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MAKING CONTROL SMARTER

HBMS100

ENERGY STORAGE BATTERY CABINET

USER MANUAL



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SmartGen – make your generator *smart*

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Table 1 Software Version

Date	Version	Note
2022-09-07	1.0	Original release.

1 OVERVIEW

HBMS100 Energy Storage Battery Cabinet is a battery management system with cell series topology, which can realize the protection of over charge/discharge for the built-in battery cells, as well as the over/under temperature protection and charge/discharge management of battery cells. It forms a perfect small and medium-sized distributed energy storage system with PCS that is widely used in industry and commerce, family and other power supply places.

HBMS100 Energy Storage Battery Cabinet is consisted of 13 HBMU100 battery boxes, 1 HBCU100 master control box, HMU8-BMS LCD module, cabinet and matched wiring harness, etc. The HBMU100 battery box and HBCU100 master control box communicate with each other via CANBUS. The HBMS100 battery box collects the voltage and temperature of the single cell from battery module and is processed by the high-performance embedded microprocessor. The whole system adopts modular design with compact structure and high reliability. The HBCU100 master control box collects all the cell voltage and temperature data through the internal CAN interface to protect the battery module. The communication with PCS can realize the charge/discharge management for the whole system, which is safe and reliable. The HMU8-BMS LCD module is able to display the SOC, SOH, cell voltage, temperature and related parameters of battery cluster. It can record the charging process and realize the real-time monitoring. The related parameters can be configured on LCD through front panel. Optional Chinese and English for operation interface is easy and reliable.

2 PERFORMANCE AND CHARACTERISTICS

HBMS100 Energy Storage Battery Cabinet is consisted of 13 HBMU100 battery boxes, 1 HBCU100 master control box, 1 HMU8-BMS monitoring module and matched wiring harness.

- HMU8-BMS monitoring module adopts 8-inch LCD with 800*600 resolution, capacitive touch screen and optional Chinese/English display;
- Sample the battery total voltage, current (Hall Current Sensor) and calculate the data of SOC and SOH;
- Alarm protections for cell over/under voltage, high/low temperature, charge/discharge overcurrent, low insulation value, abnormal communication. The tertiary alarms can set the actions of down current or high voltage power off;
- With 2 isolation RS485 communication interface; 1 CAN communication interface and 1 ETHERNET interface;
- With 2 aux. output ports (volts free NC) and 2 aux. input ports;
- The charging process can be monitored to judge the charging stage, and the battery charging voltage can be displayed with icons;
- Data of current date and total charge/discharge power (kWh) and battery capacity (Ah) can be counted;
- Can record and display the required charging time;
- Cell passive balance function;
- With alarm status indicator;
- The screen backlight time can be set by display module;
- Available for a variety of PCS protocols;
- The firmware can be upgraded through CAN interface;
- Reliable, safety and long using life;
- Fast plug-in connection can achieve the high efficiency operation and maintenance;
- Standardized design and modular installation.

Table 2 Technical Parameters

Items	Parameter
Voltage Range	(582.4~759.2)VDC
Rated Voltage	665.6VDC
Cell Specification	Lithium iron phosphate, 3.2V/50Ah
Cell Specification	1P16S
Series/Parallel Specification	1P208S
Rated Capacity	50 Ah
Rated Energy	33.28 kWh
Max. Output Power	33.28 kW
Max. Discharging Current	50 A
Max. Charging Current	50 A
End-off Voltage	416 V
Max. Charging Voltage	759.2 V
Recommended Backup Time	60 min
Cycle Index (25°C,0.5C/1C,100%DOD)	>2000
Working Temperature	0~40°C
Working Humidity	<80%R.H(No condensation)
Communication Mode	RS485/CAN/ETHERNET
Battery Box Dimension (W×D×H)	480mm×390mm×133mm
Master Control Box Dimension (W×D×H)	480mm×500mm×220mm
Cabinet Dimension (W×D×H)	604mm×1000mm×1800mm
System No.	1
Protection Level	IP20

4 SYSTEM COMPOSITION

4.1 WORKING PRINCIPLE

Battery system is consisted of 1 HBCU100 master control box, 13 HBMU100 battery boxes (include battery pack), 1 HMU8-BMS monitoring module and so on.

HBMU100 battery box is mainly composed of HBMU100-16 module, battery pack, temperature sensor, high-voltage connector, etc. The HBMU100-16 is installed in the battery box, mainly responsible for real-time sampling of battery voltage and temperature, comprehensively obtaining the max./min voltage and temperature of the battery pack. If necessary, the thermal management control will be carried out. It communicates with HBCU100 via the internal CAN BUS of HBMU100-16.

HBCU100 Master Control Box consists of HBCU100 module, isolating switch, power module, insulation monitoring module, heavy relay, high-voltage connector, etc. In the master control box, HBCU100 module is responsible for collecting current information, total voltage information, SOC of battery. The insulation leakage and other states detected by the insulation monitoring module. The power module provides DC working power for the whole system. The external CAN interface is connected to PCS, data exchange and charging/discharging management are carried out according to the agreed CAN protocol. HBCU100 values fault alarm information based on the battery state and the fault threshold. When HBCU100 determines that the battery is allowed to charge, the HBCU100 will charge according to the given charging current. During the charging process, HBCU100 monitors the battery in real-time. When the abnormal fault occurs, it will send the stop order to stop charging, when the battery is almost full, the charger will be controlled to reduce the charging current, when the battery is fully charged, it will stop charging. HBMU100-16 receives the order from HBCU100 during the charging/discharging process to manage the battery in a balanced way. In case of voltage inconsistency, HBMU100-16 will perform the balance operation according to the balance strategy.

The HMU8-BMS monitoring module is installed on the front panel of the cabinet, it can display the battery voltage, battery temperature, charge/discharge current and other parameters in real-time, and display the fault alarms in real-time.

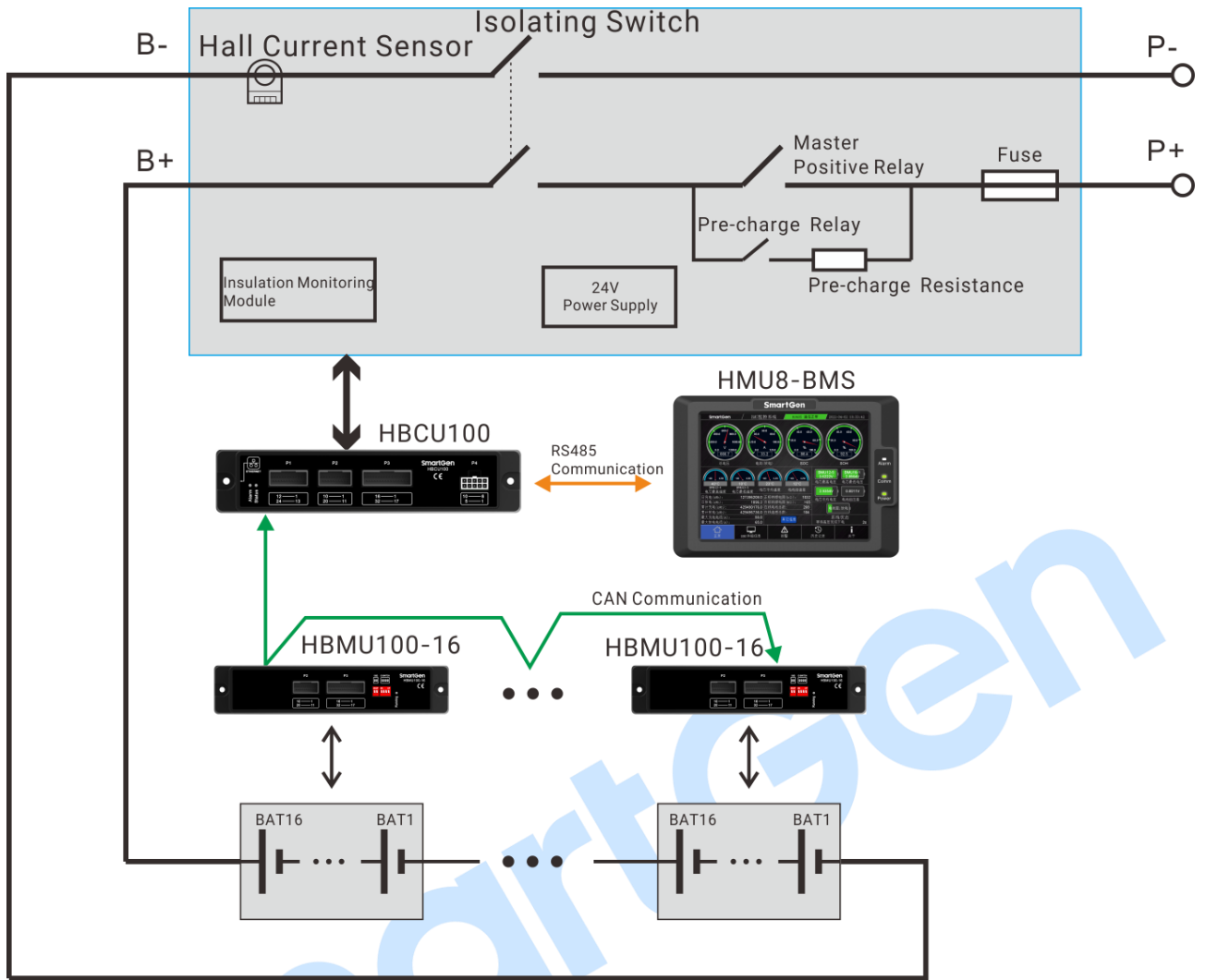


Fig.1 – BMS Block Diagram

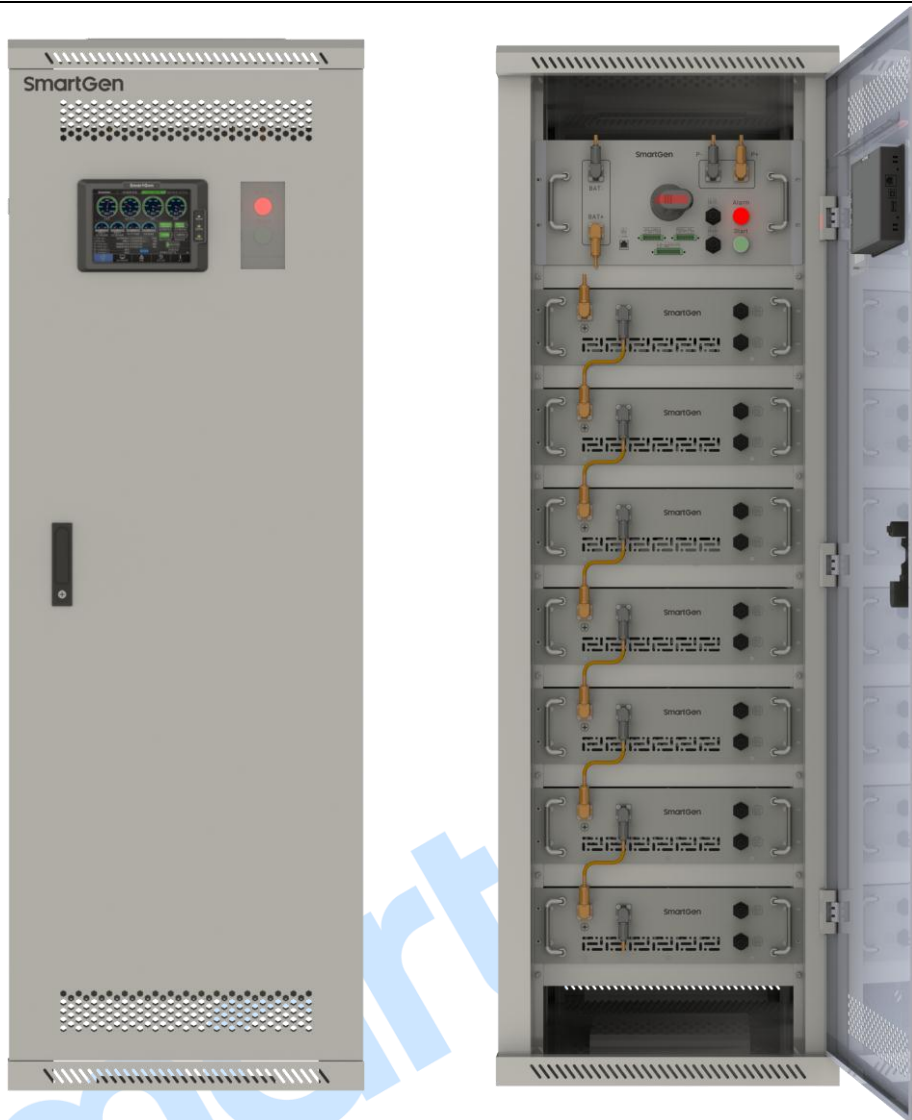


Fig.2 – The Front View of Cabinet

4.2 HBMU100 BATTERY BOX

HBMU100 Battery Box collects the cell voltage and temperature data of all the battery modules through the internal CAN interface to realize the protection of battery modules.

HBMU100 Battery Box is consisted of HBMU100-16 module, cell package, temperature sensor, and high-voltage connector. Each cell package is composed of 16 battery cells and each of the two cells is equipped with a temperature sensor for a total of 8 temperature sensors.

Performance and Characteristics:

- Modular design for easy installation;
- Quick battery connection plug for easy wiring;
- Fast power supply and CAN communication plug.

Table 3 Battery Cell Box Specification Parameter

Items	Parameter
Voltage Range	(44.8~58.4)VDC
Rated Voltage	51.2VDC
Cell Specification	Lithium iron phosphate, 3.2V/50Ah
Cell Specification	1P16S
Rated Capacity	50 Ah
Rated Energy	2.56 kWh
Max. Output Power	2.56 kW
Cycle Index(25°C,0.5C/1C,100%DOD)	>2000
Working Temperature	0~40°C
Working Humidity	<80%R.H(No Condensation)
Communication Mode	CAN
Battery Box Dimension (W×D×H)	480mm×390mm×133mm
Protection Level	IP20
System Reference Weight	36kg

Battery Positive Battery Negative Power Supply & Comm. Plug



Power Supply & Comm. Plug

Fig.3 – Front Panel of HBCU Battery Box

Table 4 The Plug Description

Icon	No.	Function	Cable Size	Remark
	1	24V+	0.5mm ²	24V positive of power supply
	2	24V-	0.5mm ²	24V negative of power supply
	3	CANH	0.5mm ²	Communication Port CANH
	4	CANL	0.5mm ²	Communication Port CANL

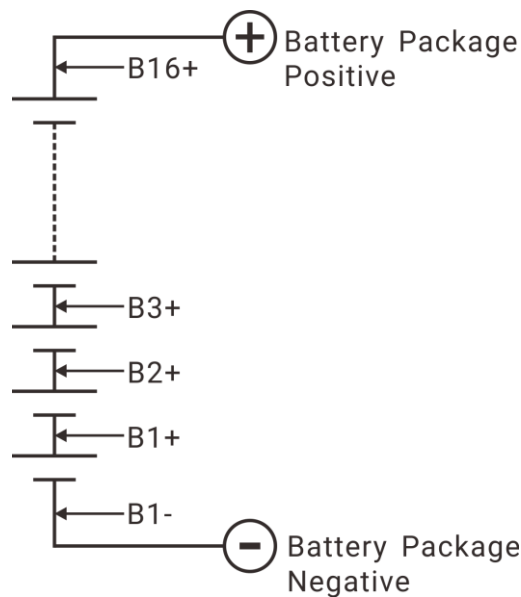


Fig.4 –Internal Battery Voltage Sampling Harness and Battery Connection Diagram

⚠ Note: Non-professional personnel are not allowed to disassemble or alter the wiring in the box.

4.3 HBCU100 MASTER CONTROL BOX

HBCU100 Master Control Box is the core of the whole energy storage cabinet. The voltage and temperature data of all the battery cells are collected via the internal CAN interface to realize the protection of battery modules. Its communication function with PCS can realize the charge/discharge management of the whole battery system together with the built-in dual switch (isolating switch + main circuit relay).

HBCU100 Master Control Box consists of HBCU100 module, isolating switch, insulation monitoring module, power module, heavy relay and Hall current sensor. The HBCU100 module uploads the analysis of the cell voltage and temperature to the HBMU100-16 to finish the cell protection and SOC/SOH calculation.

Performance and Characteristics:

- Modular design and easy installation;
- The manual isolating switch to realize the electric isolation of the whole system, easy maintenance and high safety;
- With alarm indicator and start button (with lamp);
- Quick plug battery and CAB communication plug for easy installation;
- Quick plug PCS can realize the fast connection with PCS system;
- With 2 sets of external isolation RS485 communication terminals and one external CAN communication terminal, 2 ETHERNET interface;
- With 2 external aux. output terminals (volts free NC), 2 external aux. input terminals;
- With cell passive balance function.

Table 5 Specification

Item	Parameter
Working Voltage	DC24V, reverse connection protection
DC High-voltage Input	DC (300-1000)V, Resolution 0.1V
Current Sampling Input	±100A, Resolution 0.1A
Temperature Sampling Input	One NTC 10K-3950 type temperature sensor
Intranet Communication CAN	Non-isolated CAN interface, 250kbps, communicate with HBMU100
Aux. Output	2, 1A 30VDC, volts free output
Aux. Input	2, connect to negative of power supply (24V-RMS)
ETHERNET Interface	Self-adapting 10/100Mbps, Modbus TCP/IP communication protocol
RS485 Interface	2, isolation, half-duplex, baud rate can be set, Modbus-RTU communication protocol, maximum communication distance 1000m.
Working Temperature	(-40~80)°C
Working Humidity	(20~93)%
Master Control Box Dimension (W×D×H)	480mm×500mm×220mm
Protection Level	IP20
System Reference Weight	16kg

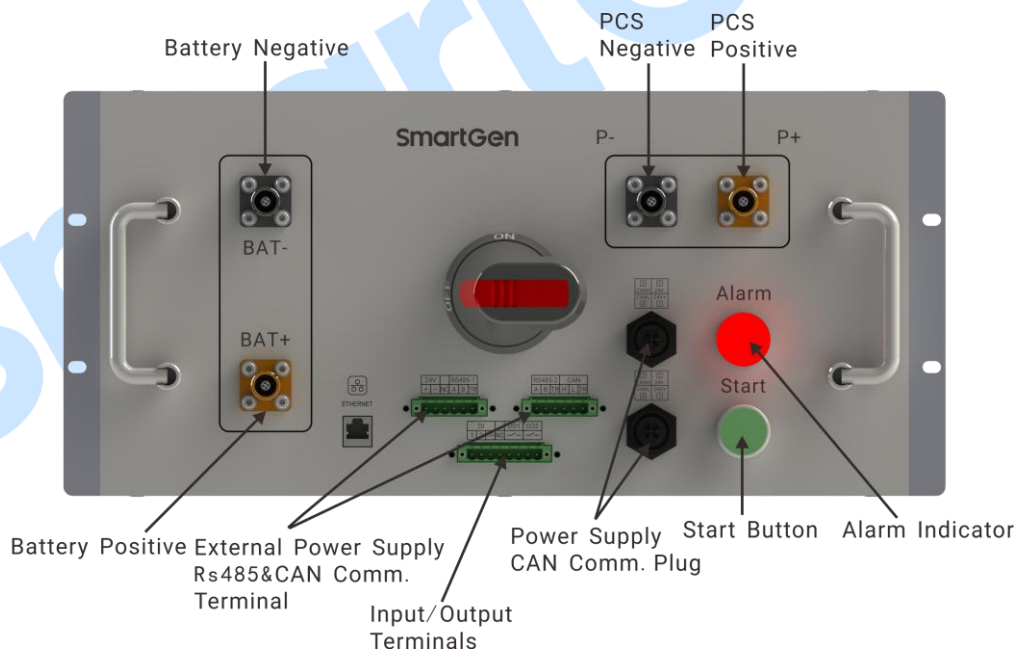


Fig.5 – Front Panel of HBCU100 Master Control Box

Table 6 Plug Description

Icon	No.	Function	Cable Size	Remark
	1	24V+	0.5mm ²	24V positive of power supply
	2	24V-	0.5mm ²	24V negative of power supply
	3	CANH	0.5mm ²	Communication port CANH
	4	CANL	0.5mm ²	Communication port CANL

Table 7 Terminal Description

Plug Sign	No.	Function	Cable Size	Remark
	1	24V+	0.5mm ²	24V positive of power supply
	2	24V-	0.5mm ²	24V negative of power supply
	3	NC	/	The terminal is hang up in the air, and no grounding is allowed.
	4	RS485_1A	0.5mm ²	RS485 communication port
	5	RS485_1B	0.5mm ²	RS485 communication port
	6	TR	0.5mm ²	According to the on-site wirings, it is short connected with RS4851A to connect to 120Ω terminal impedance matching resistance.
	7	RS485_2A	0.5mm ²	RS485 communication port
	8	RS485_2B	0.5mm ²	RS485 communication port
	9	TR	0.5mm ²	According to the on-site wirings, it is short connected with RS4851A to connect to 120Ω terminal impedance matching resistance.
	10	CANH	0.5mm ²	Communication port CANH
	11	CANL	0.5mm ²	Communication port CANL
	12	TR	0.5mm ²	According to the on-site wirings, it is short connected with CANH to connect to 120Ω terminal impedance matching resistance.
	13	DI1	0.5mm ²	Aux. input 1, active for DICOM.
	14	DI2	0.5mm ²	Aux. input 2, active for DICOM.
	15	DICOM	0.5mm ²	Common port of aux. input port.
	16	NC	/	Terminal is hang up in the air, and no grounding is allowed.
	17	DO1	0.5mm ²	Volts free (NC), Capacity 1A DC30V
	18	DO1	0.5mm ²	
	19	DO2	0.5mm ²	Volts free (NC), Capacity 1A DC30V
	20	DO2	0.5mm ²	

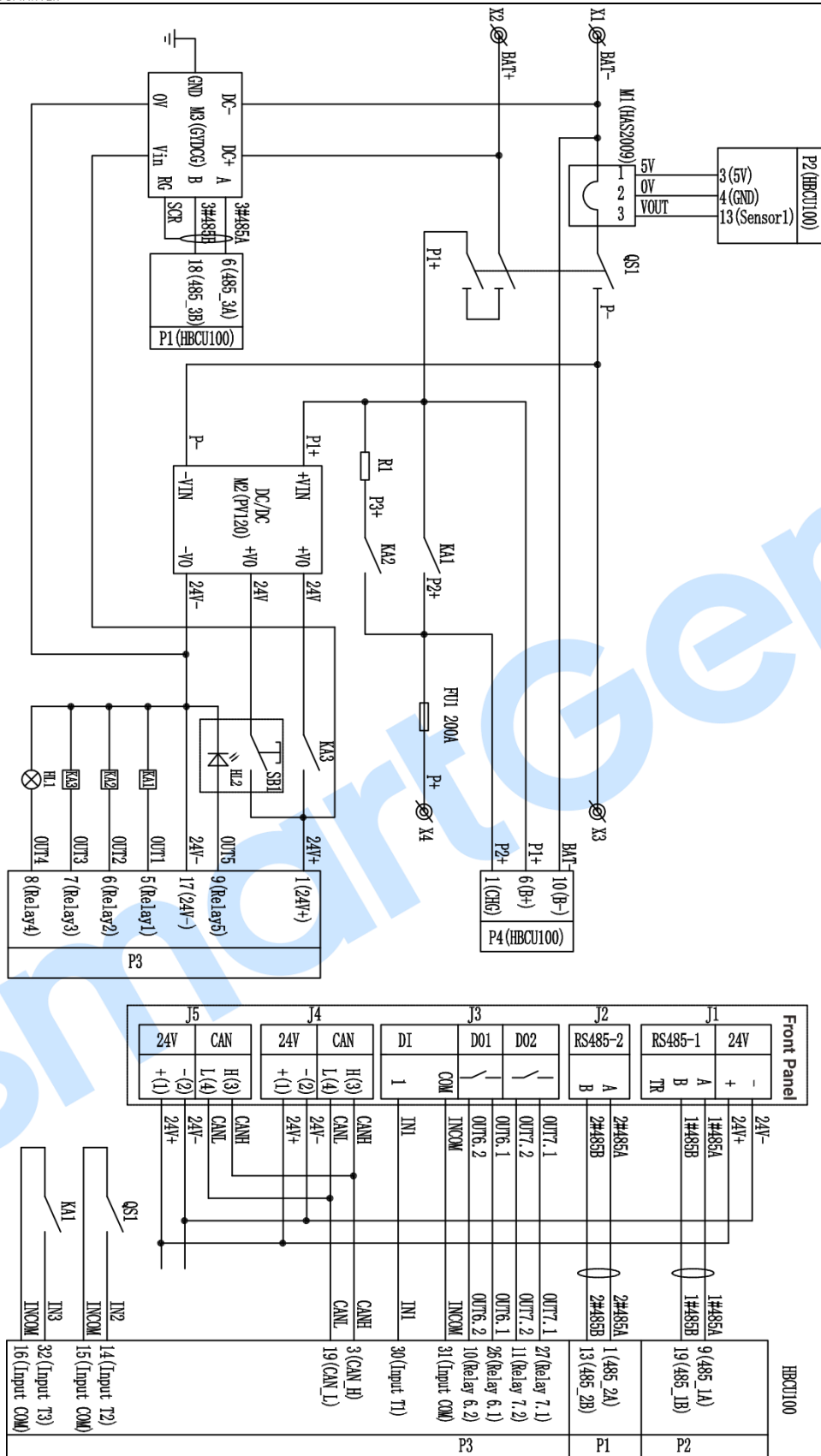


Fig.6 – Schematic Diagram of HBCU100 Master Control Box

⚠ Note: High voltage inside, non-professional personnel are not allowed to disassemble or alter the wiring in the box.

4.4 HMU8-BMS MONITORING MODULE

HMU8-BMS Monitoring Controller adopts high-performance ARM chip, capacitive touch color LCD with high resolution, Chinese and English are optional to display, which can realize the battery total voltage, current, SOC data monitoring and parameter adjustment through RS485 interface for HBCU100. It has compact structure, simple operation and reliable operation.

Performance and Characteristics:

- 8-inch LCD with 800*600 resolution, capacitive touch screen operation. Optional Chinese and English to display;
- Battery total voltage, current and SOC data can be display;
- With event log function, which can display 200 pieces of historical records;
- With alarm information display function;
- Parameter configuration function, the parameter of HBCU100 can be set via screen, which is convenient for on-site personnel to debug;
- A single BMU can be debugged and the whole energy storage system can be upgraded by CAN interface;
- Modular design, pluggable terminal and embedded installation mode with compact structure and easy installation.



Fig.7 – Front Panel Drawing



Fig.8 – Main Interface of HMU8-BMS



Fig.9 – Details Interface of HMU8-BMS

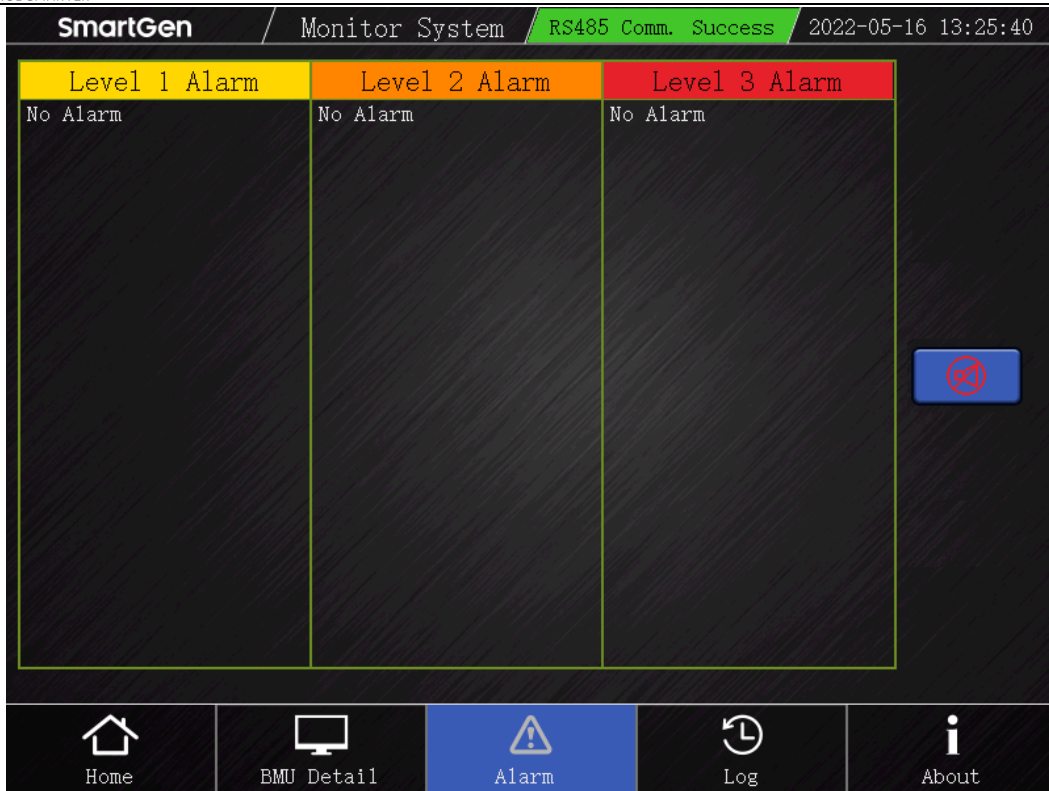


Fig.10 – Alarm Record Interface of HMU8-BMS



Fig.11 – Event Log Interface of HMU8-BMS

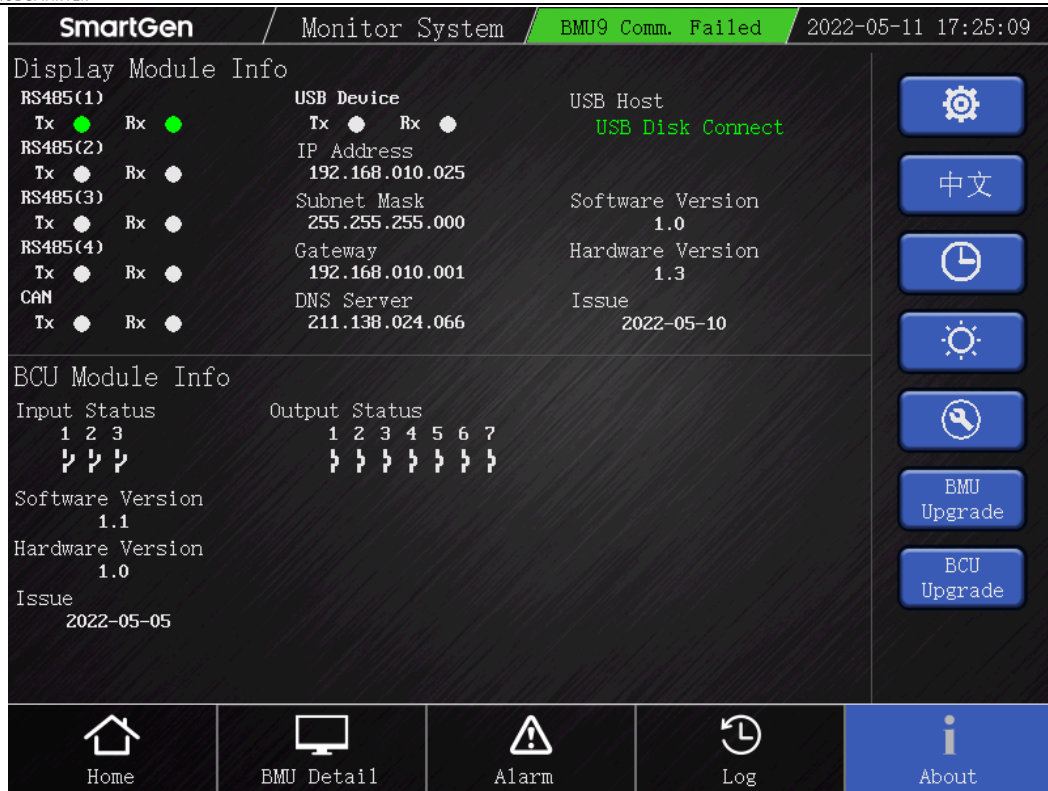










Fig.12 – About Interface of HMU8-BMS

5 MATCHING WIRING HARNESS AND CONNECTION

Table 8 Matching Wiring Harness

Name	Graphic Example	Purpose	Quantity
Battery Wiring Harness A		Short series connection between adjacent cell boxes.	13
Battery Wiring Harness B		Short series connection between opposite cell boxes.	1
Battery Wiring Harness C		Short connection between negative side of 1# cell box and negative side of master control box.	1

Name	Graphic Example	Purpose	Quantity
Battery Wiring Harness D		Short Connection between positive side of 13# cell box and positive side of master control box.	1
Battery Wiring Harness E		Short connection between negative side of master control box and negative side of PCS.	1
Battery Wiring Harness F		Short connection between positive side of master control box and positive side of PCS.	1
Comm. Wiring Harness A		Short connection of master control box and cell box, communication between cell boxes.	12
Comm. Wiring Harness B		Short connection of communication between cell boxes.	1

Wiring Description:

Battery Wiring Harness A: an orange plug on one end and a black plug on the other end. For series connection between two adjacent cell boxes, such as 1# cell box positive+ connects to 2# cell box negative-, the orange plug goes to 1# cell box positive+ and the black plug goes to 2# cell box negative.

Battery Wiring Harness B: an orange plug on one end and a black plug on the other end. For series connection between two opposite cell boxes, such as #6 cell box negative- connects to #7 cell box positive+, the orange plug goes to 1# cell box positive+ and the black plug goes to 2# cell box negative.

Battery Wiring Harness C: two ends are black plugs. For series connection between 1# cell box negative and master control box negative (BAT-).

Battery Wiring Harness D: two ends are orange plugs. For series connection between #13 cell box positive and master control box positive (BAT+).

Battery Wiring Harness E: a black plug on one end and SC25-8 copper cable lug on the other end. For series connection between master control box output negative (P-) and PCS negative. The black plug goes to master control box output (P-), SC25-8 copper cable lug connects to PCS terminal.

Battery Wiring Harness F: an orange plug on one end and SC25-8 copper cable lug on the other end. For series connection between master control box output positive (P+) and PCS positive. The orange plug goes to master control box output (p+), SC25-8 copper cable lug connects to PCS terminal.

Communication Wiring Harness A: both two ends are black 4-pin round plugs. It is used as a communication power cable between two adjacent cell boxes, cell box and master control box. When connecting the plug, align it with card slot and tighten it by rotating the nut.

Communication Wiring Harness A: both two ends are black 4-pin round plugs. It is used as a communication power cable between two opposite cell boxes. When connecting the plug, align it with card slot and tighten it by rotating the nut.

Please refer to the following wiring diagram (Fig.13) for the above connection.

▲Note: The positive and negative plugs must be inserted correctly. The orange corresponds to the positive side and the black corresponds to the negative side. Counter insertions are not allowed.

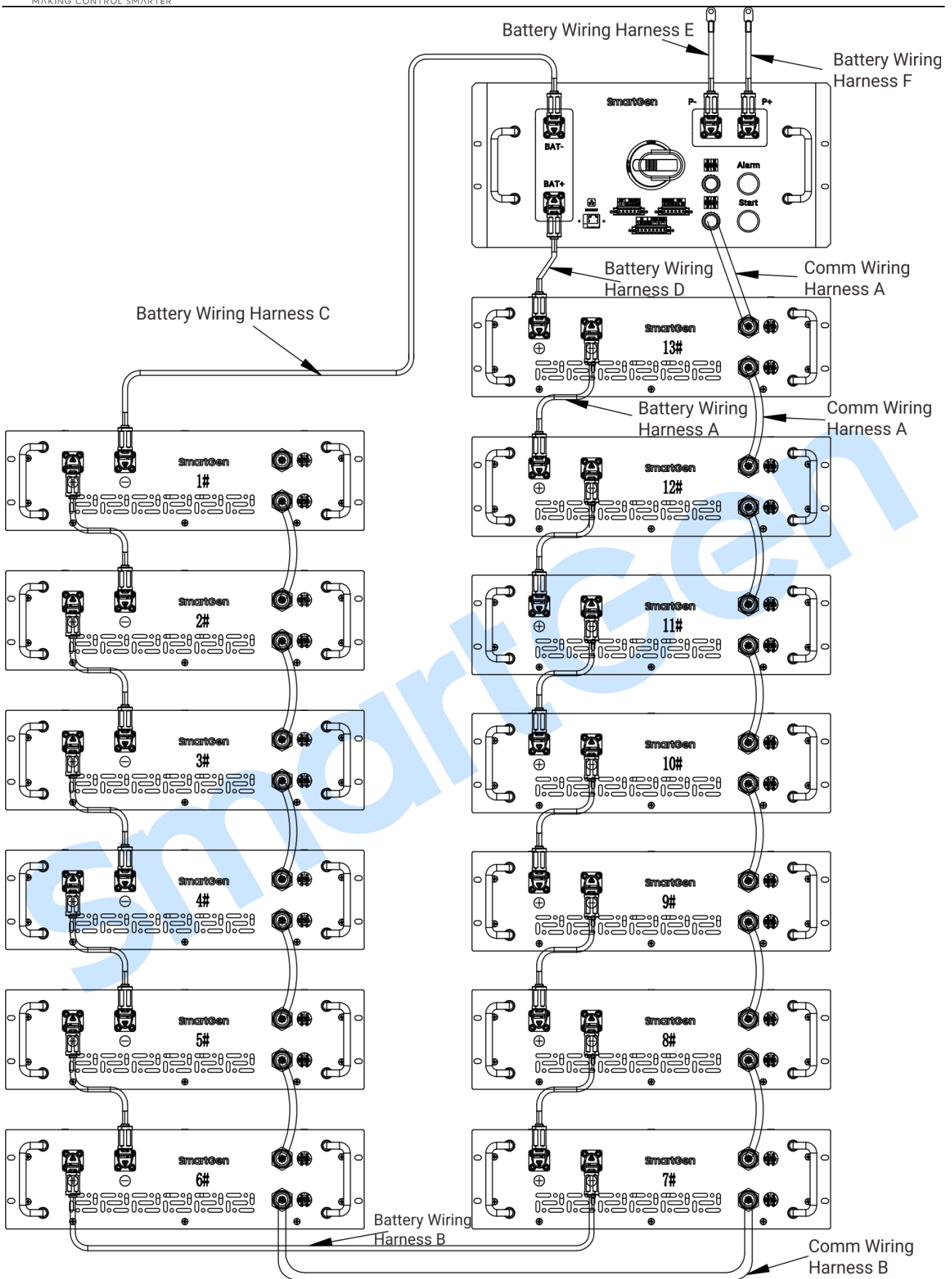


Fig.13 – Matching Display Connection Diagram

6 OPERATION PROCEDURE

1. Connect all the matching wiring harnesses correctly according to the diagram and ensure that all the wirings are correctly connected.

2. Measure if the battery voltage and other parameters are normal, if the voltage is abnormal, please check the wirings until it is normal.

3. Make sure the wiring connection is correct. Firstly, rotate the handle of the manual isolating switch to make it turn on, and then press the green start button on the master control box unit the red power indicator is light on, and then release the green start button. At this time, the system will enter the normal working mode. In this circumstance, the battery parameters such as voltage, temperature, communication can be checked through HMU8-BMS monitoring module.

4. Disconnect the isolating switch to stop the whole system.

7 CASE AND DIMENSIONS

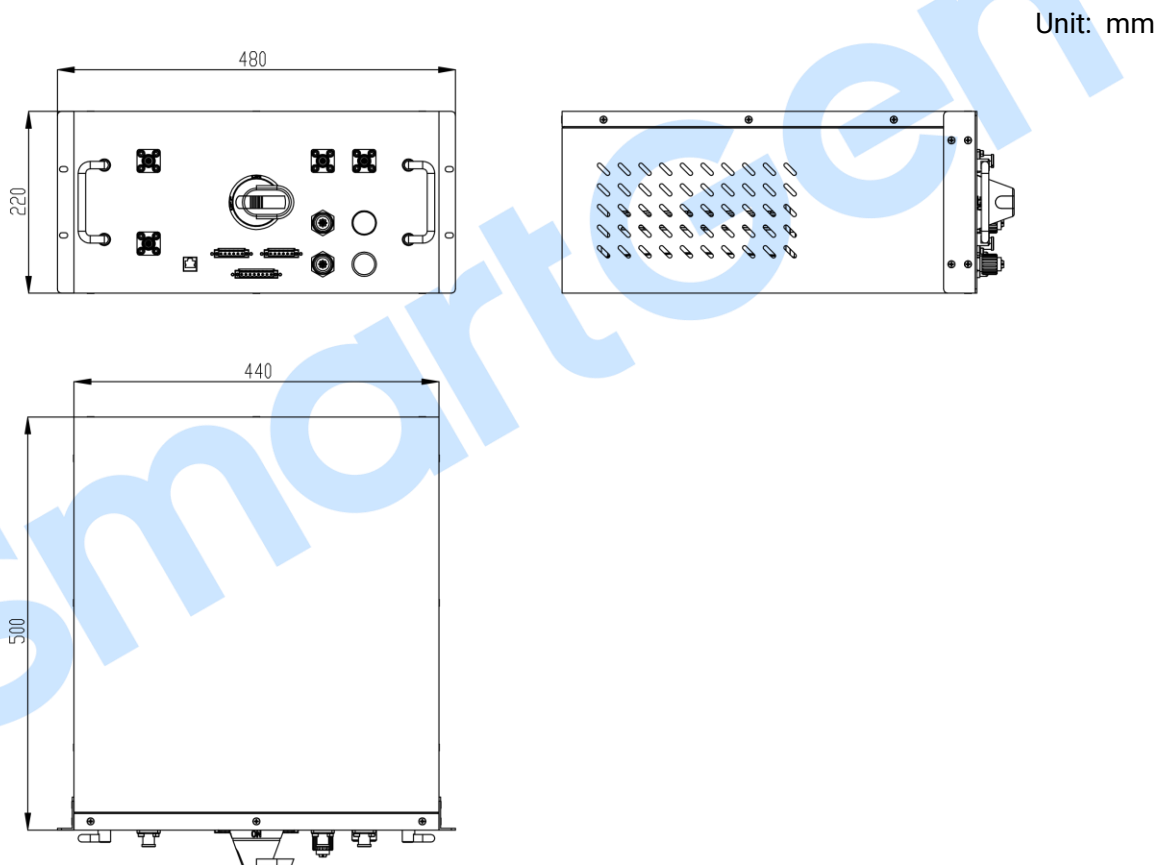


Fig.14 – HBCU100 Overall Dimensions

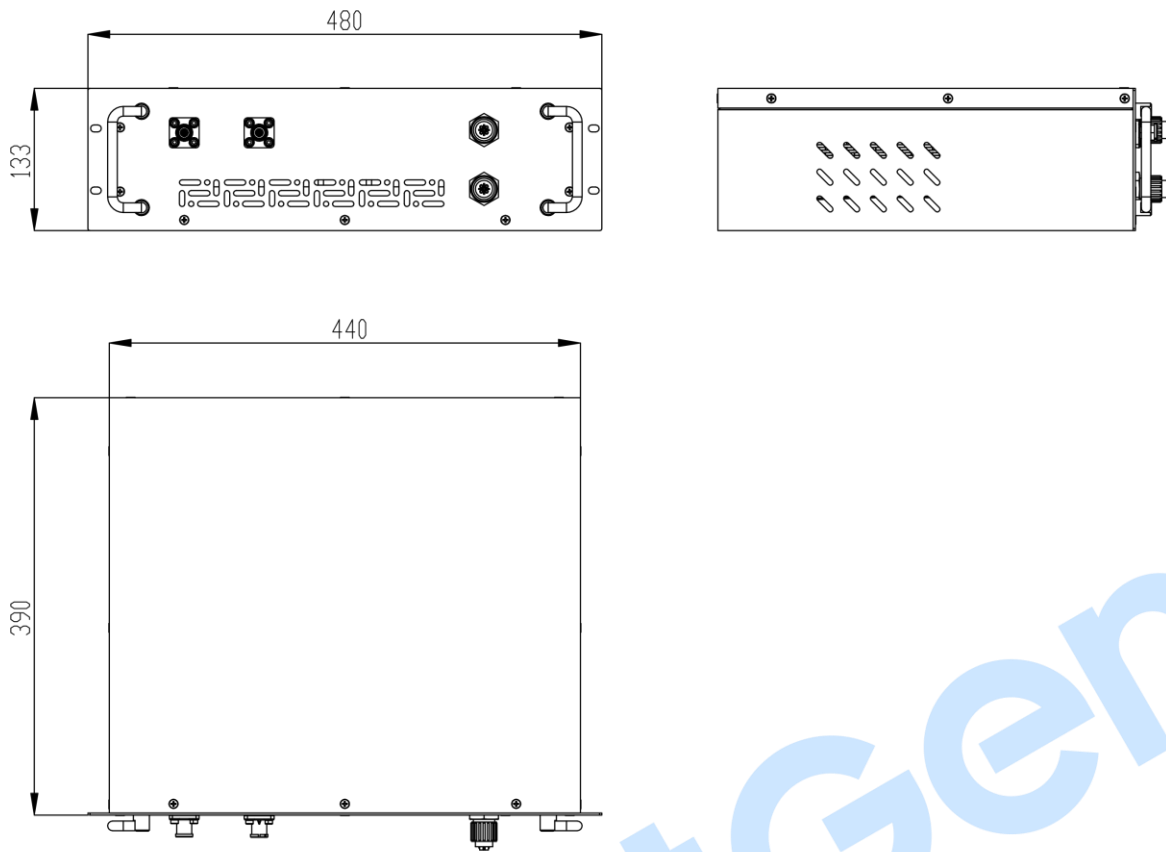


Fig.15 – HBMU100 Overall Dimensions

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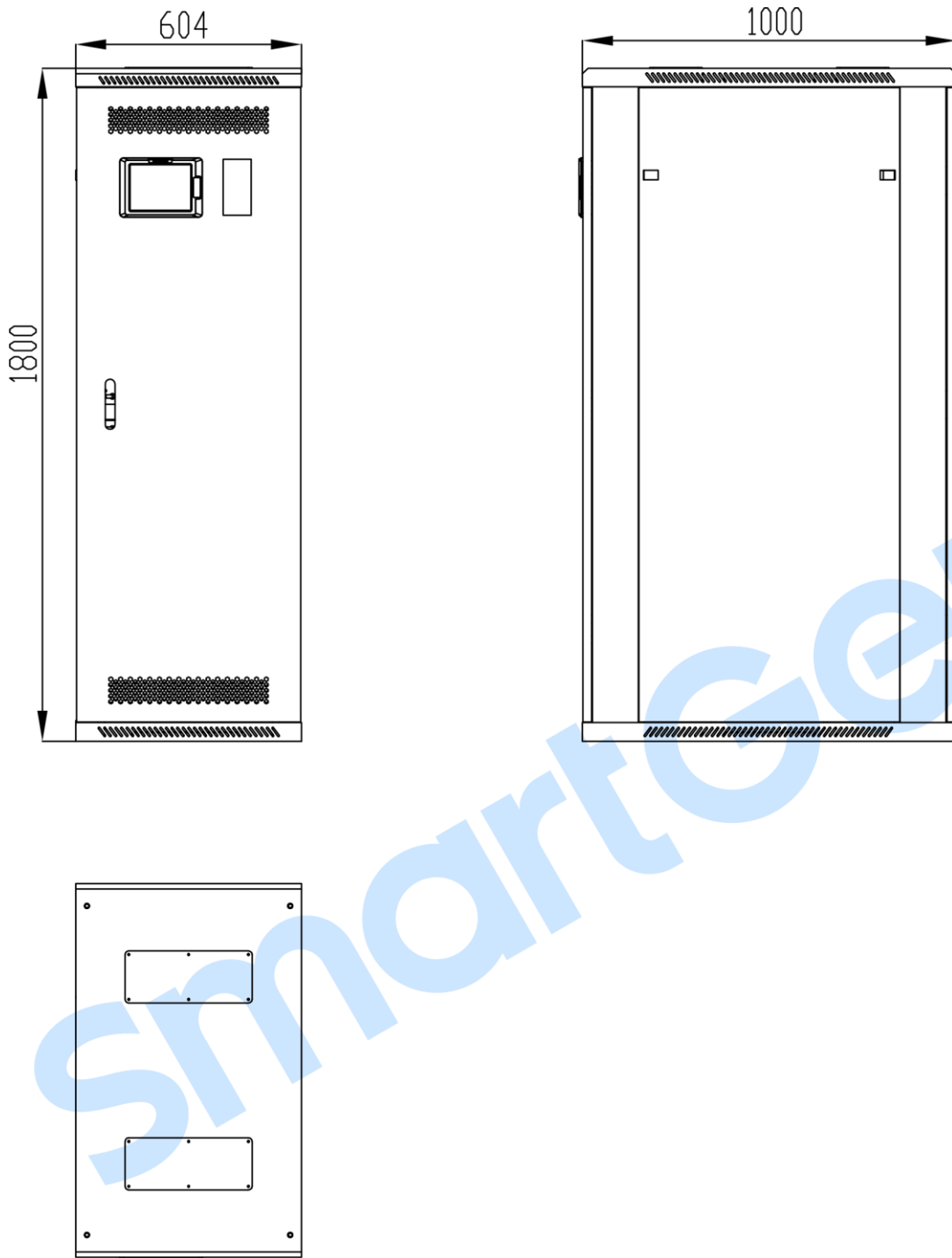


Fig.16 – HBMS100 Overall Dimensions

8 TROUBLESHOOTING

Table 9 Troubleshooting

Symptom	可能采取的措施 Possible Measures
System not working	<ol style="list-style-type: none"> 1. Make sure that the working voltage is within the normal voltage range; 2. Whether the start button is pressed; 3. Professional and technical personnel maintenance.
Faults display on HMU8-BMS	<ol style="list-style-type: none"> 1. Check the battery protection parameter setting; 2. Disconnect the charger or stop battery power supply; 3. Check communication wirings.
Comm. faults display on HMU8-BMS	Check whether communication interface is loose or falls off.
HMU8-BMS not working	<ol style="list-style-type: none"> 1. Check the mainframe is powered on; 2. Check the wirings between HBCU100 master control box and HMU8-BMS are correct;
HMU8-BMS displays voltage abnormal	Battery connections are incorrect.