic fastener.
Fault code 8	Bus short circuit	1. Disconnect the load from the inverter and restart it to see whether operation resumes.	If it resumes, too many high inrush loads are connected; disconnect some of them from the inverter.
Fault code 26	BMS fault	1. View the BMS fault information in the battery management software.	Fix the battery problem according to the fault information.
Warning code 56	Lost link with BMS	1. Check that the communication cable is plugged into the correct port of the lithium battery.	A lithium battery may have several communication ports; the cable must be plugged into the correct one.
		2. Check that the battery DIP switch setting matches the protocol in use.	The battery supports different BMS protocols; the protocol is selected with the DIP switch on the battery.
		3. Check that the pinout of the BMS communication cable on the battery side matches the inverter pinout.	If not, replace the cable with the correct one.
		4. Check that the BMS protocol is compatible with the inverter.	If the protocol is not among those compatible with the inverter, change the protocol.
		5. To check, swap the battery or the inverter.	If everything works after the swap, the communication hardware is faulty.

NOTE
Updates to the content and version of this manual are not announced separately.

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