

Solar Energy Australia

Guardian Series

Installation Manual V1.2



Contents

| | | |
|-----|---|----|
| 1 | Introduction..... | 2 |
| 2 | Transportation..... | 3 |
| 3 | Safety..... | 3 |
| 3.1 | Basic Safety..... | 4 |
| 3.2 | Handling..... | 4 |
| 3.3 | Storage of Battery..... | 4 |
| 3.4 | Medical Applications..... | 4 |
| 3.5 | Damaged Battery..... | 5 |
| 3.6 | Fire..... | 5 |
| 4 | Product Description..... | 6 |
| 4.1 | Weight and Dimensions..... | 6 |
| 4.2 | Specifications..... | 7 |
| 5 | Charging and Discharging..... | 8 |
| 6 | Installation..... | 9 |
| 7 | Location and Environment..... | 9 |
| 7.1 | Clearances..... | 10 |
| 8 | Battery System Installation..... | 11 |
| 8.1 | Unpacking the Battery System..... | 11 |
| 8.2 | Setting up for Assembly..... | 11 |
| 8.3 | Installing the Modules..... | 12 |
| 8.4 | Connecting the earth..... | 12 |
| 8.5 | Connecting the Communications Cables..... | 12 |
| 8.6 | Attach the Bus Bars..... | 13 |
| 8.7 | Final assembly..... | 13 |
| 8.8 | Connector Box..... | 13 |
| 9 | Start-up Procedure..... | 14 |
| 9.1 | Shut Down Procedure..... | 14 |
| 10 | Battery Module LED Status..... | 15 |
| 11 | Initial Installation Charge..... | 15 |
| 12 | Warranty..... | 15 |

1 Introduction

The revolution is here with Solar Energy Australia's range of Solar Battery storage giving every day Aussies the chance to be truly grid independent. On-grid or Off grid, Solar Energy Australia has the right solutions.

Alternative Energy is growing with consumers turning away from Utilities and grid power where possible. Installing batteries with your photovoltaic array and inverter reduce greenhouse gases and cost of living. Batteries allow people to run the house from solar day and night.

Battery Storage give consumers the power to keep the energy generated during the day and use at night. Why sell power during the day for minimal gain when you can keep and store it to use when you most need it - at night!

Solar batteries store energy from a solar PV system for later use. It allows you to keep appliances running when the sun is down or during a power outage. If your rooftop solar system and battery are large enough, you can be truly grid independent.

There are no battery installation sites too big or too small to take advantage of world class safety, market leading energy density and our first-class customer service

Please make yourself familiar with this manual with special attention to icons



Caution



Warning



Danger

2 Transportation

Solar Energy Australia's lithium-ion batteries have Dangerous Goods classification of (DG) Class 9 UN3480. And approved for transport in Australia. The batteries are shipped in a partially discharged state with terminal protection and the circuit breaker off.

Batteries should not be shipped 'loose' or preinstalled in a cabinet, they should be shipped in the original manufacturer's packaging, positioned on the flat (horizontally) and secured to a skid or pallet.



3 Safety

Guardian batteries must only be installed by a suitably qualified person. The installer and owner should read this manual and understand each section.

Guardian batteries come equipped with a BMS (Battery Management System) built in. The BMS manages the charge and discharge of the lithium cells. The BMS does not allow > 100A charge or discharge at anytime, the battery is protected by the BMS, not a temperature rated K-curve breaker.

Solar Energy Australia recommend that a dual pole isolation MCCB be installed at the battery to protect the system and consumers as per BBG (Best Practice Guide)

It is the responsibility of the suitably qualified and experienced person who can specify the correct cables sizes and ratings, external circuit protection, polarity checking and double checking the polarity before commissioning.

As per Australia's BPG:

A suitably qualified person is

- A degree qualification in electrical engineering and at least two years experience in the use of electrical equipment safety standards for regulatory purposes; or
- An advanced diploma or equivalent qualification in an electrical discipline and at least three years experience in the use of electrical equipment safety standards for regulatory purposes; or
- A trade qualification In an electrical discipline and at least four years experience in the use of electrical equipment safety standards for regulatory purposes.

3.1 Basic Safety

Lithium-ion batteries can be dangerous if not handled correctly. The below precautions should be always followed

- Battery should not be exposed to temperatures above or below the temperature ratings specified within this manual.
- Battery should not be installed in direct sunlight.
- Battery must not be exposed to strong impacts.
- Battery must not be crushed or punctured.
- Battery modules are non-user serviceable and should not be opened for repair.
- Battery has no maintainable components and is must not be disassembled.
- Battery should not be touched if wet.
- Battery should be always kept dry.
- Battery should only be used as per this manual

3.2 Handling



- Battery modules are heavy and a 2-person lift is recommended
- Correct and proper lifting techniques or equipment should be applied when moving and installing batteries
- Do not install a battery if it appears damaged in any way
- Do not short circuit the battery terminals
- Avoid touching metal components including but not limited to bus bars, terminals, lugs or exposed electrical conductor

3.3 Storage of Battery

- Battery should be stored horizontally
- Battery should be kept in a dry environment away from moisture.
- Battery should be stored away from incompatible substances and chemicals.
- Battery should be stored between -20 to 60°C, 25°C is the preferred temperature to limit self-discharge.
- After 6 months of storage the battery should be recharged allowing the cells to balance and maintain voltage.

3.4 Medical Applications

Solar Energy Australia batteries should not be used in critical medical applications where failure of the battery can reasonably be expected to have an effect or cause failure of equipment operation.

3.5 Damaged Battery



A damaged battery must not be used and Solar Energy Australia should be notified at the earliest opportunity.

Leaking electrolyte can cause skin irritation and chemical burns so contact should be avoided. Eye Contact: Rinse gently with running water. Seek medical attention if irritation develops.

Skin Contact: Rinse gently with running water. Seek medical attention if irritation develops.

Ingestion: If ingested do not induce vomiting and contact your local poisons information centre or doctor.

Inhalation: Evacuate area and seek professional medical attention immediately, an inhalation hazard is not expected due to product form and nature of use.

3.6 Fire



Lithium-ion batteries are considered a Class B fire, so a standard ABC or dry chemical fire extinguisher should be used. Class B is the classification given to flammable liquids. Lithium-ion batteries contain liquid electrolytes that provide a conductive pathway, so the batteries receive a Class B fire classification.

4 Product Description

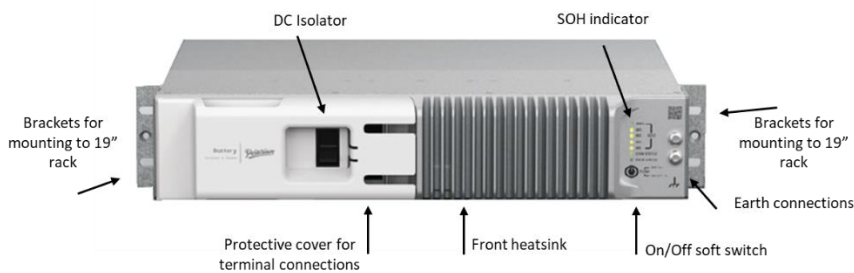
The Guardian Series are a pre-wired bank battery System using Polarium modules and a Solar Interface unit to manage surges within the inverters and allow communication between batteries for superior cell balancing and cell maintenance.

The Guardian series have pre-installed amphenol connectors allowing fast, safe and trouble-free installation. A dual pole 250A MCCB is pre-wired to enhance safety features in line with the best practice guide – Battery Energy Storage.



4.1 Weight and Dimensions

| PHYSICAL ATTRIBUTES | Guardian 26 | Guardian 38 | Guardian 50 |
|---------------------------|---|-------------|-------------|
| Weight Approx. | 240kg | 300kg | 360kg |
| Dimensions (w x d x l) mm | 685 (w) x 763 (d) x 1280 (h) mm | | |
| Connections | Amphenol Surlock 10.3mm (left, right or rear) | | |



4.2 Specifications

| Electrical Characteristics | | | |
|------------------------------------|---|---------------------------|-------------------|
| | Guardian 26 | Guardian 38 | Guardian 50 |
| Nominal Voltage | 50.8 VDC | | |
| Rated Capacity @25°C | 25.4 kWh / 500Ah | 38.1 kWh / 750 Ah | 50.8 kWh / 1000Ah |
| End-of-Discharge Voltage (LVBD)** | 35 VDC (recommend 43.4 VDC min) | | |
| Peak Charge / Discharge Current | 200 A | 300 A (<1 min) | 400A (<1 min) |
| | | Limited to 250 A via MCCB | |
| Charge Voltage for 100% SOC | 58.8 VDC | | |
| Charge Voltage for 80% SOC | 56 VDC | | |
| Efficiency | >96% | | |
| Environmental Characteristics | | | |
| Operating Temperature Charging | 0 to +50°C | | |
| Operating Temperature Discharging | -20 to +60°C | | |
| Storage Temperature | -20 to +60°C | | |
| Calendar Life @ 80% SOC 20 years | 20 years | | |
| IP Rating | IP20 Indoor use only | | |
| Cooling | Thermostatically controlled | | |
| Physical Characteristics | | | |
| Weight Approx. | 240kg | 300kg | 360kg |
| Dimensions (w x d x l) mm | 685 (w) x 763 (d) x 1280 (h) mm | | |
| Connections | Amphenol Surlock 10.3mm (left, right or rear) Left, right or rear to be specified at time of order | | |
| Safety & Compliance | | | |
| Complies to Best Practice Guide | Yes | | |
| Safety Standards | AS IEC62619:2017, AS/NZS 62368.1:2018, UN38.3 | | |
| Circuit breaker per battery module | 100 A, BMS Controlled, single pole | | |
| Battery System Circuit Breaker | 2P 250A DC MCCB Ue=500VDC Icu=15kA | | |

5 Charging and Discharging

When charging and discharging the battery system, it is essential that the charge and discharge parameters as outlined in this manual are obeyed.

Each module in the battery system has its own BMS and adds advanced features for protection when charging and discharging the batteries.

For warranty purposes, the battery must be operated within the voltage, current and temperature windows defined below and in the specifications in this manual and the data sheet.

See Solar Energy Australia's website for detailed programming parameters for PCE

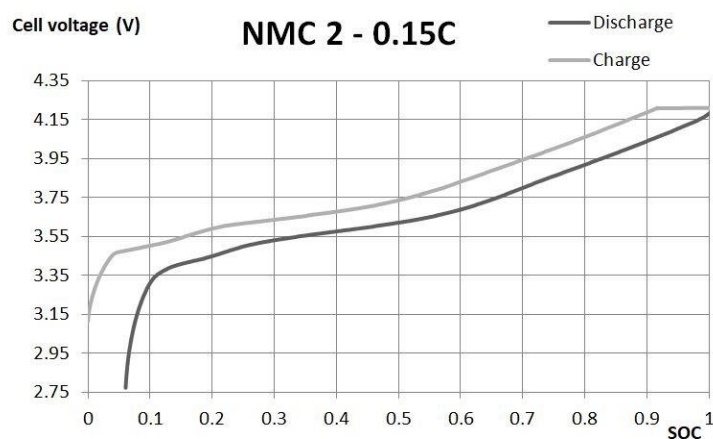
The table below identifies the general programming requirements for the PCE to ensure the battery operates within parameters

| | Guardian 26 | Guardian 38 | Guardian 50 |
|-------------------------------------|-------------|-------------|-------------|
| Maximum Charge current | 200A | 300A* | 400A* |
| Charge Current under CLD conditions | 6 - 12A ** | | |
| Maximum DOD | 80% | | |
| Max Charge Voltage | 58.8 VDC | | |
| Float Voltage | 57.1 | | |
| Shutdown Voltage (min) | 35VDC | | |
| Shutdown Voltage (Recommended) | 43.4VDC | | |
| Shutdown SOC (Recommended) | 20% | | |

* Limited by 250A MCB

** On charge cycle, if conditions vary outside recommended operational environment, the CLD (Current limiting device) will engage to protect the batteries and reduce charge current until conditions return to normal

Charging and Discharge Curves



6 Installation

There are many considerations when choosing where and how to install a battery system in a home or building.

Installation should only be carried out by a suitably qualified person. That person should familiarise themselves with this document and any documentation provided with the PCE.

The Guardian Series as declared conforming to the best practice guide; the system should be installed under section six of AS5139:2019

6.1 Location and Environment

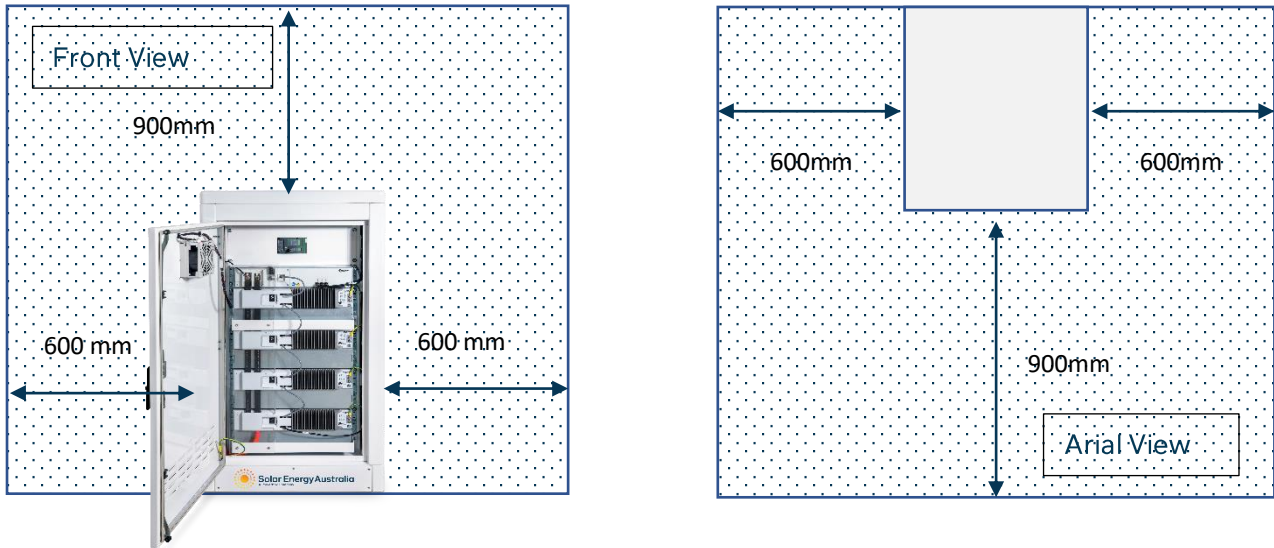
The location of the batteries should meet the below conditions:

- The Battery should not be installed where direct contact of salt air may be possible. If unavoidable, the battery installation should be indoors or an IP66 or greater enclosure.
- The floor is level, clean and free from obstacles.
- There are no explosive or flammable materials nearby as per Best Practice Guide – Battery Energy Storage
- The ideal temperature around the battery should be 25°C. Acceptable ranges are -20°C to 60°C
- The area is of a clean environment moisture and dust free.
- The enclosure is vermin proof however extra precautions should be taken to ensure no insects and vermin do not enter the enclosure
- The batteries and battery cabinets/housings are not exposed to direct sunlight.

6.2 Clearances

AS5139:2019 documents minimum clearances and locations where it is permissible to install a battery system.

Fig 4.1 Clearances required



Note: Only related PCE are allowed in the shaded areas, this includes how water systems, air-conditioners, ventilation and any other potential heat sources.

Batteries cannot be installed in a habitable room, such as a living room or bedroom. However, if you want to install a battery in a non-habitable room, such as a garage, you may need to consider ventilation.

As per AS5139, when deciding the best location for the battery system, for any house other than a brick or stone house, a non-combustible material must be installed between the battery system and building to prevent spread of fire

Speak to the experts at Solar Energy Australia if you are unsure about the most suitable location for your battery system

7 Battery System Installation

For safety purpose, Solar Energy Australia does not ship the battery modules inside the battery system.

The cabinet will come prewired with

- SI Box (Solar Interface)
- Wiring harness installed
- 250A MCCB pre-wired
- Connection plate installed
- Connection plate can be located on left, right or back of the battery system. If no location is specified, it will default to rear connection.



7.1 Unpacking the Battery System

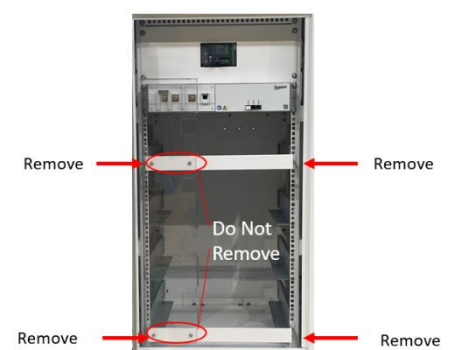
The battery modules will come delivered separately to the Cabinet and at the same time. All care should be taken when moving and removing the packaging from the battery modules. Solar Energy Australia recommend at least a 2 person lift at all times. A thorough inspection of the cabinet is recommended, if there is any damage, please contact Solar Energy Australia straightaway.



7.2 Setting up for Assembly

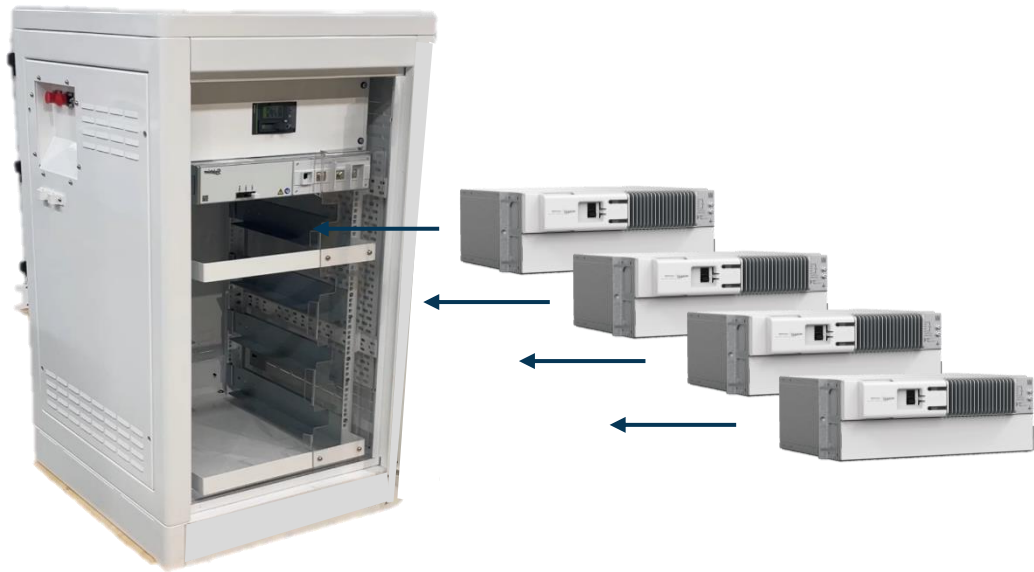
The Battery System is designed with a removeable door, for ease of assembly, SEA recommend removing the door ensuring that the thermostatically controlled fan is disconnected.

Remove the perspex battery cover by removing the four (4) screws fixing the white brackets to the cabinet, Do not remove screws fixing perspex to white cross members



7.3 Installing the Modules

Battery modules should be slotted into allocated location inside the cabinet



Using the supplied **MX** hex screws, fix the battery modules to the rack rail. Ensure all 6 fixings are used per module. Cage nuts are pre fitted for easy installation.

7.4 Connecting the earth

The cabinet is pre-wired with earthing. Connect the Earth cable to each battery as required ensuring secure connection



7.5 Connecting the Communications Cables



The Guardian Battery System includes the smarts for each module to balance the cells inside. To ensure the cells in each module and each module are equally balanced, communications between batteries need to be connected.

Connect each of the RJ45 connectors linking the battery modules and into the Si Box

7.6 Attach the Bus Bars

Before proceeding ensure that all isolators and breakers are disconnected.

The assembly kit will include two (2) x 100A bus bars per battery module.

Add all the busbars without tightening the M8 bolts to start with. Once the busbars are in place tighten the M8 bolts to torque, 15NM



7.7 Final assembly

Once all the modules are secured and cabling and connections are sure.

Replace the Perspex battery cover fixing with the 4 screws.

Replace the door

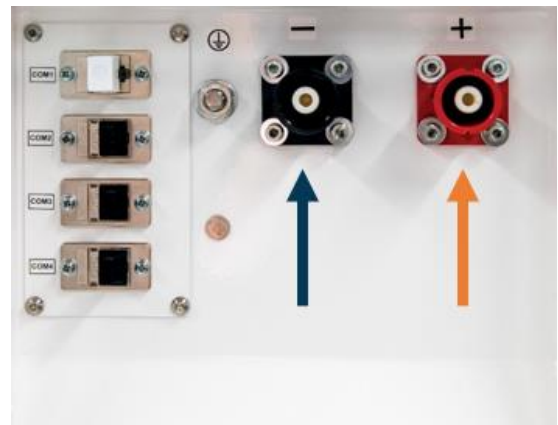
Reconnect the thermostatically controlled fan

7.8 Connector Box

The Guardian battery System comes with a connector box for easy connection.

Once the PCE is fully installed use the supplied battery cables to connect the battery system to the common DC Bus

Before connection ensure polarity is correct



8 Start-up Procedure

Before switching on the System, check polarity are correct and connections are tight, follow the order as below

- Turn on battery modules at single pole isolators
- Turn on SI box and wait till the SI box engages. A small 'click' should be heard
- Switch on main MCCB
- Turn on Solar MMPT
- Turn on Inverter

8.1 Shut Down Procedure

As with the start-up process, the shutdown procedure should be done in reverse

- Turn off the inverter
- Turn off the Solar MPPT
- Open the MCCB
- Switch off the SI Box
- Switch off individual battery modules

9 Battery Module LED Status

Each Battery has an LED panel giving an overview of the battery status

| LED | Status | Description |
|-------------|----------------|--|
| 100% | Off | Module < 100% |
| | Green | Module = 100% |
| 80% | Off | Module < 80% |
| | Green | Module = 80% |
| 60% | Off | Module < 60% |
| | Green | Module = 60% |
| 40% | Off | Module < 40% |
| | Green | Module = 40% |
| 20% | Off | Module < 20% |
| | Green | Module = 20% |
| Comm Status | Off | Normal condition |
| | Flashing Blue | Battery Installed Alone or Communication Failure |
| Pack Status | Off | Battery Module has shut down or waking up |
| | White | Fault identified – take out o service |
| | Red | Error condition preventing discharge |
| | Green | Normal conditions |
| | Flashing Green | Charge Stop Balancing mode |

10 Initial Installation Charge

Solar Energy Australia ships batteries in a partial state of charge. On commissioning the battery for the first time the battery it should be fully charged to the float stage. The battery system is commissioned and tested in our Australian warehouse before shipping although it is recommended to do a full charge to balance the cells before discharging the battery system.

11 Warranty

Solar Energy Australia batteries come with a 10 year warranty.

See our warranty document for more information

12 Contact

IF you have any questions please contact:

Solar Energy Australia

4 Beaumont Rd

Mount Kuring-Gai

NSW 2080

1800 251 380

sales@solaraustralia.com.au

NOTES:

Intentionally Blank