



ferroamp esol

PSM 10/12/15 Series

Installation manual

Ver.1.2019-05
*Esoltech AB, the battery
company*

TABLE OF CONTENTS



Warning	3
1. List of components	4
2. Cabinet Assembly	6
2.1 Wall mounting:	7
2.2 Removing the side panels.....	8
2.3 Adjusting the feet	9
2.4 Cable for LED panel.....	10
3. Battery and Controller modules.....	11
3.1 Touch Protection Covers.....	12
3.2 Insert the battery modules.....	14
3.3 Cable Installation.....	16
4. ESO module	20
4.1 ESO assembly	20
4.2 Insert the ESO.....	22
4.3 Cable installation.....	22
5. External cable	24
5.1 DC-Link cable.....	25
5.2 AC cable	27
Cable gland.....	28
6. Final Check and Finishing up	29
6.1 Jumper bricks.....	29
6.2 Finishing up.....	30
7. More information	32
7.1 Trouble shooting	32
7.2 Datasheet.....	34

WARNING

- Read through the instruction manual before installation.
- Electrical installation shall be performed by an authorized electrician in accordance with electrical standards and safety precautions
- Some component may need to be assembled before electrical installation.
- Do not open the enclosure of the electrical components. Warranty is void if the products has been modified.
- Plug in the jumper brick (battery modules) only when the system is ready to power up.

The FerroAmp PSM 10/12/15 series high performance energy storage system is designed to be installed and operated together with the EnergyHub system with the patented Adaptive Current Equalization (ACE) technology.

FerroAmp Ferroamp Elektronik AB is a research-driven platform company that builds smart integrated energy system for home and industry. The FerroAmp ACE technology is patented under PCT WO2012050501 (A1).

SES Sunwoda Energy Solution Co., Ltd is a professional energy storage solution provider with 20 years' know-how in battery industry. SES is a subsidiary of the listed Sunwoda Electronic Co., Ltd (SZ 300207) established in 1997. SES is a manufacture powerhouse with its headquarter in Shenzhen, China.

ESOL ESOLtech AB, the battery company, is based in Stockholm. A company of doer brings knowledge into reality.

1. LIST OF COMPONENTS

The PSM 10/12/15 series high performance energy storage system comes with the following components:

- Cabinet
- Battery modules
- Battery controller modules
- Energy Storage Optimizer (ESO)
- Accessories box

Knowing your system components:

Battery module 4 pcs (PSM10) 5 pcs (PSM12) 6 pcs (PSM15)	
Battery controller module 1 pcs	
Energy storage optimizer 1 pcs (6kW, PSM10) 2 pcs (12kW, PSM12/15)	
The Cabinet	see picture on the index page
The Accessories box	see the list of accessories

PSM 10/12/15 Series Installation manual

Esoltech AB, the battery company

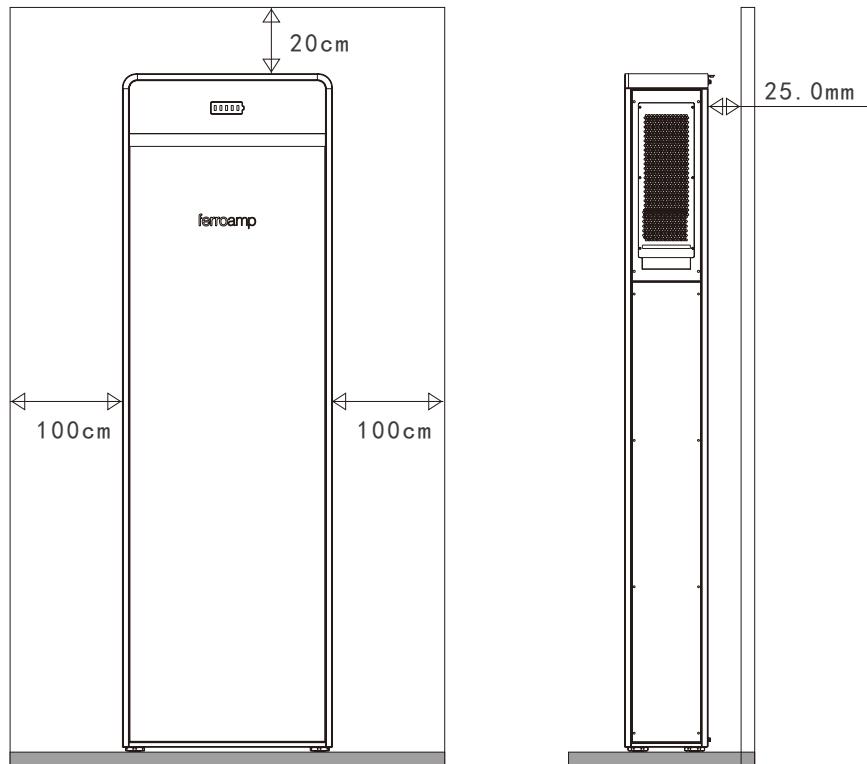
List of accessories:

Item no.	Description	quantity	note
1	Installation manual	1	This manual
2	Battery Module Comm. Cable	7	
3	Battery Module Power cable	7	
4	Battery Module Jumper Brick	6	
5	Battery Module Mounting Bolts	18	M5
6	Wall mounting bolts	2	
7	Wall mounting assembly	1	
8	Wall mounting assembly bolts	2	
9	Power Cable ESO - Battery controller	2	
10	Battery controller Power cable 230VAC	1	
11	Comm. cable: from ESO to Battery controller	1	
12	Grounding cable for ESO	1	
13	ESO Adaptor	1	
14	ESO Adaptor fixing bolts	6	M3
15	ESO front panel	1	
16	ESO front panel fixing bolts	8	M2

2. CABINET ASSEMBLY

The cabinet is pre-assembled. The PSM cabinet is designed to be installed and used indoor only. Before installation, please make sure that:

- the ambient temperature is 0 – 45 deg. (recommended 25 deg.);
- the relative humidity ranges 0-95%;
- there is enough space around the cabinet to enable a safe installation.



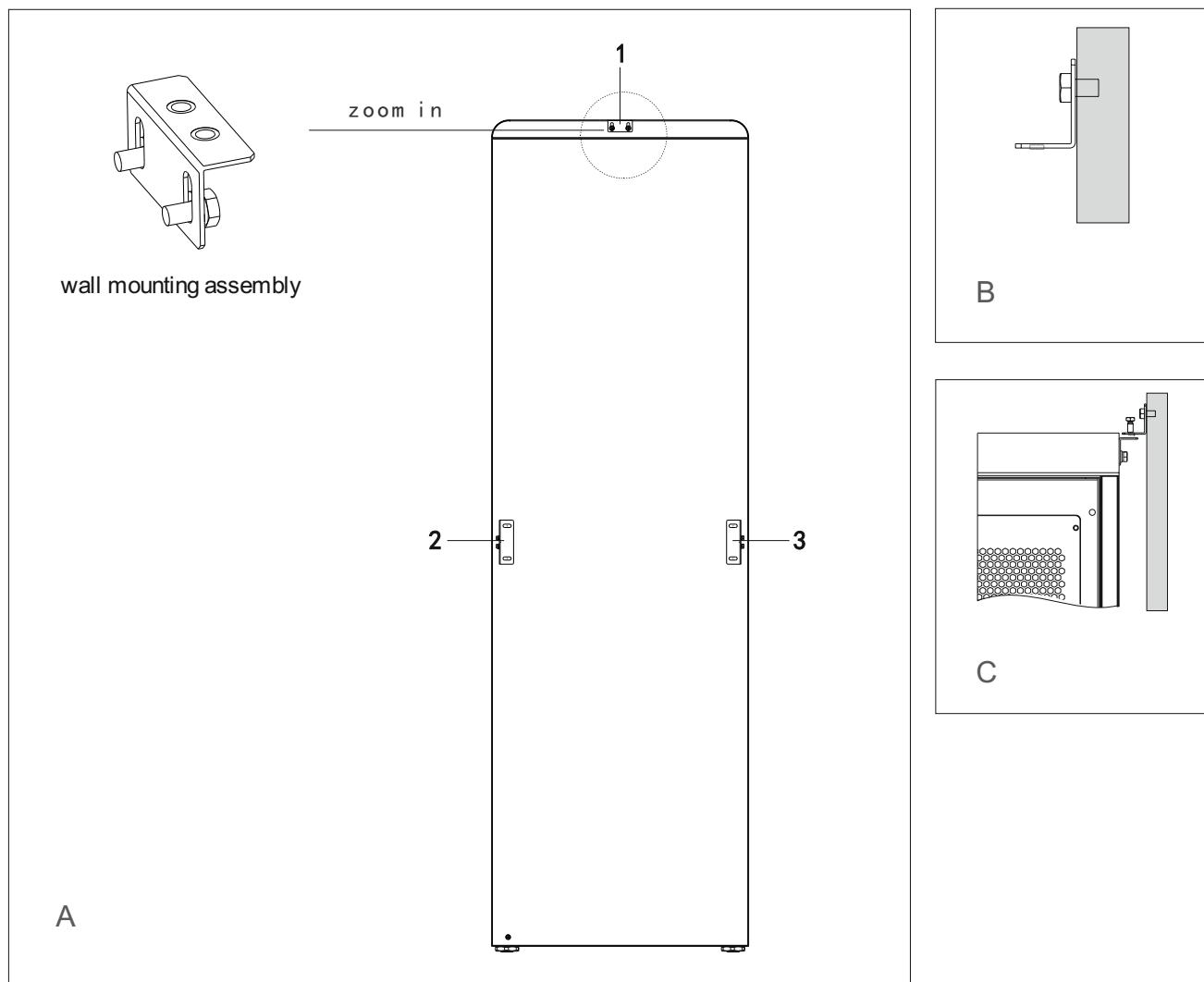
Note: the measurement in the diagram is not to the scale

2.1 Wall mounting:

Clear the wall. Measure the distance from the floor to the spot on the wall where mounting assembly shall be fixed.

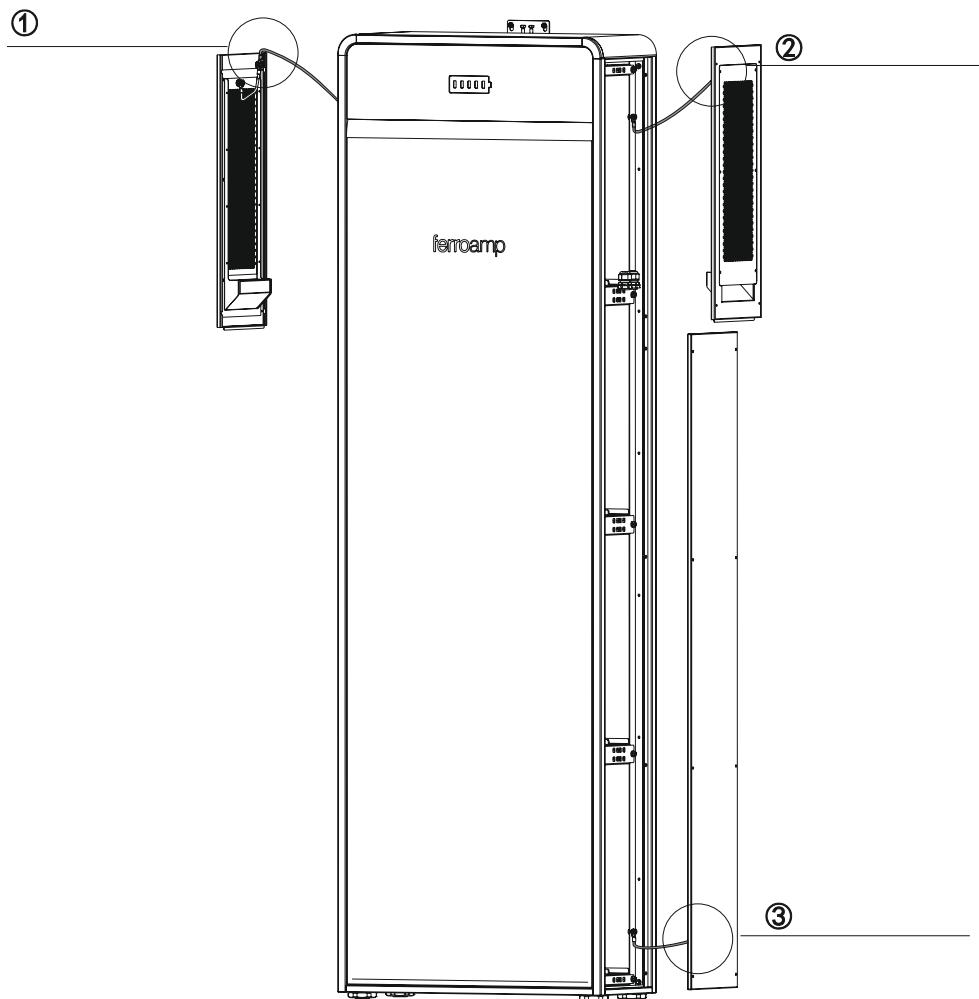
- **Figure A:** The wall mounting assembly can be attached to 3 locations on the cabinet. The cabinet is shipped with the assembly preinstalled at location 1.
- **Figure B:** Fix the wall mounting piece to the wall.
- **Figure C:** Move the cabinet to the wall and fasten the fixing bolts to make sure the cabinet is secured.

Please refer to Section 2.3 for the adjustment of the feet.

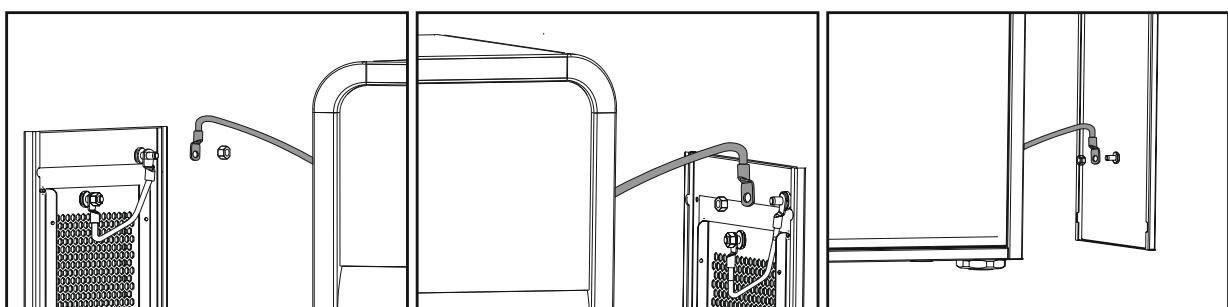


2.2 Removing the side panels

The cabinet has a symmetric design meaning that the panels on the left-hand-side are identical and exchangeable to the ones on the right.

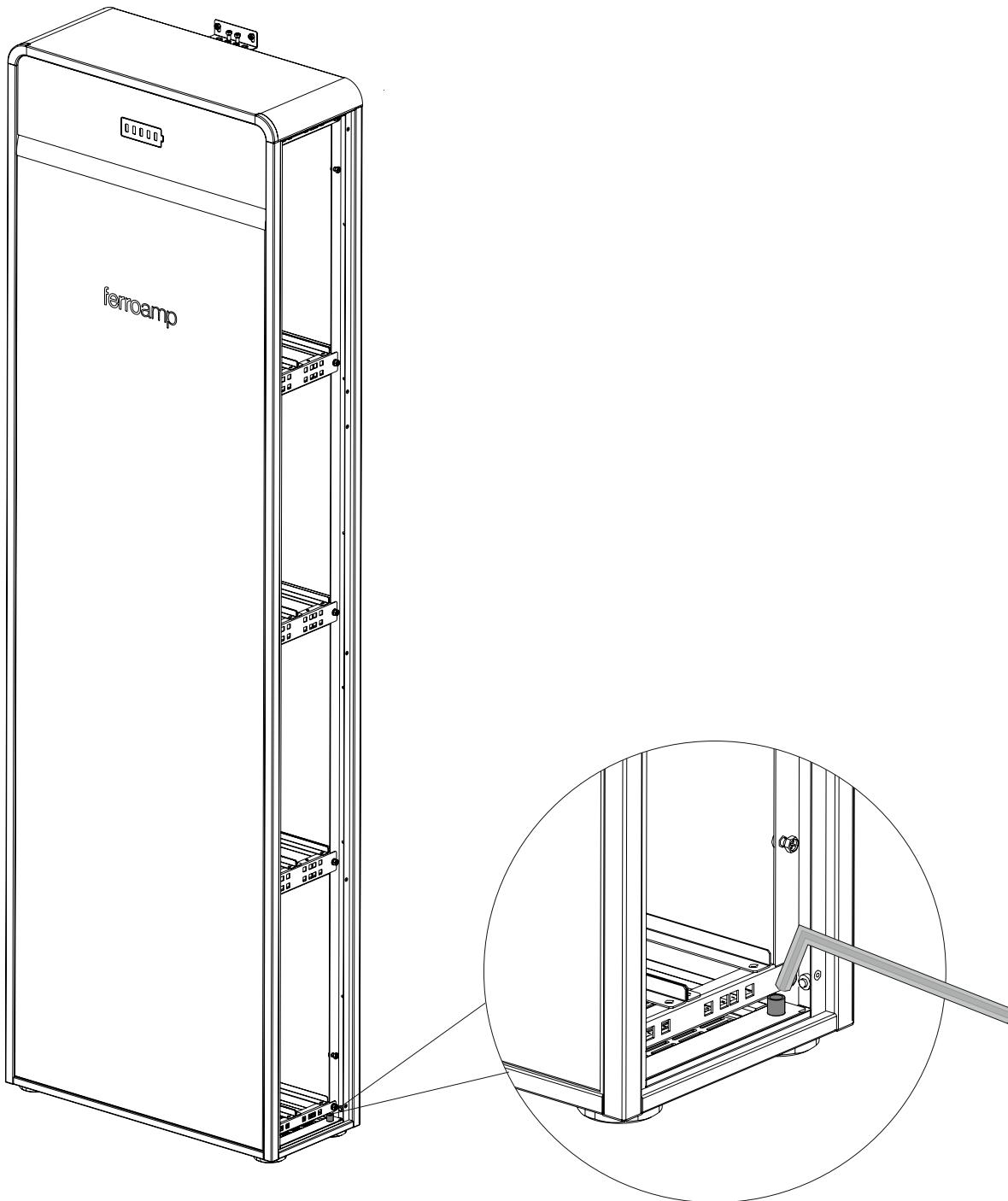


The diagram shows the upper side panels and one of the lower side panels are removed. Detach the grounding cable for installation clearance. The following shows the details of removing the grounding cables.



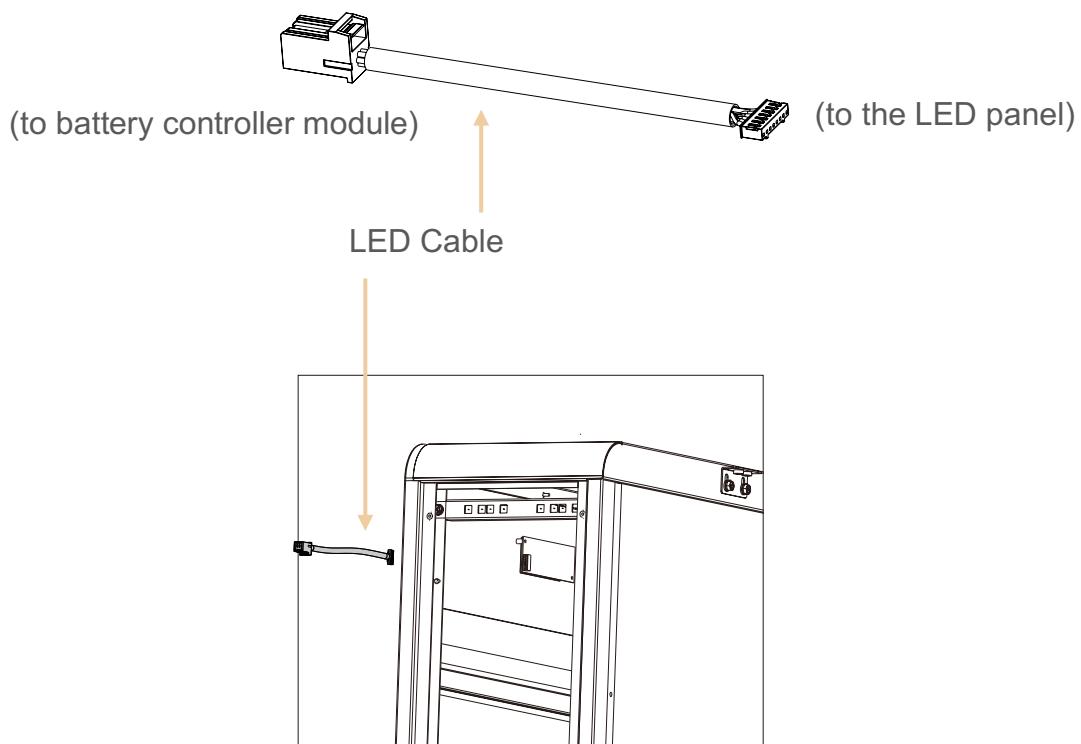
2.3 Adjusting the feet

There are 4 adjustable feet and the sockets are accessible when removing the side panels. Using the hex key (5mm) to adjust the height of the feet.

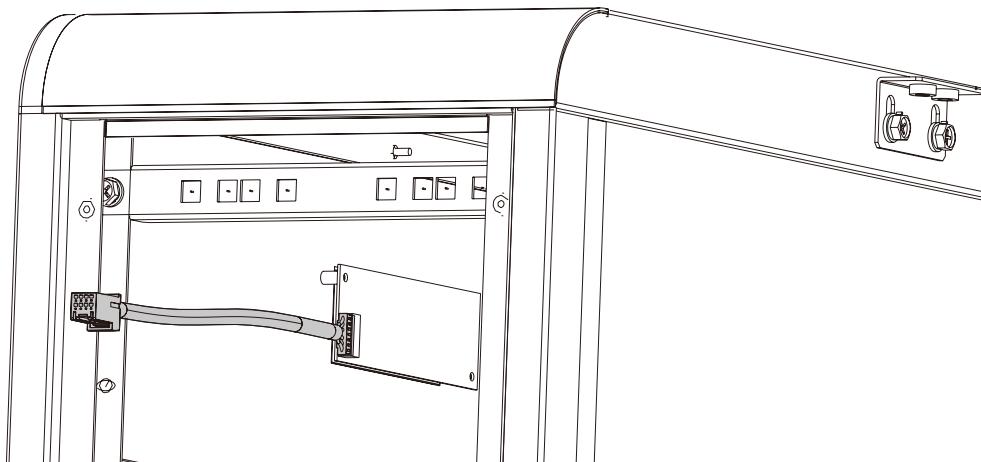


2.4 Cable for LED panel

Connecting the LED cable to the LED connector socket inside the cabinet as indicated below:



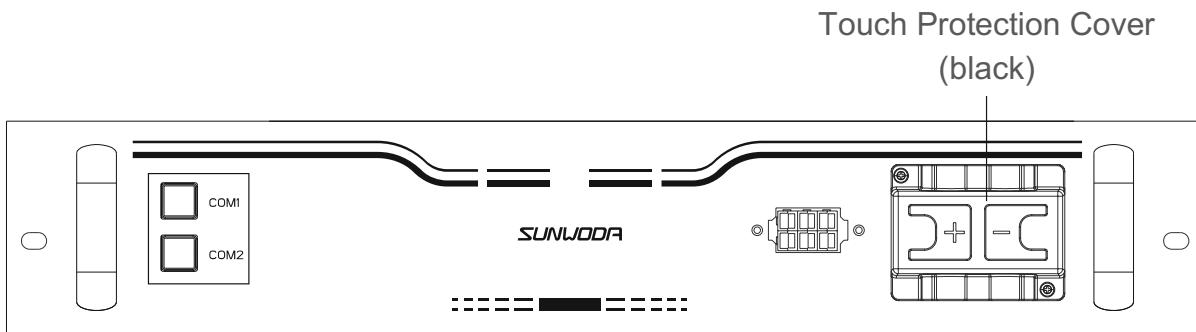
There is only one direction the cable can be inserted firmly. The following picture shows finished LED cable connection. The other end of the cable is to be connected to the battery controller module (**See also Section 3.2**).



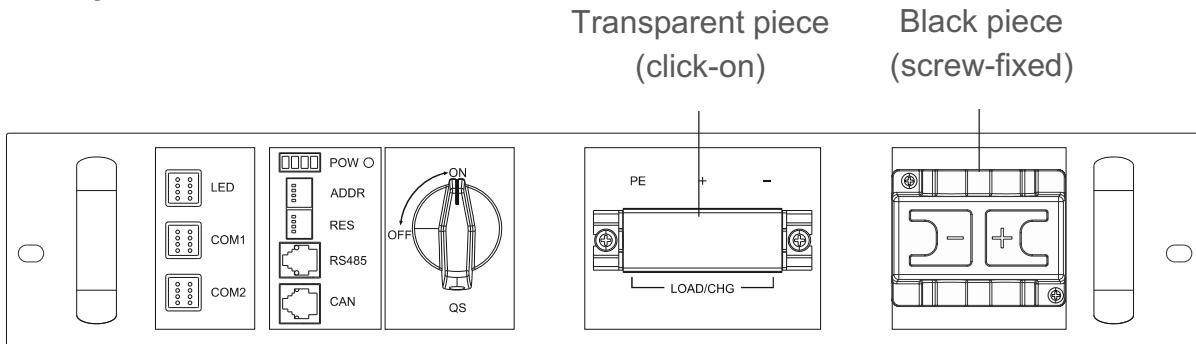
3. BATTERY AND CONTROLLER MODULES

Both the battery module and the battery controller box are shipped with protection covers preinstalled.

Battery module:



Battery controller box:

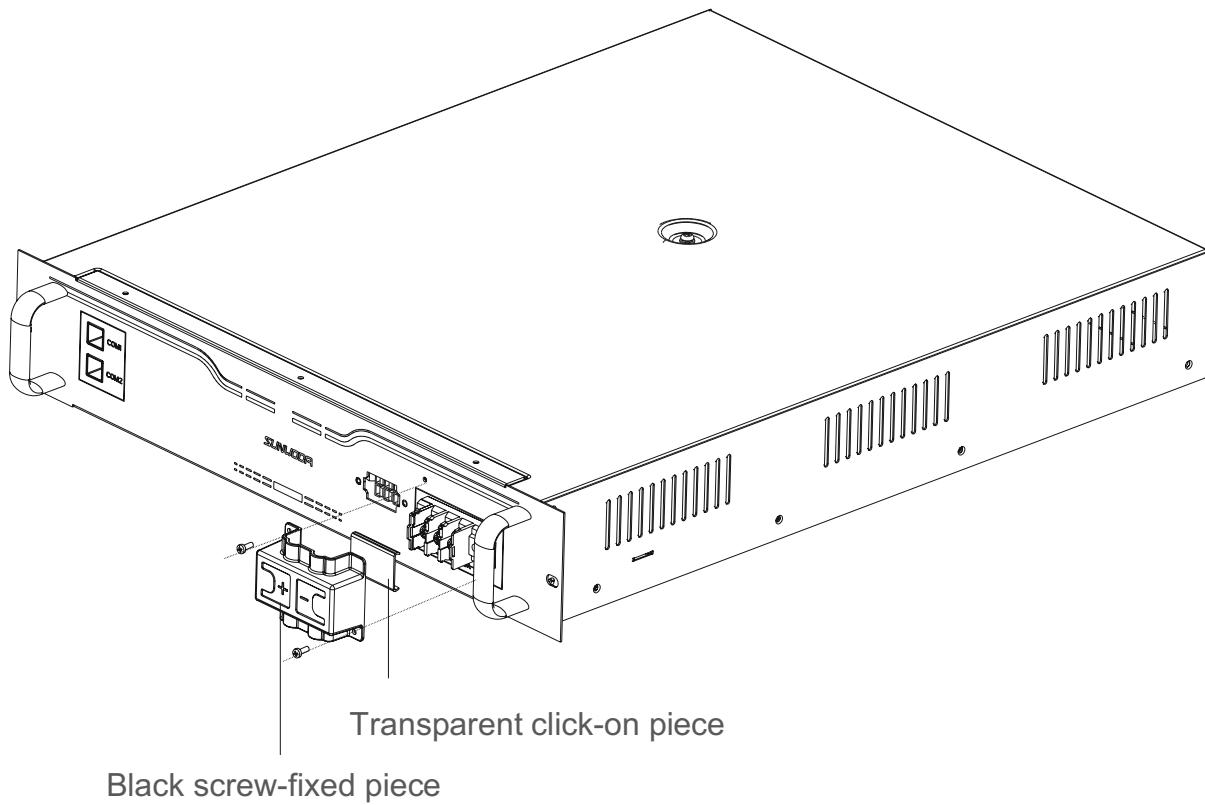


The PSM system is shipped with one battery controller module and 4 - 6 battery modules depending on system configuration.

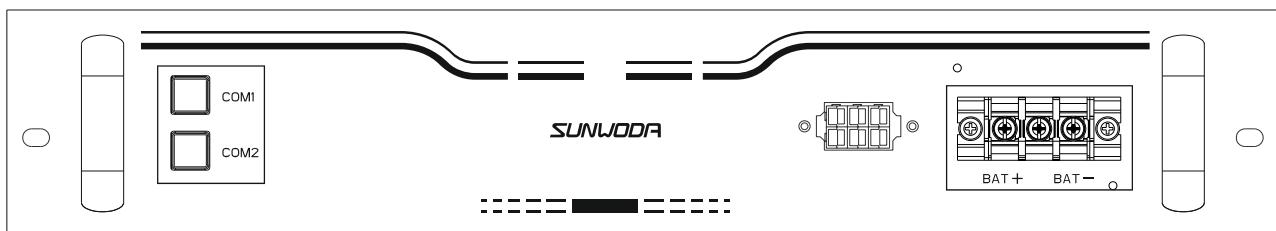
Make sure to remove the preinstalled protection cover before installation.

3.1 Touch Protection Covers

For battery module:



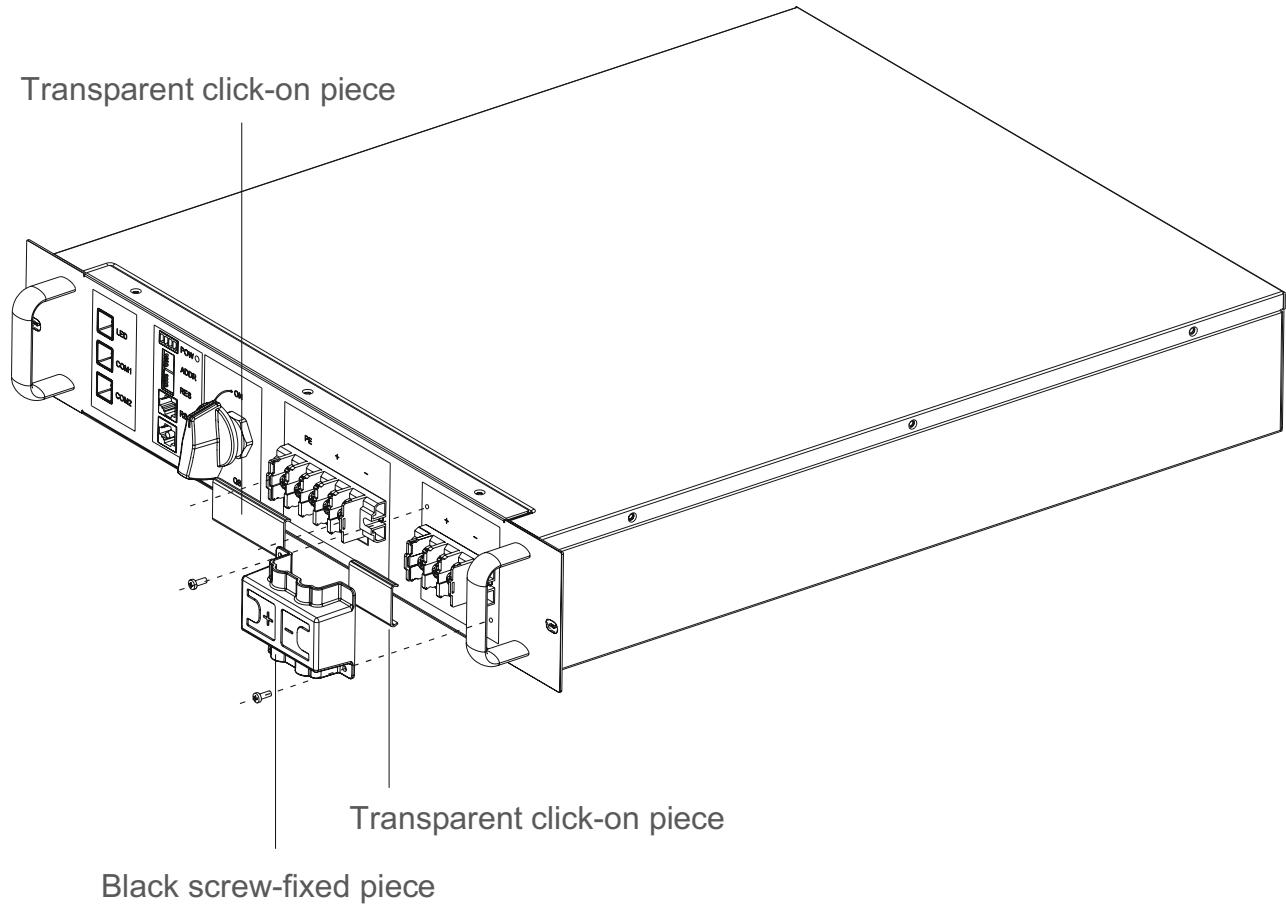
The battery module with the protection covers removed:



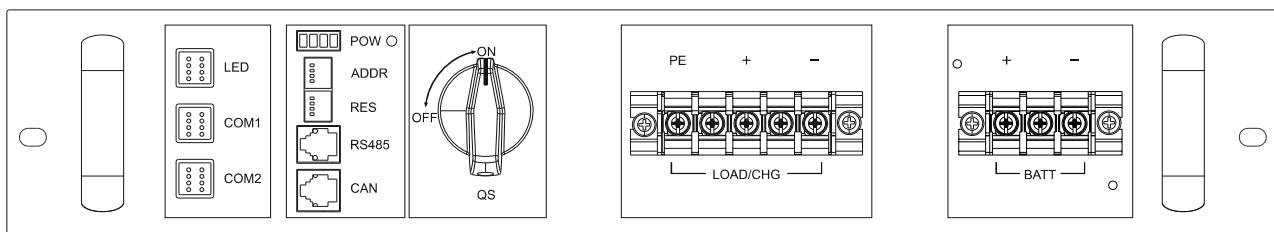
PSM 10/12/15 Series Installation manual

Esoltech AB, the battery company

For the battery controller module:

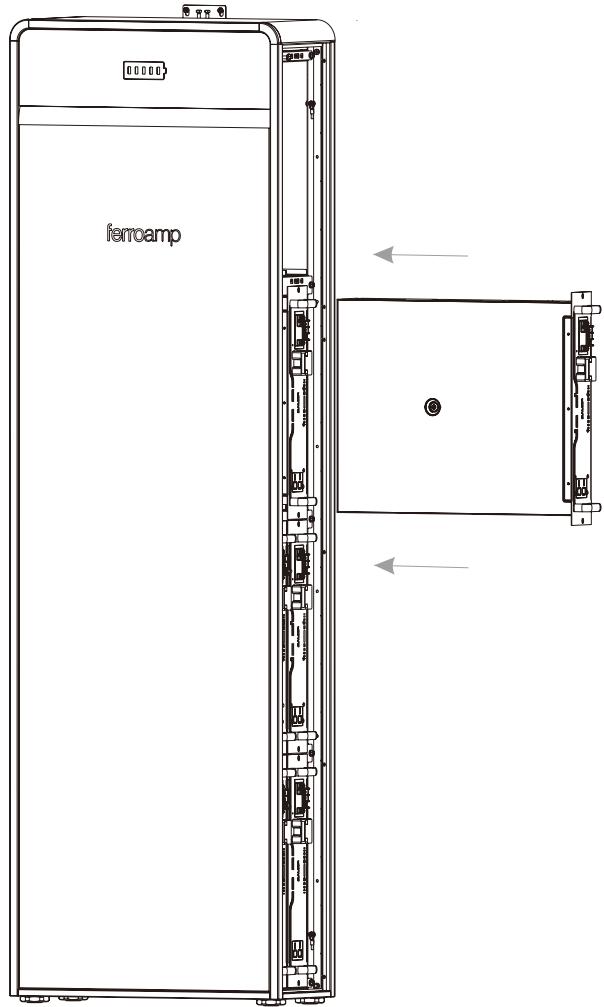


The battery controller module with the protection covers removed.



3.2 Insert the battery modules

The battery shall be inserted **one by one from the bottom** of the cabinet.



Make sure all the bolts for the inserted module fastened before installing the next module.

Install the controller module after all the battery modules are done.

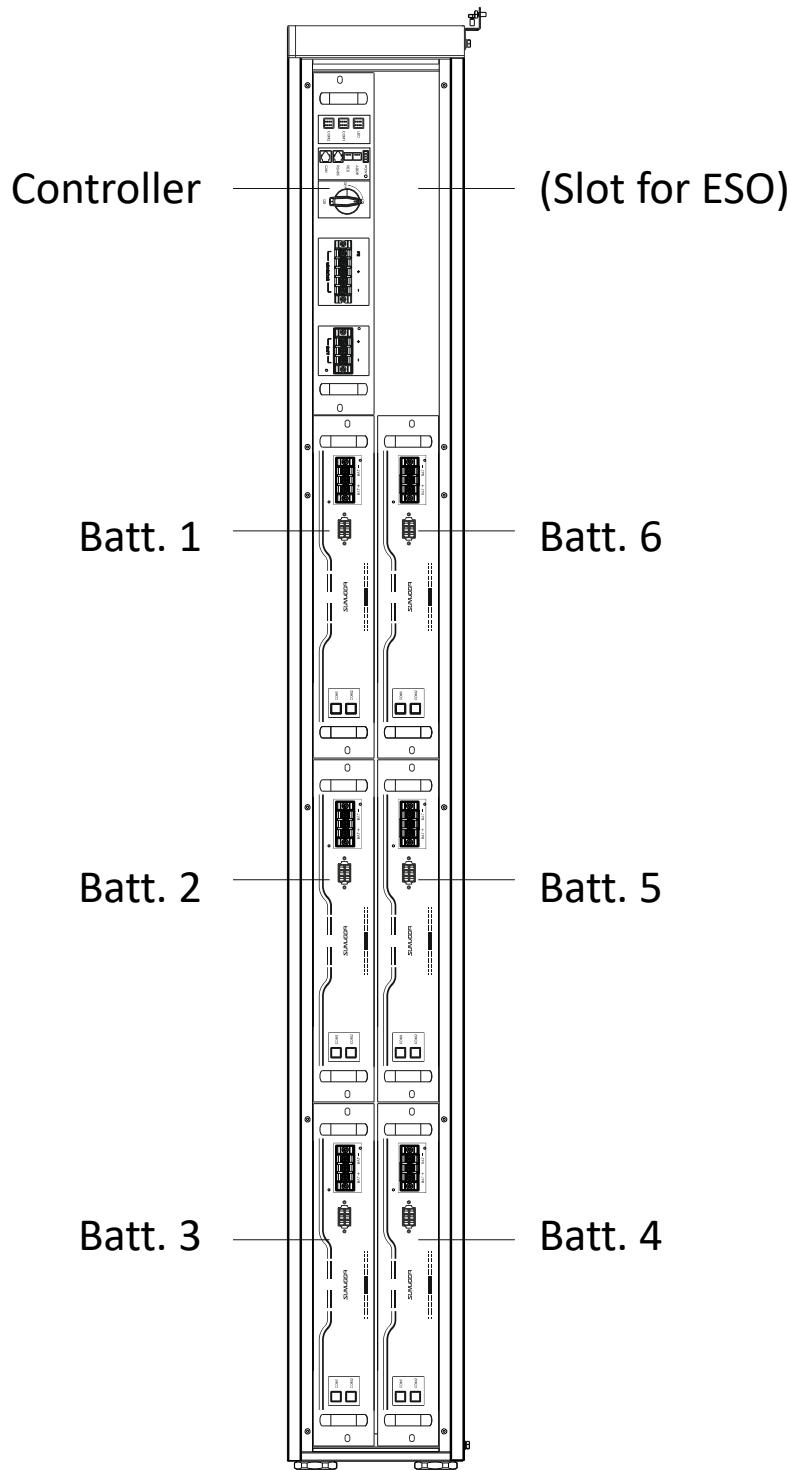
Pay special attention not to block the Cable for LED panel (**Section 2.4**) whose connection is to be done in **Section 3.3**.

PSM 10/12/15 Series Installation manual

Esoltech AB, the battery company

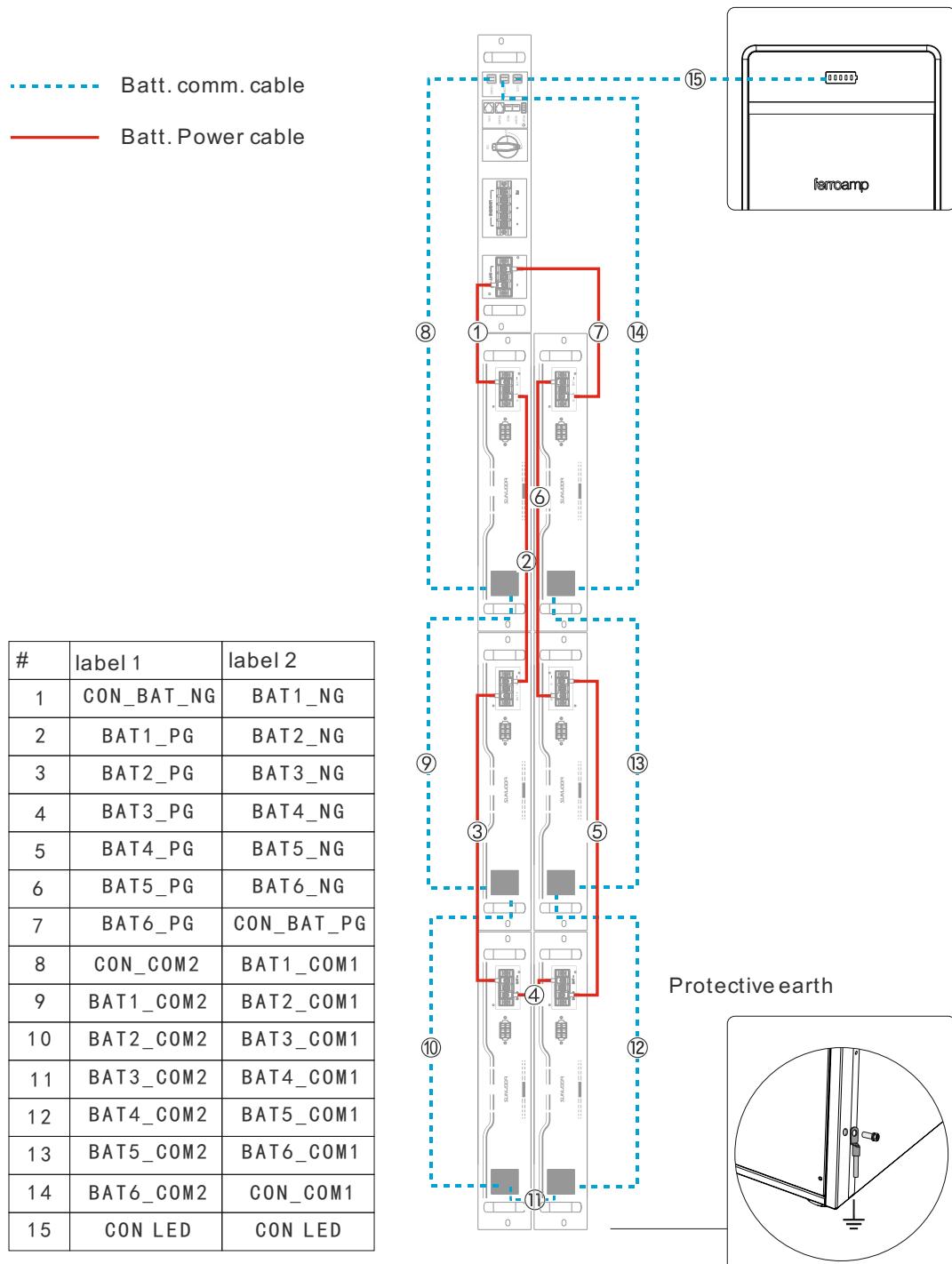
The following is a side view of the system after insertion of the battery and controller modules.

Make sure all the bolts fastened before proceeding for safety installation.



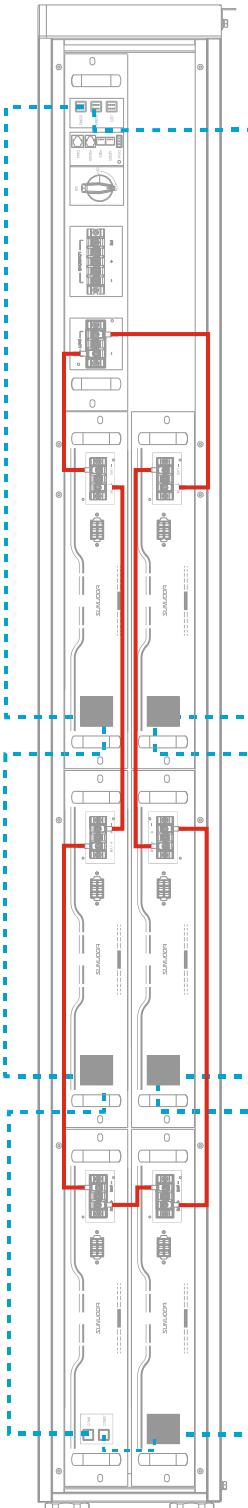
3.3 Cable Installation

3.3.1 Connection overview and the numbering of the cables (PSM15):



PSM 10/12/15 Series Installation manual

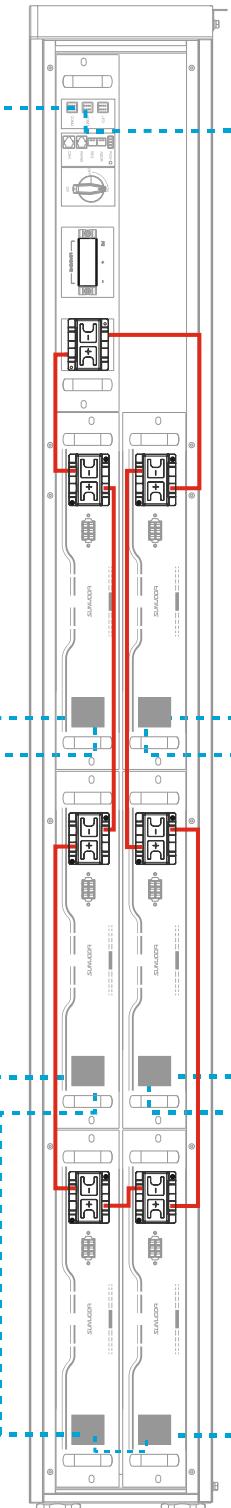
Esoltech AB, the battery company



Sort the cables according to the list above and install the cables according to the numbering. As indicated in the left-hand side figure:

- Connect the power cables (solid line)
- Connect then the communication cables (dashed line)

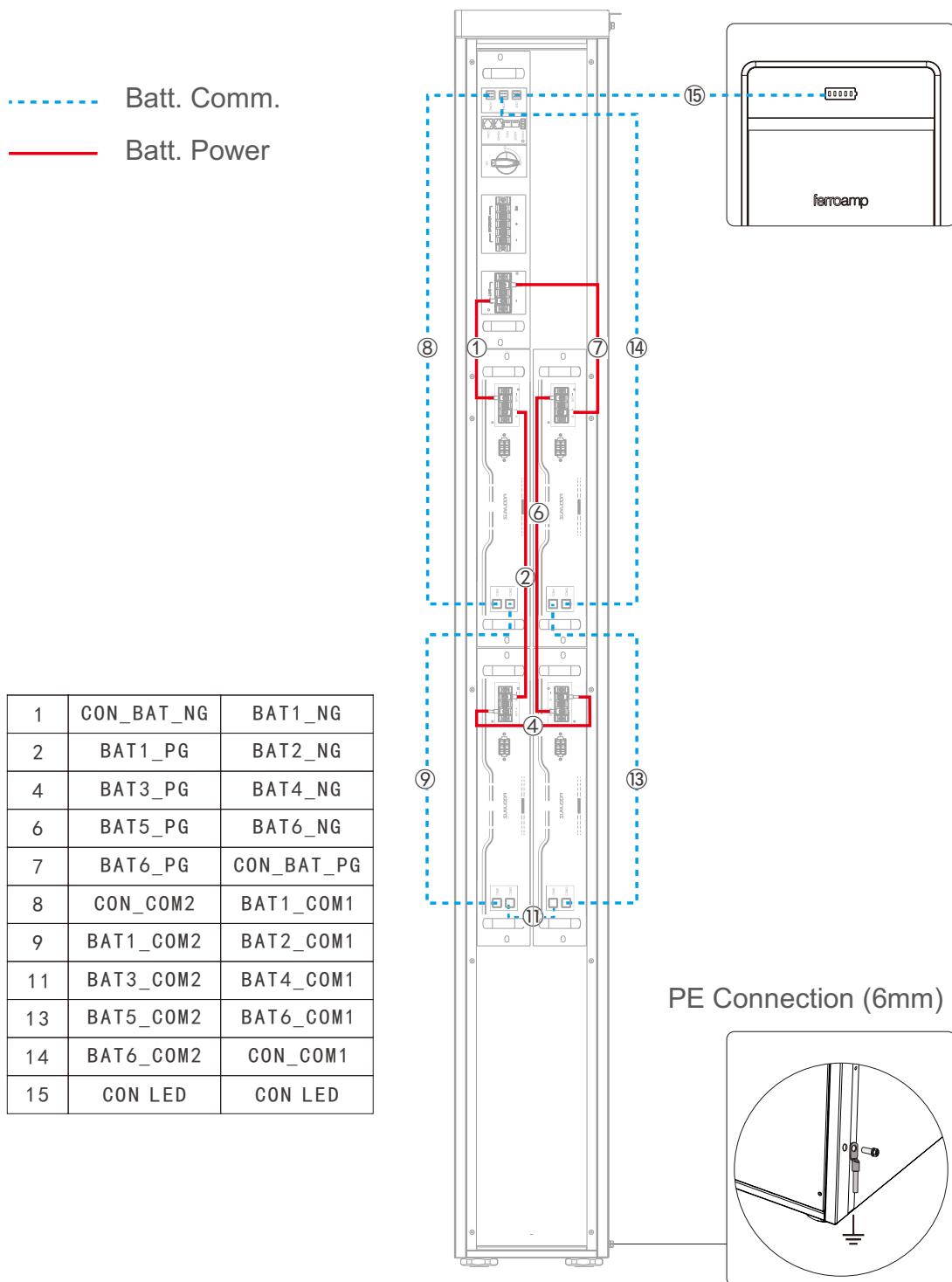
Install the battery module protection covers (**Section 3.1**) back. After the installation the system looks like the figure on right-hand side.



PSM 10/12/15 Series Installation manual

Esoltech AB, the battery company

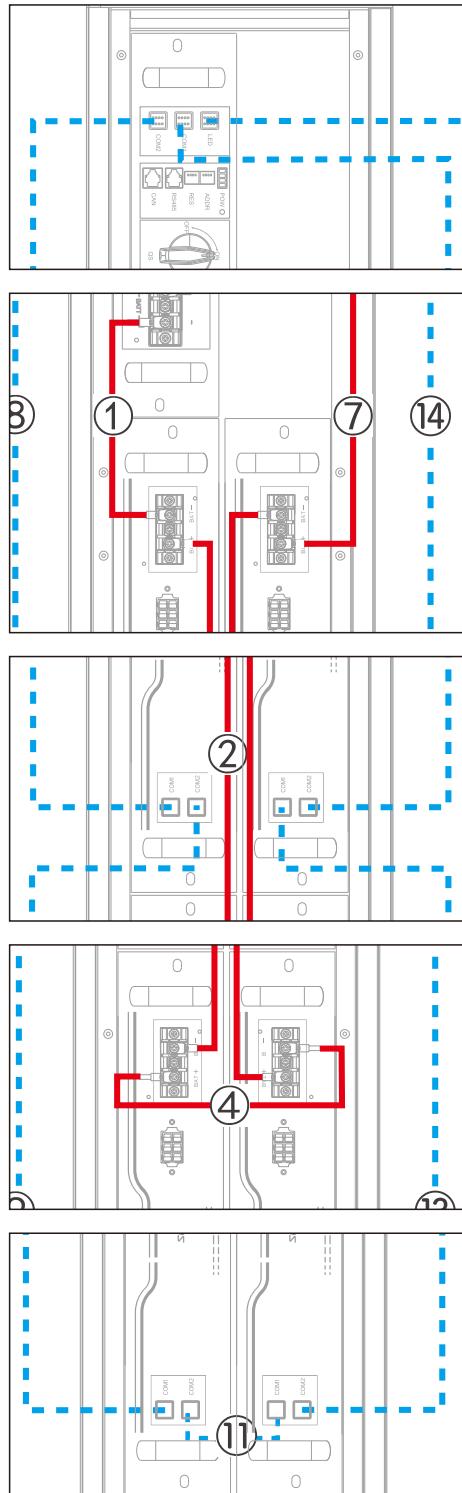
3.3.2 Connection overview and the numbering of the cables (PSM10):



PSM 10/12/15 Series Installation manual

Esoltech AB, the battery company

Zoomed in:



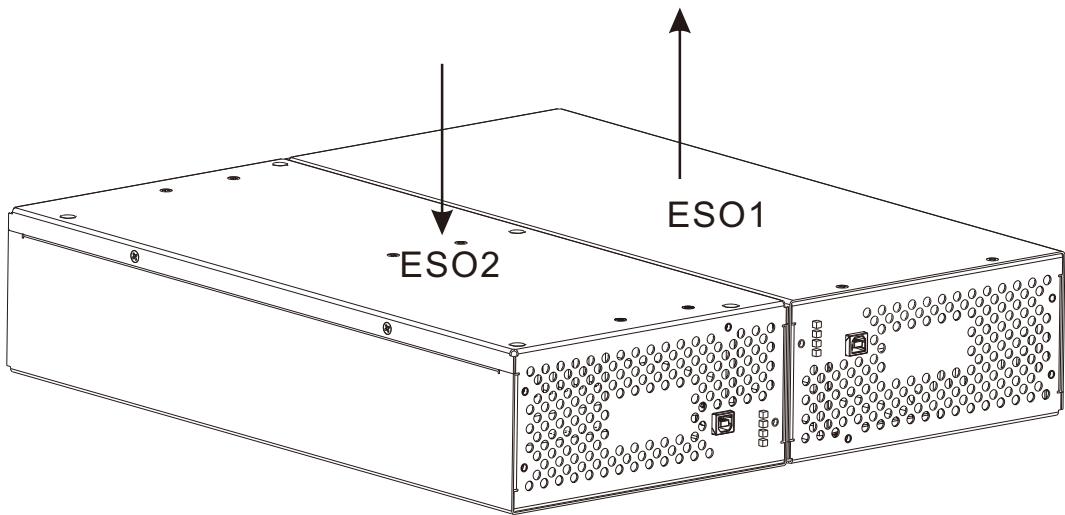
4. ESO MODULE

Depending on the system configuration, one or more ESO modules are shipped alongside with your PSM system. The ESO module is shipped in a cardboard package without pre-assembly. Each ESO module resembles a rectangular metal box. Please skip to **4.2** if ESO is shipped pre-assembled.

4.1 ESO assembly

The following instruction applies to the two-ESO system with a nominal power of 12kW.

Lay the two ESO modules side by side on a flat surface. Make sure the second one (ESO2) have the bottom metal enclosure facing upward as indicated in the picture below.



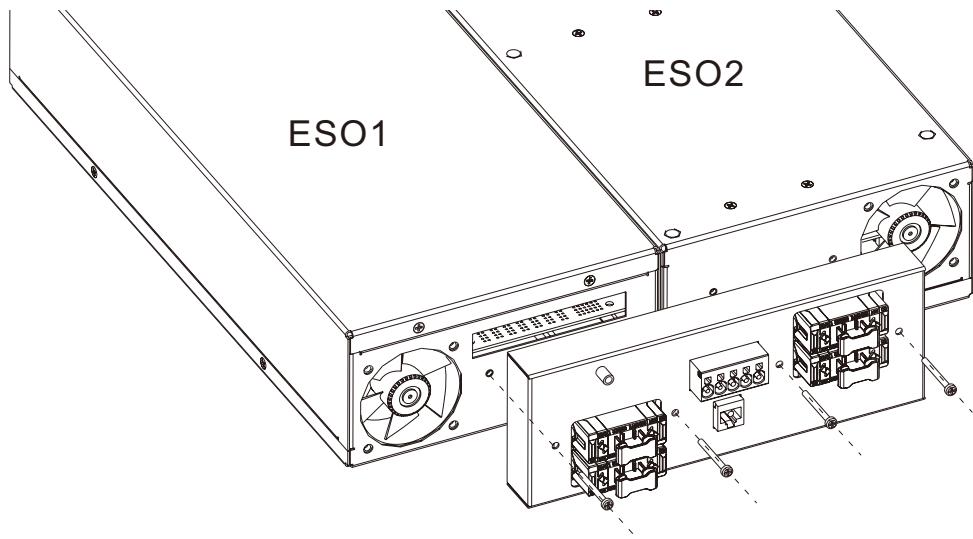
Note that the weld nuts are visible from the ESO bottom metal enclosure.

Install the ESO adaptor:

PSM 10/12/15 Series Installation manual

Esoltech AB, the battery company

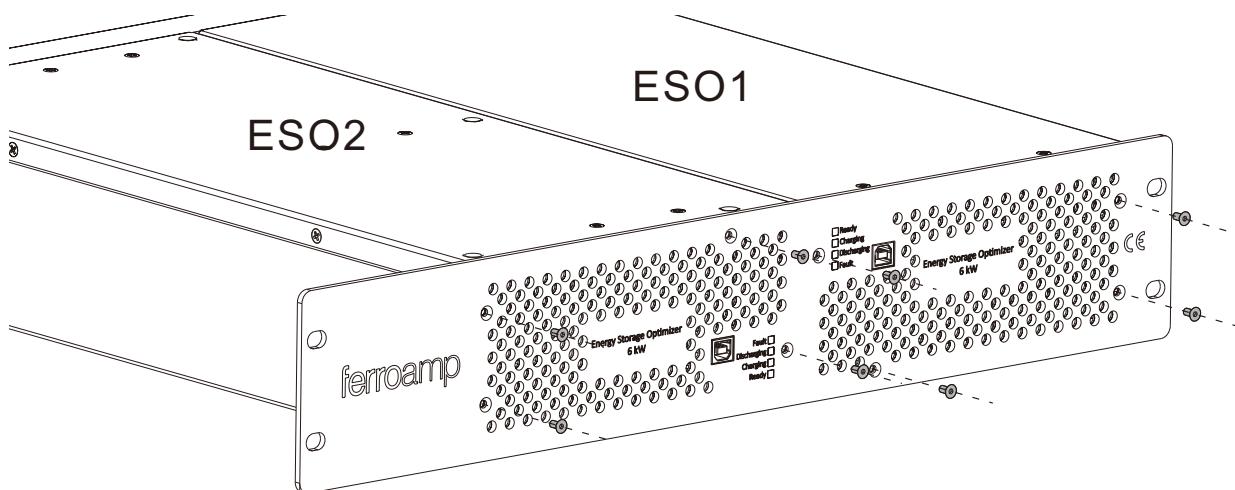
- firmly insert the adaptor into the sockets
- fasten the screws (4 pcs)



Note: do not lift the ESO off the supporting surface during the assembly

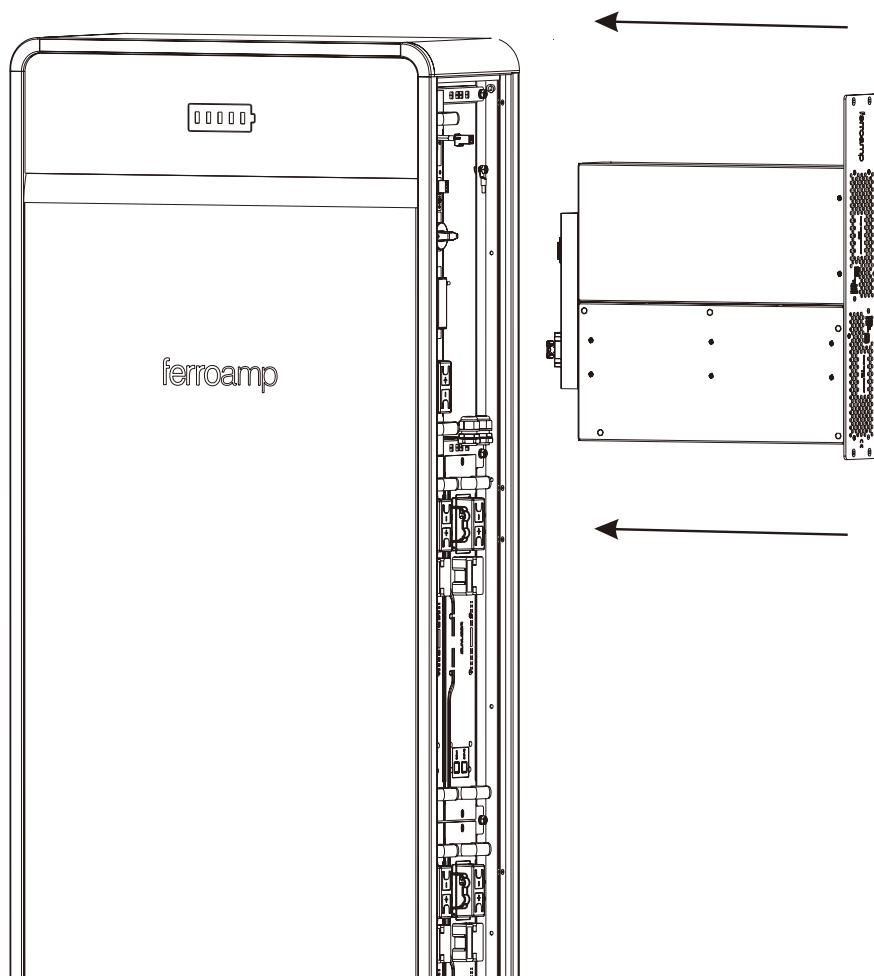
Install the ESO front plate.

- Carefully align the ESO front plate to the
- Pay specially attention to the LED prismatic piece
- Fasten the screws (8 pcs)



4.2 Insert the ESO

Insert the assembled ESO sideways and fasten the bolts.



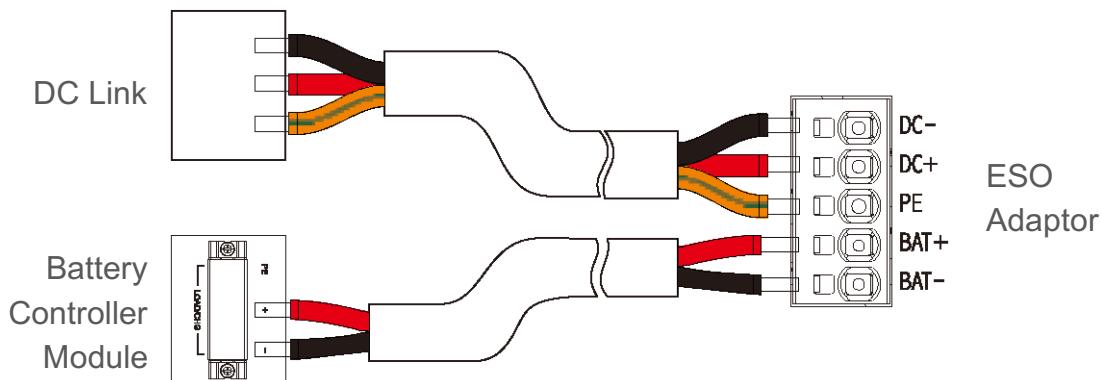
4.3 Cable installation

Power cables

The following diagram shows the power cable connecting the ESO to the battery controller module and to the DC-link.

PSM 10/12/15 Series Installation manual

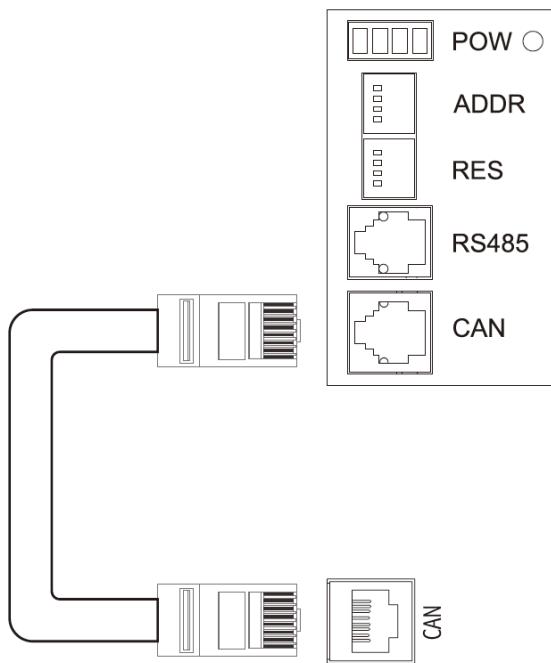
Esoltech AB, the battery company



We recommend that the DC-Link cable to be connected only when installing the external cable. The external cable installation is covered in **Section 5**.

Communication cable

The communication between ESO and the battery controller module is through a standard RJ45 cable (ethernet cable). The connection is showed as below.

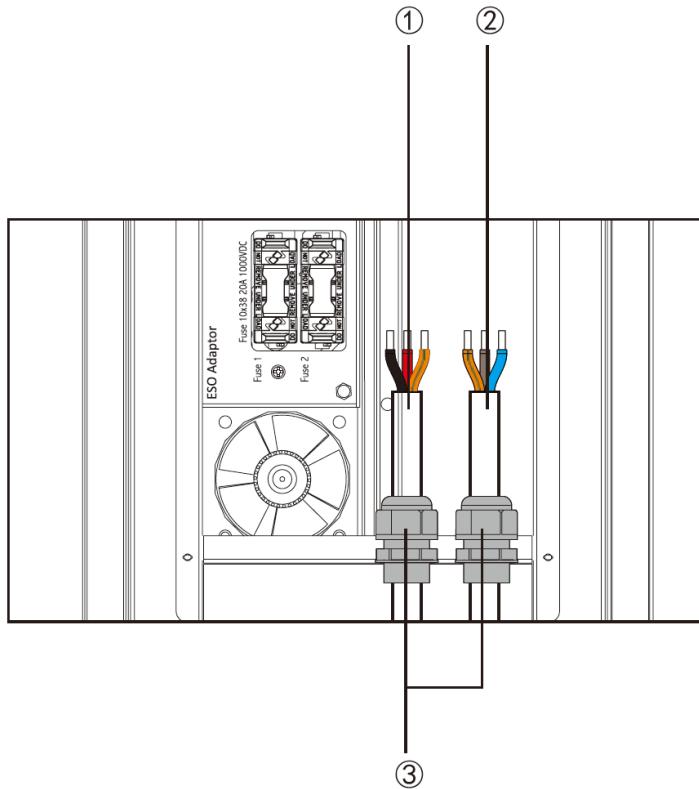
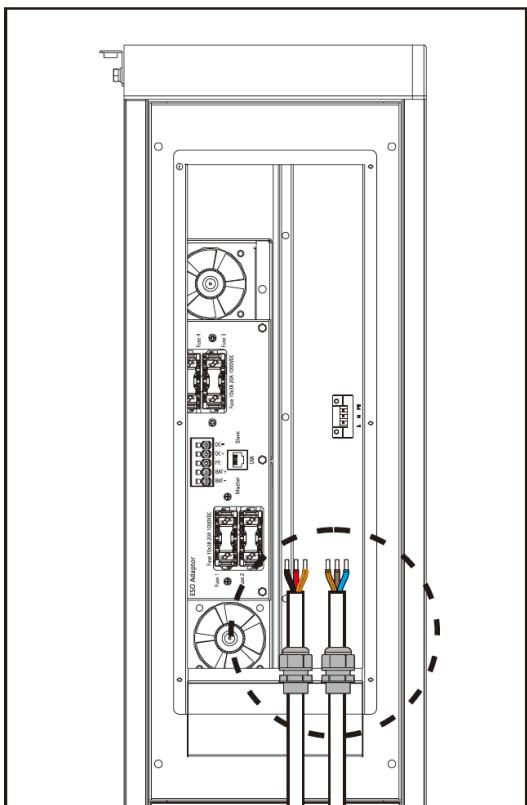


5. EXTERNAL CABLE

PSM system has two external cables:

- One DC-Link cable connecting to the FerroAmp EnergyHub
- One AC cable connecting to single phase wall socket (230VAC)

The following diagram shows a typical external cable installation.

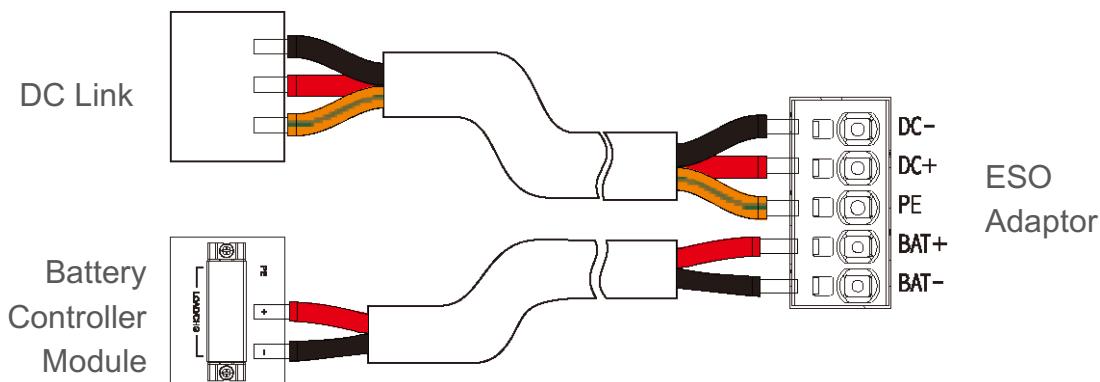


In the diagram (side panel removed):

- (1) DC-Link cable
- (2) AC230 cable
- (3) cable gland

5.1 DC-Link cable

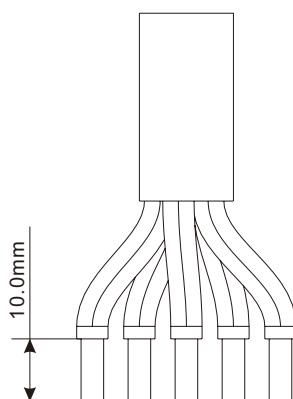
The ESO comes with a **Phoenix Contact 5P socket** on the back of ESO adaptor for easy cable installation. The socket is seen on the righthand side in the diagram below.



Consider sorting out the cable before connection.

To connect the cable:

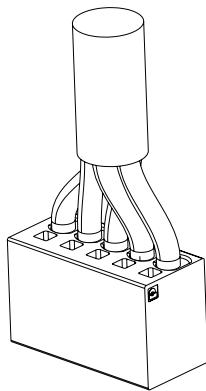
- Peeling off the cable insulation according to the following diagram.
- Install one cable at a time, apply force evenly and gently in the direction towards the cable socket, make sure each cable is fully inserted.
- Once fully inserted, the cable is locked inside the socket.



PSM 10/12/15 Series Installation manual

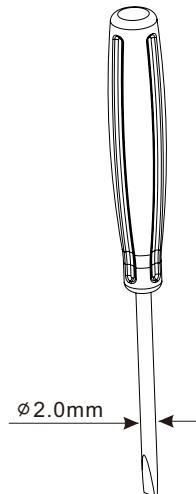
Esoltech AB, the battery company

Note: if properly inserted, the installed cable cannot be removed without using a tool. Properly installed cable looks like the one in the following.



To remove a installed cable:

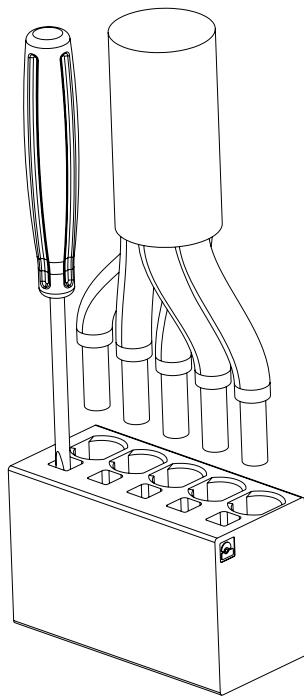
- use a flat-blade screwdriver (2mm),



- firmly insert the flat-blade into the locking-releasing hole next to the cable socket (diagram below)
- Pull out one cable at a time until all cables are fully detached

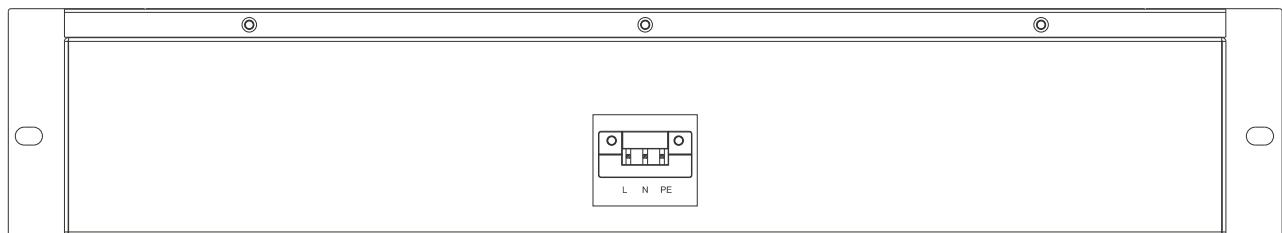
PSM 10/12/15 Series Installation manual

Esoltech AB, the battery company



5.2 AC cable

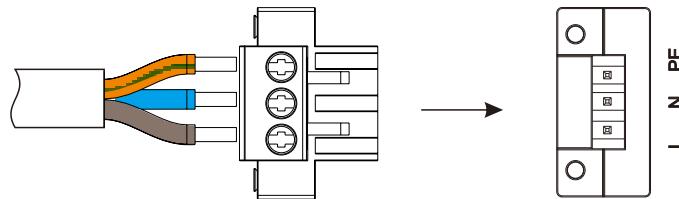
The battery controller module comes with a pluggable terminal block preinstalled. Unplug the terminal block. The back of the controller looks like below.



The following diagram shows the installation:

PSM 10/12/15 Series Installation manual

Esoltech AB, the battery company



- Build the cable / peel off the insulation (approx. 1cm)
- Insert the cable into the terminal block as indicated

Note: PLTB2.5-BF-SP terminal comes with a push-release mechanism that will release an inserted cable when pushing down

- Plug in the terminal block and fasten the screws (flat-blade 2mm)

Cable gland

Check all the external cabling before fixing the cable gland.

Make sure no tension is built when fastening the cable gland.

6. FINAL CHECK AND FINISHING UP

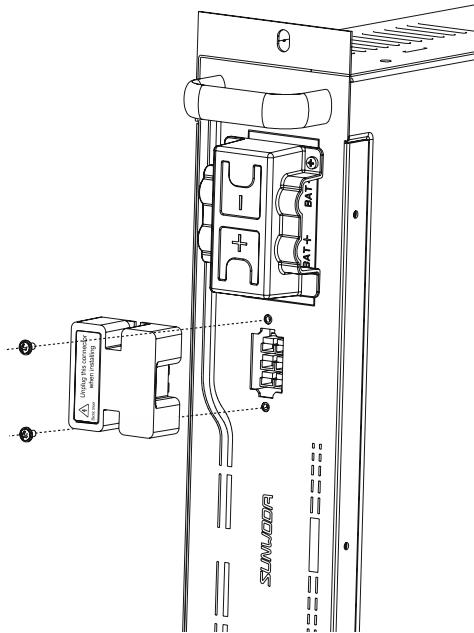
Check and make sure all the cable connection is done properly. Consider the following checklist before proceeding:

- Cables on the front side of battery modules
- Cables on the back side of the ESO (no empty socket)
- Cables on the front side of controller module
- Protection covers on both the battery and controller modules

6.1 Jumper bricks

Both the battery and the controller module come with jumper bricks for safety consideration.

The battery is physically cut off from the internal circuit if the jumper brick is removed. Install the batter jumper brick according to the following diagram.



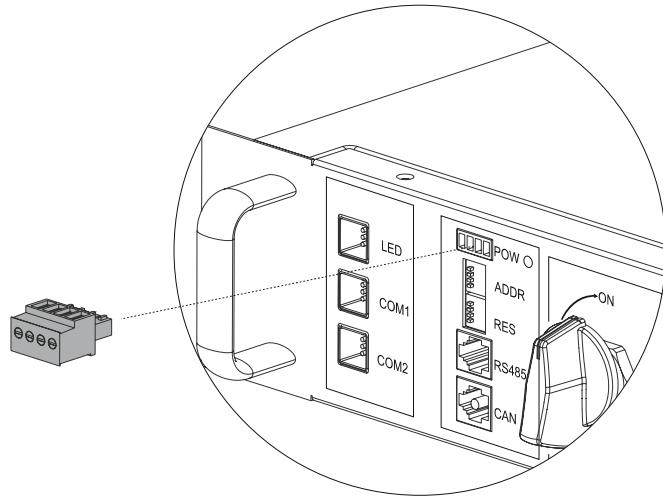
Make sure all the screws are properly fastened.

PSM 10/12/15 Series Installation manual

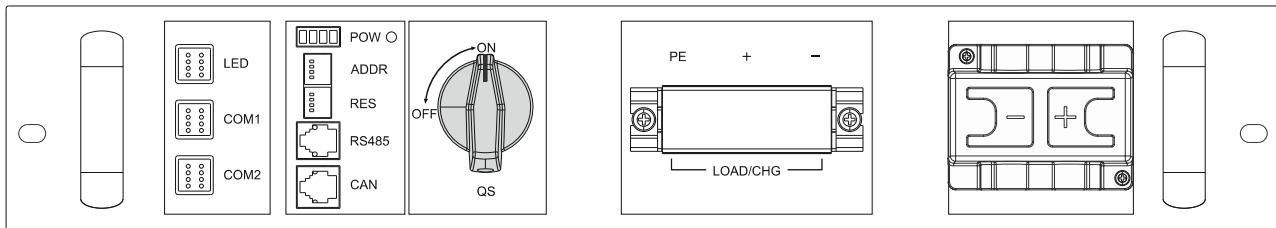
Esoltech AB, the battery company

The battery controller comes with a green jumper that needs to be installed. The power to the controller is cut off if the jumper is removed.

Insert the jumper according to the following diagram



The battery controller has no power output if the QS breaker is switched off. The QS breaker on the battery controller module is switched on by default.



Make sure all the connection is properly done before switching the QS to ON.

6.2 Finishing up

It is the last step of the installation. Put back all the side panels in reverse order they were removed. Make sure all the screws are properly fastened.

Note: the PSM system does not come with any switch.

PSM 10/12/15 Series Installation manual

Esoltech AB, the battery company

The LED lights up when plugging the AC plug into a wall socket. You may hear click which indicate the system initiates self-diagnosis. Your PSM system is now ready.

Contact your system administrator for a proper setting of the PSM in your FerroAmp Portal system.

After a proper configuration, the PSM system will display as a battery in your Portal. The PSM is automatically controlled by the EnergyHub through the Portal.

7. MORE INFORMATION

7.1 Trouble shooting

LED indicator (★ is flashing, ★★ is flashing quickly, ● is always on and the flashing frequency is 1Hz)

States description		LED 1	LED 2	LED 3	LED 4	LED 5	Remarks
Power off							Lights off
Self-inspection							LED flashing
Charging	SOC 0% - 20%	★					LED1-LED5 flashing
	SOC 21% - 40%	●	★				LED2-LED5 flashing
	SOC 41% - 60%	●	●	★			LED3-LED5 flashing
	SOC 61% - 80%	●	●	●	★		LED4-LED5 flashing
	SOC 81% - 100%	●	●	●	●	★	LED5 flashing
	Over vol. warning	★	●				
	Over temp. warning	★		●			
	Over current warning	★	●	●			
	Over vol. protection	★★	●				
	Over temp. protection	★★		●			
Discharging	Over current protection	★★	●	●			
	SOC 0% - 20%	●					
	SOC 21% - 40%	●	●				
	SOC 41% - 60%	●	●	●			
	SOC 61% - 80%	●	●	●	●		
	SOC 81% - 100%	●	●	●	●	●	
	Under vol. warning	★			●		
	Over temp. warning	★	●		●		
	Over current warning	★	●	●	●		
	Under vol. protection	★★			●		
	Over temp. protection	★★	●		●		
	Over current protection	★★	●	●	●		
Error		★	★	★	★	★	

PSM 10/12/15 Series Installation manual

Esoltech AB, the battery company

Manufacture supplied information

1. Battery Module

Model No. H102025M-S with High-voltage Control Module

2. Battery controller module

HV control module H100030H-P01 (off-grid)

HV control module H100030H-P02 (AC powered)

7.2 Datasheet

PSM System Model	DC coupled energy storage				
	PSM 10/4	PSM 15/6	PSM 15/12		
Storage capacity, W_{NOM}	10 kWh	15 kWh	15 kWh		
Maximum power rating, P_{MAX}	4 kW	6 kW	12 kW		
Battery voltage, V_{NOM}	410 V	614 V			
Maximum cont. battery charge current, I_{BAC}	20 A				
Maximum cont. battery discharge current, I_{BAD}	20 A				
Electrical roundtrip efficiency incl. DC/DC converter	93 % typical				
Cycle life	6000 cycles @ 80% DOD, EOL capacity 70%				
Cell chemistry	LiFePO4				
Maximum battery potential to ground	1000 Vpk				
Battery fuses	20 A, 1000 V, 10x38 mm gPV				
SOC precision	$\leq 5\%$				
Standby consumption incl. DC/DC converters	$\leq 5\text{ W}$		$\leq 10\text{ W}$		
Protection functions	Over voltage, over temperature, over current, isolation fault, pre-charge protection, short-circuit protection				
DC-nanogrid					
Number of included ESO DC/DC converters	1		2		
DC bus voltage, V_{DC}	760 V (nominal)				
DC bus voltage range, V_{DC}	720 - 800				
Maximum DC bus current, $I_{DC(max)}$	10 A	10 A	20 A		
DC bus connection	3-wire (DC+, DC-, PE)				
DC bus communication	Narrow band power line communication (PLC)				
Physical					
Dimensions H x W x D	1550 x 630 x 250 mm		2050 x 630 x 250 mm		
Weight	140 kg		210 kg		
Color	Black				
Installation					
Ambient temperature	0°C – 40°C				
Humidity	10 – 90% RH non condensing				
Degree of protection	IP 20				
BMS Power supply	230 VAC, max 40 W				
Compliance					
Battery safety	EN 62619, UN38.3				
LVD	EN 62477-1				
EMC	EN 61000-6-3, EN 61000-6-2				