48V 16kWh Wall Mountable Battery Module Product Manual

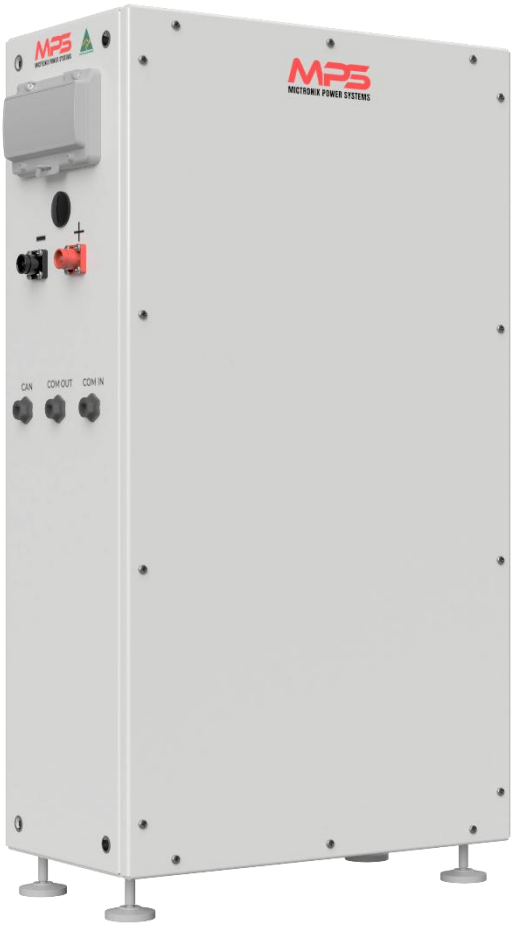
Introduction

The MPS-48V-16 is a robust, high power LFP energy storage solution that can be used in a wide range of applications.

The battery module has been designed and made in Australia to suit Australian conditions over a long service life, maintaining maximum performance.

Simplicity of installation and maintenance was a priority in the design process.

Mictronix Power Systems (MPS) strives to manufacture as much of the battery module in Australia as possible, feeding money back into the local economy.



Contents

Safety

Designers and installers must have a detailed understanding of this manual before undertaking any work involving the battery module. They must also be qualified to carry out the installation of the battery module(s) in the intended geographical region.

Battery charging, discharging and storage specifications must be followed at all times.

The battery module has a high quality, calibrated Battery Management System (BMS) that protects from electrical fault conditions including cell imbalance, cell over voltage, cell under voltage, discharge over temperature, discharge under temperature, charge over temperature, charge under temperature, discharge over current, charge over current and short circuit protection. Protection values can be found in the specifications table of this manual. Any connected equipment (e.g. inverter, MPPT or PCE) must be capable of safely withstanding sudden disconnection of the battery – as the BMS may isolate the battery to prevent the above conditions causing damage. Correct installation and configuration of connected equipment will help to prevent this scenario.

A 4 pole, C curve, non-polarised, 125A circuit breaker provides an isolation point for each battery module. The total current capacity of this breaker across 2 poles is 250A x 0.8 derating factor for a total of 200A. This circuit breaker provides secondary over current and short circuit protection in conjunction with the BMS. Two 200A quick connectors (1 x red/positive and 1 x black/negative) are supplied for the purpose of attaching connected equipment. The connectors are non-keyed so attention must be paid to colour and polarity. The battery modules use AA grade LiFePO4 prismatic cells that have been graded/grouped according to capacity and internal resistance. Each cell has a built-in safety over pressure release valve.

Key Safety Points

The battery module:

- Must be kept dry until installed
- Must not be pressure washed or hosed down
- Must not be exposed to salt spray
- Must not be installed in direct, sustained sunlight
- Must not be exposed to extreme vibration or ongoing movement
- Must not be installed if damaged in any way, including crushed, punctured or if any defects are observed.
- Must be removed from service and placed in a safe area if damaged
- Must be installed and serviced by a qualified person following required precautions
- Must not be opened or disassembled
- Must not be connected with reverse or incorrect polarity
- Most not be exposed to temperatures beyond those described in the specifications section of this manual.
- Must not be overcharged, over-discharged or connected to equipment that may cause over current conditions.

Transportation

- LFP or LiFePO4 batteries are classified as Dangerous Goods (DG) Class 9 UN3480.
- Road and sea transport are the designated methods of transport.
- The battery modules are shipped with the circuit breaker in the off position and at a reduced state of charge.
- Local shipping labels and regulations must be met.
- Material Safety Data Sheet (MSDS) can be requested from Mictronix Power Systems.
- The battery modules should not be placed upside down at any time.

Storage

The battery modules are shipped at a reduced state of charge. It is recommended to charge the battery every 6 months to approximately 90% SOC if in storage.

The battery module should not be stored in a fully discharged state. Upon accidental full discharge, the battery must be recharged within 2 weeks.

Handling

- The battery weighs more than 100KG and is a minimum 2-person lift. Individuals should assess their ability and preparedness to move the battery module before attempting to do so.
- Suitably rated lifting and manual handling hardware must be used to assist in transport, movement and installation.
- Safe work practices should be followed during transportation, movement and installation.
- The battery may be mechanically lifted by using suitably rated straps or chains when properly secured to a minimum of 4 of the built-in nut inserts at the same height on the chassis. For example, when lifting the battery module in the vertical position, its weight must be evenly distributed among 4 x M10 bolts secured inside the top nut inserts on each side of the chassis. Tightening torque for bolts fastened into the nut inserts shall be 25Nm.
- Ensure a clear path is available before moving the battery.
- The battery module's centre of gravity is not at the centre of the chassis.

Damaged Battery

Damaged battery modules must not be used. Please contact Mictronix Power Systems or a local recycling facility for disposal.

CAUTION: Do not open or mutilate batteries or cells. Contact with battery electrolytes must be avoided, it is harmful to the skin and eyes and may be toxic.

First Aid

Eyes

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Seek medical aid immediately.

Skin

Remove contaminated clothes and rinse skin with plenty of water or shower for 15 minutes. Seek medical aid immediately.

Inhalation

Cease exposure and move to fresh air immediately. Use oxygen if available. Seek medical aid immediately.

Ingestion

Do not induce vomiting or give food or drink. Seek medical attention immediately.

Fire

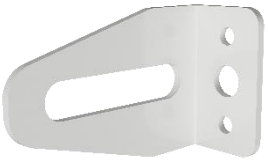
- Call 000 or your local emergency service for assistance.
- For small fires, use water spray, dry chemical, carbon dioxide or chemical foam.
- The internal cells may vent when subjected to excessive heat, exposing the battery contents.
- Toxic and flammable fumes may be released in the event of a fire. Fumes must be avoided. Keep people, pets and livestock clear of any substances released from the cells.
- Material Safety Data Sheet (MSDS) can be requested from Mictronix Power Systems.

What's In The Box

1 x MPS-48V-16 16kWh Wall Mount Battery With 4 Adjustable Feet

1 x 50mm^2 Output Cables, 2M Long, M10 Lugs

2 x Top Mount Wall Brackets with M10 Bolts



2.5M IP67 rated CAN Communication Cable RJ45

Spare IP67 Cover for RJ45 Field Termination

Optional Accessories

Elevated Wall Mounting Kit (MPS-16-WALL)

Spare IP67 Cover for RJ45 Field Termination (MPS-RJ45-IP67)

200A Quick Connector Set Suits 50mm2 Cable (MPS-QC-200/50)

Inter Battery Communications Cable 450mm (MPS-COM-LINK)

MPS-48V-16 Specifications

Weight And Dimensions

Depth	266mm
Width	480mm
Width including circuit breaker cover	510mm
Height	858mm
Height including feet	893mm
Weight	110kg

Model Number	MPS-48V-16
Nominal Voltage	51.2 V
Nominal Capacity	314 Ah
Nominal Capacity watt hours	16.08 kWh
Cell type	Prismatic
Cell Configuration	1P 16S
Cycle Life 100% DOD @ 25 degrees C	≥8,000 Cycles
Cycle Life 90% DOD @ 25 degrees C	≥8,800 Cycles
Cycle Life 100% DOD @ 45 degrees C	≥4,000 Cycles
Capacity @ 0˚C	282 Ah
Capacity @ 10˚C	299 Ah
Capacity @ 55˚C	314 Ah
Series connection	Not permitted
Parallel connection	Unlimited - Contact Mictronix
Depth of discharge	95%
Depth of discharge for maximum life	90%
Usable capacity	15.276 kWh
Battery Charging Temperature range. Protected via internal BMS	2 - 55˚C
Battery output voltage range	44.0 V - 56.8 V
Maximum discharge current	220A @ 25˚C for 10 seconds
Continuous discharge current	200A @ 25˚C
Pulse discharge current	300A @ 25˚C for 1 sec
Maximum discharge power	11.26 Kw @ 25˚C for 10 seconds
Continuous discharge power	10.24 Kw @ 25˚C
Pulse discharge power	15.36 Kw @ 25˚C for 1 second
Continuous charge current	2150A @ 25˚C
Continuous charge power	7.6 Kw @ 25˚C
Charging Temperature range	2 - 55°C
Discharging Temperature range	-20 - 60°C
Short circuit protection	2000A for 300us
Balancing type	Active balancing >3.4V per cell
Electrical connection type	MPS quick connector (200A rated)
Cooling method	Natural convection
Casing material	Aluminium
Depth	266mm
Width	480mm
Width with circuit breaker cover	510mm

Height	858mm
Weight	110kg
IP rating	IP54
Maximum altitude	2000M
Humidity Range	≤ 99% RH
Self-discharge Rate	≤ 3% Per Month
Warranty period	10 years, refer to MPS warranty statement
Certifications (cell level)	GB/UN38.3, IEC62619, UL9540A

Charge And Discharge Settings

The battery can run in managed (communications mode) or unmanaged (no communications with connected equipment).

Compatible Inverter List for Managed Mode

Inverter	Notes
Deye	Default lithium battery 00
Victron	500 kbs CAN speed. A to B cable required
SMA Sunny Island	No setting required

Managed Mode

In managed mode, the battery communicates its status and settings to the inverter via CAN bus through the CAN network port. The data includes SOC, temperature, charge settings and discharge settings. Data is broadcast on pin 4 (CAN-H) & pin 5 (CAN-L). This is the most common pinout on inverters. Victron systems use pins 7 & 8 so a Victron A to B cable would be required. Running the battery in managed mode can extend the life of the battery as the charge and discharge settings are varied depending on conditions. Many of the battery's important status indicators can also be monitored through the inverter's software.

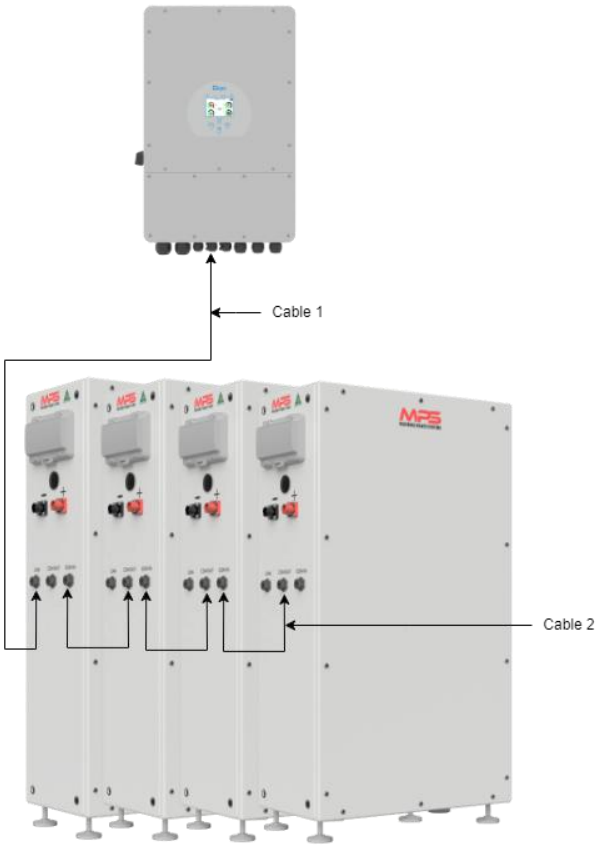
See diagram below for communications cabling layout.

Cable 1 is included with the battery and is 2.5 meters in length. This cable is a straight through termination with an IP67 rated connector on the battery side. If this cable is to be made on site, care must be taken to use an IP67 housing to maintain the water proofing of the battery. See what's in the box and optional extras for this housing.

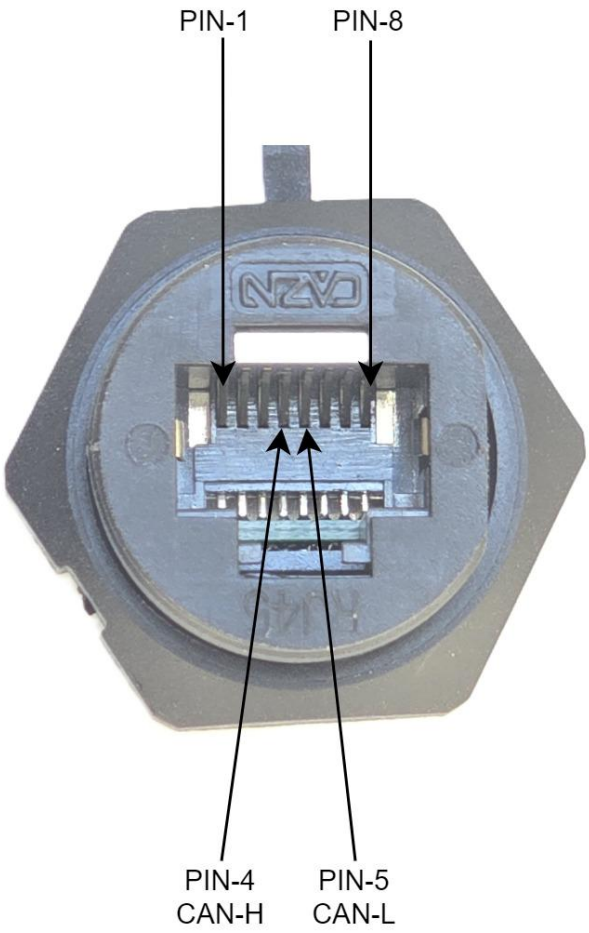
Cable 2 is used for linking batteries to each other. A total of 16 batteries can be connected together for 257 kWh of storage. This cable allows the batteries to communicate to form a unified system. Communication set up is automatic and batteries are detected automatically.

When communications ports are not used, the waterproofing caps must be used to prevent moisture ingress.

The battery module should reach full charge fortnightly to ensure internal balancing of cells and accuracy of the state of charge calculations.



CAN Port Pinout



Unmanaged Mode

In unmanaged mode, the battery relies on the inverter and/or PCE to regulate charge conditions.

The communication link between battery and inverter is not connected.

Charge settings can be found under charger settings at www.mictronix.com.au

Running the battery in unmanaged mode can have benefits if communication breakdown is a concern. When communications ports are not used, the waterproofing caps must be used to prevent moisture ingress.

Under-voltage shut down settings are a fallback of last resort should not be relied upon for correct shut down of the battery. SOC (state of charge) calculations should be used.

When the battery module has a voltage of greater than 55 volts and charge current is reducing over time, it can be assumed the battery is greater than 99% charged.

When the battery module has a voltage of less than 48 volts at less than 10A discharge load, it can be assumed the battery is less than 3% charged.

The battery module has a very flat discharge curve, Typical voltage under load is 51.2V.

The battery module should reach full charge fortnightly to ensure internal balancing of cells.

The battery is a suitable replacement for lead-acid batteries; however charger settings must be changed to suit.

Charge voltages above 56.8V will cause unnecessary balancing of the individual cells and possible sudden high voltage disconnection by the battery module's BMS as it protects the cells from damage.

If multiple charging sources are used which are not synchronized, voltages can be stepped to stop the chargers fluctuating around the end point voltage. For example, in an installation with an AC coupled inverter charger and a DC coupled MPPT. The Inverter bulk, absorption and float voltages can be set 0.5V lower than the DC coupled MPPT. Total maximum charge current rate should be accounted for.

Actual charge voltages Should be measured against settings. Low quality inverters and chargers can have large discrepancies between voltage set points and the actual voltage measured at the terminals.

Installation

This manual should be followed for correct installation of the battery.

Floor Mounting

The battery has 4 adjustable feet on the bottom of the unit. These can be used to level the battery on uneven surfaces. The battery must be fixed and secured to a solid surface by means of brackets bolted to the built-in mounting points to reduce the risk of the battery tipping over.

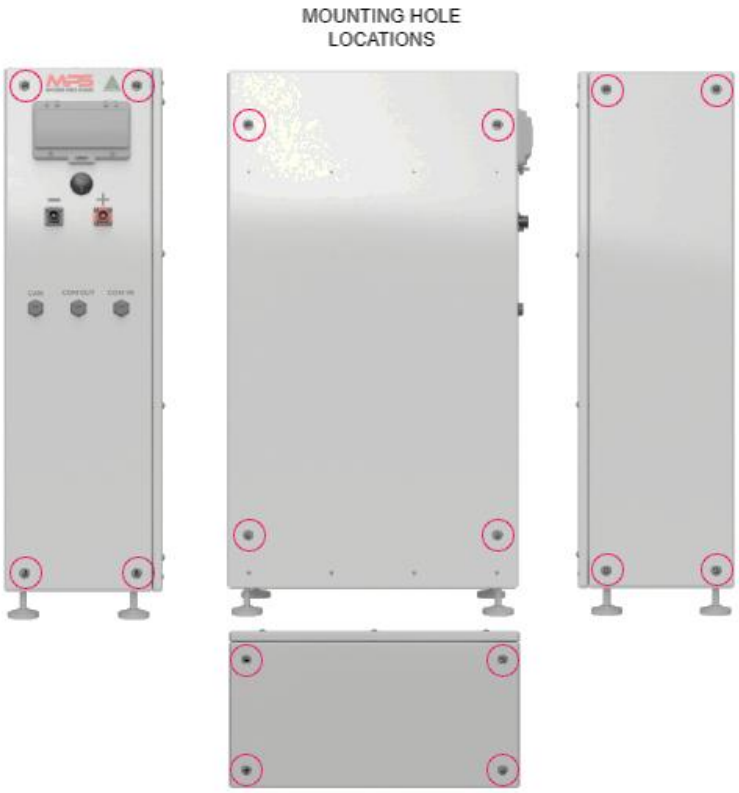
Wall Mounting

A wall mounting kit can be supplied for elevated mounting of the battery. The bottom bracket carries the full weight of the battery so sufficient fixings and a strong mounting surface must be used.

Mounting Points

A number of M10 threads are provided for flexible mounting solutions. These can be used to bolt batteries to metal frames in an industrial solution for example. The thread is an M10 sealed nut insert with a depth of approximately 20mm. Care should be taken to avoid damaging the nut insert by bottoming out the bolt or by applying torque in excess of 25Nm.

Refer to below for thread locations.

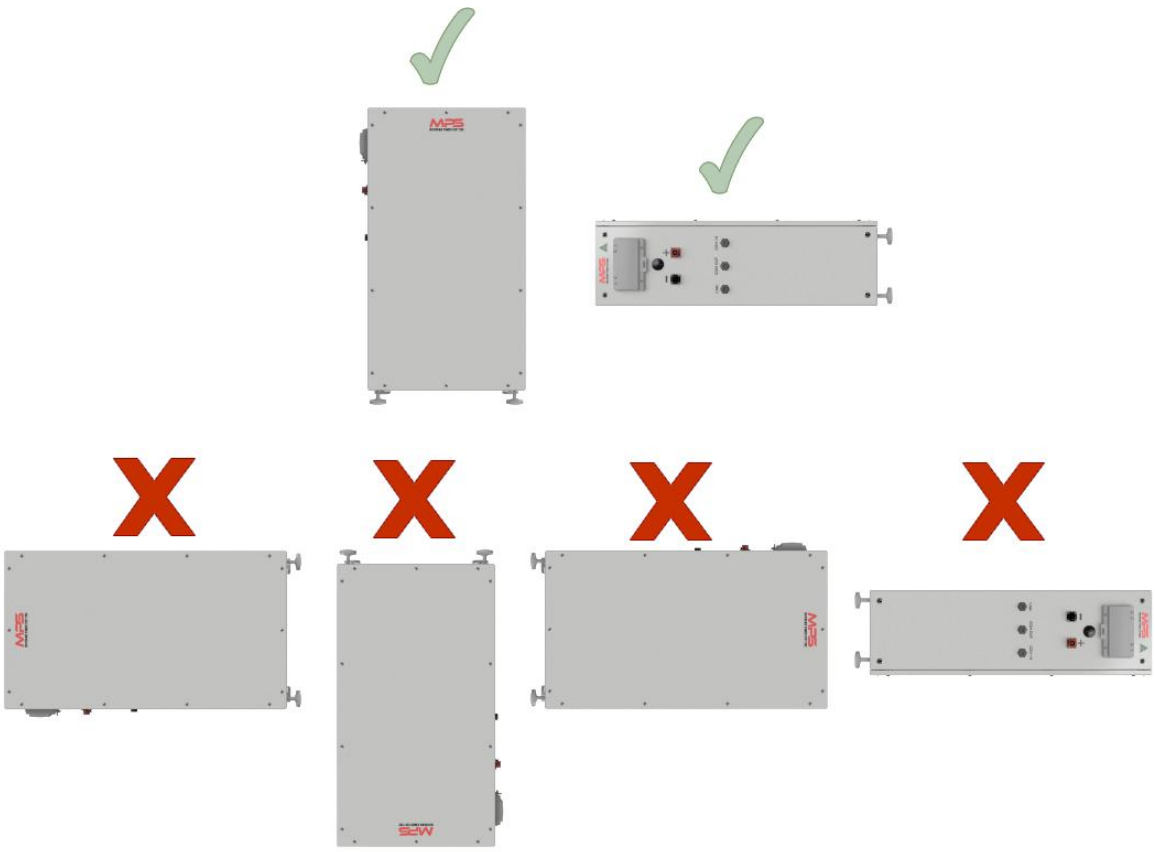


Horizontal Vs Vertical Mounting

The battery modules are designed to mount in both the horizontal and vertical position. Stacking battery modules on top of each other is not permitted.

Permitted Mounting Orientation

The battery module may be mounted vertically with the feet in the downwards direction, or horizontally with the front cover facing upwards. Other orientations are not permitted and will cause cell damage. The battery modules may not be stacked on top of each other.



Temperature

Temperature has a dramatic effect on the life of LiFePO4 batteries. Minimum and maximum temperatures are documented in the specifications section of this manual and must be adhered to.

Sustained high temperature operation (above 35°C) will significantly shorten the life span of the battery module.

High charge and discharge rates will increase the internal temperature of the battery.

Low temperatures limit the amount of discharge power and storage capacity of the battery module. This effect is removed once nominal operating temperatures are achieved and is not permanent.

The internal battery management system continuously checks cell temperature. If an over-temperature event is reached, the BMS will not allow discharging. If an under-temperature event is reached, the BMS will not allow charging. Charging and discharging will resume automatically when normal operating temperature is reached. Temperature set points can be found in the specifications table of this manual.

When the temperature of the battery module is below 12 degrees Celsius, charging should be limited to less than 0.3C (94.2A).

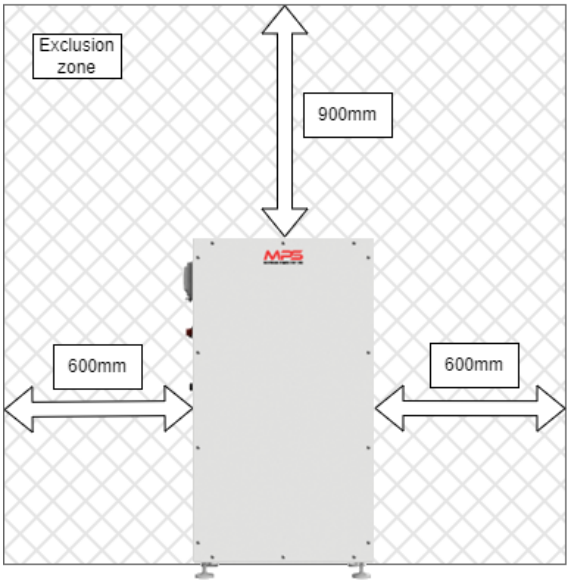
Location

The battery module may be located indoors or outdoors.

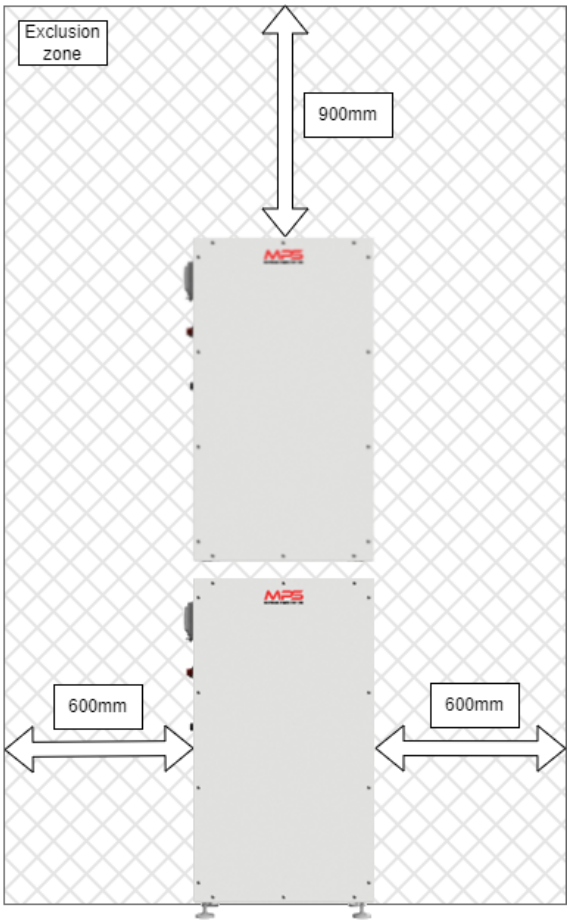
Local regulations and standards (such as AZ/NZS 5319:2019) should be followed when determining a suitable mounting location for the battery module. Direct, sustained sunlight should be avoided as the associated heat will degrade performance and lifespan of the battery module.

The battery module must **not** be located:

- In restricted locations or access paths, walkways, on roofs or inside building cavities including ceilings or walls.
- Within 600mm horizontally **or** within 900mm below any exit, window, vent, gas hot water system, heater, air conditioning unit, heat source or appliance/equipment not directly associated with the battery.
- In habitable or living areas.
- In areas subject to other environmental risks or extremes, such as excessive heat, humidity, high seismic activity, in the presence of hazardous chemicals, dust or flammable substances.



Single Battery



Vertically Mounted Batteries

Salt spray in coastal locations should be avoided to prevent corrosion.

Suitable vermin and pest protection should be applied to suit local conditions.

For maximum life in climate-controlled rooms, the cooling/heating system can be set at 25 degrees Celsius.

Under normal conditions and as part of regular cycling, the battery does not generate hazardous gases or fumes. In the event of a serious malfunction or cell failure, the cells are designed to vent excess gases and vapours generated by the fault. These emissions are toxic and flammable. If the battery is located inside a room, building or enclosed space:

- The room or enclosure must be capable of containing the fumes, gases or vapours until they are completely vented to the outside.
- Any emitted gasses or vapours must not be permitted to accumulate indefinitely – natural ventilation to the outside environment must allow dissipation of any substance vented from the battery module, including those heavier than air.
- Any emitted substances must not be permitted to dissipate or discharge directly into living or habitable areas.

Main DC Connections

The battery module is equipped with a positive (red) quick connector, and a negative (black) quick connector. The connectors deliver and receive power to and from the connected equipment.

Connectors are of the non-keyed type. Care must be taken not to mix polarity or incorrectly connect positive and negative connections.

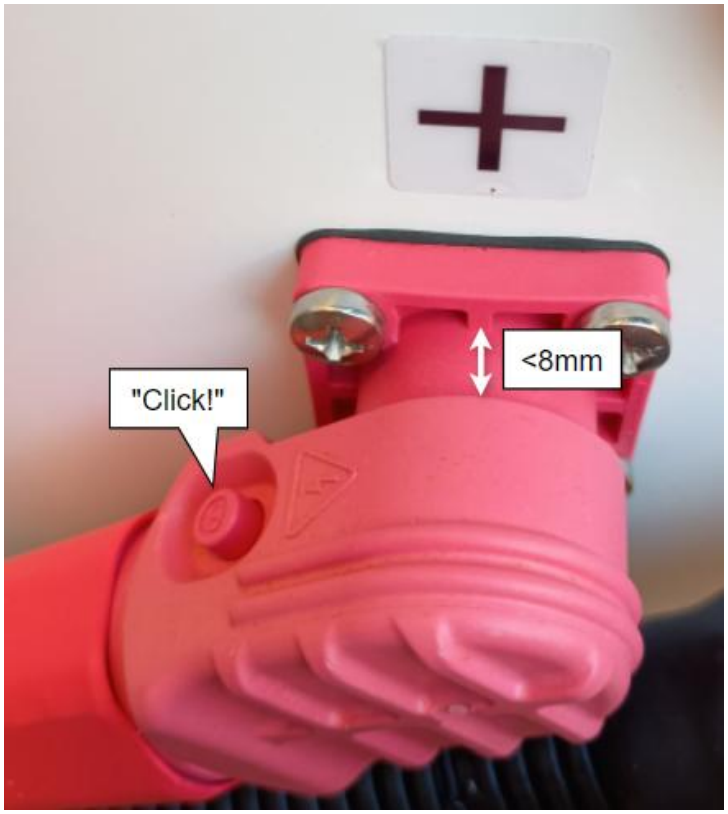
Series connections i.e. positive to negative connections, are strictly prohibited.

Multiple take offs are used and bridged to increase the discharge capability and capacity. Take offs should be the exact length and cross-sectional area to allow the battery module to discharge evenly and reduce circulating currents.

Cable sizes should be maximized to reduce voltage drop and DC ripple. If smaller cables are used, this can cause excess ripple currents which can make the inverter shut down on an over ripple event. It will also cause excessive heating of the cables and premature failure of capacitors in the inverter and or PCE's.

A minimum of 50MM^2 copper cabling is required to operate an individual battery module at its rated input and output current capacity.

Connectors must be pushed inwards until an audible click is heard, leaving a gap less than 8mm between the bottom of the connector and the flange of the socket (see figure below).



All connections and disconnections must occur while DC circuits are isolated and de-energised. Never manually disconnect the battery module while under load.

Earthing

When case earthing is required, any of the M10 fixing points can be used to fix an appropriately lugged bonding cable to the battery module or modules.

It is the installers responsibility to meet local regulations when determining earth size. The output cables are 50mm^2. Based on table 5.1 in AS/NZS 3000:2018, 16mm^2 earth would be required to carry the fault current.

Pre-Charge, Start-Up And Shut-Down Procedure

When the battery power switch is moved to the "on" position, the battery will supply reduced current to charge the inverter or PCE capacitors. It is important to correctly follow the below power-on procedure to prevent damage to the battery and inverter / PCE.

Correct switching procedures should be labelled near to the installation, in accordance with local regulations.

The below can be used for the turn on procedure. The turn off procedure should be the reverse order.

1. Engage all circuit breakers on the DC bus
2. Engage the 4 pole DC breaker on the battery / batteries
3. Engage the power switch on the battery.

The battery module can be turned off and completely isolated on both positive and negative terminals at any time by moving the external circuit breakers to the "off" position. When operating the circuit breakers, allow them to spring freely to the off position without impeding their movement. This allows quick and safe disconnection.

While the circuit breakers are designed to operate under full load and fault conditions, the connected equipment (e.g. inverter or PCE) must be properly prepared for disconnection of the battery module prior to manually operating the circuit breakers. Consult your connected equipment documentation to determine the most appropriate order in which to shut down hardware attached to the battery module.

Adding Batteries With Different States Of Charge

The battery module has a built-in current limiting device that allows safe connection of multiple of the same battery modules in parallel. If batteries with differing states of charge are connected to each other, the device will automatically limit charging current of any substantially discharged batteries to 5A. The current limiter will operate until the state of charge imbalance is reduced to normal levels.

Commissioning And Installation

The following guide can be printed and checked off as part of installation:

- Ensure the battery module circuit breaker/s are in the off position
- Install batteries to final location complying with all requirements in this manual as determined by relevant local authorities.
- If installing multiple of the same battery modules in parallel, connect each battery module to a shared battery bank main circuit breaker before connecting to the power conversion equipment. If there is only one battery, the in-built double pole non polarized circuit breaker is sufficient for isolation and protection.
- Check connected power conversion equipment is set to manufacturer specifications and is ready for voltage to be applied
- Check and test all circuit connections for polarity and tighten all terminals
- Engage the battery circuit breakers and test correct polarity on power conversion equipment. The pre charge switching procedure above should be followed.
- Commission all power conversion equipment based on the requirements in this manual
- Using a DC clamp meter, measure the current flow into and out of each battery module, ensuring even current flow
- Allow the system to reach the float charging state and test actual battery voltages vs setpoints programmed into the power conversion equipment

Maintenance

The battery module is designed with minimal maintenance requirements ensuring maximum reliability and trouble-free operation. The below items should be checked (and remediated, if required) at least annually as part of a regular maintenance program:

- If the circuit breakers operate correctly (see shutdown procedure).
- If connectors are seated properly and there are no signs of hot joints.
- If there are any signs of damaged or decaying cabling.
- The presence or indicators of any physical damage or deterioration including (but not limited to) cracks, leaks, dents, impact marks, fraying, tearing, warping, swelling, discolouration, corrosion or thermal indicators.
- If the battery module and connected equipment is securely mounted and safely positioned.
- If connected equipment is configured to operate only within the battery module's specification, including maximum charge current, discharge current, upper voltage, lower voltage limits and state of charge limits.
- If the battery module or any connected equipment has active alert or warning indicators.
- If electrical installation and safety standards have been met.
- Whether the battery module has been, or appears to have been exposed to water, excessive dust, condensing humidity, extreme temperatures, vermin, power surge or lightning strike.
- Whether the battery module's BMS is active and in good working condition.

Online monitoring is recommended where possible to aid in preventative maintenance and ongoing reliability.

Disposal

The battery module has been designed for ease of recycling at its end of life. 98% of the battery by weight can be recycled and has been assembled in a way that the module can be easily broken down into its individual components. A suitable recycling facility should be used if disposal of the battery module is required.

Before disposal it is recommended the battery module be reused in low demand applications at reduced performance levels.

CAUTION: Do not dispose of batteries or cells in a fire. The batteries may explode.

Warranty

Please refer to the warranty statement at www.mictronix.com.au