

# INSTALLATION MANUAL ENERGY STORAGE SYSTEM (ESS) **Storion-T50/T100** (Indoor, with M48112-S)

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## Version Information

Version	Date	Content
V01	Feb. 24th, 2020	First edition.
V02	May.14th, 2020	Change CT description.
V03	May.26th, 2020	Correct some spelling errors.

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## 01 INTRODUCTION

**1.1 Brief Introduction**

This manual applies for Storion-T50/T100 Li-ion battery energy storage system, mainly includes:

- (1) Safety introduction  
Introduces the product use, operating notes and qualification of operators of T50/T100 Li-ion battery energy storage system.
- (2) Product description  
Describes product appearance, product characteristics, system composition and major functions of T50/T100 Li-ion battery energy storage system.
- (3) System installation  
Introduces the installation of T50/T100, including cautions.

**1.2 Explanation of Terms**

- (1) Lithium iron phosphate cell (LiFePO<sub>4</sub>)

Basic unit constituted by electric poles and electrolytes; Each cell is independent and closed.

**!** **Note:** Paralleled cell cannot be regarded as an independent cell, even repacked as one whole battery pack.

- (2) Lithium iron phosphate pack

Combination made up of battery monitoring circuit, battery equalization circuit, electrical connectors, communication interfaces, thermal management devices and multiple Lithium iron phosphate cells.

**!** **Note:** For packs from same company, all the details such as physical size, working performance and interface specification should be consistent so that all the packs are compatible and interchangeable.

- (3) Battery management system

Electronic equipment collection for monitoring the operating information of cells, packs and system units (such as voltage, current, temperature, protective parameter of batteries), evaluating the state of charge (SOC), the state of health (SOH) and cumulative processed energy and protecting batteries for safety, etc.

- (4) Battery system unit

A combination of batteries through series parallel combination inside and a battery management system (BMS) in which accesses to DC side of a bidirectional converter.

- (5) Storage unit

A combination of a bidirectional converter and a battery system unit, which can be used as an independent load or be controlled directly by monitoring system.

## 02 SAFETY INSTRUCTIONS

**2.1 Manual Keeping**

This manual contains important information about operating the system. Before operating, please read it very carefully.

The PCS should be operated in strict accordance with the description in the manual, in case that it causes damage or loss to equipment, personnel and property.

This manual should be kept carefully for maintenance and repairation.

**2.2 Operator Requirements**

The operators should get a professional qualification, or trained.

The operators should be familiar with the whole storage system, including compositions and working principles of the system.

The operators should be familiar with the Product Instruction.

While carrying out maintenance work it has to be at least two operators in the field all the time. They can't operate on any equipment until they are all powered off and fully discharged.

It is strictly prohibited for any maintenance to be carried out when equipment are on or charged.

**2.3 Protection of Warning Sign**

The warning sign contains important information for the system to operate safely and it is strictly prohibited to torn or damage the sign.

Ensure that the warning sign is always clear.

The signs should be replaced immediately if damaged.

**2.4 Setting of Warning Sign for Safety**

While instructing, maintaining and repairing, to prevent unrelated personnel nearby to cause incorrect operation or accident, the suggestions below should be followed:

Obvious signs should be set at front switch and rear-level switch in case of accidents caused by false switching.

Warning signs or tapes should be set near the operation areas.

Keys of the system must be pulled out after maintenance or operation.

**2.5 Live Line Measurement**

High voltage in the container which may cause vital electric shock when touched by accident.

Equipment protection must be taken in live line measurements (e.g.: insulation gloves).

The measuring equipment should be connected and used correctly to ensure personnel safety. When measuring, at least two workers are needed.

### 2.6 Measuring Equipment

To ensure the electrical parameters to match requirements, related measuring equipment are required when the system is being connected or tested.

Ensure that the connection and use matches specification in case of electric arc or shock.

### 2.7 Electrostatic Prevention

Contact or improper operation of the printed circuit board or other ESD sensitive components may result in damage to the device. Unnecessary contact should be avoided.

### 2.8 Moisture Prevention

It is very likely that moisture may cause damages to the system.

Do not open the container door if the humidity is larger than 95%.

Repair or maintaining activities in wet conditions should be avoided or limited.

### 2.9 Operation after Power Failure

The battery system belongs to energy storage system, which maintains fatal high voltage even when the DC side is disconnected. Therefore, touching of the battery output is strictly prohibited.

The PCS maintains fatal voltage even when both the DC or AC side are disconnected, so it must be tested by the multimeter for safety before operation.

### 2.10 Minimum Personal Protective Equipment

For the safety of operators to the system, personal protective equipment are required. During the operation, following protective equipment are required:

No.	Item	Notes
1	Work clothes	
2	Protective shoes	
3	Protective glasses	

When doing maintenance works such as checking cables or wires, measuring voltage, replacing small electrical parts or cleaning modules and brackets, as minimum the following protective equipment are required:

No.	Item	Notes
1	Work clothes	
2	Protective shoes	
3	Protective glasses	
4	Insulated gloves	For touching live parts

**Note:** All metal tools during maintenance should be insulated.

When replacing modules, the following protective equipment are required:

No.	Item	Notes
1	Work clothes	
2	Protective shoes	
3	Protective glasses	
4	Insulated gloves	For touching live parts

**Note:** When replacing modules, the stacking machine should be used carefully in case that the modules may fall down. All workmen are suggested to wear high-safety and high strength protective shoes to protect their feet.

### 03 PRODUCT DESCRIPTION

The AlphaESS Storion-T50/T100 energy storage system supports on-grid mode and off-grid mode to run. The excessive energy generated by the PV will be stored in the batteries. The stored energy can be used when the PV is not generating enough energy.

The overall system connection diagram is as follows:

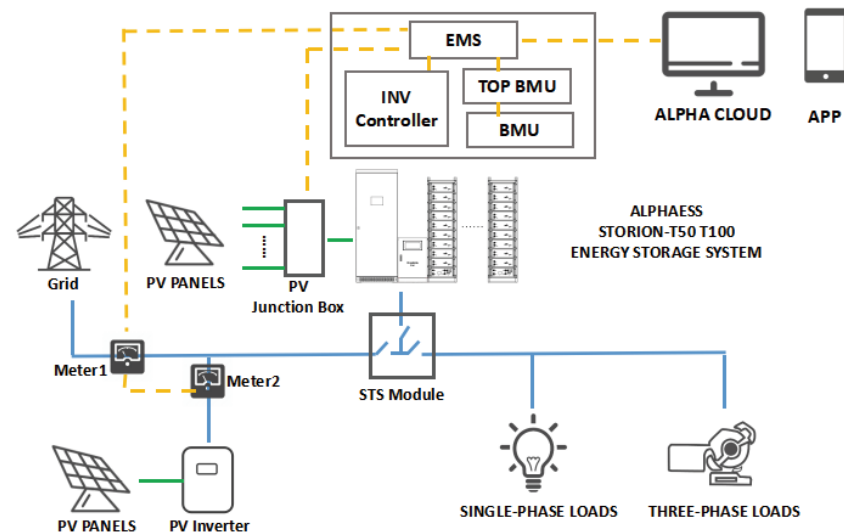


Figure 3-1 Application of the system, on-grid mode

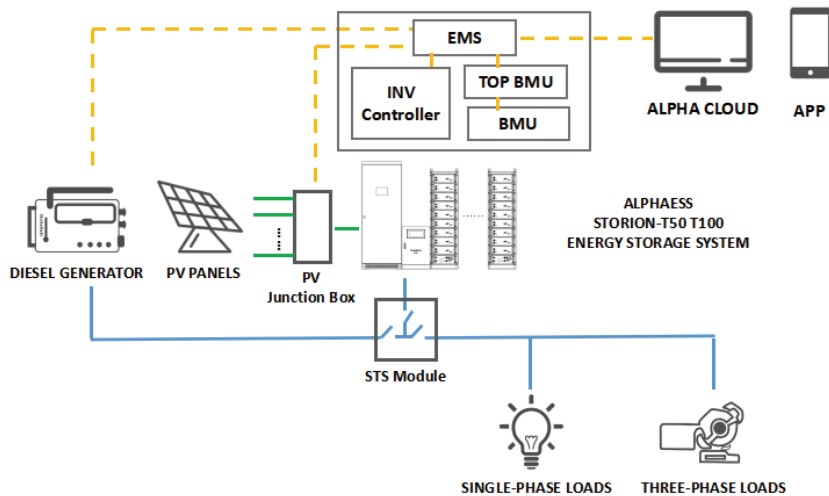


Figure 3-2 Applications of the system, off-grid mode

### 3.1 Appearance of the Product

Figure 3-3 shows the appearance of the system.

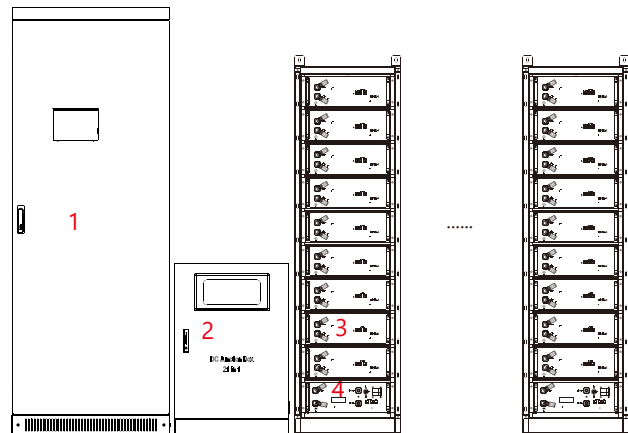


Figure 3-3 T50/T100 without container

Table 1 T50/100 System composition

Item	Components
1	Storion-T50/100-INV
2	Junction Box (With TOP BMU Box)
3	M48112-S
4	HV900112 Box

### 3.2 Product Characteristics

LiFePO4 batteries produced by AlphaESS have longer lifespan and higher reliability, which is able to satisfy the application of energy storage systems.

The system is highly modular designed, and it is easier to assemble, transport and maintain.

The system has a three-level BMS and is allowed for system expansion.

The system adopts all time balancing technology so that the consistency of batteries and modules can be well ensured.

The system is designed as a removable container which is compact in structure, flexible, convenient for installation and testing, and suitable for the working environment and is able to satisfy different kinds of applications.

The system has current balance technology between strings in case of circulating current or unbalanced power.

The system has relatively developed thermal management technology so that the consistency of the system environment can be ensured.

The system has both remote monitor function and local control function.

The system realizes flexible scheduling of electric power system through communication among BMS, PCS and monitoring system.

The system realizes emergency fire protection by using the automatic alarming and fire extinguishing system

### 3.3 Parameters of Components

#### 3.3.1 PCS

##### 3.3.1.1 Product Instruction

Storion-T50/T100-INV is a hybrid inverter. It has DC/DC and DC/AC modules. It can transform the DC electricity from PV panels into three-phase AC electricity to supply loads. The DC/DC module can charge batteries by using the electricity generated by PV panels. The DC/AC module is bidirectional so that the battery can also be charged by the grid through the inverter

##### 3.3.1.2 Appearance Instruction

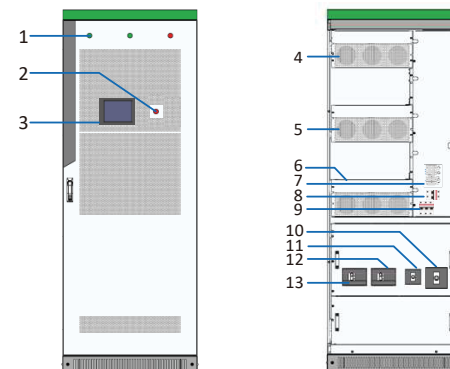


Figure 3-4 Appearance of the PCS

**Table 2 Composition of the PCS**

Position	Designation	Description
1	Indicator lights	
2	EPO (Emergency Power Off)	
3	Touch Screen	
4	PCS-DC (1~2 module(s))	50KW 1 set; 100KW 2 sets
5	PCS-AC (1~2 module(s))	50KW 1 set; 100KW 2 sets
6	STS module	Switching device; Only for the models with STS
7	Wiring terminal	Digital input and digital output
8	AUX power supply switch	
9	SPD switch	
10	AC breaker (Grid)	
11	AC breaker (Load)	
12	Battery switch	
13	PV DC switch	



**Note:** Components 7 Wiring Terminal, 8 AUX power supply switch, 9 SPD switch can be seen after unfold the dam-board.

### 3.3.1.3 Technical Parameters

**Table 3 Technical parameters of the PCS**

No.	Item	Storion-T50-INV	Storion-T100-INV
<b>AC Side Data (off-grid)</b>			
1	AC nominal output power	50 kW	100 kW
2	AC max. power	55 kW	110 kW
3	AC output voltage	400 Vac (± 10% configurable)	
4	Voltage range	400 V ± 10 %	
5	AC output current	72 A (max. 79 A)	144 A (max. 159 A)
6	AC connection	3-phase and 4-wire system (including transformer)	
7	AC frequency	50 Hz / 60 Hz	
8	Output THDu	<2 %	
9	AC PF	Listed: 0.8~1 leading or lagging (Load-depend) Actual: 0.1~1 leading or lagging (Load-depend)	
10	Overload capability	100%~110% long-term; 110%~120% 1min; 120%~150% 200ms;	
<b>DC Data(Battery Side)</b>			
11	DC voltage range	250 – 520 V	
12	One-Way maximum input Current	150 A	300 A
13	Max. DC power	50 kW	100 kW

<b>PV Side Data</b>			
14	PV voltage range	520 – 900 V (MPPT: 520~800 V)	
15	PV DC max. current (in case of completely consumption)	192 A	384 A
17	Max. PV power	100 kW	200 kW
<b>General Data</b>			
18	Max efficiency	95.5%	
19	Dimensions (W x H x L)	800 x 2160 x 800 mm	
20	Weight	520 kg	750 kg
21	Altitude	3000 m	
22	Ingress protection	IP20	
23	Noise	70 dB	
24	Operation temperature	-25 °C ~ +50 °C (De-rating over 45°C)	
25	Cooling concept	Forced Air	
26	Humidity	0~95% (Non-Condensing)	
27	Communication interfaces	Ethernet,RS-485, CAN	

### 3.3.1.4 Emergency Stop Switch

The converter stops working immediately after pushing the button.

If you want to restart the converter, please proceed in the following order:

- A. Conduct clockwise rotation on the emergency stop switch and then loosen the locking status.
- B. Push the AC breaker into "OFF" position, then turn the AC breaker "ON".
- C. Launch the machine and operate it as required

### 3.3.2 Battery System

**Table 4 Battery system parameters**

Item	Description	Parameter	Remark
1	Nominal discharge power	50 kW / 100 kW	
2	Energy storage capacity	According to the project situation	Ambient temperature is 30°C, measured at DC side
3	Continuous discharge current	1C (continuous)	
4	Direct voltage	250 ~ 520 V	
5	Communication interface	RS485, CAN2.0	

### 3.3.2.1 M48112-S

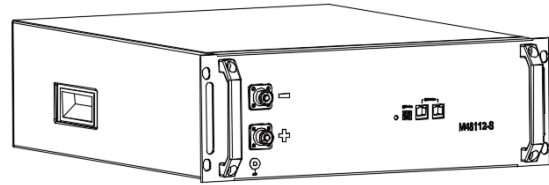


Figure 3-5 Battery front cover

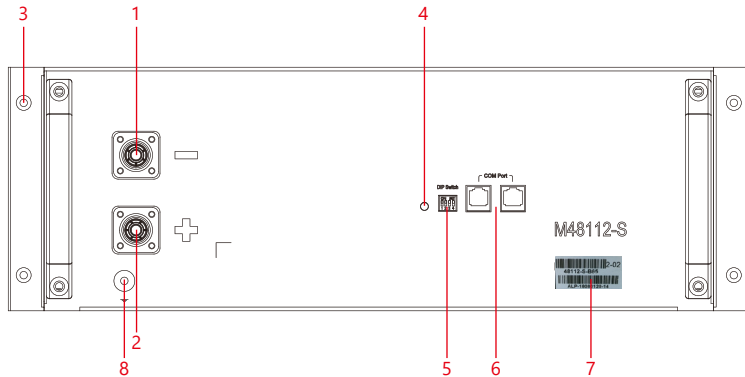


Figure 3-6 Battery front cover

Table 5 Battery interface definition

No	Description	No	Description
1	Battery negative pole	5	Dip switch
2	Battery positive pole	6	COM port (CAN) x 2
3	Earthing point x 4	7	Information label
4	LED light	8	Earthing point (reserved)

The dip switch of M48112-S defines the serial number. Please see the detailed description in the following table.

Table 6 Dip switch definition of M48112-S

Serial Number	Dip Switch	Serial Number	Dip Switch	Serial Number	Dip Switch
1		6		11	
2		7		12	
3		8		13	

4		9		14	
5		10		15	

Table 7 Battery technical parameters:

No	Description	Technical parameter	Remarks
1	Battery model	M48112-S	
2	Assembly method	16S2P	
3	Nominal voltage	51.2 V	
4	Voltage range	48 ~ 57.6 V	
5	Nominal capacity	112 Ah	Max. charge / discharge current 1C
6	Nominal stored energy	5.734 kWh	
7	Work power consumption	0.4752 W	
8	Dormant power consumption	1.52 mW	Battery dormant state
9	Max. charge/discharge current	112 A	Constant current mode
10	DC internal resistance	< 20 mΩ	Factory default
11	Transportation/storage temperature range	-20 ~ 45°C	
12	Charging work temperature range	0 ~ 50°C	
13	Discharging work temperature range	-10 ~ 50°C	
14	Communication mode	CAN	
15	Weight	70 ± 2.0 kg	
16	Size (W x D x H)	494.6 x 615.3 x 162.6 (±5) mm	
17	Humidity	15% ~ 85%	

### 3.3.2.2 HV900112

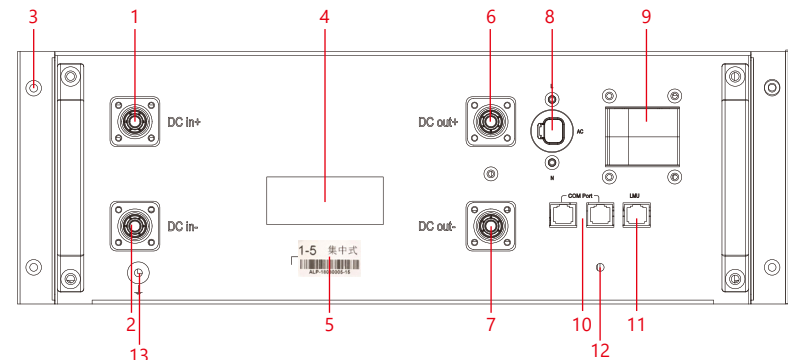


Figure 3-7 HV900112 front cover

**Table 8 HV900112 interface definition:**

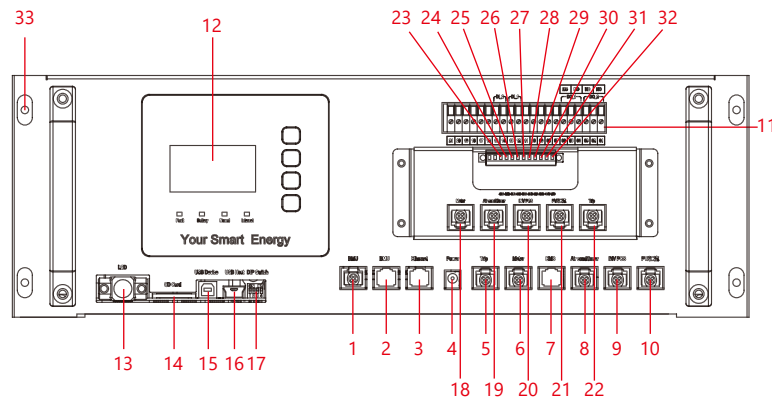
No	Description	No	Description
1	DCin+	8	DCout-
2	DCin-	9	AC input (auxiliary power)
3	Earthing point x 4	10	AC Air switch (auxiliary power)
4	Moulded case circuit breaker	11	BMU COM port (CAN) x 2
5	Information label	12	LMU COM port (CAN)
6	DCout+	13	LED light
		14	Earthing point (reserved)

**Table 9 HV900112 technical parameters:**

No	Item	Technical parameter	Remarks
1	High-voltage control box	HV900112	
2	Working voltage range	200 ~ 900 V	
3	Modules Connection	5~9 M48112-S in series	
			for T50/100, with only 5 batteries, the batteries will not be fully discharged
4	Rated current	112 A	
5	Dimensions (W x D x H)	494.6 x 552.6 x 162 ± 5mm	
6	Weight	20 kg	
7	Power consumption	<10 W	

**3.3.2.3 Top BMU Box (with EMS)**

Functions such as remote monitoring, remote upgrade, etc. can be realized through the TOP BMU Box with EMS.

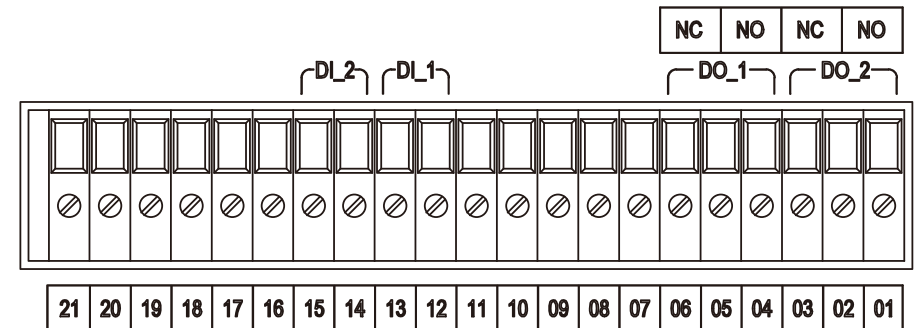


**Figure 3-8 Front cover of TOP BMU box with EMS**

**Table 10 Top BMU box with EMS interface definition:**

No	Description	No	Description
1	BMU COM port	12	DIP switch
2	BMU COM port	13	Meter COM port (reserved for RS485)
3	Ethernet	14	Air conditioner COM port( reserved for RS485)
4	Reserve power supply	15	INV PCS COM port (reserved for RS485)
5	Dry contact COM port	16	PV junction COM port (reserved for RS485)
6	Meter COM port	17	Dry contact COM port (reserved for RS485)
7	EMS COM port (reserved for external device communication with BMU)		Meter RS485A port
8	Air conditioner COM port	24	Meter RS485B port
9	PCS COM port	25	Air conditioner RS485A port
10	PV junction COM port	26	Air conditioner RS485B port
11	Dry contact port	27	PCS RS485A port
12	EMS display screen	28	PCS RS485B port
13	DB9 COM	29	PV Junction RS485A port
14	Storage card	30	PV Junction RS485B port
15	Burning port	31	Reserved
16	COM pin board	32	Reserved
		33	Earthing point x 4

**!** **Note:** TOP BMU box (with EMS) can communicate with outside device, such as PCS, Air conditioner, PV junction box, etc. You can connect from the COM port (from Port 1 to 10) in TOP BMU box to the device by using regular net cables. If the communication type is RS485, please connect to the RS485A and RS485B port in TOP BMU box. Besides, the two corresponding COM ports in TOP BMU box should be connected with each other.



**Figure 3-9 Dry contact of TOP BMU**



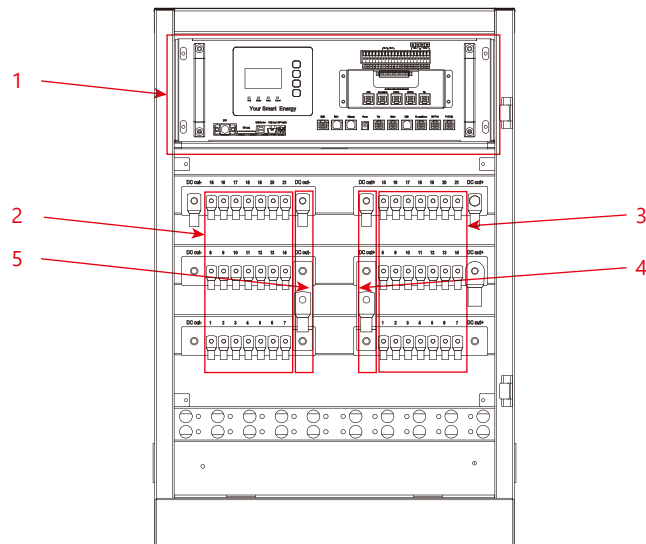
**Table 11 Dry contact description**

No	Description	No	Description
1	Dry contact of generator	12	Dry contact of Fire controller fault (+24V)
2		13	Dry contact of Fire controller fault (GND)
3	Reserved	14	Dry contact of Fire fault (+24V+)
4		15	Dry contact of Fire fault (GND)
5	Dry contact of BMS fault	16	Reserved
6			
7			
8			
9	Reserved	18	
10		19	
11		20	
		21	

**Table 12 Technical parameters:**

No	Description	Technical parameters
1	Dimensions(W x D x H)	490.6 x 323 x 161 ± 5 mm
2	COM	RS-485×4; Ethernet 10/100/1000Mbps×1
3	Internal storage	CD card, 16 GB
4	Events diary	Recent one-month happenings
5	Work voltage	24 V
6	Power consumption	<10 W

**3.3.2.4 Junction box**



**Figure 3-9 Inside of the junction box**

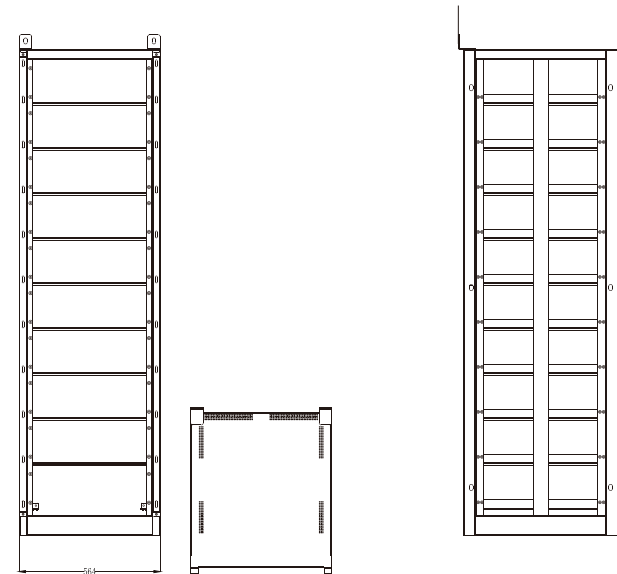
**Table 13 Wiring definition of the junction box:**

No	Description	No	Description
1	EMS	4	6 x DC OUT INV+
2	21 x DC IN BAT-	5	6 x DC OUT INV-
3	21 x DC IN BAT+		

**Table 14 Technical parameters:**

No	Description	No	Description
1	Dimensions (W x D x H)	4	564 x 439 x 845 mm
2	Weight	5	50 kg

**3.3.2.5 Battery Rack**



**Figure 3-10 Battery Rack**

**Table 15 Technical parameters:**

No	Description	No	Description
1	Dimensions (W x D x H)	4	564 x 667.5 x 2006 mm
2	Weight	5	120kg

### 3.3.3. PV Combiner Box (If applicable)

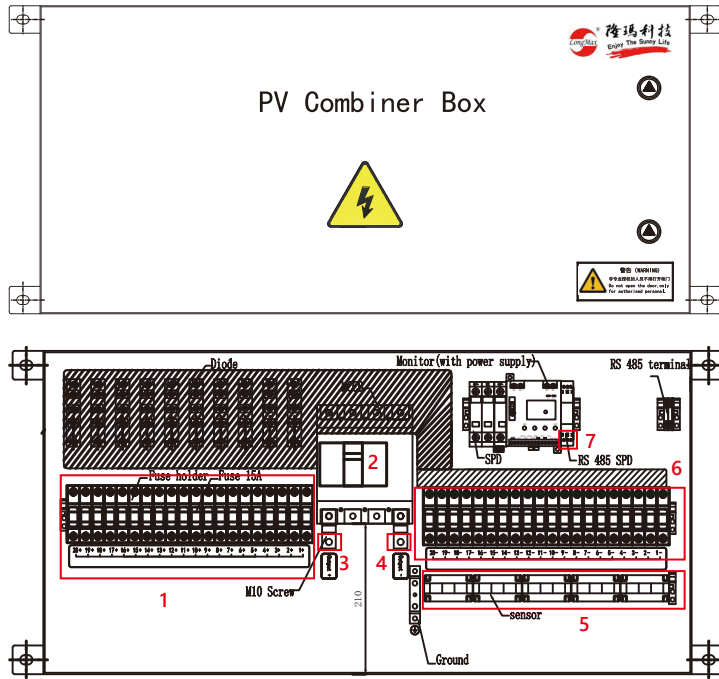


Figure 3-11 PV Combiner box

Table 16 Wiring definition of the combiner box:

No	Description	No	Description
1	PV IN +	5	HALL sensor
2	Molded case circuit breaker	6	PV IN -
3	DC OUT+	7	RS485
4	DC OUT-		

## 04 INSTALLATION

### 4.1 Installation Precautions

The following sites are not allowed for installation:

- A. Sites which are salty and where humid air can penetrate.
- B. Flooded areas.
- C. Earthquake areas (additional security measures are required here) .
- D. Sites that are higher than 3000 meters above the sea level.
- E. Sites that are in an explosive or potentially explosive atmosphere.







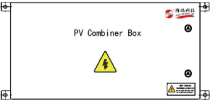



F. Sites with extreme changes of ambient temperature.


G. Sites with highly flammable materials or gases.

### 4.2 Parts List

Table 17 Parts List

M48112-S			
1 X Power Cable 420 mm, Black-Red, BAT-BAT	1 X Communication Cable 280 mm, BAT-BAT	4 X M6*16	4 X M6 Gouding Serrated Washer
HV900112			
1 X Communication Cable 500 mm, BAT-HV Box	4 X M6*16	4 X M6 Gouding Serrated Washer	1 X Terminal Resistance
1 X Power Cable 2500 mm, Black-Black, BAT-HV	1 X Power Cable 130 mm, Red-Red, BAT-HV	AC Auxiliary Power Cable 7000 mm	
DC Junction box (With TOP BMU Box)			
1 X Communication Cable 2500 mm, TOP BMU-HV BOX	1 X Terminal Resistance	4 X M6*16	4 x M6 Gouding Serrated Washer

			
1system: 1 x 4500 mm, 50mm <sup>2</sup> Power Cable, Black-Black, For Junction box- INV (T50); 1system: 1 x 4500 mm, 95mm <sup>2</sup> Power Cable, Black-Black, For Junction box- INV(T100)	1 system: 1 x 4500 mm, 50mm <sup>2</sup> Power Cable, Red-Red, For Junction box - INV(T50); 1 system: 1 x 4500 mm, 95mm <sup>2</sup> Power Cable, Red-Red, For Junction box - INV(T100);	1 cluster: 1 x Communication Cable 7500 mm EMS-INV	
<b>Battery Rack</b>			
			
1 cluster: 1 x Communication Cable 7500 mm EMS-INV	1 cluster: 1 x 4500 mm, 35mm <sup>2</sup> Power Cable, Black-Black, For HV Box - Junction box	1 cluster: 1 x 4500 mm, 35mm <sup>2</sup> Power Cable, Red-Red, For HV Box - Junction box	
<b>System</b>			
			
PV Combiner box(If applicable)	1 x Meter with 3 CT (on-grid mode-DC); 2 x Meter with 6 CT (on-grid mode -AC/Hybrid)	3*CT (on-grid mode-DC); 6*CT (on-grid mode -AC/Hybrid) Outline size (W*H*D) :90*14*40mm Through size (a*e) :20*30mm	1 x Installation manual

			
1 x Operation and maintenance manual			

**4.3 Installation**

**4.3.1. PCS Installation**

**4.3.1.1 Removal**

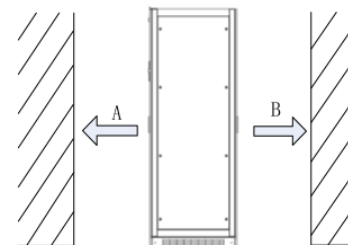
When removing the T50/T100-INV, a forklift can be used to remove the whole case. Users can lift the device bottom with a forklift or remove the inverter cabinet through the lifting hole on its top with a crane. It can be transported alone.



**Figure 4-1 Moving method for inverter**

**4.3.1.2 Operation Space**

The installation space of the PCS should have a proper distance from its peripheral walls so as to ensure that the machine door can be opened and closed conveniently and there will be sufficient space for module insertion and extraction, normal heat dissipation and user's operation.



**Figure 4-2 Installation space**

A ≥ 1,000mm, make sure that the front door of the cabinet can be fully opened and there is sufficient space for cold air to enter. Users can conveniently insert and extract the module and operate the breaker.

B ≥ 1,000mm, make sure that the rear door of the cabinet can be fully opened. Ventilation and heat dissipation should be ensured. Users can also have sufficient space for product maintenance.

### 4.3.1.3 Cabinet Installation

After the cabinet is removed to the installation position with a forklift or a tool. The cabinet should be adjusted and removed to the designed position. Then open the internal door of cabinet, and fix the cabinet with M13 screws, as shown in Figure 4-3.

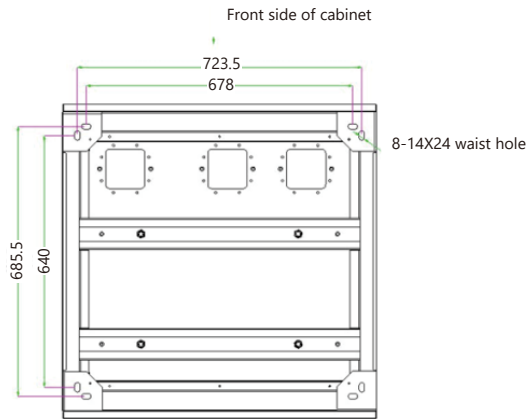


Figure 4-3 Diagram of the cabinet base

When the cabinet needs to be fixed on the steel channel, Φ14 holes can be made in the steel channel. Fix the cabinet to the steel channel with screws, as shown in Figure 4-4.

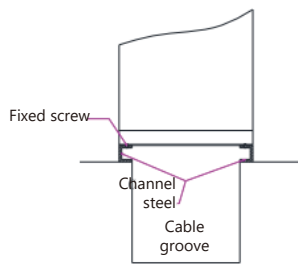


Figure 4-4 Fix the cabinet to the steel channel

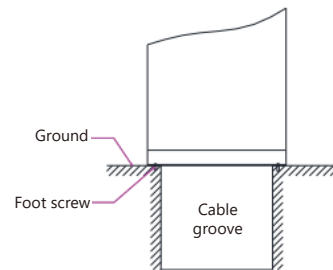


Figure 4-5 Fix the cabinet to the concrete floor

When the cabinet is fixed to the concrete floor, make holes on the floor and fix the cabinet to the concrete floor with expansion screws, as shown in Figure 4-5.

## 4.3.2 Battery System Installation

### 4.3.2.1 Battery Rack Installation

That depends on the customer

### 4.3.2.2 Battery Installation

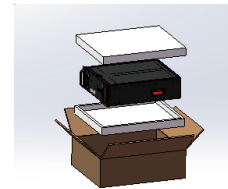


Figure 4-6 Battery packages

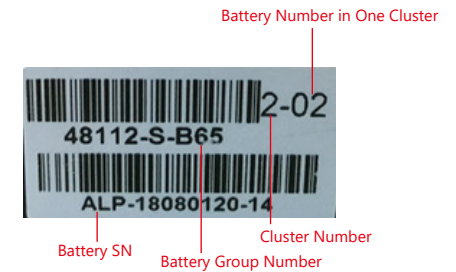


Figure 4-7 Battery label information

**Step 1:** Open all the battery packages.

**Step 2:** Check the Battery No. and cluster No. on the battery cover.

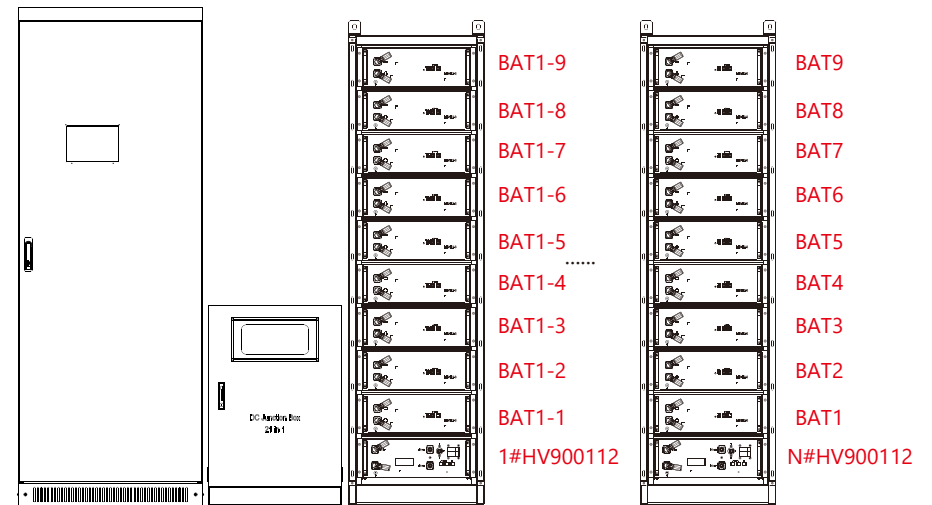


Figure 4-8 Installation the battery

**Step 3:** Put the same cluster of batteries on the same rack with the serial number of 01 to 09 from top to bottom as the above figure shows. The dip switch defines the serial number, see Table 6.



**Note:** All the cluster battery group No. shall be the same. In one cluster the dip switch of each battery should be different from others. When you are installing the battery, please to avoid scratches because of the heavy battery.

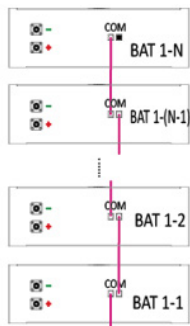
**Step 4:** After completing one rack, please check whether the installed batteries have the same cluster No. and the same battery group No.

### 4.4 Wiring

#### 4.4.1 Battery Side Wiring

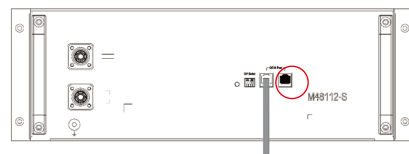
##### 4.4.1.1 Communication Cables Connection

**A.** Please refer to the following figure, connect the communication cables among batteries of each cluster. These cables are in each battery parts list.



**Figure 4-9** Communication cables connection in one cluster

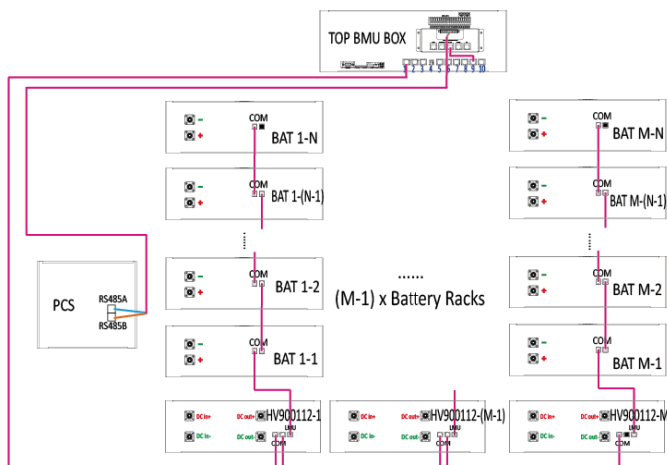
**B.** Take the terminal resistance in the HV900112 parts list and insert it into the top battery COM port of each battery cluster. You can see the detailed information Figure 4-10.



**Figure 4-10** Terminal resistance in the top battery of each cluster

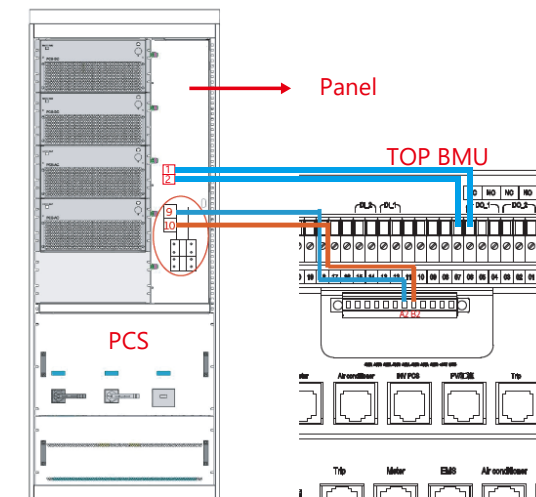
**C.** Connect the bottom battery (COM Port) to HV900105 (LMU Port) by using the communication cables from HV900105 parts list.

**D.** Connect HV900112 (COM Port) to TOP BMU box (COM Port, Port 1 or 2) by using the communication cable from TOP BMU part list. Please see Figure 4-11.



**Figure 4-11** Battery side communication cables connection

**E.** To connect the PCS and EMS please open the PCS cabinet front door and remove the panel of the right side. You can see the communication interface at the right bottom. Then please connect TOP BMU box (Port 27 -485A and Port 28 - 485B) to the PCS (Port 9 - 485A and Port 10 - 485B) by using the RS485 cable from the parts list, and connect TOP BMU box dry contact port (Port 05 and Port 06) to the PCS (Port 1 and Port 2) by using the RS485 cable from the parts list as Figure 4-12 shows.



**Figure 4-12** Battery side communication cables connection

The terminal strip ports of PCS are defined as in Table 18 shown.

**Table 18** Definition of terminal strip ports of PCS

Item	Terminal	Notes
Input Signal Loop		
1	IN1	BMS Fault Signal
2	IN1 GND	
3	IN4	On/Off-grid Switch Node 1
4	IN4 GND	
5	IN5	On/Off-grid Switch Node 2
6	IN5 GND	
External Communication Loop		
7	CAN H	From External BMS
8	CAN L	
9	485 A	To External RS485
10	485 B	
External Aux Power Input		
11	L	From External AUX Power
12	N	

- F. Connect the COM port 9 and COM port 10 of TOP BMU box with a regular net cable.
- G. Another COM port of HV900112 should be inserted with the terminal residence from HV900112 parts list. You can see the detailed information Figure 4-13.

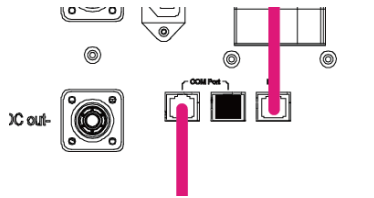


Figure 4-13 Terminal resistance in one of the HV900112

- H. Connect TOP BMU COM port 3 to Ethernet.

#### 4.4.1.2 Battery Power Cables Connection

The battery DC positive and negative port of HV900112 can be directly connected to the BAT+ and BAT- of PCS as Figure 4-14 shows.

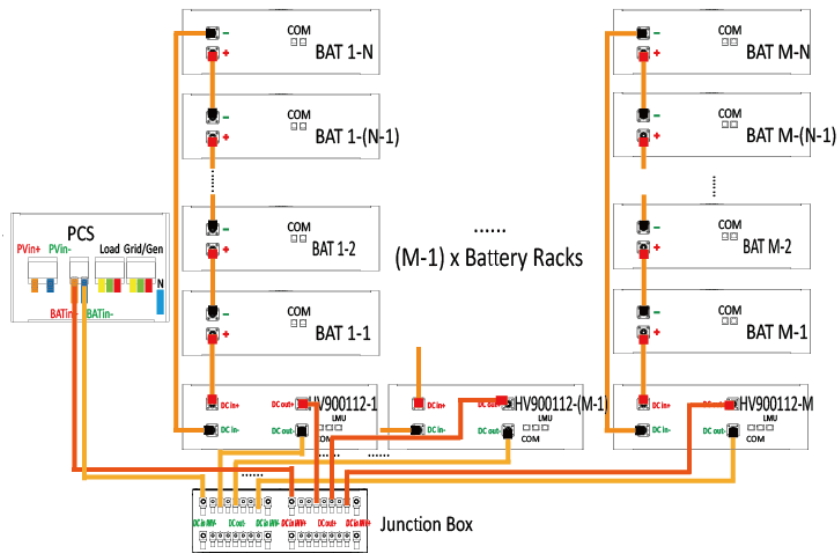


Figure 4-14 Battery side-power cables connection

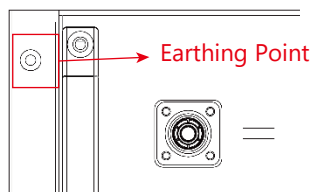


Figure 4-15 Fix all the batteries, HV900112 and TOP BMU box

After wiring the battery side, please fix each box with the four screws and four grounding serrated washers to the racks. These screws and grounding serrated washers are shipped in the corresponding batteries, HV900112, Top BMU box.

#### 4.4.2. Inverter Side-Wiring

The wiring mode of the PCS is down inlet and down outlet, the incoming and outlet wiring holes located in bottom of the PCS cabinet. The cables put into the cable trough via the wire holes at the base. Open the front door and dismantle the dam-board to see wiring of the copper bars. As for wiring requirements, single cables or multiple cables with proper wire diameter should be selected.

The wiring methods should be in accordance with the National Electrical Code or other local standards.

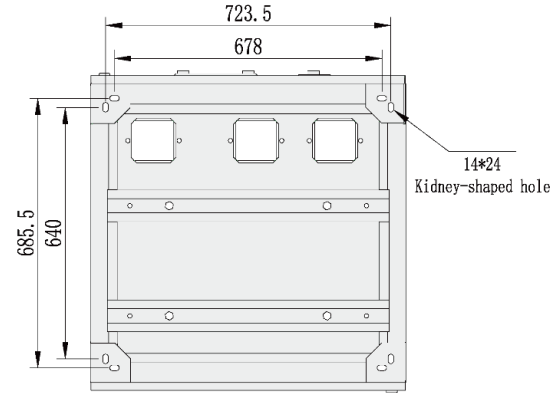


Figure 4-16 PCS rack wiring hole and corresponding copper bars

Open the dam-board beside the switch and then can see the wiring copper bar as shown below.

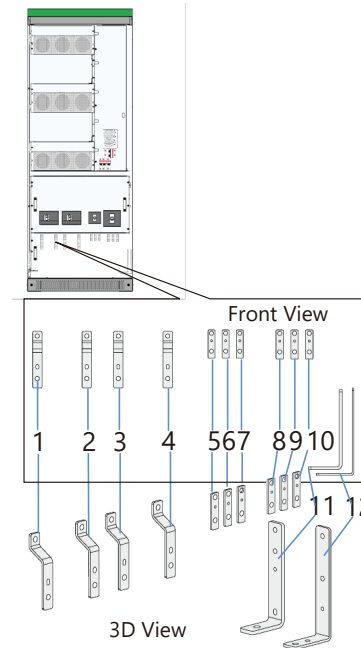


Figure 4-17 PCS wiring copper bars designation with STS module

Table 19 PCS wiring copper bars description

Position	Designation	Description
1	PV +	PV positive port, dimension is shown as below.
2	PV -	PV negative port
3	Battery +	Battery positive port
4	Battery -	Battery negative port
5	A (Load)	Phase A, dimension is shown as below.
6	B (Load)	Phase B
7	C (Load)	Phase C
8	A (Grid)	Phase A
9	B (Grid)	Phase B
10	C (Grid)	Phase C
11	N	Phase N
12	Grounding	

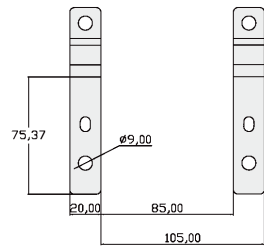


Figure 4-18 DC wiring copper bar dimension

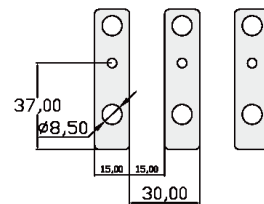


Figure 4-19 AC wiring copper bar dimension

4.4.3. System grounding

The grounding of power modules/PCS connection with the rack go through hangers on the module.

As for rack grounding, the rack bottom is installed with grounded cooper bars. During wiring, refer to the following table for cable diameter.



**WARNING**

Notice that the AC output neutral is not connected to ground.

Table 20 Grounding PE cable description

Rated power	Copper PE line section recommendation (mm <sup>2</sup> )
50kW	≥16
100kW	≥25



**WARNING**

Rack and modules need to be grounded reliably! The grounding resistance should be less than 4Ω.

4.4.4. PV Side-Wiring

- A. Use a multi-meter to measure the voltage of PV port, and ensure that the voltage is within input voltage range of PCS.
- B. Disconnect PV switch. Wiring operation can be conducted after using a multi-meter to measure and confirm that there is no voltage between positive and negative poles of PV input.
- C. Connect the positive pole of storage battery to "DC+" of DC input of DC switch.
- D. Connect the negative pole of storage battery to "DC-" of DC input of DC switch.
- E. Confirm wiring firmness.

Table 21 DC cable description

Rated power	Copper DC line section recommendation (mm <sup>2</sup> )
50kW	≥35
100kW	≥95

The PV connection is shown in Figure 4-20.

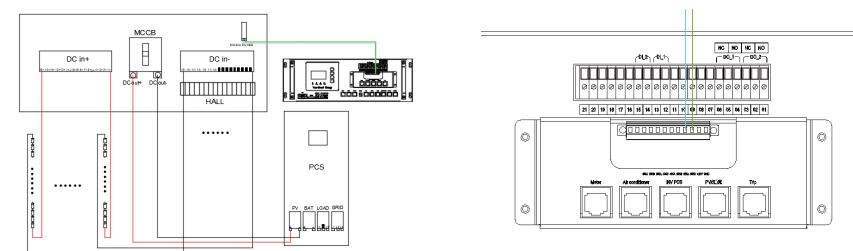


Figure 4-20 Connect the power line of the PV, With Combiner box

- A. Insert the PV input positive pole through the waterproof terminal into the positive input point, and lock it with a screwdriver.
- B. Similarly, insert the PV negative pole through the waterproof terminal into the negative input point, and lock it with a screwdriver. Remember that the negative pole passes through the Hall.
- C. Connect the power line of the PV Combiner box to the bronze medal of the DC Cabinet, as shown in Figure 4-20.
- D. Connect the RS485 communication line of the PV combiner box to the RS485 interface of the TOP BMU, as shown in Figure 4-20.

**Note:** There are numbers on the PV combiner box, remember to have one-to-one correspondence. For example, "1+" corresponds to "1-", "2+" corresponds to "2-", and so on.

- E. Connect another PV Combiner box and repeat steps a), b), c).
- F. Connect the RS485 communication line between the two PV combiner boxes, as shown in Figure 4-20.

### 4.4.5 AC Side-Wiring

- A. Ensure that the phase consequence of wires should be a positive consequence.
- B. Disconnect AC output distribution switch in PCS.
- C. Use a multi-meter to measure and ensure that the cables connected to the terminals are electrically neutral.
- D. While on-grid mode, A(L1)/B(L2)/C(L3) phases of AC output distribution switch of utility grid and PE are respectively connected to A(L1)/B(L2)/C(L3) phases of utility grid and PE.
- E. While off-grid mode, A(L1)/B(L2)/C(L3) phases of AC output distribution switch of PCS and PE are respectively connected to A(L1)/B(L2)/C(L3) phases of generator AC output and PE.
- F. Confirm wiring firmness.

Table 22 AC cable description

Rated power	Copper AC line section recommendation (mm <sup>2</sup> )
50kW	≥25(Load port); ≥50(Grid port);
100kW	≥50(Load port); ≥95(Grid port);

**WARNING**

Ensure that there is no dangerous voltage at connection points during wiring.

**NOTICE**

All wires are connected to the wiring terminals externally from the wiring holes at the bottom of PCS. After wiring, fireproofing mud should be used to seal the wiring holes.

Please refer to the following diagram to connect power cables.

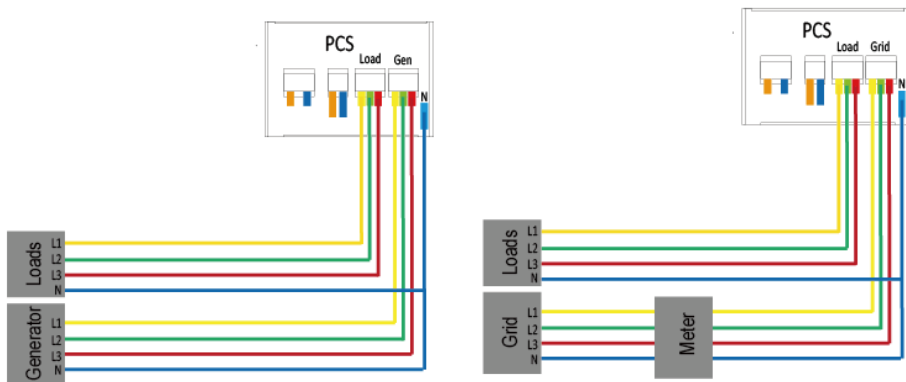


Figure 4-21 AC-Side wiring diagram, off-grid mode

Figure 4-22 AC-Side wiring diagram, on-grid mode

### 4.4.6 Meter Wiring(On-grid mode)

Please refer to the following diagram to connect the CT meter.

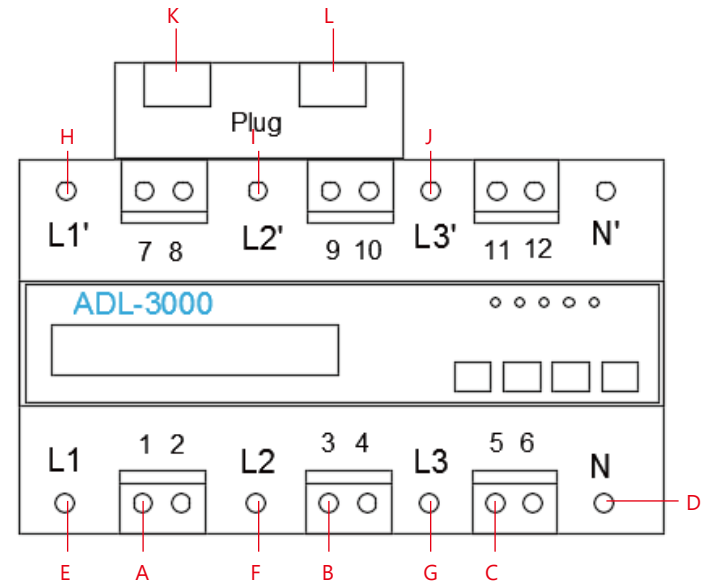


Figure 4-23 Schematic diagram of the appearance of the meter

Table 23 Ports Description

No	Description	Description
A	Power port 1	Connect to L1
B	Power port 2	Connect to L2
C	Power port 3	Connect to L3
D	Power port N	Connect to N
E	CT1 sampling line wiring port +	Connect to S1 of CT1
F	CT2 sampling line wiring port +	Connect to S1 of CT2
G	CT3 sampling line wiring port +	Connect to S1 of CT3
H	CT1 sampling line wiring port -	Connect to S2 of CT1
I	CT2 sampling line wiring port -	Connect to S2 of CT2
J	CT3 sampling line wiring port -	Connect to S2 of CT3
K	Meter communication port 1	Connect to EMS or other meters through network cable to realize communication between devices.
L	Meter communication port 2	Connect to EMS or other meters through network cable to realize communication between devices.



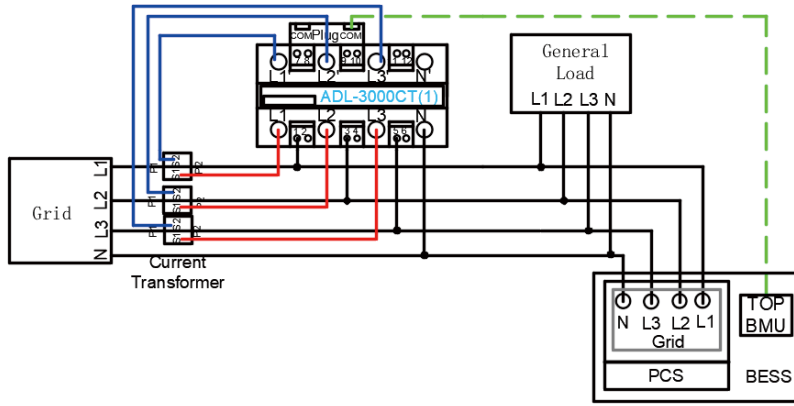


Figure 4-24 Meter wiring diagram(DC mode)

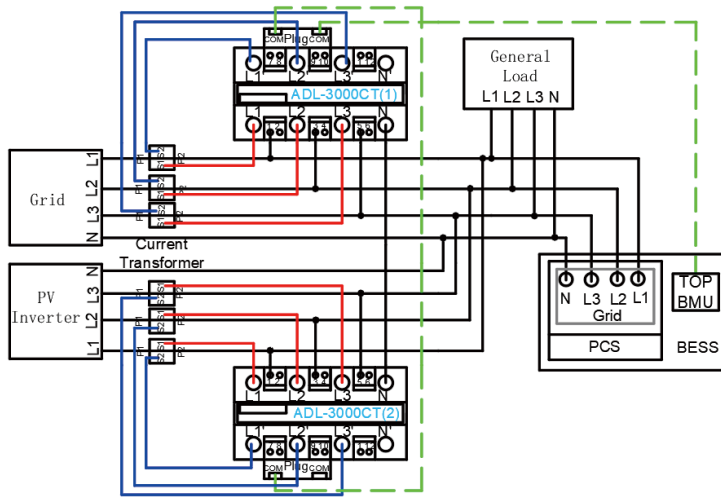


Figure 4-25 Meter wiring diagram (AC / Hybrid mode)

The meter communication cable should be connected to TOP BMU COM 6.

#### 4.4.2.1 AC Auxiliary Power Cable Connection

Please connect the AC auxiliary power inputs of each HV900112 with the Grid/GEN L phase (anyone of L1, L2 and L3 phase) and N pole of PCS by using the AC auxiliary power cable in HV900112 parts list as the following Figure 4-25 shows.

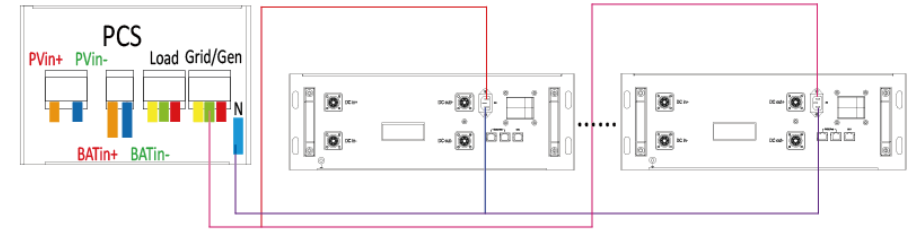


Figure 4-26 AC Auxiliary Power Cable Connection

**!** Note: The auxiliary power cable bond must be placed above the AC power cable bond. After this please tighten the screw.

#### 4.4.7. Connect the Communication Cable for the Generator

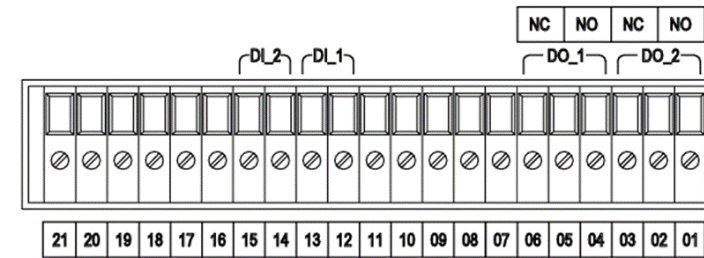


Figure 4-27 Dry contact of TOP BMU

**A.** Connect DO\_2 to the dry contact of the diesel generator, port 2 and 3 (normally closed contact), 1 and 2 (normally open), you can connect the diesel dry contact to control the 1 and 2.

**B.** Please connect the diesel control dry contact as the below picture shows:

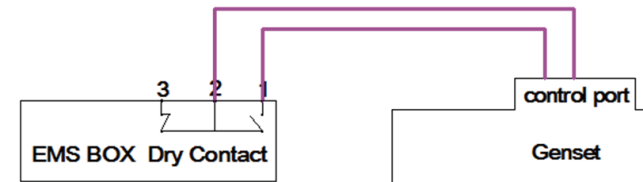


Figure 4-28 Connecting the communication cable for generator

**!** Note: Normally open/closed contact which connects the Genset according to the genset controller.

05 START-UP AND OPERATION

Please refer to the *Operation Manual* for details.

06 REMOVE THE COMMUNICATION SHORTING SCREW

When the system is running normally and the system starts commission, remove the communication shorting screw on the PCS (terminal 1, 2). For the detailed commission steps, refer to the *Commission List*.

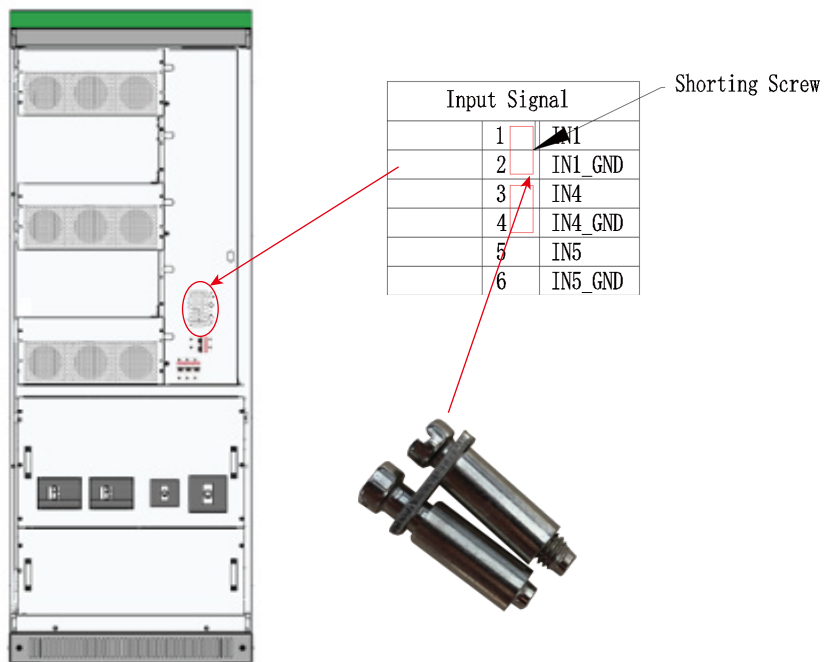


Figure 6-1 Remove the communication shorting screw

**!** **Note:** Don't throw away the communication shorting screw, find a bag and maybe we use it later.

07 CONTACT

If you have technical problems with our products, please contact the service hotline, contact information is under the IMPRINT catalog at the beginning of this manual. Please provide the following information to help you with the necessary assistance:

- A. Equipment model
- B. Serial number
- C. Battery type and number, or PV modules number and string type.
- D. Communication type
- E. Firmware version
- F. Error number and error message