Installation & Operating Manual of SIMPO HV _ V1.0

ZYC ENERGY
ZERO YOUR CARBON

Contents

1. Introduction

SIMPO HV is a new high voltage battery with 50Ah capacity, 64V voltage and 3.2kWh energy. Designed by ZYC ENERGY. The specifications can be found in *4.5 Specification*.

Up to 9 SIMPO HV Modules can be connected in series in a single tower controlled by 1 BMS. Up to 8 towers can be connected in parallel at the same time. The energy range is from 6.4kWh to 230.4kWh and can fit either residential or C&I use.

The design used in SIMPO HV makes it easy and quick to install, with the whole system taking up only 70% of the floor space of comparable products. The installed system does not require any commissioning or configuring and can start working as soon as the system is built up.

The paralleled towers are hot-swappable, which ensures that the system can be operated even when one of the towers fails.

The unique BIC design makes the communication more stable and reduces the system stop caused by communication failure.

2. Glossary

Terms	Full Name
BESS	Battery Energyn Storage System
BMS	Battery Management System
BIC	Battery Information Collector
SOC	State of Charge
SOH	State of Health
LFP	Lithium iron phosphate($LiFePO_4$)

3. Safety

When installing, commissioning, operating and maintaining the product, the safety requirements in the manual should be strictly observed. Incorrect operation or work may lead to damage to the product and other properties or injury or death of the operator or third parties.

When fixing the product with screws or other parts, use the correct tool and reinforce it with the torque indicated in the manual or on the label of the product, otherwise the product may be unstable or damaged.

When using different tools, master the tools in advance to prevent the installer from being injured due to improper handling.

Please read this manual throughly before installation to ensureproper and safe installation and use of the product.

Warning And Caution

1. Installers and users are obliged to familiarise themselves with this manual.
2. Power Cables and plugs have high voltage from the battery, be careful when wiring.
3. Ensure that a fire extinguisher is in place prior to installation and use.
4. Installation and operation must be carried out by qualified personnel and the system must be installed in restricted access areas.
5. he battery module is with certain weight, it is better to be installed by at least two personnel. With the help of tools if necessary.

3.1 Intended Use

- SIMPO HV is designed for both residential and C&I use. It is a high-voltage lithium-ion battery storage system that operates with compatible inverters in on-grid, off-grid and backup modes
- A WiFi module inside BMS allows SIMPO HV to be connected to the internet for remote monitoring and firmware upgrades.
- The IP65 enclosure allows SIMPO HV to be used both indoors and outdoors, but please make sure that it is only used in connection with a compatible inverter.
- SIMPO HV is not suitable for powering life-sustaining medical equipment. Please ensure that the battery system power failure will not cause personal injury.

3.2 Battery Module Leakage

Stop using damaged battery immediately and dispose of it in the correct place or return it to a professional.

Damage to the battery may result in leakage of electrolyte, and lifting into the electrolyte may cause consequences such as breathing.difficulties, skin irritation and chemical burns.

When the following conditions occur, the following guidelines should be followed promptly.

- Eye contact Rinse gently with running water for at least 15 minutes and seek medical help promptly.
- Skin contact Rinse under running water for more than 15 minutes, remove any contaminated clothing and seek medical attention.
- Inhalation or ingestion Leave the contaminated area and seek medical assistance.

3.3 Fire

Fire may occur with the battery if the battery is too close to a flame or the temperature of the environment is unusually high. Carbon monoxide, carbon dioxide, and other gases and emit smoke may occur if the battery is on fire. Empty the fire area in a timely manner, use a full-face self-contained breathing apparatus (SCBA) with full protective gear during fire fighting and use a dry chemical fire extinguisher to cool and extinguish the battery to prevent the fire from spreading.

3.4 Handling

- Installers should be cautious during installation to prevent damage to the battery.
- If the battery has been damaged before installation, including but not limited to shell damage, terminal port damage. Please do not use and contact us.
- Protect the battery from being damaged during transporting and handling.
- DO NOT clean the battery or allow foreign objects to enter the battery.
- DO NOT unplug any cables directly while the battery is in operation.
- DO NOT use the battery together with batteries of other brands or types.
- DO NOT short circuit the battery modules.
- Avoid subjecting the battery to external forces, such as being dragged on the ground, or having heavy objects placed on the battery.

3.5 Storage

- DO NOT store the battery in an environment that exposed to direct sunlight or high humidity, and ensure that it is kept away from heat and water.
- Batteries stored for long period of time (≥6 months) should be charged periodically to prevent irreversible damage caused by low battery power.
- If the battery is stored for a long period of time, the environment temperature should be maintained at around 25°C.
- If the battery is only stored for a short period of time, the environment temperature should also be ensured to be between 0°C and 35°C.
- DO NOT store the batteries in a high humidity environment.

4. Product Information

4.1 SIMPO HV Package

4.1.1 Battery Module Box

Battery Module

Figure 4.1

4.1.2 BMS & Base Box

BMS Accessories Box Base

Figure 4.2

4.1.3 Accessories Included

Figure 4.3

4.1.4 Extra Accessories

The parts below are not included in SIMPO HV Package but necessary for connecting to the inverter.

1.DC Cables (≥10 AWG) 2.PE Cable with Terminal(SC10-5) (≥10AWG) 3. COM Cable (Cat. 5 or Upper)

Figure 4.4

1. DC Cables with Terminal

Cables of 8/10 AWG is recommended to meet the need of SIMPO HV. Or

Copper CSA (Cross Sectional Area) : $5mm^2 \leq S \leq 9mm^2$

Determine the cable size according to your system.

2. PE Cable (CSA≥$25mm^2$) with Terminal (SC35-6).

3. Communication cable with shield (Cat 5 or higher).

4.2 Different Functional Area On BMS

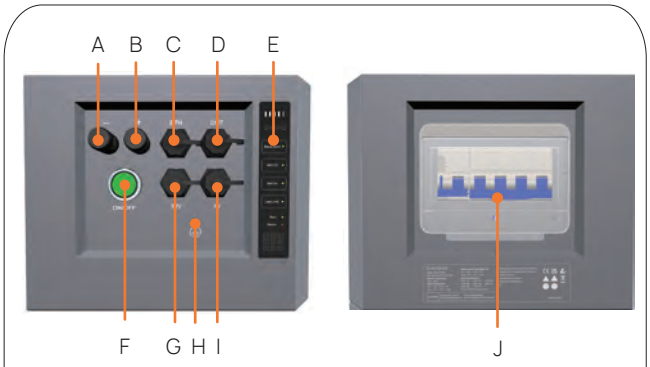


Figure 4.5

Letter	Label	Function
A	–	DC-
B	+	DC+
C	ETH	Ethernet
D	OUT	Com Out
E	HMI	Human Machine Interface
F	ON/OFF	ON/OFF
G	INV	Inverter Com
H	PE	PE Connection
I	IN	Com In
J	/	Air Switch

4.3 Specifications

SIMPO HV	Specifications							
Module Data	3.2kWh, 64V, 36.4kg							
Module Quantity in Tower	2	3	4	5	6	7	8	9
Usable Energy(kWh)	6.4	9.6	12.8	16.0	19.2	22.4	25.6	28.8
Nominal Voltage(V)	128	192	256	320	384	448	512	576
Operating Voltage Range(V)	102~150	153~225	204~300	255~375	306~350	357~525	408~600	459~675
Max Continuous Current(A)	30							
Peak Current(A) (5s)	45							
Weight(kg)	92.5	128.9	165.3	201.7	238.1	274.5	310.9	347.3
Dimension_W(mm)	610							
Dimension_D(mm)	240							
Dimension_H(mm)	685	875	1065	1255	1445	1635	1825	2015
Round-trip Efficiency	96%							
Charging Tem Range(°C)	-10~50							
Discharging Tem Range(°C)	-20~50							
Operating Humidity	Up to 95%(Non-condensing)							
IP Rating	IP65							
Communication	CAN/Modbus RS485							
Altitude(m)	≤3000							
Warranty	10 Years + 2.5 Years(Optional)							
Scalability(Parallel)	1~8 Towers							
Certificate	UN 38.3/ CE / IEC 62619 / CEC / VDE2510-50							

5. Installation

This session provides important information and detailed guidelines for installing the product to ensure a safe and smooth installation process. Installation should be well considered and all the specification of the battery should be understood to determine a suitable location and way for the installation.

5.1 Requirement For Installation Location

The location of installation should be suitable for safe operation and long-term use. The installation location should be chosen to meet the following conditions as many as possible:

a) The ground should be solid and able to support certain weight.
b) The installation environment is free of flammable and explosive materials.
c) Avoid direct sunlight, rain and snow.
d) Well-ventilated with good air circulation.
e) Keep away from children or pets to prevent injury by accident.

5.2 Tools

Tools below are necessary for the installation of SIMPO HV. Make sure you are well prepared before starting.

Figure 5.1

5.3 Place The Base

The base designed for SIMPO HV is adjustable via four bolts. Customer can adjust the height of the base to meet different needs.

The location of SIMPO HV installation should be suitable for safe operation and long-term use.

As SIMPO HV should be fixed to the wall, location selected should be against the wall.

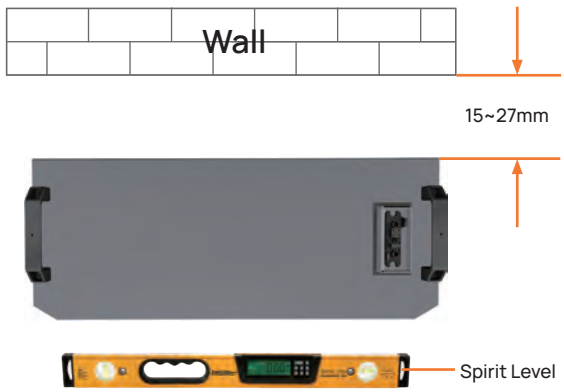
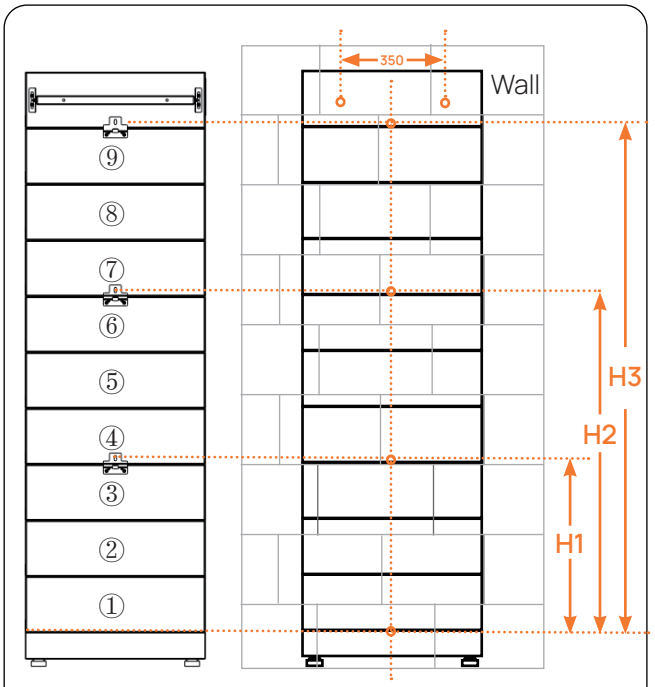


Figure 5.2

Place the base on solid ground to prevent the system from collapsing or tilting during use.

The feet of the base can be adjusted for uneven ground conditions by means of adjusting screws. When locating the base, make sure that there is a wall next to the target location for fixing and keep the distance between the base and the wall between 15 and 27 mm.

5.4 Position of Fixing Part



*Number ① ~ ⑨ represent modules sequence only in this part.

Figure 5.3

SIMPO HV is designed with no fixing parts between modules to save the space. Instead, limited fixing parts for fixing the system to the wall is designed to avoid the system from leaning or even collapsing.

Each module and BMS can be used to connect the fixing part. Every three modules stacked up is recommended to be fixed by one fixing part.

Fixing parts have threads on both sides connecting the system and the wall, therefore, holes are needed to be drilled into the wall before stacking up the modules. The perforation position depends on the position of the fixing parts, combine Figure 5.3 and the table below to drill all the holes before stacking up the system.

Module Qty per Tower	Position of Module Fixing Parts	Height of Module Perforation	Height of BMS Perforation
2	None	None	475mm
3	③	H1=591 mm	665 mm
4	④	H1=781 mm	855 mm
5	③ & ⑤	H1=591 mm H2=969 mm	1045 mm
6	③ & ⑥	H1=591 mm H2=1160 mm	1235 mm
7	③ & ⑦	H1=591 mm H2=1351 mm	1425 mm
8	③ & ⑥ & ⑧	H1=591 mm H2=1160 mm H3=1541 mm	1731 mm
9	③ & ⑥ & ⑨	H1=591mm H2=1160mm H3=1731mm	1803mm

5.5 Power Cables Crimping

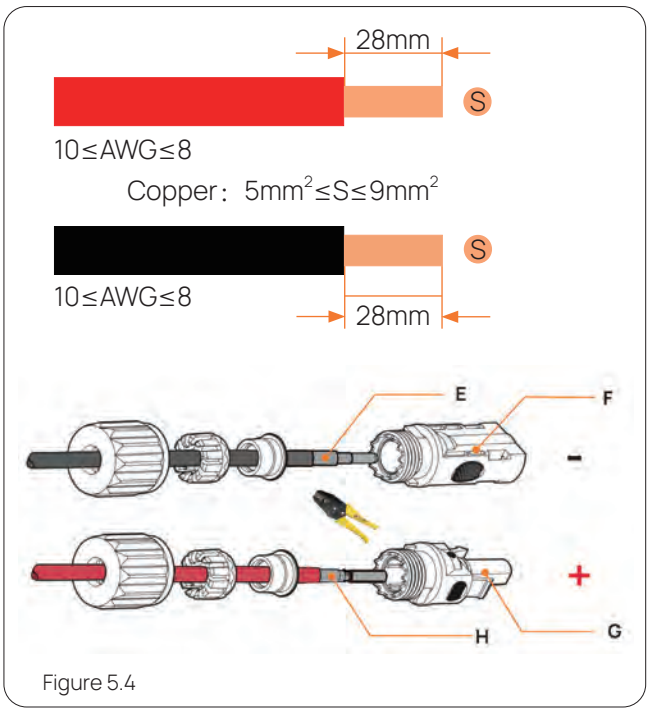


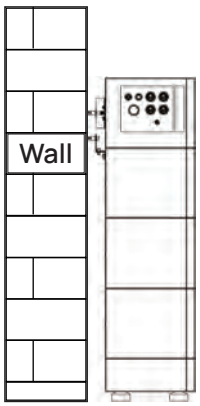
Figure 5.4

* Cables of 8/10 AWG is recommended to meet the need of SIMPO HV.
* Determine the cable size according to your system.
* Check the table below for proper cable size.

AWG	External Diameter	Current	Maximum Current	Cross Sectional Area(CSA)
	mm	A	A	mm^2
8	3.26	33.025	37.657	8.37
9	2.91	26.175	29.846	6.63
10	2.59	20.767	23.680	5.26
11	2.3	16.453	18.761	4.17
12	2.05	13.957	14.889	3.332

5.6 Fix To The Wall

5.6.1 Fix the modules:



Side view of the system

Figure 5.5

Step 1:

According to the figure 5.6, Connect **Part A** to the modules that will be fixed to the wall according to the table in Step 5.4 with **Part J**.

The Torque for tightening **Part J** should be **3.5N·m**.

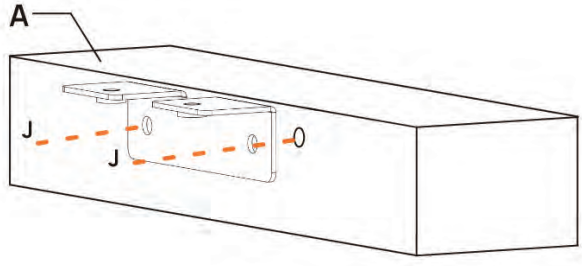


Figure 5.6

Step 2:

After stack up the module in last step. Fix **Part B** to the wall with **Part L**.

The Torque for tightening **Part L** should be **5N·m**.

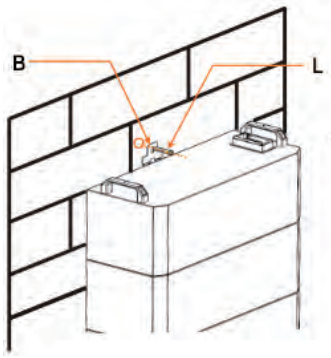


Figure 5.7

Step 3:

Connect **Part A** and **Part B** with two **Part J**.

The Torque for tightening **Part J** should be **3.5N·m**.

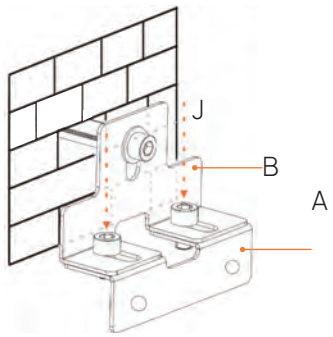
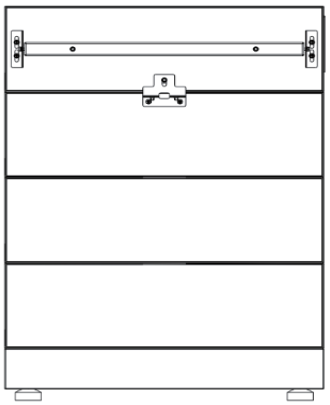


Figure 5. 8

5.6.2 Fix the BMS:



Back view of the system

Figure 5. 9

Step 1:

Connect both **Part D** to the BMS, each should be fixed by two **Part J**.

The Torque for tightening **Part J** should be **3.5N·m**.

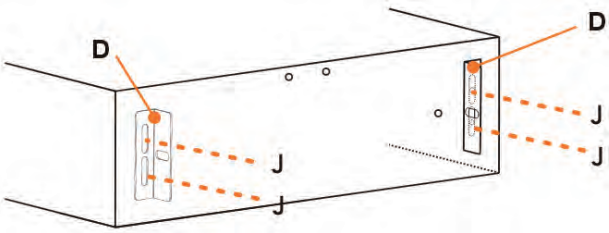


Figure 5. 10

Step 2:

Fix **Part C** to the wall with two **Part L**.

The Torque for tightening **Part L** should be **5N·m**.

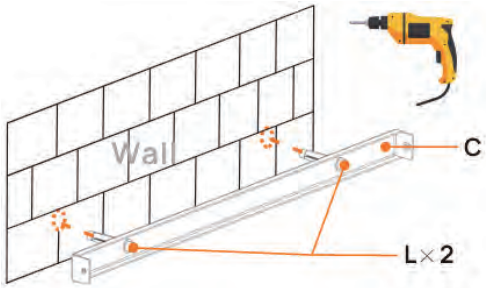


Figure 5. 11

Step 3:

Connect **Part C** and **Part D** with two **Part K**.

The Torque for tightening **Part K** should be **3.5N·m**.

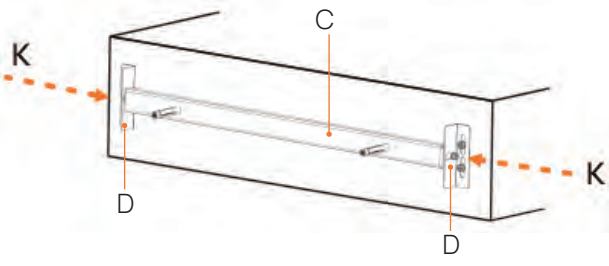


Figure 5. 12

5.7 Cables Connection

5.7.1 System overview:

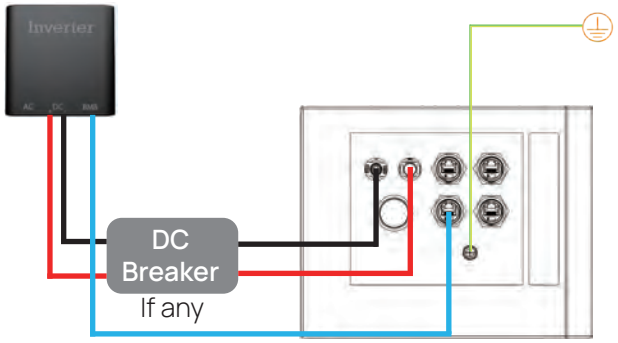


Figure 5. 13

5.7.2 Connect the PE cables:

SIMPO HV is a high voltage product with minimum of 128V. Improper operation may lead to serious safety problems, before start connecting power cables, make sure that the PE cable has been properly connected.

The torque for fixing the PE cable is **5N·m**.

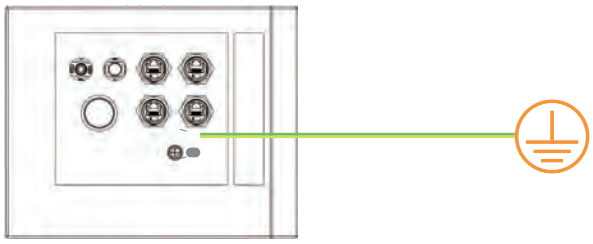


Figure 5. 14

5.7.3 Connect the Power cables:

Battery side:

Use two **Part M** to fix the power cable on battery side. Install **Part M** on both male connectors, then wire both power cables through Part M and fix them.

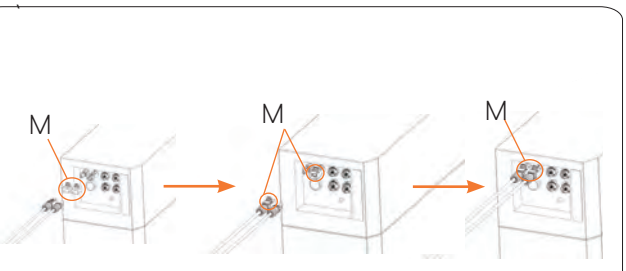


Figure 5. 15

Inverter side:

After finish the connection of battery side, connect the power cables to the inverter.

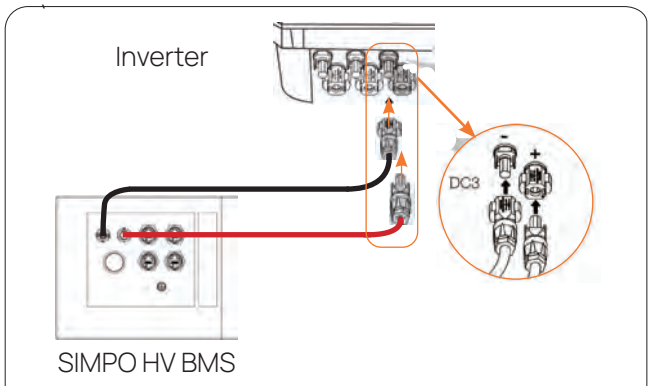


Figure 5. 16

5.7.4 Connect the Communication Cable:

Table on top is the Pin Number and definition of **'INV'** port of SIMPO HV. Please check this table and the installation guide of inverter in use then change the cable order to complete the communication connection.

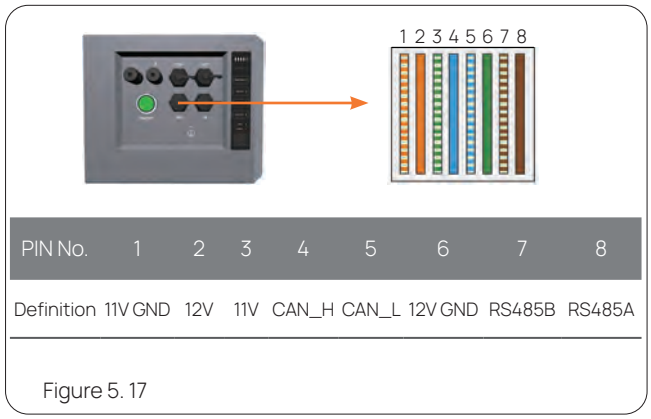
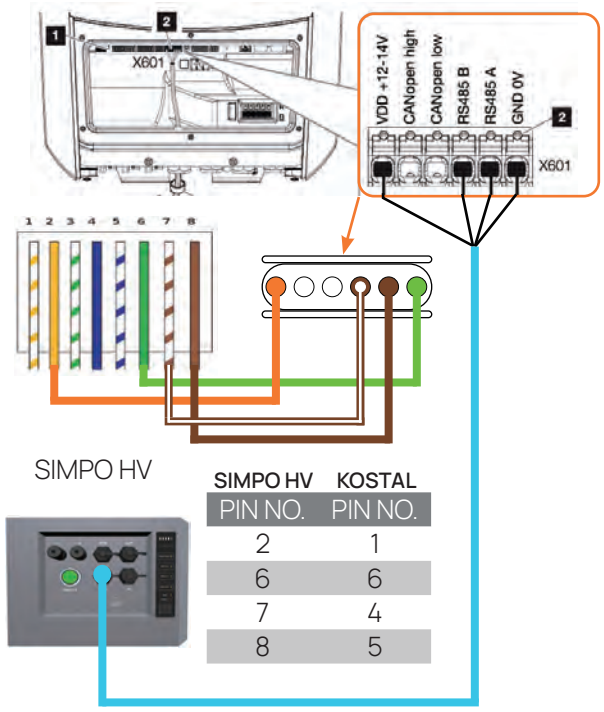


Figure 5. 17

5.8 Communication With Different Inverter Models

For different models of inverters, the pin definitions of the communication cable are different, before connecting the communication cable, please match the pin definitions of SIMPO HV with inverter.

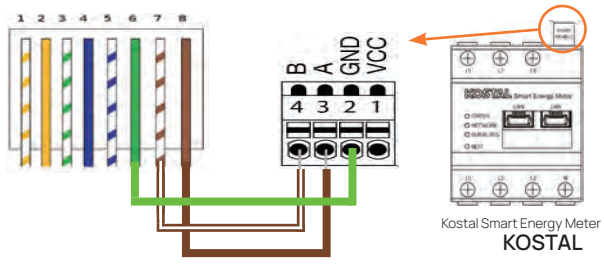
5.8.1 Communication with Kostal Plenticore Plus/ Plenticore BI



SIMPO HV PIN NO.	KOSTAL PIN NO.
2	1
6	6
7	4
8	5

Figure 5. 18

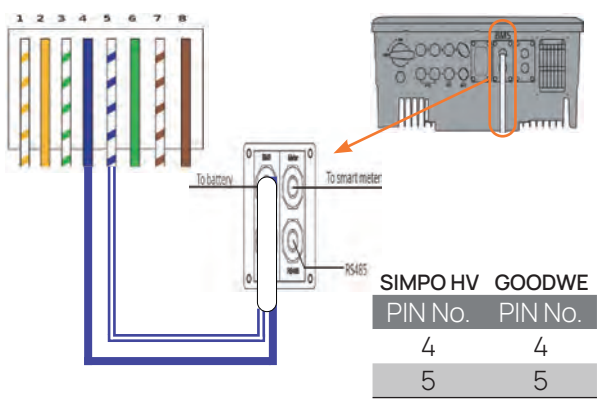
5.8.2 Communication with Kostal Piko MP Plus



SIMPO HV PIN NO.	PIN NO.
6	2
7	4
8	3

Figure 5. 19

5.8.3 Communication with GOODWE Inverters



SIMPO HV PIN No.	GOODWE PIN No.
4	4
5	5

Figure 5. 20

Settings for **GOODWE** Inverters

When connecting with GoodWe Inverter, please select 'Default 25A' when selecting 'Battery model'.

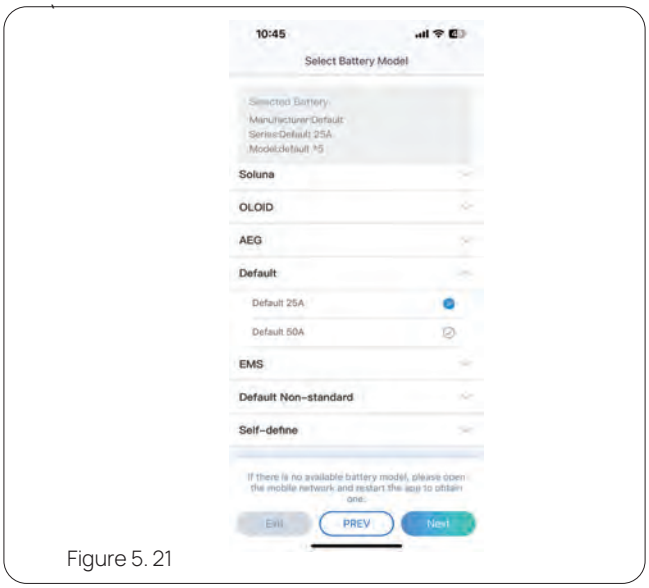
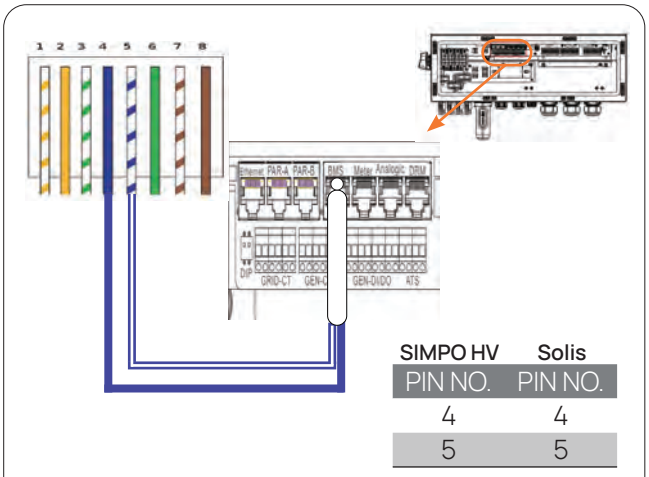


Figure 5. 21

5.8.4 Communication with Solis Inverters

Lead the communication cable through the COM1 or COM2 port of the inverter and connect to the BMS terminal.



SIMPO HV PIN NO.	Solis PIN NO.
4	4
5	5

Figure 5. 22

6. Human Machine Interface (HMI) Introduction

The HMI of SIMPO HV as an intuitive decision-making interface, which is designed to realize the visualization of real-time system data.
It allows real-time monitoring of the running status and SOC of battery, and provides proactive control, such as black start, WiFi setup and tower identification.

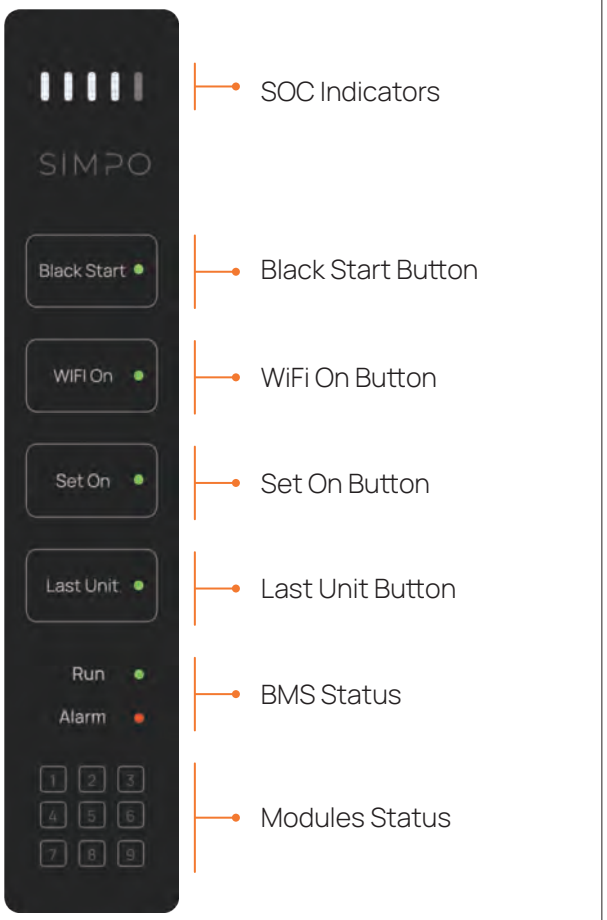


Figure 6.1

6.1 SOC Status

The SOC status indicator visually displays the current SOC of the system. Each LED can represent 20% of the battery's energy.
While discharging, the last LED in the lit state will flash rapidly (once per second).
While charging, the last LED in the lit state will flash slowly (once every 2 seconds).

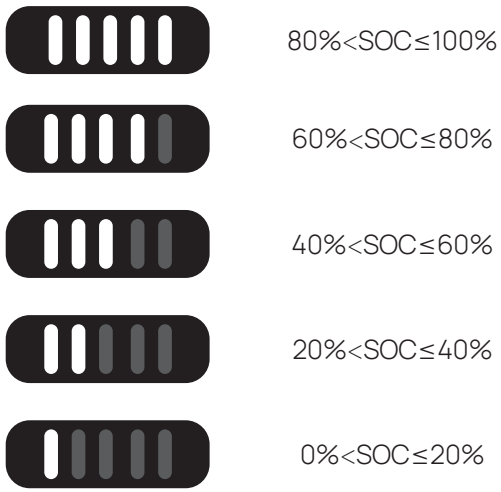


Figure 6.2

6.2 Black Start

Figure 6.3

Black Start is a function specially designed for off-grid systems by ZYC Energy.
In off-grid scenario, SIMPO HV can supply energy to the inverter to start up the system by pressing the **'Black Start'** button.
Once the inverter starts working, the black start function will automatically terminate and the LED goes out as default.

6.3 WIFI On

Figure 6.4

For SIMPO HV BMS, there is a WiFi module inside, and its WiFi function can be turned on or off via the **'WIFI On'** button on the HMI interface. When the WiFi function is on, the LED indicator has three different status.

i. System is connected to the Internet: Flash slowly.
ii. System is connected to mobile devices: Flash normally.
iii. Not connected to any device or internet: Solid On
When the LED is off, the WiFi function of SIMPO HV is off.

6.4 Set On

Default

Figure 6.5

Set On is a terminal resistor setting used for communication with inverters, which is typically only required to be set to **ON** state on the Master BMS. (Tower that is directly connected to the inverter) in the system.
All **'Set On'** LED are initially on.
Although the system can still work when all towers' **'Set On'** LED is on, it is recommended that you keep only the master tower's **'Set On'** LED on.

6.5 Last Unit

Default

Figure 6.6

'Last Unit' is designed to confirm the last tower in the system and to complete the communication connection. By default all **'Last Unit'** LED are solid on. Unlike **'Set On',** there should be only one tower that is set to be the last tower, otherwise the communication circuit can not complete.
Press the **'Last Unit'** button on each tower and see the LED off except the last tower.

6.6 Run

Default Fault

Figure 6.7

When the system is working normally, '**Run**' will light up green, and when communication fault occurs, '**Run**' will light up orange.

6.7 Alarm

Default Fault

Figure 6.8

When the system is working normally, '**Alarm**' will keep off, and when serious fault(including over-voltage, over-current, etc) occurs, '**Alarm**' will light up orange.

6.8 Module Status Indicators

Figure 6.9

This area shows the status of up to 9 modules in a single tower, numbers **1-9** corresponding the modules from top to bottom in a single tower. When the module is working properly, the indicator LED is off, and any module fails, the corresponding number will light up orange.

7. Parallel Multiple Towers

System overview:

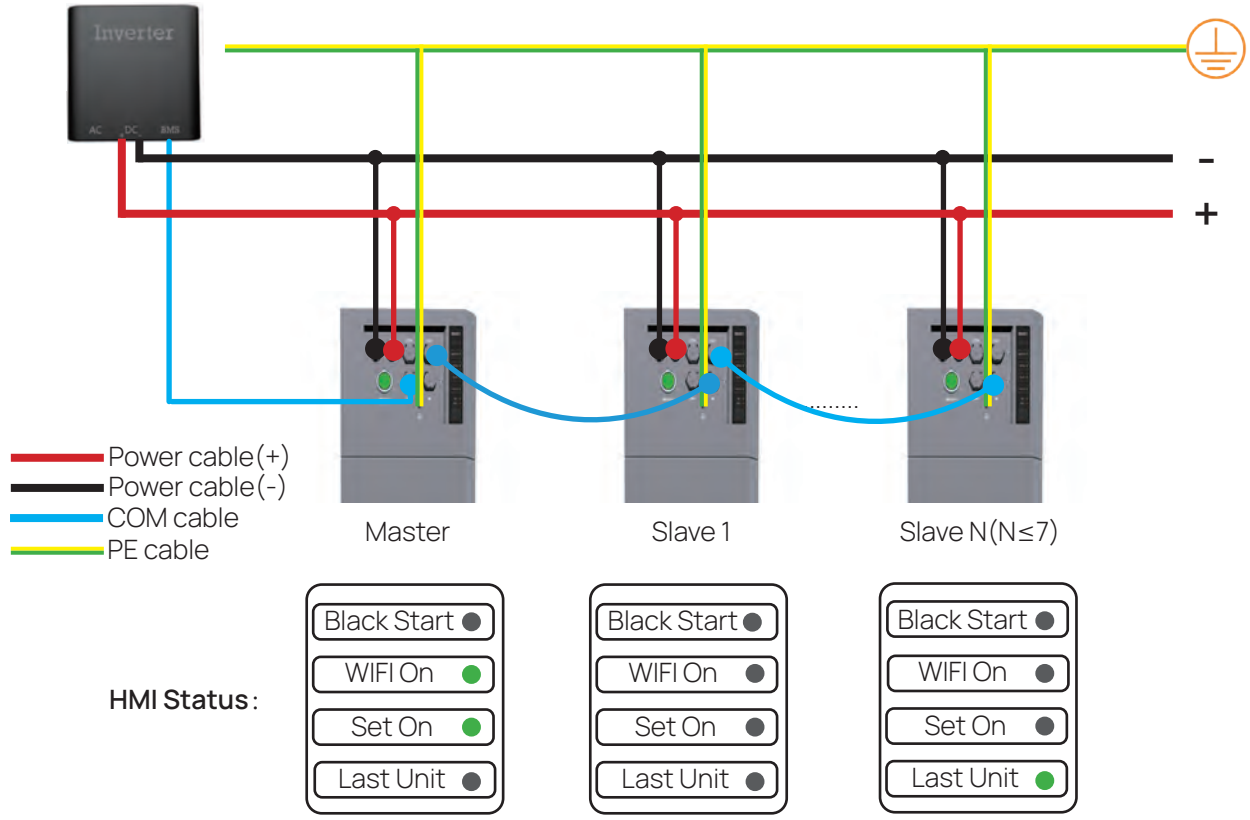


Figure 7.1

SIMPO HV allows up to 8 towers to be in parallel (1 master tower and 7 slave towers in the system). Up to 9 modules can be connected in series within one tower. To parallel multiple towers, please follow the steps below:

1. Ensure that the number of modules in each of the paralleled towers is equal, otherwise the paralleling will fail due to unbalancing voltage of the towers.
2. Connect the PE cable of each tower.
3. Connect the communication cables between towers (From the **'OUT'** port of the master tower to the **'IN'** port of Slave 1, then from the **'OUT'** port of Slave 1 to the **'IN'** port of next slave tower, and so on).
4. Connect the communication cable between the inverter and the master tower (from the **'INV'** of the master tower to the inverter).
5. Connect the power cables of all towers to the busbar, then connect the busbar to the inverter.
6. After finishing the above operations, you can start up the battery system as follow steps:

I. Turn on the air switches of all towers.

II. Press **'On/OFF'** button on the master tower to start the whole system.

III. Check the HMI status of each tower:

i. **Master tower**: The **'Set On'** should remain **ON** and the **'Last Unit'** should remain **OFF**.

ii. **The last tower**: The **'Set On'** should remain **OFF** and the **'Last Unit'** should remain **ON** .

iii. **The remaining towers**: The **'Set On'** can remain default setting and the **'Last Unit'** should remain **OFF.**

8.Commissioning

8.1 Air Switch

Figure 8.1

ZYC Energy has designed an air switch for each BMS to protect all modules in a single tower controlled by that BMS. It is mounted on the side of the BMS. The air switch will automatically disconnect to protect the modules in the event of an overvoltage or overcurrent or overdischarging condition that could harm the modules. The air switch also protects the module when internal failure occurs.

8.2 Start Up

Figure 8.2

Before starting up the system, make sure that all PE and power cables and communication cables are properly connected. Then you can follow the steps below to start up the system:

1. Turn on the DC breaker between the system and the inverter(if any).
2. Turn on the Air Switch.
3. Press the **'ON/OFF'** button to start the system.

8.3 System Shut Down

Turning the system off is as easy as turning it on, follow these steps to shut down the system:

1. Turn off the inverter.
2. Turn off the DC breaker between the system and the inverter.
3. Press and hold the ON/OFF button for 3 seconds on the BMS.
4. Observe the LED on the HMI to make sure the system is off.

8.4 Charging and Discharging

SIMPO HV is a very powerful battery, equipped with the latest low temperature technology. Making it not only able to discharge at -20℃, but also allows charging at -10℃. The charging temperature is recommended to be between -10℃ ~ 50℃ and discharging temperature is between -20℃ ~ 50℃. When discharging, SIMPO HV can provide a maximum continuous current of 30A and a peak current of 45A for up to 5 seconds.

9. Connect to the Internet & ZYC portal & ZYC Assist

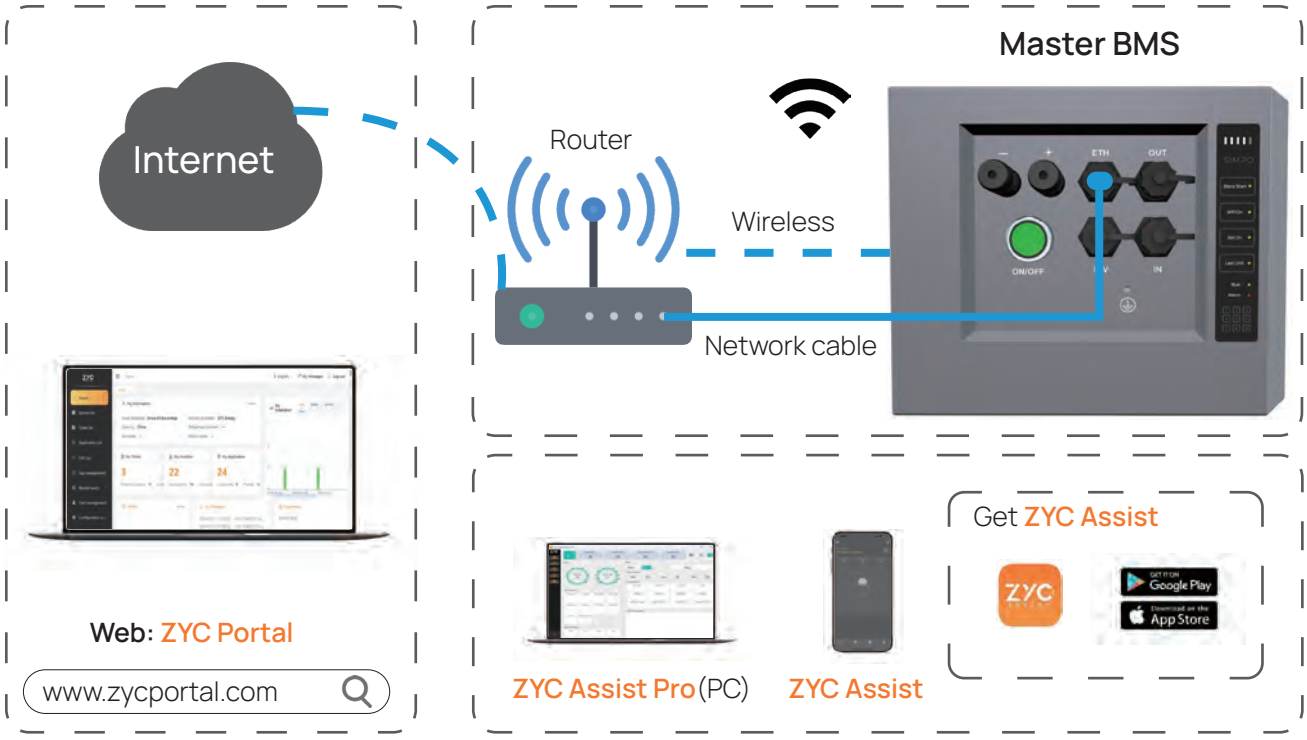


Figure 9.1

SIMPO HV BMS is equipped with a WiFi module, so no additional components are required for remote monitoring. Three options are listed below to realize the remote monitoring.

1. Connect the ETH port on SIMPO HV BMS to the router via a network cable and link your system to the internet.
2. First make sure the WiFi function is on, then use laptop or mobile phone to connect to SIMPO HV's WIFI hotspot and monitor the system through ZYC Assist or ZYC Assist Pro.
3. After connecting the SIMPO HV hotspot, use ZYC Assist or ZYC Assist Pro to configure SIMPO HV to a nearby wireless network, and monitor the system on ZYC Portal remotely.

Download ZYC Assist App

ZYC Assist is now avaliable at App Store and Google Play.

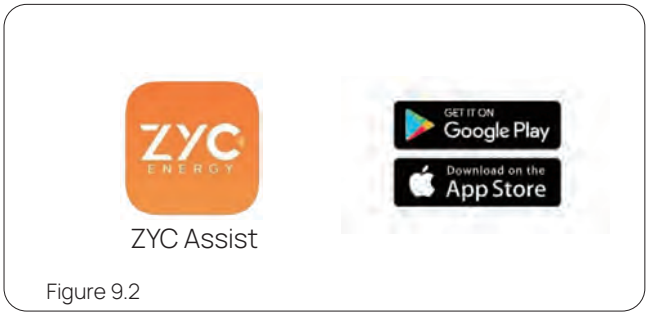
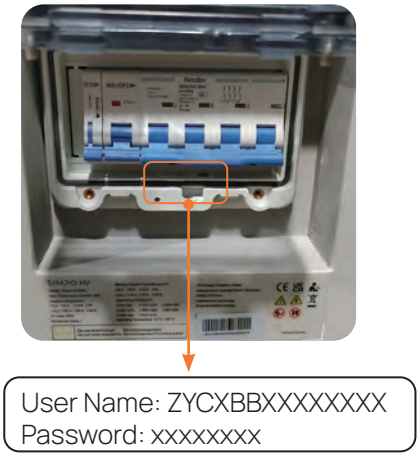


Figure 9.2

For more details of using ZYC Assist, please refer to *User Guideline of ZYC Assist*.

Find the username and password of the WiFi from the position showing below figure.



10. Extension

When expanding the system, please make sure that the existing system has a similar SOC value to the new module.

All SIMPO HV modules are shipped with a SOC of 30%, so when adding a new module to your system, please charge or discharge the existing system to 30% SOC.

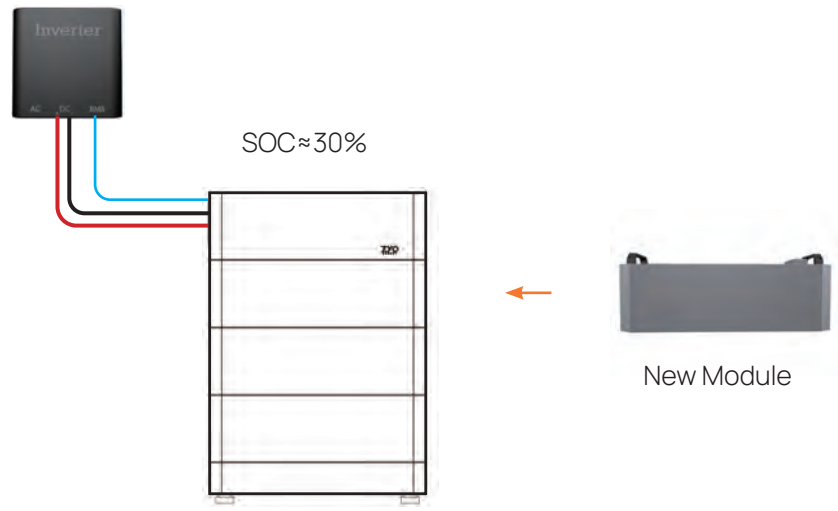


Figure 10.1

After charging or discharging the existing system to 30% SOC, follow the steps below to expand the system:

a. Turn off the inverter.
b. Turn off all the DC breaker(if any) and the air switch of BMS.
c. Remove the BMS and stack up the new module.
d. Turn on the DC breaker(if any) and the air switch.
e. Turn on the system.
f. Turn on the inverter.

Note:

If expanding a whole tower to the existing system, no SOC balancing requirement.

11. Troubleshooting

Please refer to *Service Manual of SIMPO HV.*

12. Maintenance and Storage

12.1 Keep Cleaning

SIMPO HV is recommended to be kept clean. If there is dust or stains on the enclosure of SIMPO HV, use a brush or soft towel to wipe the enclosure to remove the dust. DO NOT use any corrosive solution or stuff that may damage the battery to clean the enclosure.

12.2 Storage

SIMPO HV should be stored at the range of 10°C to 35°C and charged every 6 months. When periodically charging the battery, use no higher than 0.5C to charge the battery to 30% SOC.

13. Disposal of SIMPO HV

When disposing of discarded SIMPO HV, observe local regulations for the disposal of electronic waste and used batteries. And observe the following requirements:

- **DO NOT** dispose of SIMPO HV together with household waste.
- **DO NOT** leave the waste batteries in direct sunlight or high temperature.
- **DO NOT** dispose of used batteries in high humidity or corrosive environments.

14. Compatible Inverter

Please refer to Recommended *Minimum configuration list of SIMPO HV.*

15. Contact Us

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