Product Manual

Scalable Energy Storage Solutions

Lithium Ferro Phosphate (LFP) Battery Module

48V 2kWh and 3kWh 2RU Scalable Energy Solutions

Model Numbers GC48V-040LFP-2RU and GC48V-060LFP-2RU Series III

with or without rack tray kit

1 Introduction

Thank you for purchasing this LFP Battery Module. It has been designed and manufactured to provide many years of trouble free service.

Please read this manual prior to installing any of the LFP Battery Module models. This product manual covers the following battery module models:

- GC48V-040LFP-2RU (48Volt, 2kWh, 40Ah, 2 Rack Unit high) Series III
- GC48V-060LFP-2RU (48Volt, 3kWh, 60Ah, 2 Rack Unit high) Series III

This manual provides important information that must be followed during installation, commissioning and maintenance of the Battery Modules. Failure to follow these instructions may lead to you damaging the system it is being installed into and/or voiding your warranty. There are important safety and handling procedures that must be followed for your own safety and the safety of those around you.

This manual also contains information for customer support and factory service if it is required.

2 General Information

2.1 Life Support Policy

We do not recommend the use of any of our products in 'life support' applications where failure or malfunction of the product can be reasonably expected to cause failure of the life support device or to significantly affect its safety or effectiveness.

2.2 genZ Energy Pty Ltd

3 Safety Guidelines

Weight

These Battery Modules are heavy. Any time the Battery Module has to be handled be sure to use, enough personnel, strong supports and suitable lifting equipment.

Risk of Electric Shock

Hazardous voltages maybe present on parts inside this module. Do not attempt to open or disassemble the module. These Battery Modules contain no user serviceable parts.

Stored Energy

These Battery Modules can, especially if they are connected in parallel, produce high currents.

Qualified Service Personnel Only

Repairs and Battery replacement must be performed by qualified service personnel only.

Safety Data Sheet (SDS)

Refer to the SDS that was supplied with this module in case of an accident.

4 Specifications

NOTE: All Specifications shown are for an ambient temperature of 25C (77F) and charge / discharge rates of 0.5C unless otherwise stated.

Model	GC48V-040LFP-2RU Series III	GC48V-060LFP-2RU Series III
Nominal Voltage	Direct Current (DC) 51.2V (48V)	
Nominal Capacity	38.4Ah/2kWh	57.6Ah/3kWh
Nominal Current	19.2 Amps	28.8 Amps
Maximum Current	60 Amps (limited by circuit breaker)	
Maximum DC Power	1966 Watts	2949 Watts
Minimum Charge Current	0.38 Amps	0.58 Amps
Maximum Charge Current	19.2 Amps	28.8 Amps
Charge/Discharge cycles to specified Depth of Discharge (DoD) Capacity retention >80%	10,000 @ 80% DoD 5000 @ 90% DoD (2500@100% DoD and 1C)	
Operating Temperature Limits	Charge 0° to 55°C Discharge -20° to 60°C	
Operating Humidity (non-condensing)	85%	
IP Rating	IP50	
Battery Case Dimensions (mm)	450D x 420W x 88H	570D x 420W x 88H
Battery Tray Dimensions (mm)	450D x 483W	570D x 483W
Tray Slide Range (mm)	480 to 760	590 to 880
Terminal Connection	Genuine Anderson SB50 BLUE	
Weight Module	25.8kg	35kg
Weight Tray	Approximately 4.2kg	
[1] BMS Over Volt cut off	Approximately 58.4V	
BMS Under Volt cut off	40V	
BMS Short Circuit cut off	200 ± 30A (20mS Trip)	
BMS Over Temp cut off	65°C	
Charge time Approx.	2 hours at 19.2 A	2 hours at 28.8 A
Self-Discharge	14% per annum	
Round Trip charge/discharge efficiency	>= 96%	
Circuit Breaker Compliance	Double Pole, non-polarised, 60A IEC 60947-2	
UN Type Number (Module chemistry)	UN 3480	
Lithium Composition	As Lithium Ferro Phosphate, $LiFePO_4$ or LFP	
Decisive Voltage Classification (DVC)	Class A	
Casing /Coating	Steel / Satin white industrial coating	
Certifications	See genz.com.au for details	

[1] The over voltage cut-out may vary from that stated. This is due to the fact that the BMS protects the internal cell string voltages ahead of overall pack voltage.

5 Module Overview

5.1 Battery Management System (BMS)

This battery module is fitted (contained inside the battery module case) with a sophisticated BMS. The BMS is designed to provide user safety and protect the battery cells from:

- Over voltage charging.
- Under voltage discharging.
- Operation above a maximum temperature.
- Short circuit protection. This is in addition to the protection provided by the circuit breaker.

Should the BMS activate to protect the module, the BMS will automatically reset once a normal operational condition is detected by the BMS.

5.2 Power In/Out J1

The “POWER IN/OUT J1” connector is a standard Anderson SB50 (Blue) connector. The upper pin is positive and the lower pin is negative.

5.3 Earth Point

Connects the chassis of the battery module to ground. Another earth stud is located at the rear of the battery module.

NOTE: Neither the positive or negative terminal of this module is connected to the earth point. DC from the battery module is floating.

5.4 Dual Pole 60Amp Circuit Breaker

This is the ON/OFF control for the battery module. Turning the “BATTERY CIRCUIT BREAKER” ON (up is ON) will energise the “POWER IN/OUT J1” connector. It will also activate the power “ON” indicating Light Emitting Diode (LED).

The “BATTERY CIRCUIT BREAKER” will trip in the event of a DC overcurrent condition.

NOTE: Before installing, ensure that the circuit breaker is in the down “OFF” position.

5.5 Front Panel Knurled Knobs

Knurled knobs are provided to assist in withdrawing the battery module from the battery shelf.

6 Installation

Failure to follow these guidelines will void the limited warranty and cause potential damage to property or serious injury.

6.1 Receiving Information

Once you receive the product it should be visually inspected for damage that may have occurred during shipping. Immediately notify the carrier and place of purchase if any damage is observed. The packing materials that the product was shipped with has been designed to minimize any shipping damage. In the unlikely event that the product needs to be returned to the manufacturer, use the original packing material. Since the manufacturer is not responsible for shipping damage incurred when the product is returned, the original packing material is inexpensive insurance.

6.2 Installation Placement

The Battery Module must be installed such that it is not exposed to:

- Sources of heat or where the ambient temperature is expected to regularly exceed 55°C.
- Extreme cold where the ambient temperature is expected to regularly fall below -10°C.
- Direct sunlight.
- Rain, water, salt laden air or where the humidity is likely to cause condensation.
- A corrosive atmosphere.

Select a location, which will provide good air circulation for the Battery Module at all times. Route cables so they cannot be walked on or damaged.

Refer to the specifications for specific operating parameters.

6.3 Installation of Battery Module(s)

Be sure to read the installation placement and associated cautions before installing the Battery Module. Place the Battery Module in the final desired location and complete the rest of the installation procedure.

These battery modules can be used in any orientation provided consideration is given to protecting the circuit breaker, connector and indicator lamp from damage.

6.4 Charger

A charger specifically designed for charging LFP's must be used or the use of a charger that has configurable/programmable charging characteristics such that it meets the required profiles as detailed in this manual. If in doubt, please contact the provider of this battery module or contact genZ technical department for further guidance.

6.5 Installation of a single Battery Module

Ensure that the following is considered prior to installing:

- Use only genuine Anderson SB50 connectors.
- Use the matching colour of Anderson SB50 connector as these connectors are keyed and (for Example) only a blue Anderson will connect with a blue Anderson.
- That the polarity of the connector is observed. + and – symbols are clearly marked on both the connectors and the front panel of the module.
- The correct size of cable to the battery connector is used.

6.6 Parallel Connection

In addition to the guidelines for a single module, when connecting in parallel, the following additional considerations apply:

- As the connection of these modules in parallel can result in high currents and stored energy, the design of such a system should be made by a suitably qualified engineer.
- All battery modules should be charged prior to installation as the modules may have different states/levels of charge. Refer to the “Operation” section of this manual for charging guidelines.
- Do NOT install a fully discharged battery module into a fully charged bank of batteries.
- Do NOT install a fully charged battery module into a fully discharged bank of batteries.
- Do NOT mix these battery modules with other battery chemistry types without prior engineered testing.
- Do NOT mix these battery modules with LFP batteries from other manufacturers.

6.7 Series Connection

These battery modules are **NOT** designed for connecting in series. Connecting in series will void your warranty as well as potentially creating a hazardous situation.

6.8 Rackmount Configuration

NOTE: Any reference to racks and cabinets made in this document are outside the scope of the genZ rack mount battery module product certifications.
Please refer to the genZ LFP Battery Module Installation Guide for rack mounting options

6.9 Connecting the Battery Module

(QUALIFIED SERVICE PERSONNEL ONLY!)

- Ensure that the battery module circuit breaker is in the OFF (lever down) position.
- This should also be confirmed by seeing that the green LED is OFF.
- Attach an earth wire (if required in your design) to the earth point, located just below connector J1. An alternate earth point is also located on the rear of the module.
- Inspect for any damage to cables or connectors.
- Connect the Power In/Out J1 connector by firmly pushing the plug straight into the socket.

7 Operation

7.1 To Turn the Battery Module ON and OFF

To turn the battery module on, move the circuit breaker 'up'. This will energise the POWER IN/OUT J1 connector. It will also activate the green LED on the front panel.

To turn the battery module off, move the circuit breaker 'down'. This will de-energise the POWER IN/OUT J1 connector. It will also de-activate the green LED on the front panel.

If the green LED does not illuminate when the circuit breaker is in the 'ON' position, go to the trouble shooting section of this manual.

7.2 Power in/out J1

The DC power to the J1 connector is floating. Neither the positive nor the negative is connected to the modules chassis. DC from the battery module is floating.

When the circuit breaker is in the OFF position, as the circuit breaker is dual pole, both the positive and negative is isolated from the battery pack inside the module casing

7.3 Charging the Battery Module

These battery modules should only be charged by an approved charger that is designed to charge LFP chemistry, at the correct voltage, current and charge profile.

The charging profile described below is designed to achieve **maximum number of cycles/life** of the battery module.

7.3.1 Operating temperature

An ambient temperature of 23 to 27 Celsius is the ideal temperature for the operation of the battery. Operating outside of these temperatures will affect cycle life, capacity and possibly the warranty.

7.3.2 Charging current

Commence a charge cycle where the current is limited (Constant Current or CC) at 0.5C

- 19.2 Amps (for model GC48V-040LFP-2RU)
- 28.8 Amps (for model GC48V-060LFP-2RU)

7.3.3 Balance voltage

- Applicable to all models of 48V modules

Charge the battery module at a Constant Current until the module voltage reaches 57.6 Volts.

Continue charging at a constant voltage of 57.6 Volts for two (2) hours. This will then allow the cells to 'balance' their terminal voltage.

After two hours, the charging voltage can be removed as the module should now be fully charged.

At the completion of the above charge profile, the battery can either be stored or placed on a float charge.

7.3.4 Float voltage

If the battery module is to be placed on a float charge, maintain a voltage between 55.2 and 56 Volts.

For systems (such as uninterruptable power supplies) that will see the batteries floated for extended periods of time, the batteries should be cycled (at least to DoD 10%) and then charged as a minimum annually. For best performance a six monthly test is highly recommended.

7.4 Discharging the Battery Module

The discharge characteristics described below are to achieve maximum number of cycles/life of the battery module.

7.4.1 Battery module discharge current (0.5C)

- 19.2 Amps (for model GC48V-040LFP-2RU)
- 28.8 Amps (for model GC48V-060LFP-2RU)

It should be noted that the modules can both deliver up to 60Amps (1C) if required

7.4.2 When to charge a discharged module

While the battery module is protected by the BMS to prevent excessive battery module discharge, it is recommended to recharge the battery module as soon as practical following a discharge event.

7.5 Storage

The battery module should be stored, fully charged in an area that is protected from the elements and at an ideal temperature of 20C and low humidity. It should be stored in its original packing.

At least annually, the battery should be charged in accordance with Section 7.3 of this manual

If storing a battery for an extended period of time, reference should be made to the “Self Discharge” characteristics as indicated in the table of specifications.

It should also be noted that, a battery module that has been stored for an extended period of time may exhibit a loss of capacity when it is first placed into service. This ‘loss of capacity’ can normally be corrected by cycling the battery at least three times.

8 Maintenance

Unlike Lead Acid batteries, genZ Lithium Ferro Phosphate (LFP) battery modules are virtually maintenance free. There is no requirement to check fluid levels or salt deposit build up on battery terminals.

It should be noted that it is outside of the scope of this manual to cover the variety of different systems and locations that the battery module(s) may be used in. Users of the battery module(s) should ensure that the overall system provider/designer provides a maintenance guide and suggested maintenance interval.

The following activities are recommended for the life of the system to maximise system longevity and reliability. It should be noted that the recommended frequency for maintenance may need to be reviewed depending on the demands placed on the battery modules or the environment that they are located in.

8.1 Monthly Inspection (suggested, not mandatory)

- If the battery module forms part of a battery system or bank, check the modules to see if:
  - The circuit breakers are in their desired configuration
  - The state of the green LED on the front panel corresponds to the circuit breaker configuration
  - Ventilation and/or air-conditioning (where fitted to a room or rack) is functioning correctly to maintain the proper temperature of the battery bank. In particular the state of any filters that may become clogged due to air quality
- Inspect the Battery Module for signs of:
  - Mechanical damage
  - Damage to the connecting DC cables or Anderson connectors
  - Exposure to water, excessive condensation, chemical deposits, dust or other foreign substances that may affect the operation of the battery module(s)
  - Rodent, insect or other animal activity. This type of activity is often best detected by looking for droppings, an unusual odour such as that of urine, gnawed cables and fittings, nests, noises or mounds of sand or other foreign materials

8.2 Annual Inspection (suggested, not mandatory)

In addition to the monthly inspection:

- If the battery module forms part of a battery system or bank, check the modules to see if:
  - DC cables, busbars (where fitted), fuses (where fitted) and any other components that form part of the overall DC battery circuit are inspected for damage or signs of heat stress
  - If the battery module(s) are housed in a cabinet, the cabinet should be inspected according to the manufacturers/installers instructions. The frequency of the inspection maybe more or less than 6 months.
- If the battery module(s) are being stored (for example as spares), they should be charged according to section 7

Trouble shooting

SYMPTOM / FAULT	POSSIBLE CAUSE	POSSIBLE SOLUTION
NO OUTPUT VOLTAGE AT IN/OUT J1 POWER CONNECTOR	CIRCUIT BREAKER TURNED OFF/TRIPPED	TURN ON THE CIRCUIT BREAKER
	BMS UNDER VOLTAGE, IN PROTECTION MODE, OUTPUT OFF	RECHARGE THE BATTERY AND RECHECK FOR CORRECT OUTPUT VOLTAGE
	BMS OVERCURRENT, IN PROTECTION MODE, OUTPUT OFF	CHECK FOR SHORT CIRCUITS OR EXCESSIVE CURRENT DRAW
	BMS OVER VOLTAGE, IN PROTECTION MODE, OUTPUT OFF	CHECK FOR CHARGING CIRCUIT SUPPLYING EXCESSIVE CHARGE VOLTAGE
	BMS OVER TEMPERATURE, IN PROTECTION MODE, OUTPUT OFF	CHECK AND INVESTIGATE REASON FOR HIGH TEMPERATURE
	OTHER	RETURN TO GENZ FOR SERVICE
GREEN LED NOT ILLUMINATING WHEN CIRCUIT BREAKER ON	BMS UNDER VOLTAGE, IN PROTECTION MODE, OUTPUT OFF	RECHARGE THE BATTERY AND RECHECK FOR CORRECT OUTPUT VOLTAGE
	BMS OVERCURRENT, IN PROTECTION MODE, OUTPUT OFF	CHECK FOR SHORT CIRCUITS OR EXCESSIVE CURRENT DRAW
	BMS OVER VOLTAGE, IN PROTECTION MODE, OUTPUT OFF	CHECK FOR CHARGING CIRCUIT SUPPLYING EXCESSIVE CHARGE VOLTAGE
	BMS OVER TEMPERATURE, IN PROTECTION MODE, OUTPUT OFF	CHECK AND INVESTIGATE REASON FOR HIGH TEMPERATURE
	BATTERY VOLTAGE TOO LOW	RECHARGE THE BATTERY MODULE
	OTHER	RETURN TO GENZ FOR SERVICE

SYMPTOM / FAULT	POSSIBLE CAUSE	POSSIBLE SOLUTION
CIRCUIT BREAKER TRIPS	EXCESSIVE DISCHARGE CURRENT	USING A CLAMP METER, CHECK THAT THE CURRENT BEING DRAWN FROM THE BATTERY MODULE IS LESS THAN 60AMPS. REFER TO INFORMATION/WARNING REGARDING STATE OF CHARGE
	EXCESSIVE CHARGE CURRENT	USING A CLAMP METER, CHECK THAT THE CURRENT BEING SUPPLIED TO THE BATTERY MODULE IS LESS THAN 60AMPS. REFER TO INFORMATION/WARNING REGARDING STATE OF CHARGE
	OTHER	RETURN TO GENZ FOR SERVICE
BATTERY MODULE FAILING TO CHARGE OR HOLD CHARGE	INSUFFICENT CHARGE VOLTAGE/CURRENT	CHECK FOR FAULTY CHARGER, POOR CABLING OR LOOSE CONNECTORS
	SOLAR OR OTHER CHARGER NOT CONFIGURED CORRECTLY	REFER TO THE MANUFACTURER OR THE SOLAR OR MAINS CHARGER
	BATTERY CHARGER MAY WELL BE FAILING TO START A CHARGE CYCLE. THIS MAY OCCUR WITH SOME SMART CHARGERS THAT REQUIRE SEEING AT LEAST SOME VOLTAGE FROM A BATTERY	CHECK WITH CHARGER MANUFACTURER OR SUBSTITUTE THE CHARGER FOR A DIFFERENT TYPE OR USE A DC POWER SUPPLY SET TO THE CORRECT CHARGE VOLTAGE AND CURRENT
	OTHER	RETURN TO GENZ FOR SERVICE

9 Warranty & Service Information

9.1 General Information

Refer to the genZ website at www.genz.com.au for full details of the warranty on this product.

To ensure that you are covered by our 10 Year Limited Warranty, the purchaser shall follow the below requirements:

- The battery module(s) have been purchased from genZ Energy, an authorised distributor, dealer or reseller
- Overall system design shall be by a suitably qualified professional
- Installation and commissioning by a licenced, accredited (for example, through the Clean Energy Council) installer
- Installation in accordance with the genZ installation manual and this product manual
- Overall system is maintained in accordance with instructions and manuals associated with not only the battery module(s), but, any chargers, inverters or any other equipment used in the overall system
- The overall system has been configured such that charging and discharging requirements (as detailed in this manual) are met
- The person or persons installing these battery module(s) has provided all necessary information concerning the operation and maintenance of the battery module(s) and associated system to the end user.

9.2 Registration

It is important that you maintain a record of your purchase details relating to the battery. Details such as, the model number, serial number of the battery module(s), place of purchase and/or who installed it.

9.3 Before Calling for Service

Verify that the charger and load are operating correctly. Refer to the “Trouble Shooting” section of this manual.

If you believe that the battery module is not delivering it’s rated *capacity (refer to Section 4, Specifications) the battery module may be considered faulty if it fails to deliver less than 70% of it’s rated capacity during the warranty period.

*Note: Some chargers/inverters display the capacity of a battery module or the battery system. These calculated values can be inaccurate for a number of technical reasons and as such should not be relied on.

To determine the battery capacity, the below process should be conducted by a suitably qualified professional:

- Fully discharge the battery at 0.5C until the low voltage cut-off is reached
- Fully charge the battery at the recommended voltage and 0.5C rate for 24 consecutive hours
- Fully discharge the battery at a constant 0.5C until the low voltage cut-off is reached. Perform this at an ambient temperature between 23°C and 27°C. Record the number of hours it takes to reach low voltage cut-off point.
- Fully charge the battery at the recommended voltage and 0.5C rate for 24 consecutive hours
- The test is now complete

The percentage of rated capacity can now be calculated as:
Percentage of rated capacity (%) = [[(0.5 x C) x hours to discharge] /C] * 100

Where:
C = Rated Capacity (Amp Hours)

Example:
48V 3kWh battery module has a rated capacity of 57.6Ah
0.5C equates to a constant current load of 28.8Amps
The battery is discharged at a constant 28.8Amps until it reaches cut-off, which takes 1.6 hours.
So:
[((0.5 x 57.6) x 1.6) / 57.6] x 100 = 80%

9.4 Warranty or Service

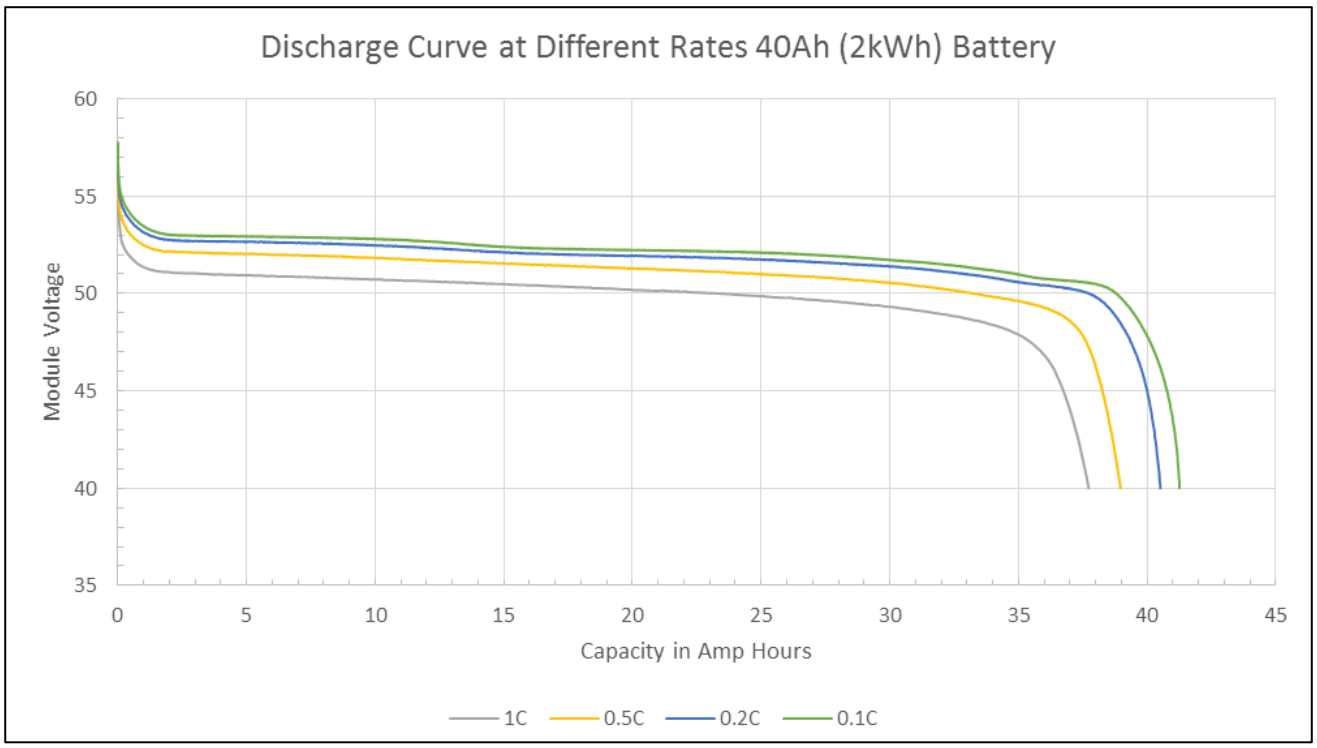
In the unlikely event that you believe the module is faulty, contact the place of purchase or dealer/distributor first. If you cannot reach your dealer, or if they cannot resolve the issue please visit the genZ web site at www.genz.com.au for contact details for technical support.

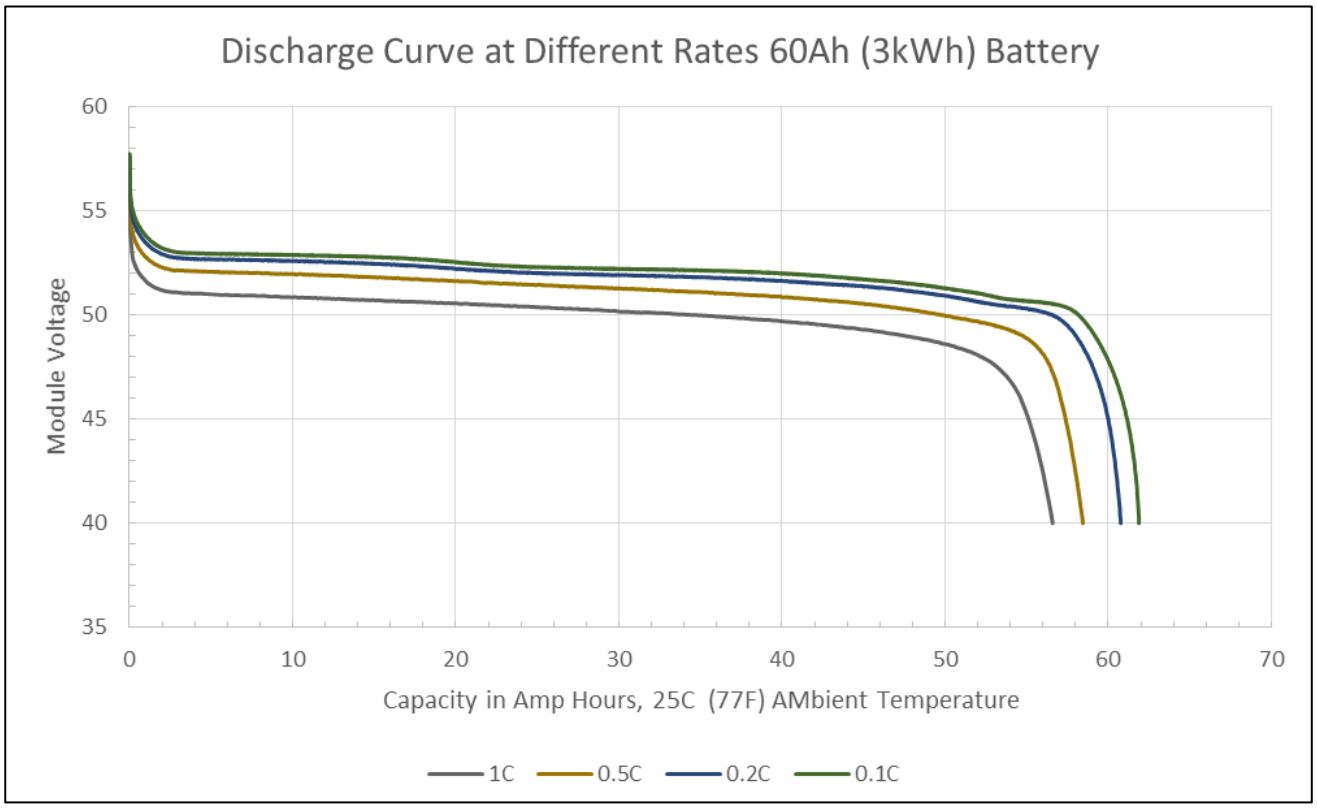
Please ensure that you have the following information available:

a) Where and when the unit was purchased.
b) The model number.
c) Serial number of your module.
d) Information on the nature of the failure.

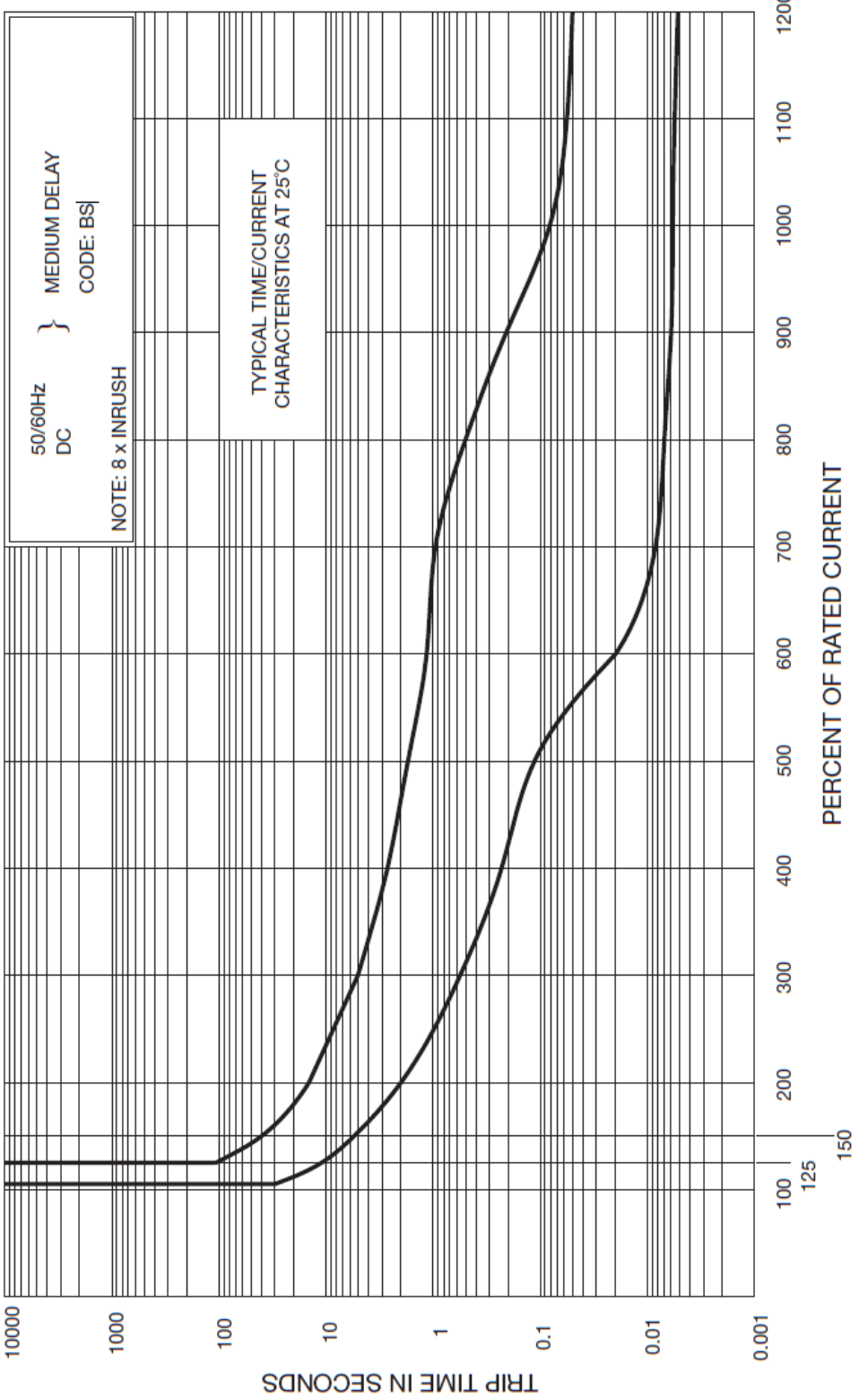
http://www.genz.com.au

10 Appendix A – Discharge and Capacity Curves (25°C)





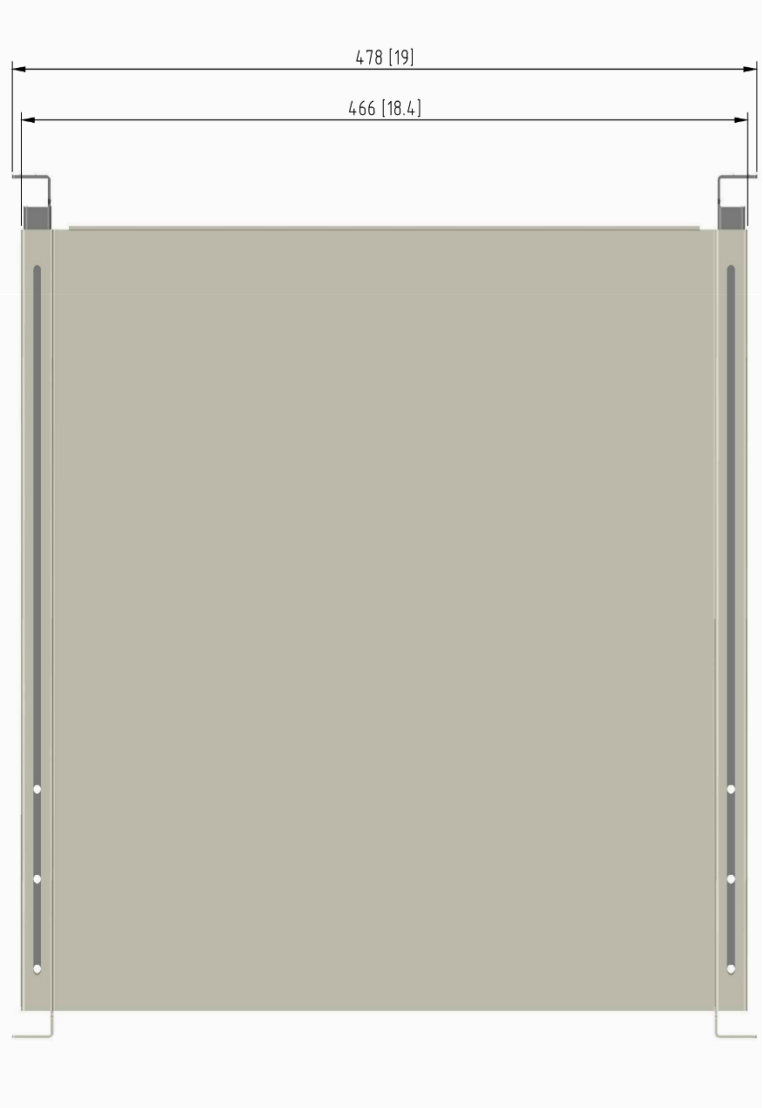
11 Appendix B – Circuit Breaker Trip Curve (BS)

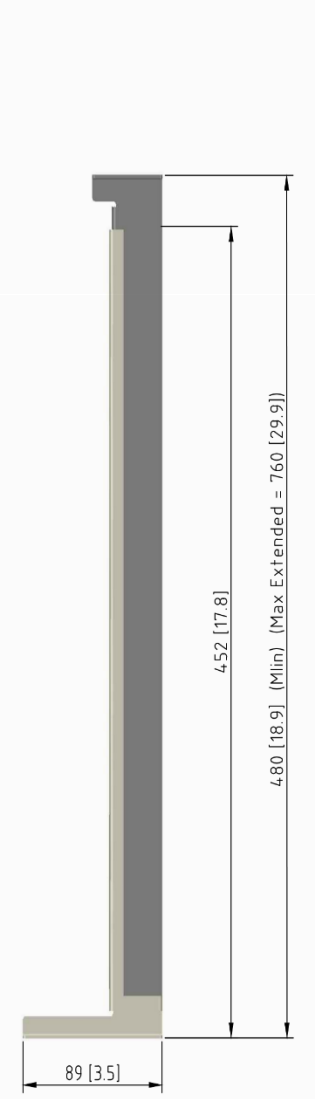


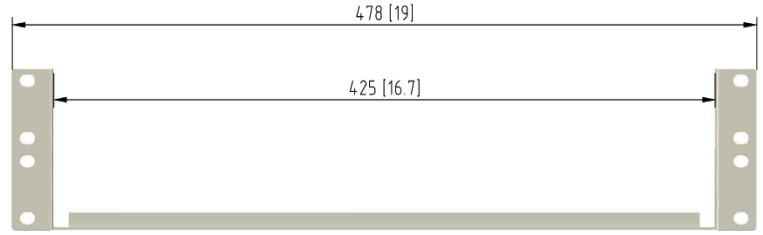
PERCENTAGE OF RATED CURRENT	100%	125%	150%	200%	300%	400%	500%	600%	700%	800%	900%	1000%	1100%	1200%
MINIMUM TRIP TIME IN SECONDS	NO TRIP	12	5.5	2	0.55	0.21	0.12	0.02	0.0085	0.007	0.006	0.006	0.0055	0.005
MAXIMUM TRIP TIME IN SECONDS	NO TRIP	100	40	14	5	2.8	1.8	1.2	0.98	0.5	0.2	0.08	0.058	0.05

12 Appendix C – Dimensions

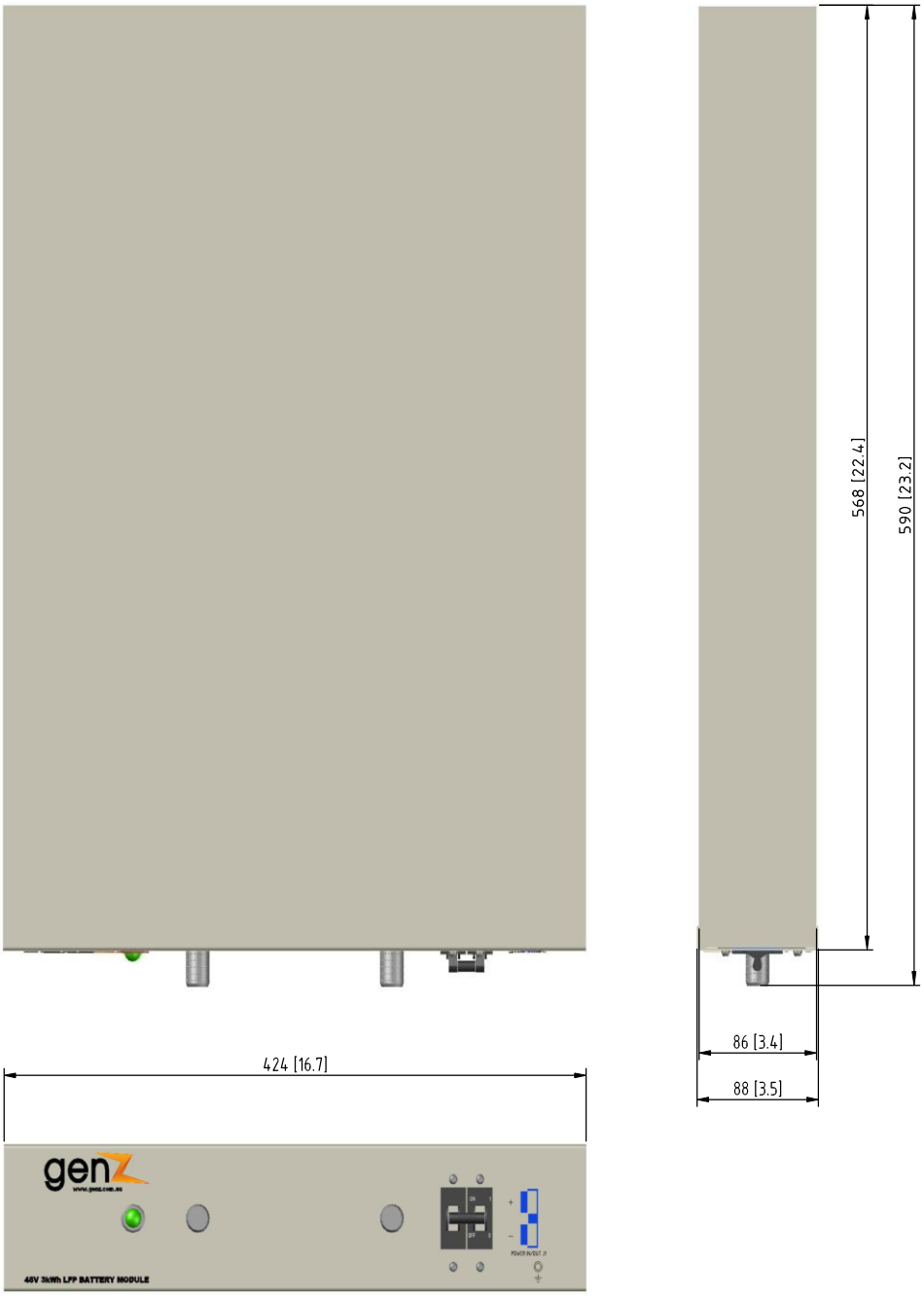
12.1 2kWh Module and Tray

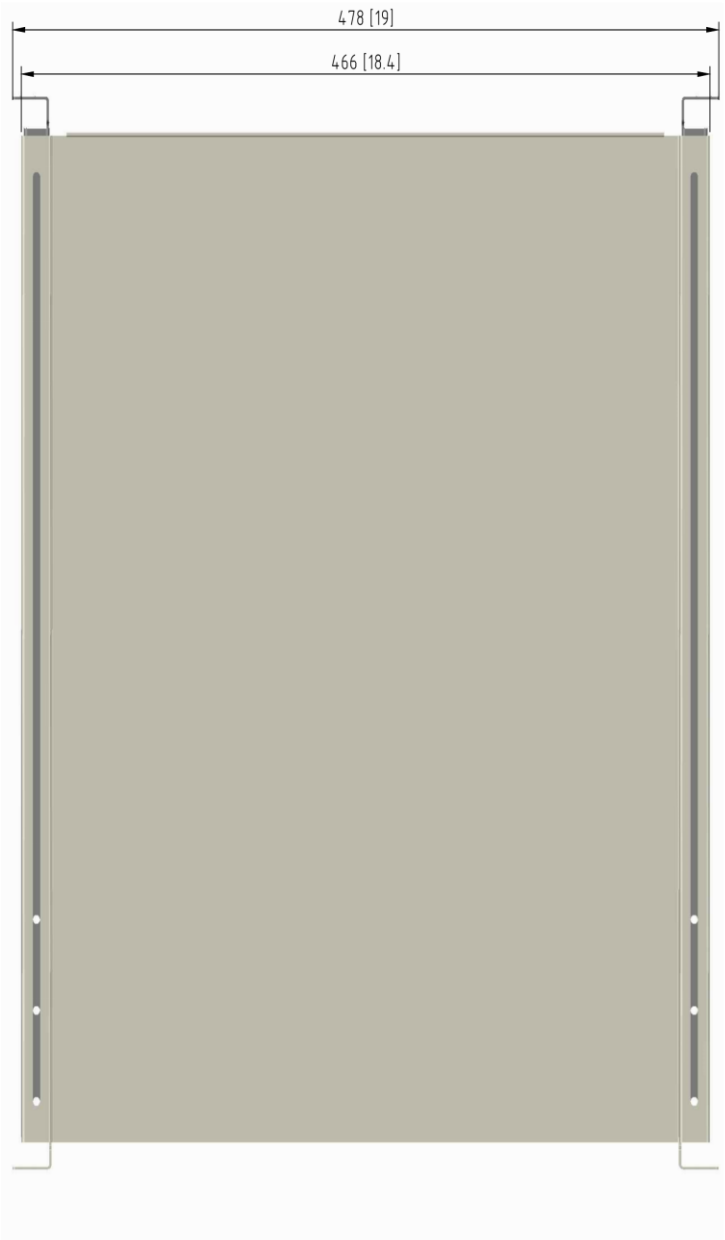






12.2 3kWh Module and Tray





13 Appendix D – Warranted Operating Parameters

Although genZ batteries are capable of performing at high rates and depths of discharge within a very wide temperature range, in order to achieve extended life cycles and to comply with the Warranty, the following operating guidelines should be followed:

Operating Parameters for 10 Year Warranty			
Equivalent to 80% Retained Capacity	10,000 Cycles	5,000 Cycles	2,500 Cycles
Discharge/Charge Rate	0.5 C		
Depth of Discharge (DoD)	80%	90%	100%
Operating Temperature Range (°C)	0 to 27	0 to 40	0 to 40
Programming Settings for Ancillary Equipment			
Low cut off voltage	50.38V	49.73	40.4
Float voltage	55.2V	55.2	56.0

Note: Within the terms of this warranty a cycle is defined as discharging the battery to the specified depth of discharge and then charging it back up to full capacity (at the specified discharge/charge rate).

Notes:

Serial Number:
Model Number:
Place of Purchase:
Date of Purchase:
Owner:

genZ Energy Pty Ltd

Western Australia

Email: info@genz.com.au
Web: www.genz.com.au