



# **Lithium-Ion Phosphate (LFP) Battery Energy Storage System Force-H3-US Operation Manual**

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5PMPA08-00303

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# 1 Information about this manual

## 1.1 Purpose

This manual describes the Force-H3-US from Pylontech in terms of its overview, installation, commissioning, maintenance, etc. Please read this manual before installing the battery and follow the instructions carefully during installation. In case of any confusion, please contact Pylontech immediately for advice and clarification (Contact information can be found on the back cover of the manual).

## 1.2 Explanation of Symbols

Symbol	Description
	<p><b>Danger:</b> Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.</p> <p><b>Danger:</b> Indique un danger avec un niveau de risque élevé, qui s'il n'est pas évité, peut entraîner des graves blessures voire la mort.</p>
	<p><b>Warning:</b> Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.</p> <p><b>Avertissement:</b> Indique un risque de danger de niveau moyen, qui s'il n'est pas évité, peut entraîner des graves blessures voire la mort.</p>
	<p><b>Caution:</b> Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.</p> <p><b>Attention:</b> Indique un risque 'il n'est pa évité, peut entraîner des blessures mineures ou modérées.</p>

### 1.3 Abbreviations in this Manual

Abbreviation	Designation
Pylontech	Pylon Technologies Co., Ltd.
QC	Quality Control
BMS	Battery Management System
PCS	Power Conversion System
SOC	State of Charge
UPS	Uninterruptible Power Supply
BESS	Battery Energy Storage System
EMS	Energy Management System

## 2 Safety

### 2.1 Symbols

	<p>Read the manual before installing and operating the battery system. Lisez le manuel du produit avant d'utiliser le système de batterie.</p>
	<p>General warning label indicating potential hazards. Étiquette générale d'avertissement indiquant les dangers potentiels.</p>
	<p>Warning: electric shock! Avertissement: choc électrique!</p>
	<p>Warning: flammable materials. Attention: matériaux inflammables.</p>
	<p>Do not connect the positive and negative reversely. N'inversez pas la connexion des pôles positif et négatif.</p>
	<p>Keep away from flame or ignition sources. Tenir à l'écart des flammes ou des sources d'inflammation.</p>

	<p>Keep away from children. Maintenir loin des enfants.</p>
	<p>Recycle label. Étiquette de recyclage.</p>
	<p>The certificate label for Safety by Intertek. Étiquette de certificat de sécurité par Intertek.</p>

## 2.2 Personal Requirements

Qualified personnel must have the following skills:

Le personnel qualifié doit avoir les compétences suivantes:

- Training in the installation and commissioning of the electrical system, as well as the dealing with hazards.

Formation en matière d'installation et de mise en service du système électrique, et de gestion des risques.

- Knowledge of the manual and other related documents.  
Connaissance du manuel et d'autres documents concerné.
- Knowledge of the local regulations and directives.  
Connaissance des réglementations et directives locales.



## 2.3 General Safety

### Declaration

This system is only operated by authorized personnel. Read all safety instructions carefully prior to any work and follow these instructions at all times when working with the system.

Le système ne doit être utilisé que par des personnes autorisées. Lisez attentivement toutes les consignes de sécurité avant toute intervention et respectez-les à tout moment lorsque vous travaillez avec le système.

Incorrect operation or work may cause:

Une opération ou un travail incorrect peut causer:

- Injury or death to the operator or a third party.  
Blessure ou mort à l'opérateur ou à un tiers.
- Damage to the system hardware and other properties belonging to the operator or a third party.  
Dommage au matériel du système et à d'autres propriétés appartenant à l'opérateur ou à un tiers.

### General Requirements

#### DANGER

**Danger:** Batteries deliver electric power, resulting in burns or a fire hazard when short circuit or incorrect installment occurs.

**Danger:** Les batteries fournissent de l'énergie électrique, ce qui entraîne des brûlures ou un risque d'incendie en cas de court-circuit ou d'installation incorrecte.

#### DANGER

**Danger:** Lethal voltages are present in the battery terminals and cables. Severe injuries or death may occur if you touch the cables and terminals.

**Danger:** Des tensions mortelles sont présentes dans les bornes et les câbles de la batterie. Des blessures graves, voire la mort, peuvent survenir si vous touchez les câbles et les bornes.

 **DANGER**

**Danger:** Battery strings will produce high voltage DC power and can cause a lethal voltage and an electric shock. Only qualified personnel can perform the wiring of the battery strings.

**Danger:** Les systèmes de batteries produisent une alimentation en CC de haute tension et peuvent provoquer une tension mortelle et un choc électrique. Seul le personnel qualifié peut effectuer le câblage des chaînes de batteries.

 **WARNING**

**Warning:** DO NOT open or deform the battery module, otherwise the product will be out of warranty scope.

**Avertissement:** NE PAS ouvrir ou déformer le module de batterie, sinon le produit ne sera plus couvert par la garantie.

 **WARNING**

**Warning:** Whenever operating the battery system, wear suitable personal protective equipment (PPE) such as rubber gloves, rubber boots and goggles.

**Avertissement:** Chaque fois que vous utilisez le système de batterie, portez un équipement de protection individuelle (EPI) approprié tel que des gants en caoutchouc, des bottes en caoutchouc et des lunettes.

 **WARNING**

**Warning:** For this system, working temperature is  $-50^{\circ}\text{F} \sim 131^{\circ}\text{F}$  ( $-10^{\circ}\text{C} \sim 55^{\circ}\text{C}$ ) and the optimum temperature is:  $64.4^{\circ}\text{F} \sim 82.4^{\circ}\text{F}$  ( $18^{\circ}\text{C} \sim 28^{\circ}\text{C}$ ). Out of the working temperature range may cause the battery system over/low temperature alarm or protection which will further lead to the cycle life reduction. It will affect the warranty terms as well.

**Attention:** Pour ce système, la température de fonctionnement est de  $-50^{\circ}\text{F} \sim 131^{\circ}\text{F}$  ( $-10^{\circ}\text{C} \sim 55^{\circ}\text{C}$ ) et la température optimale est :  $64.4^{\circ}\text{F} \sim 82.4^{\circ}\text{F}$  ( $18^{\circ}\text{C} \sim 28^{\circ}\text{C}$ ). Si la température se retrouve en dehors de la plage de température de fonctionnement, une alarme ou une protection contre une température trop haute /trop basse du système de batterie peut entraîner une réduction de la durée de vie ou nombre de cycles. Cela affectera également les conditions de garantie.

 **WARNING**

**Warning:** For battery installation, the installer shall refer to NFPA70 or similar local installation standard for operation.

**Avertissement:** Pour l'installation de la batterie, l'installateur doit se référer à la norme NFPA70 ou à une norme d'installation locale similaire pour le fonctionnement.

 **WARNING**

**Warning:** Pulling out the connectors while the system is working could lead to battery system damage or personal injury. Do not pull out the connectors while system is in operation. De-energize all multiple power sources and verify that there is no voltage.

**Avertissement:** retirer les connecteurs pendant que le système fonctionne peut entraîner des dommages au système de batterie ou des blessures. Ne retirez pas les connecteurs lorsque le système est en fonctionnement. Coupez toutes les sources d'alimentation et vérifiez qu'il n'y a pas de tension.

 **CAUTION**

**Caution:** Improper settings or maintenance can permanently damage the battery.

**Attention:** des réglages ou un entretien inappropriés peuvent endommager définitivement la batterie.

 **CAUTION**

**Caution:** Incorrect inverter parameters will lead to the premature aging of battery or battery system failure.

**Attention:** des paramètres incorrects de l'onduleur entraîneront d'autres défauts/dommages à la batterie.

 **CAUTION**

**Caution:** Battery needs to be recharged within 12 hours, after fully discharged.

**Attention:** La batterie doit être rechargée dans les 12 heures après avoir été complètement déchargée.

## 2.4 Safety Instructions Before Connecting the Battery

### CAUTION

#### Caution:

- After unpacking, please check product and packing list first, if the product is damaged or lack of parts, please contact the local retailer.
- Before installation, be sure to cut off the grid power and make sure the battery is in the switched-off mode.
- Wiring must be correct, do not mistake the positive and negative cables, and ensure no short circuit with the external device.
- DO NOT connect the battery with AC power directly.
- Battery system must be well grounded and the resistance must be less than 100mΩ.
- Please ensure the electrical parameters of battery system are compatible to related equipment.
- Keep the battery away from water and fire.

#### Attention:

- Après le déballage, veuillez d'abord vérifier le produit et la liste de colisage. Si le produit est endommagé ou manque de pièces, veuillez contacter le détaillant local.
- Avant l'installation, assurez-vous de couper l'alimentation du réseau et assurez-vous que la batterie est en mode éteint.
- Le câblage doit être correct, ne confondez pas les câbles positifs et négatifs et assurez-vous qu'il n'y a pas de court-circuit avec l'appareil externe.
- NE connectez PAS la batterie directement au secteur.
- Le système de batterie doit être bien mis à la terre et la résistance doit être inférieure à 100 mΩ.
- Veuillez vous assurer que les paramètres électriques du système de batterie sont compatibles avec l'équipement associé.
- Gardez la batterie à l'écart de l'eau et du feu.

## 2.5 Safety Instructions in Using the Battery

### CAUTION

#### Caution:

- If the battery system needs to be moved or repaired, the power must be cut off and the battery is completely shut down in advance.
- DO NOT connect the battery with other different type of battery.
- DO NOT let the batteries work with faulty or incompatible inverter.
- DO NOT disassemble the battery (QC tab removed or damaged).
- In case of fire, only dry powder fire extinguisher can be used. DO NOT use liquid fire extinguishers.

#### Attention:

- Si le système de batterie doit être déplacé ou réparé, l'alimentation doit être coupée et la batterie doit être complètement éteinte au préalable.
- NE connectez PAS la batterie à un autre type de batterie.
- NE laissez PAS les batteries fonctionner avec un onduleur défectueux ou incompatible.
- NE PAS démonter la batterie (onglet QC retiré ou endommagé).
- En cas d'incendie, seul un extincteur à poudre sèche peut être utilisé. NE PAS utiliser d'extincteurs liquides.

## 3 System Introduction

### 3.1 System Description

#### 3.1.1 System Overview

Force-H3-US is a high voltage battery storage system based on lithium iron phosphate battery, which is one of the new energy storage products developed and produced by Pylontech. It can be used to provide reliable power for various types of equipment and systems. Force-H3-US enables multiple strings parallel operation feature, which provides tremendous flexibility in system design and configuration. Force-H3-US is especially suitable for those application scenarios which require high power output, limited installation space, restricted load-bearing and long cycle life.

Force H3-US is designed to be used in indoor and outdoor environments.



**Fig. 3-1: Force-H3-US**

### 3.1.2 Single String System Specifications

Specifications	Product Name						
	Force-H3-102.4/102.4-US	Force-H3-102.4/204.8-US	Force-H3-102.4/307.2-US	Force-H3-102.4/409.6-US	Force-H3-102.4/512-US	Force-H3-102.4/614.4-US	Force-H3-102.4/716.8-US
Battery Module Quantity (pc)	1	2	3	4	5	6	7
Battery System Energy (kWh)	4.966	9.932	14.898	19.864	24.83	29.796	34.762
Battery System Usable Energy (kWh)	4.966	9.932	14.898	19.864	24.83	29.796	34.762
Battery System Rated DC Power (kW)	4.966	9.932	14.898	19.864	24.83	29.796	34.762
Battery System Voltage (VDC)	102.4	204.8	307.2	409.6	512	614.4	716.8
Battery System Charge Upper Voltage (VDC)	115.2	230.4	345.6	460.8	576	691.2	806.4
Battery System Discharge Lower Voltage (VDC)	92.8	185.6	278.4	371.2	464	556.8	649.6
Dimensions (W x D x H, inch)	21.26 x 13.78 14.17 (inch ) (540 x 350 x 360 mm)	21.26 x 13.78 x 20.87 (inch) 540 x 350 x 530 mm)	21.26 x 13.78 x 27.56 (inch) (540 x 350 x 700 mm)	21.26 x 13.78 x 34.25 (inch) (540 x 350 x 870 mm)	21.26 x 13.78 x 40.94 (inch) (540 x 350 x 1040 mm)	21.26 x 13.78 x 47.64 (inch) (540 x 350 x 1210 mm)	21.26 x 13.78 x 54.33 (inch) (540 x 350 x 1380 mm)
Weight (lb)	116.8 lb (53 kg)	202.8 lb (92 kg)	288.8 lb (131 kg)	374.8 lb (170 kg)	460.8 lb (209 kg)	546.7 lb (248 kg)	632.8 lb (287 kg)
Battery Control Model	FC1000-US						
Battery Module Model	FH10050-US						
Single Battery Module Energy (kWh)	4.966						
Single Battery Module Voltage (VDC)	102.4						
Battery Module Capacity (Ah)	48.5						
Battery System Charge Current (Amps, Rated)	48.5						
Battery System	55						

Charge Current (Amps, maximum @15minutes)	
Battery System Discharge Current (Amps, Normal)	48.5
Battery System Discharge Current (Amps, maximum @15 minutes)	55
Short circuit rating	3000 Amps /2 milliseconds
Depth of Discharge	100 %
Communication	CANBUS/Modbus RTU
IP Rating	IP55/I
Pollution Degree	PD3
Design Life (year)	15+
Operation Temperature (°F)	-50°F~ 131°F (-10°C~ 55°C) *
Storage Temperature (°F)	-68°F~ 140°F (-20°C~ 60°C)
Altitude (feet)	<13,123.36 ft (4,000 m)
Humidity (% , RH)	5 ~ 95
Product Certificate	UL1973, UL9540A, UL9540
Transfer Certificate	UN38.3
Environmental certification	RoHS、Reach、WEEE
Single Battery Control Module Dimensions	21.26 inch (w) x 13.78 inch (D) x 5.90 inch (H) (540 x 350 x150 mm)
Single Battery Module Dimensions	21.26 inch (w) x 13.78 inch (D) x 6.69 inch (H) (540 x 350 x 170 mm)
Battery Bottom Base Dimensions	21.26 inch (w) x 13.78 inch (D) x 1.57 inch (H) (540 mm x 350 mm x 40 mm)
Country of Manufacture	China

\* In high (>104°F) or low temperature (< 50°F) environment, the charging and discharging power of the battery system will be limited according to BMS operation logic.



### 3.1.3 Multi-string System Parameters (maximum 6 Strings per System)

For multi-string operation, ensure that:

- The battery type in the whole system is the same.
- The battery amount of each string is the same.

Specifications	Force-H3-US in multi-strings				
Battery System Voltage (VDC)*	204.8 / 307.2 / 409.6 / 512 / 614.4 / 716.8				
Battery System string amount(pcs)	2	3	4	5	6
Battery System capacity (Ah)	97	145.5	194	242.5	291
Battery System Operation Current (Amps, Standard)	20	30	40	50	60
Battery System Operation Current (Amps, Rated)	80	120	160	200	240
Battery System Operation Current (Amps, maximum @15 minutes)	110	165	220	275	330
P-Combiner 3/6-V2 Operation Current (Amps, Normal)	50**		100**		
P-Combiner 3/6-V2 Operation Current (Amps, maximum @15 seconds)	80**		160**		

\*The Battery System Voltage varies depending on battery amount in serial per string.

\*\*The current is based on BMS theoretical operation current. If using P-Combiner 3-V2 as the combiner box of the multi-strings` battery system wiring connection, the maximum continuous operation current is 50 Amps, maximum peak operation current is 80 Amps for 15 seconds. Please make sure the real operation current not exceed the combiner box power rating.

\*The current is based on BMS theoretical operation current. If using P-Combiner 6-V2 as the combiner box of the multi-strings` battery system wiring connection, the maximum continuous operation current is 100 Amps, maximum peak operation current is 160 Amps for 15 seconds. Please make sure the real operation current not exceed the combiner box power rating.

#### CAUTION

**Caution:** DO NOT use P-Combiner-HV-3/6-V2 or similar concept of multi-strings connection method in case the multiple battery strings need to be operated independently.

**Attention:** NE PAS utiliser le P-Combiner-HV-3/6-V2 ou un concept similaire de méthode de connexion multi-chaînes au cas où les plusieurs chaînes de batteries devraient fonctionner indépendamment.

## 3.2 Battery Module

### 3.2.1 Battery Module Specifications



Fig. 3-2: Battery Module

Parameter	FH10050-US
Cell Technology	Li-ion (LFP)
Battery Module Energy (kWh)	4.966
Battery Module Voltage (VDC)	102.4
Battery Module Capacity (Ah)	48.5
Battery Module Serial Cell Quantity (pc)	32
Battery Cell Voltage (VDC)	3.2
Battery Cell Capacity (Ah)	48.5
Dimension (W x D x H, inch)	21.26 inch x 13.78 inch x 6.69 inch (540 mm x 350 mm x 170 mm)
Weight (lb)	85.98 lb (39 kg)
Operation Life (year)	15+
Operation Cycle Life (cycle) *	8,000
Operation Temperature (°F) **	-50°F ~ 131°F (-10°C ~ 55°C)
Storage Temperature (°F)	-68°F ~ 140°F (-20°C ~ 60°C)
Transfer Certificate	UN38.3

\* Operation Cycle Life is defined based on specific operation conditions, for more details please check with Pylontech service team.

\*\* In high(>104°F) or low temperature(< 50°F) environment, the charging and discharging power of the battery system will be limited according to BMS operation logic.

### 3.2.2 Capacity Expansion

A new battery module can be added onto an existing system at any time. Please ensure that the new battery module has an equivalent OCV (Open Circuit Voltage) compared to existing modules before adding on and make a full charge of the new system. In a serial connection system, the new module, even with a higher SOH, shall follow the system worst SOH condition module to perform.

## 3.3 Control Module

### 3.3.1 Control Module Specifications

Specifications	S1500M5A180L
Related Product	FC1000-US
Control Module Working Voltage (VDC)	80 - 1000
System Operation Voltage (VDC)	172.8 - 921.6
Charge Current (Amps, maximum @15 minutes)	55
Discharge Current (Amps, maximum @15 minutes)	55
Self-consumption (W)	< 16
Dimension (W x D x H, inch)	21.26 inch x 13.78 inch x 5.90 inch (540 mm x 350 mm x150 mm)
Weight (lb)	26.46 lb (12 kg)
Communication Protocol	CANBUS / Modbus RTU
Operation Life (year)	15+
Operation Temperature (°F)	-50°F ~ 131°F (-10°C ~ 55°C)
Storage Temperature (°F)	-68°F ~ 140°F (-20°C ~ 60°C)

### 3.3.2 Control Module Display Panel

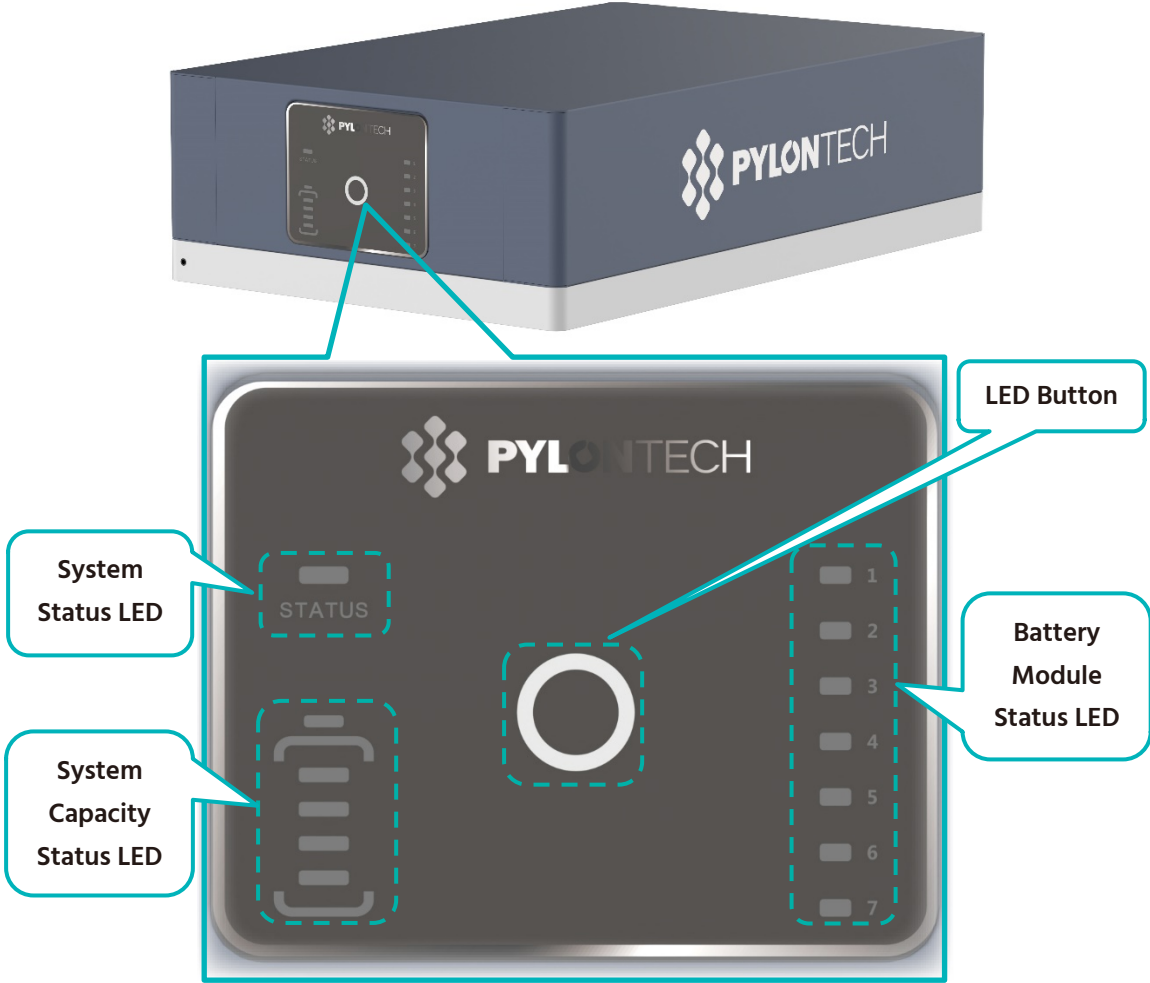



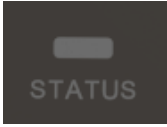




Fig. 3-3: Control Module Display Panel

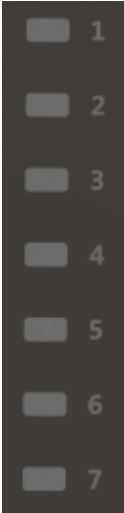
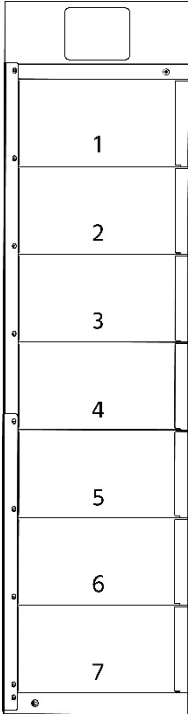


**LED Button**

Button	Action	Instructions
	Short Press	Display the LED panel for 20 seconds.
	Long Press 1 (about 5~10 seconds)	(1) When System Status LED fast flashes blue  , release the button, then it is 115200 baud rate of RS485. (2) When System Status LED fast flashes orange  , release the button, then it is 9600 baud rate of RS485. (3) If a special protocol (except Pylontech Protocol) is selected, follow 'Long Press 2', then the baud rate changing described here is ineffective.
	Long Press 2 (>10 seconds)	Communication Protocol Selection, for details please check with Pylontech service team. Communication Protocol Selection Guidance.

## System Status LED

		<p>Refer to Instructions of the <i>LED Indicators Instructions</i> below.</p>
		


## Battery Module Status LED

		<p>Blue light</p> 	Normal
		<p>Orange light</p> 	<p>Individual module alarm or protection occurs. See trouble shooting steps in <i>section 7.3</i>.</p>

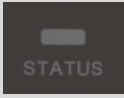
















### Instructions:

- (1) Each Status LED (1~7) represents one individual battery module from number 1 (the one right beneath the control module) to number 7 (the one next to the base), as shown in the above illustration.
- (2) If your system has less than 7 battery modules, the Status LED without corresponding battery will be always OFF.

## System Capacity Status LED

	<p>Indicate the system SOC. Each LED indicates 25%SOC</p>
---	---

## LED Indicators Instructions

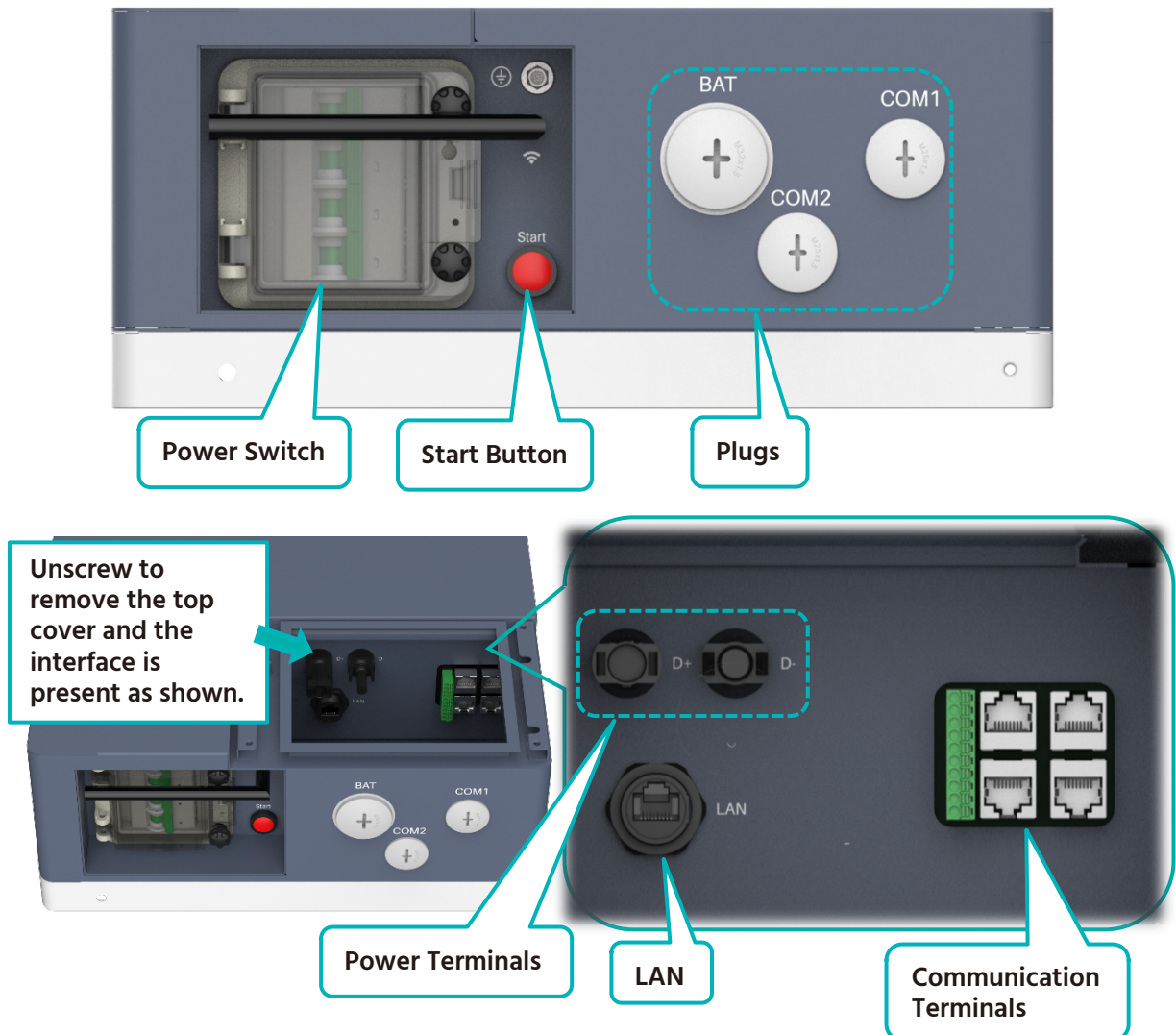
Status			Remark
Self-checking	 Blue, Flashing*	All flashing*	
Self-checking failure	 Orange, Slow flashing**	Off	See trouble shooting steps in <i>section 7.3</i> .
Black start success	 Blue, fast flashing**	Off	
Black start failure	 Orange, fast flashing**	Off	See trouble shooting steps in <i>section 7.3</i> .
Communication Lost or BMS error	 Orange, solid	 Indicating SOC, Blue, solid	See trouble shooting steps in <i>section 7.3</i> .
Idle	 Blue, slow flashing**	 Indicating SOC, Blue, solid	
Charge	 Blue, solid	 Indicating SOC, blue, solid	
Floating charge	 Blue, solid	 All flashing, horse race lamp	
Discharge	 Blue, flashing*	 Indicating SOC, blue, solid	
System sleep	 Blue, flashing*	Off	Battery module status off.

\*Flashing: 0.5s ON/0.5s OFF.

\*\*Slow flashing: 2.0s ON/1.0s OFF.

\*\* Fast flashing: 0.1s ON/0.1s OFF.

### 3.3.3 Control Module Interface Panel



#### Power Switch (under the protection cover)

**ON:** Power Switch ON, able to turn on battery system by Start Button.

**OFF:** Power Switch OFF, able to turn off system completely, no power output.

#### **CAUTION**

**Caution:** If the power switch is tripped off due to over current or short circuit, be sure to **wait more than 30 minutes**, then you can turn it on again; otherwise it may cause damage to the switch.

**Attention:** si l'interrupteur d'alimentation est déclenché en raison d'une surintensité ou d'un court-circuit, assurez-vous d'attendre plus de 30 minutes, puis vous pourrez le rallumer; sinon cela pourrait endommager l'interrupteur.

**NOTE:** After using the power switch, lock the protection cover by tightening the two screws on the cover to make it water-proof.

## Start Button

### CAUTION

**Caution:** Press the Start button and hold more than 5 seconds until the buzzer rings to turn on the controller.



**Power on:** Press and hold  $\geq 5\text{sec}$  till the buzzer rings  
**Mise sous tension:** Appuyez et maintenez  $\geq 5\text{sec}$  jusqu'à ce que le buzzer sonne

**Attention:** Bouton de démarrage: appuyez sur ce bouton et maintenez-le enfoncé pendant plus de 5 secondes jusqu'à ce que le buzzer sonne pour allumer le contrôleur.

**Multi-string starting sequence:** please start up the last string (from communication structure, the last slave string, see the table below) of battery system first, one by one to the first string which shall be started up lastly. Details as below table.

Communication Structure	Startup Sequence
Master string*	Last Start up
Slave string 1	5th Start up
Slave string 2	4th Start up (if has)
Slave string 3	3rd Start up (if has)
Slave string 4	2nd Start up (if has)
Slave string 5	1st Start up (if has)

\* BMS of the rack with Link Port 0 EMPTY is defined as the Master string, which communicates with the inverter or upper controller. In one system, there's ONLY ONE Master string, the rest are defined as the slave strings.

**Black start function:** When the system is turned on, and relay is OPEN, press the Start Button more than 10 seconds. Then relay will be CLOSE for about 10 minutes without communication (depending on conditions).

**Multi-string Black Start:** Black start operation is ONLY needed to be performed on Master string. And it will close circuit for one of the strings within the system for 10 minutes. The slave string black start function is ONLY controlled by master string.

## Plugs

There are three plugs on the panel. Make sure to take out the plugs before connecting the power cables or communication cables. REMEMBER to install the plugs back to the EMPTY holes to guarantee sealing performance of the panel.

**NOTE:** To ensure the sealing performance of the panel, the cable sleeves with proper sizes should be selected to match the diameters of the holes.



## Grounding

Grounding point for connecting grounding cable.

## Wi-Fi

Manufacturer: Pylon Technologies Co., Ltd.

Address: Plant 8, No.505 Kunkai Road, JinXi Town, 215324 Kunshan City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA

Importer: XXXX (Located in installed country)

Address: XXXX (Located in installed country)

Basic Information of Wi-Fi	
Wireless maximum Output Power	<20 dBm
Operating frequency	2412-2472 MHz
Gain of antenna	2.5 dBi
Modulation system	DBPSK/DQPSK/CCK(DSSS) BPSK/QPSK/16QAM/64QAM(OFDM)
Modulating Repetition	1 Mbps/2 Mbps/5.5 Mbps/11 Mbps (DSSS) 6 Mbps/9 Mbps/12 Mbps/18 Mbps/24 Mbps/36 Mbps/48 Mbps/ 54 Mbps (OFDM) MCS0~MCS7 (802.11n 20MHz)
Channel spacing	5 MHZ
Type of antenna	2.4G IPEX-SMA Antenna

**NOTE:** For network connection, please scan the QR code below to get Network Connecting Instructions or contact Pylontech service team for further questions.



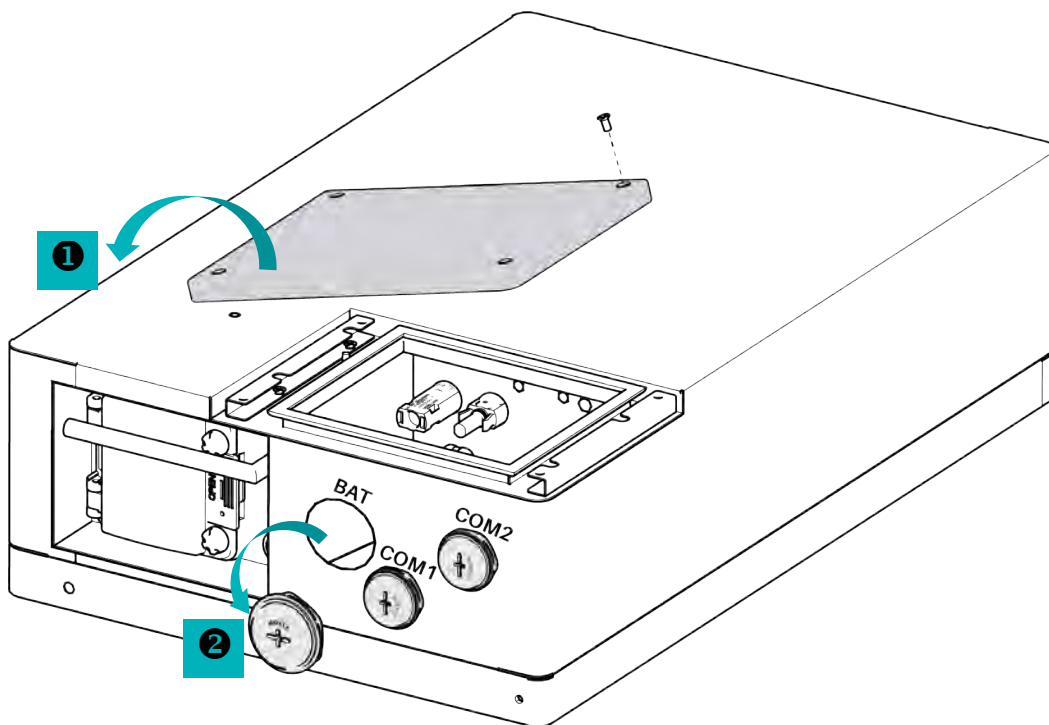
## Power Terminals (+/-)

Connect power cables of battery system with inverter.

During multi-strings operation, you can select P-Combiner-HV-3-V2 (up to 3 strings, maximum 50 Amps) or P-Combiner-HV-6-V2 (up to 6 strings, maximum 100 Amps) for connection. For more details of P-Combiner, please check with your distributor or Pylontech service team.

As there's a protection case over the interface panel, follow the steps below to proceed:

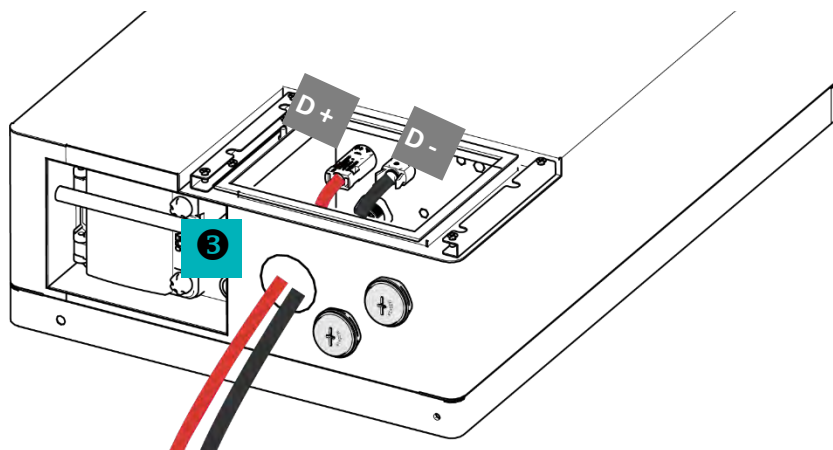
- ❶ Dismantle the four screws to remove the top cover.
- ❷ Take out the plug from the BAT hole on the panel.



Refer to the following table for the specifications of the holes and choose the cable conduits with matching diameter for installation.

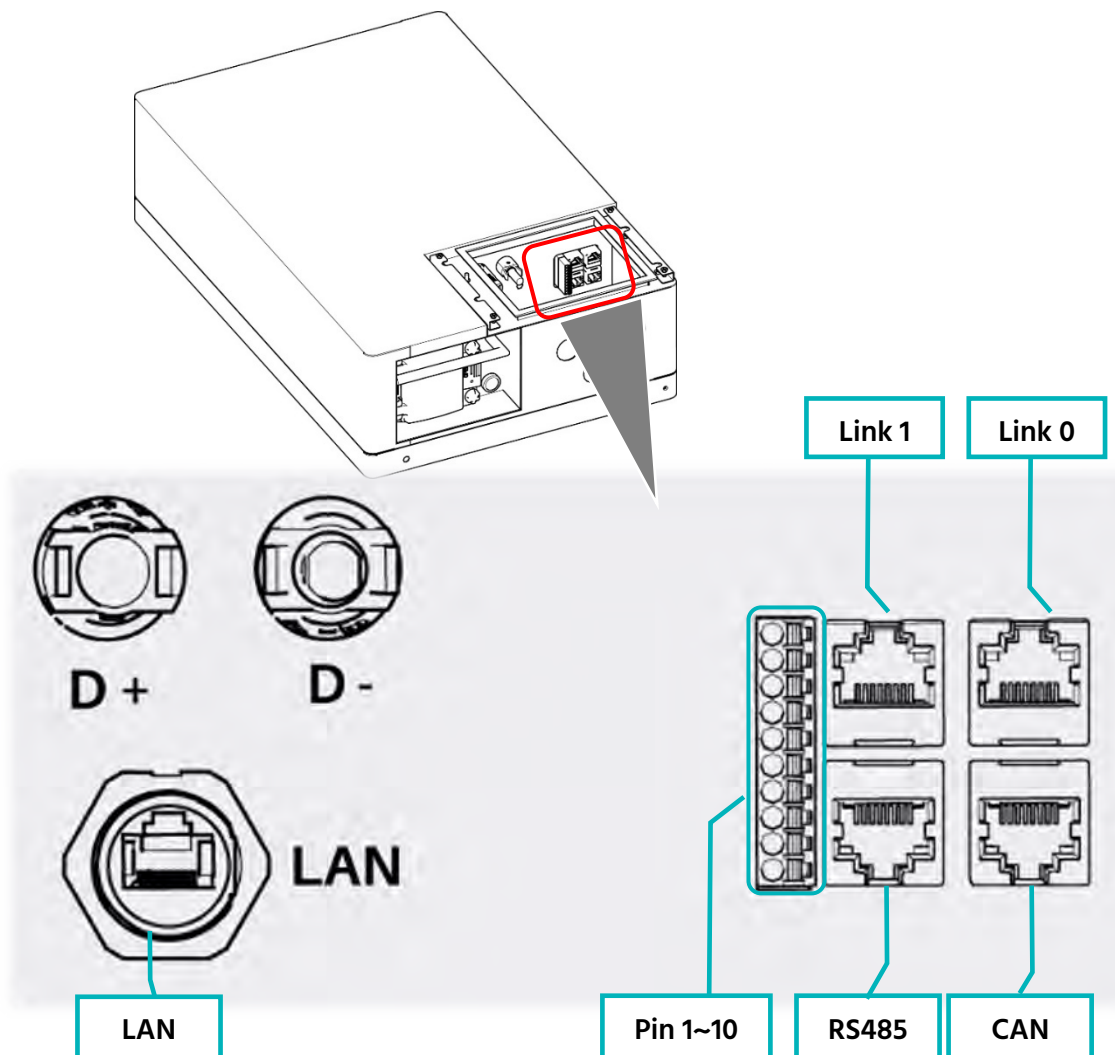
BAT (M32 x1.5)	COM1 (M25 x 1.5)	COM2 (M25 x 1.5)
φ1.43 inch (36.3 mm)	φ1.03 inch (26.2 mm)	φ1.03 inch (26.2 mm)

③ Insert the power cables into the hole to connect the power terminals correctly.



### Communication Terminals (RS485 / CAN / RS232/Link0/Link1)

**NOTE:** Before connecting the communication terminals, remove the top cover as described above (step ①), then the communication terminals are present as shown below.



Following instructions are for your reference:

**LAN:** Used for where the Wi-Fi signal is not good or there is no Wi-Fi. To connect to the online portal directly through a network cable (another side to the internet router).

**Link0/Link1 Communication Terminal:** (RJ45 port) designed only for multi-strings operation, connecting from the first BMS Link 1 to the second BMS Link 0, then from the second BMS Link 1 to the third BMS link 0 (if has), all the way to the last BMS Link 0. The BMS with Link Port 0 EMPTY is defined as the Master string, which communicates with the inverter or upper controller.

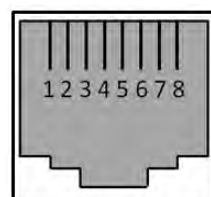
**NOTE:** For multi-strings operation, please firstly make sure the communication cables between multiple BMSs are properly connected between Link 1 and Link 0, prior to the startup process.

**CAN Communication Terminal:** (RJ45 port) follows CAN protocol, for communication between battery system and inverter.

**RS485 Communication Terminal:** (RJ45 port) follows MODBUS 485 protocol, for communication between battery system and inverter.

### Definitions of RJ45 Port PIN

No.	CAN	RS485
1	---	---
2	GND	---
3	---	---
4	CANH	---
5	CANL	---
6	---	---
7	---	RS485A
8	---	RS485B



RJ45 Port



RJ45 Plug

### Pin 1~10 Assignment Table:

1	2	3	4	5	6	7	8	9	10
-	+	GND	H	L	IN+	IN-	TX	RX	GND
E-Stop		CAN			For SMA		RS232		

**E-STOP:** Emergency stop feature is default inactivated. If you need to use such function, please contact Pylontech service team.

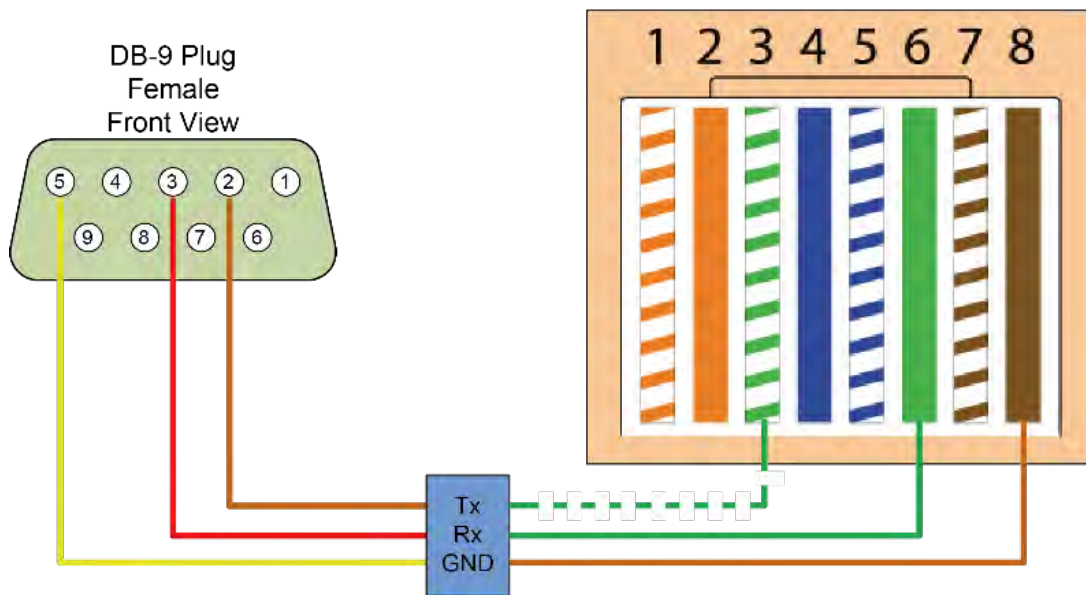
**IN+/IN-:** PIN6/PIN7 terminals are used for SMA inverter Enable Line feature, for more details please check with Pylontech service team.

**RS232 Communication Terminal:** for manufacturer or professionals to debug or service.

- If you have RS232 debug tool (DB9 – USB – RJ45) provided by PYLONTECH before, PIN8~10 here corresponds to PIN3, PIN6 and PIN8 of RJ45.

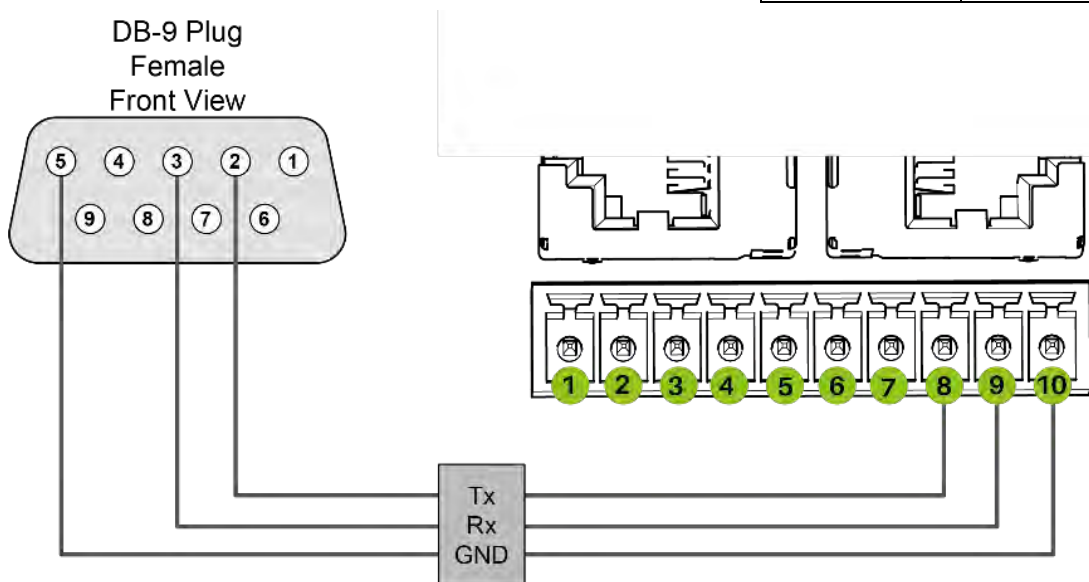
PIN 1-10	RJ45
PIN 8	PIN 3 (Green and white)
PIN 9	PIN 6 (Green)
PIN10	PIN 8 (Brown)

RJ-45 Plug  
Top-view



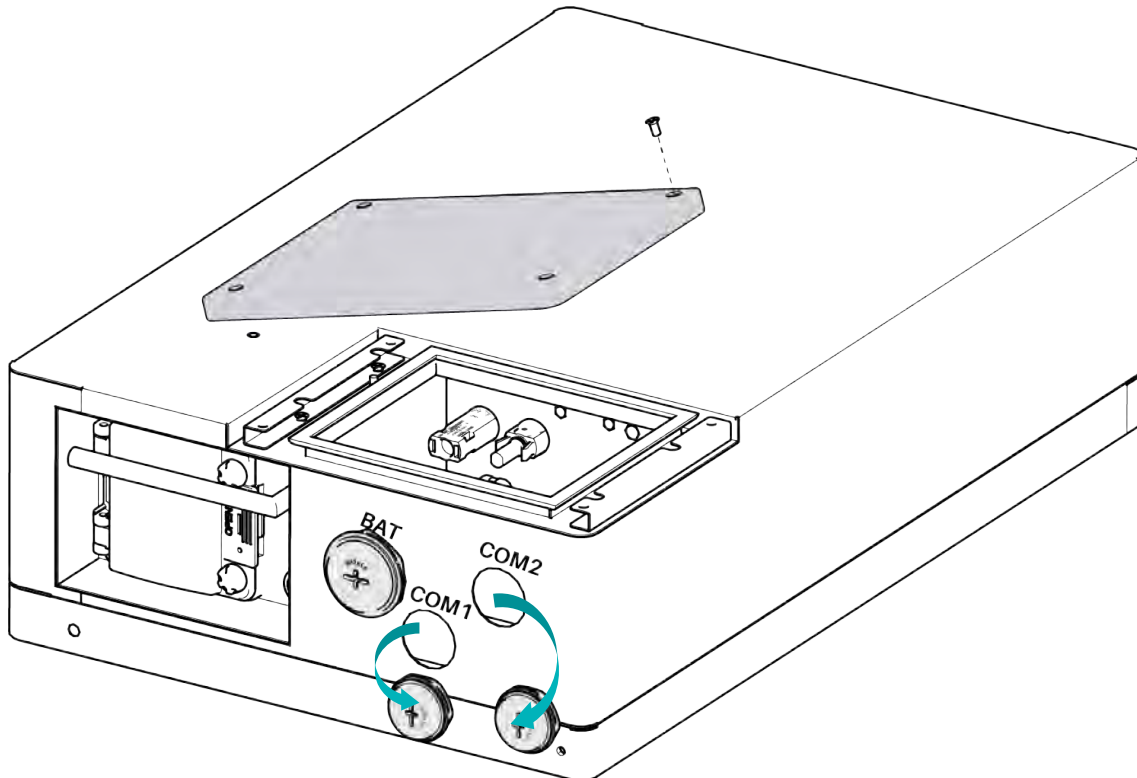
- If you use a new RS232 debug tool (DB9 – USB), the Pin 8~10 here corresponds to PIN 2,3,5 of DB9 terminal.

PIN 1-10	DB9
PIN 8	PIN2
PIN9	PIN3
PIN10	PIN5



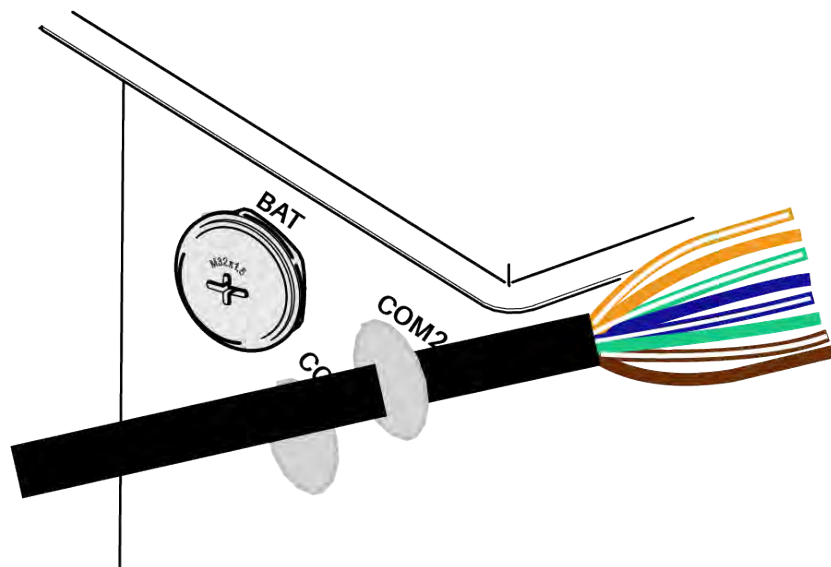
For communication cables connection of PIN1 - 10 terminal station, please follow the steps below:

1. Remove the top cover and take out the plugs of COM1 and COM2 from the panel.

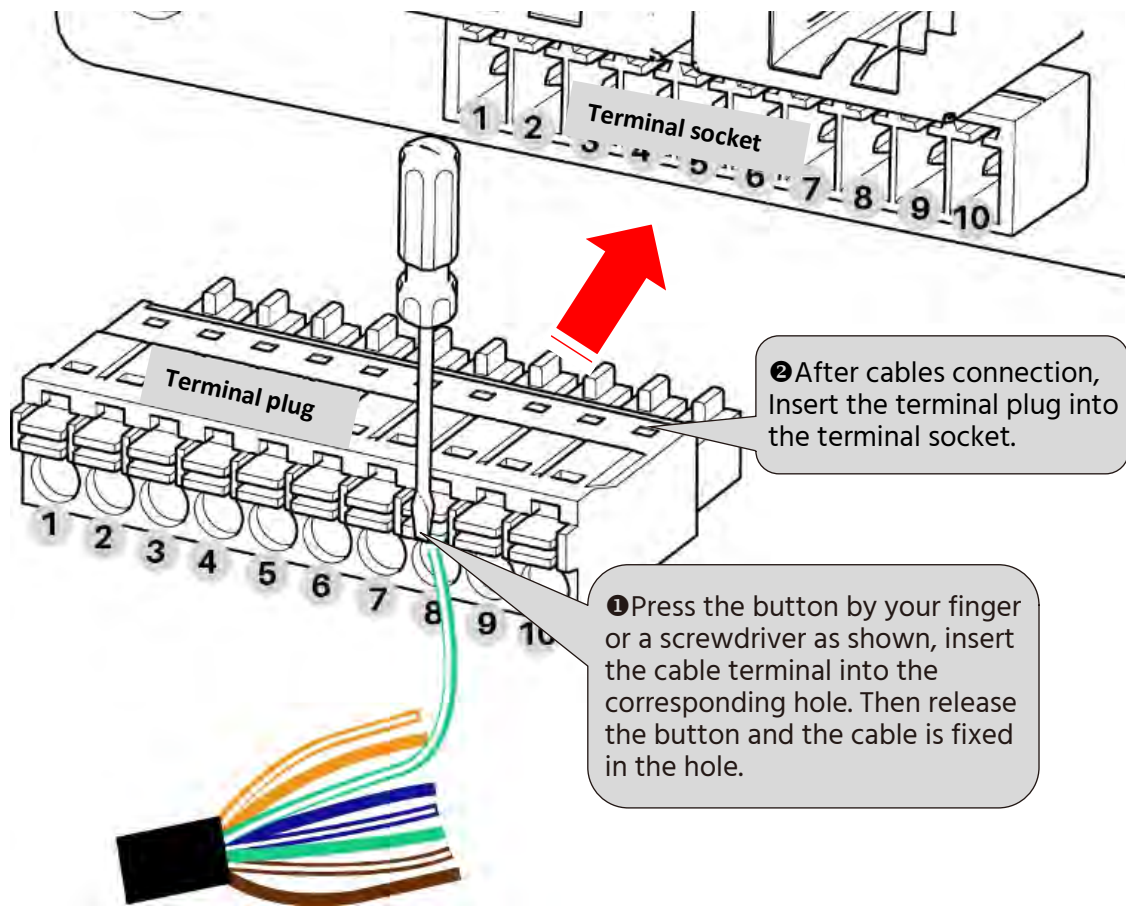


2. Insert the communication cable into the hole of COM1 or COM2 (either hole is available). Refer to the following table for the specifications of the holes and choose the cable conduits with matching diameter for installation.

BAT (M32 x1.5)	COM1 (M25 x 1.5)	COM2 (M25 x 1.5)
φ1.43 inch (36.3 mm)	φ1.03 inch (26.2 mm)	φ1.03 inch (26.2 mm)



3. Follow the instructions of *Pin 1~10 Assignment Table*, and insert the cable terminal into the corresponding pin of the terminal plug.



**NOTE:** After communication cables connection, REMEMBER to install the plugs back to the EMPTY holes in the panel to guarantee sealing performance of the panel.

### 3.4 System Diagram

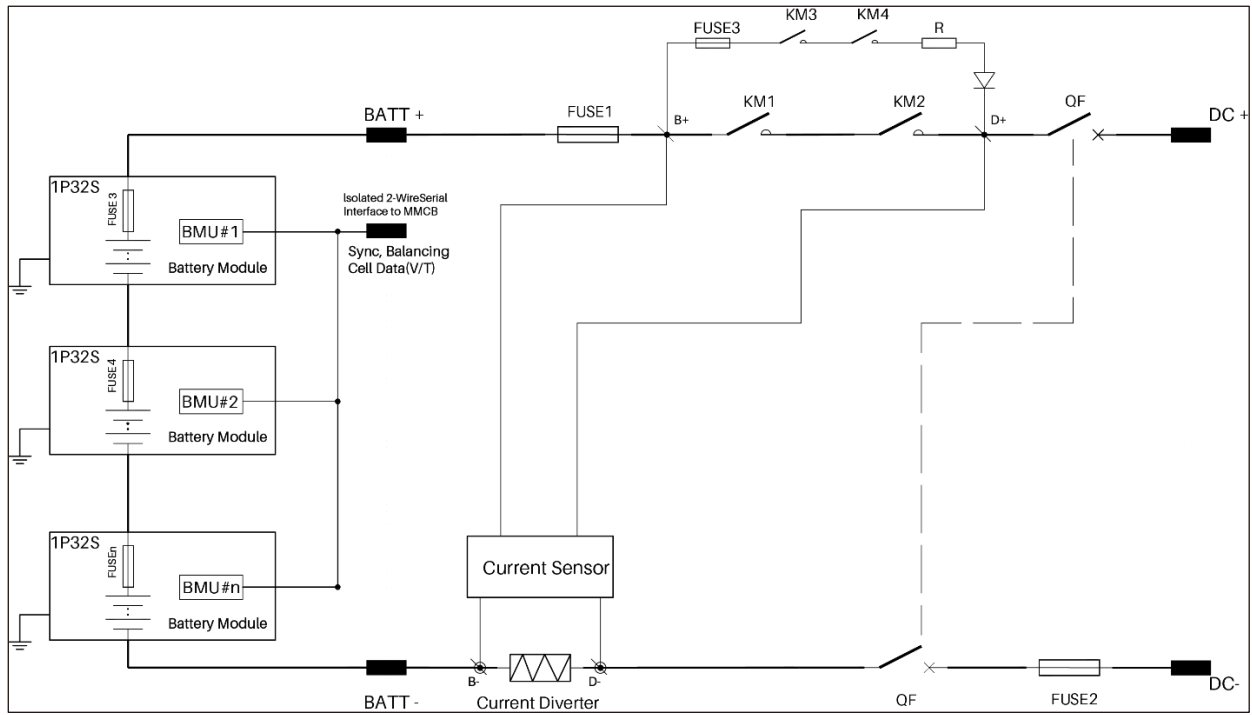


Fig. 3-4: System Diagram



## 4 Installation

Please check every installation step in detail at <Annex 1: Installation and System Turn-on Process List> during the installation.

### 4.1 Checking Before the Installation

#### Checking the Outer Packing and Deliverables

- After receiving the product, check the outer packing for damage, such as holes, cracks, deformation and so on. If any damage is found, contact the local retailer as soon as possible.
- After unpacking the battery, check that the deliverables are complete. If any item is missing or damaged, contact the local retailer as soon as possible.

#### Packing List












FC1000-US Battery Control Module		Set
1	FC1000-US Battery Controller	1
2	Force-H3-US base	1
3	9.84 feet (3 meters) black external communication cable (RJ45)	2
4	4.92 feet (1.5 meters) black internal communication cable (RJ45)	1
5	9.84 feet (3 meters) DC+ red external power cable (8AWG)	1
6	9.84 feet (3 meters) DC- black external power cable (8AWG)	1
7	3.28 feet (1 meter) yellow-green grounding cable (10AWG)	1
8	M4 screws for fixing brackets	18
9	M8 bolts for fixing the base	6
10	M6 screws for fixing grounding cable	1
11	Product Manual	1
12	Warranty card	1
13	Qualified Certificate Card	1
14	Communication protocol setup manual	1
15	22.5 inch (571.5 mm) left bracket (For up to 3 battery modules installation)	1
16	22.5 inch (571.5 mm) right bracket (For up to 3 battery modules installation)	1
17	27.8 inch (706.6 mm) bracket (For up to 4 battery modules installation)	2
18	Anti-Toppling Bracket	2
19	M4 screws for fixing the battery module and control module	2
20	Dismantle tool	1
21	Moisture-proof desiccant	1
FH10050-US Battery Module		
1	FH10050-US battery module	1
2	Qualified Certificate Card	1
3	Moisture-proof desiccant	1

#### NOTE:

- For details about actual deliverables, see the Packing List in the packing case.
- No additional kits are needed for Force-H3-US installation.

## 4.2 Preparing Tools and Instruments

### Tools and Instruments

Type	Tools and Instruments		
Installation	 <p>Wire Cutter</p>	 <p>Crimping Modular Plier</p>	 <p>Cable Ties</p>
	 <p>Screwdriver Set</p>	 <p>Electric Screwdriver</p>	 <p>1000VDC Multimeter</p>
	 <p>Adjustable Wrench</p>	 <p>Sleeve Piece</p>	
Personal protective equipment (PPE)	 <p>Insulated gloves</p>	 <p>Safety goggles</p>	 <p>Safety shoes</p>

**NOTE:** Use properly insulated tools to prevent accidental electric shock or short circuits. If insulated tools are not available, cover the entire exposed metal surfaces with available insulated alternatives, except their tips, with electrical tape.

## 4.3 Selecting the Installation Sites

### 4.3.1 Working Environment Requirements

#### Cleaning

##### DANGER

**Danger:** Before installation and system power on, the dust and iron scurf must be removed to keep a clean environment.

The system cannot be installed in desert area without an enclosure to prevent from sand.

**Danger:** Avant l'installation et la mise sous tension du système, la poussière et les traces de fer doivent être éliminées pour maintenir un environnement propre.

Le système ne peut pas être installé dans une zone désertique sans une enceinte pour éviter le sable.

##### DANGER

**Danger:** Battery module has active DC power at terminals all the time. Be careful to handle the modules.

**Danger:** Le module de batterie dispose en permanence d'une alimentation CC active aux bornes. Soyez prudent lors de la manipulation des modules.

#### Temperature

The system working temperature range:  $-10^{\circ}\text{C}\sim 55^{\circ}\text{C}$  ( $-50^{\circ}\text{F}\sim 131^{\circ}\text{F}$ ); Optimum temperature:  $18^{\circ}\text{C}\sim 28^{\circ}\text{C}$  ( $64.4^{\circ}\text{F}\sim 82.4^{\circ}\text{F}$ ).

There are no mandatory ventilation requirements for battery module, but please avoid of installation in confined area. The aeration shall avoid high salinity, humidity or temperature. **DO NOT** expose the battery system to direct sun light. It is suggested to build sunshade equipment.

##### CAUTION

**Caution:** The IP rating of Force-H3-US system is IP55. But please avoid frost or direct sunlight. Out of the working temperature range will cause the battery system high / low temperature alarm or protection which will further lead to the cycle life reduction. According to the environment requirements, a cooling system or heating system should be installed when necessary.

**Attention:** l'indice IP du système Force-H3-US est IP55. Mais évitez le gel ou la lumière directe du soleil. En dehors de la plage de température de fonctionnement, une alarme ou une protection de température élevée/basse du système de batterie entraînera une réduction supplémentaire de la durée de vie du cycle. Selon les exigences environnementales, un système de refroidissement ou un système de chauffage doit être installé si nécessaire.

## Fire-extinguisher System

### DANGER

**Danger:** The fire-extinguisher system must be equipped for safety purpose. The fire system needs to be checked regularly to ensure a normal working status. Regarding to the using and maintenance requirements, please follow local fire equipment guidance.

**Danger:** Le système d'extincteur doit être équipé à des fins de sécurité. Le système d'incendie doit être vérifié régulièrement pour garantir un état de fonctionnement normal. En ce qui concerne les exigences d'utilisation et d'entretien, veuillez suivre les directives locales en matière d'équipement d'incendie.

## Grounding System

### DANGER

**Danger:** Before the battery installation, ensure that the grounding point of the base is stable and reliable. If the battery system is installed in an independent equipment cabin (e.g. container), the grounding of the cabin must be stable and reliable.

The resistance of the grounding system must be  $\leq 100 \text{ m}\Omega$ .

**Danger:** Avant l'installation de la batterie, assurez-vous que le point de mise à la terre du sous-sol est stable et fiable. Si le système de batterie est installé dans une cabine d'équipement indépendante (par exemple un conteneur), la mise à la terre de la cabine doit être stable et fiable.

La résistance du système de mise à la terre doit être  $\leq 100 \text{ m}\Omega$ .

## Clearance

Minimum clearance to heat source shall be more than 6.56 feet (2 meters).

For multi-strings' system clearance requirements, please refer to *section 4.3.4*.

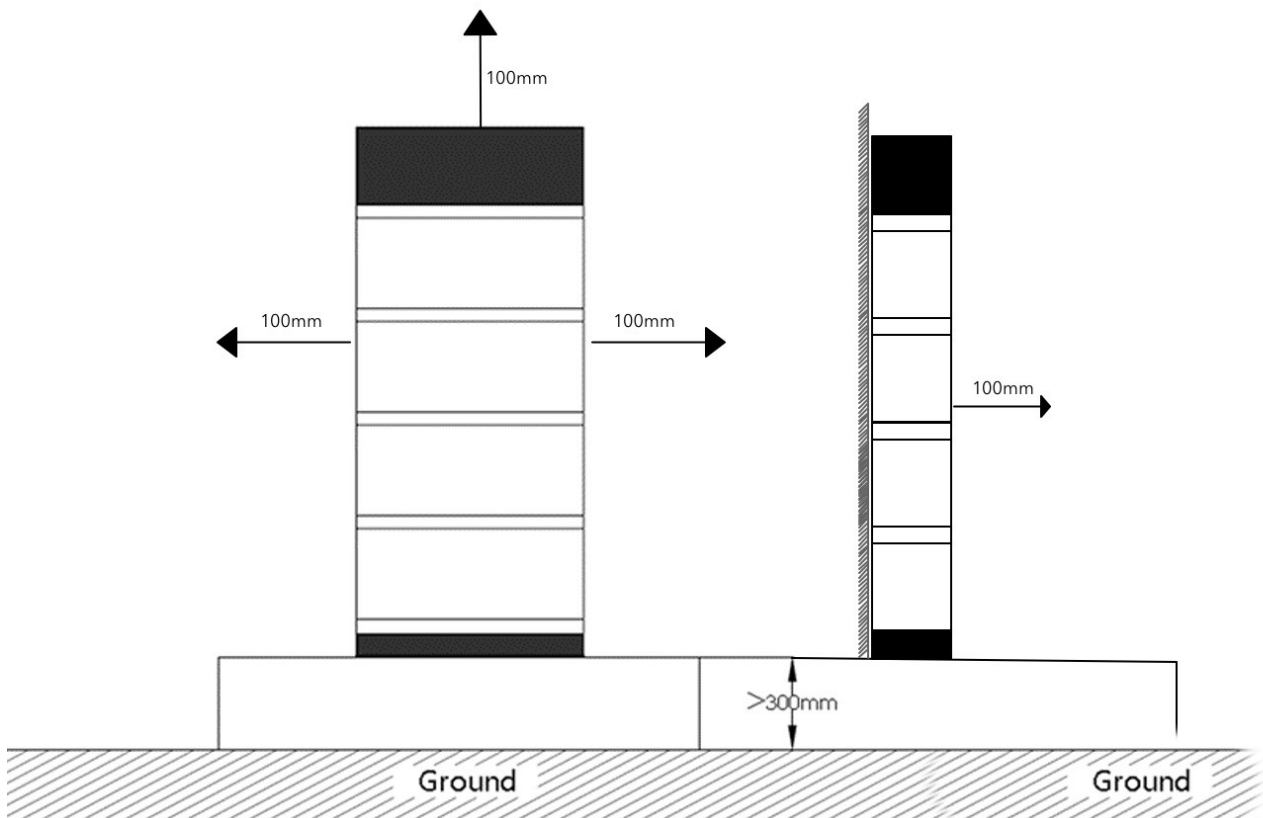
### 4.3.2 Installation Space Requirements

**⚠ WARNING**

**Warning:** The power terminals of this system have high DC voltage. It must be installed in a restricted access area.

**Avertissement:** les bornes d'alimentation de la batterie ont une tension continue élevée. Il doit être installé dans une zone d'accès restreint.

Force-H3 system must not be immersed in water. The battery base cannot be exposed to rain or other water sources. As a suggestion, the base's height shall be >11.8 inch (300 mm) above the ground.

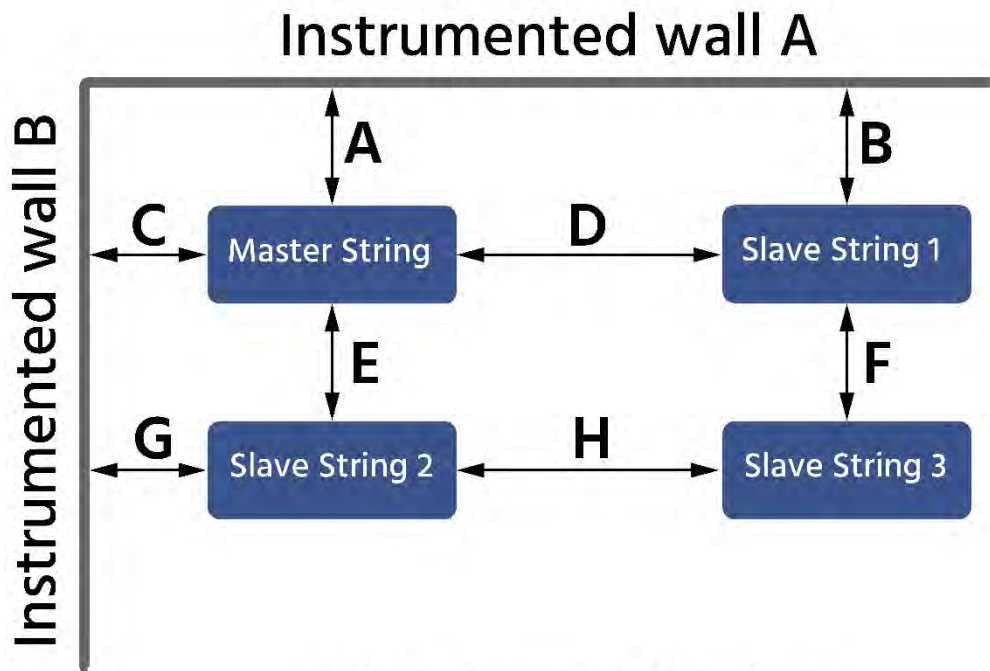


### 4.3.3 Installation Foundation Requirements

The support surface should have sufficient load capacity to support the weight of whole battery system (202.8 lb~ 632.7 lb) [92~287 kg].

The system must be installed on a fixed and flat support surface.

#### 4.3.4 Multi-Strings' System Clearance Requirements



Unit's arrangement (top view)

- A- 1.57 inch (40mm)
- B- 1.57 inch (40mm)
- C- 1.57 inch (40mm)
- D- 3.94 inch (100mm)
- E- 1.57 inch (40mm)
- F- 1.57 inch (40mm)
- G- 1.57 inch (40mm)
- H- 3.94 inch (100mm)

**NOTE:** As long as the clearance requirements (shown above) are met, the locations of the master string and slave strings can be altered based on your practical condition.

## 4.4 System Installation

### DANGER

**Danger:** The system is a high voltage DC system, operated by qualified and authorized person only.

**Danger:** Le système est un système de courant continu à haute tension, qui ne doit être manipulé que par du personnel qualifié et autorisé.

### 4.4.1 Mounting the Battery Rack Base

The weight of the base is light, which a single person can handle with.

Battery rack base holes (unit: inch)

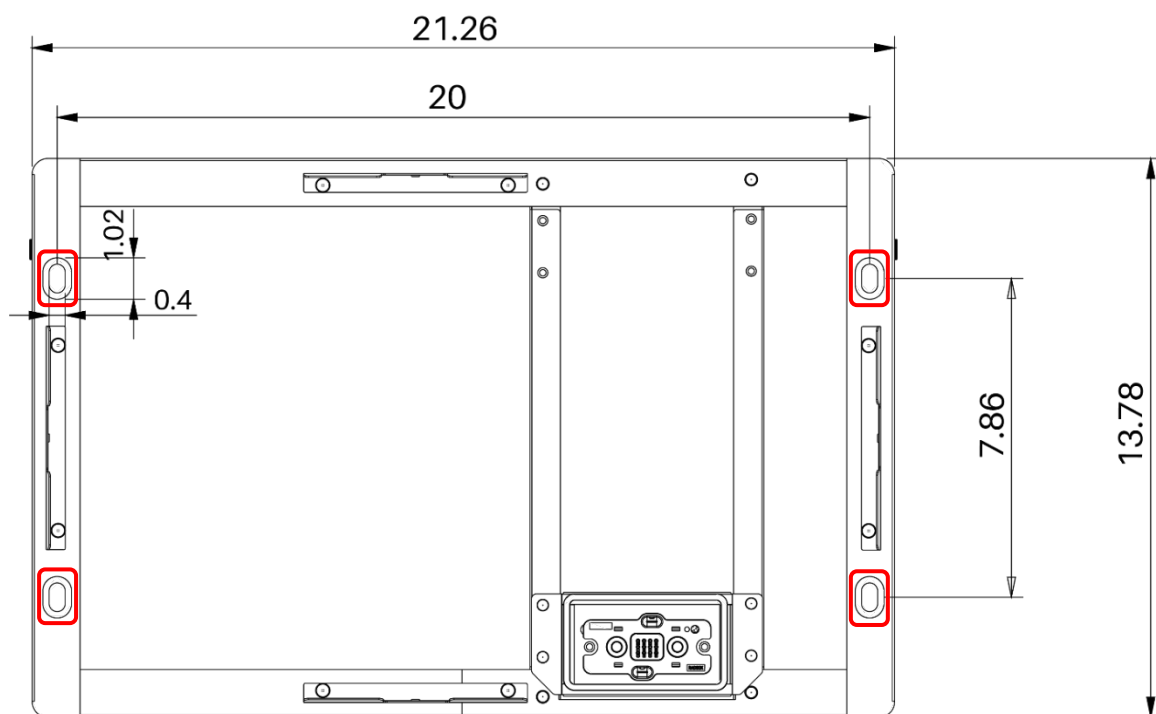


Fig. 4-1: Battery rack base holes' (circled in red) bitmap (unit: inch)

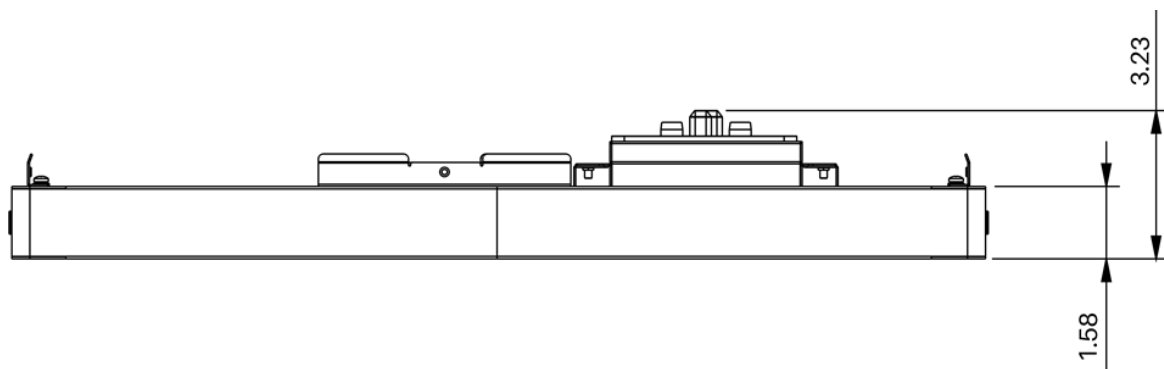


Fig. 4-2: Battery rack base bitmap (unit: inch)

#### 4.4.2 Installing the Battery Module onto the Base

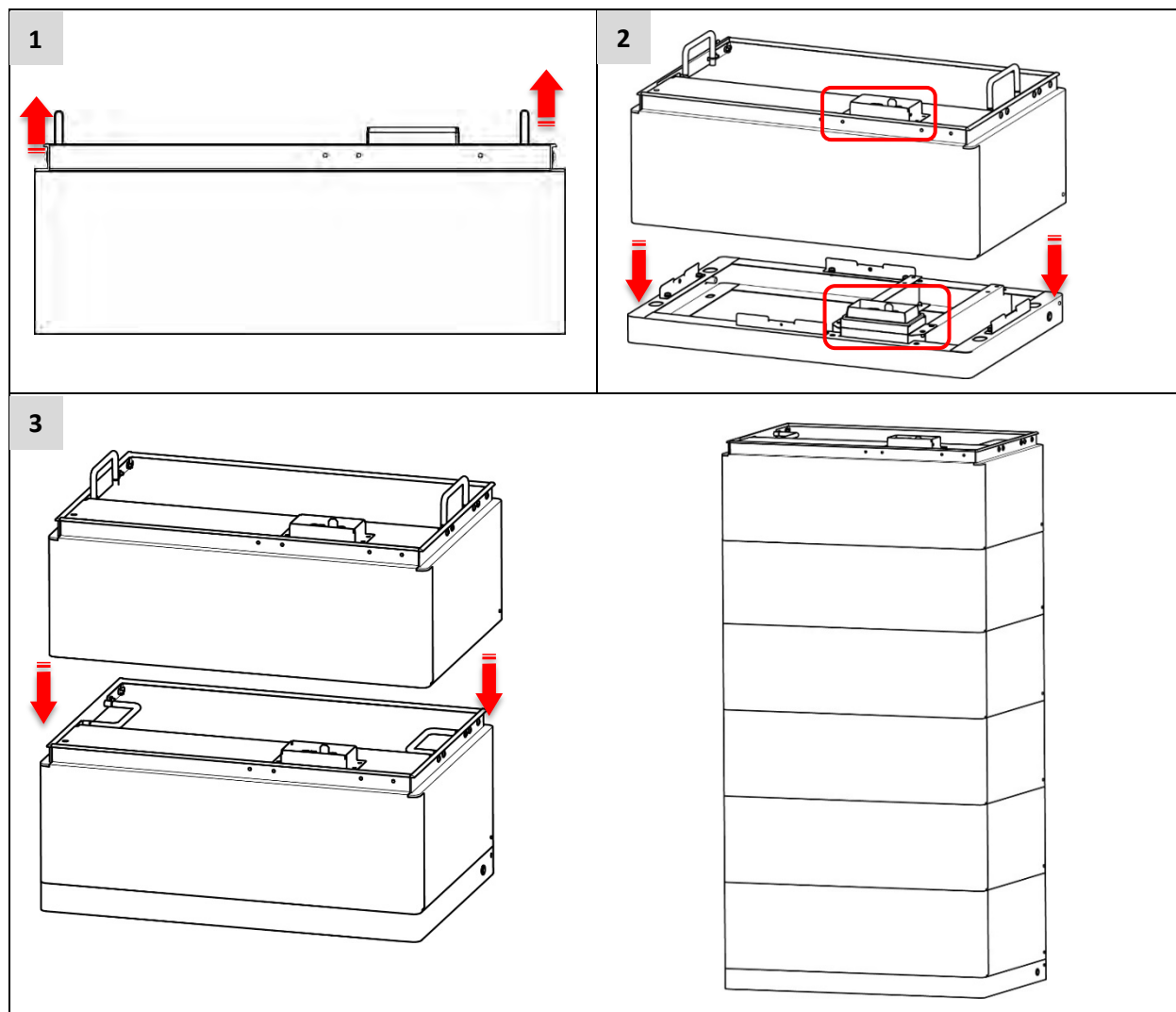
##### **WARNING**

**Warning:** Single battery module is 86 lb (39 kg). The battery module must be handled by more than 2 people if there're no handling tools.

**Avertissement:** un module de batterie unique pèse 86 lb (39 kg). Le module batterie doit être manipulé par plus de 2 personnes s'il n'y a pas d'outils de manipulation.

1. Lift the two handles on the battery module as below, making sure the battery not tilting to one side.
2. Adjust to keep the connector of the battery (circled in red) align with the connector of the base (circled in red). Slowly put down the battery, fitting it properly onto the base.
3. Continue to install the left battery modules one by one onto the existing battery.

**NOTE:** Maximum 7 battery modules are allowed to be installed in one string.





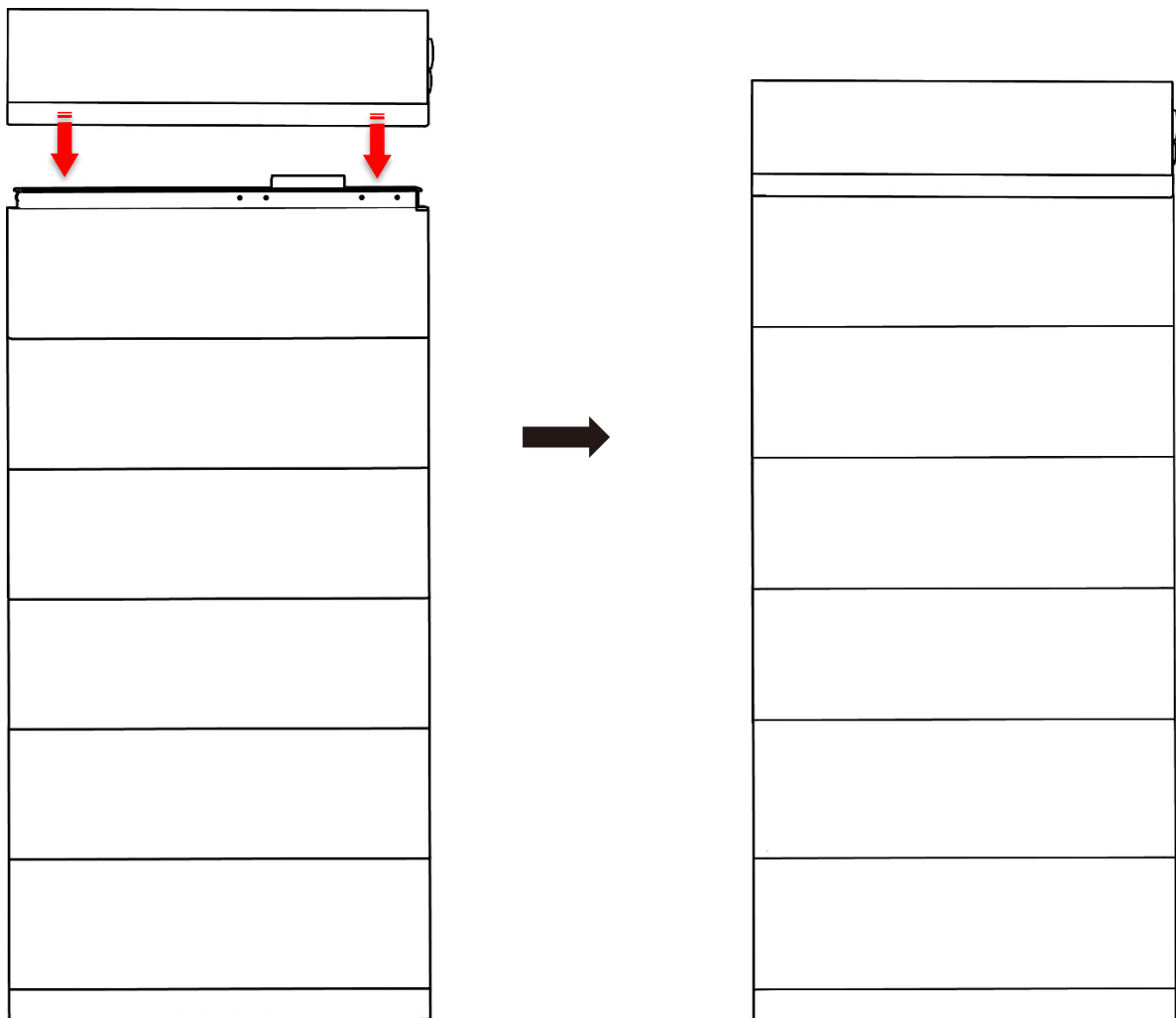
#### 4.4.3 Battery Modules and Control Module (BMS) Pile up

**⚠ DANGER**

**Danger:** When battery is connected together with the base, the internal socket still has high voltage DC power from serial connected battery modules.

**Danger:** Lorsque la batterie est connectée à la base, la prise interne reçoit toujours une alimentation CC haute tension provenant des modules de batterie connectés en série.

1. After installation of the battery module, lift up the control module (BMS), adjusting to make its connector align with the connector of the battery module.
2. Slowly place down the control module (BMS) on the installed battery module.

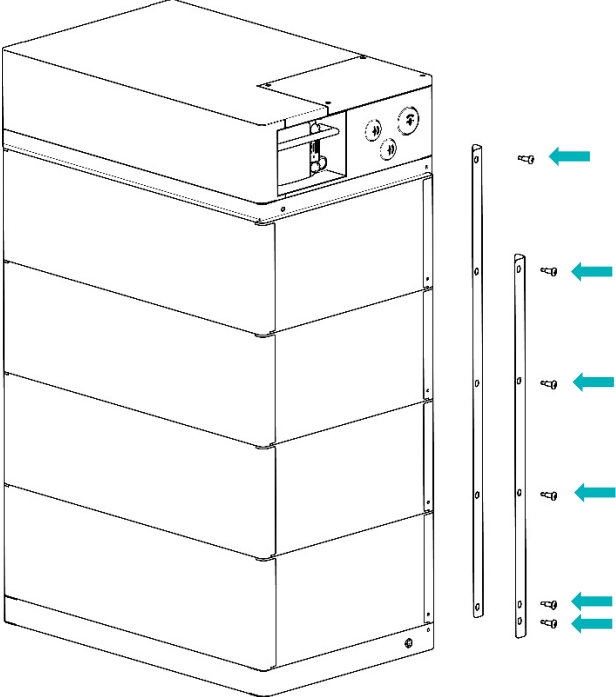


**NOTE:** The above picture is just for reference. The quantity of the battery modules is based on your practical system.

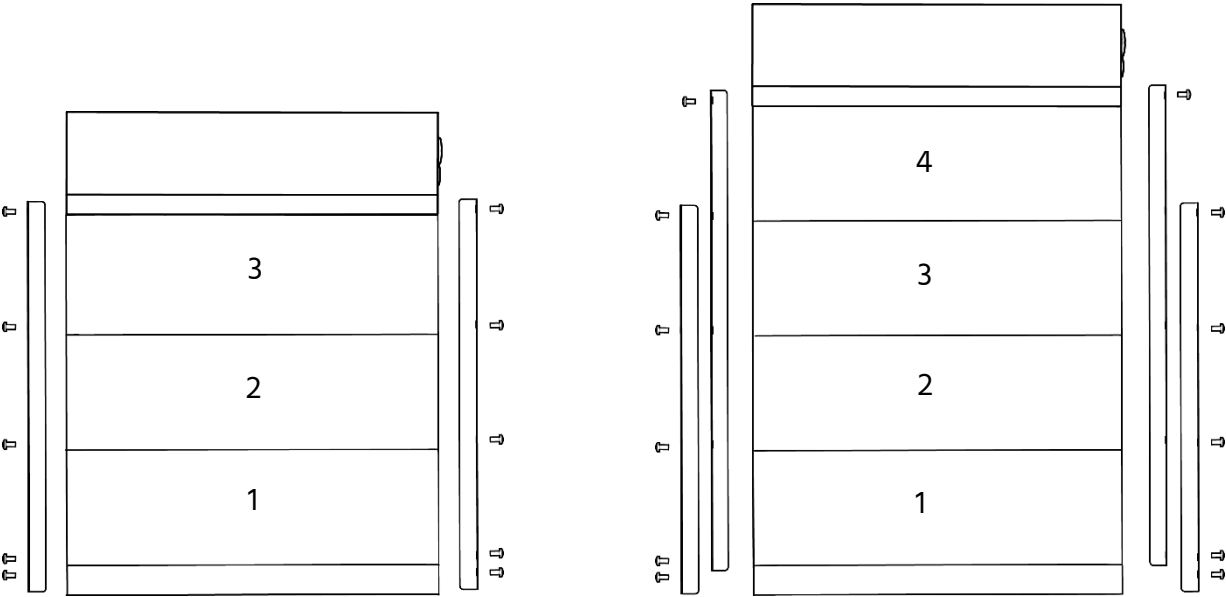
### 4.4.4 Installing the Metal Brackets for the System

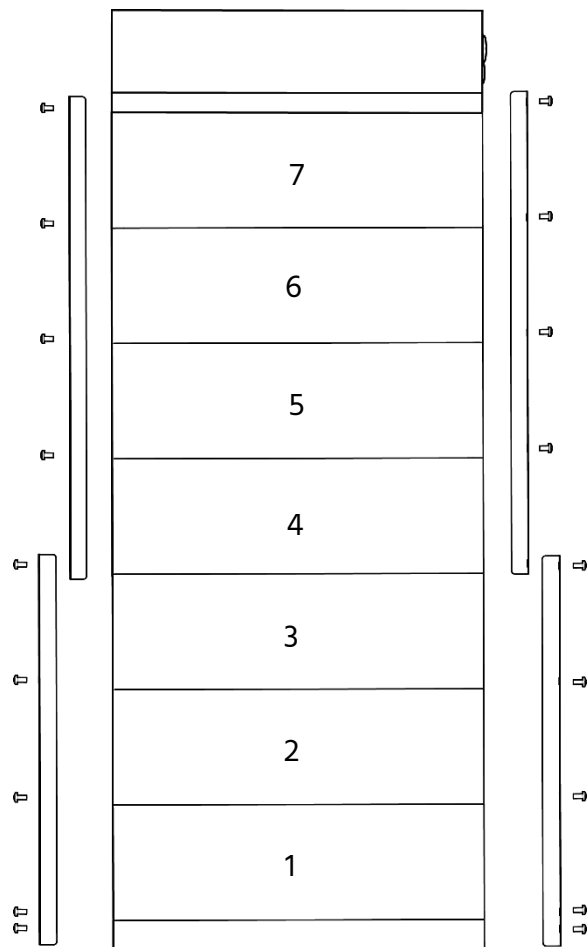
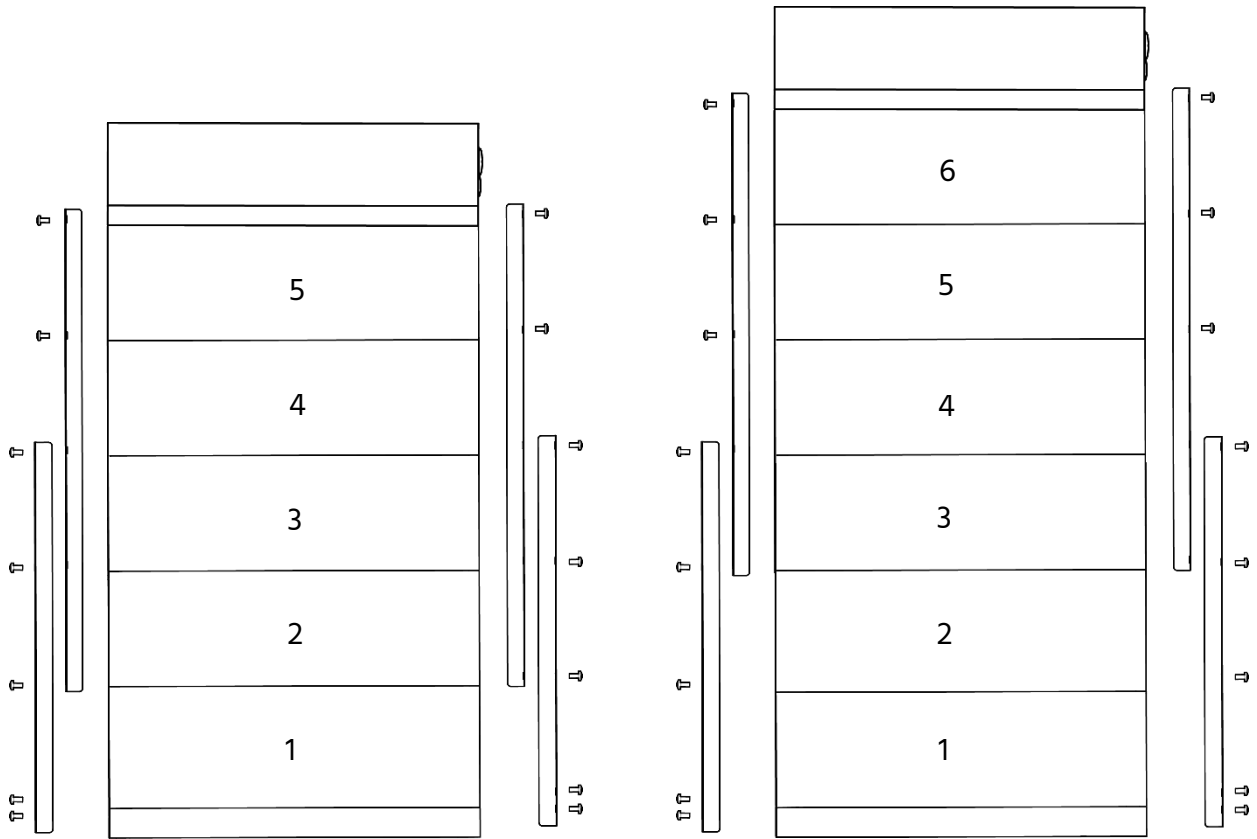
In control module's package, there are 2 pcs short and 2 pcs long metal brackets.

Fix these metal brackets at both back sides of the battery modules (see the illustration on the right).



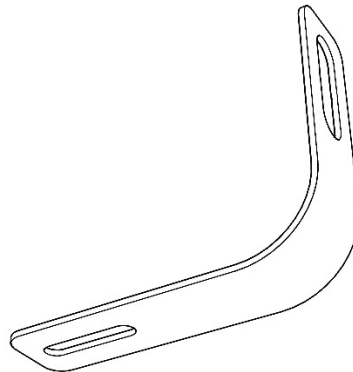
Please follow the illustrations below to install the metal brackets for your practical system.





#### 4.4.5 Installing the Anti-Toppling Brackets for the System

Force H3 system is equipped with two anti-toppling brackets as follows.



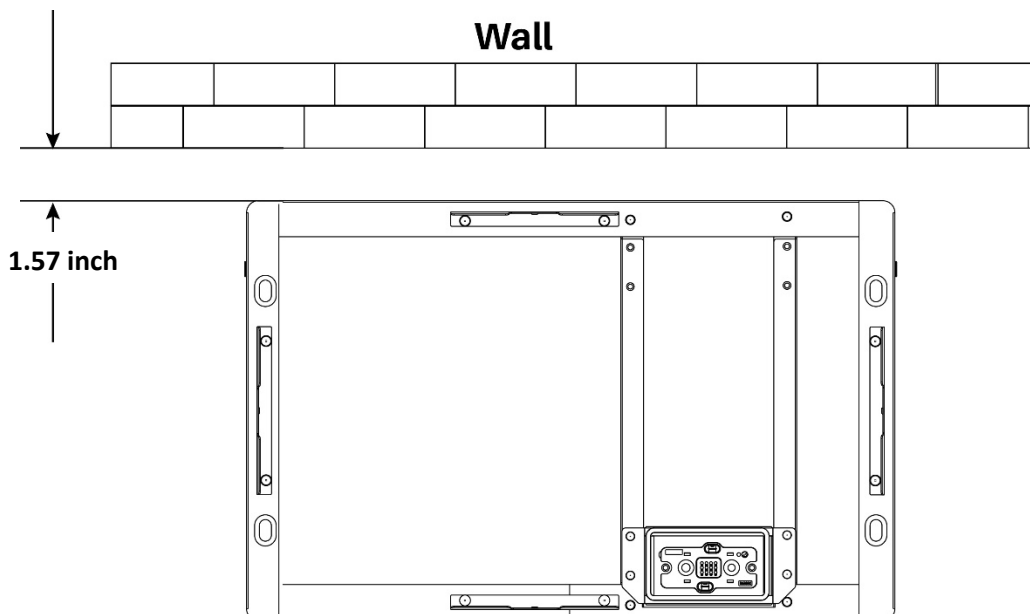
Such brackets act as an alternative of ground mounting of the battery system. Customers can choose either of the following methods for the system installation:

- Ground mounting with 4 x M8 expansion bolts to the support surface (see *section 4.4.1*).
- Bracket mounting with 2 x M8 expansion bolts to the wall (Battery system still needs to be placed on the support surface for supporting the overall weight.)

As long as the installation area meets the requirement of the installation site (see *section 4.3*), in either case the installation stability is guaranteed.

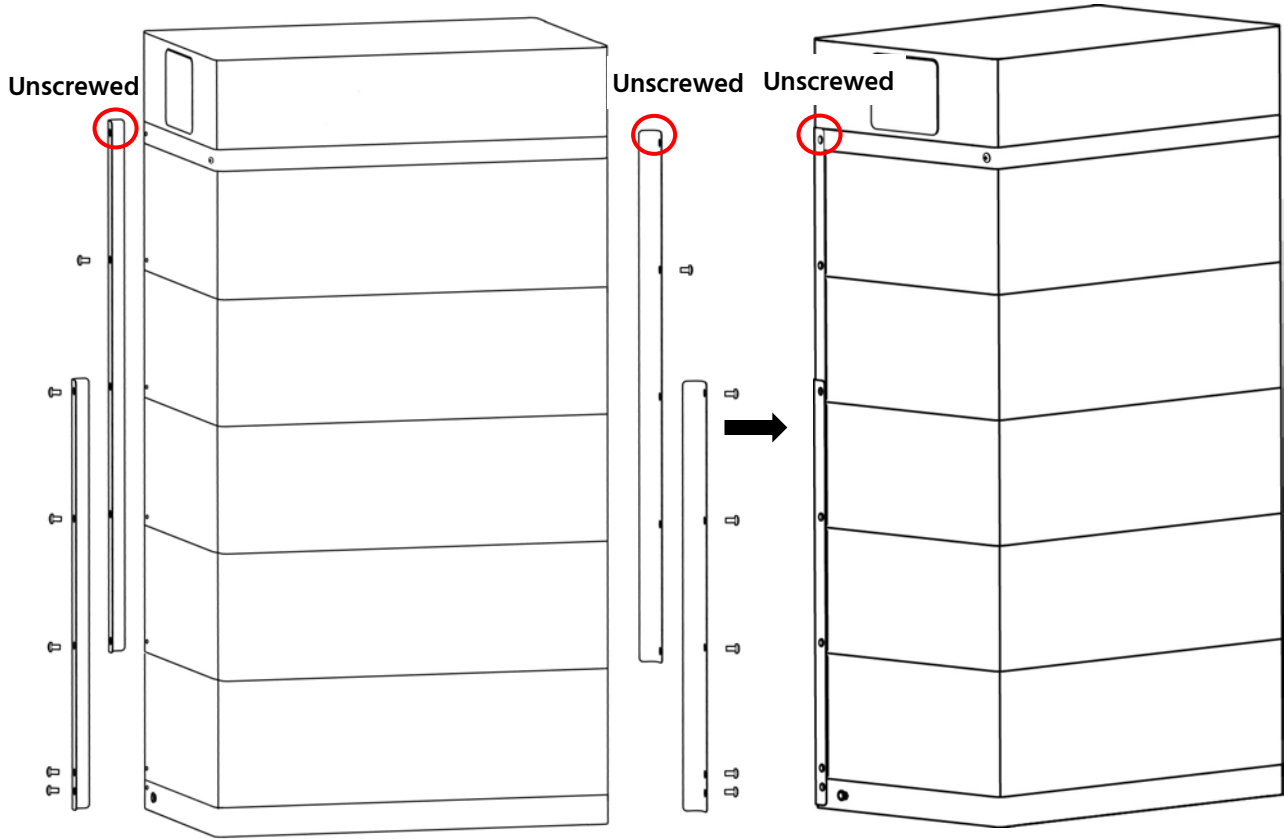
The detailed installation process with such brackets are as follows:

1. Put the base along the wall and reserve 1.57 inch (40 mm) distance between back of the base and the wall.



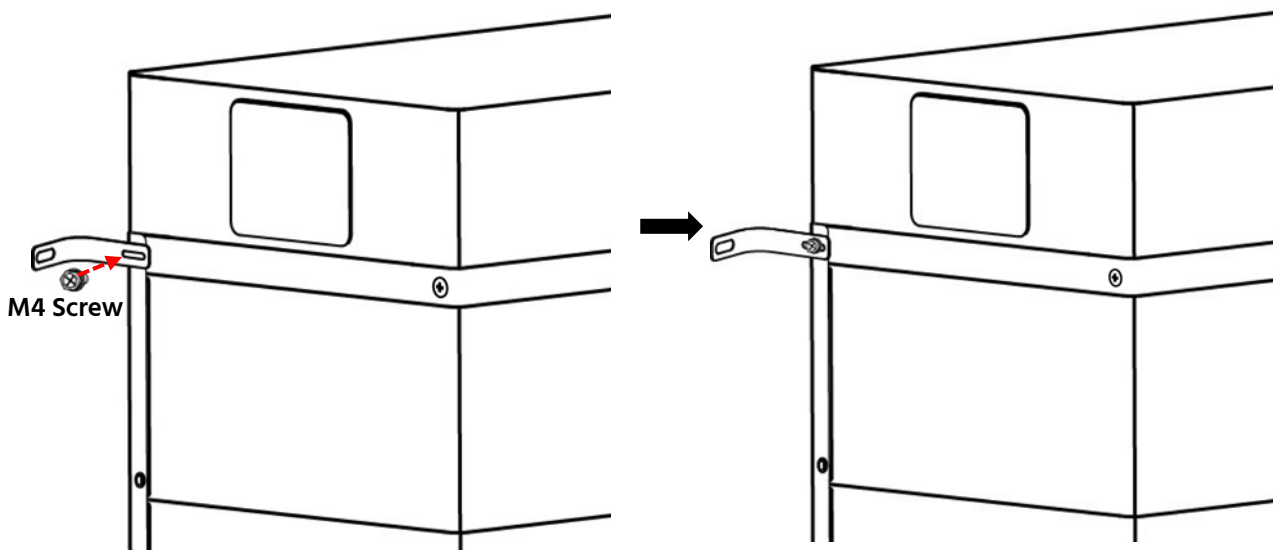
2. Follow the steps described above correctly to install all the battery modules, BMS and brackets, referring to *section 4.4.2, 4.4.3 and 4.4.4*.

**NOTE:** When installing the metal brackets at the back side, ALWAYS remain the two connecting points between brackets and BMS unlocked shown as below.

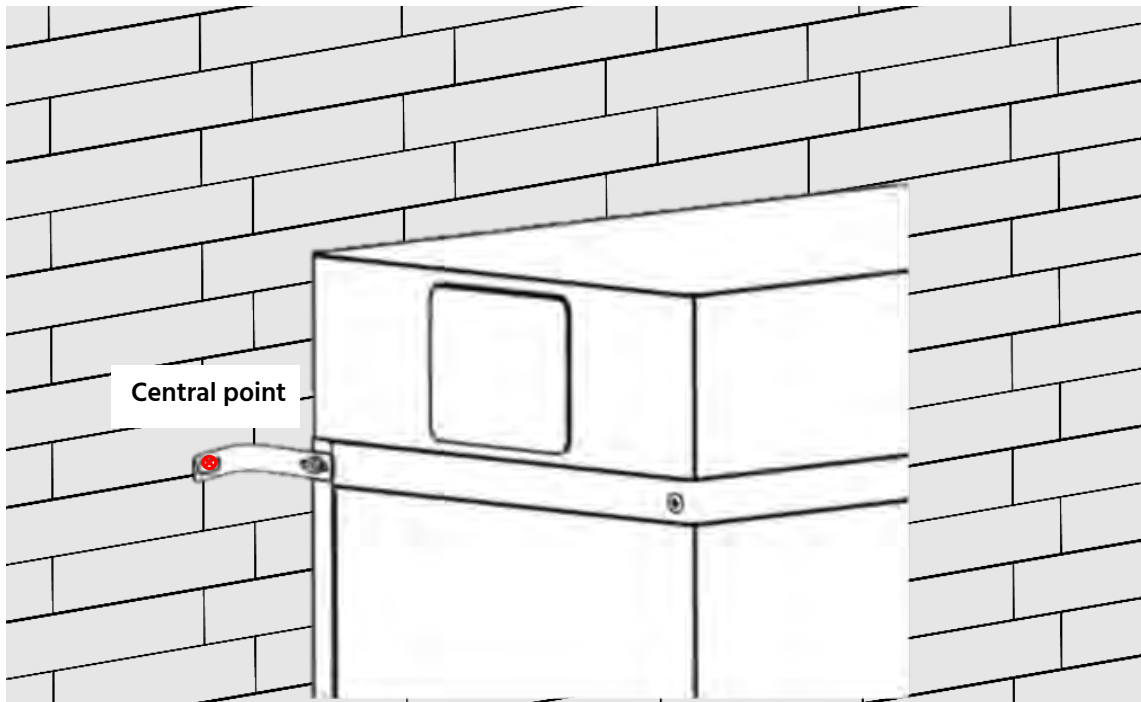


3. Follow the illustrations below, firstly fit the anti-toppling brackets on back sides of the BMS, then use M4 screws to fix.

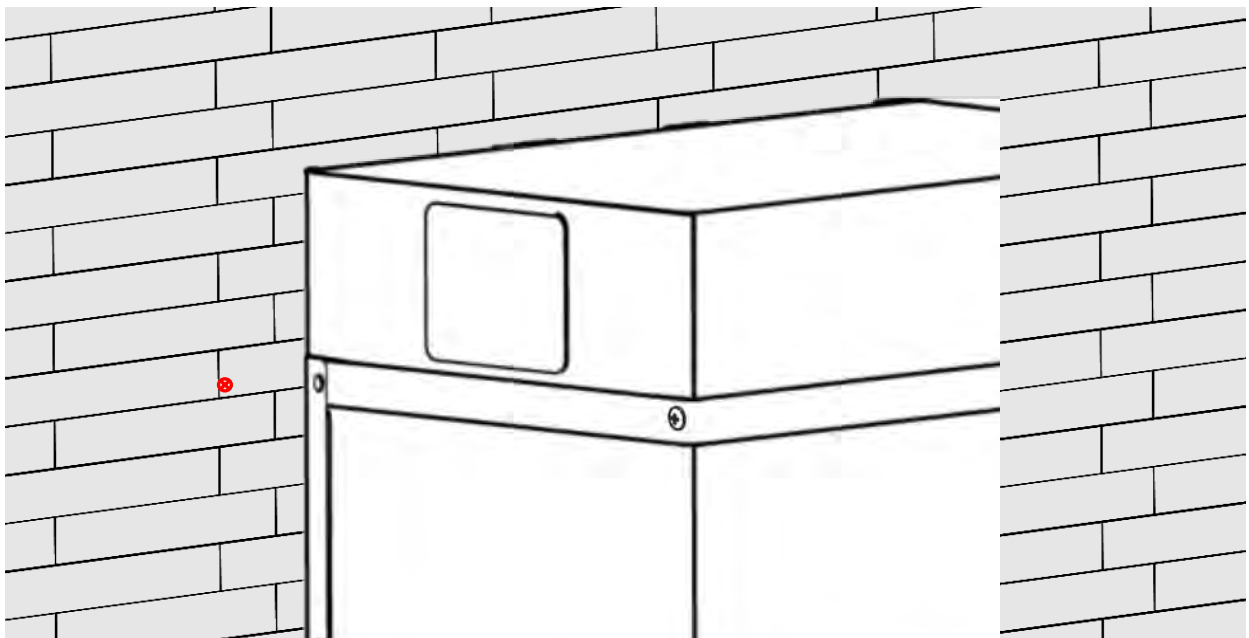
**REMEMBER** to fit the brackets on both sides of BMS, same with following steps :



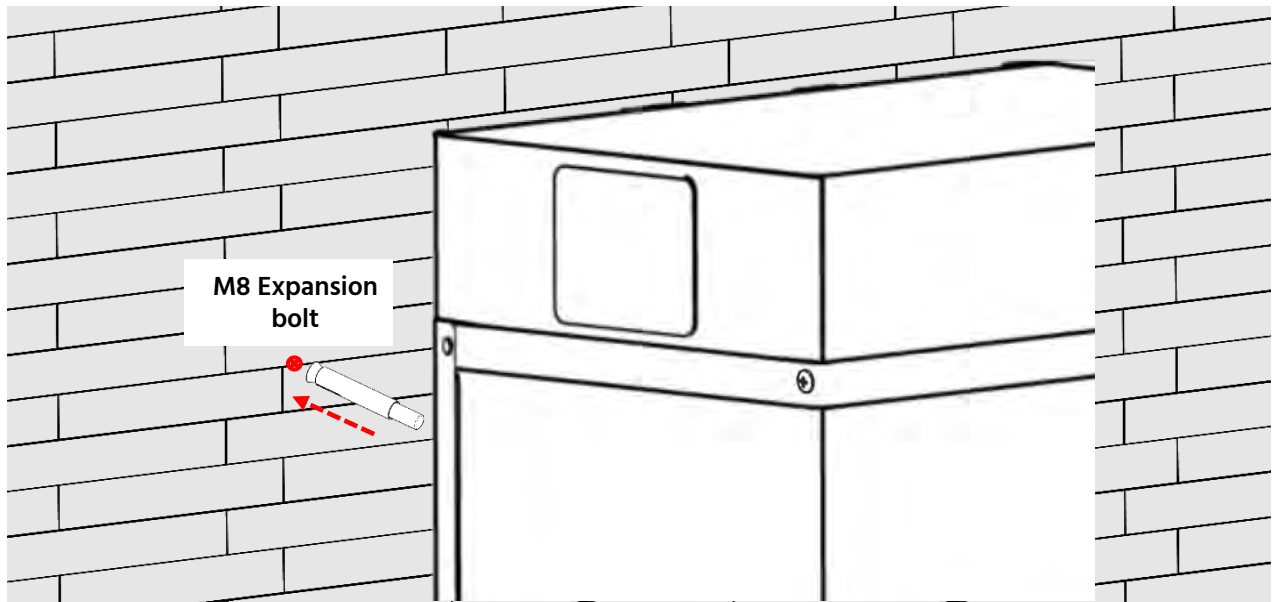
4. Mark the central points of the slotted holes at both sides on the wall.



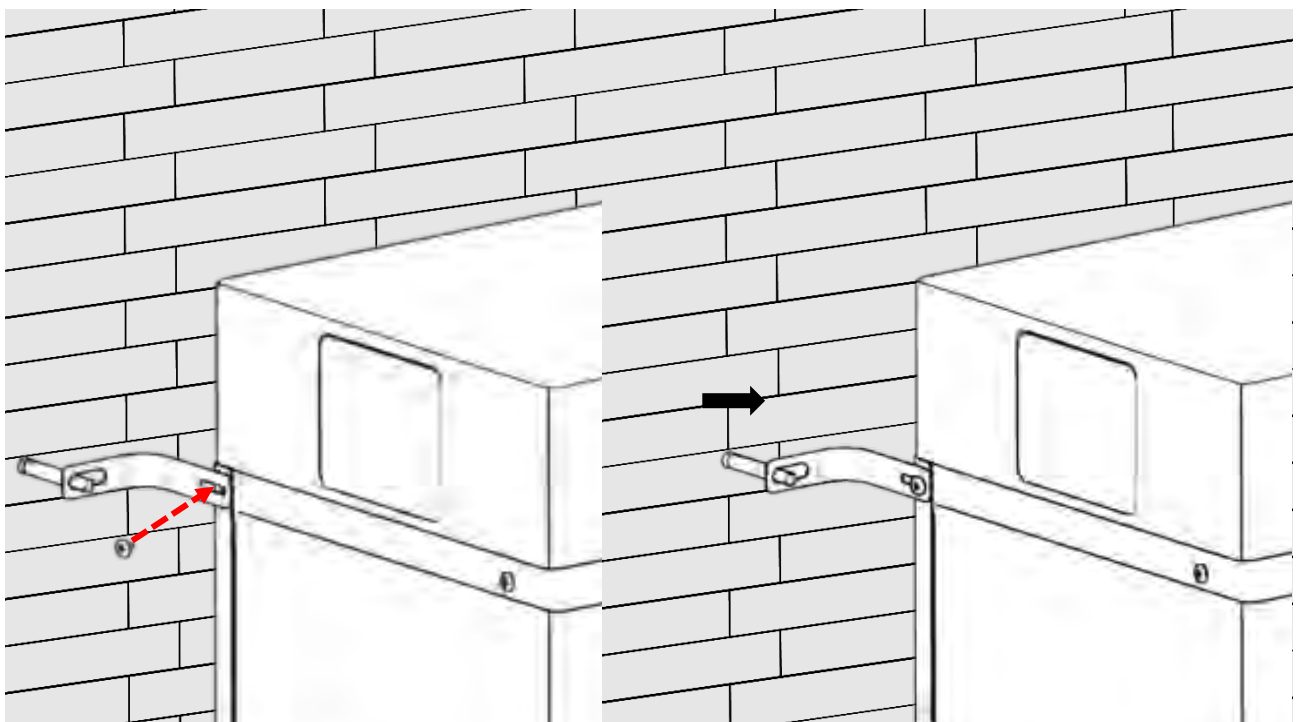
5. Dismantle the brackets on both sides. Aligning the central points, drill two holes ( $\geq 2.36$  inch depth) in the wall with a drilling tool, and clean the holes.



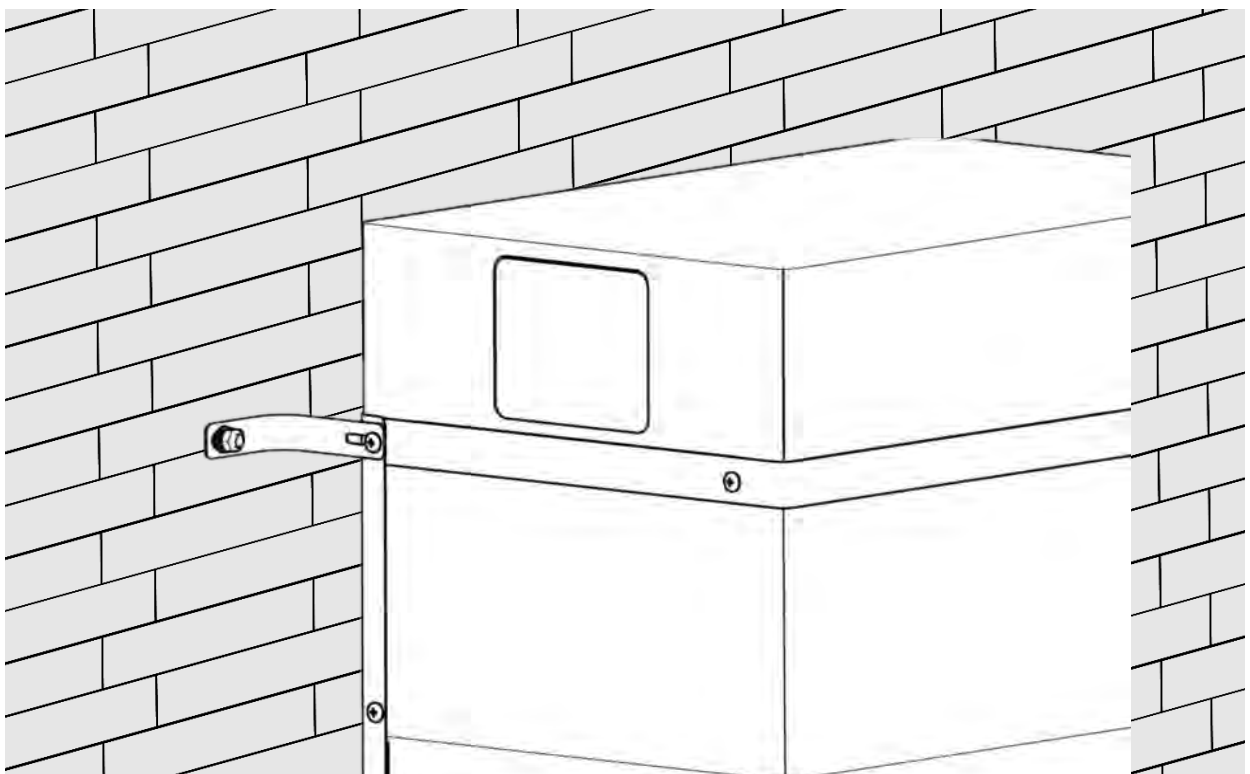
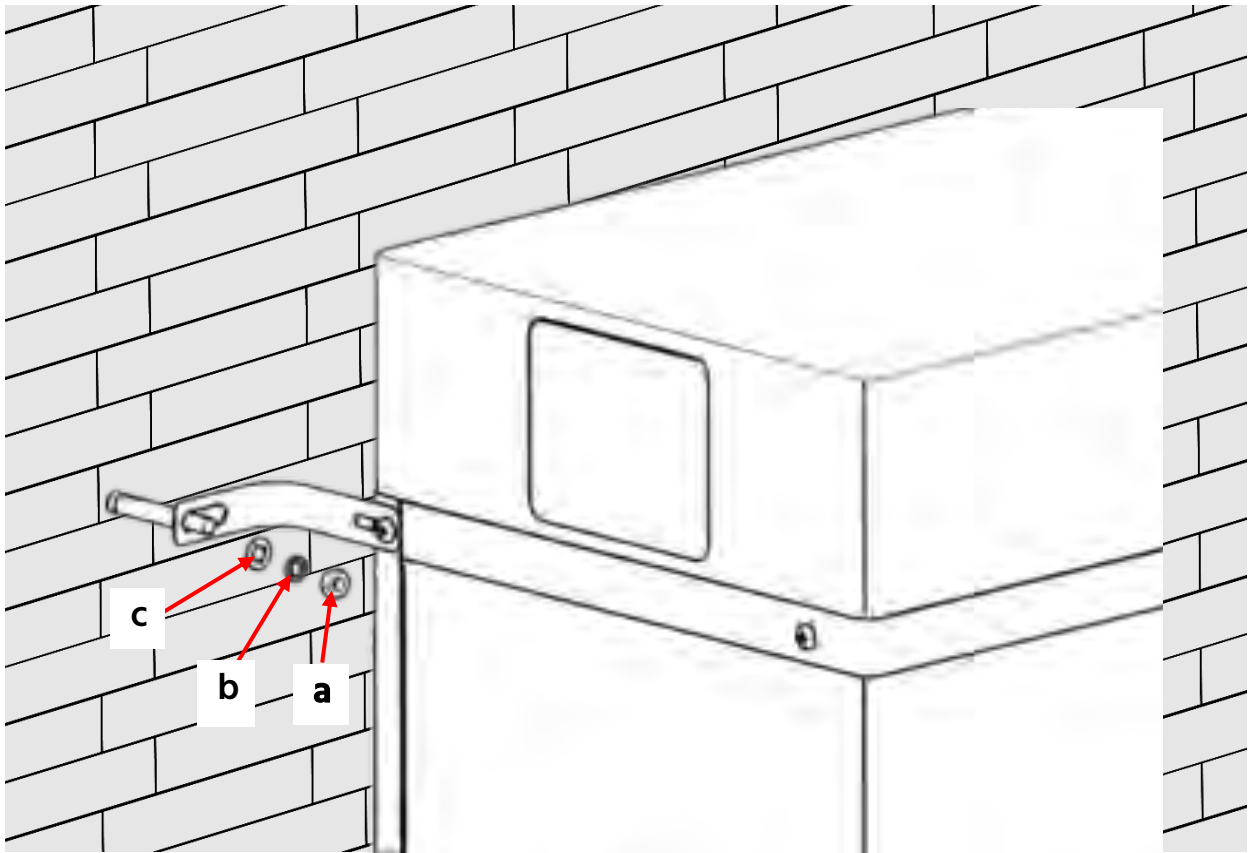
6. Embed the two M8 expansion bolts into the holes respectively.



7. Fit the brackets across the M8 expansion bolts on both sides, then fix the brackets on the BMS with M4 screws.



8. Fix the M8 nut (a) across the 8 mm flat gasket (c) and spring washer (b), with 106 lb-inch~115 lb-inch (12~13 N.m) torque. Repeat this step for the other bracket.





## 5 Cable Connection

### DANGER

**Danger:** The battery system is high voltage DC system. Ensure that the grounding of the rack is stable and reliable.

**Danger:** Le système de batterie est un système CC haute tension. Assurez-vous que la mise à la terre est fixe et fiable.

### DANGER

**Danger:** No short circuit or reserved connection of the battery system's positive and negative ports.

**Danger:** Pas de court-circuit ni de connexion inversée des ports positif et négatif du système de batterie.

### CAUTION

**Caution:** Wrong communication cables connection will cause the battery system failure.

**Attention:** Une mauvaise connexion des câbles de communication entraînera une défaillance du système de batterie.

### 5.1 Checking Cables

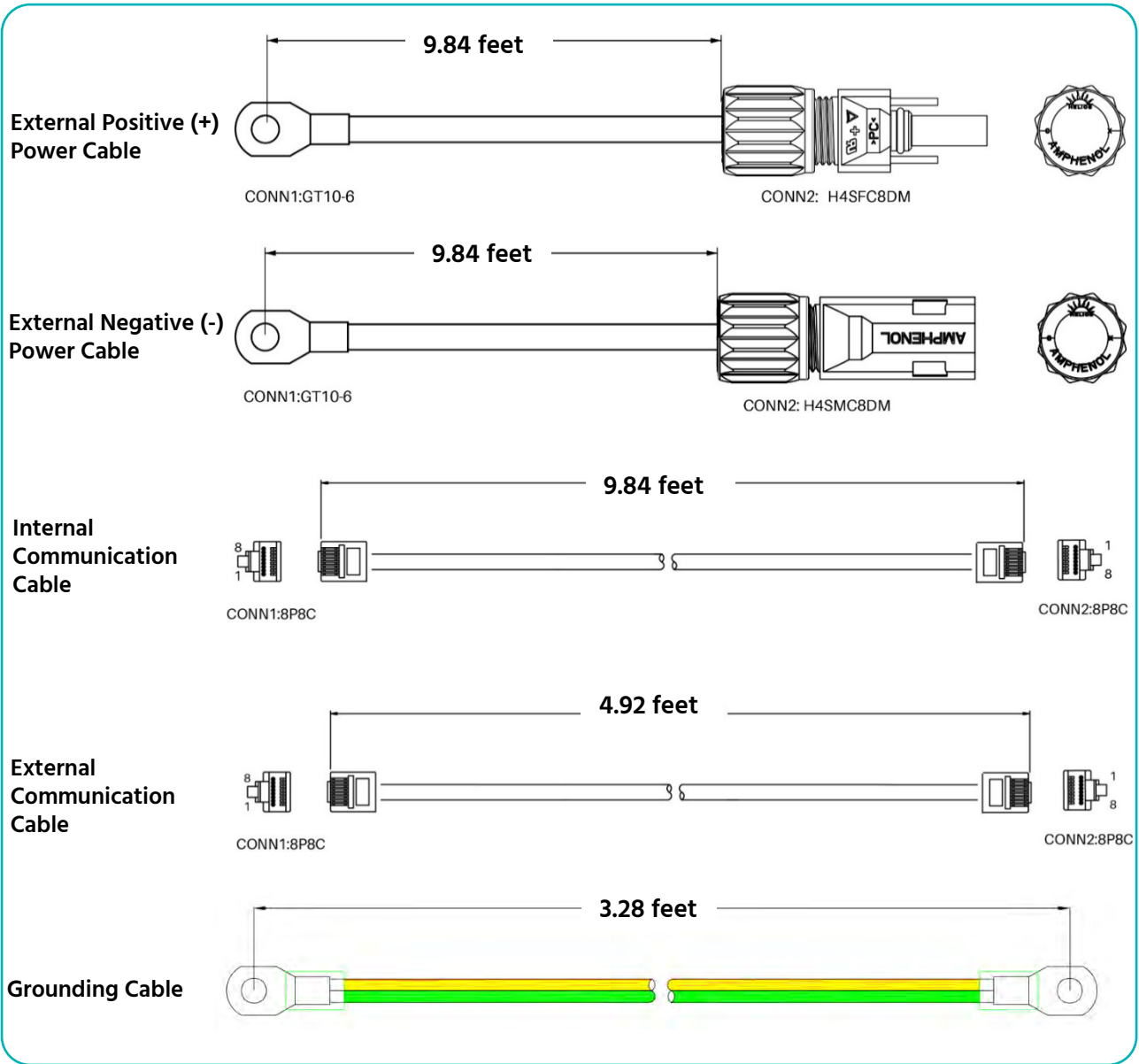
#### CAUTION

**Caution:** Power cables use water-proofed connectors. To disconnect, it is required to use a special tool (in the accessory bag), shown as the picture. Do not pull out the cables directly.

**Attention:** les câbles d'alimentation utilisent des connecteurs étanches. Pour le débrancher, il est nécessaire d'utiliser un outil spécial (dans le sac d'accessoires), présenté comme sur la photo. Ne retirez pas les câbles directement.



**NOTE:** Communication cable uses RJ45 connector and water-proof cover (M19-RJ45) which match with the communication port on the control module.

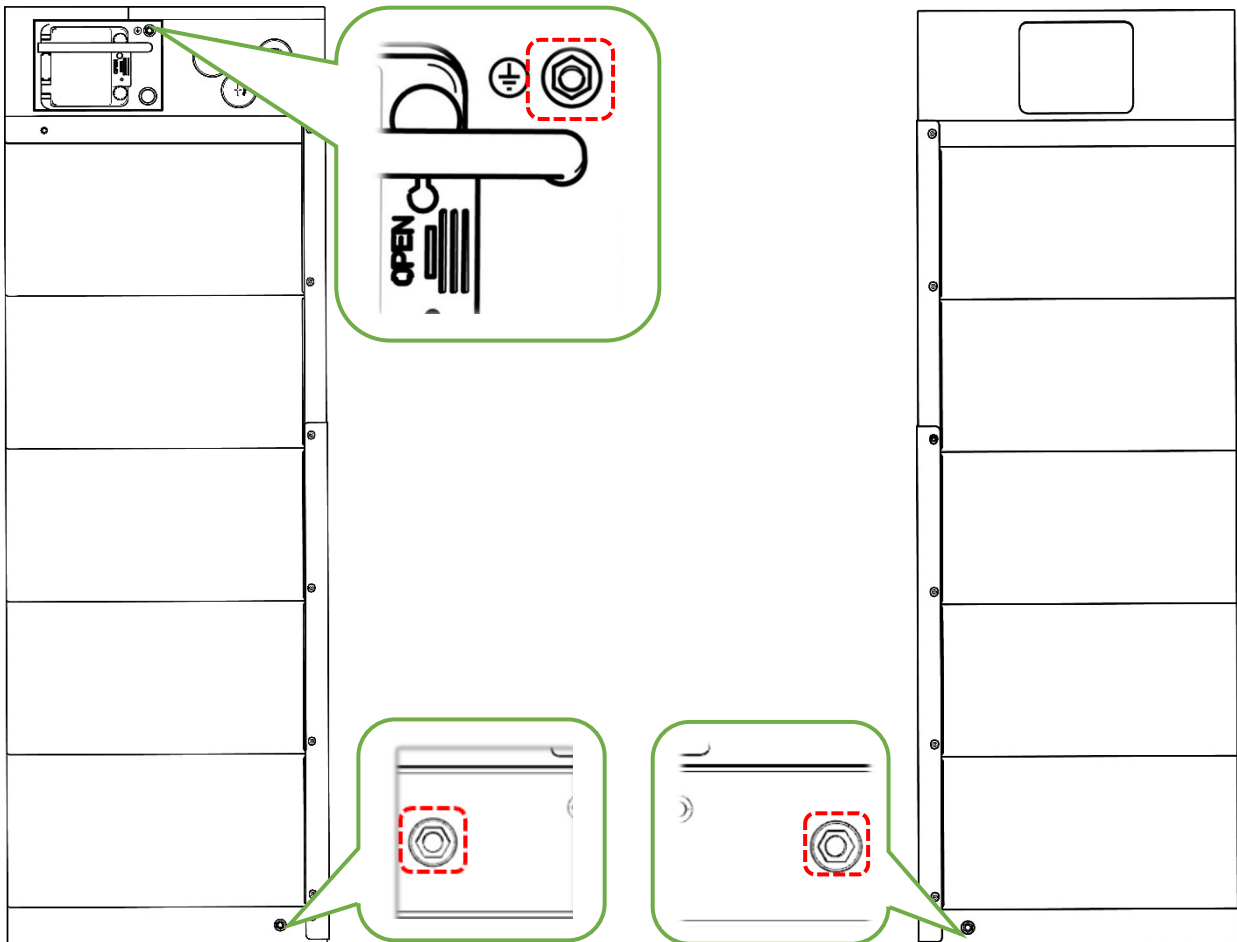


## 5.2 Grounding

### WARNING

**Warning:** The Force-H3-US modules has 3 grounding points as follows. Grounding cable must be  $\geq 10$  AWG. The cable shall be copper with yellow-green color.

**Avertissement:** Les modules Force-H3-US disposent de 3 points de mise à la terre. Le câble de mise à la terre doit être  $\geq 10$  AWG. Le câble sera en cuivre de couleur jaune-vert.



## 5.3 Multi-string Cable Connections

### 5.3.1 Electrical Wiring

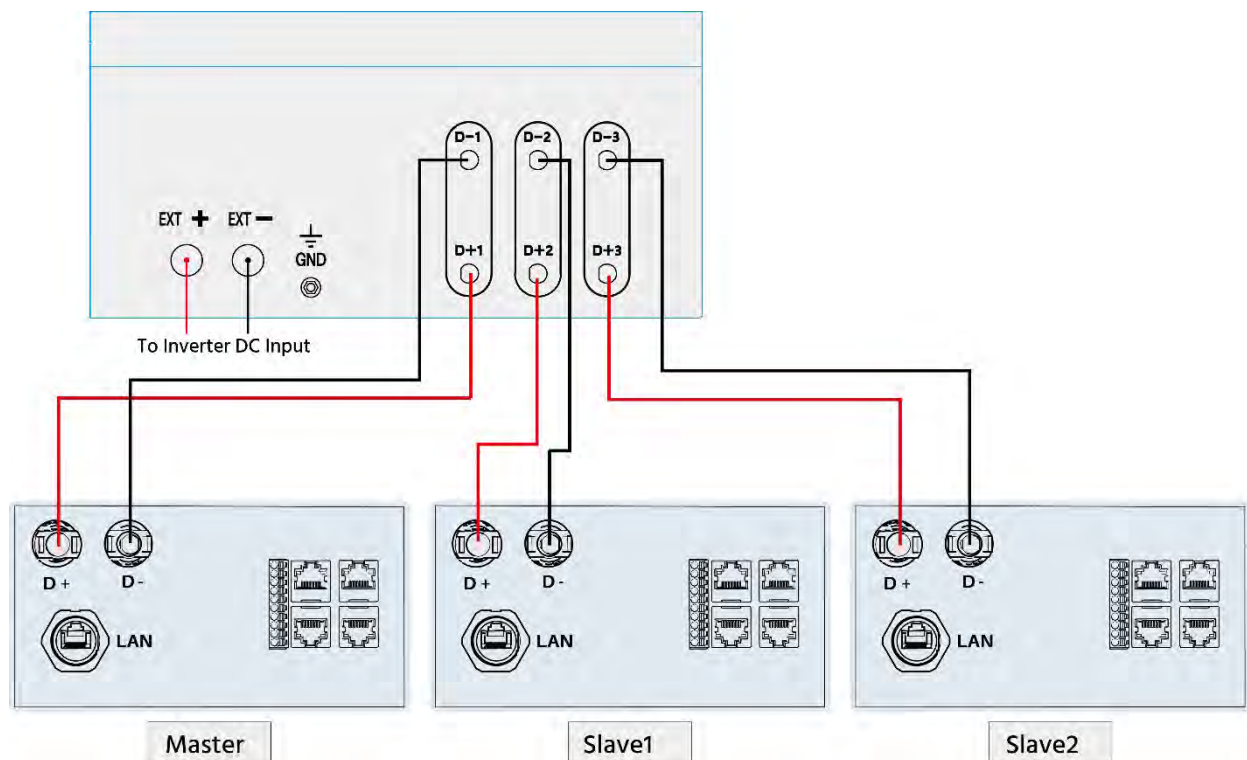
#### A. Wiring diagram of 3 strings` system (String quantity $\leq 3$ )

It is suggested to use P-Combiner-HV-3-V2 for up to 3 strings, maximum 50Amps continuous operation.

#### **CAUTION**

**Caution:** DO NOT use P-Combiner-HV-3-V2 or similar concept of multi-strings connection method in case the multiple battery strings need to be operated independently.

**Attention:** NE PAS utiliser le P-Combiner-HV-3-V2 ou un concept similaire de méthode de connexion multi-chaînes au cas où les plusieurs chaînes de batteries devraient fonctionner indépendamment.



**NOTE:** Make sure to have the D+ & D- plugs into the combiner box properly.

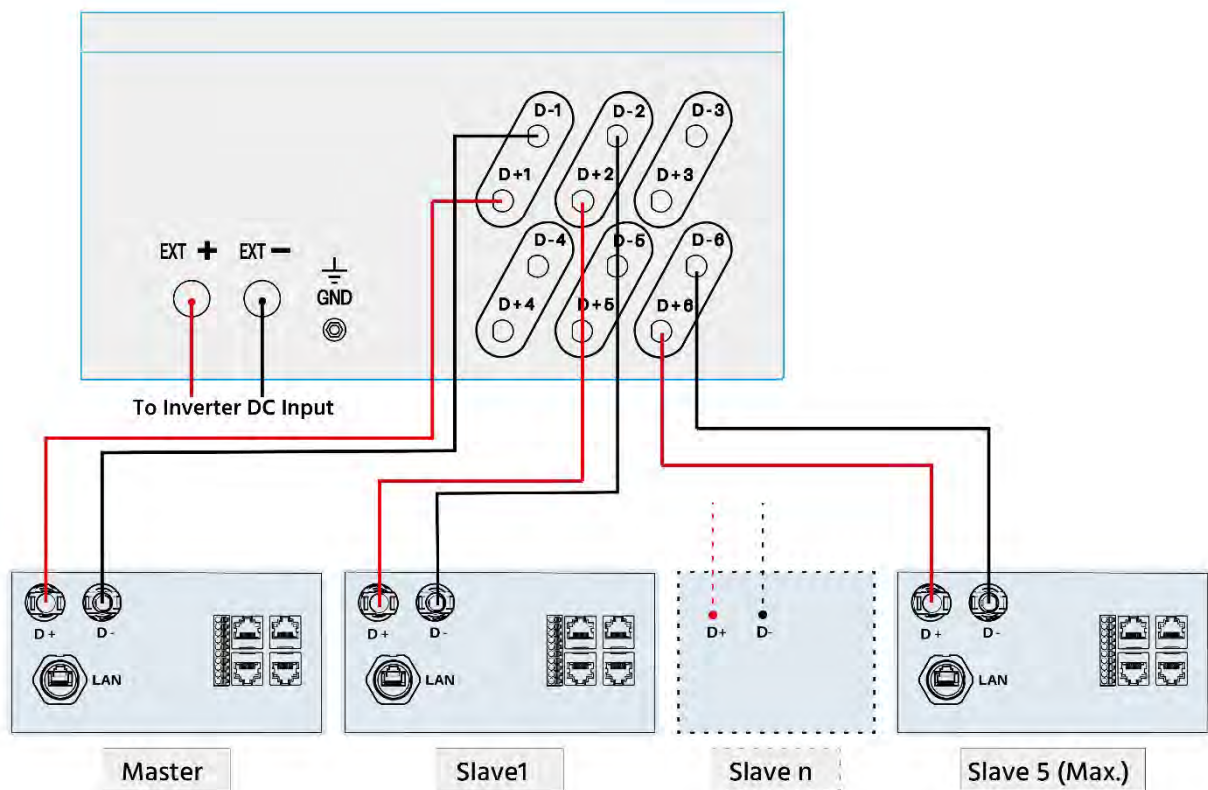
## B. Wiring diagram of multi strings' system ( $3 < \text{String quantity} \leq 6$ )

It is suggested to use P-Combiner-HV-6-V2 for up to 6 strings, maximum 100 Amps continuous operation.

### **CAUTION**

**Caution:** DO NOT use P-Combiner-HV-6-V2 or similar concept of multi-strings connection method in case the multiple battery strings need to be operated independently.

**Attention:** NE PAS utiliser le P-Combiner-HV-6-V2 ou un concept similaire de méthode de connexion multi-chaînes au cas où les plusieurs chaînes de batteries devraient fonctionner indépendamment.



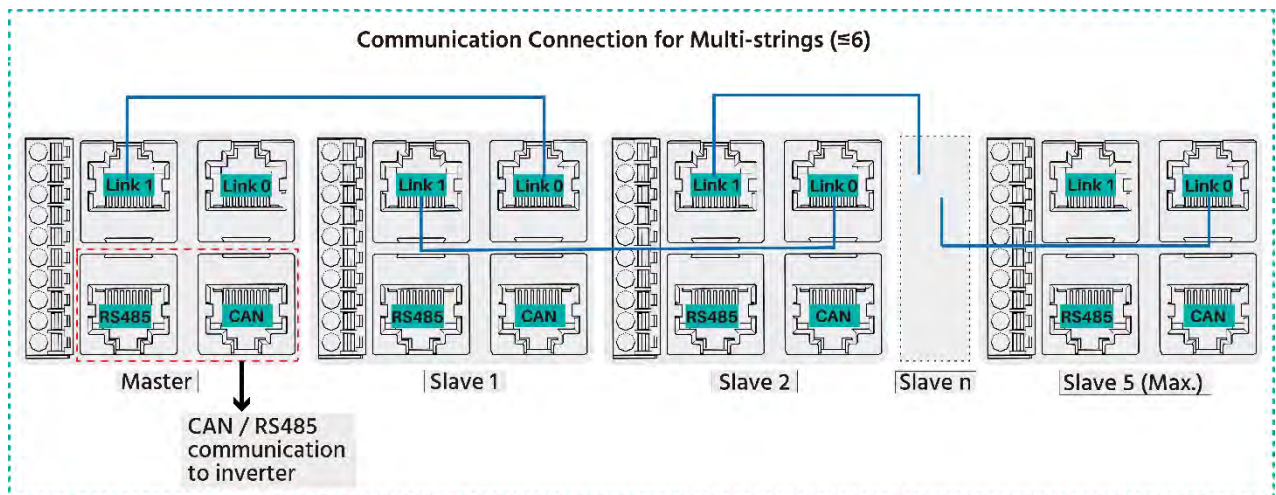
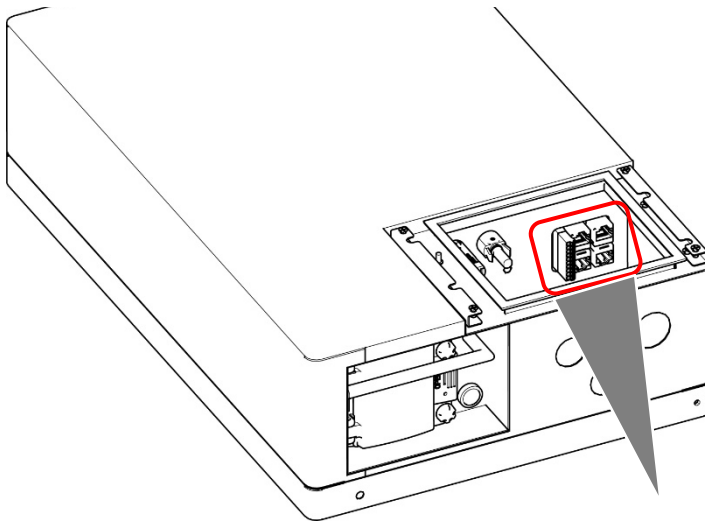
**NOTE:** Make sure to have the D+ & D- plugs into the combiner box properly.

### 5.3.2 Communication Cable Connections of Master and Slave Battery Strings

The communication for master/slave string connection shall use an 8 pin pin-pin RJ45 cable, connecting from the first BMS Link 1 to the second BMS Link 0, then from the second BMS Link 1 to third BMS link 0(if has), all the way to the last BMS Link 0.

The BMS with Link Port 0 EMPTY is defined as the Master string. Select either CAN or RS485 on the master string for further connection with the inverter or upper controller.

The CAN/RS485 Port of the slave string is ineffective in this case.



### 5.3.3 Safety Precautions after Cables Connection

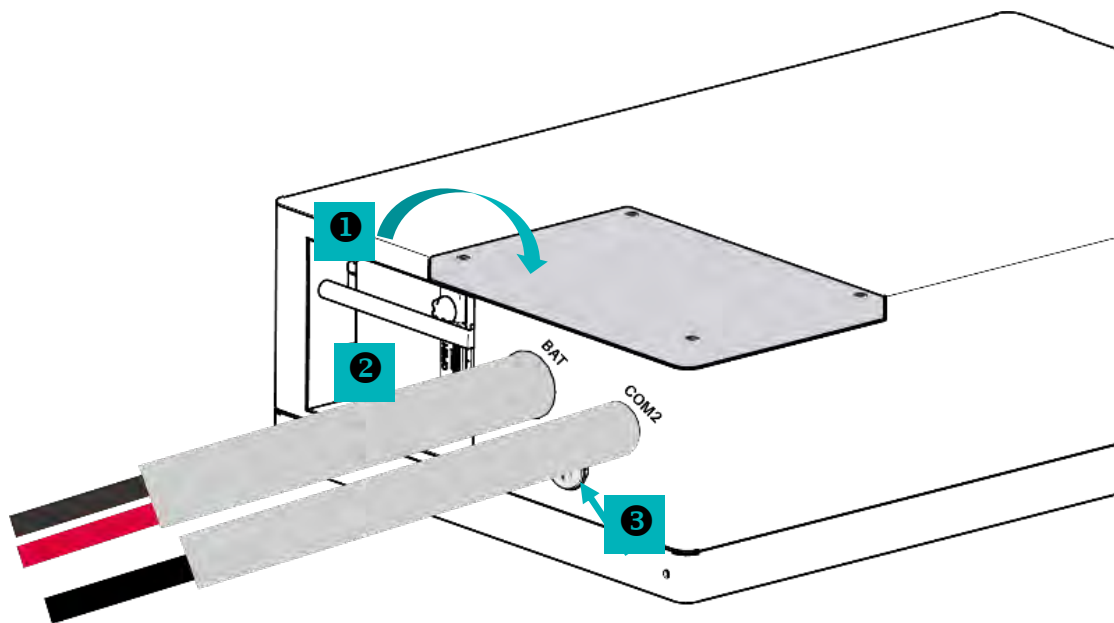
After connecting the power cables and communication cables, be sure to proceed as follows for safety.

❶ Screw the top cover back to the case.

❷ Put the installed cables through the cable conduits and fix the cable conduits into the holes.

**NOTE:** The material and installation direction of the cable conduits shall be determined upon agreement of the dealer and the customer, and the local installation policy (i.e. NFPA 855, NFPA70) shall be considered by the installer/customer.

❸ Install the plug back to the EMPTY hole if there is any to guarantee sealing performance of the panel.



**NOTE:** After installation, DO NOT forget to register online for full warranty:

[www.pylontech.com.cn/service/support](http://www.pylontech.com.cn/service/support)

## 6 Commissioning

### 6.1 System Turning On

#### 6.1.1 Single String System Turning On

##### **WARNING**

**Warning:** Double check all the power cables and communication cables. Ensure that the voltage of the inverter/PCS matches the voltage of the battery system. Check that all the power switches are OFF.



**Avertissement:** vérifiez à nouveau tous les câbles d'alimentation et les câbles de communication. Assurez-vous que la tension de l'onduleur/PCS correspond à la tension du système de batterie. Vérifiez que tous les interrupteurs d'alimentation sont éteints.

#### **Procedure:**

1. Check the grounding is connected.
2. Check all the cables are connected correctly.
3. If necessary, turn on the switch for battery on the inverter or the switch between inverter and battery system. If possible, turn on AC or PV power source to wake up the inverter.
4. Open the protection cover of Power Switch on the control module (BMS). And turn on Power Switch.
5. Press Start Button for at least 5 seconds or until buzzer rings. Battery takes 10-30 seconds for self-checking.

If the inverter is powered by AC or PV source, most types of inverters can set up communication with BMS automatically, in this case, the BMS will close relay and system is ready for work.

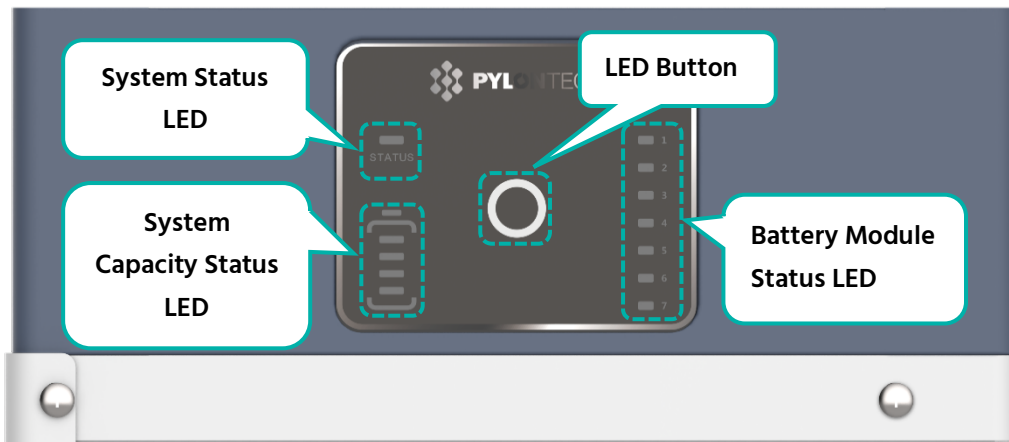
If after 30 seconds' self-checking, the LED becomes as follows, this means the inverter needs to be powered on by the battery energy:

<b>STATUS:</b>  Orange, solid	<b>SOC:</b>  Blue, Solid
--	---

In this case, press the Start Button for at least 10 seconds, till the Status LED lighting Blue and fast flashing. Then the battery will perform black start to support the inverter. After the inverter is started and communication is set, the BMS is ready for work.



If the battery has been configured to a different communication protocol, please follow LED Long Press 2 guidance in *section 3.3.2*. Make sure to select the correct protocol and restart BMS to enable the communication with inverter.



**CAUTION**

**Caution:** If the power switch is tripped off due to over current or short circuit, be sure to wait more than 30 minutes, then it can be turned on again; otherwise it may cause damage to the switch.

**Attention:** Si le disjoncteur est déclenché en raison d'une surintensité ou d'un court-circuit, veuillez à attendre plus de 30 minutes, puis il pourra être rallumé; sinon cela pourrait endommager le disjoncteur.

**WARNING**

**Warning:** If there is any failure during the self-check process, be sure to debug the failure prior to next step. If the "STATUS" LED shows orange from the beginning, it means there is failure in the battery string. In this case, the Power Relays in BMS will open, and debugging must be done first.

**Avertissement:** en cas d'échec au cours du processus d'auto-vérification, assurez-vous de déboguer l'échec avant l'étape suivante. Si la LED « STATUS » est orange depuis le début, cela signifie qu'il y a une panne dans la chaîne de batterie. Dans ce cas, les relais de puissance du BMS s'ouvriront et le débogage devra être effectué en premier.

**NOTE:** The LED lamp will be off in 20 seconds without any operation.

 **CAUTION**

**Caution:** During the first time starting, the system requires full charge process for SOC calibration purpose.

**Attention:** lors du premier démarrage, le système nécessite un processus de charge complète à des fins d'étalonnage SOC.

 **CAUTION**

**Caution:** After long time storage without charging, it is suggested to fully charge the whole Battery Energy Storage System (BESS) prior to installation. Depending on the SOC level, regularly every 6 months' full charge is requested during continuous operation as well. it will be handled automatically by the communication between BESS and external device.

**Attention:** Après un stockage prolongé sans charge, il est suggéré de charger complètement l'ensemble du système de stockage d'énergie par batterie (BESS) avant l'installation. En fonction du niveau SOC, une charge complète est régulièrement demandée tous les 6 mois également en fonctionnement continu. il sera géré automatiquement par la communication entre le BESS et le périphérique externe.

## 6.1.2 Multi-strings System Turning On

 **WARNING**

**Warning:** Double check all the power cables and communication cables. Make sure the voltage of the inverter/PCS matches the voltage of the battery system. Check to make sure all the power switches are OFF.

**Avertissement:** vérifiez à nouveau tous les câbles d'alimentation et les câbles de communication. Assurez-vous que la tension de l'onduleur/PCS correspond à la tension du système de batterie. Vérifiez que tous les interrupteurs d'alimentation sont éteints.

**Procedure:**



1. Check grounding is connected.
2. Check all cables are connected correctly, especially the Link 1 / Link 0 between master and slave strings.
3. If necessary, turn on the switch for battery on the inverter or the switch between inverter and battery system. If possible, turn on AC or PV power source to wake up the inverter.
4. Open protect cover of power switch. And turn on power switch on the control module (BMS)of all the strings.
5. From the last string, press the start button for at least 5 seconds or until buzzer rings for start-up. Then further turn on each string one by one following the table below, the start-up interval between each string shall be less than 30 seconds:

Communication Structure	Start-up Sequence
Master string	Last Start-up
Slave string 1	5th Start-up
Slave string 2	4th Start-up (if has)
Slave string 3	3rd Start-up (if has)
Slave string 4	2nd Start-up (if has)
Slave string 5	1st Start-up (if has)

6. After all strings start-up, the battery system takes 30 seconds for self-checking.

If the inverter is powered by AC or PV source, most types of inverters can set up communication with BMS automatically. In this case, the BMS will close relay and system is ready for work.

If after 30 seconds' self-checking the LED becomes as follows, this means the inverter needs to be powered on by the battery energy:

<b>STATUS:</b>  Orange, solid	<b>SOC:</b>  Blue, Solid
--	---

In this case, press and hold the Start button for at least 10 seconds, till the Status LED lighting Blue and fast flashing. Then battery will perform black start to support inverter. After the inverter is started and communication is established, the BMS is ready for work.

## 6.2 System Debug

This system debug is for BESS system (Battery Energy Storage System). It must be operated with configured UPS, PCS and EMS system together, which means that the BESS debug cannot be performed alone.

Debug Procedure	Content
Preparations for debug	Turn on the BESS system, referring to <i>section 6.1</i> . DO NOT turn on the load before turning on the whole BESS system. <b>NOTE:</b> If the equipment other than the BESS has the turning on procedure of its own system, ensure to follow its operation instructions.
Working together with inverter	<ol style="list-style-type: none"> <li>(1) Check the communication cable connection and make sure the cable order on battery and inverter side are matched. All undefined pins are suggested to be empty.</li> <li>(2) Check the baud rate of inverter. The default value of battery CAN is 500kbps, MODBUS 485 is 9600 bps. If necessary, change the baud rate of RS485.</li> <li>(3) Check that the terminal resistance CAN 120 <math>\Omega</math>, RS485 120 <math>\Omega</math>.</li> <li>(4) If necessary, check the setting on inverter or control box has right parameters and brand of battery. And check the information of BESS shown on inverter is correct.</li> </ol>

## 7 Maintenance

### 7.1 System Turning Off

#### DANGER

**Danger:** When any failure occurs or there is a need for service, the battery storage system must be powered off at first.

**Danger:** En cas de panne ou de nécessité d'entretien, le système de stockage par batterie doit d'abord être mis hors tension.

#### Procedure

1. Turn off inverter or power supply on DC side.
2. Turn off the switch between PCS and battery system.
3. Turn off the power switch of all BMSs.

#### CAUTION

**Caution:** Before replacing the battery module for service, make sure to charge/discharge the existing battery module voltage similar to the replaced one. Otherwise the system needs long time to do balance for this replaced battery module.

**Attention:** Avant de remplacer le module de batterie pour l'entretien, assurez-vous de charger/décharger la tension du module de batterie existant similaire à celle remplacée. Sinon, le système a besoin de beaucoup de temps pour équilibrer ce module de batterie remplacé.

#### CAUTION

**Caution:** When restart is required for any troubleshooting steps, make sure to restart the entire system (every BMS within the system). Please do not only restart partially of the BMS within the system, which will further lead to error.

**Attention:** lorsque le redémarrage est requis pour toute étape de dépannage, assurez-vous de redémarrer l'ensemble du système (chaque BMS du système). Veuillez ne pas redémarrer seulement partiellement le BMS dans le système, ce qui entraînerait encore davantage d'erreurs.

## 7.2 Battery Maintenance

### DANGER

**Danger:** The maintenance of battery must be done by qualified and authorized person only.

**Danger:** L'entretien de la batterie doit être effectué uniquement par une personne qualifiée et autorisée.

### DANGER

**Danger:** The power must be turned off prior to any maintenance of the battery.

**Danger:** L'alimentation doit être coupée avant tout entretien de la batterie.

### **Voltage Inspection**

Check the voltage of battery system through the monitor system. Check if the system is abnormal voltage. For example: Single cell's voltage is abnormally high or low.

### **SOC Inspection**

Check the SOC of battery system through the monitor system. Check if the battery string is abnormal SOC.

### **Cable Inspection**

Visual inspect all the cables of battery system. Check if the cables are broken, aging, or getting loose.

### **Balancing**

The battery strings will become unbalanced if not full charged for a long time. The balancing maintenance (full charged) should be done every 3 months and is usually done automatically by communication between the system and external device.

### **Output Relay Inspection**

Under low load condition (low current), switch the output relay to OFF and ON to hear the clicking sound, which means this relay can be turned off and on normally.

### **History Inspection**

Analyze the history records to check if there is an accident (alarm and protection) and analyze the reasons.

### **Environment Inspection**

Check the installation environment such as dust, water, insect etc. Ensure that it is suitable for IP55 battery system.

## Shutdown and Maintenance

Some battery function must be restarted before ESS maintenance. ESS maintenance shall be done at least once every 6 months.

### 7.3 Troubleshooting

#### DANGER

**Danger:** This system is a high voltage DC system, operated by qualified and authorized person only.

**Danger:** Le système est un système de courant continu à haute tension, qui ne doit être manipulé que par du personnel qualifié et autorisé.

#### DANGER

**Danger:** Before checking the failure, ensure to check that all the cables connection and the BESS system can be turned on normally.

**Danger:** Avant de vérifier la panne, assurez-vous de vérifier toutes les connexions des câbles et de vérifier si le BESS peut être allumé normalement.

No	Problem	Possible Reason	Solution
1	No power output, no LED on.	Too short time for pressing Start button.	Press and hold at least 5 seconds to turn on. Press and hold at least 10 seconds for black start.
		The button battery in controller is missing or has failure. The power supply in control module (BMS) has failure.	Change the control module.
		The battery voltage is too low.	Ensure that there are at least 2 battery modules.
		The connector of base has failure, or the base is not connected.	Ensure that the base is in connected properly and change base if necessary.
2	After turning on, Status LED slow flashing orange. Others off.	Self-checking failure. DC side has a voltage, but voltage difference with the battery system is higher than 20 volts.	Ensure that there is no DC voltage or set correct DC voltage before pressing Start button. Follow power on process to turn on.
		BMS internal failure.	Use debug tool/Wi-Fi monitoring to further analysis or change the control module.

No	Problem	Possible Reason	Solution
3	Status LED fast flashing orange, others off.	The time interval after latest black start is too short.	Wait more than 5 minutes and try black start again.
		The battery system under error condition such as: temperature or current protection or other errors, thus no response to black start.	Ensure that there is no other protection factor. Or use debug tool for further analysis.
4	Buzzer ring continues	Relay adhesion or failure.	Completely disconnect battery system with any DC source then make a restart. If problem still exists, then replace the controller.
5	Status LED solid orange. Battery module LED blue solid.	Communication lost with inverter	Check the communication cable PIN and wiring is correct. Check the inverter communication settings
		Over current protection.	Check DC side. And wait until BMS release protection.
		Control module failure.	Use debug tool for further analysis or change the control module.
6	Status LED solid orange. Battery module exists LED in orange solid	Over/ under temperature protection.	Check environment temperature. And wait BMS release.
		Over voltage protection.	Check DC charge voltage setting or wait BMS release.
		Under voltage protection.	Perform black start function, and then charge the system.
		Battery module BMS failure	Use debug tool for further analysis or change the battery module.
7	All LED blue but no output.	Fuse fusing	Change the control module
8	Other failure	Cell failure or electrical board failure. Or debug tool is needed for further analysis.	If you still can't debug the failure, please contact with distributor or Pylontech.

Once a certain failure is detected following the trouble shooting procedure, turn off the battery string first before replacement so as to avoid further over discharge to the system due to the self-consumption.



## 7.4 Replacement of Main Components

### DANGER

**Danger:** This system is a high voltage DC system, operated by qualified and authorized person only.

**Danger:** Le système est un système de courant continu à haute tension, qui ne doit être manipulé que par du personnel qualifié et autorisé.

### DANGER

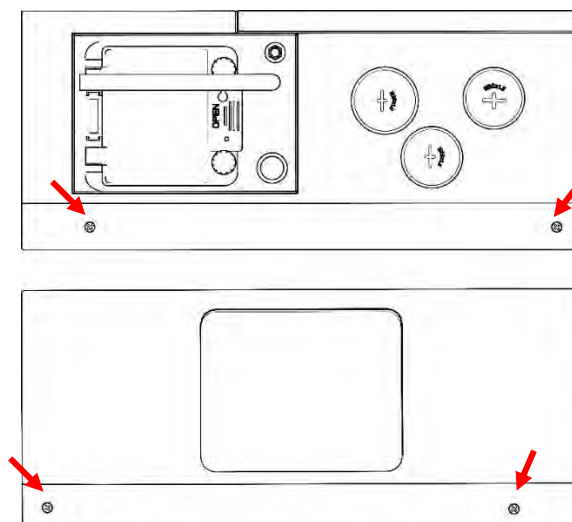
**Danger:** Before replacing the main component, turn off the maintenance battery string's power, and ensure that the D+ and D- terminal are without power. Refer to *chapter 7* for turning off process.

**Danger:** Avant de remplacer les composants principaux, coupez d'abord l'alimentation de la chaîne de batteries de maintenance. Assurez-vous que les bornes D+ et D- sont hors tension. Reportez-vous à la *chapitre 7* pour arrêter le processus.

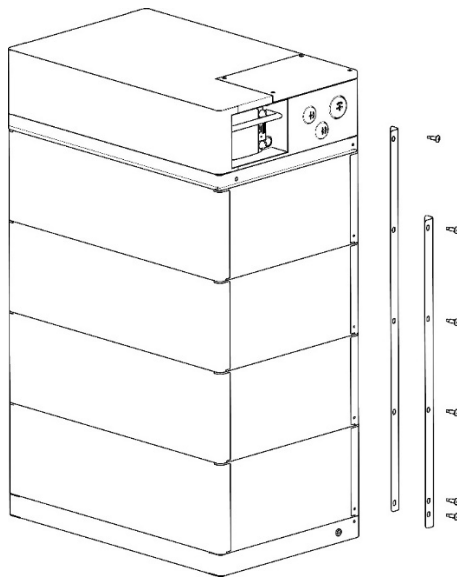
### 7.4.1 Replacement of Battery Module

#### Procedure

1. Charge existing module to full (SOC 100%). Make sure new battery module is 100% SOC as well.
2. Turn off the whole battery string's power. Make sure to confirm the D+ and D- terminals are without power. Refer to *section 7.1* for turning off process.
3. Dismantle D+ and D- power cables, communication cable and grounding cable.
4. Dismantle the control module's fix screws on the interface panel and display panel.



5. Dismantle the fix metal brackets as follows.

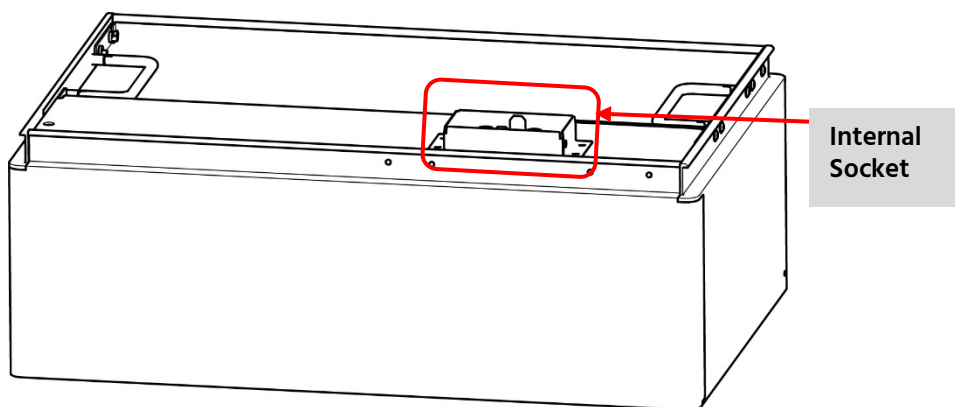


6. Remove the control module and each battery module one by one.

**! DANGER**

**Danger:** When battery is connected together with the base, the internal socket still has high voltage DC power from serial connected battery modules.

**Danger:** Lorsque la batterie est connectée à la base, la prise interne reçoit toujours une alimentation CC haute tension provenant des modules de batterie connectés en série.



**! WARNING**

**Warning:** Single battery module weights 86 lb (39 kg). If there are no handling tools, at least more than 2 people are needed to handle with it.

**Avertissement:** un module de batterie unique pèse 86 lb (39 kg). S'il n'y a pas d'outils de manutention, il faut au moins plus de 2 personnes pour la manipuler.

7. Pile up the new battery module. And install back the battery modules and control module.
8. Fix back the two screws on the control Module's. And install back the fix metal brackets.
9. Install back grounding cable, communication cable and the D+ and D- power cables.
10. Turn on this battery string, referring to *section 6.1*.

## 7.4.2 Replacement of Control Module

### Procedure

1. Turn off the whole battery string's power. Make sure to confirm the D+ and D- terminals are without power. Refer to *section 7.1* for turning off process.
2. Dismantle D+ and D- power cables, communication cable and grounding cable.
3. Dismantle the control module's fix screws on the left and right (same as *section 7.4.1*).
4. Dismantle the fix metal brackets (same as *section 7.4.1*).
5. Remove the control module.

#### DANGER

**Danger:** When battery is connected together with the base. the internal socket still has high voltage DC power from serial connected battery modules. Beware of electric shock.

**Danger:** Lorsque la batterie est connectée à la base, la prise interne reçoit toujours une alimentation CC haute tension provenant des modules de batterie connectés en série. Attention aux chocs électriques.

6. Pile up the new control module.
7. Fix back the screws on the control module's interface panel and display panel. And install back the fix metal brackets.
8. Install back grounding cable, communication cable and the D+ and D- power cables.
9. Turn on this battery string, referring to *section 6.1*.

## 8 Shipment and Storage

### 8.1 Shipment

Before shipment, single module is pre-charged to about 100% SOC, or according to customer requirements. After delivered on-site, the remaining battery capacity is determined by the storage time and condition.

- The battery modules should meet the UN38.3 certificate standard.
- In particular, local rules and policies (e.g. ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road) for the product transportation shall be complied with. For more details, please enquiry the Safety Data Sheet (SDS) from Pylontech: [service@pylontech.com.cn](mailto:service@pylontech.com.cn).

### 8.2 Storage

For long-term storage, e.g. if it needs to be stored for a long time (more than 6 months), the battery cells are highly suggested to be stored in the temperature range of 41°F~113°F (5°C~45°C), relative humidity <65% and corrosive-gas-freed environment. It is required to charge them every six months, and the SOC should be no less than 90%.

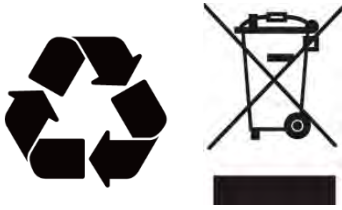
#### CAUTION

**Caution:** If you do not follow the above instructions for long term storage of the battery, the cycle life will decrease heavily.

**Attention:** Si vous ne suivez pas les instructions ci-dessus pour un stockage à long terme, la durée de vie de la batterie diminuera considérablement.

## 9 Disposal

In case a battery (normal condition or damaged) needs disposal or needs recycling, it shall follow the local recycling regulations to process, and use the best available techniques to achieve a relevant recycling efficiency.



## Annex 1: Installation and System Turn-on Process List

Tick after completion	No.	Item	Remark
<input type="checkbox"/>	1	Select the installation sites to meet all technical requirements.	Refer to <i>section 4.3</i> .
<input type="checkbox"/>	2	Battery base is installed following the technical requirements.	Refer to <i>section 4.4.1</i> .
<input type="checkbox"/>	3	Install the battery modules.	Refer to <i>section 4.4.2</i> .
<input type="checkbox"/>	4	Install the control module (BMS) and the battery module well.	Refer to <i>section 4.4.3</i> .
<input type="checkbox"/>	5	Connect D+ and D- between BMS to the inverter/PCS or confluence cabinet.	Refer to <i>section 5.3</i> .
<input type="checkbox"/>	6	Connect the grounding cable.	Refer to <i>section 5.2</i> .
<input type="checkbox"/>	7	Double check that all the power cables, communication cables, grounding cable are installed well.	Refer to <i>section 5.2 and 5.3</i> .
<input type="checkbox"/>	8	Switch on the external power or inverter/PCS, and ensure that all the power equipment can work normally.	Refer to <i>section 6.1</i> .
<input type="checkbox"/>	9	The first installation should do full charging progress automatically. If the status LED of BMS turns to blue, it means this battery string is in operation.	

## Annex 2: System Turn-off Process List

Tick after completion	No.	Item	Remark
<input type="checkbox"/>	1	Soft-off the inverter through inverter's control panel.	Refer to <i>section 7.1</i> .
<input type="checkbox"/>	2	Turn off the switch between inverter and this battery string (Force-H3-US), or turn off the power switch of inverter, to make sure no current through this battery string.	Refer to <i>section 7.1</i> .
<input type="checkbox"/>	3	Turn off the power switch of the BMS.	Refer to <i>section 7.1</i> .



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