ALVOLTA
BUILT FOR POWER

OWNER'S MANUAL



ALVOLTA LUNA-HL 100V 10A MPPT WITH LOAD CONTROL

ALV-10010L

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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 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-HL controller features a built-in LED display, and can be externally connected to the Alvolta Observer LCD screen to provide clear, real-time system information and configuration options. The Luna-HL controller also supports 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.

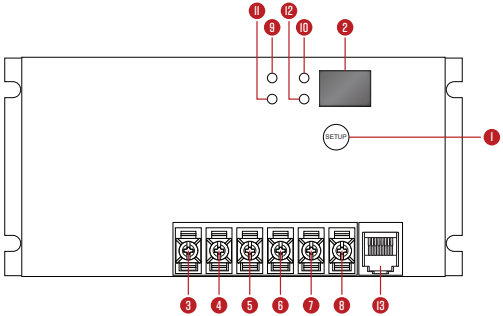
FEATURES

- 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.
- 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.
- Supports automatic identification of 12/24V lead-acid batteries.
- Features double-peak or multi-peak MPPT technology, suitable for partial shading or partial damage of solar panels.

- Features a four-stage charging mode: MPPT - equalising charge - boost charge - float charge.
- 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 features a fault code indication, making fault identification easy and convenient.
- The controller can be connected to the Alvolta Observer LCD screen or a separate Bluetooth module to view equipment operating data and status, and modify the controller parameters.
- With multiple load control modes, the controller can automatically identify day and night, and enhance the flexibility of the load system.
- The controller features over-charge, over-discharge, over-load, short-circuit, reverse connection, over-temperature, TVS and anti-reverse charge protection.

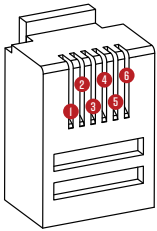
INTERFACE & INDICATORS

MAIN INTERFACE



1	Key
2	LED display
3	Solar positive terminal (+)
4	Solar negative terminal (-)
5	Battery positive terminal (+)
6	Battery negative terminal (-)
7	Load positive terminal (+)
8	Load negative terminal (-)
9	Charge indicator
10	Mode indicator
11	Battery indicator
12	Fault indicator
13	RS232 interface

RS232 COMMUNICATION INTERFACE



1	TX Transmitting
2	RX Receiving
3	Power/signal ground
4	Power/signal ground
5	Power Supply Positive
6	Power Supply Positive

INDICATOR LIGHTS

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)	Boost 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

Battery Indicator Specifications:

No.	Light Indication	Indication Description
1	On normally	Normal battery voltage
2	Slow flash (on 1s, off 1s)	Battery over-discharge
3	Quick flash (on 0.1s, off 0.1s)	Battery over-voltage

Fault Code Specifications:

Code	Code Description	Control Strategy
E0	No fault	-
E1	Over-discharge of the battery	No discharge
E2	Over-voltage of the battery	No charge or discharge
E3	Battery under-voltage warning	The battery indicator light indicates that the battery can be charged normally
E4	Load short-circuit	Turn off the load immediately
E5	Over-load	Disconnect the load after delay in accordance with multiples of rated current
E6	Overheated device	De-rating charge according to over-temperature strategy
E8	Excessive solar input power	Current-limiting charging
E0.	Over-voltage of the solar panel	No charge
E5.	Battery not connected or lithium battery protection	-
E8.	BMS over-charge protection	No charge

Work Load Mode Code Specifications:

Code	Description of Mode
0	Pure optical control, the load is turned on & off through optical control
1	The load is turned on & off through optical control, after a 1 hour delay
2	The load is turned on & off through optical control, after a 2 hour delay
3	The load is turned on & off through optical control, after a 3 hour delay
4	The load is turned on & off through optical control, after a 4 hour delay
5	The load is turned on & off through optical control, after a 5 hour delay
6	The load is turned on & off through optical control, after a 6 hour delay
7	The load is turned on & off through optical control, after a 7 hour delay
8	The load is turned on & off through optical control, after a 8 hour delay
9	The load is turned on & off through optical control, after a 9 hour delay
10	The load is turned on & off through optical control, after a 10 hour delay
11	The load is turned on & off through optical control, after a 11 hour delay
12	The load is turned on & off through optical control, after a 12 hour delay
13	The load is turned on & off through optical control, after a 13 hour delay
14	The load is turned on & off through optical control, after a 14 hour delay
15	Manual mode (by default)
16	Debugging mode
17	Constant on mode

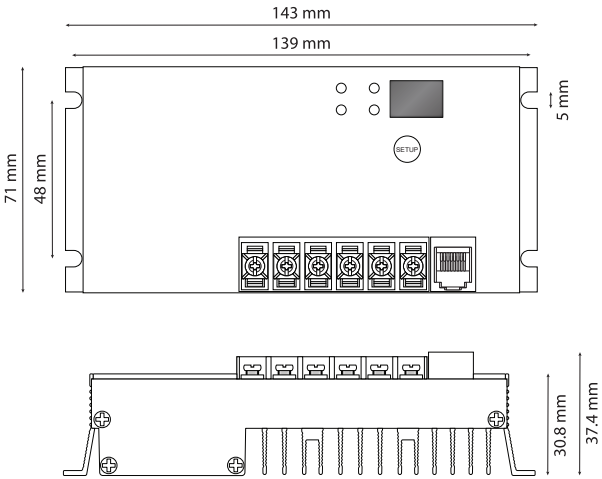
SPECIFICATIONS

Specifications:

System Voltage	12 / 24 V
Rated Charging Current	10A
Battery Voltage Range	8 - 32V DC
Maximum PV Open Circuit Voltage	100V
Charging Mode	Trace MPPT at maximum power
Maximum Solar Panel Power	130W at 12V, 260W at 24V
No-Load Loss	≤ 10mA
Connection Type	TR Screw Terminal
Maximum Cable Size	10mm² (8AWG)
Charging Conversion Efficiency	≤ 98%
MPPT Tracking Efficiency	> 99%
Rated Load Current	10A
Overload Protection	1.25x of 10s protection, 1.5x of 5s protection, 2x of 1s protection
Load Working Mode	Pure optical control, light & time control, manual mode, debugging mode, constant-on mode
Optical Control Voltage	Optical control on: 5V, Optical control off: 6V
Optical Control Delay	Optical control on: 5 min, Optical control off: 1 min
Internal Over-temperature Protection	Linear power reduction operation triggered by temperature over +60°C
Grounding Mode	Common negative grounding
Operating Temperature Range	-35°C - +65°C
Ingress Protection	IP64
Altitude	≤ 3000m
Colour	Black
Dimensions (w x h x d)	143 x 71 x 37.4mm
Weight	0.43kg
Warranty	3 Years
Protection Features	PV Over-voltage, PV Reverse-connection, Input Over-power, Internal Over-temperature, Over-load, Battery Over-voltage, Battery Over-discharge, Battery Reverse-connection, Charge PV Short-circuit, Load Short-circuit, TVS Lightning Protection, and Reverse Charge Protection at Night

*See battery parameters table for specifications on lithium battery system voltages.

Model Dimensions:



BATTERY PARAMETERS

Default Battery Voltage Parameters:

Battery Type	Lithium	Sealed Lead-Acid	Gel Lead-Acid	Flooded Lead-Acid	Custom Default Values
System Voltage	4 Strings: 12 V 8 Strings: 24 V	12 V Auto 24 V Auto			
Over-voltage Protection Voltage	16.4 V 32.8 V	16.0 V 32.0 V	16.0 V 32.0 V	16.0 V 32.0 V	9.0 - 17.0 V 18.0 - 34.0V
Over-voltage Restoration Voltage	15.4 V 31.8 V	15.0 V 30.0 V	15.0 V 30.0 V	15.0 V 30.0 V	-
Charging Limit Voltage	14.4 V 28.8 V	15.5 V 31.0 V	15.5 V 31.0 V	15.5 V 31.0 V	9.0 - 17.0 V 18.0 - 34.0 V
Equalising Charge Voltage	-	14.6 V 29.2 V	-	14.8 V 29.6 V	9.0 - 17.0 V 18.0 - 34.0 V
Boost Charge Voltage	14.4 V 28.8 V	14.4 V 28.8 V	14.2 V 28.4 V	14.6 V 29.2 V	9.0 - 17.0 V 18.0 - 34.0 V
Float Charge Voltage	-	13.8 V 27.6 V	13.8 V 27.6 V	13.8 V 27.6 V	9.0 - 17.0 V 18.0 - 34.0 V
Boost Return Voltage	13.2 V 26.4 V	13.2 V 26.4 V	13.2 V 26.4 V	13.2 V 26.4 V	9.0 - 17.0 V 18.0 - 34.0 V
Over-discharge Return Voltage	12.0 V 24.0 V	12.6 V 25.2 V	12.6 V 25.2 V	12.6 V 25.2 V	9.0 - 17.0 V 18.0 - 34.0 V
Under-voltage Alarm	11.0 V 22.0 V	12.2 V 24.4 V	12.2 V 24.4 V	12.2 V 24.4 V	-
Under-voltage Alarm Voltage	10.8 V 21.6 V	12.0 V 24.0 V	12.0 V 24.0 V	12.0 V 24.0 V	9.0 - 17.0 V 18.0 - 34.0 V
Over-discharge Protection Voltage	10.0 V 20.0 V	11.1 V 22.2 V	11.1 V 22.2 V	11.1 V 22.2 V	9.0 - 17.0 V 18.0 - 34.0 V
Discharge Cut-off Voltage	9.2 V 18.4 V	10.6 V 21.2 V	10.6 V 21.2 V	10.6 V 21.2 V	9.0 - 17.0 V 18.0 - 34.0 V
Equalising Charging Interval	30 days	30 days	30 days	30 days	30 days
Equalising Charging Duration	120 min	120 min	120 min	120 min	120 min
Boost Charging Duration	120 min	120 min	120 min	120 min	120 min

PARAMETER SETTING: LOAD WORK MODE

1. Pure Optical Mode (0):

This mode operates the system based entirely on ambient light levels. At dusk, when sunlight fades and drops below the activation threshold, the controller waits for 5 minutes (to prevent accidental triggers) and then turns on the connected equipment. At dawn, when the sun rises and light exceeds the turn-off threshold, the controller automatically turns the equipment off.

2. Optical Control + Time Control (1-14):

This mode turns the system on at sunset and turns it off after a set number of hours. Connected loads will be turned on 5 minutes after sunlight drops below the activation threshold. The loads will stay on for a customised duration and turns off automatically once that time expires. Refer to Table D to configure your desired operation runtime.

3. Manual Mode (15) (default):

In manual mode, the user can control the load manually by pressing the key or setting the parameters via the Alvolta app. This mode can also be used in some cases for debugging or specific circumstances.

4. Debugging Mode (16):

Debugging mode is used to verify that the system is installed correctly. When activated, the loads will automatically turn OFF (break) when a light signal is detected, and turn ON (make) when there is no light signal. This allows users to easily test and confirm proper system behaviour during setup.

5. Constant On Mode (17):

Once powered on, the system provides continuous power to the loads at all times. This mode is ideal for devices that require an uninterrupted 24-hour power supply.

OPERATION INSTRUCTIONS

1. Load Mode and Fault Code Browsing:

During normal operation, the LED screen remains off to save power. To check the system status, press the Key button. The LED screen will light up along with either the Mode or Fault indicator light.

If the Mode indicator light is on: The number on the LED screen represents the controller's current Load Work Mode.

If the Fault indicator light is on: The number on the LED screen is a Fault Code. Refer to Table C to diagnose the error.

2. Load Mode Setting:

With the Mode indicator light illuminated, press and hold the Key button for 3 seconds until the screen flashes. Press the key briefly to cycle through the mode numbers. To save and exit, press and hold the key for 3 seconds or wait 8 seconds until the LED display stops flashing. Refer to Table D for mode definitions.

3. Battery Type Setting:

With the Mode indicator lit, press and hold the key button for 8 seconds until the current battery type flashes on the screen. Press the key briefly to cycle through options (see Table E). To save, hold the key for 3 seconds or wait 8 seconds until the LED stops flashing.

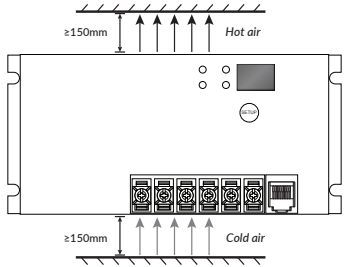
Important: Charging may temporarily pause during this change but will quickly resume. You must reboot the controller (power off, then power on) for the new battery settings to take effect.

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.

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 controller

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.

b. 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. Prepare the cable. Use cables with current density not higher than 4A/mm² and plan the length. Peel 8mm insulated layer from the terminal connected with the controller to reduce the length of the connecting cable as far as possible. It is recommended that the battery cable be shorter than 3m to reduce the power loss.

b. Connect the battery to the controller. Ensure that the positive (+) and negative (-) terminals are connected correctly. When connected correctly, the indicator light will turn on. If the indicator light does not turn on, check the connection to ensure it is correct.

c. Connect the solar panels to the controller. Ensure that the positive (+) and negative (-) terminals are connected correctly. When connected correctly and the panel receives sufficient sunlight, the indicator light will turn on. If the indicator light does not turn on, check the connection to ensure it is correct. The solar panel should generate voltage immediately if it exposed to the sunlight. Do not use a connect a battery that is 36V or greater, as the voltage generated by the battery exceeds what this controller can safely handle.

d. Connect the load line to the controller. Ensure that the positive (+) and negative (-) terminals are connected correctly, and the load does not exceed the rated current for this controller.

e. This controller features a negative common grounding design. If grounding is required, ground the negative pole of any group of terminals.

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.

Over-temperature protection inside device:
- When the interior temperature of the controller is beyond the set value, the controller will reduce the charging power or stop the charging cycle to reduce the temperature of the controller.

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.

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	Troubleshooting
The indicator light is not on	Check whether the input side is connected correctly, and whether the Remote On/Off is short-circuited correctly.
There is no output on the output side	Use the **Alvolta** app to check for any abnormal messages, whether output is prohibited, whether the battery is over-charged/under-charged, whether the controller is over-heated, and whether there is a short circuit or over-load.
The charging power is below the rated value	Check whether the current limit is over-temperature and whether the maximum output current value is correctly set through the app, and is lower than the rated output current.

WARRANTY INFO

ALVOLTA
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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.

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