# Installation Manual


## Lithium Battery Pack

# SOLUNA 15K Pack HV

## Suitable for indoor installations

## DLG Energy (Shanghai) Co., Ltd

## August 2020 Version V1b

# About this manual

This manual describes how to install the DLG Energy (Shanghai) Co.,Ltd of Soluna 15K PACK HV. Read this manual before you attempt to install the product, and follow the instructions throughout the installation process.

If you are uncertain about any of the requirements, recommendations, or safety procedures described in this manual, contact DLG Energy (Shanghai) Co.,Ltd immediately for advice and clarification.

The information included in this manual is accurate at the time of publication. however, with regards to the product design and technical specification updates, our company reserves the right to make changes at any time without prior notice. e. In addition, the illustrations in this manual are meant to help explain system configuration concepts and installation instructions. The illustrated items may differ from the actual items at the installation location.

Please search the products sections of the websites www.soluna.com.au or www.solunabattery.com to confirm that you are reading the latest version of the Installation Manual. Please search for the Australian version.

Version Information

| Version | Date | Content | Author |
|---|---|---|---|
| V1.0 | May 2020 | First edition | Henry |
| V1b | August 2020 | Updated indoor version | Louis |
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# 1. Safety precautions

### Warning Sign

Warning signs are used to warn you about the conditions that may cause severe injury or damage to the device. They instruct you to exercise caution to prevent danger. The following table describes the warning signs used in this manual.

| Sign | Description |
|---|---|
|  | This battery pack contains high voltage which can cause electric shock resulting in severe injury. |
|  | Make sure that the battery polarity is connected correctly. |
|  | Keep the battery pack away from open flame or ignition sources |
|  | Keep the battery pack away from children. |
|  | Read the manual before installing and operating the battery pack. |
|  | The battery pack is heavy enough to cause severe injury |
|  | The battery pack may leak corrosive electrolyte. |
|  | The battery pack may explode. |
|  | The battery pack should not be disposed with household waste at the end of its working life. |
|  | Physical injury or damage to the devices may occur if related requirements are not followed |

## Safety instructions

For safety reasons, installers are responsible for familiarising themselves with the contents of this manual and all warnings before performing installation.

## General safety precautions

| | |
|---|---|
|  | Failure to observe the precautions described in this section can cause serious injury to persons or damage to property, observe the following precautions |

## Risks of explosion

1) Do not subject the battery pack to strong impacts.
2) Do not crush or puncture the battery pack.
3) Do not dispose of the battery pack in a fire.

## Risks of fire

1) Do not expose the battery pack to temperatures in excess of 60°C.
2) Do not place the battery pack near a heat source, such as a fireplace.
3) Do not expose the battery pack to direct sunlight.
4) Do not allow the battery connectors to touch conductive objects such as wires.

## Risks of electric shock

1) Do not disassemble the battery pack.
2) Do not touch the battery pack with wet hands.
3) Do not expose the battery pack to moisture or liquids.
4) Keep the battery pack away from children and animals.

## Risks of damage to the battery pack

1) Do not allow the battery pack to come in contact with liquids.
2) Do not subject the battery pack to high pressures.
3) Do not place any objects on top of the battery pack.

## Battery handling guide

1) Use the battery pack only as directed.
2) Do not use the battery pack if it is defective, appears cracked, broken or otherwise damaged, or fails to operate broken or otherwise damaged, or fails to operate.
3) Do not attempt to open, disassemble, repair, tamper with, or modify

the battery pack. The battery pack is not user serviceable.

4) To protect the battery pack and its components from damage when transporting, handle with care.
5) Do not impact, pull, drag or step on the battery pack.
6) Do not subject it to any strong force.
7) Do not insert foreign objects into any part of the battery pack.
8) Do not use cleaning solvents to clean the battery pack.

**Response to emergency situations**

The Soluna 15K PACK HV battery pack comprises multiple batteries that are designed to prevent hazards resulting from failures. However, DLG cannot guarantee their absolute safety.

**Leaking batteries**

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. Electrolyte is corrosive and contact may cause skin irritation and chemical burns. If one is exposed to the leaked substance, do these actions:

1. Inhalation

   Evacuate the contaminated area, and seek medical attention immediately.
2. Eye contact

   Rinse eyes with flowing water for 15 minutes, and seek medical attention immediately.
3. Skin contact

   Wash the affected area thoroughly with soap and water, and seek medical attention immediately.
4. Ingestion

   Induce vomiting, and seek medical attention immediately.
5. Fire

   In case there is a fire, always have an ABC or carbon dioxide extinguisher.

| | |
|---|---|
|  | The battery pack may catch fire when heated above 150°C.<br>If a fire breaks out in the location where the battery pack is installed, do these actions: |

1) Extinguish the fire before the battery pack catches fire.
2) If it is impossible to extinguish the fire but you have time, move the battery pack to a safe area before it catches fire.
3) If the battery pack has caught fire, do not try to extinguish the fire. Evacuate people immediately.

| | |
|---|---|
|  | If the battery catches fire, it will produce noxious and poisonous gases. Do not approach. |

### Wet batteries

If the battery pack is wet or submerged in water, do not try to access it. Contact DLG or your distributor for technical assistance.

### Damaged batteries

Damaged batteries are dangerous and must be handled with extreme caution. They are not fit for use and may pose a danger to people or property.

If the battery pack seems to be damaged, pack it in its original container, and then return it to DLG or your distributor.

| | |
|---|---|
|  | Damaged batteries may leak electrolyte or produce flammable gas. If you suspect such damage, immediately contact DLG for advice and information. |

### Qualified installers

This manual and the tasks and procedures described herein are intended for use by skilled workers only. A skilled worker is defined as a trained and qualified electrician or installer who has all of the following skills and experience:

1) Knowledge of the functional principles and operation of on-grid systems.
2) Knowledge of the dangers and risks associated with installing and using electrical devices and acceptable mitigation methods.
3) Knowledge of the installation of electrical devices
4) Knowledge of and adherence to this manual and all safety precautions and best practices.

### Safety gear

Wear the following safety gear when dealing with the battery pack. Installers must meet the relevant requirements of international standards, such as IEC 60364, or the domestic legislation.

| Item | Photo | Name |
|---|---|---|
| 1 |  | Insulated gloves |
| 2 |  | Safety goggles |
| 3 |  | Safety shoes |

# 2. Product Introduction

The Soluna 15K PACK HV is an NCM lithium battery product with a BMS (Battery Management System). It is a high-voltage battery module with CAN communication, under-voltage, over-voltage, over-current, over-temperature, under-temperature protection functions. It has the characteristics of high energy density, long life, safety and reliability and so on, and It is your trustworthy green environmental product

**Features**

1) Excellent safety performance.
2) Long cycle life.
3) Support for CAN-communication.
4) High energy density
5) Excellent battery management system

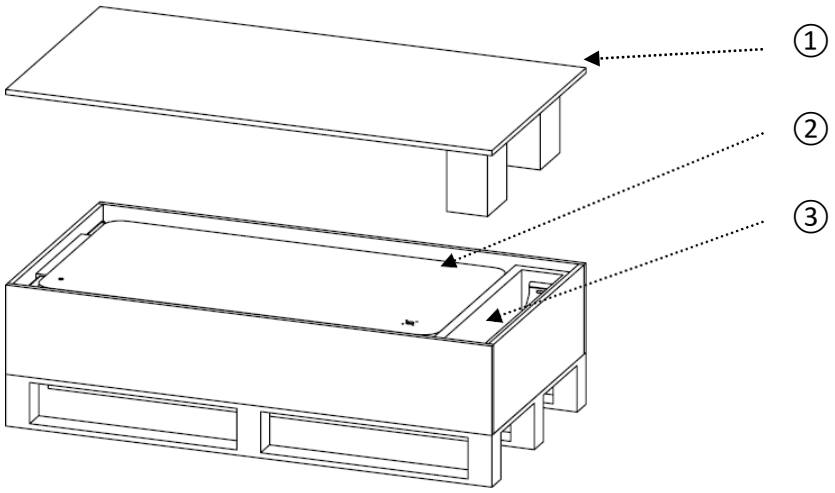
**Application**

1) Back-up power
2) Micro-grid
3) Home Energy Storage system

**Unpacking the package**

**Packing box**

Remove the nails from the wooden case with a claw hammer and open the wooden case, then, remove the wooden board .




| Number | Name | Remark |
|---|---|---|
| ① | Wooden board | |
| ② | Soluna 15K PACK HV | |
| ③ | Accessory Box | |

Pull out the battery pack and stand it upright. Check if the battery pack is damaged. All the other items are contained in a box in one corner of the carton. Take them out and check if any item is missing.

***Keep the carton for future storage or transportation***

**Packing lists**

The following table lists the numbers of each item included. If anything is damaged or missing, contact DLG or your distributor.

| Item | Name | Qty (pcs) | Remark |
|---|---|---|---|
| 1 | Soluna 15K PACK HV | 1 | |
| 2 | PE wire | 1 | |
| 3 | Inner-hexagon wrench(3.0) | 1 | |
| 4 | Inner-hexagon wrench(4.0) | 1 | |
| 5 | Inner-hexagon screw (M4) | 4 | |
| 6 | Inner-hexagon screw （M6） | 2 | |
| 7 | Phillips screw（M6） | 10 | |
| 8 | Expansion screw | 8 | |
| 9 | CAN communication wire | 1 | |

**Installation materials**

These installation materials shall be prepared by installers.

1) Charging cables
2) Network cables

**Installation location**

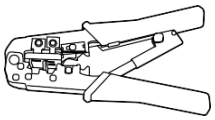
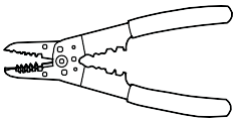
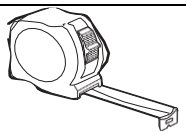
Make sure that the installation location meets the following conditions:

1) The building is designed to withstand earthquakes.
2) The location is internal and out of direct sunlight.
3) The floor is flat and level.
4) There are no flammable or explosive materials nearby.
5) The ambient temperature is between 15 and 30°C.
6) The temperature and humidity remain at a constant level.
7) There is minimal dust and dirt in the area.
8) There are no corrosive gases present, including ammonia and acid vapor.

| | |
|---|---|
| ⚠ | If the ambient temperature is outside the operating range, the battery pack stops operating to protect itself. The optimal temperature range for the battery pack to operate is 15°C to 30°C. Frequent exposure to harsh temperatures may deteriorate the performance and lifetime of the battery packs. |

**Installation tools**

The following tools are required to install the battery pack:

| Item | Photo | Name |
|---|---|---|
| 1 |  | Phillips-screwdriver bit |
| 2 |  | Network crimper |
| 3 |  | Wire cutters |
| 4 |  | Wire stripper |
| 5 |  | Tape measure |

Use properly insulated tools to prevent accidental electric shock or short circuits. Use adjustable tools and measuring instruments that are certified for precision and accuracy.

**Outline Dimension**

Depth

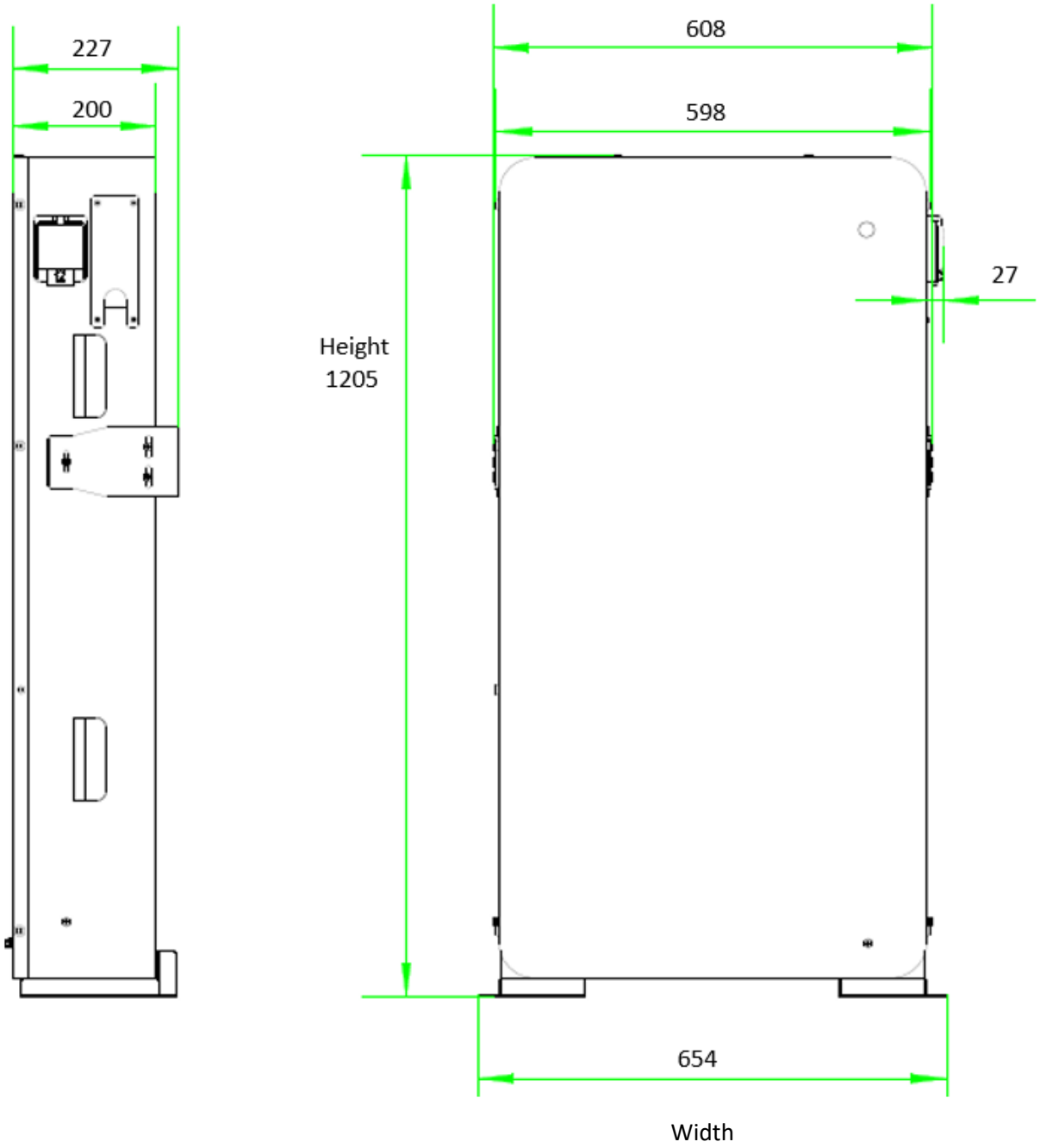



Figure 2.1 outline dimension

| | | |
|---|---|---|
| **Width** | 654±2 | mm |
| **Depth** | 227±2 | mm |
| **Height** | 1205±3 | mm |
| **Weight** | 148 | kg |

## Technical data

### Physical Characteristics

| | |
|---|---|
| Width | 654±2mm |
| Depth | 227±2mm |
| Height | 1205±3mm |
| Weight | 148kg |

Electrical Characteristics

| | |
|---|---|
| Battery type | NCM |
| Total Energy Capacity | 15 kWh |
| Usable Energy Capacity | 12 kWh |
| Battery Capacity | 36.6 Ah |
| Voltage Range | 350~478V |
| Nominal Voltage | 410V |
| Charge Voltage (CV) | 478V |
| Discharge Voltage | 342V |
| Charge/Discharge Current (Nominal) | 15A/15A |
| Max. Charge/Discharge Current | 30A/30A |
| Charge/Discharge Power (Nominal) | 6 kW |
| Max .Charge/Discharge Power | 10 kW |
| DOD | 80% |
| Cycle life | ≥3600 |
| Battery Pack Round-Trip Efficiency | >95% |
| DC Disconnect | Contactor Fuse |

BMS

| | |
|---|---|
| Power consumption | ≤100mA (work), ≤0.1mA (sleep) |
| Monitoring parameters | System Voltage, System Current Cell Voltage, Cell temp |
| Communication | CAN |

Operating Conditions

| | |
|---|---|
| Operating Temperature | -10~45 ℃ |
| Operating Temperature (Recommended) | 15~30 ℃ |
| Storage Temperature | -20~60 ℃ |
| Humidity | 5%~95% |
| Altitude | Max. 2,000 m |
| Cooling Strategy | Natural Convection |

Reliability & Certification

| | |
|---|---|
| Certificates | Cell：UL1642 Battery：IEC62619 & UL1973 |
| Hazardous Materials Classification | Class 9 |
| Transportation | UN38.3 |
| Ingress Rating | IP54 |

**Appearance**

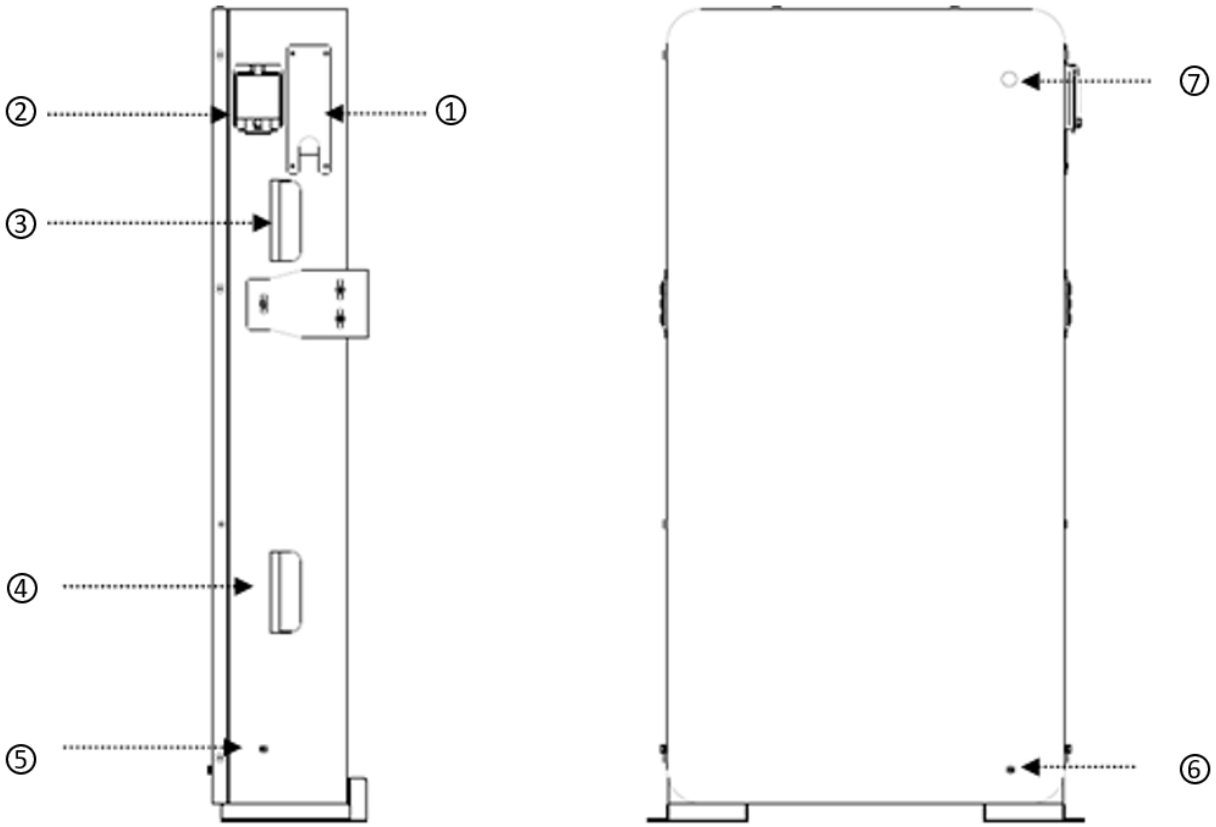



Figure 2.2 Appearance

| Number | Name | Remark |
|---|---|---|
| ① | Cable entry | |
| ② | Power ON/OFF | |
| ③ | Upper handle | |
| ④ | Lower handle | |
| ⑤ | Grounding | |
| ⑥ | Grounding | |
| ⑦ | Power light | |

**Wiring port**

User can see the wiring port of Soluna 15K PACK HV after the cover cap opened, please see the below picture in
details

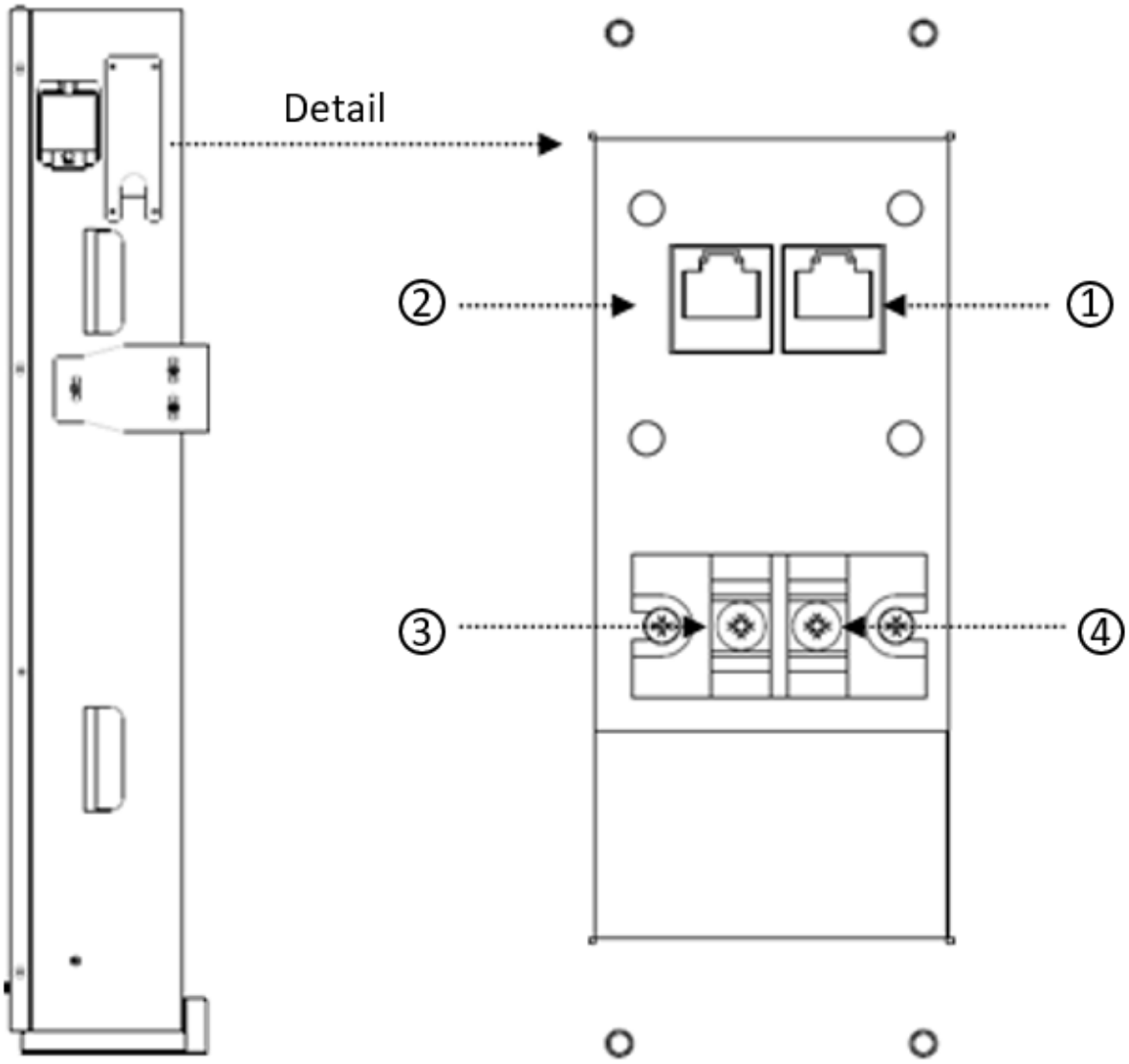



Figure 2.3 wiring port

| Number | Name | Remark |
|---|---|---|
| ① | CAN1 port | For external communication (inverter) |
| ② | CAN2 port | For internal communication (BMS) |
| ③ | Battery '+' | |
| ④ | Battery '-' | |

# 3 Installation

| | |
|---|---|
|  | The battery pack is too heavy for one to carry. Make sure that two or more persons are available。 |

Note: An external bipole circuit breaker is required for battery output. During installation, an external bipole DC isolator is required.

**Spacing during installation and operation**

To ensure proper ventilation during installation, where possible, please reserve 200cms in all directions around the BESS.

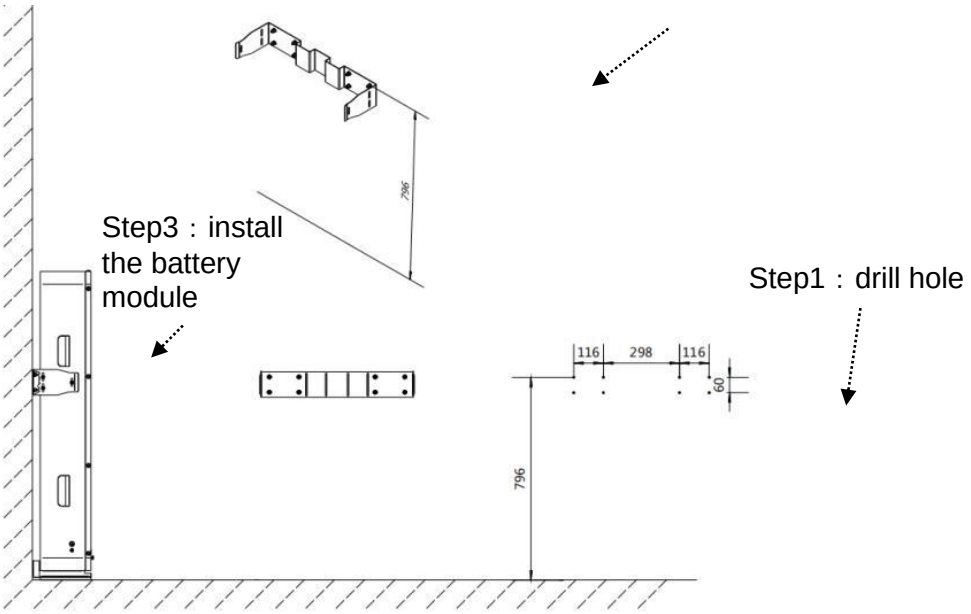
| Position | Min spacing | Remark |
|---|---|---|
| Side spacing | 100cm | There needs to be a clearance of 100cm on either side of the Soluna BESS |
| Above | 40cm | Nothing should be placed on top of the battery, allow a clearance of 40cm |
| Below | | Always use the supplied floor mounting brackets. The bracket heights are adjustable to allow the installer to ensure the unit is level when installed. The minimum height is the bottom of the bracket. |
| Backspacing | 10cm | It needs to be installed against the wall |

Note:
For detailed requirements about the narrowest maintenance channel, escape route, etc. refer to the applicable standards of the country/region where the project is located.

**Installation requirement**

The Soluna 15K Pack HV should be installed against the wall. Eight holes should be drilled on the wall in order to fix the racks of the battery module.
Please find the following pictures for details.

**Screw the brackets to the wall**

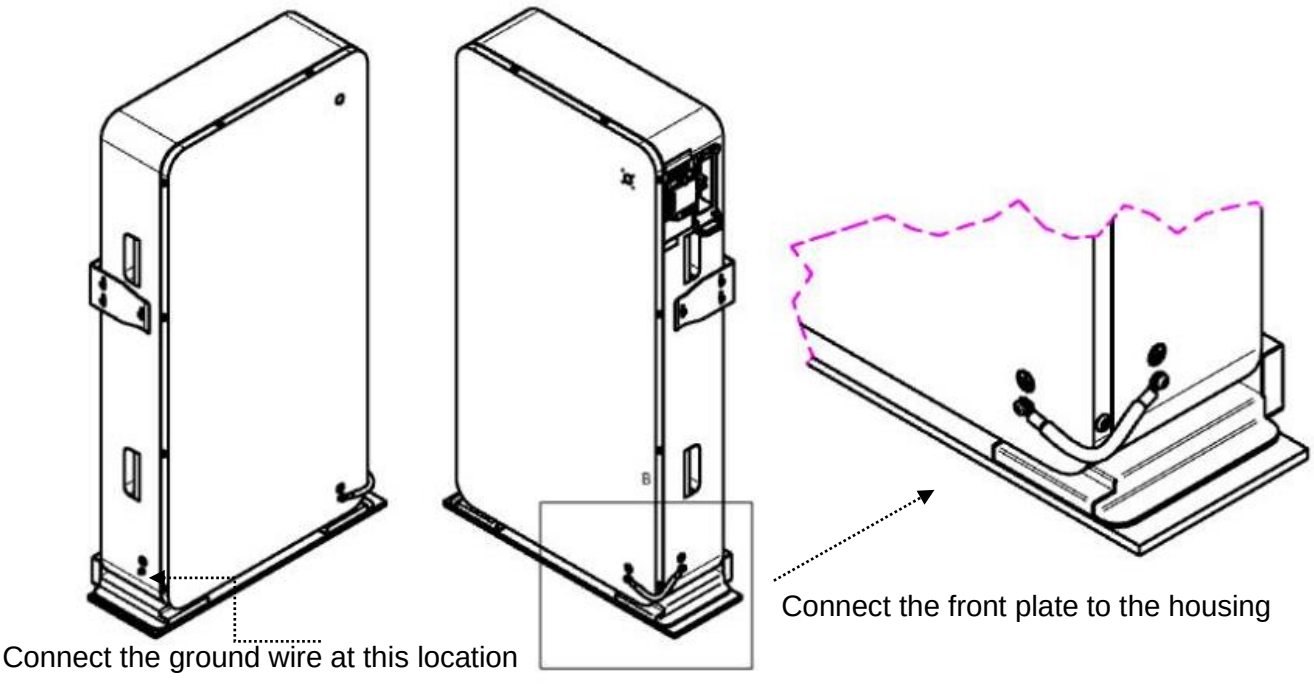



## Wiring specification

In order to standardize the wiring specification of Soluna 15K PACK HV, the following requirements are required for connecting wires of Soluna 15K PACK HV.

| Battery wire | Communication cable |
|---|---|
| It is recommended to use 8AWG of conductor with double insulation | It is recommended to use Standard communication cable with shielding function |

## Ground connection specification



**CAN communication interface (CAN 1 & CAN 2)**

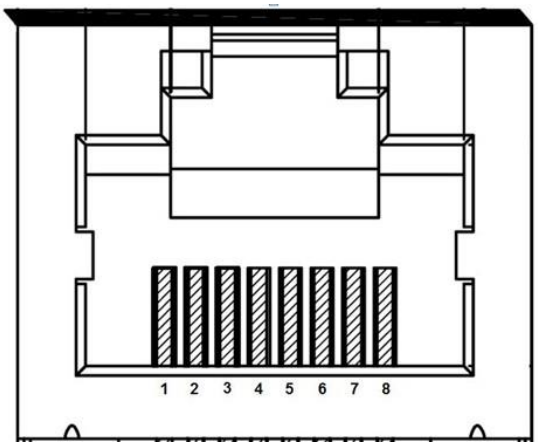



**Figure 2.4 CAN interface definition**

**CAN1 port (for external communication)**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| — | — | — | CAN1H | CAN1L | — | — | — |

**CAN2 port (for internal communication)**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| — | — | — | — | — | — | CAN2H | CAN2L |

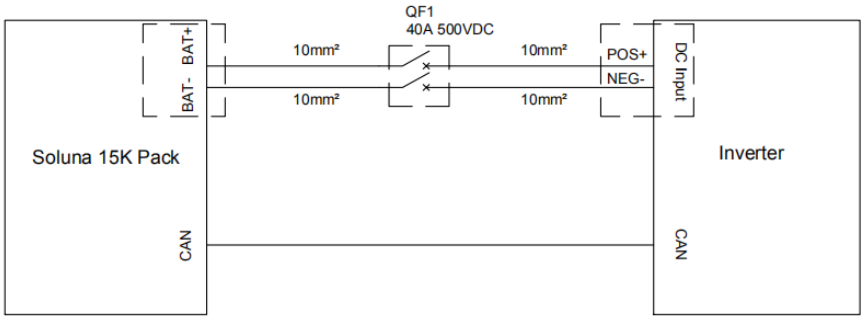
Remark

CAN1H/CAN1L using for external communication

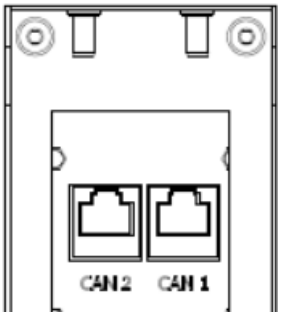
CAN2H/CAN2L using for internal communication

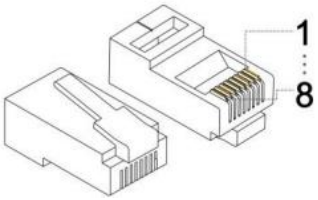
1. Electrical connection

1.1 Please find the following diagram for details

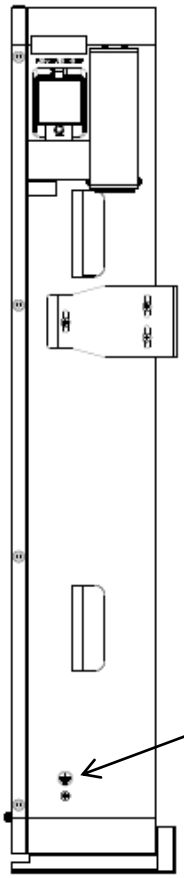



1.2 Preparation



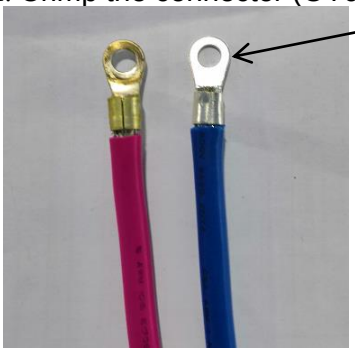
1.3 Electrical Connection Procedures



**Step 1** Connect grounding cable
It is recommended to fasten grounding terminal and grounding cable with M6 screw

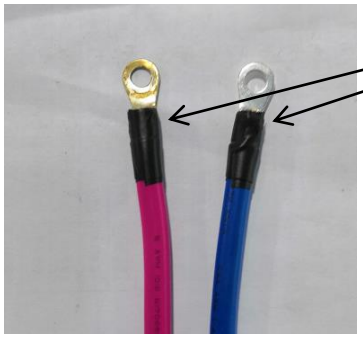
Step 2 Make power cables.

1. Crimp the connector (OT6-5)



Terminal model-----OT6-5
Crimp the connector with a wire crimper

2. Would insulating tape



Width of insulating tape------12mm±2
2 turns of insulating tape

Step 3

Lock the Power cables & communication cable

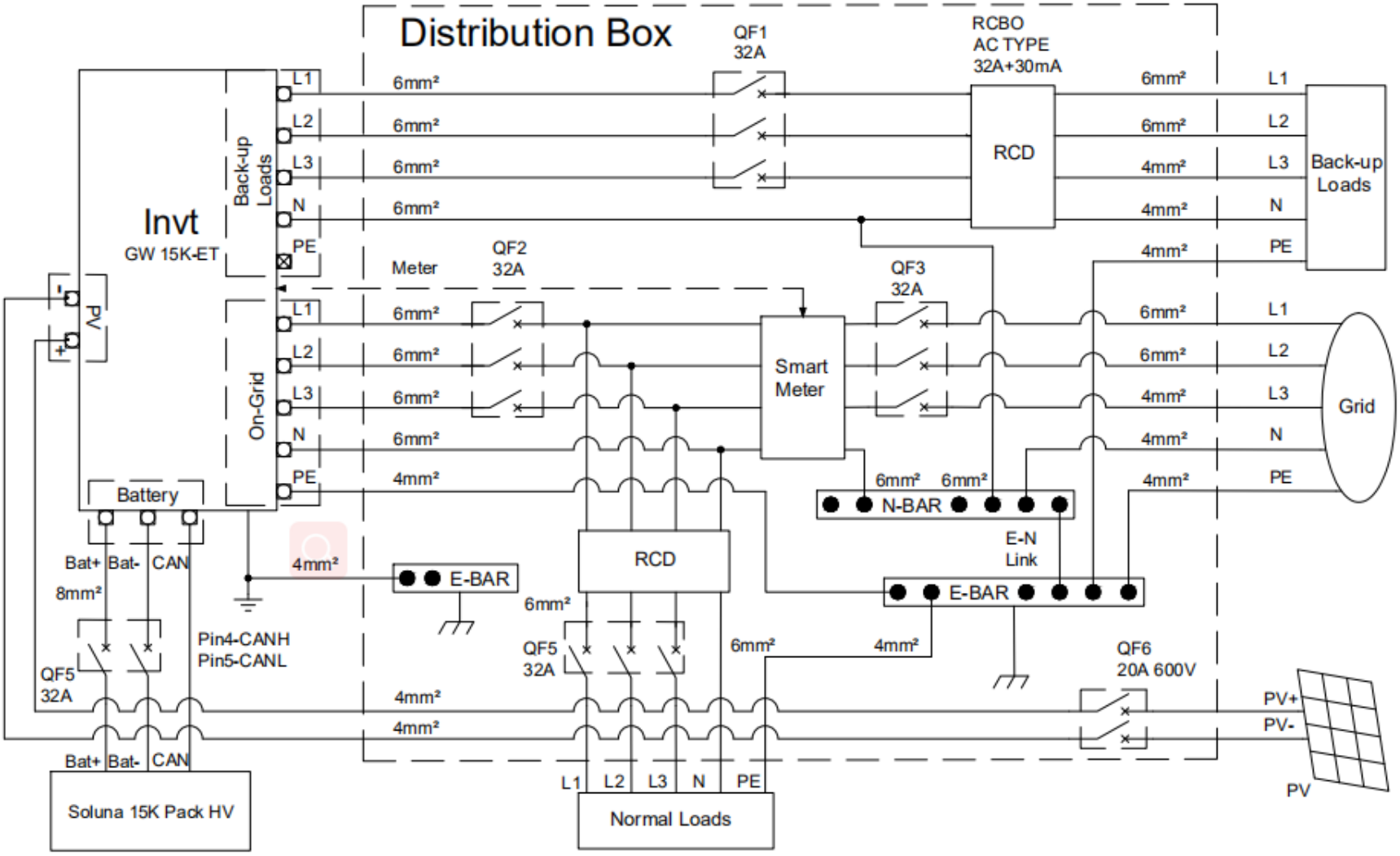

Take out of communication cable from accessory box, and Plug the communication cable

Lock the power cable with a Phillips screwdriver (M5)

Step 4

Lock the cover


Lock the cover with a hexagon wrench (2.5mm)

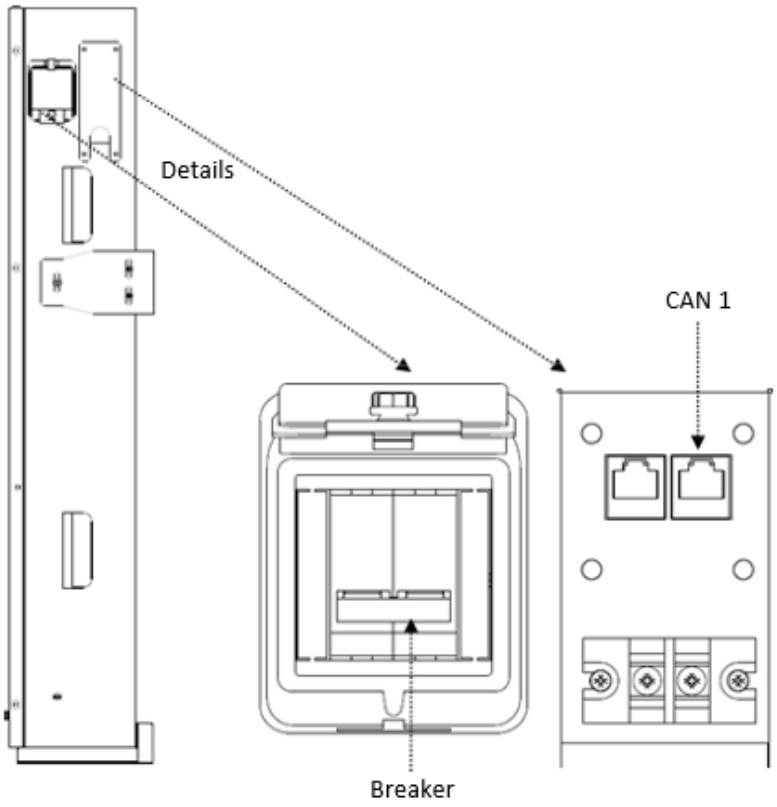

Distribution Box
QF1
32A
RCBO
AC TYPE
32A+30mA
RCD
Back-up
Loads
Grid
Invt
GW 15K-ET
Back-up
Loads
On-Grid
PV
Meter
QF2
32A
QF3
32A
Smart
Meter
Battery
N-BAR
E-N
Link
E-BAR
RCD
E-BAR
Bat+ Bat- CAN
Pin4-CANH
Pin5-CANL
QF5
32A
QF5
32A
QF6
20A 600V
PV+
PV-
PV
Bat+ Bat- CAN
Soluna 15K Pack HV
L1 L2 L3 N PE
Normal Loads
6mm²
4mm²
8mm²

4.How to operate the Soluna 15K PACK HV

Please see below information for details.

1. Connect the inverter and battery module with communication wire.
2. Connect inverter and DC port of battery modules with wires.
3. Turn on the breaker , the breaker is on the right side of Soluna 15K Pack HV.
4. To shut down, switch off the breaker

Please see below figure for details.



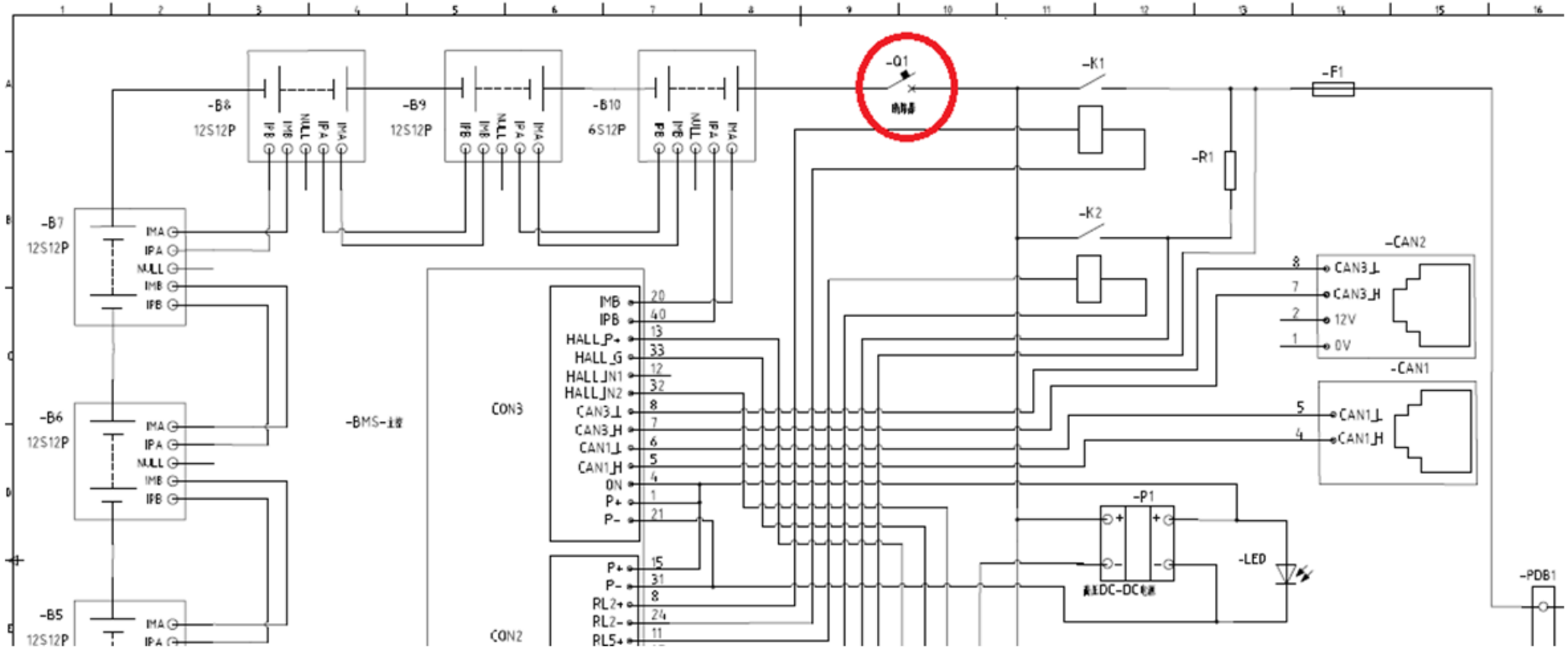

# 4. Consumer ‘Start Up’ and ‘Shut Down’ procedure

1. Turn on the breaker (push the breaker ‘up’), the breaker is on the right side of Soluna 15K Pack HV (see above).
2. To shut down, switch off the breaker

Remark:

1. CAN 1 is connected to the inverter for communication
2. Soluna 15K Pack HV can only operate after receiving the inverter’s communication instructions.

The circuit breaker is unipolar，Pls see the schematic below for details (the components in the red circle is the circuit breaker).



# 5. Care and Maintenance

Keep the area around the unit clear of debris.

The Soluna 15K Pack HV does not require pre-scheduled preventative maintenance, it is not designed to be opened. The unit is replaced if there is a failure diagnosed.

### Firmware upgrade

To upgrade the firmware, you will require the following:

- Laptop (with USB port)
- CAN box
- System password

The following steps should be followed to upgrade the firmware, call 1300 126 888 for the Username and Password (installer only) if required.

1. Please open the battery switch, the power indicator will be lit.
2. Plug one side of the CAN box in the CAN 2 port, the other side in your computer.
3. Open the file Soluna BMS Monitor
4. In the “Username” field enter “*****”
5. In the “Password” field enter “*****”
6. Click “Log in”
7. In the upper left corner, click “CAN converter setup”
8. Click “Turn on the device”.
9. When connected the screen will show “BMS Successful handshake”
10. Click “Firmware upgrade”
11. Open file chose 15K BMS then click Automatically reset after download
12. Click “start downloading”
13. The installation of the firmware is complete when “Download successful” appears
14. Any issues please contact 1300 126 888

# 6. Troubleshooting

Check the indicators on the front to determine the state of the battery pack.

A warning state is triggered when a condition, such as with voltage or current or temperature, is beyond design limitations.

The battery pack's BMS periodically reports its operating state to the inverter. when the battery pack falls outside prescribed limits, it enters a warning state. When a warning is reported, the inverter immediately stops operation. Use the monitoring software on the inverter to identify what caused the warning. The possible warning messages are as follows:

1) Battery Over Voltage
2) Battery Under Voltage
3) Battery Over Temperature
4) Battery Under Temperature
5) Battery Discharge Over Current
6) Battery Charge Over Current

The abnormal state is cleared when the battery pack recovers normal operation.

# 7. Contact us

If you have any questions, please contact us.

DLG Energy (Shanghai) Co.,Ltd

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Tel: +86-21-57475835 ext. 8102
Email: sales@solunabattery.com
Web: www.solunabattery.com