MPS

MICTRONIX POWER SYSTEMS

PRODUCT MANUAL

HIGH POWER 120V LFP BATTERY MODULE

AUSTRALIAN MADE AND OWNED

INTRODUCTION

The Mictronix 120V, 6.4Kwh high power LFP battery module is a robust 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.

TABLE OF CONTENTS

MICTRONIX POWER SYSTEMS

SAFETY

Designers and installers must have a detailed understanding of this manual before undertaking any works 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 all fault conditions including cell balancing, cell over voltage, cell under voltage, discharge over temperature, charge over temperature, discharge over current, charge over current and short circuit protection. Values can be found in the specifications chart of this manual.

A 2 pole, K curve, non-polarised, 25A circuit breaker provides an isolation point for each battery module. This circuit also provides secondary over current and short circuit protection in conjunction with the BMS. Internal fusing provides a safe way of managing arc flash, allowing for easy installation of large battery systems.

2 x positive and 2 x negative 120A quick connectors are supplied for the purpose of paralleling multiple battery modules and supplying output power. The connectors are internally bridged after the circuit breaker, allowing pass through even when the circuit breaker is in the off position. This should be noted during system isolations. The connectors are non-keyed so attention must be paid to colour and polarity.

Mictronix battery modules use AA grade Lifepo4 pouch 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

- Battery modules should be kept dry at all times
- Battery modules must not be exposed to salt spray
- Battery modules should not be installed in direct sunlight
- Battery modules should not be exposed to extreme vibration
- Battery modules must not be used if crushed, punctured or if visual damage is observed
- Battery modules must be removed from service if damaged
- Battery modules must not be installed by unqualified persons
- Battery module must not be installed in areas with high humidity
- Battery module must not be disassembled
- Do not reverse the polarity of the battery module

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 should 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.
- The battery module should not be stored in a fully discharged state. Upon full discharge, the battery must be recharged within 24 hours.

HANDLING

- The battery is a 2-person lift and specialised lifting hardware may be used.
  The battery weighs 47KG.
- Safe work practices should be followed during transportation and installation.
- If damage to the battery module occurs during transport or installation, it must not be used.

DAMAGED BATTERY

- Damaged battery modules must not be used. Please contact Mictronix Power Systems or a local recycling facility for disposal.
- Contact with leaking battery electrolytes should be avoided as it can cause skin irritation and burns.

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

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

Ingestion

Give at least 2 glasses of milk or water. Induce vomiting unless the patient is unconscious. Seek medical aid immediately.

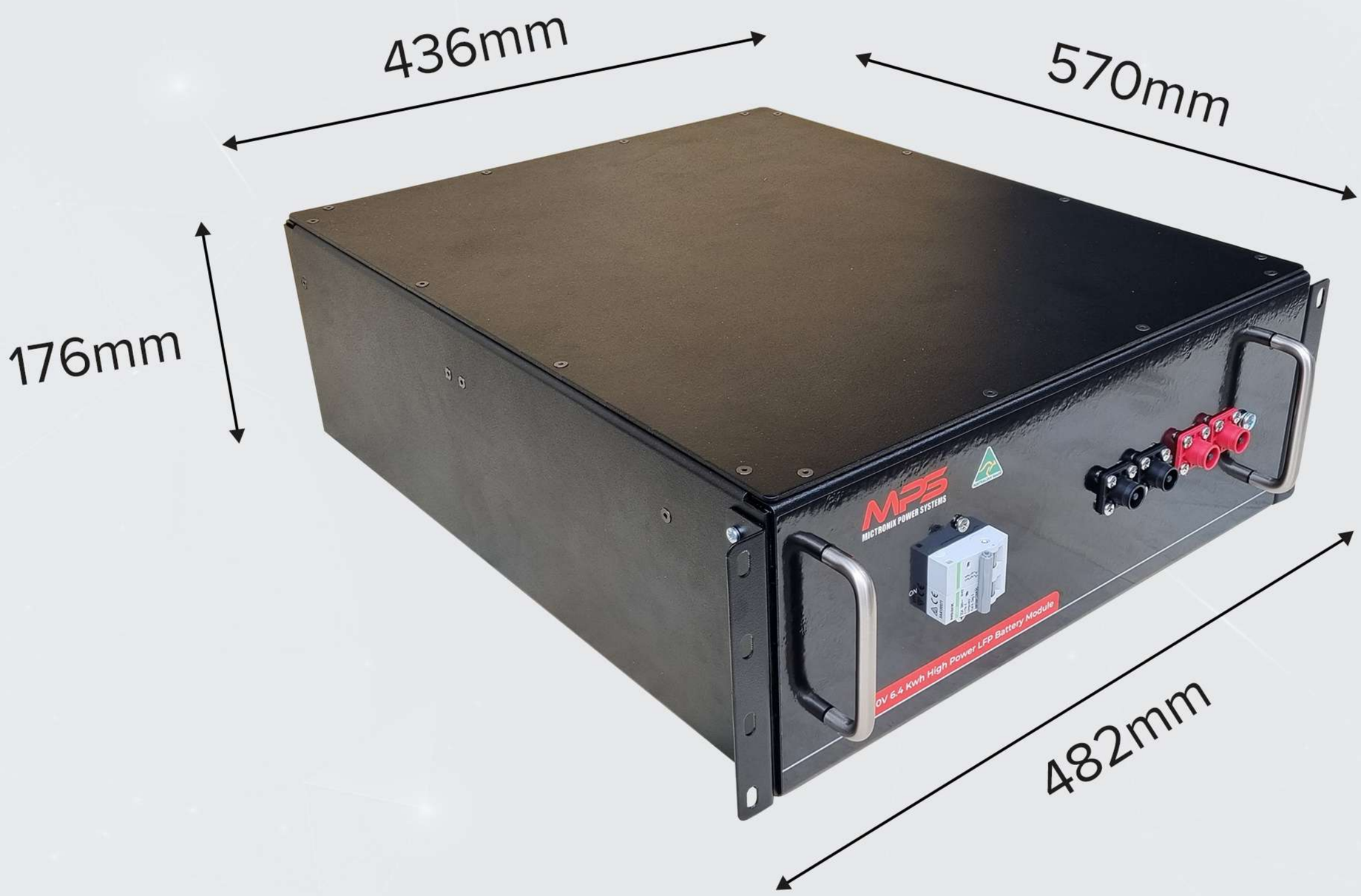
FIRE

- Water should not be used in the event of a fire. Carbon Dioxide (CO2) or dry powder can be used.
- The internal cells may vent when subjected to excessive heat, exposing the battery contents.
- Toxic fumes may be released in the event of a fire. Fumes should be avoided.
- Material Safety Data Sheet (MSDS) can be requested from Mictronix Power Systems.

SPECIFICATIONS

WEIGHT AND DIMENSIONS

Depth	570mm
Width	436mm
Width with rack mount ears	482mm
Height	176mm (4RU)
Weight	47kg
Mounting width	19-inch rack mount compatible



MODEL NUMBER	MPS-120-6.4
Nominal Voltage	**128V**
Nominal Capacity	**50Ah**
Nominal Capacity watt hours	**6.4Kwh**
Cell type	**Pouch**
Cell configuration	**1P 40S**
Cycle Life 100% DOD @ 25 degrees C	**≥ 2,500 Cycles**
Cycle Life 75% DOD @ 25 degrees C	**≥ 5,500 Cycles**
Cycle Life 50% DOD @ 25 degrees C	**≥ 10,000 Cycles**
Cycle Life 100% DOD @ 45 degrees C	**≥ 1,200 Cycles**
Capacity @ 0°C	**42.5Ah**
Capacity @ 55°C	**47Ah**
Series connection	**Not permitted**
Parallel connection	**Unlimited - contact Mictronix**
Recommended depth of discharge	**90%**
Usable capacity	**5.76Kwh**
Battery Charging Temperature range. Protected via internal BMS	**0 - 60°C**
Normal Charge Voltage CV/CC*	**140.00V**
Standby (Float) Voltage	**140.00V**
Maximum Charge Current	**25A @ 25°C limited by circuit breaker**
Recommended Charge Current for Maximum Life	**≤16A**
Battery Discharge Temperature range	**-10 - 60°C**
Battery Output Voltage Range	**110V - 143V**
Maximum Discharge Current	**25A @ 25°C for 30 mins**
Continuous Discharge Current	**16A @ 25°C**
Pulse Discharge Current	**32A @ 25°C for 30 sec**
Maximum Discharge Power	**3.2Kw @ 25°C for 30 mins**
Continuous Discharge Power	**2.05Kw @ 25°C**
Pulse Discharge Power	**4.1Kw @ 25°C for 30 sec**

Over-charge Protection Per Cell	**3.75V ± 0.05V**
Over-charge Release Per Cell	**3.60V ± 0.05V**
Over-charge Release Method	**Cell discharges below release voltage**
Over-discharge Protection Per Cell	**2.10V ± 0.05V**
Over-discharge Release Per Cell	**2.30V ± 0.05V**
Over-discharge Release Method	**Disconnect load**

Discharge Over Current	**60A for 0.14s**
Short circuit protection	**255A for 300us**
Over Current Release Method	**Disconnect Load**
Battery Discharge Over Temperature	**Protection to 60°C ± 5°C** **Release at 50°C ± 5°C**
Battery Charge Over Temperature	**Protection to 60°C ± 5°C** **Release at 50°C ± 5°C**

Internal string fuse rating	**32A**
Internal string fuse type	**10 x 38 ceramic clip in**
Internal string fuse interrupt rating	**100 KA**

Electrical connection type	**5.7mm quick connector (120A rated)**
Cooling method	**Natural convection**
Casing material	**Aluminium**
Depth	**570mm**
Width	**436mm**
Width with ears	**482mm**
Height	**176mm (4RU)**
Weight	**47Kg**
Mounting arrangement	**Mounting in any orientation permitted**
IP rating	**IP40**
Maximum altitude	**2000M**
Humidity Range non condensing	**≤ 80% RH**
Self-discharge Rate	**≤ 3% Per Month**
Warranty period	**Refer to Mictronix warranty statement**
Certifications (cell level)	**GB/UN38.3 IEC62619**

MICTRONIX POWER SYSTEMS

CHARGE AND DISCHARGE SETTINGS

The battery installer should have an accurate method of determining state of charge based on coulomb counting. Voltage is not an appropriate method for determining state of charge for Lifepo4 battery systems. The Victron BMV-700H is the recommended product for this task due to its high accuracy and programmability. Inverters which measure state of charge based on current flow and or battery voltage are notoriously inaccurate. This inaccuracy is compounded over time when a full charge is not reached regularly.

Under-voltage shut down settings should not be relied upon for correct shut down of the battery loads. They are merely a fall back. SOC (state of charge) shall be used.

When the battery module has a voltage of greater than 137 volts and charge current is dropping it can be assumed the battery is greater than 99% charged.

When the battery module has a voltage of less than 120 volts at less than 5A 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 128V.

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

The battery module is intended to be a suitable replacement option for lead based batteries, however charger settings must be changed to suit.

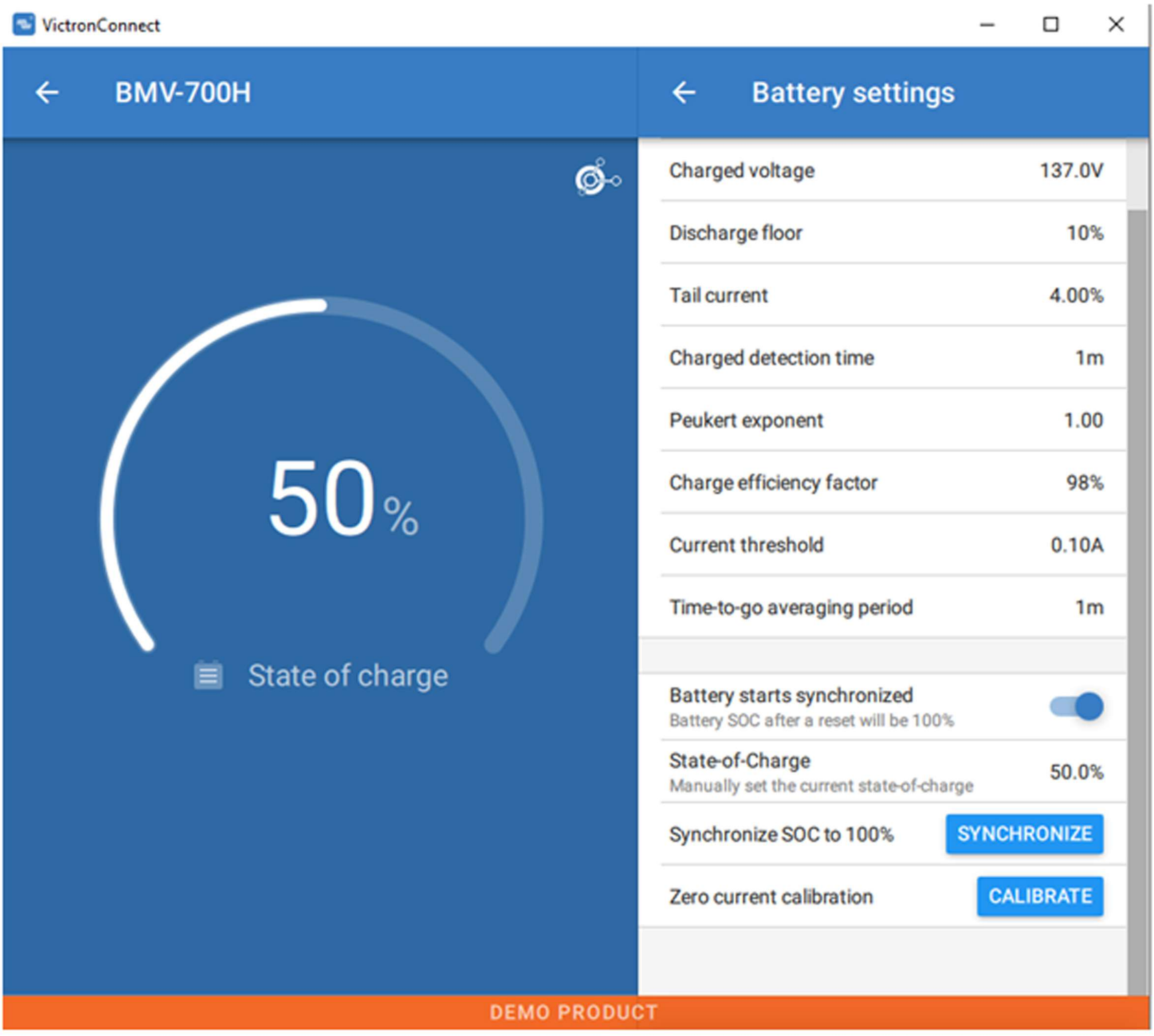
Charge voltages above 144V will cause unnecessary balancing of the individual cells and possible high voltage disconnect of the battery module's BMS.

If multiple charging sources are used which are not synchronised, voltages can be stepped to stop the chargers fluctuating around the end point voltage. For example, in an installation with 3 x MPPT chargers, you could set the following: MPPT1 Bulk voltage = 140V, MPPT2 Bulk voltage = 139.9V, MPPT3 Bulk voltage = 139.8V. Total maximum charge current rate should be accounted for.

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

BATTERY MONITOR

ONE MODULE



MICTRONIX POWER SYSTEMS

INSTALLATION

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

RACK MOUNTING

The battery modules have been designed to fit a regular 19-inch rack mount enclosure. Each battery module will take up 4RU of vertical space.

Ears are supplied with screws to enable secure fixation to the cabinet rails using cage nuts or threaded holes. The ears should not be relied upon alone to support the weight of the battery. Shelves can be used. Mictronix Power Systems can supply clip in rails to provide adequate support.

HORIZONTAL VS VERTICAL MOUNTING

The battery modules are designed to mount in the horizontal position with the handles facing outwards. The battery modules can be mounted in other orientations as pouch cells are not affected by orientation.

TEMPERATURE

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

Sustained high temperature operation will significantly shorten the life span of the battery module.

High charge and discharge rates will increase the 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 or discharging. Once the reset temperature has been reached, charging the battery will re enable the BMS to allow for charging and discharging. Alternatively the battery module can be cycled off then on using the built in circuit breaker to re enable the BMS. Temperature set points can be found in the specifications section of this manual.

When the temperature of the battery module is below 15 degrees Celsius, charging should be limited to less than 0.2C. When the temperature of the battery module is below 3 degrees Celsius, charging should be stopped.

LOCATION

Local regulations should be followed when determining a mounting location for the battery module. Direct sunlight should be avoided.

Salt spray in coastal locations should be avoided. Otherwise, a sealed enclosure/or filtration may need to be used.

Suitable vermin protection should be used to suit the location.

Humidity levels should be within the figures detailed in the specifications section of this manual. As the battery is a large thermal sink, care should be taken to avoid humidity condensing on or around the battery module.

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

ELECTRICAL CONNECTIONS

MAIN DC CONNECTIONS

The battery module is equipped with 2 x positive 5.7mm quick connectors, which are bridged internally and 2 x negative 5.7mm quick connectors, which are bridged internally. All connectors are capable of delivering and receiving power.

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

Linking cables can be used to bridge battery modules to increase battery capacity. Series connections i.e. positive to negative connections are strictly prohibited.

Bridging batteries should be limited when the maximum discharge current will exceed the power capability of the connector as detailed in the specifications. Multiple take offs can be used and bridged to increase the discharge capability and reduce voltage drop. Take offs should be the exact length and cross-sectional area to allow the battery module to discharge evenly and reduce circulating currents.

When using linking cables, the main output cables should be placed at opposite ends of the battery bank ensuring the modules charge / discharge evenly across the bank, and reduce the risk of circulating currents between modules.

Cable sizes should be maximised 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.

EARTHING

When case earthing is required, the supplied M6 screw can be used to fix an appropriately lugged bonding cable to the battery module or modules.

COMMISSIONING AND INSTALLATION

Upon commissioning of the battery module, the following guide can be printed and checked off:

- Ensure the battery module circuit breaker/s are in the off position.
- Install batteries to final location ensuring all requirements in this manual and local government requirements are followed.
- Install linking cables between battery modules ensuring correct colour and polarity is maintained.
- Install main output cables from battery modules to a final battery bank main circuit breaker, before connecting to the power conversion equipment.
- 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 breaker on 1 x battery module only and test correct polarity on power conversion equipment.
- Engage the battery circuit breaker on the remaining battery modules.
- 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.

SWITCHING ARRANGEMENTS

Pre charge circuit breakers shall be used with large power inverters. Damage to the battery module can occur when energising power conversion equipment incorrectly. Upon energising a power system, the large bank of capacitors in the power conversion equipment draws excessive current for a short amount of time. This can cause an inductive spike which will trip the battery management system, battery breaker and can permanently damage the battery module.

It is important to have the correct switching procedure labelled on site and have trained professionals carry out switching.

MAINTENANCE

The battery module is deigned to be maintenance free ensuring maximum reliability and trouble-free operation. The below items can be checked as part of a regular maintenance program regardless:

- Check for signs of water or condensation around the battery module.
- Check for signs of vermin.
- Remove excessive dust build up.
- Check the operation of circuit breakers.
- Check connectors are seated properly and there are no signs of hot joints.
- Check for splitting and tearing of cabling.

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.

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

A suitable recycling facility should be used if disposal of the battery module is required.

WARRANTY

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

BATTERYWORKS

Available through Battery Works Australia.

www.battery.com.au

Brisbane

186 Kerry Rd,
Archerfield Queensland 4108

+61 7 3266 6122

Sydney

U9/49-63 Victoria St
Smithfield, New South Wales 2164

+61 2 8107 3915

Perth

26 Mordaunt Cct
Canning Vale, Western Australia 6155

+61 8 6183 7796

PRODUCT MANUAL

HIGH POWER 120V LFP BATTERY MODULE

MPS
MICTRONIX POWER SYSTEMS

AUSTRALIAN MADE AND OWNED