BLUE NOVA energy

SBB™ MKII Series

Product User Manual

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01 DOCUMENT SCOPE

1.1 Applicable products

This user manual contains information specific to the **BlueNova SBB™ (Single Box Battery) MKII Series.** At the time of publication of this manual, the SBB™ MKII Series consisted of only one product, namely **BN52V-314-16k SBB™ MKII**.

If you are unsure whether the information in this document is applicable to your specific product, please contact BlueNova's Technical Support department for confirmation before proceeding with carrying out any guidelines and/or instructions contained herein.

1.2 Target audience

This document has been compiled to provide supportive information predominantly to energy industry professionals tasked with installation and/or technical maintenance of SBB™ MKII Single Box Batteries. Such individuals should be:

- adequately trained and experienced in the installation and maintenance of electrical DC systems.
- capable of interpreting electrical circuit diagrams.
- familiar with the composition and basic operating principles of multi-product energy storage systems.
- aware of and compliant to the industry safety standards of the associated country / region.

This document also contains information of a more general nature which might be of use to any one or more individuals involved with the basic day-to-day operation, transportation, storage and/or disposal of SBB™ MKII Single Box Batteries, as well as those needing to act in the interest of occupational health & safety under associated circumstances.

1.3 Symbols

The table below lists the various symbols used throughout this manual alongside the meaning of each:

Symbol	Meaning	Description
	NOTICE	Indicates supplementary information relevant to the chapter / section. Taking note of this information may provide further insight into the topic at hand.
	WARNING	Indicates information that is of critical importance to product/system functionality. Failure to adhere to these instructions may lead to product/system malfunction and/or damage.
	DANGER!	Indicates information that is of critical importance to product/system functionality and personal safety. Failure to adhere to these instructions may lead to product/system malfunction and/or damage, serious personal injury or even death.

1.4 Terminology

The table below lists some of the product- and system-specific terms & abbreviations used throughout this manual:

Abbr.	Term	Description
BMS	Battery Management System	A battery-integrated electronic system used to facilitate balanced charging, autonomous protective countermeasures & other functions.
EMS	Energy Management System	An energy system-integrated solution used to facilitate serial communication, remote monitoring & other system control measures.
ESS	Energy Storage System	An electrical system which includes one or more batteries.
PCS	Power Conversion System	A bi-directional inverter used in energy storage systems.
PPE	Personal Protective Equipment	Equipment worn by operators to minimise the risk of personal injury.
SBB™ MKII	Single Box Battery, Mark II	The product / -range covered in this document.

Additionally, the table below lists some of the industry-specific terms & abbreviations used throughout this manual:

Term / abbr.	Meaning
A	**Ampere.** The unit of measurement of electrical current.
AC	**Alternating current**. Electrical current that changes direction several times per second, such as supplied by utility grids, inverter output to loads & other devices. Incompatible with batteries directly.
Ah	**Ampere-hour**. The unit of measurement of cell capacity. Battery capacity is not specified in Ah as a rule, but instead in Wh / kWh / MWh.
C*(n)*	Battery **rate of charge** and/or discharge (where n = the number of hours required to hypothetically recharge the battery in question from 0-100% SoC at constant current).
CAN	**Controller Area Network.** A widely used serial communication protocol.
DC	**Direct current**. Electrical current that flows in one direction only, such as supplied by batteries and solar PV panels/-arrays.
EoL	**End-of-life.** The point at which a battery reaches a predetermined number of cycles. Normally specified alongside the minimum capacity retained at this point.
FW	**Firmware**. Specialised software normally installed directly onto one or more hardware-integrated ROM modules for the purposes of establishing functionality in the hardware.
HVAC	**Heating, ventilation & air conditioning.** In energy storage systems, this refers to the peripheral hardware and/or integrated subsystem(s) used for system temperature regulation.
IP*(xy)*	**Ingress protection** rating. Indicates how well an electrical device's enclosure protects the device from contamination by foreign matter (where x = numerical rating for solids, and y = for liquids).
kWh	**Kilowatt-hour**. The unit of measurement of energy (and by extension, also battery capacity).
LiFePO4	**Lithium iron phosphate**. Part of the lithium-ion family of battery chemistries. Unlike almost all other lithium battery chemistries, LiFePO4 (sometimes also: LFP) is inherently safe.
Ω	**Ohm**. The unit of measurement of electrical resistance.
RS485	**Recommended Standard #485.** A serial communication protocol standard for multi-node systems.
SoC	Battery **state of charge.** Expressed as a percentage.
SoH	Battery **state of health**. Expressed as a percentage of the maximum remaining usable capacity in comparison to the original capacity of a battery.
V	**Voltage**. The unit of measurement of an electrical source's potential to deliver energy.
VAC	The **voltage** of an electrical source with **alternating current.**
VDC	The **voltage** of an electrical component / source with **direct current.**
Wh	**Watt-hour**. The unit of measurement of energy (and by extension, also battery capacity).

02 SAFETY REQUIREMENTS

2.1 Safety introduction

IMPORTANT: Due to the inherently high risks associated with live electrical systems, the information included in this chapter should be regarded as of critical importance. Failure to adhere any of to the safety requirements included in this chapter may lead to damaged products/components, voiding of associated product warranties (where applicable), damage and/or destruction of assets in proximity to such systems, electrical shock, serious injury and even death.

2.2 General safety requirements

The following non-exhaustive list of safety requirements are applicable to electrical systems in general:

Electrical devices & components (incl. SBB™ MKII batteries) should always be installed, uninstalled, operated and/or serviced by suitably qualified personnel only.

Always wear appropriate PPE and use tools & equipment of the correct type and condition when installing, uninstalling, operating, servicing, transporting and/or otherwise handling electrical equipment.

Do not install, service or remove components of an electrical system unattended. Always ensure that one or more suitably qualified individuals remain in proximity to assist in case of emergencies.

Electrical connections between any two or more stand-alone electrical components/devices in an electrical system should include some slack. High tension connections between such components/devices may lead to deterioration of connection integrity over time, increase the risk of heat build-up and lead to thermal events.

Do not use water or other electrically conductive fluids to clean electrical device enclosures and/or any other surface(s) in close direct contact with connected components in an electrical system.

Electrically conductive accessories and/or jewellery should be removed before commencing with installation, uninstallation and/or maintenance of electrical systems, components or devices.

Before connecting any wires, cables or components in any electrical system which includes one or more live energy sources, measure the voltage between the relevant connector(s) and intended connection point(s) first. Do not proceed with any such connections if the measured voltage may damage connecting surfaces.

Air inlets and/or outlets of electrical device enclosures should remain free from obstruction. Obstructed air inlets/outlets may lead to insufficient heat dissipation and cause additional side effects incl. malfunction, damage and/or failure of such devices, thermal events & additional damage to peripheral assets.

2.3 Battery safety requirements

The following list of safety requirements are applicable specifically to SBB™ MKII Series batteries:

Avoid direct contact with non-isolated conductive surfaces & potentially live connection points (i.e. battery terminals) in electrical system. Do not install, service or otherwise directly interact with batteries, battery-connected circuitry & components without wearing the required PPE or using the appropriate tools.

Batteries must be isolated (i.e. switched off and disconnected from all peripheral components) before being installed, serviced, repaired, uninstalled or relocated for any purpose at any given time.

Do not short-circuit the positive and negative electrodes of individual battery cells, batteries or multi-battery configurations. Voltage may remain present over any two or more such electrodes even when the associated batteries/cells are disconnected from the associated electrical system and switched off.

All conductive wiring & connection points in battery-integrated systems should be electrically insulated to the fullest extent possible. Do not install batteries in systems where any of the connective wiring and/or connection points are not sufficiently insulated.

Before commencing with the installation of one or more SBB™ MKII Series batteries, each battery should be earthed first. Conversely, when uninstalling SBB™ MKII Series batteries, the earthing connection to each battery should be left intact (connected) until all other connections to each battery have been disconnected.

(Re)connecting & powering on the various components connected to any electrical system in which one or more SBB™ MKII Series batteries have been (re)installed should be done in strict accordance with the associated procedure(s) included in this document.

Do not store, install, service or repair batteries in locations where ambient factors such as temperature, humidity, etc. exceeds (or will likely exceed in the foreseeable future) the acceptable range associated with each, as specified on the product datasheet.

Do not connect SBB™ MKII Series batteries to AC power sources directly. Do not connect SBB™ MKII Series batteries to non-compatible DC power sources directly. Do not connect SBB™ MKII batteries in series.

Do not connect batteries to PV panels or -configurations directly. Always install the appropriate fusing & compatible supplier pre-approved MPPT module(s) between batteries and PV panel configurations.

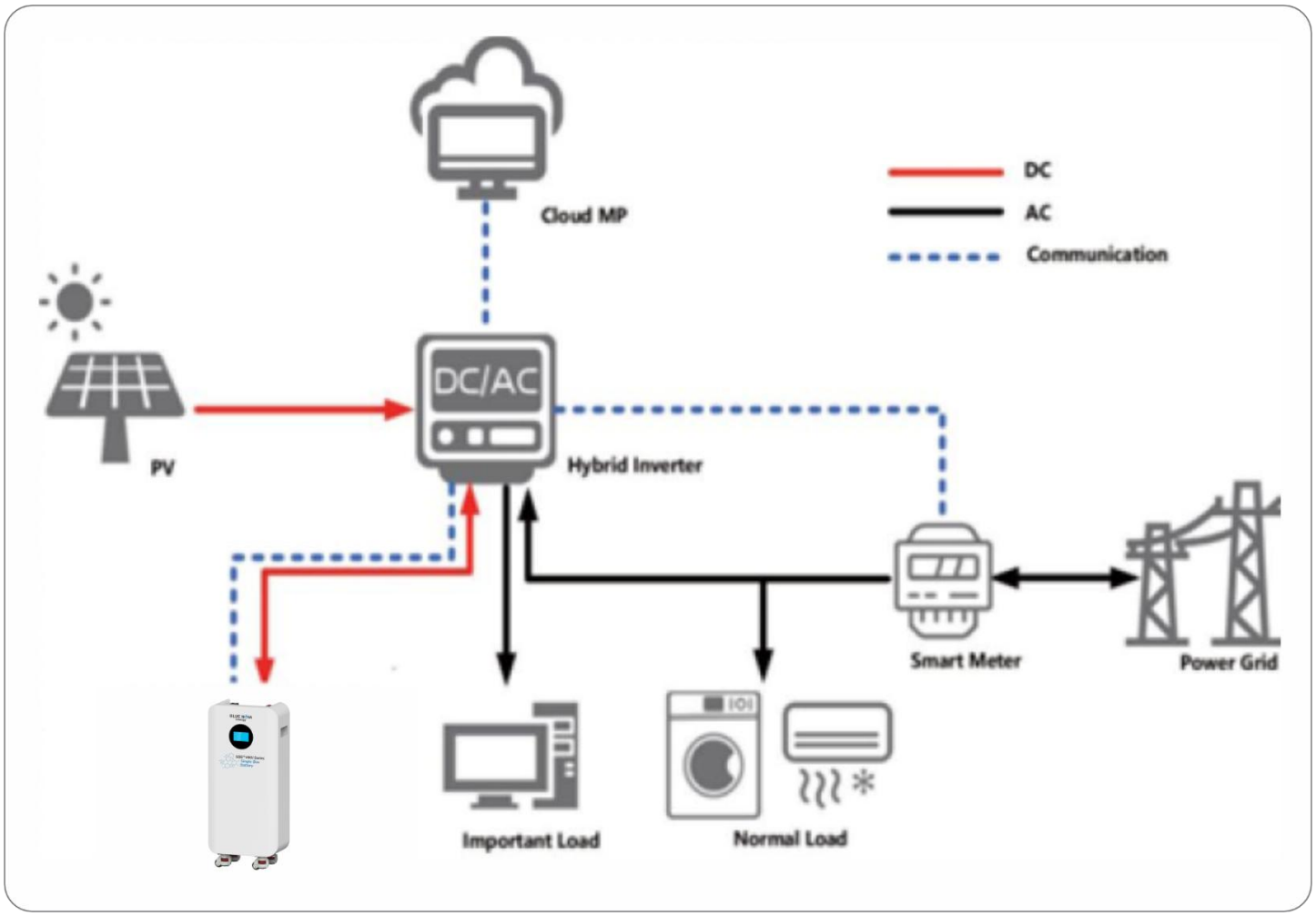
SBB™ MKII Series batteries of which any integrated $LiFePO_4$ cell(s) exhibit expansion/bulging should be discontinued from use immediately and repaired/replaced as necessary.

SBB™ MKII Series batteries stored for extended periods should be recharged at least once every 3 months. In such cases, a calibrated product-compatible inverter/charger should be used to recharge each battery individually to 40~60% SoC in accordance with the relevant procedure(s) contained in this document.

03 PRODUCT OVERVIEW

3.1 Product applications

SBB™ MKII Series batteries can be used to provide backup power, load shifting and peak shaving in residential and small commercial applications. The diagram below illustrates the general operational capability of a typical SBB™ MKII Series battery installation:



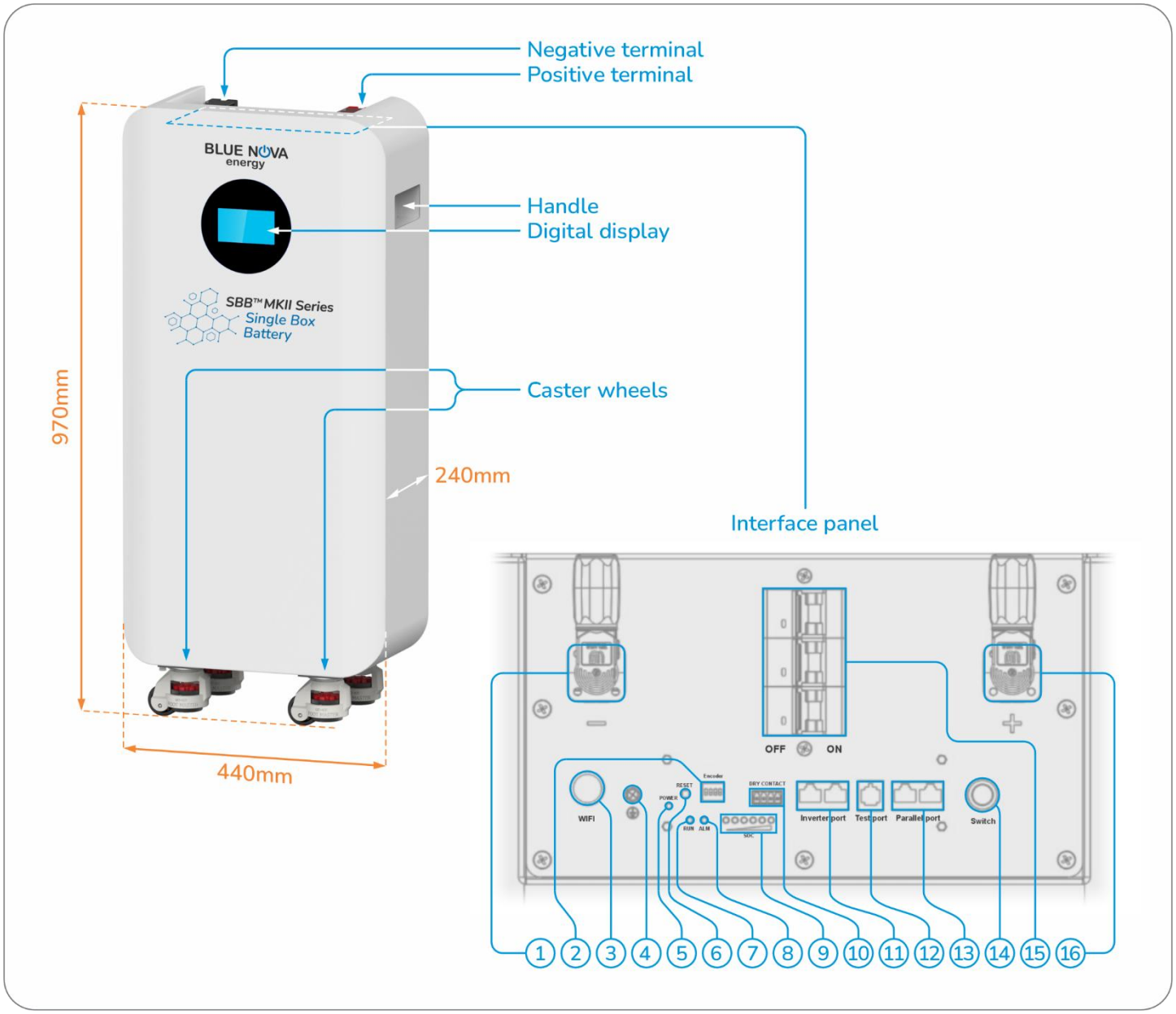
3.2 Summary of features

SBB™ MKII Series batteries include the following functions & features:

- **High performance BMS:** Ensures that the cells in each SBB™ MKII battery are balanced during charge cycles and includes autonomous protective measures against adverse operating conditions.
- **Alarms:** Triggered upon detection of operating conditions such as over-voltage, under-voltage, over-current, short circuit connections, temperature out-of-range, electronic component failure & battery failure.
- **Serial communication:** Includes serial communication (RS485 / CAN) integration capability with compatible peripheral devices. Supports uploading of measured health & performance data to select monitoring platforms.
- **Parallel configuration:** Up to 15 x SBB™ MKII batteries can be interconnected in parallel per system.

3.3 Component layout

The diagram below illustrates the dimensions and external component layout of an SBB™ MKII Series battery:



The 16 x numbered components on the interface panel in the diagram above are described in the table below:

#	Label	Type	Function
1	–	Terminal	The negative terminal of the battery.
2	Encoder	DIP switch array	Used to define the address of a specific battery in an interconnected parallel battery configuration.
3	WIFI	LED	Indicates the connection status of the battery to a compatible Bluetooth™ access point within range.
4	⏚	Connection point	Indicates the connection point from which the battery's enclosure should be connected to an electrical earthing point.

(Table continued from previous page)

#	Label	Type	Function
5	POWER	LED	Indicates whether the battery is switched on or off.
6	RESET	Push button	Press this button to reboot the battery.
7	RUN	LED	Indicates the operational status of the battery (see 3.3.1 below).
8	ALM	Button	Indicates whether the battery is in alarm status (see 3.3.1 below).
9	SOC	LED array	Indicates the state-of-charge of the battery (see 3.3.1 below).
10	DRY CONTACT	Connection point array	
11	Inverter port	2 x RJ45 ports	Used to connect the serial communication (CAN/RS485) of the battery/parallel battery configuration to a compatible inverter.
12	Test port	RJ11 port	Used for debugging purposes. Do not connect devices to this port.
13	Parallel port	2 x RJ45 ports	Used to establish serial communication between batteries interconnected in a parallel battery configuration.
14	Switch	Push button	Press this button to switch the battery on. Keep this button depressed for a few seconds to shut the battery down.
15	OFF ON	3 x breakers	Safety feature. Automatically opens to disconnect the associated battery whenever out-of-range operation is detected.
16	+	Terminal	The positive terminal of the battery.

3.4 Technical specifications

The table below lists the technical specifications of SBB™ MKII Series batteries:

General product specifications	
Cell chemistry & configuration	Lithium iron phosphate ($LiFePO_4$) | 16S1P
Cell specifications	$V_{(nom)}$ = 3.2V | Capacity = 314Ah @C2, 25°C
Battery voltage	51.2V nominal
Battery (energy) capacity	Total installed capacity @100% DoD = 16 077Wh; Usable capacity @recommended max. 80% DoD = 12 861Wh
Multi-unit configuration range	1S1P ~ 1S15P units (16 ~ 241kWh per system)
Serial communication	CAN, RS485
User interface	Integrated 4.3” touch screen
Dimensions (unboxed)	440 x 240 x 970mm (W x D x H)
Net weight (unboxed)	±140kg
Voltage, current & cycle life specifications	
Operating voltage range	43.2V ~ 57.6V
Max. charge current	Continuous: 150A | Peak: 160A (for ≤60 seconds)
Max. discharge current	Continuous: 200A | Peak: 210A (for ≤60 seconds)
Cycle life	≥8000 cycles @80% DoD, C2, 25°C
Environmental & safety specifications	
Ambient temperature range	Charge: 0°C ~ 50°C | Discharge: -20°C ~ 50°C
Ambient humidity range	0 ~ 95% relative humidity (non-condensing)
Ingress protection rating	IP20 (for indoor use only)
Certifications	CE-EMC; UN38.3; MSDS; IEC62619

While the above specifications are guaranteed to be correct at the time of publication of this user manual, BlueNova products remain subject to continued improvement where possible. Any information associated with such changes therefore remain subject to change, and will be published in the relevant datasheet first.

04 PRE-INSTALLATION

4.1 Packing list

The following components are included with each newly ordered SBB™ MKII Series battery shipped:

Item no.	Item name	Qty	Note(s)
1	SBB™ MKII Series battery	1	Main component.
2	Positive terminal power cable	1	Red cable fitted with a terminal connector lug.
3	Negative terminal power cable	1	Black cable fitted with a terminal connector lug.
4	Serial communication cable	1	Fitted with 1 x RJ45 connector on each end.
5	Ground / earthing cable	1	Fitted with a connector lug.

Verify that each of the above components are included and undamaged upon delivery of each SBB™ MKII Series battery. Should any of the above not be included in a shipment, please contact BlueNova Technical Support before proceeding.

4.2 PPE & Tools

The PPE & tools which may be required to successfully install SBB™ MKII Series batteries are listed below:

Safety boots	Anti-static gloves	Safety goggles	Hard hat
Calibrated multimeter	Screwdriver set	Torque wrench & sockets	Insulation tape
Forklift / pallet jack	Foldable ladder	Measuring tape	Levelling instrument

4.3 Site requirements

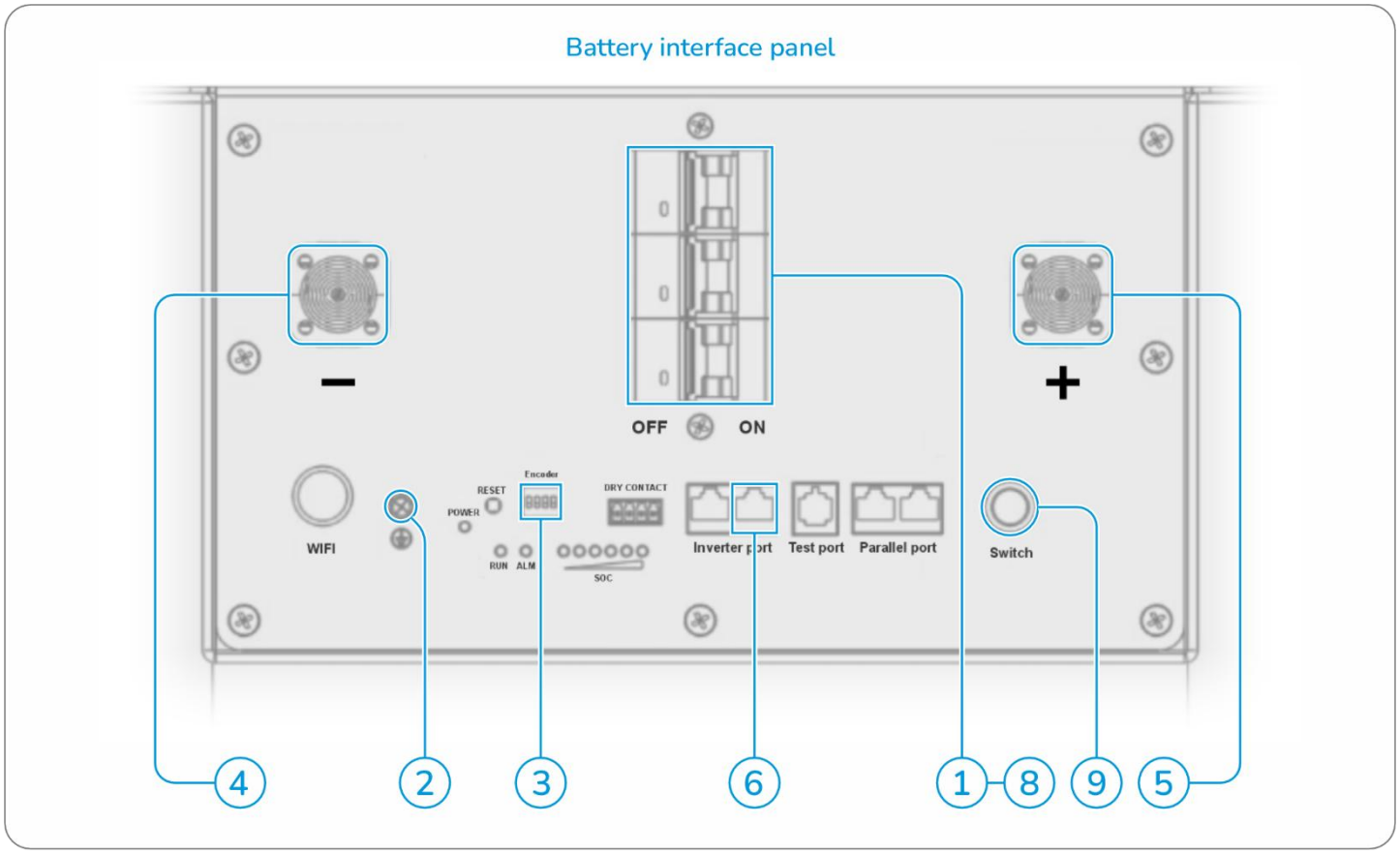
The following site requirements must be met before proceeding with the installation of SBB™ MKII Series batteries:

- The allocated site/area/building should be free from flammable and/or explosive materials in proximity.
- The surface on which SBB™ MKII Series batteries are due to be installed must be solid & level.
- SBB™ MKII Series batteries should not be installed near heat sources or in areas exposed to direct sunlight.
- The site/area/building should be protected against water leakage & excess ingress of other foreign materials.
- The appropriate measures should be taken to ensure that the temperature & humidity at the site/area/building remain within acceptable levels in accordance with product datasheet specifications.
- The allocated site/area/building should include sufficient ventilation.
- SBB™ MKII Series batteries should only be installed in locations where they will remain accessible to relevant technical personnel if/when necessary – especially in cases of emergency.
- The allocated site/area/building should include all the required industry-standard safety signage & equipment (fire extinguishers etc.) associated with electrical installations.

05 INSTALLATION

5.1 Installation: Single battery

The diagram and corresponding instructions below describe the procedure for installing a single SBB™ MKII battery:

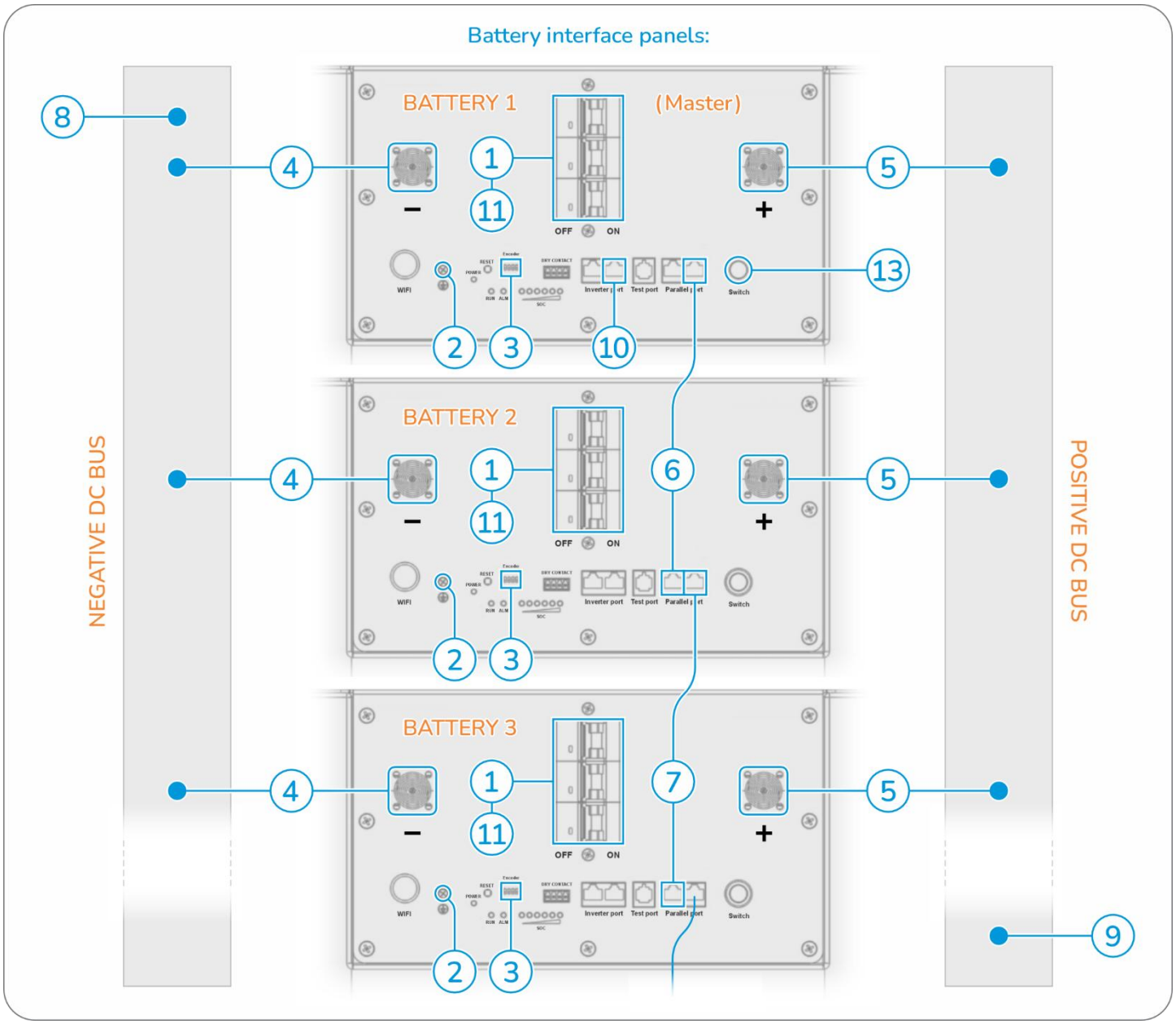


Step-by-step instructions:

1. Ensure that the battery-integrated breaker switches (and the inverter/charger to connect to) are switched off.
2. Connect the battery's enclosure to an electrical earthing point.
3. Set the switches on the DIP switch array to [ON | OFF | OFF | OFF] (see section 5.3 for more information).
4. Connect the battery's negative terminal to the appropriate negative terminal of the system's inverter/charger.
5. Connect the battery's positive terminal to the appropriate positive terminal of the system's inverter/charger.
6. Connect the battery's second RJ45 "Inverter port" to the appropriate serial communication port of the system's inverter/charger. See section 5.4 for more information on RJ45 connector pinout configuration.
7. Switch the inverter/charger on (not illustrated in the diagram above).
8. Switch battery-integrated breakers on.
9. Switch the battery on by pressing the indicated button.

5.2 Installation: Parallel batteries

The diagram and corresponding instructions below describe the procedure for installing SBB™ MKII batteries in parallel. Up tp 15 x SBB™ MKII Series batteries can be installed in parallel per system:



Step-by-step instructions:

1. Ensure that each battery's integrated breaker switches (and the inverter/charger to connect to) are switched off.
2. Connect each battery's enclosure to an electrical earthing point.
3. Set the switches of the DIP switch array on each battery according to the instructions included in section 5.3 of this user manual.

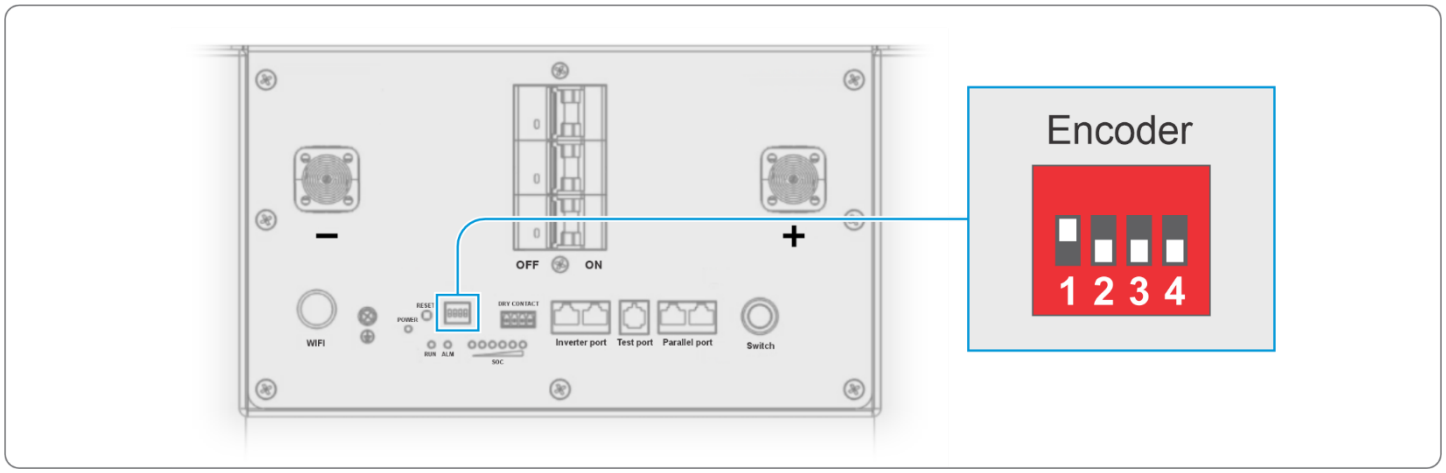
(Instructions continued from previous page)

4. Connect the negative terminal of each battery to a common negative DC bus bar. Each cable used for this purpose should be of the same length, diameter, conductive material and quality.
5. Connect the positive terminal of each battery to a common positive DC bus bar. Each cable used for this purpose should be of the same length, diameter, conductive material and quality.
6. Connect the second RJ45 “Parallel port” of battery 1 (master) to the first RJ45 “Parallel port” of battery 2 with an appropriate RJ45 cable. See section 5.4 for more information on RJ45 pinout configuration.
7. Connect the second RJ45 “Parallel port” of battery 2 to the first RJ45 “Parallel port” of battery 3 with an appropriate RJ45 cable. Continue this process until the serial communication of all batteries included in the parallel configuration are interconnected. See section 5.4 for more information on RJ45 pinout configuration.
8. Connect the negative DC bus bar to the appropriate negative terminal on the system’s inverter/charger.
9. Connect the positive DC bus bar to the appropriate positive terminal on the system’s inverter/charger.
10. Connect the master battery’s second RJ45 “Inverter port” to the appropriate serial communication port of the system’s inverter/charger. See section 5.4 for more information on RJ45 pinout configuration.
11. Switch each battery’s integrated breakers on.
12. Switch the system’s inverter/charger on (not illustrated in the diagram above).
13. Switch the first (master) battery on by pressing the indicated button. The rest of the interconnected batteries in the configuration should then switch on automatically.

> ⚠ Parallel battery configurations should always be connected to the associated system’s inverter/charger from end-to-end, i.e. from the positive terminal of the first battery (or closest point thereto on a common positive DC bus bar) and the negative terminal of the last battery (or closest point thereto on a common negative DC bus bar) of the entire parallel configuration, or vice versa.

5.3 DIP switch array

The DIP switch array included on the interface of each SBB™ MKII Series battery is labelled with the text “Encoder” and includes 4 x DIP switches. The switch array is used to define the number of batteries connected to a specific system as well as the specific address of each individual battery included in parallel battery configurations (where applicable):

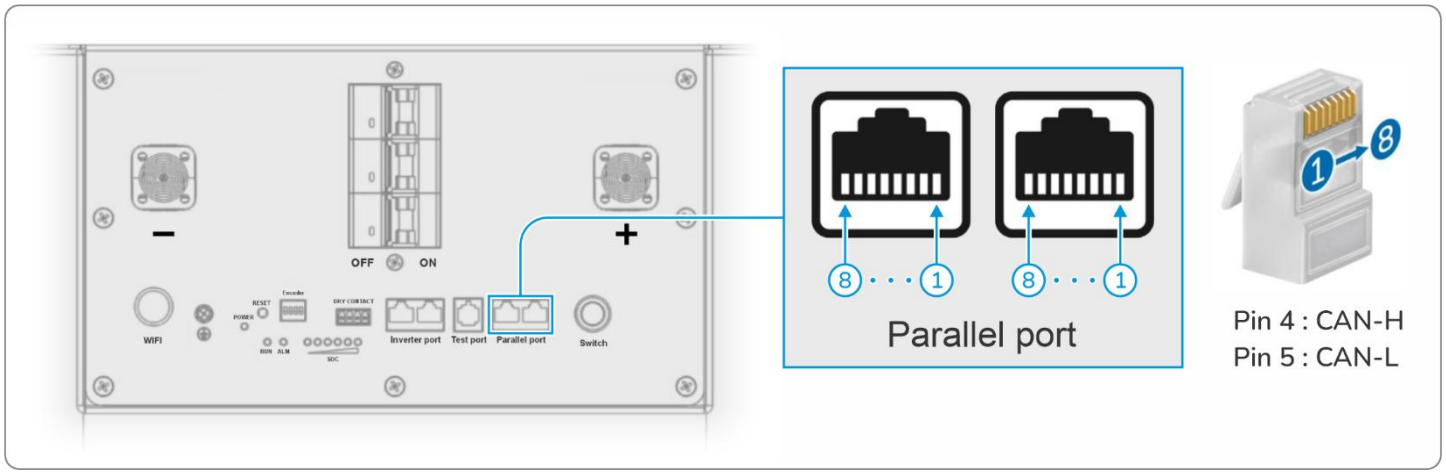


The DIP switch array(s) of both single and parallel-connected battery configurations are detailed in the table below:

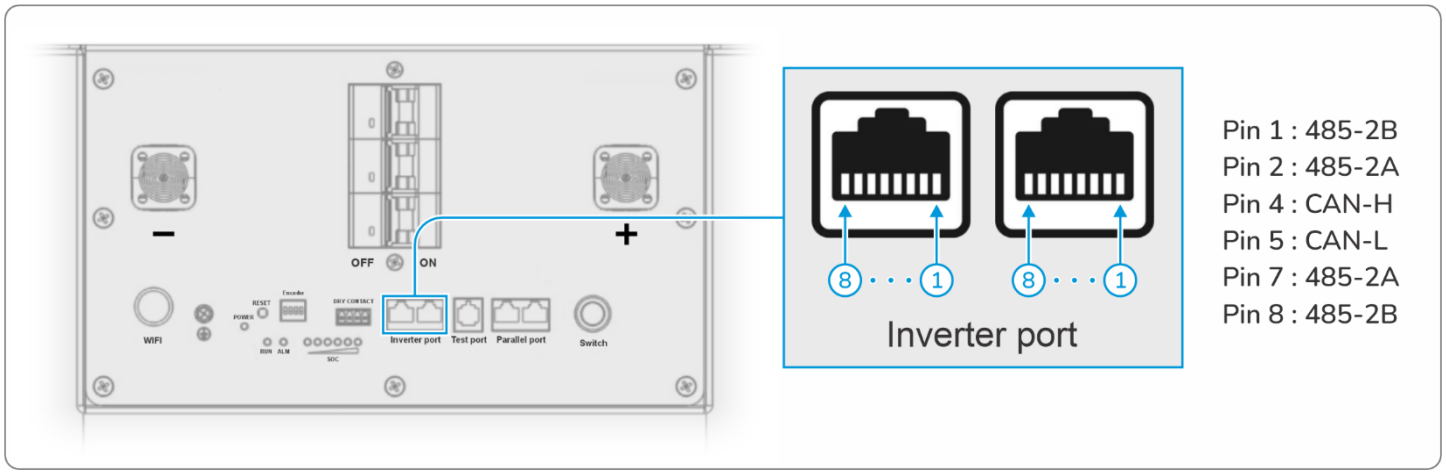
Battery number	Designation	DIP switch array configuration				Illustration
		#1	#2	#3	#4	
Battery #1	Master / single battery	▲ ON	▼ OFF	▼ OFF	▼ OFF	
Battery #2	Slave battery #1	▼ OFF	▲ ON	▼ OFF	▼ OFF	
Battery #3	Slave battery #2	▲ ON	▲ ON	▼ OFF	▼ OFF	
Battery #4	Slave battery #3	▼ OFF	▼ OFF	▲ ON	▼ OFF	
Battery #5	Slave battery #4	▲ ON	▼ OFF	▲ ON	▼ OFF	
Battery #6	Slave battery #5	▼ OFF	▲ ON	▲ ON	▼ OFF	
Battery #7	Slave battery #6	▲ ON	▲ ON	▲ ON	▼ OFF	
Battery #8	Slave battery #7	▼ OFF	▼ OFF	▼ OFF	▲ ON	
Battery #9	Slave battery #8	▲ ON	▼ OFF	▼ OFF	▲ ON	
Battery #10	Slave battery #9	▼ OFF	▲ ON	▼ OFF	▲ ON	
Battery #11	Slave battery #10	▲ ON	▲ ON	▼ OFF	▲ ON	
Battery #12	Slave battery #11	▼ OFF	▼ OFF	▲ ON	▲ ON	
Battery #13	Slave battery #12	▲ ON	▼ OFF	▲ ON	▲ ON	
Battery #14	Slave battery #13	▼ OFF	▲ ON	▲ ON	▲ ON	
Battery #15	Slave battery #14	▲ ON	▲ ON	▲ ON	▲ ON	

5.4 Serial communication

The 2 x RJ45 ports labelled “Parallel port” on each battery’s interface panel are used to interconnect the CAN serial communication of batteries included in a parallel battery configuration. The pin configuration is detailed below:



The 2 x RJ45 ports labelled “Inverter port” on each battery’s interface panel are used to connect the CAN / RS485 serial communication of batteries to a serial-compatible inverter. The pin configuration is detailed below:



SBB™ MKII Series batteries include integrated 120Ω resistors at associated serial communication ports. It is therefore not necessary to manually add terminating resistors during serial communication configuration.

5.4 Voltage-based setup

For battery installation with inverters which don’t include serial communication, the following parameters must be set:

Battery voltage (nominal)	51.2V
Bulk / float charge voltage	57.6V
Recommended charge current	140A
Max. charge/discharge current	150A

Discharge cut-off voltage	43.2V
Temperature range (charge)	0°C ~ 55°C
Temperature range (discharge)	-20°C ~ 60°C
Temperature range (idle / stored)	15°C ~ 35°C

06 OPERATION

6.1 Indicators

The SOC LED array operates with the RUN & Alarm LED and integrated buzzer to indicate state-of-charge as follows:

Operational status	RUN LED	SOC LED array	State-of-charge	Alarm LED	Buzzer
Battery idle	●	● ● ● ● ● ●	84 ~ 100% SoC	○	–
	●	● ● ● ● ● ○	66 ~ 83% SoC	○	–
	●	● ● ● ● ○ ○	50 ~ 65% SoC	○	–
	●	● ● ● ○ ○ ○	33 ~ 49% SoC	○	–
	●	● ● ○ ○ ○ ○	17 ~ 32% SoC	○	–
	●	● ○ ○ ○ ○ ○	0 ~ 16% SoC	((●))	(🔔)
Battery charging	●	● ● ● ● ● ●	100% SoC	○	–
	●	● ● ● ● ●(●)	83 ~ 99% SoC	○	–
	●	● ● ● ●(●)○	67 ~ 82% SoC	○	–
	●	● ● ●(●)○ ○	51 ~ 66% SoC	○	–
	●	● ●(●)○ ○ ○	33 ~ 50% SoC	○	–
	●	●(●)○ ○ ○ ○	17~ 32% SoC	○	–
	●	(●)○ ○ ○ ○ ○	0 ~ 16% SoC	○	–
Battery discharging	(●)	● ● ● ● ● ●	84 ~ 100% SoC	○	–
	(●)	● ● ● ● ● ○	66 ~ 83% SoC	○	–
	(●)	● ● ● ● ○ ○	50 ~ 65% SoC	○	–
	(●)	● ● ● ○ ○ ○	33 ~ 49% SoC	○	–
	(●)	● ● ○ ○ ○ ○	17 ~ 32% SoC	○	–
	(●)	● ○ ○ ○ ○ ○	8 ~ 16% SoC	○	(🔔)
	(●)	(●)○ ○ ○ ○ ○	0 ~ 7% SoC	○	((🔔))

The LEDs, integrated buzzer and on-board display indicate specific warnings and.or fault conditions as described below:

Display #	RUN LED	SOC LED array	Alarm	Buzzer	Description of warning / fault
04	○	○ ○ ○ ((●)) ○ ○	●	(((🔔)))	Battery ID error.
18	○	○ ((●)) ○ ○ ((●)) ○	●	((🔔))	Low temperature (discharge).
20	○	○ ((●)) ○ ((●)) ○ ○	●	((🔔))	Low temperature (charge).
22	○	○ ((●)) ○ ((●)) ((●)) ○	●	(((🔔)))	High / over-voltage.
24	○	○ ((●)) ((●)) ○ ○ ○	●	((🔔))	Low / under-voltage.
26	○	○ ((●)) ((●)) ○ ((●)) ○	●	((🔔))	High temperature (discharge).
28	○	○ ((●)) ((●)) ((●)) ○ ○	●	(((🔔)))	Discharge over-current.
30	○	○ ((●)) ((●)) ((●)) ((●)) ○	●	((🔔))	High temperature (charge).
32	○	((●)) ○ ○ ○ ○ ○	●	(((🔔)))	Charge over-current.
34	○	((●)) ○ ○ ○ ((●)) ○	●	((🔔))	MOS temperature too high.
36	○	((●)) ○ ○ ((●)) ○ ○	●	(((🔔)))	Short-circuit connection.
38	○	((●)) ○ ○ ((●)) ((●)) ○	●	(((🔔)))	Ambient temperature high.
40	○	((●)) ○ ((●)) ○ ○ ○	●	(((🔔)))	Ambient temperature low.

● = LED On | (●) = Flashing once every 4 seconds | ((●)) = Flashing once per second | ○ = LED Off
● = LED On | (●) = Flashing once every 4 seconds | ((●)) = Flashing once per second | ○ = LED Off
(🔔) = Buzzing once every 4 seconds | ((🔔)) = Buzzing once per second | (((🔔))) = Buzzer on (continuous)

07 EMERGENCY & FIRST AID

Emergency condition:	Procedure to follow:
8.1 Ruptured / leaking components	• **Inhalation:** Evacuate the area. Seek medical attention immediately. • **Eye contact:** Rinse eyes with clean water continuously for 15 minutes. Seek medical attention immediately afterwards. • **Skin contact:** Wash the affected area thoroughly with soap and water. Seek medical attention immediately afterwards if irritation persists. • **Ingestion:** Induce manual (non-medicinal) vomiting if possible. Seek medical attention immediately afterwards.
8.2 Thermal events	• Evacuate the area immediately. Inform local firefighting authorities. • Extinguish any fires with CO_2 fire extinguishers if it is safe to do so.
8.3 Water contact	• Avoid making physical contact with batteries damaged by water/other fluid as well as the fluid itself. Disconnect such batteries only when safe to do so.
8.4 General damage	• Visibly damaged and/or malfunctioning batteries should not remain in use but be safely removed & replaced as soon as possible.

NOTES