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User Manual

STE-QS16

51.2V 314Ah

SUNWAYS TECHNOLOGIES CO., LTD.

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1 Preface

※ 1.1 Overview

This manual is an integral part of Sunways STE-QS16 series LFP battery system (hereinafter referred to as the battery or STE-QS16 battery). It mainly introduces the assembly, installation, electrical connection, debugging, maintenance and troubleshooting of the products. Before installing and using battery, please read this manual carefully, understand the safety information and be familiar with the functions and characteristics of hybrid battery.

※ 1.2 Target Groups

This manual is applicable to the electrical installers with professional qualifications and end-users. If there are any problems in the installation process, please call Sunways service telephone at +86 400-9922-958 or email Sunways at service@sunways-tech.com for consultation.

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2 Safety Introduction

※ 2.1 Safety Precautions

- It is important and necessary to read the user manual carefully (and attachment) before installing or using battery. Failure to do so or to follow any instruction or warning in this document can result in electrical shock, serious injury, and death, or damage battery, potentially rendering it unusable.
- When battery is stored for a long time, it is required to charge once every 6 months, and the SOC should be no less than 50%.
- After battery module cannot be discharged, it needs to be recharged within 12h.
- Do not connect power terminal reversely.
- All power supplies must be disconnected during maintenance.
- Please contact the supplier within 24 hours if there is something abnormal.
- Do not use any liquid to clean the battery.
- Do not expose battery to flammable or irritating chemicals or vapor.
- Do not paint any part of battery, including any internal or external components.
- Do not connect battery with PV solar wiring directly.
- Do not install or use this product beyond provisions of the manual.
- Direct or indirect damages caused by the above reasons are not covered by warranty claim.

※ 2.2 Warnings in This Document

A warning describes a hazard to equipment or personnel. It calls attention to a procedure or practice, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the Sunways equipment and/or other equipment connected to the Sunways equipment or personal injury.

Symbol	Description
	Do not place near open fire or flammable materials.
	A potential hazard exists when the equipment is working. Wear personal protective equipment during operation.
	Warning electric shock. Power off the equipment before any operation.
	Grounding: indicate PE cable connection position.
	Do not place in areas accessible to children.
	Keep the battery away from open fire or ignition sources.
	Read the product and operation manual before operating the battery system.
	Label for Waste Electrical and Electronic Equipment (WEEE) Directive (2012/19/EU).
	The certificate label for CE.
	Recycle label.

※ 2.3 Before Connecting

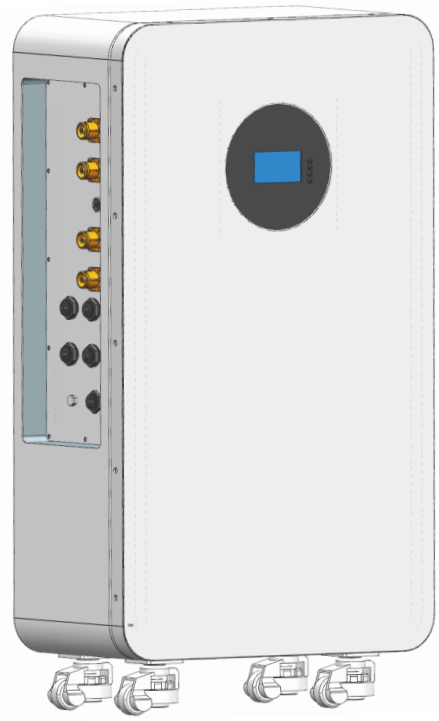
1. Please check the external packaging condition before unpacking. If it is damaged, contact corresponding local retailer.
2. After unpacking, please check the products and spare parts according to spare parts list. If the product is damaged or missing, please contact your local retailer.
3. Connect to specified matching inverter.
4. Before installation, be sure to cut off the grid power and make sure battery switch is on OFF mode.
5. It is prohibited to connect the battery and AC power directly.
6. All electrical wiring must be connected in accordance with local regulations.
7. Please ensure that electrical performance of battery system is compatible with the equipment.
8. The installation onsite shall be equipped with fire-fighting facilities that meet relevant requirements, such as fire sand, dry powder fire extinguisher, etc.

※ 2.4 In Using

- If battery system needs to be moved or repaired, power must be cut off and battery is completely shut down.
- It is prohibited to connect battery with different types of battery.
- Do not connect battery to faulty inverter.
- Except for personnel from Company or other authorized personnel, batteries shall not be opened, repaired or disassembled.The company shall not bear any liability or responsibility caused by violation of any safety operation or design standard, production standard, equipment safety standards or any other standards or requirements.

3 Product Introduction

This stand mode $LifePo_4$ lithium battery belongs to one of the series of house hold energy storage products that are independently designed and developed. It has long cycle life, high safety standard BMS software protection and strong housing, exquisite looks, and easy installation, etc. It is widely used in energy storage system with off- grid inverters, on-off grid inverters and hybrid inverters.



4 Product Function Description

※ 4.1 Appearance

51.2V 314Ah consists of battery module (including cell and mechanical parts), battery management system (BMS) as well as power and communication terminals. Product appearance is shown as following:

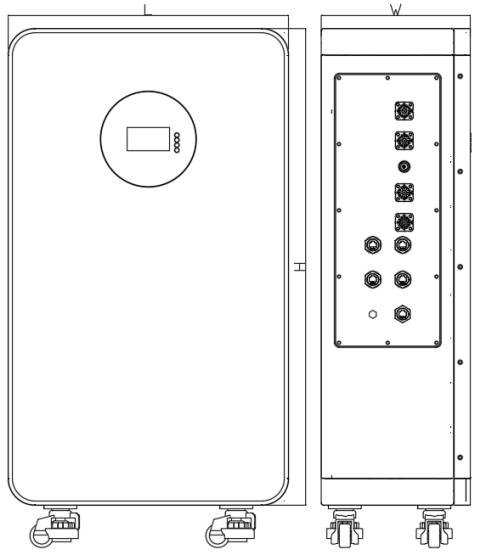


Figure 4-1

Product model			
Specification	Length（L）	Width（W）	High（H）
51.2V 314Ah	470mm	250mm	800mm

※ 4.2 Product Specifications

Item	Condition	Specification
Nominal Capacity	Standard charge/discharge	314Ah
Nominal Voltage	Average	51.2V
Standard Charging	Constant current Constant voltage End current(Cut off)	100A 57.6V 2A
Charging Voltage	/	57.6V
Max. Continuous Charge Current	25±3℃	200.0A
Standard Discharging	Constant current End voltage(Cut off)	100.0A 43.2V
Max Continuous Discharge Current	25±3℃	200.0A
Nominal Energy	25±3℃	16.076kWh
Available Energy	25±3℃	14.468kWh
Charge Operating Temperature	/	0℃ ~ 55℃
Discharge Operating Temperature	/	-10℃ ~ 55℃
Storage Temperature	/	-20℃ ~30℃
Weight	/	≈ 121.3kg
Protection Degree	/	IP65

※ 4.3 Equipment Interface Instruction

▼ 4.3.1 Interface diagram

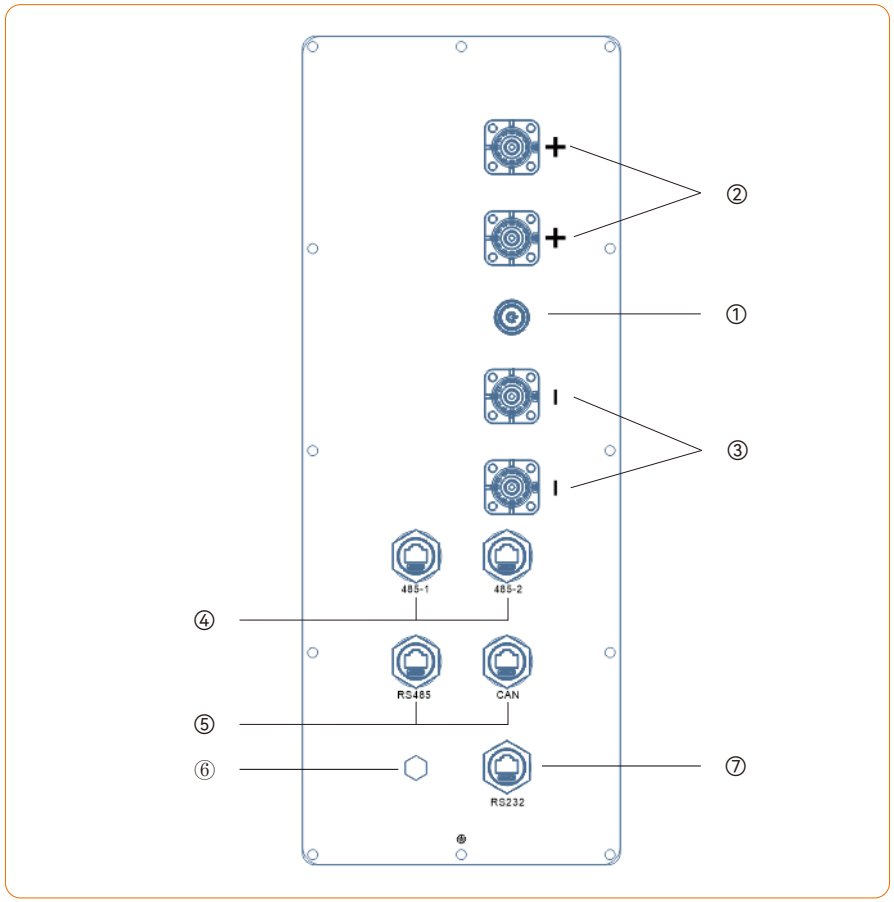


Figure 4-2

Item	Interface	Instruction
①	Start	System start switch, Press the button BMS will works
②	Positive terminal	Battery positive output--Connect 2AWG cable
③	Negative terminal	Battery negative output--Connect 2AWG cable
④	485-1/485-2	Battery parallel communication
⑤	RS232	Communicate with the upper computer
⑥	Exhaust valve	/
⑦	RS232	Communicate with the upper computer

▼ 4.3.2 RS485 Interface

The default baud rate is 9600bps, which is used for communication with the inverter. When this battery is the host, it can summarize slave data and communicate with the inverter.

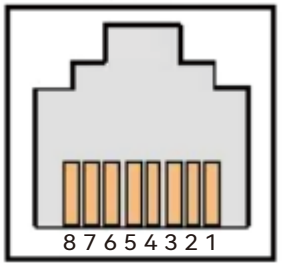


Figure 4-3 RS485

Pin	Definition
1、8	RS485-B
2、7	RS485-A
3、6	GND
4、5	NC

4.3.3 CAN Interface

The default baud rate is 500K, and this interface is used for communication with the inverter. When this battery is the host, it can summarize slave data and communicate with the inverter.

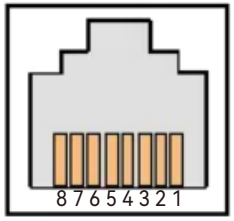


Figure 4-4 CAN

Pin	Definition
1、3、6、7、8	NC
2	GND
4	CAN-H
5	CAN-L

4.3.4 Parallel RS485

You can view the information of the PACK, with a default baud rate of 9600bps. To communicate with the monitoring device through RS485, the monitoring device serves as the host and sets the address range from 2 to 15 based on address polling data.

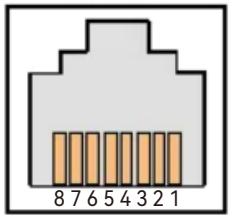


Figure 4-5A 485-1

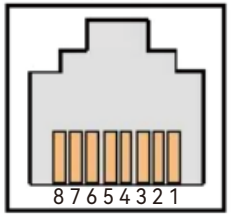


Figure 4-5B 485-2

Pin	485-1 Definition
1、3、6、7、8	NC
2	GND
4	CAN-H
5	CAN-L

Pin	485-2 Definition
1、3、6、7、8	NC
2	GND
4	CAN-H
5	CAN-L

The parallel machine has dual RS485 interfaces. The first battery that communicates with the inverter serves as the main unit, and the 485-2 of the main unit is connected to the 485-1 of the next slave unit. The communication interfaces of each battery are connected in this staggered order, so that the main battery can read the information of each battery.

4.3.5 RS232

BMS can communicate with the upper computer through RS232 interface, so that it can monitor all kinds of battery information, including battery voltage, current and temperature, working status etc. The default baud rate is 9600bps.

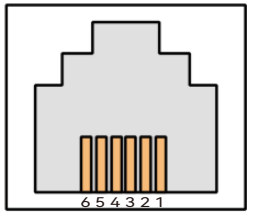


Figure 4-6 RS232

Pin	RS232 Definition
1、2、6	NC (empty)
3	TX(computer receives data)
4	RX(computer sends data)
5	GND(ground)

※ 4.4 Parallel Connection

When Connect the batteries in parallel, connect the positive terminal and positive terminal(red colour) in parallel, and the negative terminal and negative terminal (black colour) in parallel, the max parallel quantity is 15pcs, as shown in the figure below.the parallel communication line between the battery and the inverter is connected in a staggered manner, with one end at the second 485 port and the other end at the first 485 port of the parallel battery.

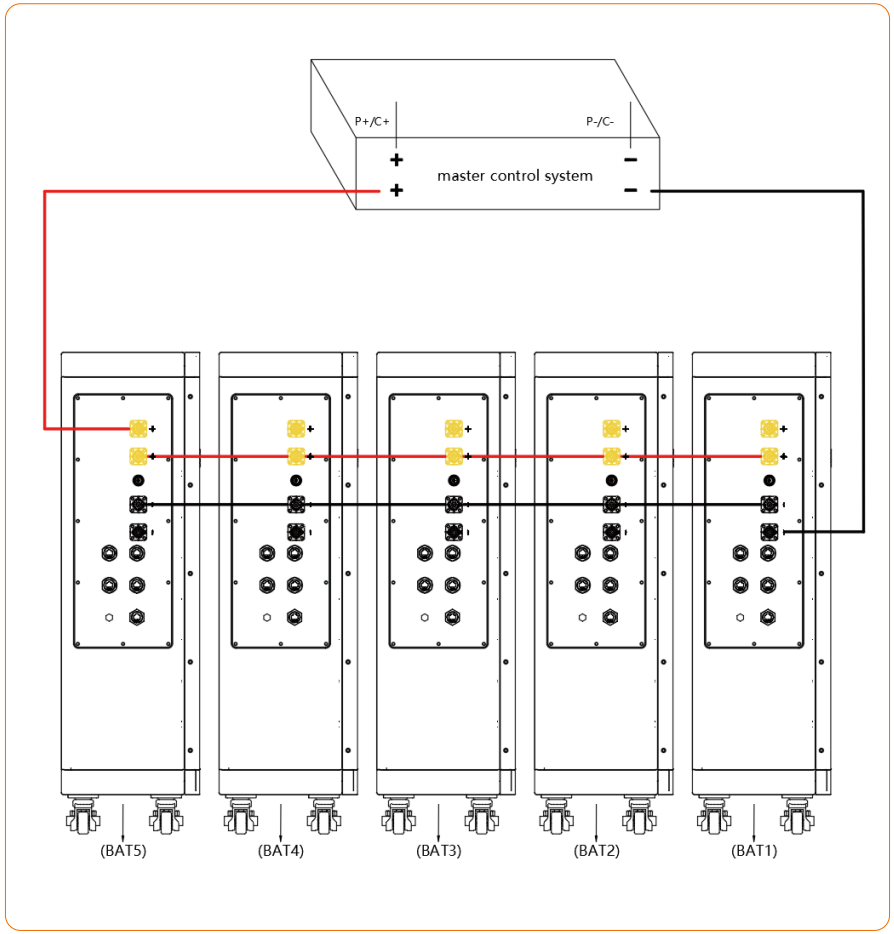


Figure 4-7 parallel connection

※ 4.5 LED Indication Function

The current power consumption and operation status of the product are shown through LED indicator Light (See Table 1, Table 2, and Table 3 for details)Working status indication.

State	Normal/ Alarm / Protection	ON/ OFF	RUN	ALM	SOC Indication LED						Instructions
		●	●	●	●	●	●	●	●	●	
Power Off	Sleep	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	All off
Standby	Normal	ON	Flash1	OFF	Indication by SOC						Standby
	Alarm	ON	Flash1	Flash3							Cell low voltage
Charge	Normal	ON	ON	OFF	Indication by SOC (The top SOC Led Flash 2)						Maximum power LED flash(flash 2), ALM does not flash for over-charge warning
	Alarm	ON	ON	Flash3							
	Over Charge Protection	ON	ON	OFF	ON	ON	ON	ON	ON	ON	If no mains supply, LED as standby
	Temperature. Over-current Fault Protection	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	Close charge
Discharge	Normal	ON	Flash3	OFF	Indication by SOC						
	Alarm	ON	Flash3	Flash3							
	Under Discharge Protection	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Close discharge
	Temperature. Over-current. Short Circuit Fault Protection	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	Close discharge
Fault		OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	Close charge Close discharge

Capacity Indicator

State		Charge						Discharge					
Capacity indicator light		L6 ●	L6 ●	L4 ●	L3 ●	L2 ●	L1 ●	L6 ●	L5 ●	L4 ●	L3 ●	L2 ●	L1 ●
Electricity (%)	0～ 16.6%	OFF	OFF	OFF	OFF	OFF	Flash 2	OFF	OFF	OFF	OFF	OFF	ON
	16.6～ 33.2%	OFF	OFF	OFF	OFF	Flash 2	ON	OFF	OFF	OFF	OFF	ON	ON
	33.2～ 49.8%	OFF	OFF	OFF	Flash 2	ON	ON	OFF	OFF	OFF	ON	ON	ON
	49.8～ 66.4%	OFF	OFF	Flash 2	ON	ON	ON	OFF	OFF	ON	ON	ON	ON
	66.4～ 83.0%	OFF	Flash 2	ON	ON	ON	ON	OFF	ON	ON	ON	ON	ON
	83.0~100%	Flash 2	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Running light ●		ON						Flash(Flash 3)					

LED Flashing Instructions

Flash way	ON	OFF
Flash 1	0.25S	3.75S
Flash 2	0.5S	0.5S
Flash 3	0.5S	1.5S

Note	The LED indicator alarm can be enabled or disabled through the host computer. The factory default is enabled.

※ 4.6 LCD introduction

After power on/sleep activation, the welcome interface will be displayed, and press the MENU key to enter the main menu page. As shown in the following figure:

▼ 4.6.1 Reference physical image



▼ 4.6.2 Display rendering



4.6.3 Main Menu Page



4.6.4 Page definition not displayed

Single cell over voltage alarm	Cell OV
Single low voltage alarm	Cell UV
Total pressure over voltage alarm	Pack OV
Total pressure low pressure alarm	Pack UV
Charging over current alarm	CHG OC
Discharge over current alarm	DSG OC
Charging high temperature alarm	CHG OT
Discharge high temperature alarm	DSG OT
Low temperature charging alarm	CHG UT
Low temperature discharge alarm	DSG UT
Environmental high temperature alarm	ENV OT
Environmental low temperature alarm	ENV UT
MOS high temperature alarm	MOS OT
Low battery	SOC Low

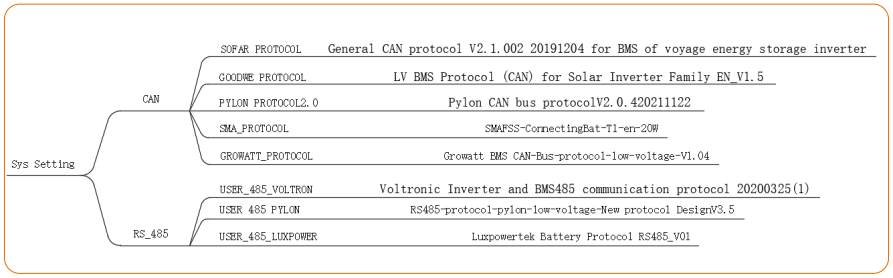
Single cell over voltage protection	Cell OVP
Single cell over discharge protection	Cell UVP
Overall Over voltage Protection	Pack OVP
Overall Over discharge Protection	Pack UVP
Charging over current protection	CHG OCP
Discharge over current protection	DSG OCP
Short circuit protection	SCP
Charger high-voltage protection	Charger OVP
Charger reverse connection	Charger In versed
Charging over temperature protection	CHG OTP
Discharge over temperature protection	DSG OTP
Low temperature protection for charging	CHG UTP
Low temperature discharge protection	DSG UTP
MOS high-temperature protection	MOS OTP
Environmental high temperature protection	ENV OTP
Environmental low-temperature protection	ENV UTP
Full charge	Fully
Charging MOS fault	CHG MOS Fault
Discharge MOS Fault	DSG MOS Fault
NTC malfunction	NTC Fault
Battery failure	Cell Fault
Sampling fault	Sampling Fault
Fault in current limiting plate	CCB Fault
Heating film malfunction	SHeater Fault

4.6.5 Key Description

1. Each item starts with "》 " or "--", where "》 " represents the current position of the cursor, and pressing the DOWN key can,Move the cursor position downwards; A project that ends with "》 " indicates that the project has content that is not displayed. Press the Enter key to enter the project The corresponding page.
2. Press ESC to return to the previous level directory; At any location, press the MENU key to return to the main menu page.
3. In sleep mode, press any button to activate the display screen.

4.6.6 Screen selection protocol

- The user selects the correct communication protocol version through buttons and passes the selected protocol version number back to the BMS motherboard Program to change the default communication protocol between BMS and the upper computer;
- The selection menu for this function is placed in the system settings menu directory.
- The menu structure is illustrated in the following figure:



The protocol confirmation is shown below:



4.6.7 Hibernate/shut down

In normal operating mode, after 1 minute of no button operation, the system will enter sleep/shutdown mode. In shutdown/sleep mode In this state, operating any button will activate the display screen.

※ 4.7 Sleep Mode

The system enters a low-power mode when any of the following conditions is met:

1. The monomer or overall over release protection is not removed within 30 seconds.
2. Press the button (3~6S) and release the button.
3. The lowest unit voltage is lower than the dormancy voltage, and the duration reaches the dormancy delay time (at the same time, meet the no communication, no protection, no equilibrium, no current).
4. The standby time is more than 24 hours (no communication, no charge and discharge, no city power).
5. Force the shutdown through the upper computer software. Before entering hibernation, ensure that the input is not connected with external voltage, otherwise it cannot enter the low power mode.

※ 4.8 Awake Mode

When the system is in the low power mode and meets any of the following conditions, the system will exit the low power mode and enter the normal operation mode:

1. Access to the charger, and the output voltage of the charger shall be greater than 48V.
2. Press the button (3~6S) and release the button.

※ 4.9 Power-off mode wake-up

1. Charging voltage should be greater than 52.5V.
2. Press the button for longer than 2 seconds and release the button.

5 BMS

※ 5.1 BMS System Schematic Diagram

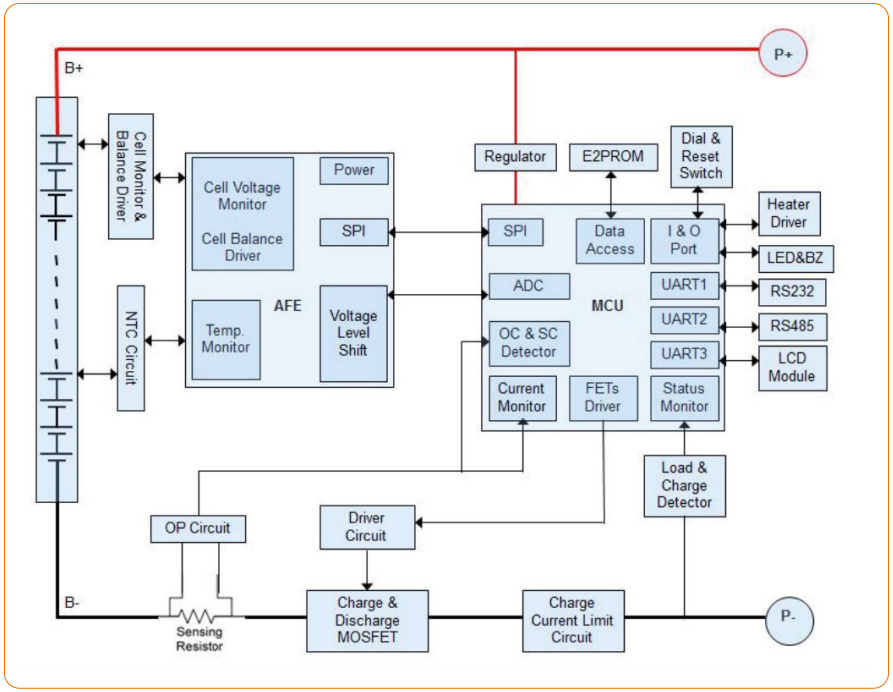


Figure 4-1

※ 5.2 BMS Parameter

No	Item		51.2V 314Ah
1	Power Consumption	Low power consumption mode	⩽ 100μA
2	Over charge Protection	Over charge detection voltage	3.65V
		Over charge release voltage	3.38V
3	Over discharge protection	Over discharge detection voltage	2.7V
		Over discharge release voltage	2.95V
4	Over current protection	Charging over current detection current (detection time)	205A (1S)
		Discharging over current detection current 1 (detection time)	205A (1S)
		Discharging over current Detection current2 (detection time)	⩾ 250A 500ms
5	Temp. Protection	Detection temperature	65°C
6	Balance	Balance voltage	3.5V

6 Emergency Situations

※ 6.1 Battery Leakage

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. If one is exposed to the leaked substance, immediately perform the actions described below.

- Inhalation: Evacuate contaminated area and seek medical aid.
- Contact with eyes: Rinse eyes with flowing water for 15 minutes and seek medical aid.
- Contact with skin: Wash affected area thoroughly with soap water and seek medical aid.

Ingestion: Induce vomiting and seek medical aid.

※ 6.2 On Fire

NO WATER!

Only dry powder fire or carbon dioxide extinguisher can be used; if possible, move the battery module to a safe area before it catches fire.

※ 6.3 Wet Batteries

If the module is wet or submerged in water, do not let people access it, then contact us or an authorized dealer for technical support. Cut off all power switch on inverter side.

※ 6.4 Damaged Batteries

Damaged batteries are dangerous and must be handled with utmost care. They are not fit for use and may pose a danger to people or property. If the module seems to be damaged, pack it in its original container, then return it to authorized dealer.

 Warning	Damaged batteries may leak electrolyte or produce flammable gas.

7 Remarks

※ 7.1 Recycle and Disposal

In case a battery (normal condition or damaged) needs disposal or needs recycling, it shall follow the local recycling regulation (Suggest Regulation (EC) Nº 1013/2006 among European Union) to process, and using the best available techniques to achieve a relevant recycling efficiency.

※ 7.2 Parts List

No	Part Name	Description	Quantity
1	Grounding wir	A 1.5 m yellow-green grounding wire	1
2	Network cable	2 meters of inverter communication network cable	2
6	Positive and negative pole line	A pair of red and black 1 meters parallel positive and negative electrode line 4	1

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