



Manual

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EPSILON 12V90Ah



User Manual Epsilon 12V90Ah

Dear customer,

This manual contains all the information necessary to install, use and maintain the Li-ion battery. We kindly ask you to read this manual carefully before using the product. In this manual, the Super B Epsilon 12V90Ah Li-ion battery will be referred to as: the Li-ion battery. This manual is meant for the installer and the user of the Li-ion battery. Only qualified, certified personnel may install and perform maintenance on the Li-ion battery. Please consult the index at the start of this manual to locate information relevant to you.

During the use of the product, user safety should always be ensured, so installers, users, service personnel and third parties can safely use the Li-ion battery.

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1. Safety guidelines and measures

1.1. General

- Do not short-circuit the Li-ion battery.
- Treat the Li-ion battery as described in this manual.
- Do not dismantle, crush, puncture, open or shred the Li-ion battery.
- Do not expose Li-ion battery to heat or fire. Avoid exposure to direct sunlight.
- Do not remove the Li-ion battery from its original packaging until required for use.
- In the event of electrolyte leaking, do not allow the liquid to come in contact with the skin or eyes. If contact has been made, wash the affected area with water and seek medical advice.
- Always use a class 2 charger which is specifically provided for use with a Lithium Iron Phosphate battery (LiFePO4)
- Observe the plus (+) and minus (–) marks on the Li-ion battery and equipment and ensure correct use.
- Do not mix batteries of different manufacture, capacity, size or type within a device.
- Keep the Li-ion battery clean and dry.
- Secondary batteries need to be charged before use. Always use the correct charger and refer this manual for proper charging instructions.
- Do not leave the Li-ion battery on prolonged charge when not in use.
- During long periods of storage maintenance, charging is needed to prevent deep discharge by self discharge
- Retain the original product documentation for future reference.
- Disconnect the Li-ion battery from the equipment when not in use.

⚠ Warning! Keep the Li-ion battery away from water, dust and contamination. Place the Li-ion battery in well ventilated areas.

1.2. Disposal



Dispose the Li-ion battery in accordance with local, state and federal laws and regulations.

Batteries may be returned to the manufacturer.

Do not mix with other (industrial) waste.

2. Introduction

2.1. Product description

The Epsilon 12V90Ah is a Lithium Iron Phosphate rechargeable battery. The unique combination of state-of-the art technology and smart software makes this Li-ion battery a robust, safe and easy to use energy storage solution.

The Li-ion battery uses safe Lithium Iron Phosphate (LiFePO₄) technology. With its integrated battery management system (BMS) the Li-ion battery is protected from deep discharging, overcharging and overheating. Eliminating the need for an external safety relay means the Li-ion battery is very easy to install.

The Epsilon 12V90Ah Li-ion battery also has integrated battery monitoring which provides details about its status such as voltage, current, temperature, state of charge and time remaining. Hands-on monitoring is possible via Bluetooth, external monitoring devices and LED indicators inform you about the actual status of your Li-ion battery.

2.2. Intended use

The Epsilon 12V90Ah Li-ion battery serves as a energy source of 12V in power systems for recreational vehicles, commercial vehicles, leisure boats, commercial vessels and stationary applications. Potential applications of this Li-ion battery include: off grid power supply, marine power supply, medium for (renewable) energy storage and (traction) battery for vehicles. Use as a starter battery is not possible. Never install multiple Li-ion batteries in series. Up to 8 batteries can be connected in parallel to increase the total capacity up to 720Ah. For more Li-ion batteries in parallel always consult with Super B.



2.3. Glossary of Terminology

| | |
|-----------------------|--|
| BMS: | Battery Management System |
| Charge cycle: | A period of use from fully charged, to fully discharged, and fully recharged again |
| Endurance Life-cycle: | The products maximum lifespan, achieved by following the guidelines presented in this manual |
| LiFePO ₄ | Lithium Iron Phosphate |
| SoC: | State of Charge |
| CCCV | Constant Current - Constant Voltage |
| DoD | Depth of Discharge |

Table 1. Glossary of terminology

2.4. Used symbols

The following icons will be used throughout the manual:

-  **Warning!** A warning indicates severe damage to the user and/or product may occur when a procedure is not carried out as described.
-  **Caution!** A caution sign indicates problems may occur if a procedure is not carried out as described. It may also serve as a reminder to the user.

3. Product specifications

3.1. Product features

- Traction battery
- Drop-in replacement for AGM/GEL lead-acid LN5 batteries
- Lithium Iron Phosphate (LiFePO4): Safe lithium technology
- Integrated short circuit protection
- Integrated BMS (Battery-Management system)
- Terminals for 2x M8 bolts
- Integrated protection device for maximum protection and safety
- Communication interface: Bluetooth (wireless) and CANopen (wired)
- Battery monitoring / History Storage
- Adaptive cell balancing
- Monitoring via BeInCharge Bluetooth app for iOS and Android

3.2. Product specifications

3.2.1. Electrical specifications

| | |
|----------------------|---------------|
| Nominal capacity | 90Ah |
| Energy | 1152Wh |
| Nominal voltage | 12.8V |
| Open circuit voltage | 13.2V |
| Self discharge | <3% per month |

Table 2. Electrical specifications

3.2.2. Mechanical specifications

| | |
|--------------------|--|
| Dimensions (LxWxH) | 353 x 175 x 190 mm / 13.9" x 6.9" x 7.5" |
| Weight | 12.5 kg / 27.6 lbs |
| Case material | PBT + PC |

| | |
|-----------------------|-----------------------|
| Ingress protection | IP51 |
| Cell type / chemistry | Cylindrical - LiFePO4 |

Table 3. Mechanical specifications

3.2.3. Charge & discharge specifications

| | |
|----------------------------------|---------------|
| Charge method | CCCV |
| Charge voltage | 14.3V - 14.6V |
| Max charge current | 90A |
| End of discharge voltage | 8V |
| Discharge current continuous | Max. 200A |
| Discharge pulse current (10 sec) | 350A |

Table 4. Charge and discharge specifications

3.2.4. Temperature specifications

| | |
|---|--|
| Charge temperature | -10°C to 45°C / 14°F to 113°F ¹ |
| Discharge temperature | -20°C to 60°C / -4°F to 140°F |
| Storage temperature short term (<1 month) | -10°C to 35°C / 14°F to 95°F |
| Storage temperature long term (>1 month) | 18°C to 28°C / 64°F to 82°F |
| Relative humidity | 10-90% |

Table 5. Temperature specifications

¹When temperature is < 0°C / 32°F and > 45°C / 113°F performance will be degraded. Charging rate between 0°C / 32°F and -10°C / 14°F will become 400mA and 8A between 45°C / 113°F and 60°C / 140°F

3.2.5. Compliance specifications

| | |
|-------------------------|---------------------------------|
| Certifications | CE, FCC, UN 38.3, UN ECE R10.05 |
| Shipping classification | UN 3480 |

Table 6. Compliance specifications

3.2.6. General product specifications

| | |
|---------------------|--|
| Battery designation | IFpR19/67[60p4s]M/-20+60/90 |
| Cycle life | >2000 (1C charge/discharge, DoD 100%) ² |

Table 7. General product specifications

²The cycle life value given above is an indication at 23°C. The Li-ion battery cycle life depends strongly on temperature and the applied charging and discharging loads.

3.3. Environmental conditions

⚠ Warning! The Li-ion battery may only be used in conditions specified in this manual. Exposing the Li-ion battery to conditions outside the specified boundaries may lead to serious damage to the product and/or the user.

Use the Li-ion battery in a dry, clean, dust free, well ventilated space. Do not expose the Li-ion battery to fire, water, solvents or excessive heat.

3.4. Scope of delivery

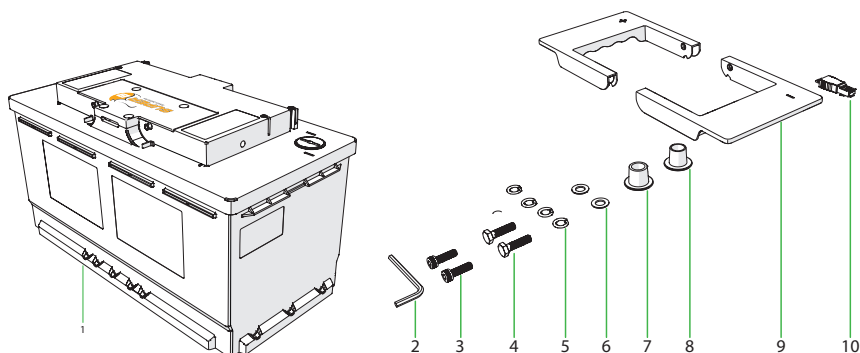


Figure 1. Components

1. (1x) Super B Epsilon 12V90Ah Li-ion battery
2. (1x) Tool (combined 2.5mm/6mm Allen key)
3. (2x) Allen Bolt M8 x 20mm
4. (2x) Hex bolt M8 x 16mm
5. (4x) Spring washer M8
6. (2x) Plain washer M8
7. (1x) Removable automotive battery pole positive
8. (1x) Removable automotive battery pole negative
9. (2x) Removable handles
10. RJ45 CAN Termination resistor

3.5. Connections, indicators and battery controls

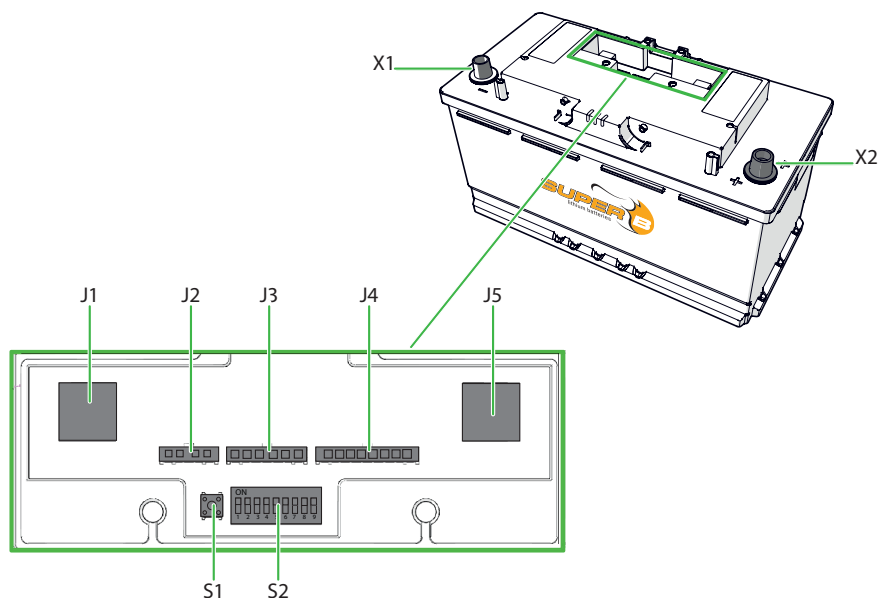


Figure 2. Connections, indicators and battery controls

J1: RJ45 (CAN1)

J2: Inputs 4 Pins

J3: Monitor 6 Pins

J4: Outputs 8 Pins

J5: RJ45 (CAN2)

S1: Push Button

S2: Configuration switch

X1: Battery Terminal up to 1x 95mm² wire connection or standard automotive terminal

X2: Battery Terminal up to 1x 95mm² wire connection or standard automotive terminal

3.5.1. J1 / CAN1 (RJ45)

| PIN # | Service description | Function |
|-------|---------------------|---|
| 1 | CAN High | Communication |
| 2 | CAN Low | Communication |
| 3 | CAN Ground | Communication |
| 4 | Not Connected | - |
| 5 | Not Connected | - |
| 6 | CAN Shield | - |
| 7 | Not Connected | - |
| 8 | CAN Power | Looped through and not used by Li-ion battery |

Table 8. CAN 1 / J1 interface

3.5.2. J2 Inputs (WR-MPC3 3mm Male Header)

| PIN # | Service description | Function Range | Range |
|-------|---------------------|------------------------------|---------------|
| 1 | IN 1A | For future use | + (0...60Vdc) |
| 2 | IN 1B | For future use | - |
| 3 | IN 2A | Storage mode (See chapter 7) | + (0...60Vdc) |
| 4 | IN 2B | Storage mode (See chapter 7) | - |

Table 9. Inputs J2

3.5.3. J3 Monitor (WR-MPC3 3mm Male Header)

| PIN # | Service description | Function | Range |
|-------|-----------------------|----------------|----------------|
| 1 | Battery + | Power | + (5... 18Vdc) |
| 2 | State of Charge (SoC) | SoC Indication | 0...10Vdc |
| 3 | Not Connected | - | - |
| 4 | Not Connected | - | - |
| 5 | LIN | For future use | -45...+45Vdc |
| 6 | Battery - | Power | - |

Table 10. Monitor J3

3.5.4. J4 Outputs (WR-MPC3 3mm Male Header)

| PIN # | Service description | Function | Range |
|-------|---------------------|--------------------------------|--------------|
| 1 | OUT 1A | Generator control ¹ | -60...+60Vdc |
| 2 | OUT 1B | Generator control ¹ | -60...+60Vdc |
| 3 | OUT 2A | Inverter control ² | -60...+60Vdc |
| 4 | OUT 2B | Inverter control ² | -60...+60Vdc |
| 5 | OUT 3A | For future use | -60...+60Vdc |
| 6 | OUT 3B | For future use | -60...+60Vdc |
| 7 | OUT 4A | For future use | -60...+60Vdc |
| 8 | OUT 4B | For future use | -60...+60Vdc |

Table 11. Outputs J

¹Generator control will activate when SoC <20% and will turn off when SoC is 100%

²Inverter control will activate when SoC >25% and will turn off when SoC is <20%

3.5.5. J5 / CAN 2 (RJ45)

| PIN # | Service description | Type of signal to the product |
|-------|---------------------|---|
| 1 | CAN High | Communication |
| 2 | CAN Low | Communication |
| 3 | CAN Ground | Power |
| 4 | Not Connected | - |
| 5 | Not Connected | - |
| 6 | CAN Shield | EMC |
| 7 | Not connected | - |
| 8 | CAN Power | Looped through and not used by Li-ion battery |

Table 12. CAN 2 / J5 interface

3.5.6. S1 Push button

| Service description | Type of signal to the product | Usage |
|---------------------|-------------------------------|--|
| Switch | Input | Single push: reset error /wake up battery Double push: initiate Bluetooth bonding |

Table 13. Switch S1

3.5.7. S2 Configuration Switch

| | CAN | | | Undefined / Spare | | | | | Protocol |
|---|----------|----------|----------|-------------------|----------|----------|----------|----------|---|
| | Switch 1 | Switch 2 | Switch 3 | Switch 4 | Switch 5 | Switch 6 | Switch 7 | Switch 8 | |
| 1 | Off | Off | Off | Off | Off | Off | Off | Off | CAN communication disabled ¹ |
| 2 | Off | On | Off | Off | Off | Off | Off | Off | CANopen enabled |

Table 14. CAN Protocol Configurations

¹When CANopen is switched off, the Li-ion battery will consume less power, see chapter 5.3

3.5.8. X1 / X2, Battery terminals

| PIN # | Service description | Range | Function |
|-------|---------------------|-------------|-------------------------|
| 1 | Battery - Terminal | - | Minus supply of battery |
| 2 | Battery + Terminal | + (14.6Vdc) | Plus supply of battery |

Table 15. Battery terminal interface

3.5.9. Bluetooth

| Service description | Type of signal to the product | Range |
|---------------------|-------------------------------|--------------------|
| Bluetooth | Communication | 10 meter (class 2) |

Table 16. Bluetooth

3.5.10. LED Indicators

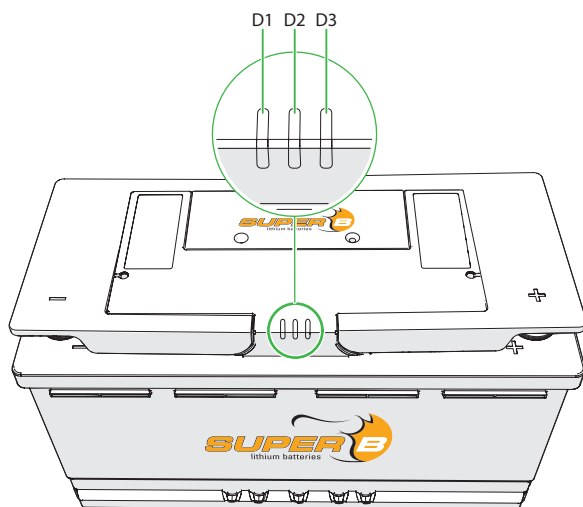


Figure 3. LED Indicators

| | D1 (Green) | D2 (Yellow) | D3 (Red) | Mode |
|---|------------|-------------|----------|--------------------------------------|
| 1 | Off | Off | Off | Empty / Deep discharge/ Storage mode |
| 2 | Off | Off | On | Alarm mode |
| 3 | On | Off | Off | Operational mode |
| 4 | Off | On | Off | Warning mode |

Table 17. LED Mode

When the Li-ion battery is in operational mode “not charging or discharging”, LED indicator flashes every 3 seconds (see for more information Chapter 10 Troubleshooting). The Green and the Red leds will flash 10 times before the Li-ion battery goes to Empty/Deep discharge/ Storage mode.

3.5.11. Operational modes

Empty mode

The Li-ion battery voltage is below 10V.

Deep discharge mode

One of the Li-ion battery cellblocks is below 1.5V. This is even possible when the Li-ion battery is at 10V. The Li-ion battery will store the state internally. The Li-ion battery is not usable anymore.

Storage mode

The Li-ion battery was set to storage mode manually.

Alarm mode

The BMS detects a failure or is used outside its specification. If a critical alarm occurs during operational mode, the mode management function goes to alarm mode.

Operational mode

The Li-ion battery is fully operational. No error is detected.

Warning mode

The Li-ion battery parameters are out of specified limit(s)

3.5.12. System components operation modes dependencies

| Operating mode | Protective disconnect device | Communication* | BMS |
|------------------------|------------------------------|----------------|----------|
| Configuring mode | Open | Yes | Active |
| Operational mode | Closed | Yes | Active |
| Alarm mode | Open | Yes | Active |
| Empty / Deep discharge | Open | No | Inactive |
| Storage mode | Open | No | Inactive |

Table 18. System components operation modes dependencies (*communication is dependent of configuration switch setting)

2.8. Optional Components

| Description | Article name | EAN code |
|-------------------------------|---|-----------------|
| 4 pins 3 mm plug | WR-MPC3, Single Row Female Receptacle Housing, 4 pins, (3.00mm) WR-MPC3 micro power connector (4 positions) | 4200 000 0006 0 |
| 6 pins 3 mm plug | WR-MPC3, Single Row Female Receptacle Housing, 6 pins, (3.00mm) WR-MPC3 micro power connector (6 positions) | 4200 000 0005 0 |
| 8 pins 3 mm plug | WR-MPC3, Single Row Female Receptacle Housing, 8 pins, (3.00mm) WR-MPC3 micro power connector (8 positions) | 4200 000 0004 0 |
| 3 mm pins | WR-MPC3, Male Crimp Terminal, (3.00mm) WR-MPC3 micro power connector contact crimp Pin | 4200 000 0007 0 |
| RJ45 cable | SB RJ45 cable 1 m | 8718531361386 |
| RJ45 termination resistor | SB RJ 45 CAN terminator Epsilon | 8718531361331 |
| BM01 Battery monitor | SB BM01 12V | 8718531361041 |
| BM01 Epsilon Cable | SB BM01 cable Epsilon | 8718531361348 |
| Touch Display + Epsilon Cable | SB Touch display Epsilon + 5m cable | 8718531361454 |
| Push button | Push button | 8718531361515 |
| Auto restart | Auto restart | 8718531361508 |

Table 19. Optional components that can be used with the Li-ion battery

4. Installation

4.1. General information

- ⚠ Warning! 12V systems only.** Never install multiple Li-ion batteries in series.
- ⚠ Warning!** Never install or use a damaged Li-ion battery.
- ⚠ Caution!** Do not reverse connect the power cables (polarity)

When connecting several batteries in parallel, always use batteries of the same brand, type, age, capacity and state of charge.

4.2. Unpacking

Check the Li-ion battery for damage after unpacking. If the Li-ion battery is damaged, contact your reseller or Super B. Do not install or use the Li-ion battery if it is damaged!

4.3. Preparing the Li-ion battery for use

- ⚠ **Caution!** Do not operate the Li-ion battery beyond published maximum specifications.
- ⚠ **Caution!** Charging at deep discharge conditions can lead to venting, excessive heat or thermal runaway of the cells.
- ⚠ **Caution!** This Li-ion battery stores fault conditions internally, like excessive charge current or deep discharge situations. Super B uses this information in the warranty process.
- ⚠ **Warning!** Do not overcharge the Li-ion battery.

4.3.1. Placement of the Li-ion battery

Before it is used, the Li-ion battery must be positioned in such a way that it will not move around in its compartment during use. Use appropriate LN5 fastening brackets for mounting.

4.3.2. Set the Li-ion battery in normal operation mode

The Li-ion battery is pre-programmed in storage mode. Before it is used, the Li-ion battery must be set up in normal operation mode.

The Li-ion battery can be set to normal operation mode by one of the following procedures:

- Press the S1 Push button for 2 seconds.
- Connect the Li-ion battery to the charger (see Chapter 5.2 Charging).
- Charge the Li-ion battery before use.

4.4. Connection wires

Use appropriate wire for the connection wires to prevent overheating and unnecessary losses. Use appropriate fuses matching the wires and load. Super B suggests to use a 95mm² connection wires. Connection wires with smaller diameters can cause overheating or unnecessary losses.

4.4.1. Connecting power cables with automotive type terminals

1. Connect the load or charger to the X2 (+) terminal of the Li-ion battery. (Figure 4)
- ⚠ **Warning!** Do not connect the X1 (-) terminal first as this may lead to short circuits.
2. Connect the load or charger to the X1 (-) terminal of the Li-ion battery. (Figure 4)
3. Ensure both contacts are tightened. (20nm)
4. Place the handle covers over the terminals. (Figure 5)

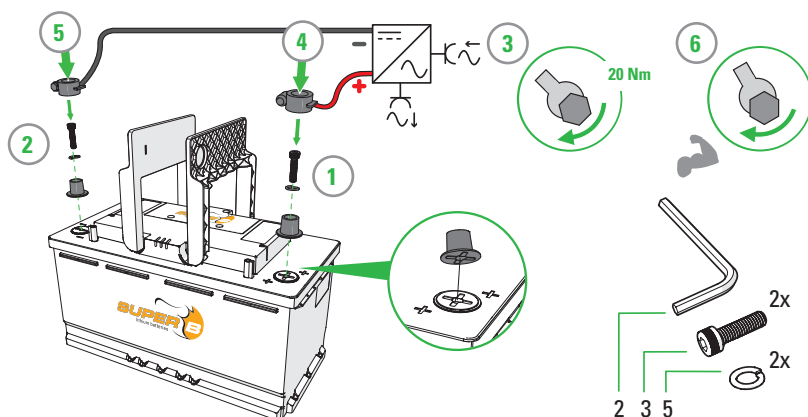


Figure 4. Connecting power cables with automotive type terminals

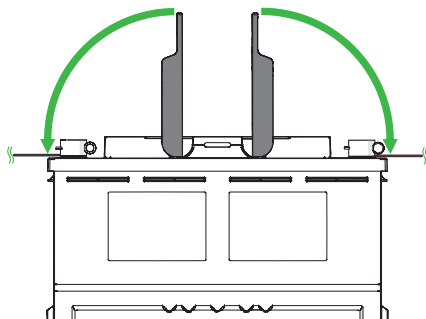


Figure 5. Place the handle covers over the terminals

4.4.2. Connecting shrink fit type of power cables

1. Remove the automotive power terminals. (Figure 6)
2. Connect the load or charger to the X2 (+) terminal of the Li-ion battery. (Figure 7)
Use the included M8 bolt, spring washer and plain washer to connect the Li-ion battery cable.

⚠ Warning! Do not connect the X1 (-) terminal first as this may lead to short circuits.

3. Connect the X1 (-) terminal of the Li-ion battery. (Figure 7)
Use the included M8 bolt, spring washer and plain washer to connect the Li-ion battery cable.
4. Ensure both contacts are tightened to 20Nm.
5. Place the handle covers over the terminals. (Figure 8)

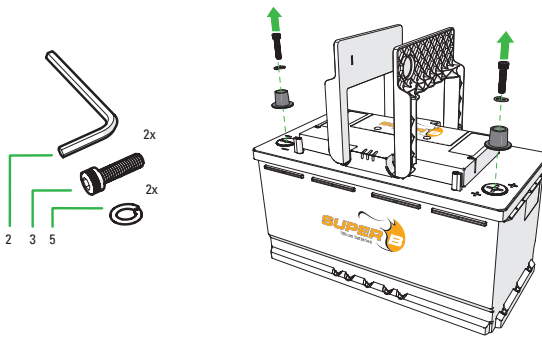


Figure 6. Remove the automotive power terminals.

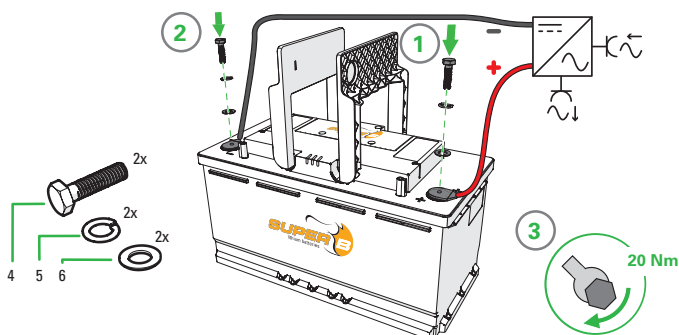


Figure 7. Connecting shrink fit type of power cables

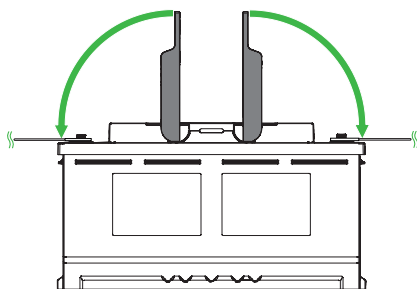


Figure 8. Place the handle covers the terminals

4.4.3. Connecting power cables with automotive type terminals and caps

1. Remove the handle covers.
 - a) Lift the handles 30°. (Figure 9)
 - b) Remove the handles by pulling them outwards. (Figure 10)
2. Connect the load or charger to the X2 (+) terminal of the Li-ion battery. (Figure 11)
- ⚠ **Warning!** Do not connect the X1 (-) terminal first as this may lead to short circuits.
3. Connect the load or charger to the X1 (-) terminal of the Li-ion battery. (Figure 11)
4. Ensure both contacts are tightened.
5. Place the accessory caps over the terminals. (Figure 12)

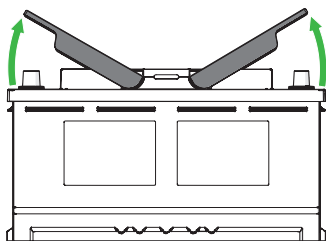


Figure 9. Lift the handles 30°.

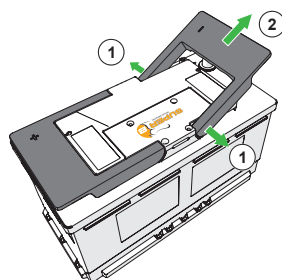


Figure 10. Remove the handles by pulling them outwards.

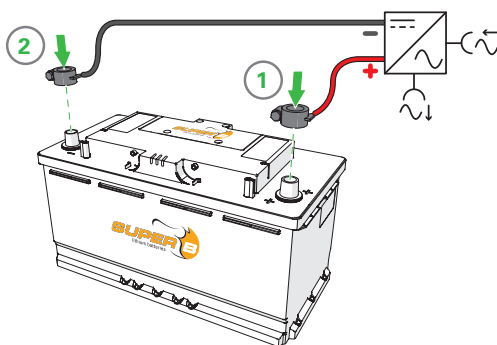


Figure 11. Connecting power cables with automotive type .

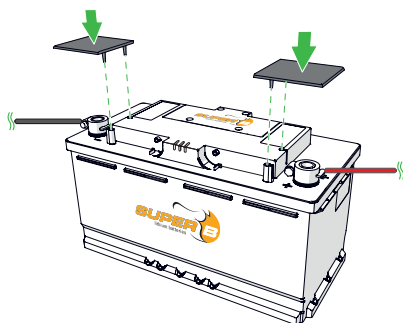


Figure 12. Place the accessory caps over the terminals. Accessory caps are not provided by Super B

4.5. Connecting to the CAN interface (RJ45)

4.5.1. Connecting the data cables

The wired communication interface must be used in a bus network topology (Table 20). Do not use a ring- or a star topology. The wired communication interface specifications restrict the Bus length/Bus speed.

| Bus length (L) | Max. stub length (S) | Accumulated stub length |
|----------------|----------------------|-------------------------|
| 250 m | 11 m | 55m |

Table 20. Wired network interface cable lengths

CAN Cables

Use a standard UTP cable to connect the Li-ion battery to your application.

Termination Resistors

A high-speed bus requires termination at the two ends of the bus.

Use termination resistors at the end nodes to impede reflections on the line. The value of this resistor should be +/- 120 ohms.

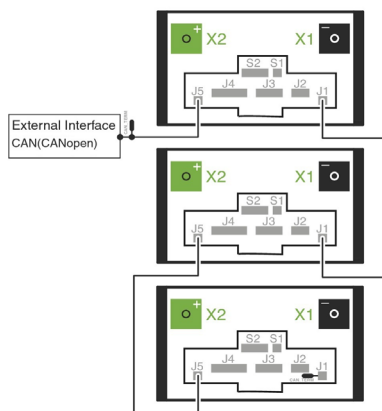


Figure 13. Example of connecting the data cables of 3 batteries with an external Interface (3x CAT5e FTP network cable, 2x RJ45 Terminators)

4.6. Connecting a charger to the Li-ion battery

⚠ Warning! Ensure you have completed all the previous steps described in chapter 4 before connecting the Li-ion battery to the charger.

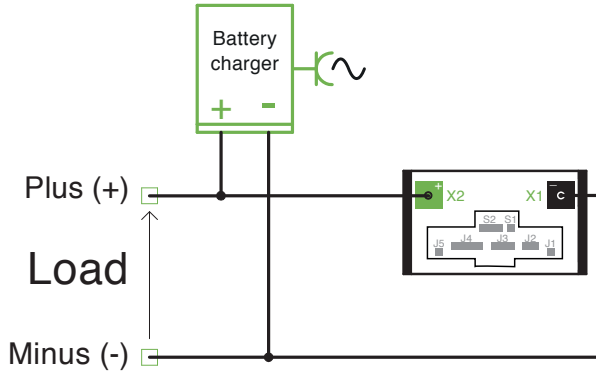


Figure 14. Connecting a charger to the Li-ion battery

4.7. Connecting Li-ion batteries in parallel

The max. number of Li-ion batteries in parallel is 8. To divide the current equally amongst batteries, use the schematic bellow:

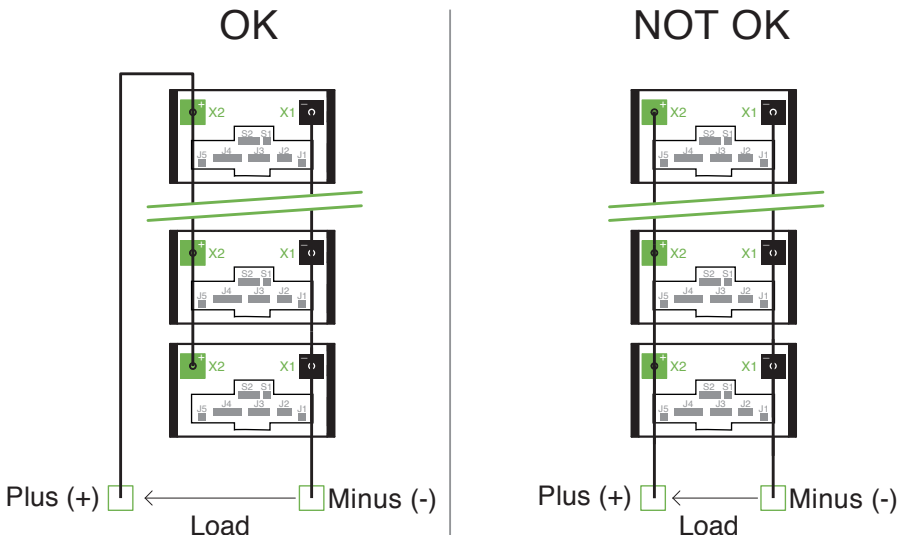


Figure 15. Connecting Li-ion batteries in parallel

OK: Equally divided battery current.

All batteries contribute equally to the current into the load.

NOT OK: Current not equally divided.

Batteries closest to load will have the highest contribution to the current into the load.

Whereas batteries further away from load will have lesser current contribution.

Wear and tear will be higher on the battery close to the load.

4.8. Disconnecting the Li-ion battery

1. Turn off any device or charger the Li-ion battery is connected to.
2. Disconnect the negative wire from the - terminal of the Li-ion battery.
3. Disconnect the positive wire from the + terminal of the Li-ion battery.

5. Battery use

5.1. General information

⚠ Warning! Follow the safety guidelines and measures of chapter 1.

⚠ Caution! Charge the Li-ion battery before use.

5.2. Charging

⚠ Warning! Never charge the Li-ion battery with a charging current larger than 1C.

⚠ Warning! Stop charging in case the Li-ion battery switches into warning mode.

⚠ Caution! Disconnect the charger from the Li-ion battery if it is not used for a long time.

⚠ Caution! To charge the Li-ion battery, use a charger which is suitable for charging Lithium Iron Phosphate batteries.

1. Connect the charger to the Li-ion battery as described in paragraph 4.6.

2. Charge the Li-ion battery in case of an under-voltage shutdown or if the state of charge drops below 20% to preserve the lifespan of the Li-ion battery.

5.2.1. Charging rate

The Li-ion battery can be charged in approximately 1 hour. Displayed in Table 21 are the charge times for the Li-ion battery at different charge currents. Always use the indicated charge current and end of charge voltage during charging.

| Charging rate | | |
|---------------|--------|----------------|
| | Time | Charge current |
| Maximum | 1 hour | 1C (90A) |

| | | |
|---------------------|---------|----------|
| Endurance lifecycle | 3 hours | C3 (30A) |
|---------------------|---------|----------|

Table 21. Charging rates at different charge currents

5.2.2. Battery balancing

The BMS automatically balances the cells if necessary. The Li-ion battery can be used normally during balancing. Balancing ensures all cells are at the same voltage level and enhances usable battery capacity.

5.3. Li-ion battery self consumption

When CANopen communication is switched on, the Li-ion battery consumes more energy. (see paragraph 3.5.7 Configuration Switch)

| Communication setting | Li-ion battery self consumption |
|----------------------------|---------------------------------|
| CAN communication enabled | 0.7 Ah per day |
| CAN communication disabled | 0.4 Ah per day |

Table 22. Li-ion battery self consumption

5.4. Battery History Recording

The complete Li-ion battery history is stored inside the Li-ion battery and can be accessed by your reseller or by Super B.

6. Inspection and cleaning

6.1. General information

⚠ Warning! Never attempt to open or dismantle the Li-ion battery! The inside of the Li-ion battery does not contain serviceable parts.

1. Disconnect the Li-ion battery from all loads and charging devices before performing cleaning and maintenance activities (see paragraph 4.8).
2. Place the enclosed protective caps over the terminals before cleaning and maintenance activities to avoid the risk of contacting the terminals.

6.2. Inspection

1. Inspect for loose and/or damaged wiring and contacts, cracks, deformations, leakage or damage of any other kind. If damage to the Li-ion battery is found, it must be replaced. Do not attempt to charge or use a damaged Li-ion battery. Do not touch the liquid from a ruptured Li-ion battery.
2. Routinely check the Li-ion battery's SoC. Lithium Iron Phosphate batteries continue to slowly self-discharge (<3% per month) when not in use or stored (see paragraph 5.3).
3. Consider replacing the Li-ion battery with a new one if you note either of the following

conditions:

- The Li-ion battery run time drops below about 80% of the original run time.
- The Li-ion battery charge time increases significantly.

6.3. Cleaning

If necessary, clean the Li-ion battery with a soft, dry cloth. Never use liquids, solvents, or abrasives to clean the Li-ion battery.

7. Storage

Follow the storage instructions in this manual to optimize the lifespan of the Li-ion battery during storage. If these instructions are not followed and the Li-ion battery has no charge remaining when it is checked, consider it to be damaged. Do not attempt to recharge or use it. Replace it with a new Li-ion battery.

See chapter 3.2.4 for storage temperature conditions.

The self-discharge of the Li-ion battery is <3% per month.

⚠ Warning! Always set the Li-ion battery in storage mode before storage.

The Li-ion battery can be set in storage mode via the BelnCharge mobile application or by using the external “push button”.

1. Charge the Li-ion battery to > 80% of its capacity before storage.
2. Disconnect the Li-ion battery from all loads and, if present, the charging device.
3. Set the Li-ion battery in storage mode.
4. Place the terminal covers over the Li-ion battery's terminals during storage.
5. Charge the Li-ion battery to > 80% of its capacity every 100 days. After charging ,set the Li-ion battery in storage mode again.

8. Transportation

Always check all applicable local, national, and international regulations before transporting a Li-ion Iron Phosphate battery.

Transporting an end-of-life, damaged, or recalled Li-ion battery may, in certain cases, be specifically limited or prohibited.

The transport of the Li-ion battery falls under hazard class UN3480, class 9. For transport over water, air and land, the Li-ion battery falls within packaging group PI965 Section II.

9. Disposal and recycling

Always discharge the Li-ion battery before disposal. Use electrical tape or other approved covering over the Li-ion battery connection points to prevent short circuits.

Li-ion battery recycling is encouraged. Dispose of the Li-ion battery in accordance with local, state and federal laws and regulations. Batteries may be returned to the manufacturer.

10. Troubleshooting

| Problem | Possible situation | Solution |
|--|--|---|
| The Li-ion battery cannot be discharged. | Li-ion battery is in operation mode Green LED is lit or flashing. (Chapter 3.5.10) | Check the installation of the Li-ion battery. |
| | Li-ion battery is in storage mode. No LED is lit or flashing (Chapter 3.5.10) | Charge the Li-ion battery or Press the S1 Push button for 1 second. |
| | Li-ion battery is in storage mode because it is empty. No LED is lit or flashing. (Chapter 3.5.10) | Charge the Li-ion battery. |
| | Red LED is flashing: alarm mode is active. The temperature of the Li-ion battery is too high. (Chapter 3.5.10) | Disconnect the Li-ion battery from load/charger and wait for it to cool down. |
| | Red LED is flashing: alarm mode is active. The discharge currents or too high. (Chapter 3.5.10) | Apply charge current or press the S1 push button. |

| | | |
|---|--|--|
| The Li-ion battery cannot be charged. | Li-ion battery is in operation mode. Green LED is lit or flashing.(Chapter 3.5.10) | Check the installation of the Li-ion battery. |
| | Li-ion battery is in alarm mode because the charging voltage is too high. Red LED is lit or flashing. (Chapter 3.5.10) | Verify that the charging voltage is within the Li-ion battery specifications. (Chapter 3.2) Discharge the Li-ion battery or press the S1 push button for 1 second. |
| | Li-ion battery is in alarm mode because of high temperature. Red LED is lit or flashing. (Chapter 3.5.10) | Disconnect the Li-ion battery from load/ charger and wait for it to cool down. |
| | Li-ion battery is in alarm mode because of too high charge current. Red LED is lit or flashing (Chapter 3.5.10) | Discharge the Li-ion battery or press the S1 push button |
| The capacity of the Li-ion battery has decreased. | The cells within the Li-ion battery are not properly balanced or the Li-ion battery is worn out. | Perform one full charge (100% SoC) cycle to balance the cells. |
| Bluetooth errors / connection problems | Connection rejected | Remove Bluetooth pairing from device settings. Verify no other device is using the Bluetooth connection. |
| | Cannot put the Li-ion battery in storage mode | Make sure the device is bonded by double pressing the S1 push button |
| | Update takes very long | Solved when using software >2.5.0 |
| | App can't find the Li-ion battery | Make sure the Li-ion battery is not in sleep / storage mode. Li-ion batteries using older software (<2.5.0) are susceptible for having connection issues. Try resetting the Li-ion battery by using the sleep button attached to connector J2. |
| Touch display errors | Touch display show CAN error | Ensure the dip switch is set correctly (1 down, 2 up, 3 down). Make sure the CAN bus is terminated by the orange terminator. |
| | Touch display doesn't show all batteries in bank but does not show an error | Go to the settings menu and press 'Start scan'. |

| | | |
|--|--|--|
| | Touch display alternates SoC of two batteries instead of showing them separately | Two batteries have the same CAN ID. (1) Set Dipswitch 8 to ON, put the Li-ion battery to sleep. (2) Set Dipswitch 8 to OFF, wake up the Li-ion battery. (3) Touch display: go to the settings menu and press 'Start scan' |
|--|--|--|

Table 23. Troubleshooting

11. Warranty and liability

11.1 Upon delivery the customer is obliged to immediately verify whether the products have been damaged during transport. In the event that any such damage has arisen, the customer must notify Super B thereof as soon as possible, in any event no later than three (3) days of delivery, by means of accurate, written statement, stating the damage and where possible a photograph. Failure to inspect the products and inform Super B within the stated time or the use of the products at any time shall be conclusive evidence that Super B has satisfactorily tendered delivery.

11.2 In the event that the customer demonstrates that any of the delivered products do not conform to the agreement, Super B (at its option, upon having received those products returned by the customer) has the option to either repair or replace such products by new products, or to refund the invoice value, exclusive of any dispatch costs.

11.3 Super B grants a three year limited warranty for damages caused by manufacturing defects starting at the time of delivery. Damages caused by manufacturing defects do not include damage resulting from (a) general wear and tear, (b) short circuit, (c) overcharging, (d) deep discharging, (e) overheating of Super B products (f) installation of the Super B product by persons unskilled to work with electro-technical devices or components, (g) any other wrongful use contrary to the Super B's user manual or the safety instruction, (h) any use contrary to the product specifications of that product; (i) any acts of force majeure.

11.4 The warranty period for parts of the product which have been repaired or replaced under the warranty, shall be twelve (12) months from the date of repair or delivery of the replacement.

11.5 Except as specified in the clause 11.3 and 11.4 Super B makes no warranty, whether express or implied, including without limitation any implied warranty of merchantability and fitness for a particular purpose or any warranty arising from any course of dealing, course of performance or usage of trade and specifically disclaims any representation or warranty that

the product will meet customer's requirements, perform any specific function or achieve a desired result other than expressly stated by Super B in writing.

11.6 Any liability to the customer in any case ceases to apply in the event that the customer fails to notify Super B of the existence of the defect within ten (10) days of having discovered the defect, in writing, in order to enable Super B to investigate the damage. Some of Super B's products electronically store usage data, including charging/discharging data, in order to enable Super B to analyse such data retroactively when investigating damage.

11.7 Any liability of Super B for damage suffered by the customer is in any case limited to the invoice amount of the relevant products, unless such damage has been caused by gross negligence or willful misconduct of Super B. Super B can never be held liable for (a) damage caused by any of the circumstances mentioned in clause 11.3, leading to damage to the Super B products or to any other device located near those products, or (b) consequential damage, including but not limited to loss of profit, loss of production, loss of business interruption, loss of product and loss of capacity irrespective of the cause of such consequential loss or (c) goodwill.

11.8 To the extent that a court determines that the limitation of liability as meant in clause 11.7 cannot be invoked against a particular claim for damages by the customer, Super B's liability for loss of property, damage to property, and bodily injury (including death) caused by the application of those particular Super B products shall in any event be limited to the amount actually paid out by Super B's insurance company to Super B in accordance with the insurance cover of that insurance policy for that particular type of damage. Super B has taken out insurance against certain risks, as described in the respective insurance policies. These policies contain a usual limitation of insurance payment to be paid out to Super B if, and to the extent that, the event is a covered event.



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