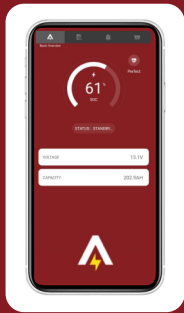




BC range of
AC to DC chargers
2 output
Live voltage output
Linear wave DC charger



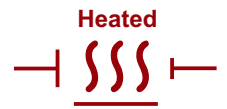
Sterling Power's range of
DC to DC chargers
Live voltage output
Linear wave DC charger
Current limiting
Protects alternator + battery



Bluetooth APP -
SMART BMS
back page



AMPS
ADVANCED MOBILE POWER SYSTEMS



LB Series Heated Lithium Iron Phosphate Batteries 12V



Important information regarding charging our lithium batteries

- Ensure your battery charger provides a live and linear wave form voltage to wake up battery's BMS (we recommend our BC range)
- Ensure your battery charger's current output is within the C rating of the battery / battery bank.
- To utilise the heating element ensure you have a powerful enough charger to achieve this.
- Ensure your battery charger's charging voltage is within the charge voltage rating.
- Ensure the series voltage does not exceed 48V. Parallel is unlimited.
- No temperature sensor is required when charging our batteries as the internal BMS trips the charging circuit.

Contents

- Page 2) Lithium battery overview
- Page 3) LB Series battery overview
- Page 4) LB12100 - specification page
- Page 5) LB12200 - specification page
- Page 6) Charging
- Page 7) More Charging
- Page 8) HEATING
- Page 9) Bluetooth AMPS App



BATTERY PREFACE LITHIUM OVERVIEW

General Information

The advantages of lithium batteries are well known over conventional batteries.

- Greater energy density, providing more usable power in the same space
- Superior charge and discharge capabilities
- Improved unit safety

They are superior on every level - everyone wants them. However installing them on vehicles was not simple and required a lot of knowledge because they have a very specific envelope for their charging and discharging curves. Failure to operate within these parameters will reduce the performance ability and life of the battery.

Lithium batteries require additional care over lead acid batteries. In AMPS batteries, much of this care is solved and monitored by the BMS onboard. The BMS tries to protect the cells from allow over-voltage, over-current, short circuit damage and over/under temperature situations.

Lithium poses a risk to alternators, and as such we cannot consider warranty claims where Lithium batteries are charged directly off of an alternator (IE, Not with a battery to battery charger to protect both the alternator and the Lithium from one another). When charging lithium from an alternator source (DC/DC charge on vehicles) we require a battery to battery charger for their current limiting and isolating properties.

Due to their very low internal resistance, Lithium batteries are very easy and quick to charge. This historically would be perceived as a good thing, however, on a mechanical source like an alternator this can rapidly lead to alternators running at 100% output for extended periods of time, and imminent degradation. Current limiting chargers limited to 80% of the alternators maximum output is AMPS' recommendation for DC/DC charge.

A.M.P.S recommends the Sterling Battery to Battery charger range for its current limiting features, its ability to isolate the battery from the alternator side, its Euro-6 compatibility and its complete voltage control.

Lithium Benefits

- Capacity and performance - Lithium batteries allow, when the BMS allows it, full use of the battery capacity, as opposed to the 50% recommended depth of discharge of a lead acid battery. Their low internal resistance allows much faster charge than many other battery types and very impressive rates of discharge.
- Often significantly lighter and significantly smaller than their lead acid competition.
- Even when being discharged to significantly greater degrees than a lead acid battery, we will still expect to see between 10-20 times the service life of a lithium battery against a lead acid battery.

A.M.P.S Warranty

Each battery comes with a 5 year limited factory warranty that is non transferable.

- Our warranty covers manufacture and material defects. Damages caused by abuse, neglect, accident, alterations and improper use are not covered under our warranty.

- Warranty is null and void if damage occurs due to negligent repairs.

- Customer is responsible for inbound shipping costs of the product to AMPS.

- AMPS will ship the repaired or warranty replacement product back to the purchaser at the purchasers cost. If your order was damaged in transit or arrives with an error, please contact us ASAP so we may take care of the matter promptly and at no expense to you. This only applies for shipping which was undertaken by our company and does not apply for shipping organised by yourself. Please do not throw out any shipping or packaging materials.

All returns for any reason will require a proof of purchase with the purchase date. The proof of purchase must be sent with the returned shipment. If you have no proof of purchase call the vendor who supplied you and acquire the appropriate documentation.

To make a claim under warranty, call our customer care line at (England 01905 771771). We will make the best effort to repair or replace the product, if found to be defective within the terms of the warranty. AMPS will ship the repaired or warranty replacement product back to the purchaser, if purchased from us

Please review the documentation included with your purchase. Our warranty only covers orders purchased from AMPS. We cannot accept warranty claims from any other AMPS distributor. Purchase or other acceptance of the product shall be on the condition and agreement that AMPS Ltd shall not be liable for incidental or consequential damages of any kind. Additionally, AMPS neither assumes nor authorizes any person for any obligation or liability in connection with the sale of this product. This warranty is made in lieu of all other obligations or liabilities. This warranty provides you specific legal rights and you may also have other rights, which vary from state to state. This warranty is in lieu of all other, expressed or implied.



BATTERY PREFACE LITHIUM OVERVIEW

LB Series Batteries All LB series batteries have a number of features that are unique to their family. Including heated features, a bespoke app and unique communication protocols.

Low temperature heating One of lithium's biggest limitations from being globally accepted as standard is their limitations regarding operational temperatures. When in a low temperature state, and receiving charge from a charge source, 80W of that charge current will actively go (per battery) to the internal heating elements on the batteries to provide the well insulated cells with warmth to get them above (or keep them above) freezing. This allows charging and operation in even the most extreme environments that would otherwise not be an option. The temperature elevates at a rate of about 1°C every 8 minutes.

Interbattery Communication The LB series of batteries have communication ports for up to 16 batteries to be connected with communication cable. This, when paired with a communication box that is in active development and nearly ready for release, will allow collated information of the entire battery bank to be read from one single point.

CANBUS Support Perhaps uniquely, the LB series of lithium battery also offers CANBUS connection ports and a communication protocol that we can provide to those who can make the best use of it.

AMPS Bluetooth Our premium battery deserves a premium BMS system and the LB series of batteries benefits from our bespoke AMPS app. Offering the client/user information on how long the battery has until it is fully charged or depleted, the current coming in or out of the battery (down to a fraction of an Amp), the state of charge of the battery, the capacity of the battery and the temperature of the battery system.

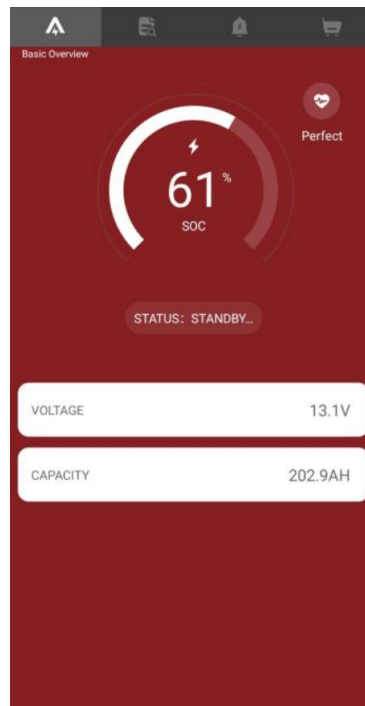
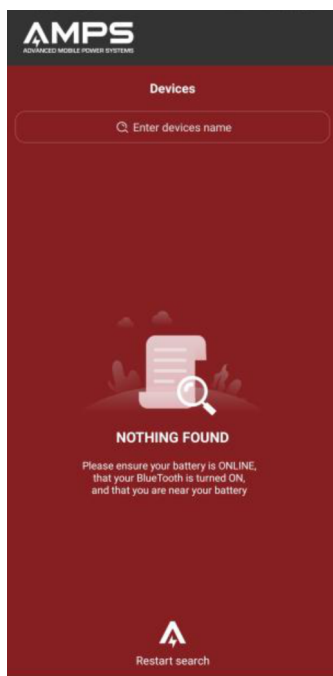
The app also has a number of user-first additions, including easy access to AMPS support information and the ability to rename your batteries to best organise what is what in your system.

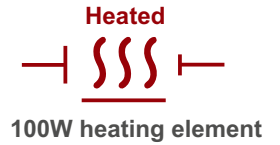
Highest Quality When designing the LB series of batteries, we realised quickly that the advanced system required the highest build quality to ensure best operation for our users and customers. We have used only the best cells and housing we could find to ensure that this premium product performs and feels as good as you want it to.

State Of Charge Meter The faceplate of all LB batteries features a small and simple battery monitor gauge to give you a brief estimate on the capacity remaining in the battery, at the push of a button.

Serviceable While we hope we never need to service a battery, the top-plate of the lithium case is removable (sealed by screws) to gain access to the BMS and battery system within. This should only be done by AMPS technicians.

AMPS App

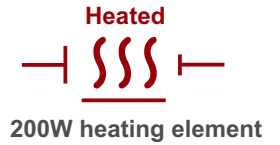




PRODUCT SPECIFICATIONS **LB12100**

Battery Capacity	100 Ampere hour (100Ah) 1280Wh
Nominal Voltage	12V
Battery Chemistry	LiFePO ₄ Chemistry - Prismatic cells
Heating Element	Yes, 1x 100W
Series Limit	4 (48V bank)
Parallel Limit	Infinite
Dimensions and Weight	31.8L x 22.5H x 16.5W (cm) - 11.73KG
Operating Temperature	Charge - 0°C to 60°C // Discharge from -20°C to 60°C - Integrated heater for low temperature operation
Operating Voltage	13.6V (4S x 3.4V)
Charge Voltage	14.2V-14.6V, 14.4V recommended
Float Voltage	13.4V-14.0V, 13.8V recommended
Max Continuous Charge Rate	1C (100A)
Max Continuous Discharge Rate	1C (100A)
BMS Features	<ul style="list-style-type: none">• Bluetooth interface for battery information• Low temperature battery disconnect (0°C for charge, -20°C for discharge)• Over voltage disconnect (14.8V or above on input)• Low voltage disconnect• Cell imbalance disconnect (Cell voltage differential of above 0.3V)• Automatic cell voltage balancing• Over current disconnect protection• Short circuit protection
Operational Quiescent Current	10mA
Standby Quiescent Current	0.1mA
UL Marking	ANSI/CAN/UL 1973
Charge Curve	Constant Current / Constant Voltage - CC/CV
Terminals	M8
Warranty	5 years
Appearance	LB12100





PRODUCT SPECIFICATIONS LB12200

Battery Capacity	200 Ampere hour (200Ah) 2560Wh
Nominal Voltage	12V
Battery Chemistry	LiFePO ₄ Chemistry - Prismatic cells
Heating Element	Yes, 2x 100W (200W)
Series Limit	4 (48V bank)
Parallel Limit	Infinite
Dimensions and Weight	50.5L x 25.5H x 17.2W (cm) - 24KG
Operating Temperature	Charge - 0°C to 60°C // Discharge from -20°C to 60°C - Integrated heater for low temperature operation
Operating Voltage	13.6V (4S x 3.4V)
Charge Voltage	14.2V-14.6V, 14.4V recommended
Float Voltage	13.4V-14.0V, 13.8V recommended
Max Continuous Charge Rate	1C (200A)
Max Continuous Discharge Rate	1C (200A)
BMS Features	<ul style="list-style-type: none"> • Bluetooth interface for battery information • Low temperature battery disconnect (0°C for charge, -20°C for discharge) • Over voltage disconnect (14.8V or above on input) • Low voltage disconnect • Cell imbalance disconnect (Cell voltage differential of above 0.3V) • Automatic cell voltage balancing • Over current disconnect protection • Short circuit protection
Operational Quiescent Current	10mA
Standby Quiescent Current	0.1mA
UL Marking	ANSI/CAN/UL 1973
Charge Curve	Constant Current / Constant Voltage - CC/CV
Terminals	M8
Warranty	5 years

Appearance
LB12200





Charging Parameters LITHIUM CHARGING

Bulk / Absorption The ideal voltage is 14.2V-14.6V. If the voltage climbs above this voltage the BMS inside the battery(s) shall simply open circuit, by which point your battery is full anyway. Likewise, when the batteries are deemed full the BMS opens the charge circuit.

There is no harm in having an hour of absorption. This may actually be beneficial if you have voltage drop down your wires from your charger to the battery(s). But, as stated above, once the battery is full the BMS disconnects the charge circuit anyway.

Float As the BMS disconnects when full, there is no need for float. However, if you wish for your battery charger to maintain a status of 'power supply', then a float between 13.6V-13.8V is fine. This is slightly higher than the resting voltage of a full battery. Therefore, if any DC loads are applied the charger shall provide power up to its current rating.

Temperature compensation / temperature trips Temperature compensation is not required. When the cells are at 0 DegC (or lower) the BMS stops any charge entering the battery. The discharge circuit remains engaged down to -20DegC. For our batteries, there is no need to fit a temperature sensor as our BMS protects the battery. The downside to fitting a temperature sensor is that the battery chargers may not provide any charge at 0DegC or lower, therefore your battery charger can not aid with providing current from any potential loads that may be running.

High Voltage cutoff 14.8V+
Low Voltage cutoff <11.0V
Charge current rating varies depending on model. Approximately 100% of the Ah capacity in A (1C)
Discharge current rating varies depending on model. Approximately 100% of the Ah capacity in A (1C)

Chargers / Inverters Please ensure both the charger and the inverter (charging source and load) are within the charge specs of the battery(s) that you are connect them to. When you add multiple in parallel you can multiply the C ratings of the batteries proportionately. If you exceed the charge or discharge rating of the battery(s) the BMS shall simply disconnect the charge or discharge circuit. For example, a 3KW inverter at 12V is slightly less than 300A. 2x 100Ah battery give a combined discharge rating of 300A.

Series voltage limit 48V

Parallel limit unlimited

Other Do not submerge
Do not short circuit
Do not reverse polarity
Do not expose to excess heat
Do not mishandle, drop, throw or apply force
Ensure terminals are tightly bound to the ring terminals

Orientation There is not a specific orientation for lithium battery storage. However, ensure the battery is well secured.

Storage and maintenance If you wish to store the batteries for a long period of time the recommended state of charge to store lithium batteries is approximately 50%. There is no additional maintenance required. We recommend ensuring there is always charge in the battery and ensure the battery terminals and the associated ring terminals are tight.

State of Charge Meter



An **approximate** state of charge LED meter.
4 out of 4 green LEDs = 75-100% SOC
3 out of 4 green LEDs = 50-75% SOC
2 out of 4 green LEDs = 25-50% SOC
1 out of 4 green LEDs = 0-25% SOC

Please do NOT rely on this LED meter for exactly Ah capacity determinations. It is approximate.

Button



Button - press once to turn on charge meter.
Press and hold for 5 seconds to RESET battery if it has tripped (high/low current, voltage / short circuit etc..)

Spec Table

Part No	Capacity Ah	Charge V	Charge Current (max)	Discharge Current (max)	Bluetooth	series limit	Dimensions (cm) LHW	Weight (kg)	Battery Terminal
LB12100	100Ah	≤14.6V	100A	100A	yes	48V	31.8 x 22.5 x 16.5	11.8	8mm
LB12200	200Ah	≤14.6V	200A	200A	yes	48V	50.5 x 25.5 x 17.2	24	8mm



2 factors to consider when specifying the charger

- 1) How fast you wish to charge the battery up, ensure you are within the C rating of the battery / battery bank.
- 2) Enough power from the charger to run the heating element with the knowledge that you shall need surplus to run additional DC loads (if running).

If in doubt err towards the larger power rate.

CHARGING Recommend Battery Chargers and DC to DC charging

AC-DC Charging

AMPS AC to DC Battery Charger / from mains

To charge our lithium batteries we recommend using our very own range of battery chargers - the BC series.

Ensure, when charging your batteries, you keep the current rating and voltage rating within the specification of the batteries.

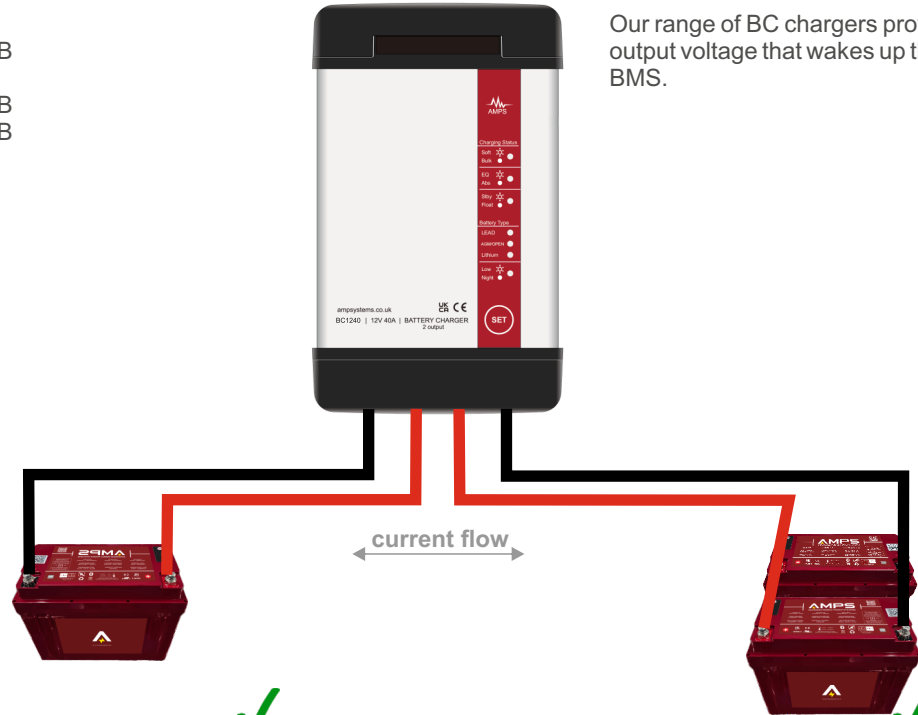
For example, the 12V 100Ah LB12100 battery could be charged with 2x 12V 40A (2x BC1240) battery chargers.

When paralleling batteries to increase Ah capacity, the charger current rating can increase proportionately.

Most of our battery chargers are comfortably under the charge rating of the batteries.

If charger rating is too high, the BMS inside the battery shall trip to protect the battery.

- BC1220
- BC1220B
- BC1240
- BC1240B
- BC2420B



Our range of BC chargers provide a live output voltage that wakes up the battery BMS.

- Lead acid style battery ✓✓
- AMPS lithium battery ✓✓
- Other lithium batteries ✓✓

- Lead acid style battery ✓✓
- AMPS lithium battery ✓✓
- Other lithium batteries ✓✓

DC-DC Charging

Sterling Power's DC to DC Battery Chargers - Charging when driving / cruising along

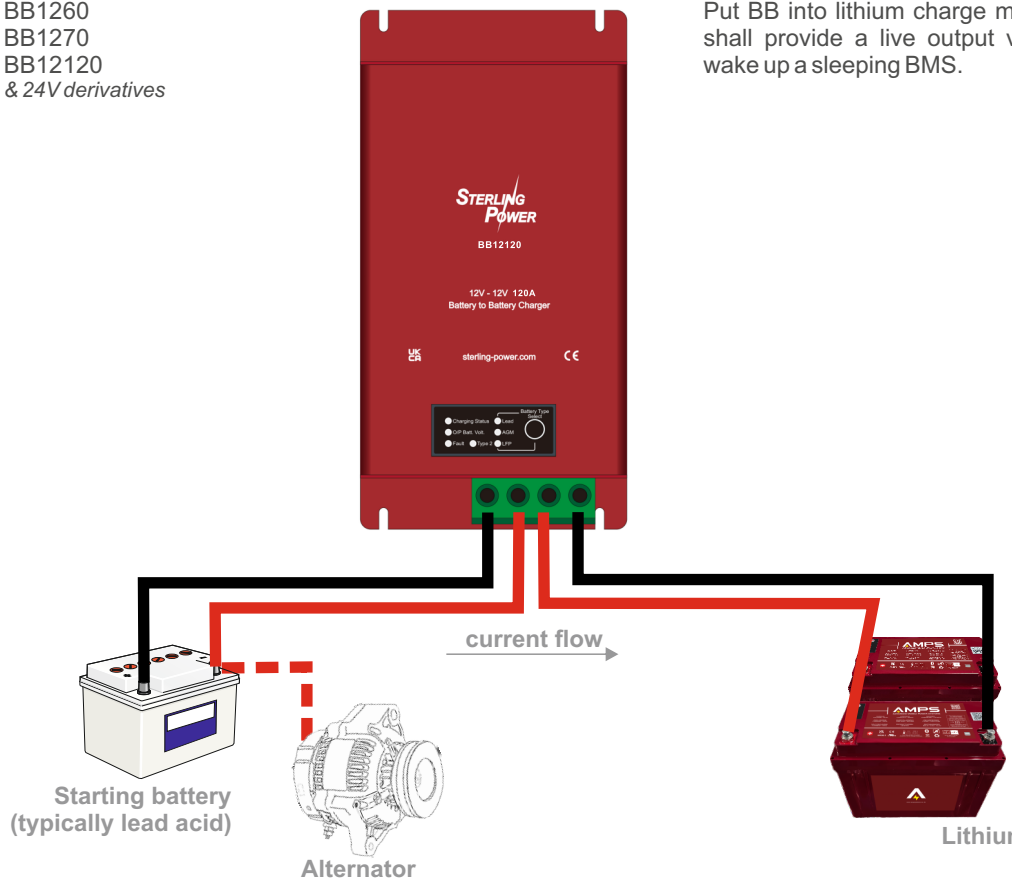
Battery to Battery Chargers / DC to DC chargers provides lithium batteries with the correct charging current and charging voltage.

As above, ensure your DC to DC charger is within the current spec of the battery(s) you wish to charge up.

Also, ensure your DC to DC charger is ~70% or lower than your alternator's current rating. Lithium batteries are prone to asking maximum performance from your alternator - resulting in your alternator over heating.

The DC to DC chargers essentially provide appropriate current levels at the correct voltage charging profile.

- BB1230
- BB1260
- BB1270
- BB12120
- & 24V derivatives



Put BB into lithium charge mode. This shall provide a live output voltage to wake up a sleeping BMS.

Starting battery (typically lead acid)

Alternator

Lithium Battery



2 factors to consider when specifying the charger

1) How fast you wish to charge the battery up, ensure you are within the C rating of the battery / battery bank.

2) Enough power from the charger to run the heating element with the knowledge that you shall need surplus to run additional DC loads (if running).

If in doubt, err towards a higher power rate.

HEATING Activating the heating element

What happens?

When the temperature sensor detects 0DegC or lower on the cells the charging circuit disconnects altogether. Therefore, you can not charge up the battery.

The battery simply sits there allowing current do be drawn from it, if required. But, no current can enter the cells.

This is where the heating elements in the batteries comes in to play.

To activate the heating element there are **no** buttons **nor** setup requirements necessary. You simply require a charger that provides:
 LB12200: ~14V at 15+ (200W+).
 LB12100: ~14V at 8A+ (100W+).

The wattage from the charger shall be used by the heating elements to warm up the cells.

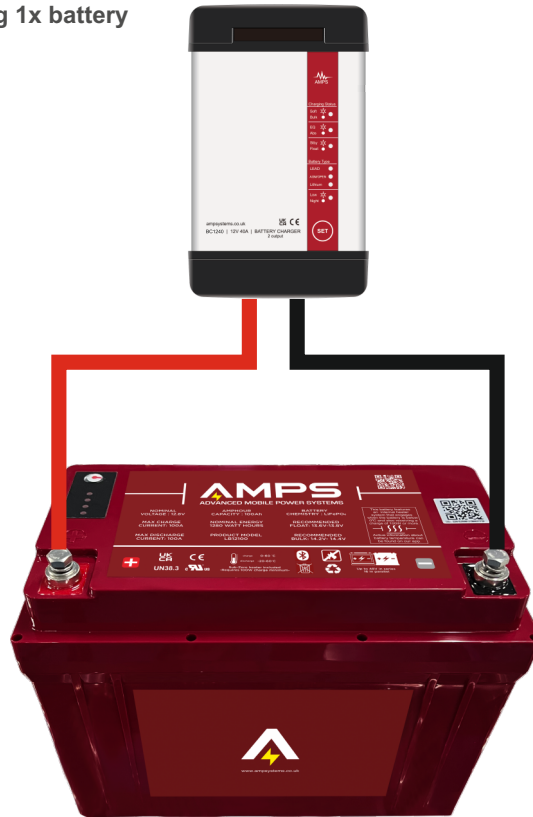
If the wattage is insufficient the heating element shall simply switch off. It shall not partially activate.

Once the cells hit approximately +5DegC, the charge circuit engages and the heating element turns off.

If the cells' temperature drops below 0DegC, again, the charging circuit disconnects and the heating elements turns back on again.

If you have constant DC loads that consumes a proportion of this power, this needs to be taken in to account when specifying your charger's rating.

Charging 1x battery



Obligatory minimum charger size for heater
 LB12100: ~14V at 8A+ (100W+).
 LB12200: ~14V at 15A+ (200W+).

If you wish for the heating element to have any chance of working. If in doubt, go higher in power.

-15DegC -> +5 DegC at -15DegC ambient takes 40 minutes.

-5DegC -> +5DegC at -5DegC ambient takes 20 minutes.

Charging multiple batteries



Obligatory minimum charger size for heater
 2x batteries = 200W+ 100Ah LB12100
 3x batteries = 300W+

2x batteries = 400W+ 200Ah LB12200
 3x batteries = 600W+

Pro-rate for additional batteries

If you wish for the heating element to have any chance of working. If in doubt, go higher in power.

BC Charger	Voltage	Current	Power W
BC1220	12V	20A	288
BC1240	12V	40A	576
BC2420	24V	20A	576



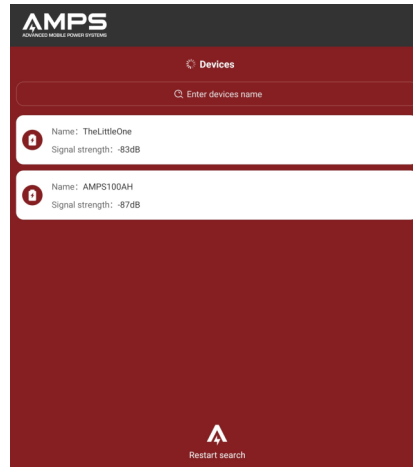
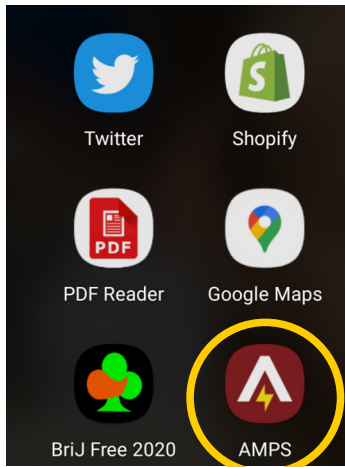
Bluetooth BMS Bluetooth BMS functions and Features

The code for your battery is on a sticker on the side of your battery.

- 1) Please go onto the website to get the app link
- 2) Ensure you have Bluetooth activated on your phone.
- 3) Open the App on your phone follow the steps below:



BMS App looks like this

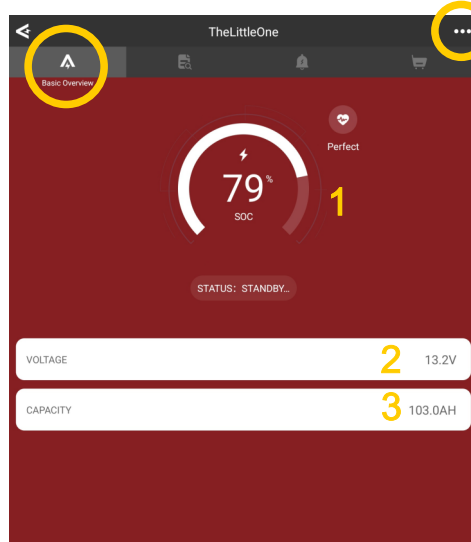


Battery search page

Here is the landing page to search for the battery.

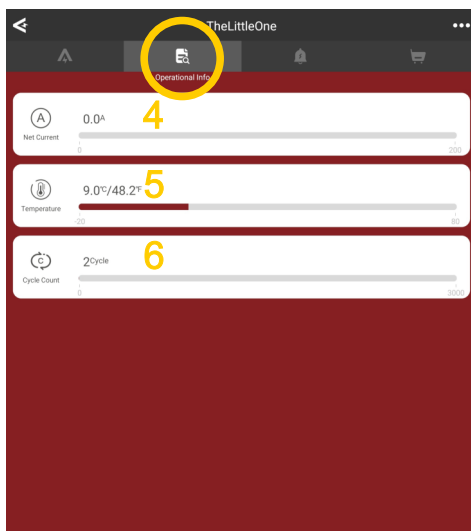
If you only have 1x battery - only 1 device shall appear here. If you have multiple the alphanumeric code for each of the batteries is on a sticker on the side of battery.

Once you have selected the battery you wish to view it may be worth changing the battery name. The 3 dots in the top right hand corner take you through to the name change area. Use passcode 5678 to change name.



This is the main Status Display of the AMPS app. The main features that shall be of greatest interest are as follows:

- 1) SOC (state of charge) - this is given as a % figure. This is a fairly accurate capacity figure of your battery.
- 2) Voltage. This is the voltage of your battery.
- 3) Capacity. The accurate Ah capacity of the battery.



4) Current. This shows current flow - +ve means current coming in and -ve means current leaving.

5) Temperature - this shows the temperature of the cells. This is the average temperature across the 4x strings of batteries - each have their own temperature sensor.

6) Cycles - this is a number of cycle. How many time the battery has been charged and discharged.