

Product Specification

Name: LiFePO4 Server Rack Battery

Model: GP-SR1-HC280-RN150

Application: Household Energy Storage

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Gobel Power

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Modification Record Table

No.	Version	Date	Description	Signature
1	1.0	2022-9-02	New Release	
2	1.1	2022-9-15	Upgraded	

Customer Requirements

	Requirement	Standard
1	Active Balance <input type="checkbox"/> Yes <input type="checkbox"/> No	5A
2	Fast Fuse <input type="checkbox"/> Yes <input type="checkbox"/> No	150A
3	Bluetooth <input type="checkbox"/> Yes <input type="checkbox"/> No	
4	Compatible Inverter	
5	Cell Model <input type="checkbox"/> HC <input type="checkbox"/> EVE <input type="checkbox"/> CATL	280Ah
6	Color <input type="checkbox"/> Black <input type="checkbox"/> White	
7		

	Signature	Date
Customer Signature		

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Definitions

Terms	Definitions
C	C Rate, ratio of Current and Full Capacity. For example, a fresh cell with 100Ah nominal capacity, if charge/discharge current is 100A, C Rate is 1C. After many cycles, the cell full capacity drops to 90Ah, if charge/discharge current is 90A, C Rate is 1C.
CRR	Capacity Retention Rate. While environment condition change, or the cell are used, the full capacity will drop to below nominal capacity. The ratio of present full capacity and nominal capacity is CRR.
BMS	Battery Management System
HMS	Battery Health Management System, Active Balancer
CC	Constant Current
CV	Constant Voltage
SOC	State of Charge, ratio of present charged quantity with that of fully charged.

1. Scope

This document describes the Product Specification of the LiFePO4 lithium battery GP-SR1-HC280-RN150 supplied by Gobel Power.

2. Model

2.1 Specification: 51.2V/280Ah

2.2 Appearance:

Dimension			Terminal Type:
Item	Description	Dimension/mm	M6
L	Long	771.5±2	Label:
W	Width	482.6±2	
H	Hight	241±2	Other Declare:
Weight	Net Weight	118Kg	



3. Battery Pack Specification

General Specification

No.	Items		Specifications
1	Nominal Capacity		280Ah @ 0.5C Discharge
2	Min Capacity		275Ah @ 0.5C Discharge
3	Nominal Voltage		51.2V
4	Charge Voltage		58.4V
5	Working Voltage		41.6V~58.4V (>0°C)
			41.6V~58.4V (≤0°C) (Continuous charge not allowed)
6	Charge Current		Standard Charge: 0.25C
			Rapid Charge: 0.5C
7	Standard Charge Method		0.25C constant current charge to 58.4V, then 58.4V constant voltage charge till charge current drops to 0.05C (10°C~45°C)
8	Charging Time		Standard Charge: about 4 hours
			Rapid Charge: about 2 hours
9	Max Charge Current		140A
10	Max Discharge Current		150A
11	Standard Discharge Method		0.5C constant current discharge to 41.6V
12	Working	Charging	0°C~50°C

	Temperature	Discharging	-30°C~60°C
13	Storage Temperature		-20°C~45°C with 30%~50% SOC, charge every 1 month
14	Internal Resistance		≤150mΩ
15	Circuit Breaker		200A
16	Fast Fuse (Optional)		150A

Visual Inspection

There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of the battery pack.

Standard Environmental Test Condition

Unless otherwise specified, all test stated in this Product Specification are conducted at below condition:

- Temperature: 25°C
- Relative Humidity: 45% ~ 85%

Electrical Characteristics

No.	Items	Test Method and Condition	Criteria
1	Standard Charge	<ol style="list-style-type: none"> 1. C-CC: Charge initially with constant current at 0.25C to 58.4V 2. C-CV: Charge with constant voltage at 58.4V till charge current drops to 0.05C 	≤150A
2	Minimum Capacity	The capacity means the discharge capacity of the battery pack, which is measured with 0.25C discharge current and 41.6V cutoff voltage after standard charge to 100% SOC	275Ah

3	Cell Self-Discharge	Capacity after 28 days storage at 25°C, measured under Standard Charge and Discharge Method	CRR>97%
4	Cell Initial Impedance	Internal resistance measured at AC 1KHz with 50% SOC	≤1.5mΩ
5	The Finished Product Resistance	Internal resistance measured at AC 1KHz with 50% SOC	≤150mΩ
6	Voltage	Before shipment	51V
7	Cell Cycle Life	<p>Cell Test Condition:</p> <p>Step 1: 0.5C charge to 58.4V and 0.05C cutoff current</p> <p>Step 2: Standby 10min</p> <p>Step 3: 0.5C discharge to 40V</p> <p>Step 4: Standby 10min</p> <p>Step 5: Repeat Step 1-4 for 500 times, record the capacity retention after 1st cycle and 500th cycle</p> <p>Step 6: Calculate expected cycle number with 70% CRR by linear extrapolation.</p>	≥70% CRR after 7500 cycles

Special Electronic Characteristics of Cells

No.	Items	Test Method and Condition	Criteria
1	Discharge at Low Temperature	After standard charging, lay the battery 16h at -20±2°C, then discharge at 0.5C to 32V, record the discharging time	≥80min
2	Discharge at High Temperature	After standard charging, lay the battery 2h at 55±2°C, then discharge at 0.5C to 40V, record the discharging time	≥110min

Mechanical Characteristics

No.	Items	Test Method and Condition	Criteria
1	Vibration Test	After standard charging, fix the battery to vibration table and subject to vibration with 10Hz~55Hz frequency, each axis of XYZ for 30min, frequency changes 1Hz every 1min	No explosion No fire No leakage
2	Drop Test	The battery is to be dropped from 1m height for 2 times onto concrete ground	No explosion\ No fire No leakage

Safety Test (Cell)

No.	Items	Test Method and Condition	Criteria
1	Over-charge	Charge at 0.5C after standard charge, the battery voltage reaches to 150% Charge Cutoff Voltage or charge time reaches to 90min (stop the experiment if any condition reached)	No fire No explosion No smoke
2	Over-discharge	Discharge at 0.5C at 25°C±5°C for 90min	No explosion No fire No smoke No leakage
3	Short Circuit	Connect positive and negative terminal by conductive wire (<5mΩ) for 10min after standard charge	No explosion No fire No Smoke
4	Heat Shock	After charging, place the cell in a hot box, rise temperature to 130°C±2°C at 5°C/min, then keep for 30min	No explosion No fire

Long Time Storage

Suggested Long time storage SOC: 30%~50%.

Please activate the battery once every 3 months according to following steps:

1. Charge at 0.25C to 58.4V, and rest for 5 minutes
2. Discharge at 0.5C to 41.6V and rest for 5 minutes
3. Charge at 0.25C to 51V.

4. Product Cautionary Statement and Disclosure

Please review the following terms before using the product. Keep this paper for future reference.

- Place the battery out of the reach of children and infants.
- Do not place the battery in ovens or other similar appliances.
- Do not remove the product label.
- Do not attempt to open the battery pack.
- Do not expose to environment above 60°C (300F).
- Do not short circuit the positive and negative terminals of the battery with wire or other metal objects. Do not transport or store the battery with metal items.
- Do not expose the battery to direct heat or flame. Do not use or store the battery near to fire or a location subject to high temperature.
- Do not immerse or dampen the battery in water, saltwater, or any other liquid.
- Do not puncture the battery with any sharp objects. Do not hit it with a hammering device or similar devices. Do not step on it, drop it or subject it to strong shock.
- Do not use the battery if it is damaged or deformed.
- Immediately cease use of the battery if it produces strange smells, smokes or becomes abnormally hot.
- If the battery fluids leak and contact with an eye, do not rub the eye, immediately flush it with plenty of water before seeking medical assistance.

5. Others

Any matters that this specification sheet does not cover should be conferred between the customer and Gobel Power.

6. BMS Features

General Specification

No.	Items	Description	Default Value	Error
1	Overcharge Warning	Cell Overcharge Warning Voltage	3550mV	±10mV
		Pack Overcharge Warning Voltage	56.8V	±200mV
2	Overcharge Protection	Cell Overcharge Voltage 1/2	3650mV/3750mV	±10mV
		Cell Overcharge Detection Delay	1000ms	N/A
		Cell Overcharge Release Condition (Any)	3450mV	
			Discharge Current > 1A	
			SOC < 96%	
		Pack Overcharge Voltage	58.4V	±200mV
		Pack Overcharge Detection Delay	1000ms	N/A
		Pack Overcharge Release Condition (Any)	55.2V	
			Discharge Current > 1A	
			SOC < 96%	
3	Voltage Difference Warning	Cell Voltage Difference Warning Threshold	800mV	N/A
4	Voltage Difference	Cell Voltage Difference Protection Threshold	1000mV	N/A

	Protection	Cell Voltage Difference Protection Delay	2000ms	N/A
		Cell Voltage Difference Protection Release	500mV	N/A
5	Over Discharge Warning	Cell Over Discharge Warning Voltage	3100mV	±10mV
		Pack Over Discharge Warning Voltage	49.6V	±10mV
6	Over Discharge Protection	Cell Over Discharge Voltage 1/2	2600mV/2500mV	±10mV
		Cell Over Discharge Detection Delay	1000ms	N/A
		Cell Over Discharge Release Condition (Any)	2800mV	
			Charge Current > 1A	
		Pack Over Discharge Voltage	41.6V	±200mV
		Pack Over Discharge Detection Delay	1000ms	N/A
		Pack Over Discharge Release Condition	44.8V	
			Charge Current > 1A	
7	Over Current Warning	Over Current Warning Threshold	150A	±2A
8	Over Current Protection	Discharge Over Current Protection Current 1	155A	±2A
		Discharge Over Current Protection Delay 1	3s	N/A
		Discharge Over Current Protection Current 2	300A	±2A
		Discharge Over Current	160ms	N/A

		Protection Delay 2		
		Discharge Over Current Protection Release Condition	30s (<3 times)	
			Charge Current > 1A	
		Charge Over Current Protection Current	145A	±2A
		Charge Over Current Protection Delay	1s	±1s
		Charge Over Current Protection Release Condition	30s (<3 times)	
			Discharge Current > 1A	
9	Short Circuit Protection	Short Circuit Protection Threshold	≥800A	N/A
		Short Circuit Protection Delay	≤100μs	N/A
		Short Circuit Protection Release Condition	30s (<3 times)	
			Charge Current > 1A	
10	Temperature Protection	MOS High Temperature Protection	115℃	±3℃
		MOS High Temperature Protection Release	80℃	±3℃
		Charge High Temperature Warning	50℃	±2℃
		Charge High Temperature Protection	55℃	±2℃
		Charge High Temperature Protection Release	50℃	±2℃
		Charge Low Temperature Warning	5℃	±3℃

		Charge Low Temperature Protection	0℃	±3℃
		Charge Low Temperature Protection Release	5℃	±3℃
		Discharge High Temperature Warning	55℃	±2℃
		Discharge High Temperature Protection	60℃	±2℃
		Discharge High Temperature Protection Release	55℃	±2℃
		Discharge Low Temperature Warning	-20℃	±3℃
		Discharge Low Temperature Protection	-30℃	±3℃
		Discharge Low Temperature Protection Release	-20℃	±3℃
11	RS485 Port	For Parallel Connection	9600bps	N/A
12	RS232 Port	For Upper Computer	9600bps	N/A
13	CAN Port	For Inverter Communication	500Kbps	N/A
14	Resistance	Circuit Resistance	≤5mΩ	N/A
15	Power Consumption	Working Self Consumption	≤25mA	N/A
		Standby Self Consumption	≤100μA	N/A
16	Capacity	Low-Capacity Warning	SOC < 10%	N/A
		Capacity Range	0~655Ah	N/A
17	Sleep	Sleep Voltage	3V	N/A
		Sleep Delay	60s	N/A

	Active Balance (Optional)	Max Balance Current	5A	
		Cell Voltage Difference Result	<5mV	
		Work Energy Consumption	12mA	
		Sleep Energy Consumption	0.1mA	
		Sleep Voltage	<3V	

LED Indicator

There are 6 LEDs, 1 for Alarm, 1 for Run, 4 for Capacity.

● is solid lights, ★ is flashing lights (1Hz).

Battery Condition		Capacity				ALM	RUN
		1	2	3	4	5	6
Charge	1%~10%	★					★
	10%~40%	●	★				★
	40%~70%	●	●	★			★
	70%~99%	●	●	●	★		★
	100%	●	●	●	●		★
Discharge	0%	★				★	★
	1%~10%	●					★
	10%~40%	●	●				★
	40%~70%	●	●	●			★
	70%~100%	●	●	●	●		★
Parallel	1%~10%	●					★

Connection and Standby	10%~40%	●	●				★
	40%~70%	●	●	●			★
	70%~100%	●	●	●	●		★
Warning	Low-Capacity Warning					★	★
	Low Voltage Warning					★	★
	Over Voltage Warning					★	★
	Charge Over Current Warning					★	★
	Discharge Over Current Warning					★	★
	Charge Low Temperature Warning					★	★
	Charge High Temperature Warning					★	★
	Discharge Low Temperature Warning					★	★
	Discharge High Temperature Warning					★	★
	MOS High Temperature Warning					★	★
	Fan Malfunction Warning					★	★
	Cell Balance Warning					★	★
Protection	Low Voltage Protection	●				●	★
	Over Voltage Protection						★
	Charge Over Current Protection		●			●	★

	Discharge Over Current Protection			●		●	★
	Charge Low Temperature Protection	●	●			●	★
	Charge High Temperature Protection	●		●		●	★
	Discharge Low Temperature Protection	●			●	●	★
	Discharge High Temperature Protection		●	●		●	★
	MOS High Temperature Protection		●		●	●	★
	Discharge Short Circuit Protection	●	●		●	●	★
Error	Charge MOS Malfunction					●	
	Discharge MOS Malfunction		●			●	
	Cell Voltage Detection Malfunction			●		●	
	Cell Voltage Detection Leads Broken				●	●	
	Cell Temperature Detection Malfunction	●	●			●	
	Cell Temperature Detection Leads Broken	●		●		●	
	Current Detection Malfunction	●			●	●	
	Cells Voltage Severely Unbalanced		●	●		●	
	Wrong Settings		●		●	●	

	Parallel Malfunction			●	●	●	
	Pre-charge Circuit Malfunction	●	●	●		●	
	Communication Malfunction	●	●		●	●	
	Charger Malfunction	●		●	●	●	
	Multiple Malfunctions	●	●	●	●	●	

Buzzer (Optional)

Error: beep per 1s

Protection: beep per 2s

Warning: beep per 3s

Power On/Off Button

Optional 1: Self-locking button. press down the button, power on, press again, power off.

Sleep and Wake Up

Sleep: Battery will be in Sleep Mode if any following conditions reached.

- 1) Cell or Pack Over Discharge Protection lasts for 30s and not released
- 2) Press down Power On/Off button for 3s then release
- 3) Lowest voltage of cells is below 'Sleep Voltage' set value in settings while no charging and discharging.
- 4) Standby for more than 24 hours while no charging and discharging
- 5) Manually switch to sleep in upper computer.

Wake Up: Battery will be out of Sleep Mode if any following conditions reached.

- 1) Charger is plugged in; voltage of charger is greater than 48V
- 2) Press down Power On/Off button for 3s then release
- 3) Plug in communication cable, open upper computer software (not available if in Over Discharging Protection)

Note: Battery will be in Sleep Mode if Over Discharge Protection is on. Battery will automatically wake up every 4 hours and switch on Charge/Discharge MOS, if charging is available, battery will be charged, otherwise battery will go back to Sleep Mode. If it has been waked up for 10 times but charging is not available, battery will not automatically wake up again.

Communication

- 1) RS232: BMS can communicate with upper computer through RS232 port, default band rate is 9600bps. Various cells information can be monitored in the upper computer software.
- 2) RS485: Parallely connected batteries can communicate through RS485 port, default band rate is 9600bps.
- 3) CAN: Battery can communicate with inverter through CAN port, default band rate is 500Kbps.

DIP Switch

- 1) Automatic Allocation: If address of each battery is not set by DIP Switch, BMS will automatically detect all batteries and allocate address. The battery with lowest address will be Master Battery.
- 2) Manually Allocation: Address of each battery can be manually set by DIP Switch. Address definitions are in following table.

Address	1#	2#	3#	4#	5#	6#	Battery
0	OFF	OFF	OFF	OFF			No Parallel
1	ON	OFF	OFF	OFF			Master B1
2	OFF	ON	OFF	OFF			B2
3	ON	ON	OFF	OFF			B3
4	OFF	OFF	ON	OFF			B4
5	ON	OFF	ON	OFF			B5
6	OFF	ON	ON	OFF			B6
7	ON	ON	ON	OFF			B7

8	OFF	OFF	OFF	ON			B8
9	ON	OFF	OFF	ON			B9
10	OFF	ON	OFF	ON			B10
11	ON	ON	OFF	ON			B11
12	OFF	OFF	ON	ON			B12
13	ON	OFF	ON	ON			B13
14	OFF	ON	ON	ON			B14
15	ON	ON	ON	ON			B15

Temperature Sensor

4 NTC sensors.

DRY Port

350V, 100mA, ON Resistance 50Ω.

Upper Computer Software

The software can monitor and set up BMS parameters, such as voltage, current, temperature, SOC and SOH. Remote control and parameters setting only works for Master Battery.

7. Quality Control

Type	Inspection Item
Factory Inspection	Appearance/Polarity/Label
	Dimension/Weight
	Capacity (Standard Charge/Discharge)
	Communication
	Cells Balance
	Button's Function
	BMS Readings/Settings
Type Inspection	Capacity under High Temperature
	Capacity under Low Temperature
	Self-Discharging Rate
	Energy Efficiency
	Over Discharge Protection
	Over Charge Protection
	Temperature Protection
	Short Circuit Protection
	Over Current Protection
	Drop, Vibration
	Cycle Life

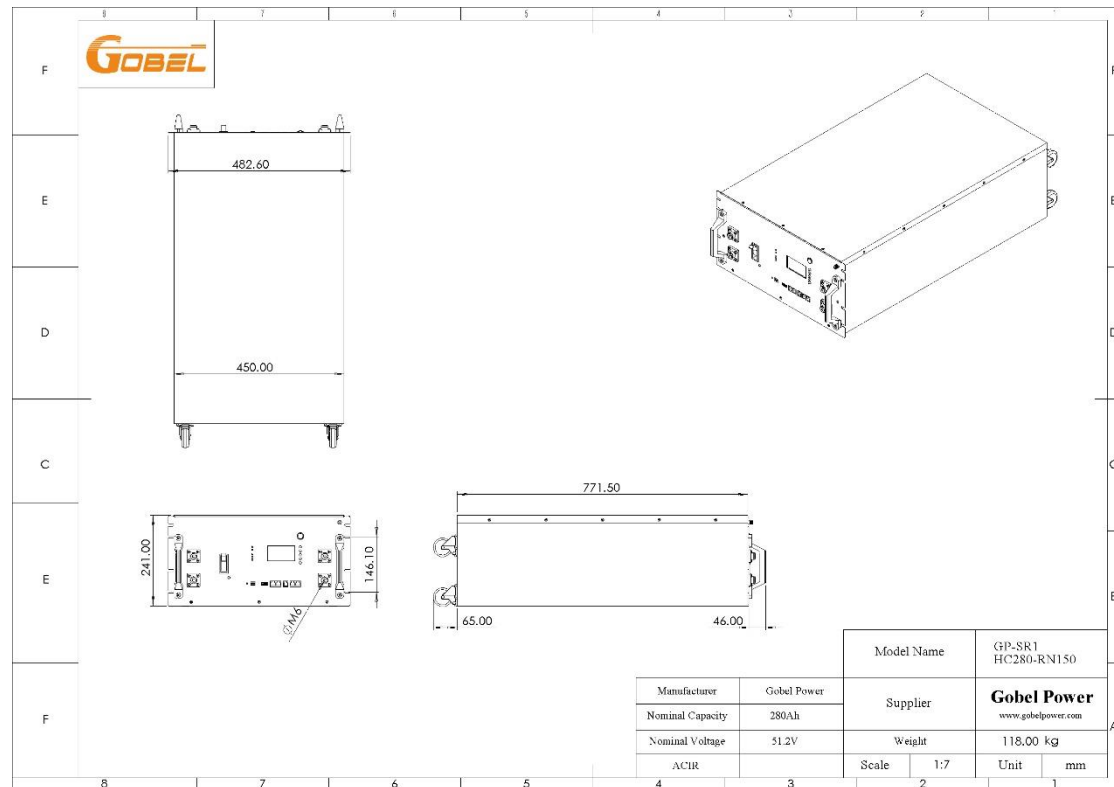
Factory Inspection: Each battery should be inspected before shipping.

Type Inspection: Sample test should be done if any of following conditions reached,

- 1) New product
- 2) New factory
- 3) Product that has not been produced for 1 year
- 4) New electrical design
- 5) Different models of cell or BMS are used.

8. Battery Pack Diagram

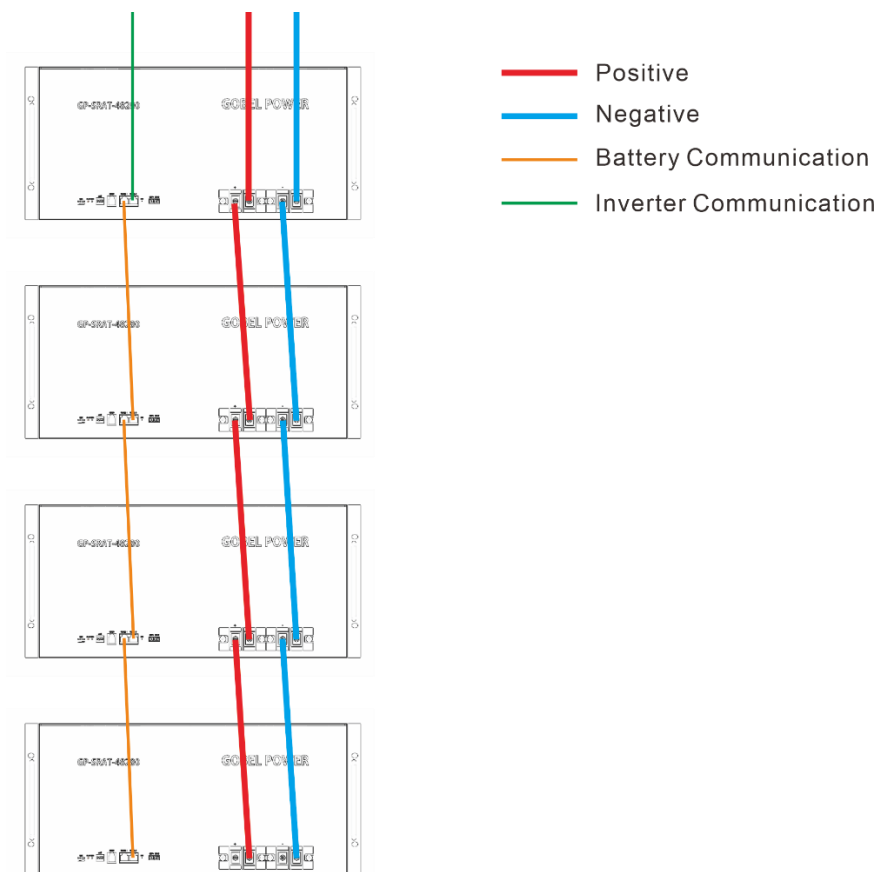
Schedule Drawing



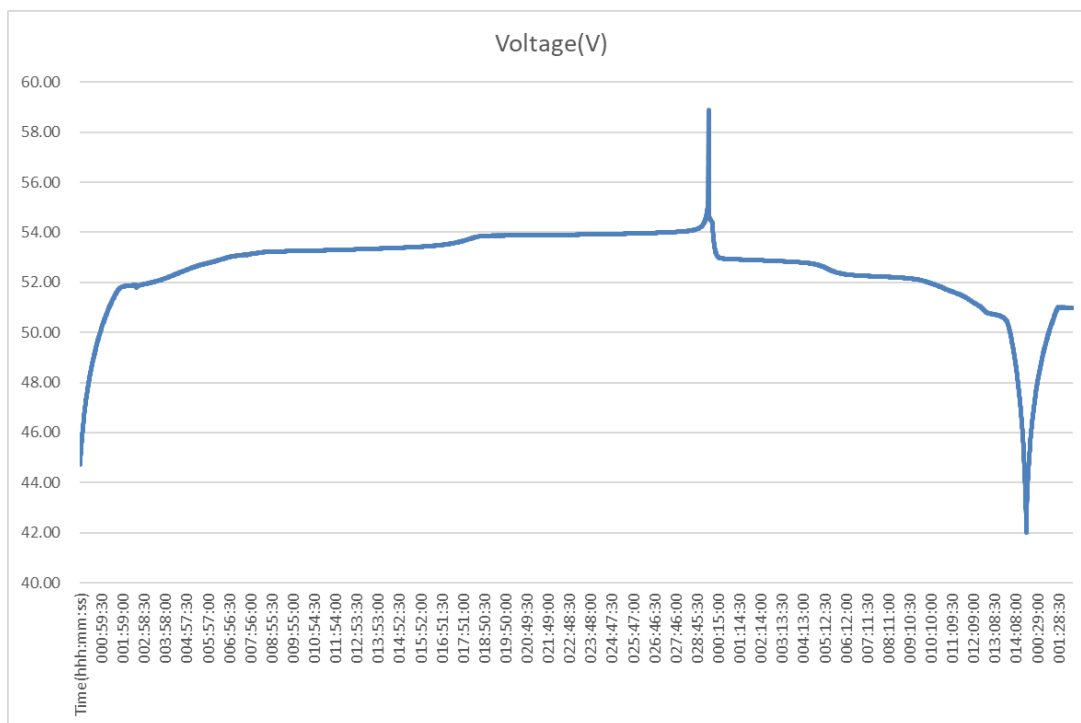
The diagram illustrates the architecture of a Battery Management System (BMS). At the top, a green box labeled "HMS (Optional)" is connected to a central blue box labeled "Cells Array" with a "+" sign on the left and a "-" sign on the right. The "Cells Array" is connected to a red line on the left, which passes through a "Breaker (Optional)" and a "Fast Fuse (Optional)" before reaching the "P+" terminal. On the right, a blue line connects the "Cells Array" to the "P-" terminal. A purple box labeled "BMS" is connected to the "Cells Array" via "Voltage Leads" and "Temperature Leads". The "BMS" is also connected to several optional components: a "Bluetooth Module (Optional)", a "Heating/Cooling (Optional)" unit, a "Screen (Optional)", a "Capacity Indicator", a "Power Button", and a communication module (CAN, RS485, RS232, DRY, Address, Reset).

Parallel Connection Diagram

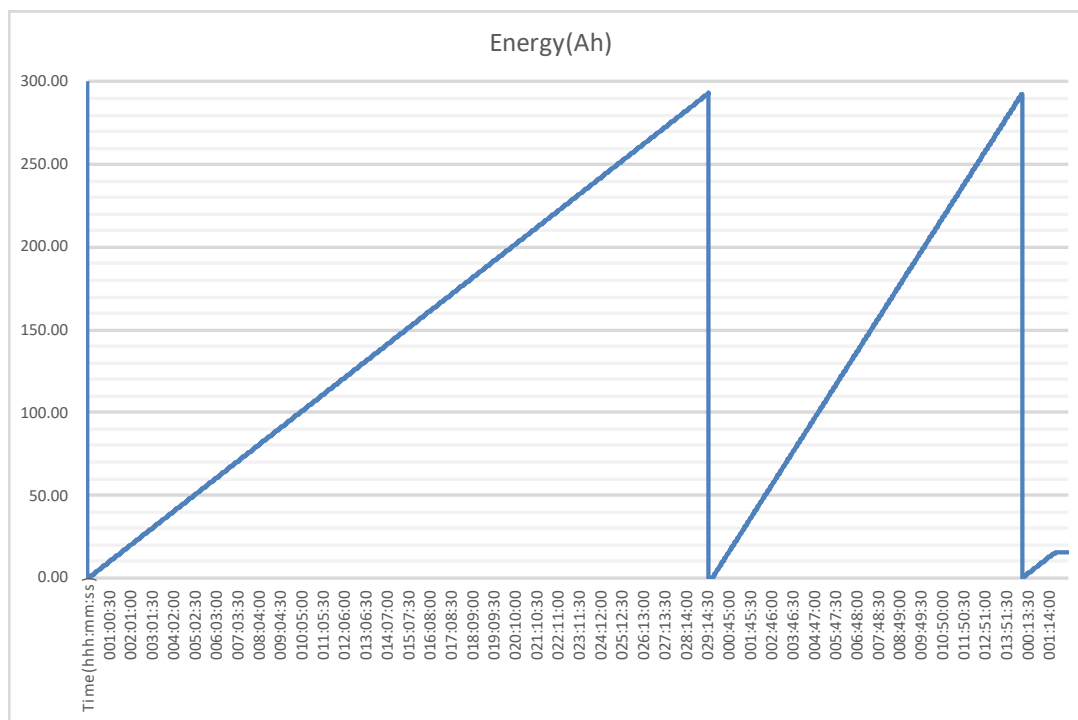
Support max 15 batteries parallel connection.



Test Curve (10A Charge and 20A Discharge)



Voltage During Charge and Discharge



Energy In and Out During Charge and Discharge