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INSTALLATION MANUAL



SS4037-11 Advanced Lithium-Ion battery

SS4037-11 INSTALLATION MANUAL v1.0

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Introduction

This manual is intended to provide assistance to an installer for the installation and commissioning of the range of Solar MD Lithium Ion phosphate (LiFePO₄) energy storage solutions.

Product Description

The SS4037-11 battery solution is available in one standard size and can be paralleled to meet most residential applications. The rated voltage is 51.2V nominal (to suit 48V systems). Larger systems are provided by Solar MD based on specific project requirements.

WARNING: Read the entire document before installing or using the Solar MD battery. Failure to comply with the instructions or warnings in this document could result in electrical shock or serious injury that can result in death or damage to the product that can render the SS4037 Solar MD battery inoperable.

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Product Specifications

All SS4037-11 specifications & descriptions contained in this document are verified to be accurate at the time of printing. Solar MD reserves the right to make any product revisions & improvements at any time.

Errors or Inaccuracies

To communicate any inaccuracies, omissions or to provide general feedback regarding this manual, send an email to info@solarmd.co.za

Copyrights

All information in this document is subject to the copyright of Solar MD (Pty) Ltd. Additional information is available upon request.

Safety Information

This manual contains important instructions and warnings that must be followed when using SS4037-11.

Read all instructions before installing and using the SS4037-11.

⚠ Warnings

- Use SS4037-11 only as instructed.
- For communication and other information please read the BMS manual.
- Do not attempt to disassemble, repair, modify, or tamper with this battery unit.
- Do not insert foreign objects into any part of battery unit.
- Avoid exposure to any moisture.
- Do not expose to extreme temperatures.
- Do not drill any holes into the box.
- Use only an approved Solar MD installer to install this product.

⚠ Cautions

Failure to comply will void the warranty

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Specification

Solar MD 3.7kWh SS4037-11 specification			
Battery type	Lithium Iron Phosphate	Scalability	Yes
Battery module	SS4037-11	Communication	CANBUS 500kpbs/CAN 2.0B
Rated battery capacity	3686 Wh	Can BUS termination	Single 120 Ohm
Output power	Max 5 kW / 100A 1.38C	Canbus id range:	256 - 499
Usable battery energy @ 0.3VC	3.68 kWh	Protection method	Cell level: uv / ov / oc Position: x / y / x Acceleration: x / y / z Temperature: ot / ut
Nominal voltage	51.2V	Protection phy	Mechanical relay NO
Number of battery modules	1 module	Com (CANBUS) isolation	Yes 1.5kV
Weight	37kg	Transportation protection	Yes
Operating voltage	44.8V-55.6Vdc	Indicator	Led, programmable
Communication	CANBUS	Addition IO	3 GPO
Dimensions of SS44037: h/w/d	620mm/320mm /200mm	Cell balancing	Passive balancing
Net Weight of SS4037	35 Kg	Counters	Cycle counters and SoH
Battery cycle life [+25 °C]	> 4000	AUX power output	5V 1A max
Charging efficiency	99%	Storage duration	6 months@+25°C
Operating temperature	-5°C ~+50°C	Safety standards compliance	IEC 62619/UN 38.3/UL1642
Transport	UN3480 & UN38.3	Cell Certificate	TUV / CE / RCM / UL1642

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Mechanical installation

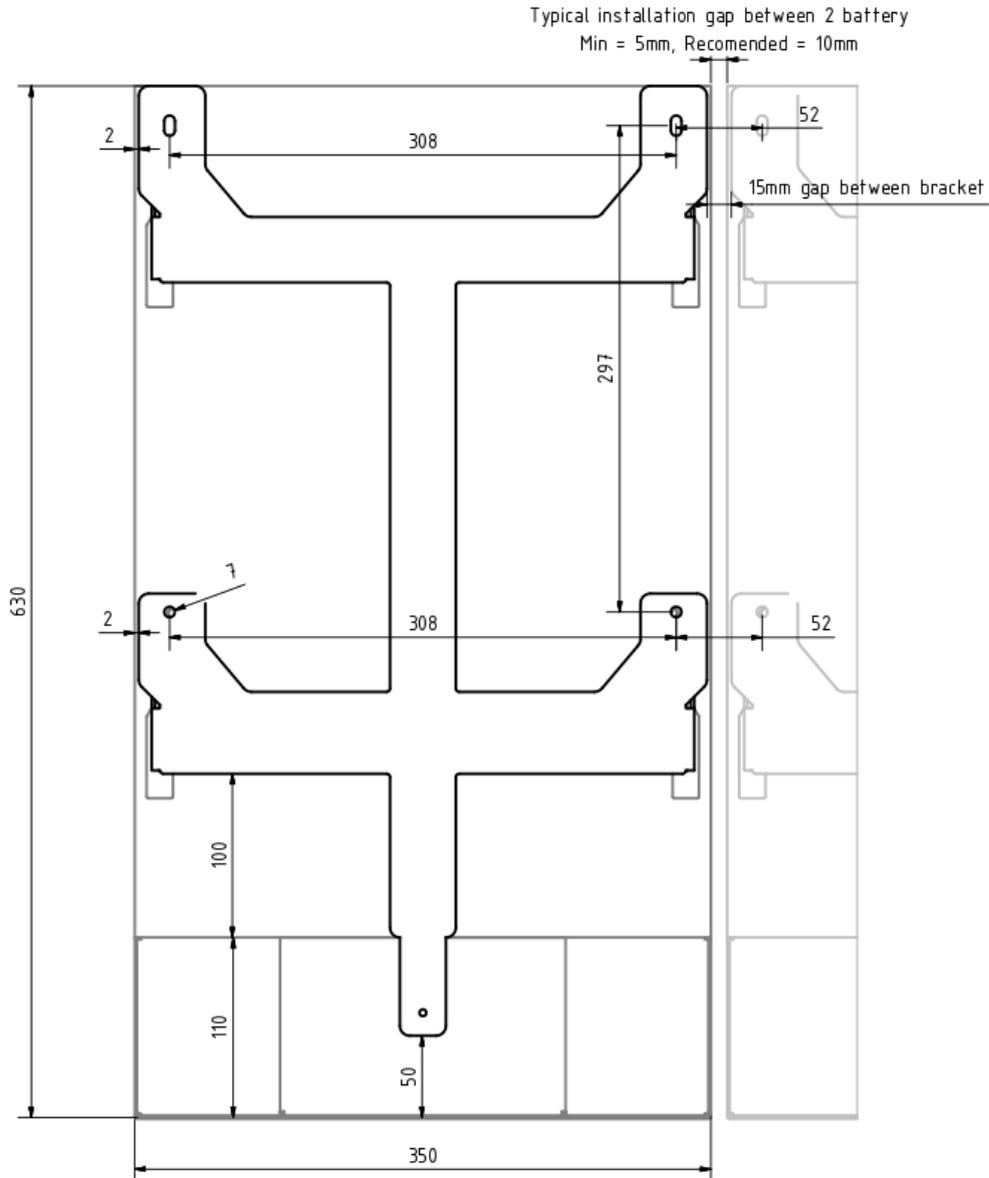


Figure 1: Rear Battery Bracket

Please use the correct mounting screws for the correct wall surface. Screw head should not be bigger than 16mm in diameter. The Battery is only to be installed in the upright position with a maximum tilt angle of 30 degrees.

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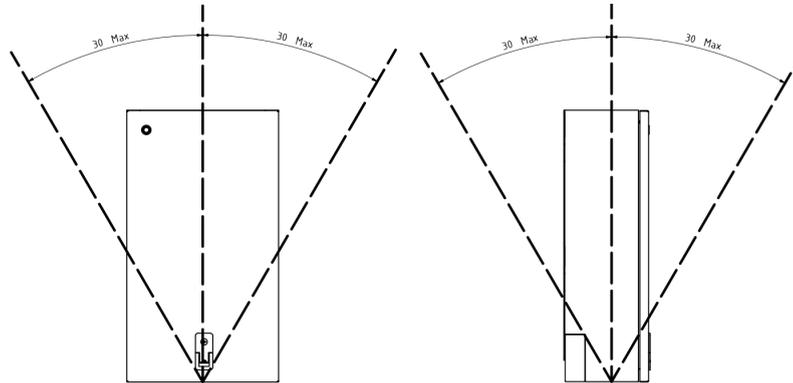


Figure 2: Maximum tilt angle

Installing bottom cover plate

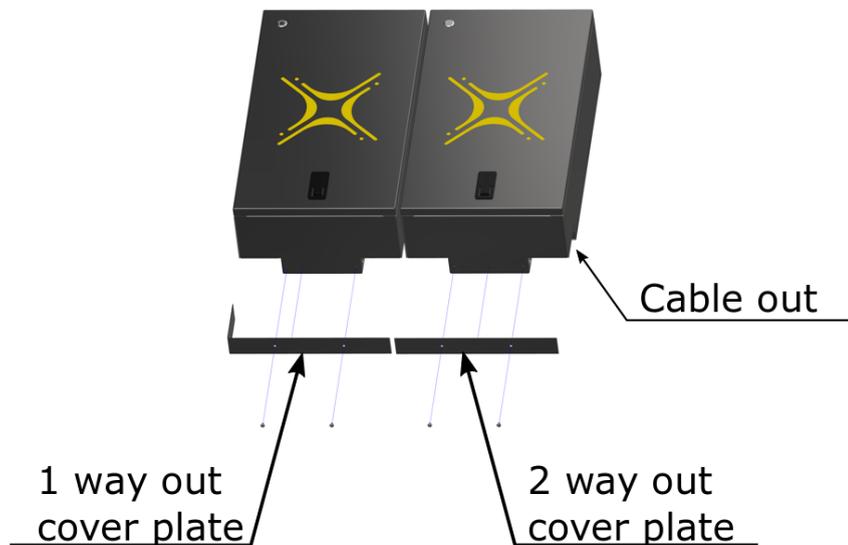


Figure 3: Bottom cover installation for single or dual cable exit points

The Battery comes with two covers for single or dual cable exit points. Use the 1 or 2 way out cover plate and fix it with the two M5x6 bolts provided in the box.

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Electrical installation

Step 1. Before connecting anything be sure that battery is off and the ON/OFF switch (fig4 pos 3) is in the OFF position.

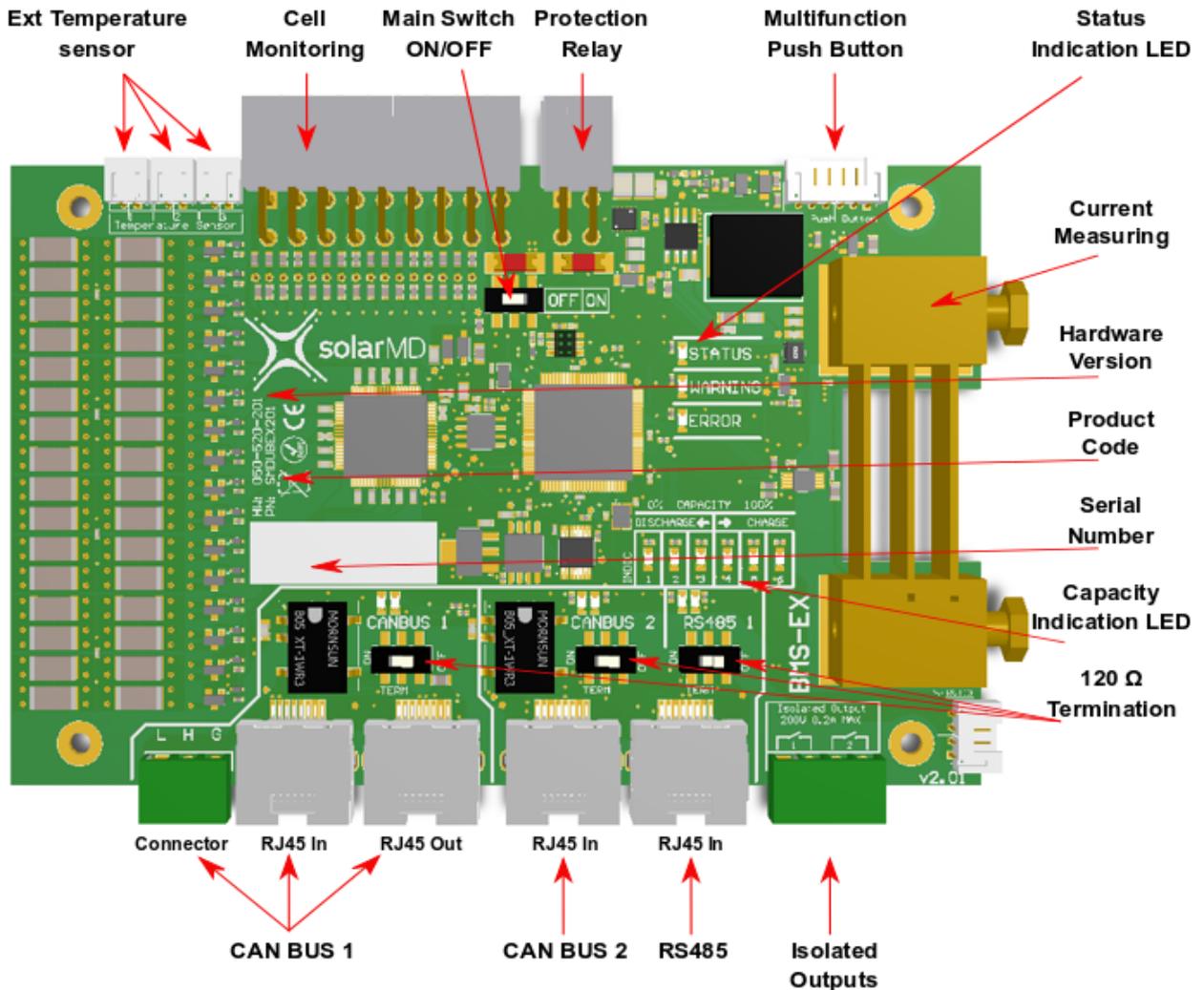


Figure 4: BMS board component location

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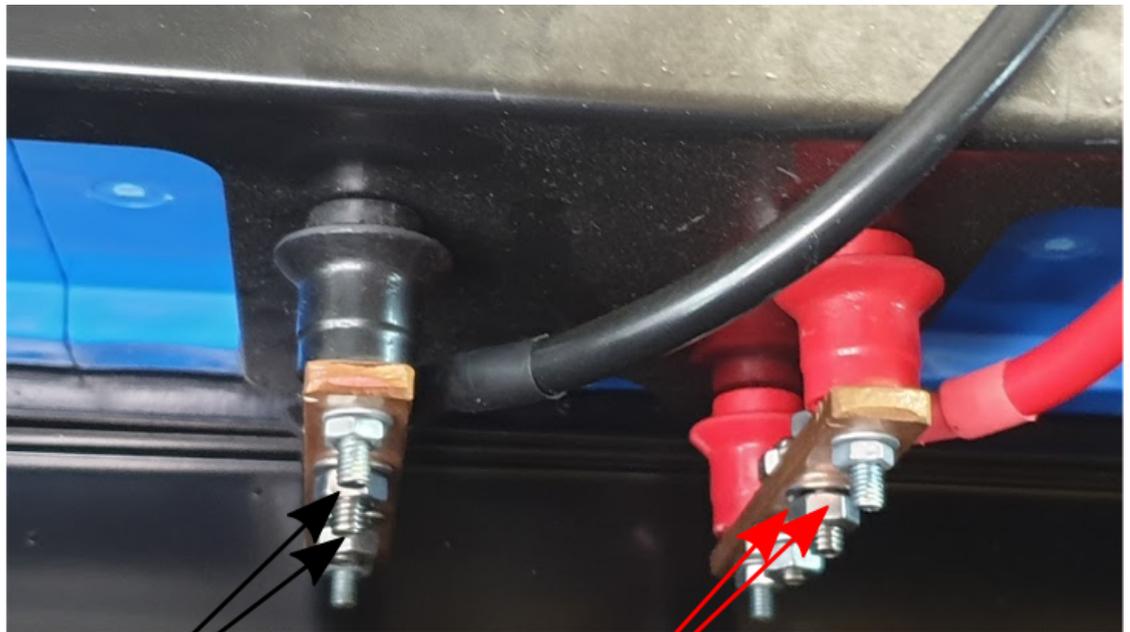


Connecting Inverters/chargers/UPS to the battery unit while it is ON can cause big sparks due to capacitors inside the connected device. This could cause serious injuries.



Connecting main battery terminal must be with the correct size cable.

Based on the rated current of the battery and inverter as well as cable length.



4x Negative
Connection point

4x Positive
Connection point

Figure 5 connection terminal

Step 2. Connect the negative cable to the battery negative busbar and positive to battery positive as shown in figure 5. Make sure that all the connections are tight.

All used connection points should be suitably tightened, ensuring good electrical connection between the lug and busbar. A bad connection could cause serious damage to the battery and inverter, and could void the warranty.

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Commissioning

Step 1. Ensure all DC cables are tight according to specifications.

Step 2. If the battery operates in parallel with other Energy sources, make sure that the difference between battery voltage and DC bus is not more than 2.5V. If greater than 2.5V please Charge or Discharge other source accordingly until voltage difference is in safe ranges under 2.5V.



Caution! A hot connection with difference in voltage can cause very high equalization current which can burn the fuses of the battery!



Caution! Measure the voltage of the battery before connecting the dc Cables.

Step 3. Turn BMS board ON/OFF switch to the ON position (figure 4 pos 3)

Step 4. Connect Multi-purpose button if not connected to the BMS board connector see (figure 4 pos 5)

Step 5. Hold multi-purpose button until light come on.

Note: If commissioning two or more batteries.

Once the system is switched on and load is added, measure current flow on each battery. Ensure that the load is distributed across each battery equally.



Warning! If the battery does not switch the main protection Contact ON in 7 seconds, please check BMS board indication LED for faults. See section BMS Error and Warnings on page 12 of this manual.

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Multicolor multipurpose button

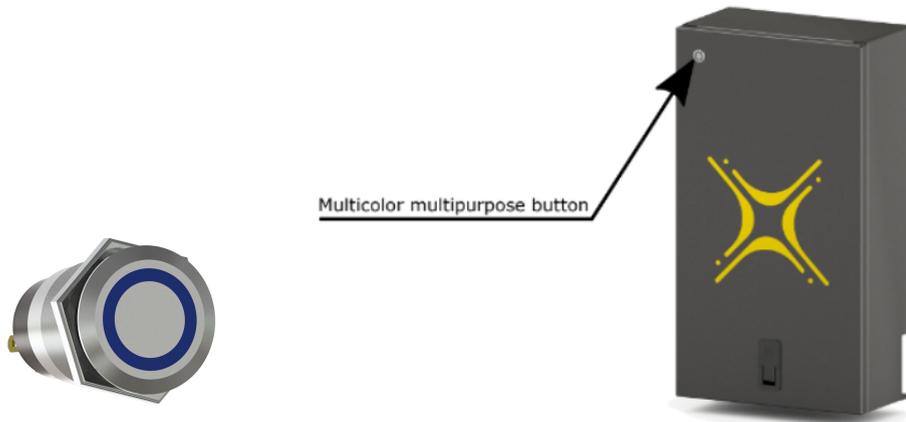


Figure 6: Multicolor / Multipurpose button.

Button function

The new Solar MD Multipurpose button has an extended functionality in combination with the BMS-EX. The Multipurpose Button can be used to directly execute 6 predefined functions and a shutdown instruction. In combination with the 6 Indication LEDs on BMS-EX, the user can choose between each function by holding the button until the LEDs count match the number of the function. By releasing the button while moving through the functions, LEDs will start blinking and wait for the user to press the button again within 3 seconds.

The predefined functions are:

1. Reserved
2. Change indication LED function between: Show Capacity, Show Current, and Off
3. Reserved
4. Wake up if Sleep mode is active.
5. Activate Override Off state for 60sec
6. Activate Override On state for 60sec

If the button is held continuously after function 6, shutdown mode is activated and the battery will send a signal to switch off in 4sec.

Further holding the button causes the BMS to delay complete shutdown for a maximum of 3 minutes. This operation is used when the technician wants to continue read or write parameters after shutdown.

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Button indication

**Access to all features in future development

The Multipurpose button advanced indication functionality, allows the user to choose between 5 different states. Mixed combinations are also allowed when a combination of multiple batteries with BMS-EX are used. The User can change the preferred stage by logging into his mypower24 Energy Portal and go to the Battery Settings.

Illumination off

**For future development

When this state has been selected, the button serves as an on/off switch without illumination (fixed colour).

Color based on capacity

When this state has been selected, the button shows static illumination in a color based on the state of charge. From RED at 0% SoC (State of Charge) to GREEN at 100% state of charge.

Color based on capacity with current direction based on shading.

**For future development

When this state has been selected, the button shows flashing illumination in a color based on the state of charge and flashing code based on the electrical current direction (charge / discharge). From RED at 0% SoC (State of Charge) to GREEN at 100% state of charge. The flashing code for charge goes through illumination interruption for 1 interval and slow illumination into the color based on the SoC for 5 intervals. The flashing code for discharge represents the opposite from charge - study color for 1 interval and slow loss of color following illumination interruption. Solar MD users refer for both as charging / discharging waves.

Fixed color with current direction based in shading

**For future development

When this state has been selected, the button shows illumination in a color based on the user choice and flashing code based on the electrical current direction (charge / discharge). The flashing code for charge goes through illumination interruption for 1 interval and slow illumination for 5 intervals. The flashing code for discharge represents the opposite from charge - study color for 1 interval and slow loss of color following illumination interruption. Solar MD users refer for both as charging / discharging waves.

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BMS Warnings and Errors

Method of displaying general warnings and errors:

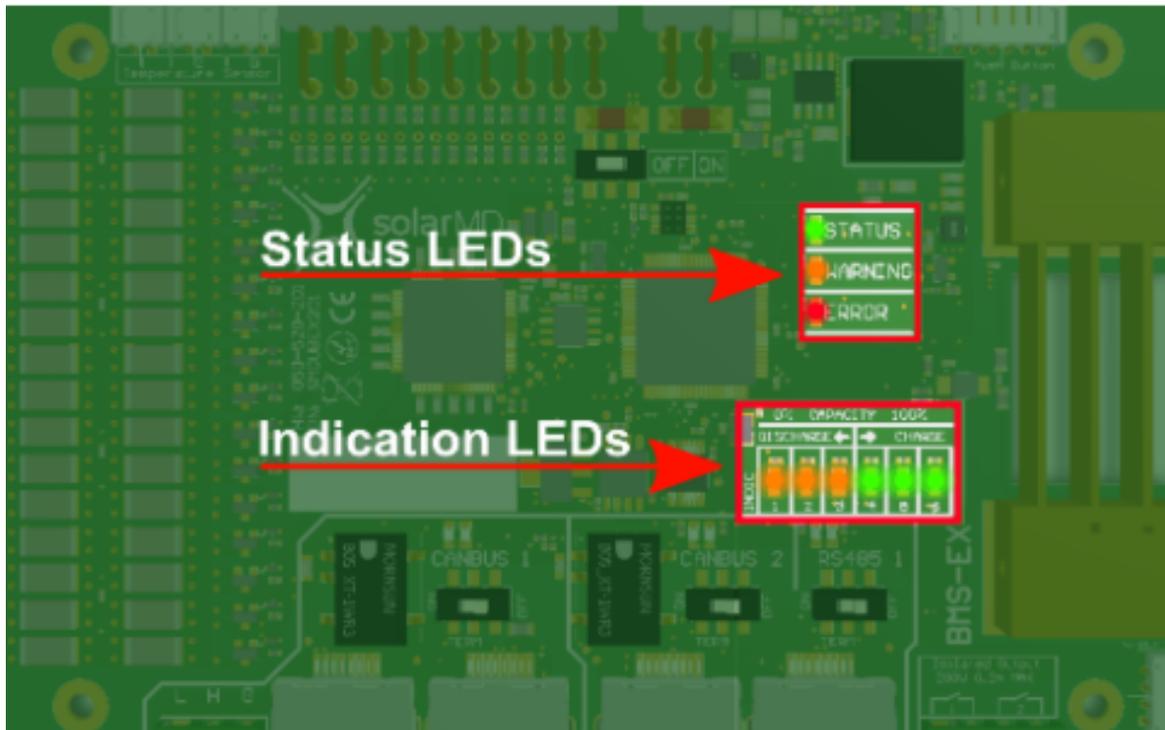


Figure 7: Display general warnings and errors, Main status LEDs and Indication LEDs.

The Status LEDs determine what the indication LEDs will show.

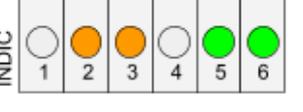
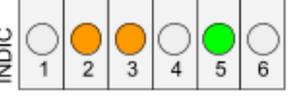
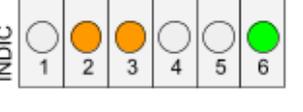
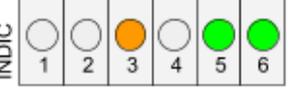
1. If the Status LED is Green the indication LEDs will show:
 - a) Battery capacity
 - b) Current flow and direction
 - c) Off

The functionality of the indication LEDs are configurable, see more on this: multifunction push button.

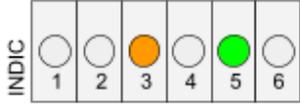
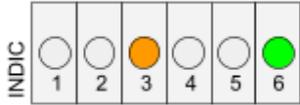
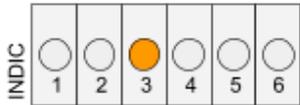
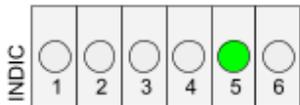
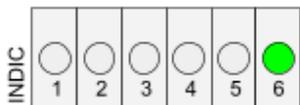
2. If the Warning LED is Orange
 - a) The indication LEDs will show the warning number in binary, which corresponds to that tabulated below in the warning register.
3. If the Error LED is Red
 - a) The indication LEDs will show the error number in binary, which corresponds to that tabulated below in the error register.

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Warning Register

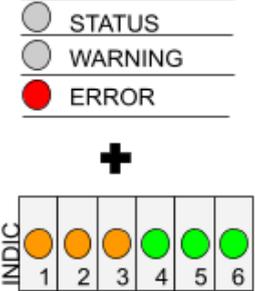
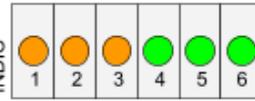
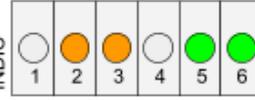
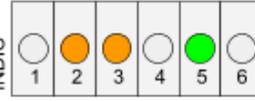
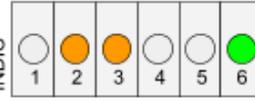
Warning Code	Visual Representation	Description
30	<p>Visual Representation</p> <p>○ STATUS ● WARNING ○ ERROR</p> <p>+</p> <p>INDIC 1 2 3 4 5 6</p> 	Pending Awake High
29	<p>INDIC 1 2 3 4 5 6</p> 	Pending Awake Low
28	<p>INDIC 1 2 3 4 5 6</p> 	Positive fuse blown
27	<p>INDIC 1 2 3 4 5 6</p> 	Negative fuse blown
26	<p>INDIC 1 2 3 4 5 6</p> 	<ul style="list-style-type: none"> • Override ON active
25	<p>INDIC 1 2 3 4 5 6</p> 	<ul style="list-style-type: none"> • Override OFF active
11	<p>INDIC 1 2 3 4 5 6</p> 	Discharge current too high

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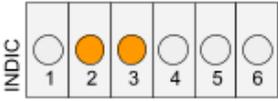
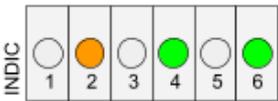
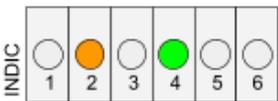
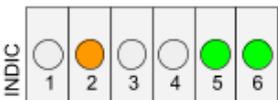
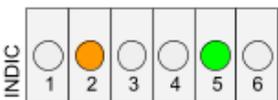
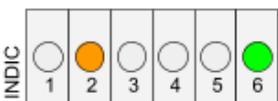
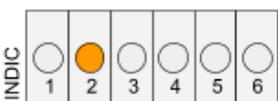
10		Charge current too high
9		Cell temperature too low
8		Cell temperature too high
2		Battery cell voltage too high
1		Battery cell voltage too low

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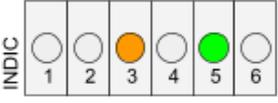
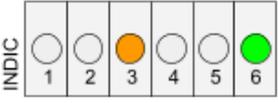
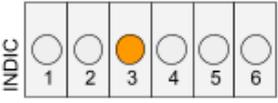
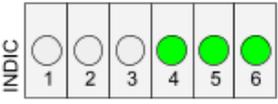
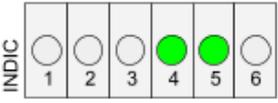
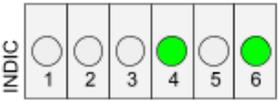
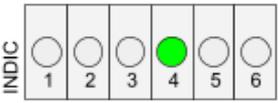
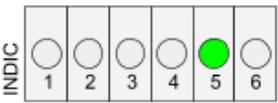
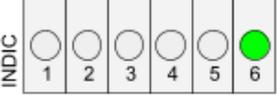
Error Register

Error Code	Visual Representation 	Description
31		Max 14921 not responding (Cell monitoring)
30		Max 14921 thermal shutdown
29		Open cell detected
28		Internal EEPROM error
27		External EEPROM error
26		Balancing error internal FET circuit
25		ADC reference not correct

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24		<ul style="list-style-type: none"> • Override On out of range
23		Internal fault
22		Cell overvoltage
21		<ul style="list-style-type: none"> • Charge Over current
20		Pack overvoltage
19		Pack undervoltage
18		Pack undervoltage
17		Over current charge
16		Over current discharge
15		User shutdown init

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14		Remote shutdown init
10		Relay coil over current
9		Relay fuse blown
8		Relay coil open
7		Gyro Z out of range
6		Gyro Y out of range
5		Gyro X out of range
4		<ul style="list-style-type: none"> Ext NTC 3 fault
3		<ul style="list-style-type: none"> Ext NTC 2 fault
2		<ul style="list-style-type: none"> Ext NTC 1 fault
1		Cell temperature too high

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CANBUS connection.

Bms EX used CAN 2.0B @ 500000 kb. Connecting other device operating at different speed rate is not allowed. For connection please use twisted pair wires in a shielded cable to minimize RF emissions. RJ45 connections can be used for daisy chaining BMS EX together using a straight Ethernet cable. The output of the Bms EX CAN transceiver is galvanically isolated.

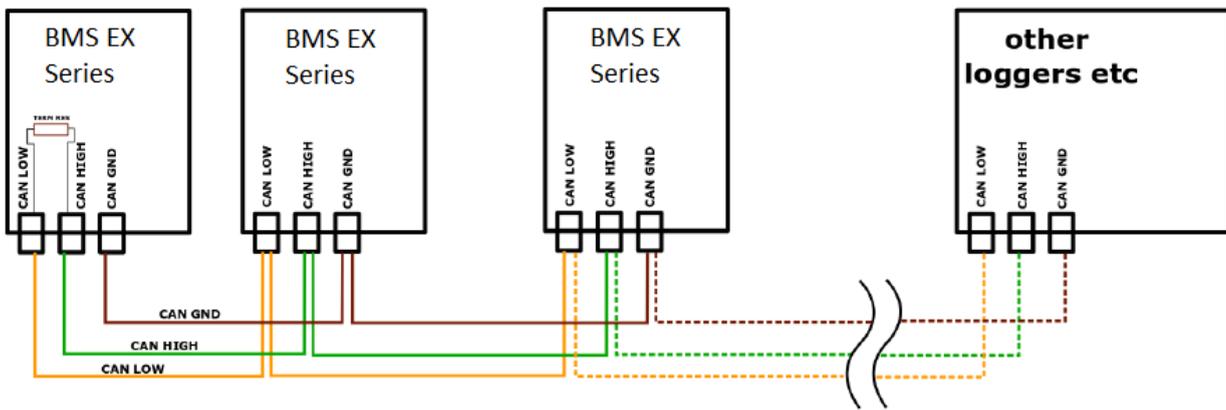
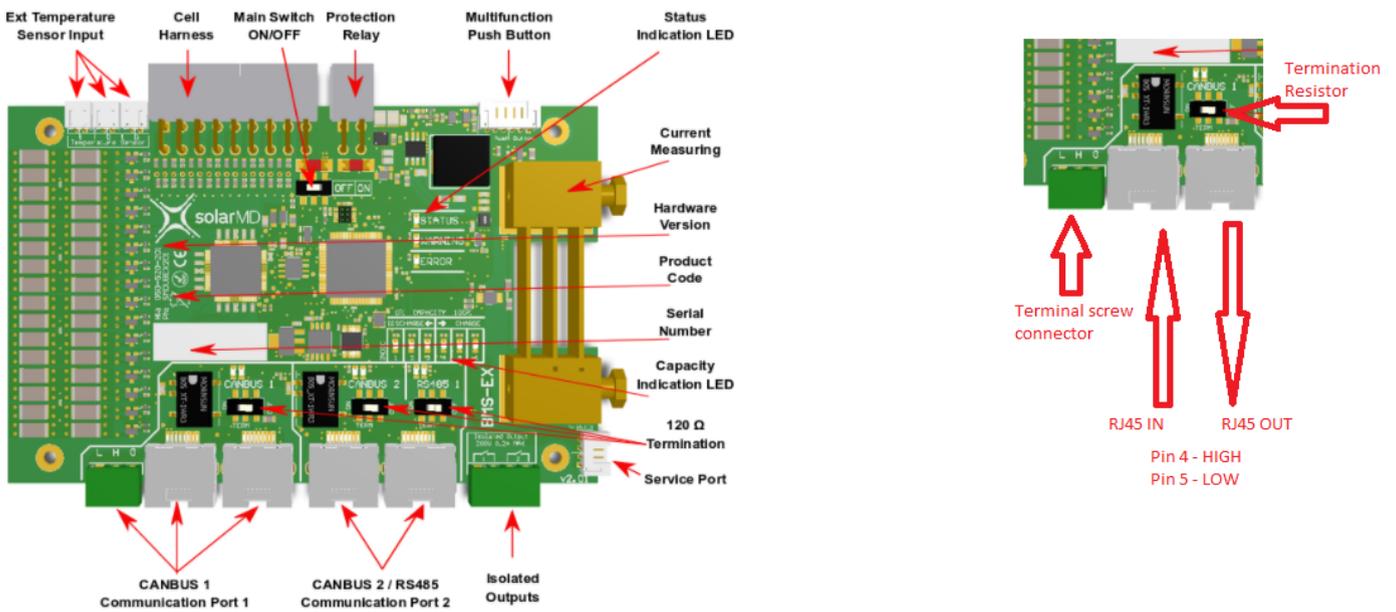


Figure 8: BMS-E connection to the CANBUS.



Model: BMS-EX

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CANBUS warnings.

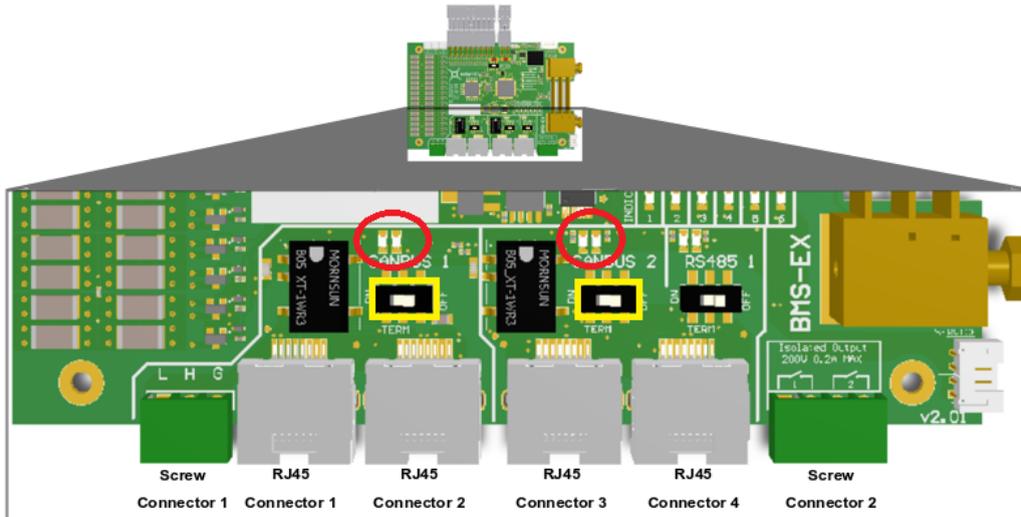
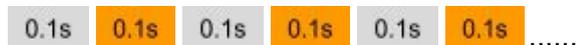


Figure 9 CANBUS Termination resistor and Warning LED location

The Orange LED (WARN) is used to display warning for canbus only. Reading this warning is possible with pulse counting.



- CANBUS line open or no termination resistor set. [1]



- CAN BUS line in initialization stage. Canbus init occur when the line was opened and then established. Minimum period for initialization is 30sec. In this period all nodes are scanned in the network and scanned for ID and serial number collisions. [2]



- Duplicate CAN ID detected with no "auto ID" set. [3]



- Duplicate Serial number detected. [4]



- CANBUS Internal fault. [5]

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Troubleshooting Warnings / Errors

Code	Cause	Solution
Warnings (Figure 6)		
1-2	<ol style="list-style-type: none"> Inverter / rectifier settings may not be correct. Battery cells may be disbalanced 	<ol style="list-style-type: none"> Check the battery settings Contact Solar MD support
3-4	System design is not correct.	Add additional battery, decrease charging / discharging current from your inverter / rectifier / load
5-6	Manual override	Manual override has been activated - please check with your installer
29-30	The BMS is ready to switch on after deep discharge / charge	Connect charger / load to the Battery
Errors (Figure 7 & 8)		
5,6,7	The battery is not installed in upright position	Install the battery in the right position
15,16,17	The BMS has been shut down manually or remotely	Switch on the BMS
18,19	The absolute maximum charge/discharge current has been achieved	The BMS will restart automatically, please contact support team or approved installer
21	The BMS is set for different number cells in series as the actually installed	Contact your installer or Solar MD support team
cvt22	Battery cell voltage way too low.	Fill in the failure report and send to info@solarmd.co.za The unit needs to return to the factory for testing
23	Battery cell voltage way too high	The BMS will restart automatically after pending awake condition
24,25,26, 27,28,30, 31	BMS Internal failure	Fill in the failure report and send to info@solarmd.co.za The BMS will be dispatched to you for replacement
29	Battery factory failure	Fill in the failure report and send to info@solarmd.co.za The unit needs to return to the factory for testing
CANBUS Warning (Figure 10)		
1	<ol style="list-style-type: none"> Canbus line open. Single CANBUS resistor not terminated. 	<ol style="list-style-type: none"> Check if the minimum of two nodes are connected on the line with the same transmission speed. Check if single resistor is terminated via the jumper. Located top left of can LEDS(Fig 10).

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Maximum charging / discharging voltages for non supported devices.

- Bulk charge (stop charging) 54.6V
- Float charge (if applicable) 53.8V
- Low battery discharge: 48V

Check that the Equalisation function are disalld, then verify if there is a voltage difference on the inverter display and the battery terminals @0.3C discharge / charge current. If so adjust the values above.

Please check if your inverter charger has been approved by Solar MD and it is CAN compatible.

For the latest Solar MD installation documents go to:
www.solarmd.com

To secure the full 10-year product warranty for the end user, be sure to register your battery online – login.mypower24.co.za.