ALVOLTA
BUILT FOR POWER

OWNER'S MANUAL



ALVOLTA LUNA-S MPPT SOLAR CONTROLLERS

ALV-10020B: 100V / 20A | ALV-10030B: 100V / 30A | ALV-10040B: 100V / 40A
ALV-10050B: 100V / 50A

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DISCLAIMER

All data and specifications provided in this maunal are tested under standard test conditions, and may deviate marginally from actual values. Alvolta and its associates reserve the right to make modifications to the provided information without notice. Alvolta maintains the goal to supply customers with recent information regarding its products.

SAFETY INSTRUCTIONS

IMPORTANT, READ CAREFULLY & RETAIN FOR REFERENCE

- WARNING: It is very important to review this manual thoroughly before attempting installation.
- Do NOT exceed the electrical specifications of this device.
- Do NOT plug in any AC source to this DC-DC product. Doing so may result in fire or damage to the device.
- Do NOT leave the battery disconnected while the solar input is connected for an extended period of time. Doing so may result in damage to the unit.
- Ensure children are kept away from this device at all times.
- Take care when installing or working with batteries. Wear protective clothing and eyewear, and wash you hands when installation is complete. If contact with battery acid is made, rinse with water immediately.
- Ensure external metal objects are removed when working with batteries, and take care when using metal tools to work on batteries. If external metal objects are dropped into a battery, a short-circuit or damage to the battery may occur.
- Ensure the ambient environment is well ventilated, because the battery may produce acid gas when charging.
- Do NOT connect lithium batteries in reverse polarity. Doing so may result in fire or damage to the device.
- Stay away from sparks, as the battery may produce combustible gases.
- During outdoor installation, avoid direct sunlight and rainwater infiltration.
- Ensure that cable connections are tightened and cables are fixed in the system correctly. False connections and corroded cables may cause extreme heat that can melt the cable insulation, burn surrounding areas or cause a fire.
- Ensure the device is installed by competent and trained professionals where required.
- Ensure appropriately sized wiring, fuses and circuit protection devices are used in the installation of this device.
- Connecting live equipment to this device, such as solar panels or batteries, can cause arcing to occur. Ensure all devices are isolated prior to installation where possible and ensure appropriate PPE is worn at all times.

OVERVIEW

The Alvolta Luna Solar Controller series uses PowerCatcher Maximum Power Point Tracking (MPPT) technology to maximise the energy harvested from connected solar panels. PowerCatcher technology continuously tracks the solar panel's maximum power point, optimising the charging efficiency under changing sunlight and temperature conditions, therefore increasing the overall energy yield of the solar power system.

Designed for off-grid photovoltaic (PV) systems, Alvolta Luna controllers manage the charging process between the solar panels and the battery bank to ensure safe, efficient and reliable operation. As the central control component of the system, it helps to maximise energy utilisation while protecting the battery and improving overall system performance.

Alvolta Luna controllers incorporate comprehensive fault detection and protection features to safeguard against damage caused by installation errors, wiring faults, or abnormal system conditions. These built-in protections help ensure reliable operation and extend the service life of both the controller and connected equipment.

The Alvolta Luna-S controllers can be externally connected to the Alvolta Observer LCD screen to provide clear, real-time system information and configuration options. Luna-S controllers also support monitoring, data logging, and parameter configuration through the Alvolta app, PC software, and other compatible communication interfaces, allowing users to manage the system locally or remotely.

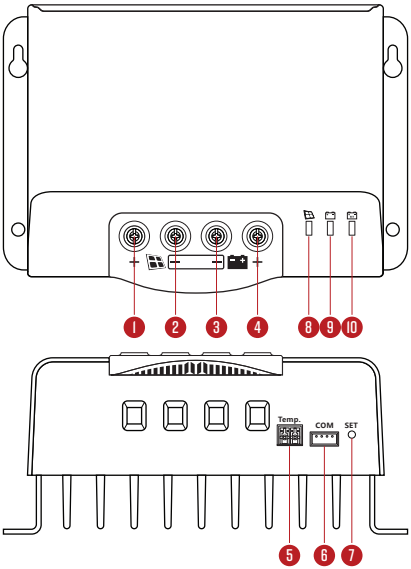
FEATURES

- PowerCatcher maximum power point tracking technology allows the controller to track the maximum power point of solar panels even in a complex environment. Compared with the traditional MPPT tracking technology, it boasts faster response speed and higher tracking efficiency of up to 99.9%.
- The built-in maximum power point tracking (MPPT) algorithm can significantly increase energy utilisation efficiency of the photovoltaic system, which is about 15% to 20% higher than traditional PWM charging.
- Charging output has an active voltage stabilisation function to support compatibility with lithium batteries. etc
- The advanced MPPT design offers conversion efficiency of up to 98%.
- Preset a variety of battery types: lithium batteries, sealed lead-acid batteries, flooded lead-acid, gel batteries and user-defined options.

- The controller features a current-limiting charging mode. If the solar array power output exceeds the controller's capacity and the charging current surpasses its rated limit, the controller will automatically reduce the charging power. This ensures the system operates safely at its maximum rated charging current.
- The controller supports automatic identification of lead-acid battery voltage.
- The controller supports the standard Modbus protocol to meet communication needs in different occasions.
- The controller features a built-in over-temperature protection mechanism, which switches the charging power to a linear decline when the temperature exceeds a set value.
- The controller features temperature compensation and automatic adjustment of charge and discharge parameters help to improve battery life.
- The controller features solar panel short circuit protection, battery open circuit protection and TVS lightning protection.
- The controller can be connected to the Alvolta Observer LCD screen or a separate Bluetooth module to view equipment operating data and status, and modifiy the controller parameters.

INTERFACE & INDICATORS

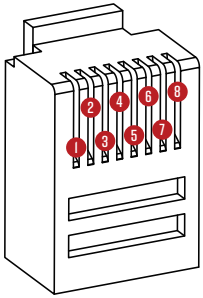
MAIN INTERFACE



1	Solar panel positive terminal (+)
2	Solar panel negative terminal (-)
3	Battery negative terminal (-)
4	Battery positive terminal (+)
5	External temperature sensor interface
6	Communication interface
7	Key
8	PV Charging indicator
9	Battery Level indicator
10	Battery Type indicator

CAN COMMUNICATION INTERFACE

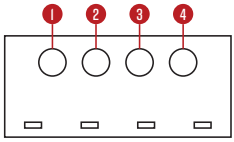
CAN Communication
- 250 kbps baud rate
- RV-C protocol



1	-
2	-
3	-
4	-
5	Ground
6	-
7	CAN_H
8	CAN_L

TTL COMMUNICATION INTERFACE

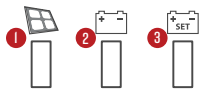
The Modbus protocol can be used to perform data monitoring, parameter setting and other operations for the controller via the TTL port.



1	Communication power out
2	RX data receiving terminal
3	TX data sending terminal
4	GND

INDICATOR LIGHTS

Indicator Specifications:



No.	Indicator Label	Indicator Description
1	PV array indication	Indicates the current charging mode of controller
2	BAT indication	Indicates the current state of the battery
3	BAT type indication	Indicates the current battery type

Charge State Indicator Specifications:

No.	Charge Diagram	Light Indication	Charge State Description
1	BULK	On normally	MPPT Charge
2	ACCEPTANCE	Slow flash (on 1s, off 1s)	Lifting Charge
3	FLOAT	Single flash (on 0.1s, off 1.9s)	Floating Charge
4	EQUALIZE	Quick flash (on 0.1s, off 0.1s)	Equalising Charge
5	CURRENT-LIMITED	Double flash (on 0.1s, off 0.1s, on again 0.1s, off again 1.7s)	Current Limiting Charge
6		Off	Over-voltage or Over-temp

Battery Indicator Specifications:

Indicator Colour	Light Indication	Indication Description
Green	On normally	Battery fully charged
Yellow	On normally	Battery voltage normal
Red	On normally	Battery voltage below under-voltage point
	Quick flash (on 0.1s, off 0.1s)	Battery over-voltage or over-temperature

Battery Type Indicator Specifications:

Indicator Colour	Battery Type
Green	Sealed lead-acid
Yellow	Flooded lead-acid
Red	Gel lead-acid
Blue	12V lithium-ion
Purple	24V lithium-ion
White	Custom

KEY FUNCTION

There is a key on the controller, which is used in conjunction with the battery type indicator for selection of battery type. The specific operation mode is as follows:

In the current operating state, press and hold the key for 8 seconds. The battery type indicator (the colour displayed is that of the previously saved battery type) starts to flash (the controller turns off charging and other works and enters idle state). At this point, each time the key is pressed, the battery type indicator changes a colour which corresponds to a battery type (refer to above colour indicator table). After the battery type is selected, press and hold the key for 8 seconds again or maintain no operation for 15 seconds. Then, the controller will automatically save the currently set battery type and enter the normal operating mode.

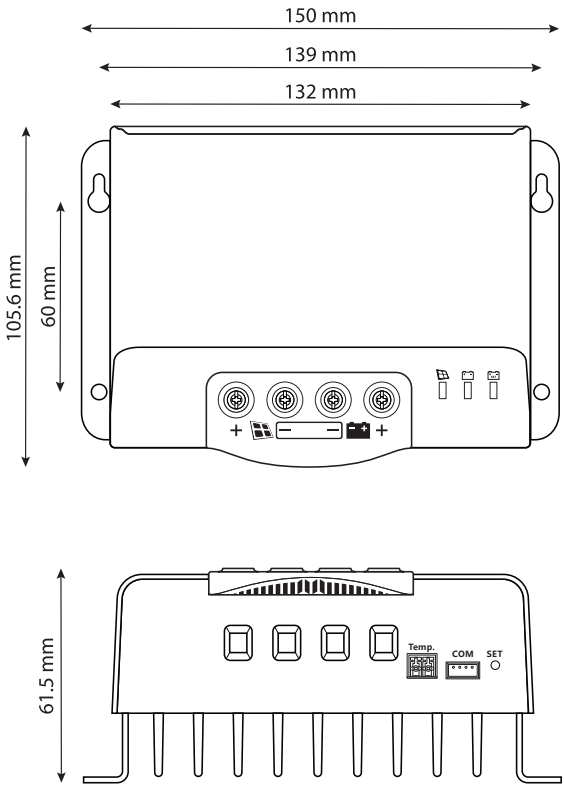
In addition, if you press and hold the key for 20s, the controller will restore the factory default parameters.

SPECIFICATIONS

Specifications:

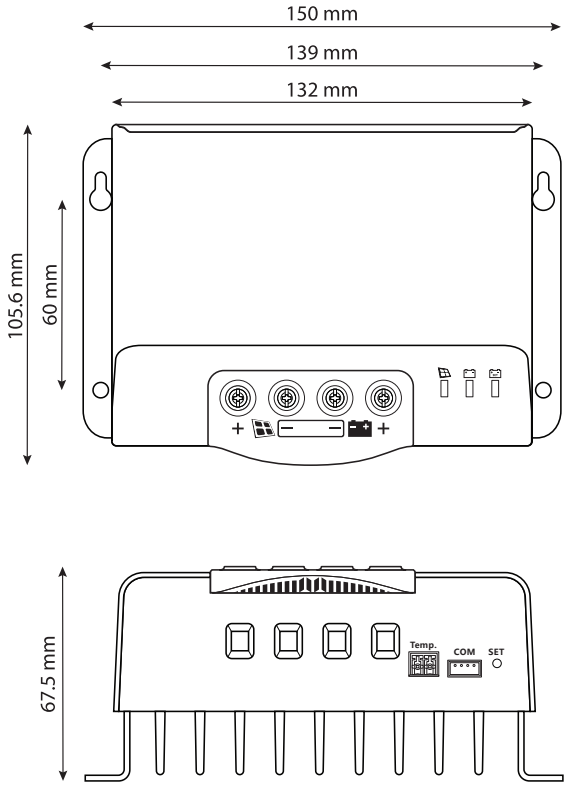
Model	ALV-10020B	ALV-10030B	ALV-10040B	ALV-10050B
Rated Charging Current	20A	30A	40A	50A
System Voltage	12 / 24V			
Battery Voltage Range	9 - 32V DC			
Maximum PV Open Circuit Voltage	92V at 25°C			
Maximum PV Input Power (12V)	260W	400W	550W	660W
Maximum PV Input Power (24V)	520W	800W	1100W	1320W
Zero Load Loss	< 10mA			
Connection Type	TR Screw Terminal			
Maximum Cable Size	10mm² (8AWG)			
Charging Conversion Efficiency	≤ 98%			
MPPT Tracking Efficiency	> 99%			
Temperature Compensation Factor	-3mV / °C/2V (for lead-acid batteries only)			
Communication	Bluetooth, TTL and CAN (RV-C)			
Operating Temperature Range	-35°C - +65°C			
Ingress Protection	IP32			
Altitude	≤ 3000m			
Colour	Black			
Dimensions (w x h x d)	150 x 105.6 x 61.5mm	150 x 105.6 x 67.5mm	183 x 127 x 65.5mm	183 x 127 x 69.5mm
Weight	0.65kg	0.83kg	1.04kg	1.36kg
Warranty	3 Years			
Protection Features	Battery Over-charging, Battery Over-discharge, Battery Reverse-polarity Interior Over-temperature, Over-current, PV Over-voltage, PV Reverse-polarity, PV Short-circuit Protection, TVS Lightning Protection and Reverse Charge Protection at Night			

ALV-10020B Model Dimensions:



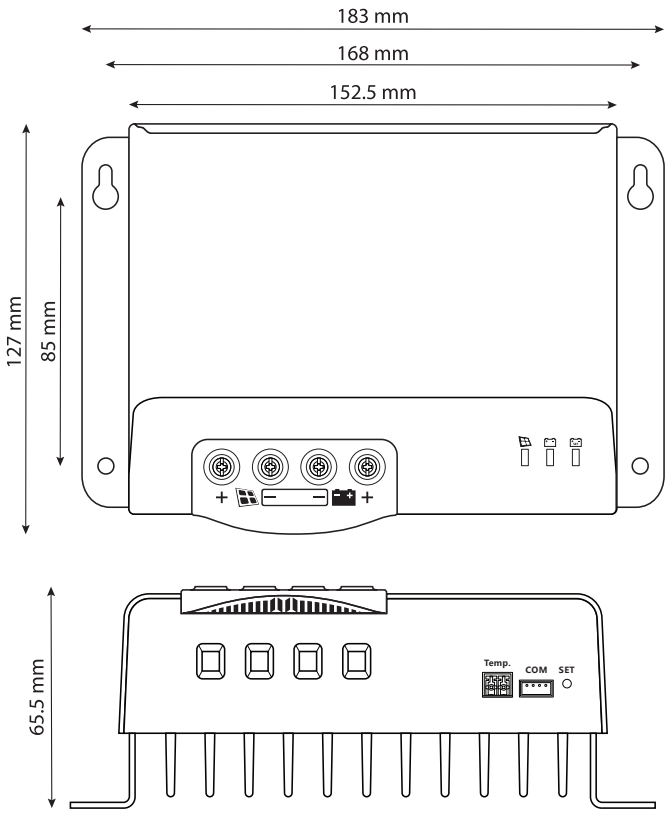
- Mounting hole size: 5mm

ALV-10030B Model Dimensions:



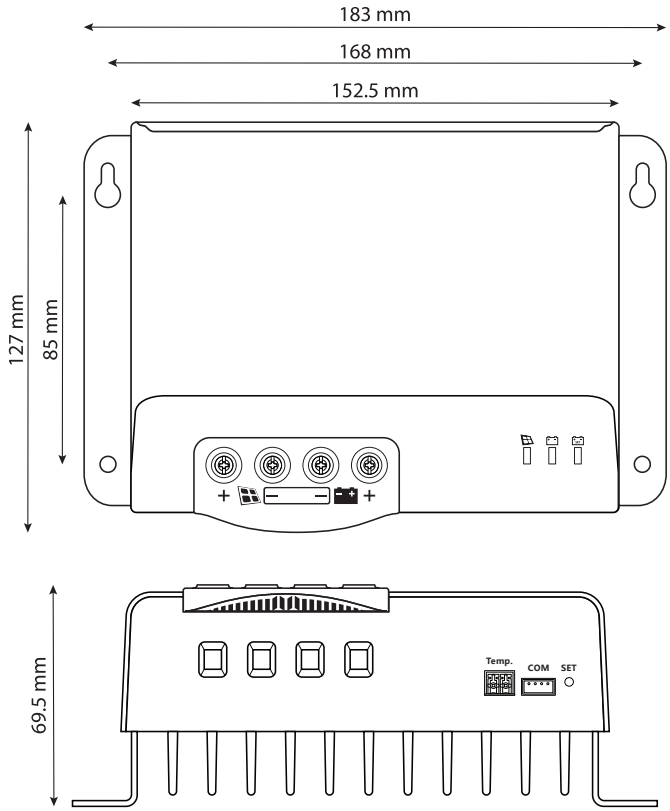
- Mounting hole size: 5mm

ALV-10040B Model Dimensions:



- Mounting hole size: 5mm

ALV-10050B Model Dimensions:



- Mounting hole size: 5mm

BATTERY PARAMETERS

Default Battery Voltage Parameters:

Battery Type	Lithium	Sealed Lead-Acid	Gel Lead-Acid	Flooded Lead-Acid	Custom Default Values
Over-voltage Disconnection Voltage	-	16.0 V	16.0 V	16.0 V	9.0 - 17.0 V
Equalising Charge Voltage	-	14.6 V	-	14.8 V	9.0 - 17.0 V
Boost Charge Voltage	14.4 V	14.4 V	14.2 V	14.6 V	9.0 - 17.0 V
Floating Charge Voltage	-	13.8 V	13.8 V	13.8 V	9.0 - 17.0 V
Boost Charge Recovery Voltage	-	13.2 V	13.2 V	13.2 V	9.0 - 17.0 V
Equalising Charging Duration	-	120 min	-	120 min	0 - 600 min
Equalising Charging Interval	-	30 days	0 days	30 days	0 - 250 days
Boost Charging Duration	-	120 min	120 min	120 min	0 - 600 min

If a user-defined battery is used, the default voltage parameters of the system are the same as those of the sealed lead-acid battery. The following logic must be followed when you modify battery charge and discharge parameters:

Overvoltage disconnection voltage > charge limit voltage ≥ equalizing charge voltage ≥ boost charge voltage ≥ floating charge voltage> boost charge recovery voltage

Overvoltage disconnection voltage> Overvoltage disconnection recovery voltage

INSTALLATION

PRE-INSTALLATION PRECAUTIONS

- PV arrays may generate very high open circuit voltages. Disconnect the circuit breaker or fuse before wiring and be very careful during wiring. Ensure that solar panels are completely covered from sunlight during installation.
- Never install the controller and a vented battery in the same enclosed space.
- The battery terminals on the controller can be connected to either a single battery or a battery bank. Subsequent instructions in this manual apply to systems using a single battery, but are equally applicable to systems using a battery bank.
- Follow the safety recommendations of the battery manufacturer.
- Select the system connection wire with a current density of no less than 4A/mm².
- This device has a common negative design. If grounding is required, enure that the negative terminal is grounded.

WIRE AND FUSE SELECTION

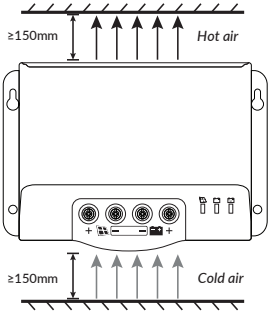
Wiring and installation must meet the requirements of national and local electrical codes. PV and battery connection wires must be selected based on the parameter of rated current.

Please refer to the table below for wire and fuse specifications:

Wire Selection Specifications:	
PV Maximum Input Current	20A
PV Wire Gauge	5 mm² / 10 AWG
Rated Charge Current	20A
Battery Wire Gauge	5 mm² / 10 AWG

CONTROLLER INSTALLATION

When installing the controller, ensure that the installation will provide adequate airflow around the controller, and reserve at least a 150mm space above and below the controller for natural convection cooling. If installed in a closed container, ensure there is reliable heat dissipation through the container.



1. Select an installation location

a. Choose a location that will avoid direct sunlight, minimise exposure to high temperatures, and is suitably ventilated.

2. Install mounting screws

a. Mark the mounting position according to the mounting dimensions of the controller, drill two mounting holes of suitable size at the two marks and fix the screws on the two mounting holes.

3. Install the controller

a. Align the controller fixing holes with the two pre-fixed screws to hang the controller up, and then fix the two screws below.

4. Wire the controller

a. Access the corresponding interface according to the screen mark of each terminal, and pay attention not to connect the positive and negative in reverse.

CONTROLLER WIRING

1. Wiring information

When all cables are connected firmly and reliably, check whether the wiring is proper and whether the polarity is reversed. After confirmation, connect the battery fuse or circuit breaker and observe whether the LED indicator is on. If not, disconnect the fuse or circuit breaker immediately and check whether wiring is correct.

Once the battery is on and can be registered by the controller, connect the solar panel. If there is sufficient sunlight, the charge indicator of the controller will be steady on or flash and start to charge the battery.

Warning: When the controller has stopped charging for 10 minutes, reverse polarity of the battery can damage the controller's internal components.

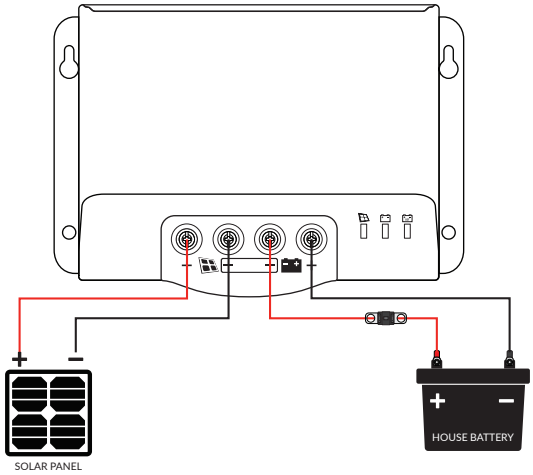
Note:

- Note that the battery fuse shall be installed as close as possible to the battery terminal. The recommended distance is not more than 150mm.
- The battery temperature is 25°C (fixed value) when the controller is not collected to a remote temperature sensor.

2. Wiring diagram

a. Connect the battery cables, positive then negative

b. Connect the solar cables, positive then negative



PROTECTION FEATURES

Waterproofing protection:
- IP32 rated

Input power limited protection:
- When the power of the solar panel is higher than the rated value, the controller will limit the power of the solar panel within the rated power range to prevent damage by over current, and the controller enters the current-limiting charge.

Battery reverse polarity protection:
- If the battery polarity is reversed, the system will not work but it will not burn out the controller.

PV input end voltage is too high:
- If the voltage at the PV array input end is too high, the controller will automatically shut off the PV input.

PV input end short circuit protection:
- If the voltage at the PV array input end is short circuited, the controller will turn off charging; after short circuit is removed, charging will automatically recover.

PV input reverse polarity protection:
- When the polarity of the PV array is reversed, the controller will not be damaged, and normal operation will continue after the wiring error is corrected.

Reverse Charging Protection:
- When the PV array voltage drops at night, the controller automatically blocks reverse current to prevent the battery bank from discharging into the PV array.

Over-temperature protection:
- When the temperature of the controller exceeds the set value, it will reduce charging power or stop charging.

TVS lightning protection
- TVS is a protection feature that creates an almost instantaneous shield to protect fragile equipment in the case of indirect lightning strikes, power spikes and electrostatic discharge.

SYSTEM MAINTENANCE

- In order to maintain the best long-term performance for controllers, it is recommended to conduct inspections twice a year.
- Make sure the airflow around the controller is not obstructed and remove any dirt or debris from the heat sink.
- Check if the insulation layers of all exposed cables are damaged due to sun exposure, friction with other objects nearby, dry rot, destruction of insects or rodents, etc. If so, it is necessary to repair or replace the cable.
- Verify if indicators are consistent with the device operations. Please note to take corrective actions for any malfunctions or error indications if necessary.
- Check all wiring terminals for corrosion, insulation damage, signs of high temperature or burning/discoloration.
- Tighten terminal screws.
- Check for dirt, insects nesting and corrosion and clean as required.
- If the lightning arrester has failed, replace it in time to protect the controller and other devices in the system from being damaged by lightning or electrical spikes.

Warning: To carry out any of the operations above, please ensure that all power to the controller has been disconnected. Afterwards, perform a final inspection and commence operation. Operation and maintenance should only be handled by trained professionals where necessary.

TROUBLESHOOTING

Common Troubleshooting:

Issue	Possible Cause	Troubleshooting
After the backup battery is connected for charging, there is no response and the indicator light is not on.	Wrong or loose connection of the backup battery	Check whether the connection of the backup battery cables are correct and reliable. If not, connect correctly and then recalibrate.
	Lithium battery protection	Connect a solar panel or a vehicle alternator to charge and activate the lithium battery
The controller cannot charge the backup battery via solar during the daytime.	Wrong or loose connection of the solar panel	Check whether the connection of the solar panel cables are correct and reliable. If not, connect correctly and then recalibrate.
	The solar panel is being blocked	Ensure the solar panel is not blocked, shaded, or dirty
	Error in the backup battery system voltage level setting	Ensure the system voltage level set by the controller is identical with the actual battery voltage level used
The backup battery cannot be charged by the alternator while the vehicle is running.	Wrong or loose connection of the alternator	Check whether the connection of the alternator cables are correct and reliable. If not, connect correctly and then recalibrate.
	Error in the backup battery system voltage level setting	Ensure the system voltage level set by the controller is identical with the actual battery voltage level used

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WARRANTY INFO

ALVOLTA
BUILT FOR POWER

3 YEAR WARRANTY

At Alvolta, we build all our gear for reliable power. We stand behind the quality and durability of our components. Our product development team rigorously tests our products to ensure they will perform in the Australian climate.

Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonable foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

Alvolta warrants that our products are free from manufacturing defects in material and workmanship for the warranty period. The warranty commences on the date of purchase by the original purchaser. If a defect arises during the warranty period, we will repair, replace or provide an appropriate remedy in accordance with the Australian Consumer Law.

To access the benefits of this warranty, you must retain your proof of purchase and follow any other direction we reasonably give you.

Processing a Warranty Claim

If you believe your product is defective, it must be returned to us for inspection by our warranty claims department. Please contact our customer service team to provide details of the defect. They will assist you through the process of your warranty claim, including how to return the product for inspection.

Once we receive your returned product, our technicians will inspect it. We will then notify you of the outcome of your claim.

If we accept your warranty claim, we will either repair, replace or refund the goods at our discretion. We will also reimburse you for the shipping costs you incurred in sending the goods back to us. Any products that we choose to replace or refund become the property of our company.

If we do not accept your claim, we will advise you of the reason and hold your product for collection. You will need to arrange and pay for the product to be shipped back to you. If your product is not collected within 30 days of your warranty claim being finalised, we may destroy it.

Your warranty is voided if we (at our sole discretion) determine that there is evidence of one or more of the following:

Negligence: Improper installation, improper or extreme use, use that contravenes this instruction manual, etc.

Abuse: Road hazards, damage beyond the limits of “normal wear and tear.”

Unauthorised Repair: Repair service performed by an unauthorised service centre.

Disassembly: Any attempt to open, tamper with or otherwise compromise the integrity of the product.

Consequential Damage: Damage to this product caused by the failure of another component of the vehicle or device in which this product is installed.

Note regarding exterior finishes: we use the highest quality materials available, but depending on location, environment and exposure, the colour of exterior surfaces can fade. We will not approve any warranty claims that relate to colour fading.

Discontinued Items

Discontinued items that are still under warranty will be reviewed by our company. If a discontinued item is covered under warranty it may be replaced by an equivalent or superior item. If an equivalent item is not available our company will determine terms of resolution on a case-by-case basis.