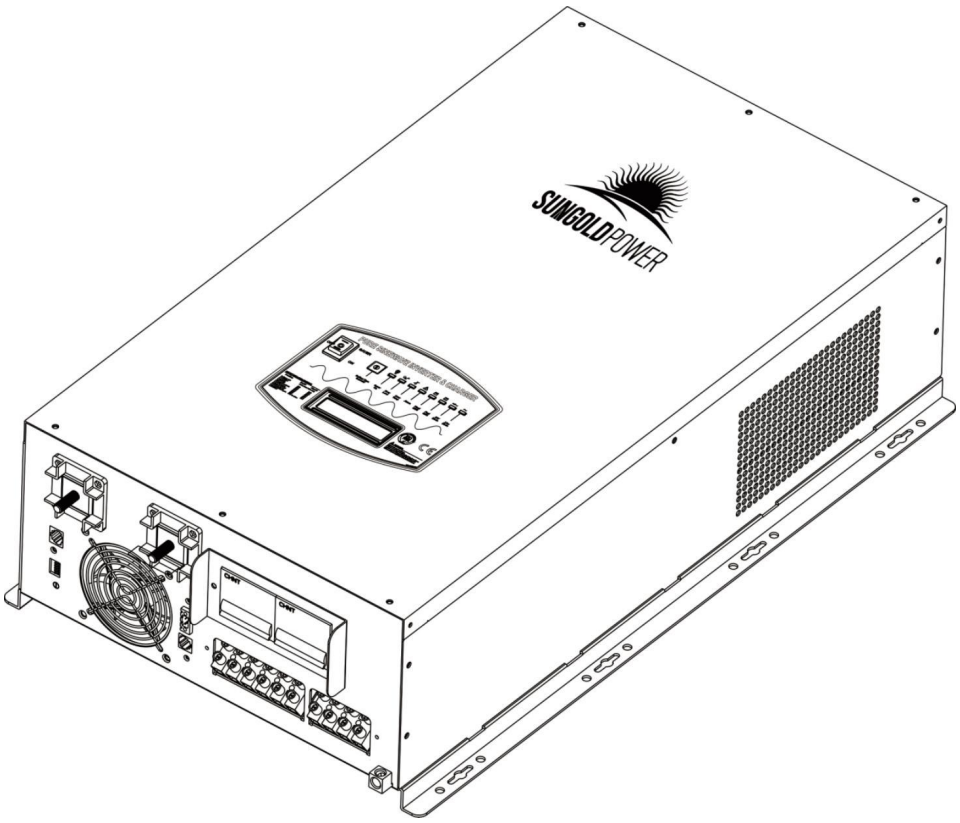
LF-PV Series

Pure Sine Wave Inverter
For All Home & Office Appliances

User's Manual

Version 1.0



Utility + Inverter + Charger + Transfer SW + Solar Power + AGS

All in One

LF-PV Series Inverter/Charger

Installation and Operation Manual

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1. Important Safety Information

WARNING!

This manual contains important instructions for all LF-PV Inverter/Charger models that shall be followed during installation and maintenance of the inverter.

1.1 General Safety Precautions

1. Before installing and using the LF Inverter/Charger, read all instructions and cautionary markings on the LF Inverter /Charger and all appropriate sections of this guide. Be sure to read all instructions and cautionary markings for any equipment attached to this unit.
2. This unit is designed for indoor use only. Do not expose the LF Inverter/Charger to rain, snow, or spray.
3. To reduce risk of fire hazard, do not cover or obstruct the ventilation openings. Do not install the LF Inverter/Charger in a zero-clearance compartment. Overheating may result.
4. Use only attachments recommended or sold by the manufacturer. Doing otherwise may result in a risk of fire, electric shock, or injury to persons.
5. To avoid a risk of fire and electric shock, make sure that existing wiring is in good condition and that wire is not undersized. Do not operate the LF Inverter/Charger with damaged or substandard wiring.
6. Do not operate the LF Inverter/Charger if it has received a sharp blow, been dropped, or otherwise damaged in any way. If the LF Inverter/Charger is damaged, see the Warranty section.
7. Do not disassemble the LF Inverter/Charger. It contains no user-serviceable parts. See Warranty for instructions on obtaining service. Attempting to service the LF Inverter/Charger yourself may result in a risk of electrical shock or fire. Internal capacitors remain charged after all power is disconnected.
8. The LF Inverter contains more than one live circuit (batteries and AC line). Power may be present at more than one source. To reduce the risk of electrical shock, disconnect both AC and DC power from the LF Inverter/Charger before attempting any maintenance or cleaning or working on any circuits connected to the LF Inverter/Charger. Turning off controls will not reduce this risk.
9. Use insulated tools to reduce the chance of short-circuits when installing or working with the inverter, the batteries, or PV array.

1.2 Precautions When Working with Batteries

1. Make sure the area around the battery is well ventilated.
2. Never smoke or allow a spark or flame near the engine or batteries.
3. Use caution to reduce the risk or dropping a metal tool on the battery. It could spark or short circuit the battery or other electrical parts and could cause an explosion.
4. Remove all metal items, like rings, brace lets, and watches when working with lead-acid batteries. Lead-acid batteries produce a short circuit current high enough to weld metal to skin, causing a severe burn.
5. Have someone within range of your voice or close enough to come to your aid when you work near a lead-acid battery.
6. Have plenty of fresh water and soap near by in case battery acid contacts skin, clothing, or eyes.
7. Wear complete eye protection and clothing protection. Avoid touching your eyes while working near batteries.
8. If battery acid contacts skin or clot hing, wash immediately with soap and water. If acid enters your eye, immediately flood it with running cold water for at least twenty minutes and get medical attention immediately.
9. If you need to remove a battery, always remove the grounded terminal from the battery first. Make sure

all accessories are off so you don't cause a spark.
10. Always use identical types of batteries.
11. Never install old or untested batteries. Check each battery's date code or label to ensure age and type.
12. Batteries are temperature sensitive. For optimum performance, the should be installed in a stable temperature environment.
13. Always recycle old batteries. Contact yo ur local recycling center for proper disposal information.

2. Introduction

2.1 General Information

Thank you for purchasing the LF Series Inverter/Charger.
LF-PV Series Pure Sine Wave Inverter is a combination of an inverter, charger, solar power and Auto-transfer switch into one complete system . It is packed with unique features and it is one of the most advanced inverter/chargers in the market today.
The inverter features an AC pass-through circuit, powering your home appliances from utility or generator power while charging the battery. When utility power fails, the battery backup system keeps your appliances powered until utility power is restored. Internal protection circuits prevent over-discharge of the batteries by shutting down the inverter when a low battery condition occurs. When utility or generator power is restored, the inverter transfers to the AC source and recharges the batteries.

Accessories allow the LF-PV series to also serve as a central hub of a renewable energy system. Set the LF-PV Series inverter to battery priority mode, designates the inverter-preferred UPS configuration. In this configuration, the load power in normally provided by the inverter. However, if the inverter output is interrupted, an internal transfer switch automatically transfers the load from the inverter to commercial AC power. The transfer time between inverter and line is short(6ms typical), and such transfers are normally not detected by even highly sensitive loads. Upon restoration of inverter power, the inverter will transfer back to inverter power.
On the line priority mode, when utility AC power cuts off(or falls out of acceptable range), the transfer relay is de-energized and the load is automatically transferred to the Inverter output. Once the qualified AC utility is restored, the relay is energized and the load is automatically reconnected to AC utility.
It features power factor corrected, sophisticated multi-stage charging and pure sine wave output with unprecedentedly high surge capability to meet demanding power needs of inductive loads without endangering the equipment.

LF-PV Series Inverter is equipped with a powerful charger of up to 120Amp (depending on Model). The overload capacity is 300% of continuous output for up to 20 seconds to reliably support tools and equipment longer

Another important feature is that the inverter can be easily customized to Battery priority via a DIP switch, this helps to extract maximum power from battery in renewable energy systems. Thus, the LF-PV Series Pure Sine Wave Inverter is suitable for Renewable energy system, Utility, RV, Marine and Emergency appliances.

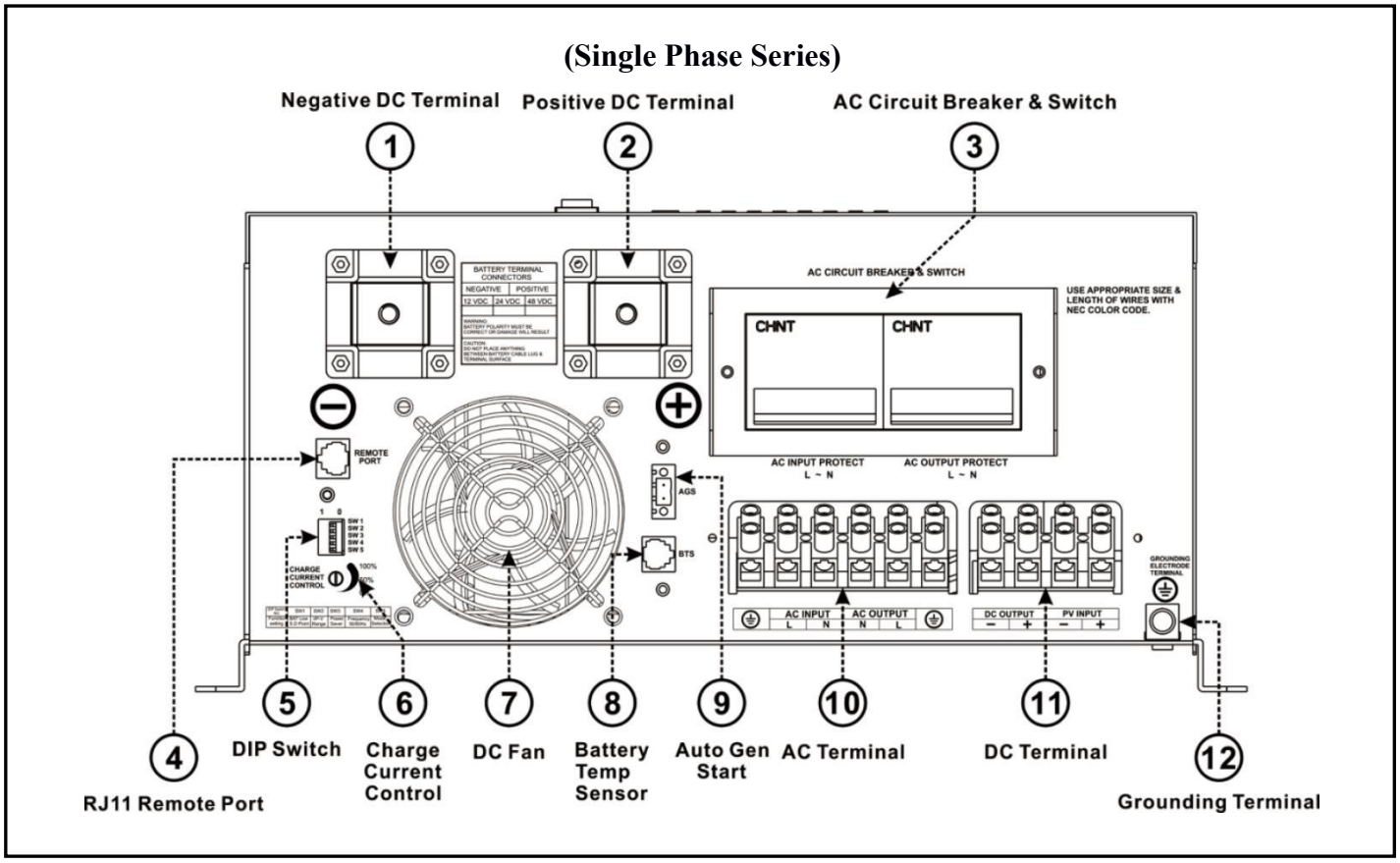
To get the most out of the power inverter, it must be installed, used and maintained properly. Please read the instructions in this manual before installing and operating.

2.2 Application

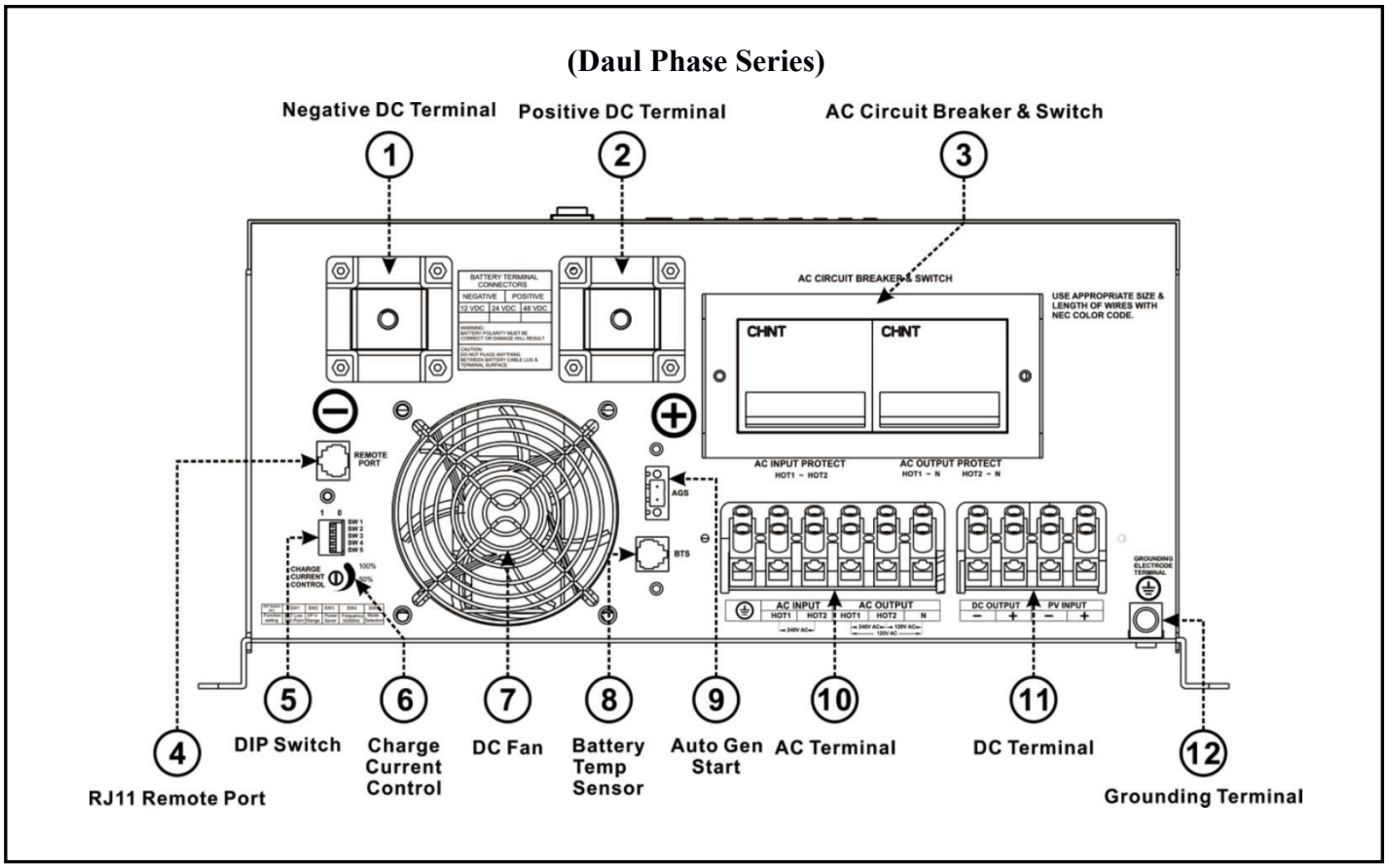
Power tools–circular saws, drills, grinders, sanders, buffers, weed and hedge trimmers, air compressors.
Office equipment – computers, printers, monitors, facsimile machines, scanners.
Household items – vacuum cleaners, fans, fluorescent and incandescent lights, shavers, sewing machines.
Kitchen appliances – coffee makers, blenders, ice markers, toasters.
Industrial equipment – metal halide lamp, high – pressure sodium lamp.
Home entertainment electronics – television, VCRs, video games, stereos, musical instruments, satellite equipment.

2.3 The Mechanical Drawing of LF-PV Series

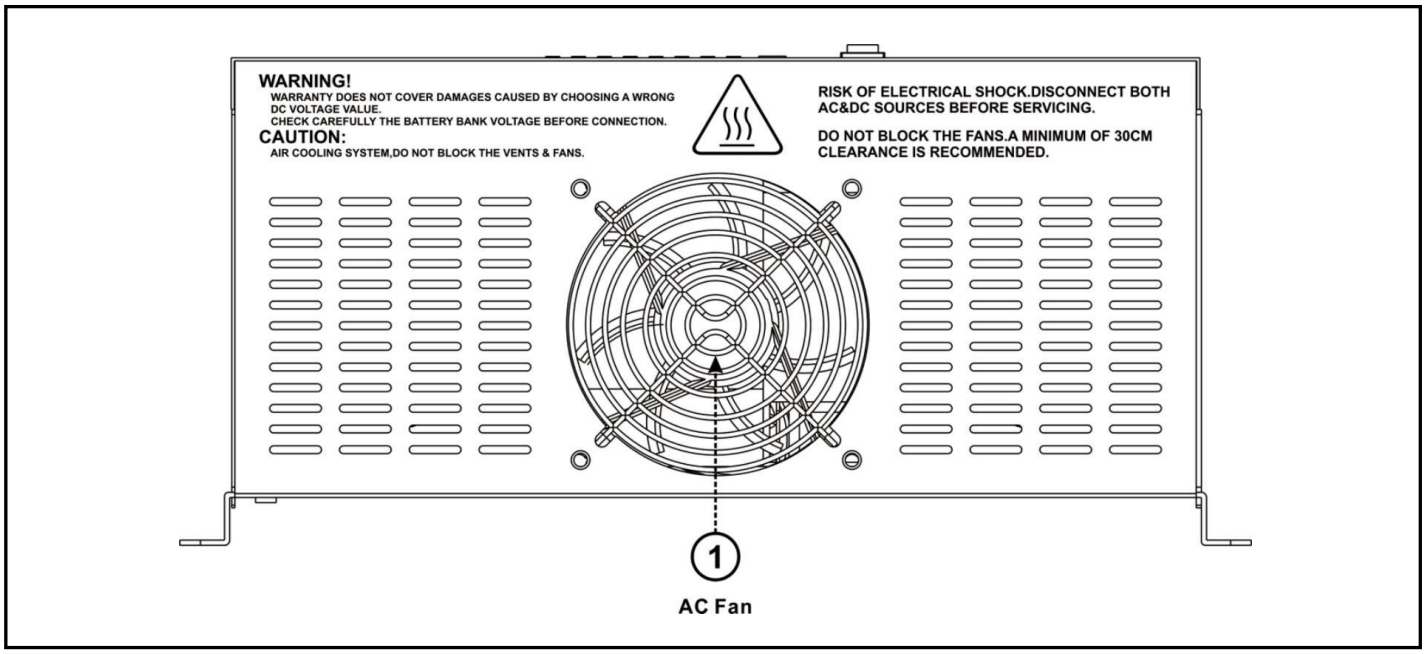
2.3.1 The Front Side Mechanical Drawing of LF-PV 4-12KW Series



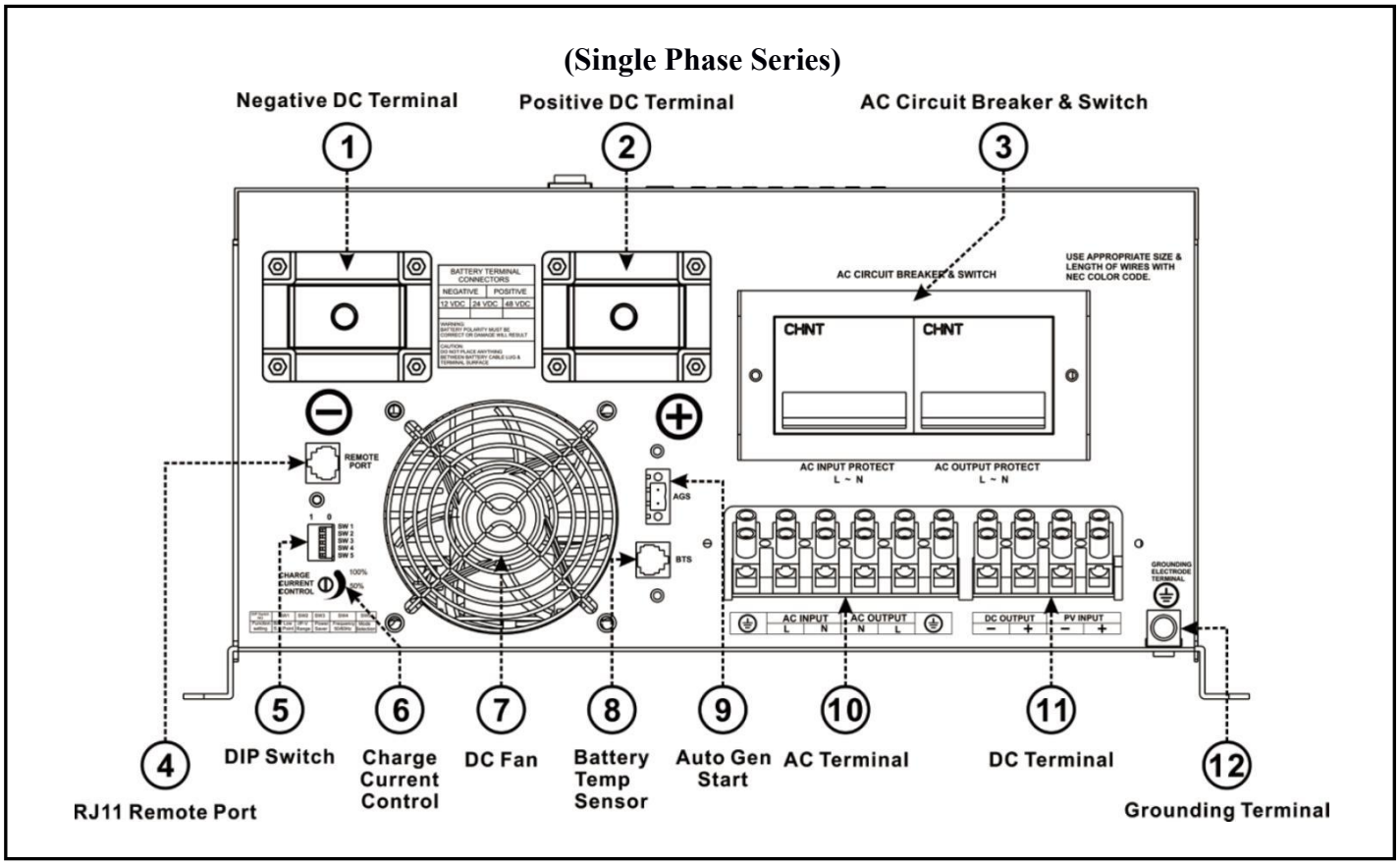
2.3.2 The Front Side Mechanical Drawing of LF-PV 4-12KW Series



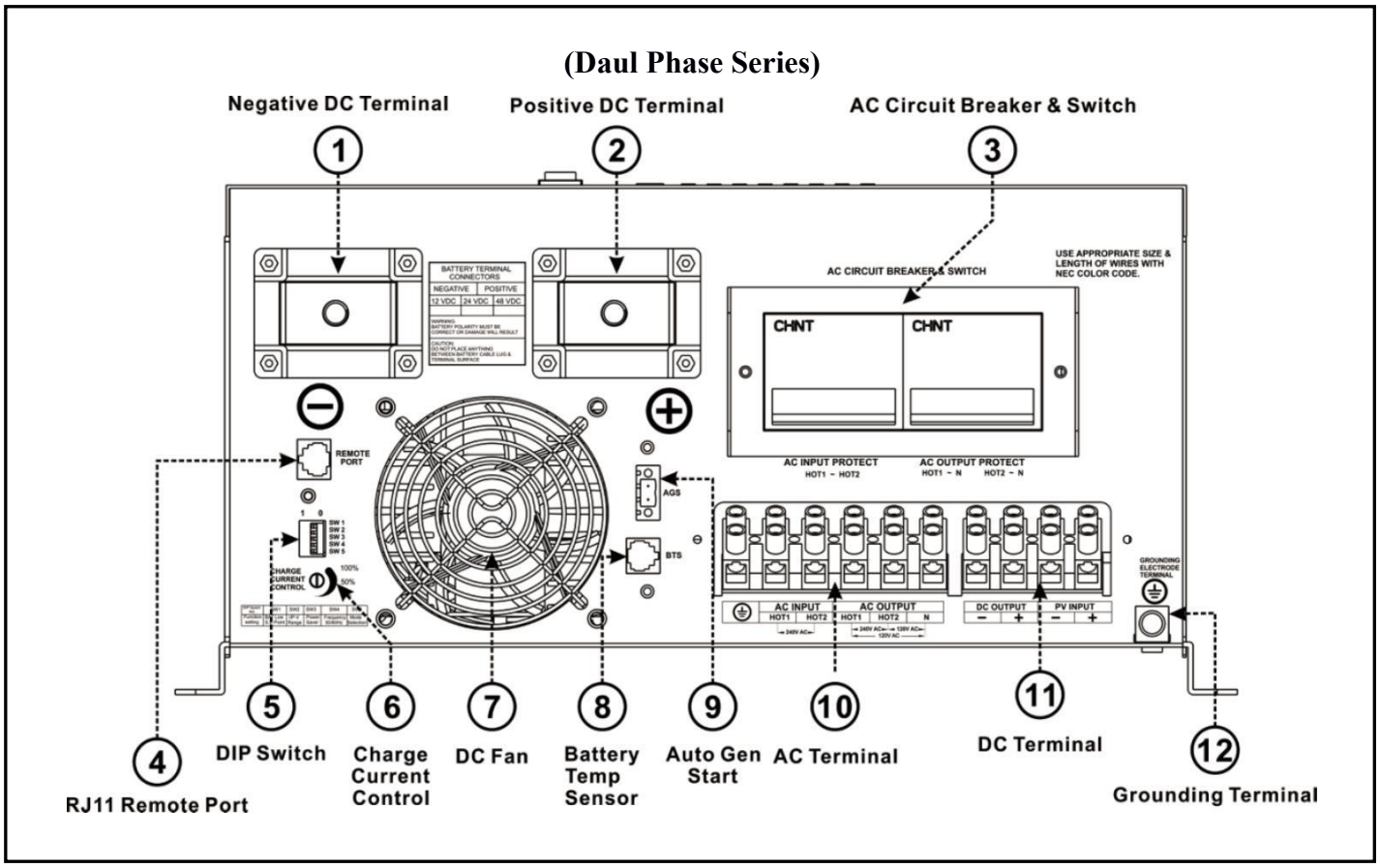
2.3.3 The Rear Side Mechanical Drawing of LF-PV 4-6KW Series



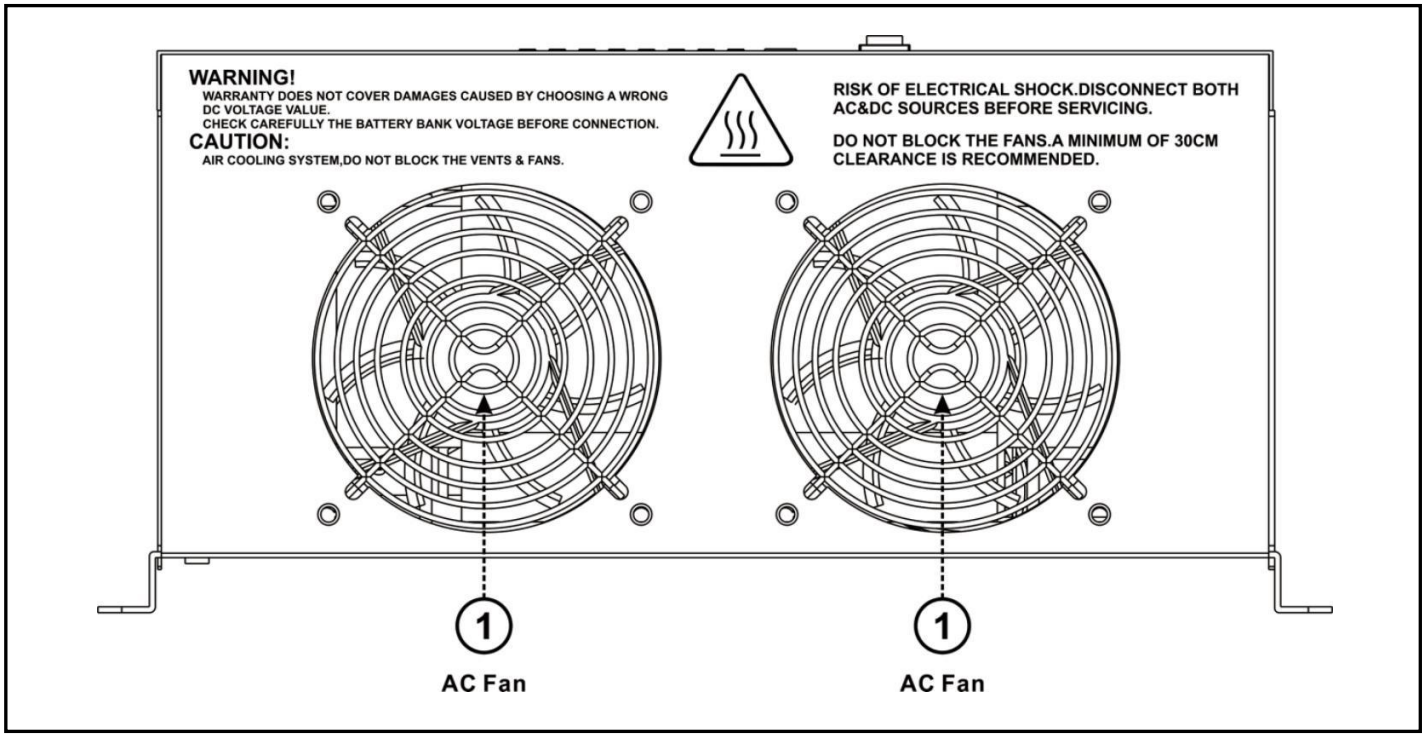
2.3.4 The Front Side Mechanical Drawing of LF 15-18KW Series



2.3.5 The Front Side Mechanical Drawing of LF 15-18KW Series



2.3.6 The Rear Side Mechanical Drawing of LF 8-18KW Series



2.4 Features

- Smart Remote Control (RJ11 or RJ45)
- Battery Temperature Sensor (BTS)
- Automatic Generator Start (AGS)
- Support Solar Panel with MPPT Function
- Designed For Harsh Environment Operation
- DC Start & Automatic Self-Diagnostic Function
- Compatible With Linear & Non-Linear Load
- Easy to Install & Easy to Operate & Easy to Solve
- Low DC Voltage Supports Home & Office Appliances
- Powerful Charge Rate Up to 120Amp, Selectable From 0%-100%
- High Efficiency Design & “Power Saving Mode” to Conserve Energy
- Battery Priority Mode, Designates the Inverter-Preferred UPS Configuration
- 13 Vdc Battery Recover Point, Dedicated for Renewable Energy Systems
- 8 pre Set Battery Type Selector plus De-sulphation for Totally Flat Batteries
- 4-step Intelligent Battery Charging, PFC (Power Factor Correction) for Charger
- 8 ms Typical Transfer Time Between Utility & Battery, Guarantees Power Continuity
- 15s Delay Before Transfer when AC Recover, Protection for Load when Used with Generator

2.5 Electrical Performance

2.5.1 Inverter

Topology

The LF-PV inverter/charger is built according to the following topology.
Inverter: Full Bridge Topology.
AC Charger: Isolate Boost Topology
Solar Charger: MPPT PV Controller
Because of high efficiency IGBT and 16bit, 4.9MHz microprocessor and heavy transformers, it outputs PURE SINE WAVE Waveform with an average THD of 8% (Max 10%) depending of load connected and battery voltage.
The peak efficiency of LF-PV series is 88%.

Overload Capacity

The LF-PV series inverters have different overload capacities, making it ideal to handle demanding loads.
1 For 110%<Load<125%(±10%), no audible alarm in 14 minutes, beeps 0.5s every 1s in the 15th minute, and Fault(Turn off) after the 15th minute.
2 For 125%<Load<150%(±10%), beeps 0.5s every 1s and Fault(Turn off) after the 1 minute.
3 For 300%≧Load>150%(±10%), beeps 0.5s every 1s and Fault(Turn off) after 20s.

2.5.2 AC Charger

LF Series is equipped with an active PFC (Power Factor Corrected) multistage battery charger. The PFC feature is used to control the amount of power used to charge the batteries in order to obtain a power factor as close as possible to 1.
Unlike other inverters whose max charging current decreases according to the input AC voltage, LF-PV series charger is able to output max current as long as input AC voltage is in the range of 164-243VAC (95-127VAC for 120V model), and AC freq is in the range of 48-54Hz(58-64Hz for 60Hz model).
The LF-PV series inverter is with a strong charging current of 120Amp (for 4KW,12V), and the max charge current can be adjusted from 0%-100% via a linear switch at the right of the battery type selector. This will be helpful if you are using our powerful charger on a small capacity battery bank. Fortunately, the linear switch can effectively reduce the max charging current to 20% of its peak.
Choosing “0” in the battery type selector will disable charging function.
There are mainly 3 stages:
Bulk Charging: This is the initial stage of charging. While Bulk Charging, the charger supplies the battery with controlled constant current. The charger will remain in Bulk charge until the Absorption charge voltage (determined by the Battery Type selection) is achieved.
Software timer will measure the time from A/C start until the battery charger reaches 0.3V below the boost voltage, then take this time asT0 and T0×2 = T1.
Absorb Charging: This is the second charging stage and begins after the absorb voltage has been reached. Absorb Charging provides the batteries with a constant voltage and reduces the DC charging current in order to maintain the absorb voltage setting.
In this period, the inverter will start a T1 timer; the charger will keep the boost voltage in Boost CV mode until the T1 timer has run out. Then drop the voltage down to the float voltage. The timer has a minimum time of 1 hour and a maximum time of 12 hours.
Float Charging: The third charging stage occurs at the end of the Absorb Charging time. While Float charging, the charge voltage is reduced to the fl oat charge voltage (determined by the Battery Type selection*). In this stage, the batteries are kept fully charged and ready if needed by the inverter.
If the A/C is reconnected or the battery voltage drops below 12Vdc/24Vdc/48Vdc, the charger will reset the

cycle above.

If the charge maintains the float state for 10 days, the charger will deliberately reset the cycle to protect the battery.

Table 2.5.1 Battery Charging Processes

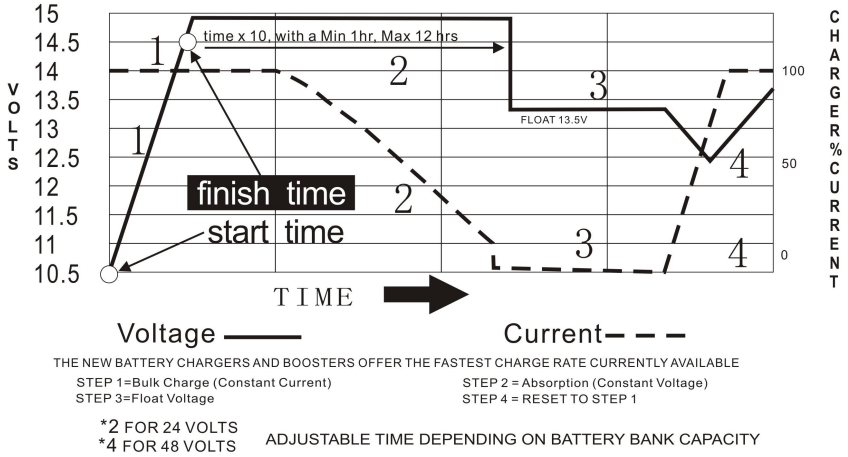


Table 2.5.2 Battery Type Selector

Switch Setting	Description	Fast Mode / VDC	Float Mode / VDC
0	Charger Off		
1	Gel USA	14.0	13.7
2	AGM 1	14.1	13.4
3	Lithium	13.8	13.6
4	Sealed Lead Acid	14.4	13.6
5	Gel EURO	14.4	13.8
6	Open Lead Acid	14.8	13.3
7	LiFePO4	14.0	13.8
8	De-sulphation	15.5 (4 Hours then Off)	
9	Classic LFP	13.6	13.5

For 12Vdc Battery Mode (*2 for 24Vdc Mode ; *4 for 48Vdc Mode)

De-sulphation

The de-sulphation cycle on switch position 8 is marked in red because this is a very dangerous setting if you do not know what you are doing. Before ever attempting to use this cycle you must clearly understand what it does and when and how you would use it.

What causes sulphation? This can occur with infrequent use of the batteries(nor), or if the batteries have been left discharged so low that they will not accept a charge. This cycle is a very high voltage charge cycle designed to try to break down the sulfated crust that is preventing the plates taking a charge and thus allow the plates to clean up and so accept charge once again.

Charging depleted batteries

The LF-PV series inverter allows start up and through power with depleted batteries.

For 12VDC model, after the battery voltage goes below 10V, if the switch is still (and always) kept in "ON" position, the inverter is always connected with battery, and the battery voltage does not drop below 2V, the inverter will be able to charge the battery once qualified AC inputs are present.

Before the battery voltage goes below 9VDC, the charging can be activated when the switch is turned to “Off”, then to “ON”.

When the voltage goes below 9VDC, and you accidently turn the switch to OFF or disconnect the inverter from battery, the inverter will not be able to charge the battery once again, because the CPU loses memory during this process.

Tabel 2.5.3 AC Charging Current for LF model

Model Watt	Battery Voltage	AC Charger Current Max	Model Watt	Battery Voltage	AC Charger Current Max
1.000	12 Vdc	35 ± 5 Amp	**2.000**	12 Vdc	60 ± 5 Amp
	24 Vdc	20 ± 5 Amp		24 Vdc	30 ± 5 Amp
	48 Vdc	10 ± 5 Amp		48 Vdc	15 ± 5 Amp
3.000	12 Vdc	80 ± 5 Amp	**4.000**	12 Vdc	100 ± 5 Amp
	24 Vdc	45 ± 5 Amp		24 Vdc	55 ± 5 Amp
	48 Vdc	25 ± 5 Amp		48 Vdc	35 ± 5 Amp
5.000	24 Vdc	65 ± 5 Amp	**6.000**	24 Vdc	80 ± 5 Amp
	48 Vdc	40 ± 5 Amp		48 Vdc	50 ± 5 Amp
8.000	24 Vdc	100 ± 5 Amp	**10.000**	48 Vdc	80 ± 5 Amp
	48 Vdc	65 ± 5 Amp	**12.000**	48 Vdc	120 ± 5 Amp
15.000	48 Vdc	100 ± 5 Amp	**18.000**	48 Vdc	100 ± 5 Amp

The charging capacity will go to peak in around 3 seconds. This may cause a generator to drop frequency, making inverter transfer to battery mode.
It is suggested to gradually put charging load on the generator by switching the charging switch from min to max, together with the 15s switch delay, our inverter gives the generator enough time to spin up. This will depend on the size of the generator and rate of charge.

2.5.3 Transfer

While in the Standby Mode, the AC input is continually monitored. Whenever AC power falls below the VAC Trip voltage (154 VAC, default setting for 230VAC,90VAC for 120VAC), the inverter automatically transfers back to the Inverter Mode with minimum interruption to your appliances - as long as the inverter is turned on. The transfer from Standby mode to Inverter mode occurs in approximately 8 milliseconds. And it is the same time from Inverter mode to Standby mode.
Though it is not designed as a computer UPS system, this transfer time is usually fast enough to keep your equipment powered up.
There is a 15-second delay from the time the inverter senses that continuously qualified AC is present at the input terminals to when the transfer is made. This delay is built in to provide time for a generator to spin-up to a stable voltage and avoid relay chattering. The inverter will not transfer to generator until it has locked onto the generator's output. This delay is also designed to avoid frequent switching when input utility is unstable.

2.5.4 Frequency adjust

The frequency of the inverter is arranged by the SW4. Refer to the Table 2.5.11.
The factory default configuration for 220/230/240VAC inverter is 50Hz, and 60Hz for 100/110/120VAC inverter. While the output freq can be easily changed once a qualified freq is applied to the inverter.

2.5.5 Solar Charger

Listed below is the spec for solar charger

Table 2.5.4 Solar Charge Electrical Specification @ 25℃

Rated Voltage	**12Vdc**	**24Vdc**	**48Vdc**
Rated Charge Current (Includes Load Current)	80Amp		
Load Ccurrent	15Amp		
Input Voltage Range	15-145Vdc	30-145Vdc	60-145Vdc
Max. PV Open Circuit Array Voltage	145Vdc		
Overload Protection (DC load)	2.0 * I(Rated)>5s； 1.5 * I(Rated) >20s 1.25 * I(Rated) Temperature Controlled		
Typical Idle Consumption	At idle < 10mA		
Bulk Charge	14.6Vdc	29.2Vdc	58.4Vdc
Floating Charge	13.4Vdc	26.8Vdc	53.6Vdc
Equalization Charge	14.0Vdc	28.0Vdc	58.0Vdc
Over Charge Disconnect	14.8Vdc	29.6Vdc	59.2Vdc
Over Charge Recovery	13.6Vdc	27.2Vdc	54.4Vdc
Over Discharge Disconnect	10.8Vdc	21.6Vdc	43.2Vdc
Over Discharge Reconnect	12.3Vdc	24.6Vdc	49.6Vdc
Temperature Compensation	-13.2mV/℃	-26.4mV/℃	-52.8mV/℃
Lead Acid Battery Settings	Adjustable		
NiCad Battery Settings	Adjustable		
Low Voltage Reconnect	12.0-14.0Vdc	24.0-28.0Vdc	48.0-56.0Vdc
Low Voltage Disconnect	10.5-12.5Vdc	21.0-25.0Vdc	42.0-50.0Vdc
Ambient Temperature	0-40℃ (Full load) 40-60℃ (De-rating)		
Altitude	Operating 5000m, Non-Operating 16000m		
Battery Temperature Sensor①	BTS (Optional) Remote Battery Temperature Sensor for Increased Charging Precision		
Terminal Size (Fine/Single Wire)	#8 AWG		

NOTE:

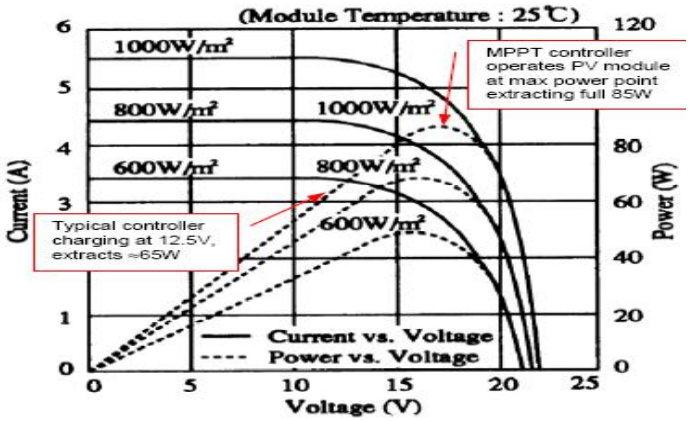
①The optional battery temperature sensor automatically adjusts the charging process of the controller according to the type of battery that is selected by user through battery type selector. With the battery temperature sensor installed, the controller will increase or decrease the battery charging voltage depending on the temperature of the battery to optimize the charge to the battery and maintain optional performance of the battery.

Maximum Power Point Tracking (MPPT) Function

Maximum Power Point Tracking, frequently referred to as MPPT, is an electronic system that operates the Photovoltaic (PV) modules in a manner that allows the modules to produce all the power they are capable of. The PV-seeker Charge controller is a microprocessor-based system designed to implement the MPPT.
And it can increase charge current up to 30% or more compared to traditional charge controllers

(See Table 2.5.4).

Table 2.5.5 Current, Power Vs. Voltage Characteristics



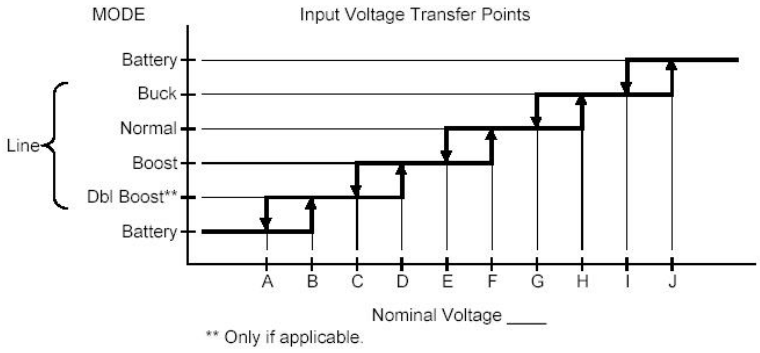
The Charge controller built in is with 12/24/48V battery voltage auto detecting function.
The output voltage of solar charger will be accordingly 12/24/48VDC. The qualified DC input volt range fo 12VDC invertert is 15 -145VDC, for 24VDCinverter is 30 -145VDC and for 48VDC inverter is 60 -100VDC.
If the voltage falls out of this range, the charger will not work properly. Special attention should be paid to this when configuring the solar array.

2.5.6 Automatic Voltage Regulation(Optional)

The automatic voltage regulation function is for full series of LF Pure Sine Wave Inverter/ Charger except split phase models including LF1000W~6000W.
Instead of simply bypassing the input AC to power the loads, the LF-PV series inverter stabilizes the input AC voltage to a range of 230V/120V ± 10%.
Connected with batteries, the LFS Series inverter will function as a UPS with max transfer time of 10 ms.
With all the unique features our inverter provides, it will bring you long-term trouble free operation beyond your expectation.

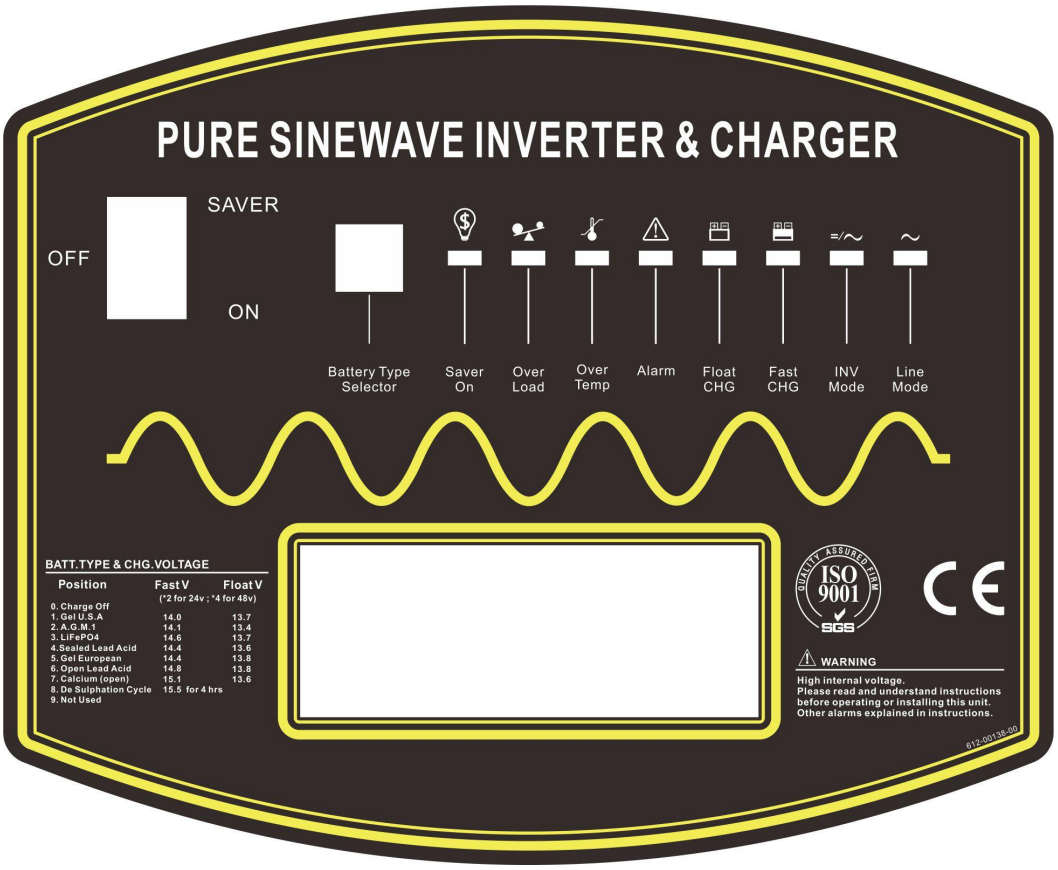
Function Introduction

Table 2.5.5 Input Voltage Transfer Points



LF-PV Function (Optional)	LF-PV Series					
	LV (NA/JPN)			HV (INTL)		
Acceptable Input Voltage Range (Vac)	**0-160**			**0-300**		
Nominal Input Voltages (Vac)	**100**	**110**	**120**	**220**	**230**	**240**
(A) Line low loss N/W (On battery)	75/65	84/72	92/78	168/143	176/150	183/156
(B) Line Low comeback N/W (On Boost)	80/70	89/77	97/83	178/153	186/160	193/166
(C) Line 2nd boost threshold (On Boost)	**	**	**	**	**	**
(D) Line 2nd boost comeback (On Normal)	**	**	**	**	**	**
(E) Line 1st boost threshold (On Boost)	90	99	108	198	207	216
(F) Line 1st boost comeback (On Normal)	93	103	112	205	215	225
(G) Line buck comeback (On Normal)	106	118	128	235	246	256
(H) Line buck threshold (On Buck)	110	121	132	242	253	264
(I) Line high comeback (On Buck)	115	127	139	253	266	278
(J) Line high loss (On Battery)	120	132	144	263	276	288

2.5.7 Power Saver Mode



There are 3 different working status for LF inverter: “Power Saver Auto” 、“Power Saver Off” and “Power Off”.

When power switch is in “Unit Off” position, the inverter is powered off.

When power switch is turned to either of “Power Saver Auto” or “Power Saver Off”, the inverter is powered on.Power saver function is designed to conserve battery power when AC power is not or rarely required by the loads.

In this mode, the inverter pulses the AC output looking for an AC load (i.e., electrical appliance). Whenever an AC load (greater than 25 watts) is turned on, the inverter recognizes the need for power and automatically starts inverting and output goes to full voltage. When there is no load (or less than 25 watts) detected, the inverter automatically goes back into search mode to minimize energy consumption from the battery bank. In "Power saver on" mode, the inverter will draw power mainly in sensing moments, thus the idle consumption is significantly reduced.

Power saver on	Power saver off	Power saver on (Load detected)
		

Note: The minimum power of load to take inverter out of sleep mode (Power Saver On) is 25 Watts.

Table 2.5.6 LF Series Idle Power Consumption

Model	Power Saver Off	Power Saver Auto	
	Idle(Max)	3Secs(Max)	Stand-By Mode
1.0KW	18W	7.5W	**2.5W**
1.5KW	18W	7.5W	
2.0KW	30W	10.0W	
3.0KW	60W	15.0W	
4.0KW	70W	20.0W	
5.0KW	80W	25.0W	
6.0KW	90W	25.0W	
8.0KW	120W	30.0W	
10.0KW	150W	35.0W	
12.0KW	180W	40.0W	
15.0KW	225W	45.0W	
18.0KW	270W	50.0W	

When in the search sense mode, the green power LED will blink and the inverter will make a ticking sound. At full output voltage, the green power LED will light steadily and the inverter will make a steady humming sound. When the inverter is used as an "Un-interruptible power supply" the search sense mode or "Power Saver On" function should be defeated.

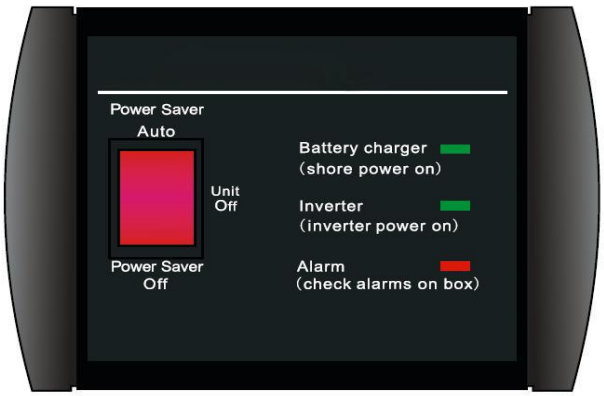
Exceptions

Some devices when scanned by the load sensor cannot be detected. Small fluorescent lights are the most common example. (Try altering the plug polarity by turning the plug over.) Some computers and sophisticated electronics have power supplies that do not present a load until line voltage is available. When this occurs, each unit waits for the other to begin. To drive these loads either a small companion load must be used to bring the inverter out of its search mode, or the inverter may be programmed to remain at full output voltage.

2.5.8 Protections

The LF-PV series inverter is equipped with extensive protections against various harsh situations/faults. These protections include:
AC Input over voltage protection/AC Input low voltage protection
Low battery alarm/High battery alarm
Over temperature protection/Over load protection
Short Circuit protection (1sec after fault)
Back feeding protection
When Over temperature /Over load occur, after the fault is cleared, the master switch has to be reset to restart the inverter.
The Low batter voltage trip point can be customized from defaulted value 10VDC to 10.5VDC turn the SW1 on DIP switch.
The inverter will go to Over temp protection when heat sink temp. ≥105ºC, and go to Fault (shutdown Output) after 30 seconds. The switch has to be reset to activate the inverter.
The LF series Inverter has back feeding protection which avoids presenting an AC voltage on the AC input terminal in Invert mode.
After the reason for fault is cleared, the inverter has to be reset to start working.

2.5.9 Remote control Module



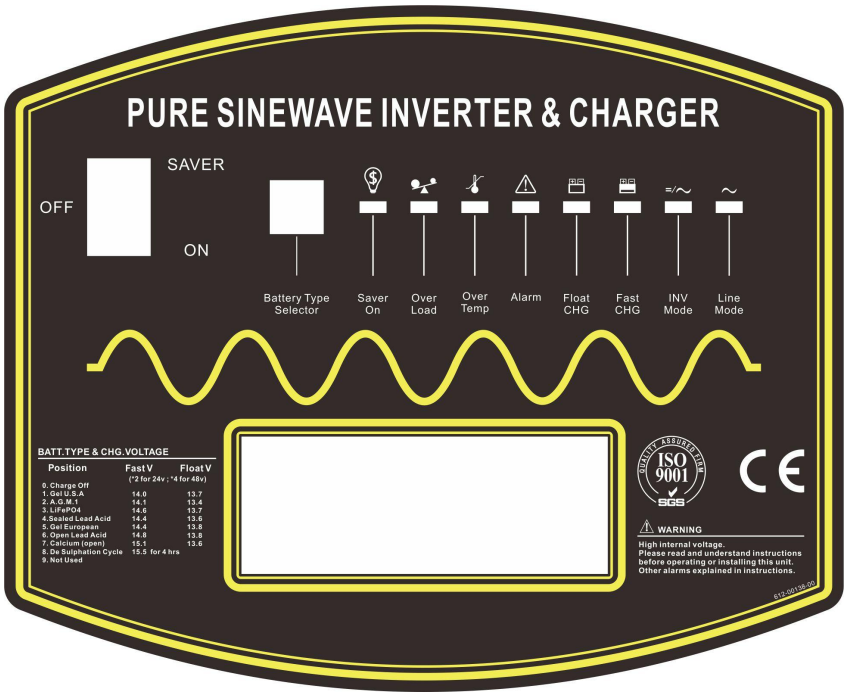
Apart from the switch panel on the front of the inverter, an extra switch panel connected to the RJ11 port at the DC side of the inverter thru a standard telephone cable can also control the operation of the inverter.
If an extra switch panel is connected to the inverter via “remote control port”, together with the panel on the inverter case, the two panels will be connected and operated in parallel.
Whichever first switches from “Off” to “Power saver off” or “Power saver on”, it will power the inverter on.
If the commands from the two panels conflict, the inverter will accept command according to the following priority:
Power saver on> Power saver off> Power off
Only when both panels are turned to “Unit Off” position will the inverter be powered off.
The Max length of the cable is 10 meters.

WARNING

Never cut the telephone cable when the cable is attached to inverter and battery is connected to the inverter. Even if the inverter is turned off. It will damage the remote PCB inside if the cable is short circuited during cutting.

2.5.10 LED Indicator & LCD

Table 2.5.7 LF Series LED Indicators



LINE MODE	GREEN LED lit in AC Mode	Please refer to **'Indicator and Buzzer'** for the detailed information.
INVERTER MODE	GREEN LED lit in Inverter Mode	
FAST CHARGE	YELLOW LED lit in Fast Charging Mode	
FLOAT CHARGE	GREEN LED lit in Float Charging Mode	
ALARM MODE	RED LED lit in Error State	
OVER TEMP TRIP	RED LED lit in Over Temperature	
OVER LOAD TRIP	RED LED lit in Over Load	
POWER SAVER ON	GREEN LED lit in Power Saver Mode	

Table 2.5.8 LF Series LCD Indicato

1 Greeting message Welcome To xxxxx	2 AC Status & Input Voltage AC: normal I/P-V:230V
3 Output Voltage/Frequency & Battery voltage O/P-V:230V F:50HZ BAT-V:12.5V	4 Output Current / Load(in percentage) O/P Current:100%

2.5.11 Audible Alarm

Table 2.5.9 LF Series Audible Alarm Spec

Battery Voltage Low	Inverter green LED lit, and the buzzer beeps 0.5s every 5s.
Battery Voltage High	Inverter green LED lit, and the buzzer beeps 0.5s every 1s and Fault after 60s.
Invert Mode Over-Load	(1)110%<load<125%(±10%), No audible alarm in 14 minutes, Beeps 0.5s every 1s in 15th minute and Fault after 15 minutes; (2)125% <load<150%(±10%), Beeps 0.5s every 1s and Fault after 60s; (3)Load>150%(±10%), Beeps 0.5s every 1s and Fault after 20s;
Over Temperature	Heat-sink temp. ≥105℃, Over temp red LED Lighting, beeps 0.5s every 1s;

2.5.12 FAN Operation

For 1-3KW, there is one multiple controlled DC fan, For 4-6KW, there is two multiple controlled DC fan which starts to work according to the following logic
For 8-12KW, there is two multiple controlled DC fan and one AC fan. The DC fan will work in the same way as the one on 1-3KW, while the AC fan will work once there is AC output from the inverter.
So when the inverter is in power saver mode, the AC fan will work from time to time in response to the pulse sent by the inverter in power saver mode.
The Operation of the DC fan at the DC terminal side is controlled by the following logic
(Refer to Table 2.5.10):

Table 2.5.10 LF Series Fan Operation Logic

Condition	Enter condition	Leave condition	Speed
HEAT SINK TEMPERATURE	T ≤ 60℃	T > 65℃	Off
	65℃≤ T <85 ℃	T ≤ 60℃ / T ≥ 85℃	50%
	T > 85℃	T ≤ 80℃	100%
CHARGER CURRENT	I ≤ 15%	I ≥ 20%	Off
	20%< I ≤ 50%	I ≤ 15% / I ≥ 50%	50%
	I > 50%	I ≤ 40%	100%
LOAD% (INV MODE)	Load < 30%	Load ≥ 30%	Off
	30% ≤ Load < 50%	Load ≤ 20% / Load ≥ 50%	50%
	Load ≥ 50%	Load ≤ 40%	100%

Allow at least 30cm of clearance around the inverter for air flow. Make sure that the air can circulate freely around the unit.
Variable speed fan operation is required in inverter and charge mode. This is to be implemented in such a way as to ensure high reliability and safe unit and component operating temperatures in an operating ambient temperature up to 50°C.

- Speed to be controlled in a smooth manner as a function of internal temperature and/or current.
- Fan should not start/stop suddenly.
- Fan should run at minimum speed needed to cool unit.
- Fan noise level target <60db at a distance of 1m.

2.5.13 DIP Switches

On the front panel of inverter, there are 5 DIP switches which enable users to customize the performance of the device.

Table 2.5.11 LF Series Dip Switch Function Setting

DIP Switch NO.	Switch Function		Position: 0	Position: 1
SW1	Low Battery Trip Volt		10.0Vdc For Deep-Cycle Battery	10.5Vdc For Starting Battery
			*2 for 24Vdc, *4 for 48Vdc	
SW2	AC Input Range / (AVR)	AC Source	For Utility Mode	For Generator Mode
		230Vac HV	184-253Vac / (176-276Vac)	140-270Vac / (150-276Vac)
		120Vac LV	100-135Vac / (92-144Vac)	90-135Vac / (78-144Vac)
SW3	Power Saver Auto Setting		Night Charger Function	Detect Load Per 3Secs
SW4	O/P Frequency Setting		50Hz	60Hz
SW5	Solar/AC Priority Setting		Utility Priority	Battery Priority

SW1: Low Battery Trip Volt:

For 12VDC model, the Low Battery Trip Volt is set at 10.0Vdc by typical deep cycle lead acid battery. It can be customized to 10.5Vdc using SW1 for sealed car battery, this is to prevent batteries from over-discharging while there is only a small load applied on the inverter.(*2 for 24VDC, *4 for 48VDC)

SW2: AC Input Range:

There are different acceptable AC input ranges for different kinds of loads.

For some relatively sensitive electronic devices, a narrow input range of 184-253VAC (100-135V for 120VAC model) is required to protect them.

While for some resistive loads which work in a wide voltage range, the input AC range can be customized to 140-270VAC (90-135V for 120VAC model), this helps to power loads with the most AC input power without frequent switches to the battery bank.

In order to make the inverter accept dirty power from a generator, when the SW2 is switched to position “1”, the inverter will bypass an AC input with a wide voltage and frequency(40Hz-70Hz for 50Hz/60Hz). Accordingly, the AC charger will also work in a wide voltage and frequency range (43Hz-67Hz for 50Hz/60Hz). This will avoid frequent switches between battery and generator. But some sensitive loads will suffer from the low quality power.

The pros and cons should be clearly realized.

SW3: Power Saver Auto Setting :

In Power Saver Mode, when the SW3 is switched to position “0”, inverter will work in Unit Off Charging mode, it will stay in standby mode without sensing loads. It won’t output any power even if a load is turned on. The inverter will not perform any function and only stay idle in this mode. When a qualified AC input present, it will switch to AC input power to charge the battery and supply the load at the same time.

When the SW3 is switched to position “0”, the inverter is initially in standby mode and sends a pulse to detect the presence of a load every 3 seconds. Each pulse lasts for 250ms. The inverter will remain in standby mode until a load has been detected. Then it will wake up from standby mode and start to inverter electricity from the battery bank to supply the load.

SW4: Frequency Switch:

The output frequency of the inverter can be set at either 50Hz or 60Hz by SW4.

SW5: Solar Mode/AC Mode Priority:

Our inverter is designed with AC priority by default. This means, when AC input is present, the battery will be charged first, and the inverter will transfer the input AC to power the load. Only when the AC input is stable for a continuous period of 15 days, the inverter will start a battery inverting cycle to protect the battery. After 1 normal charging cycle ac through put will be restored.

The AC Priority and Battery Priority switch is SW5. When you choose battery priority, the inverter will inverting from battery despite the AC input. Only when the battery voltage is reaches low voltage alarm point(10.5V for 12V), the inverter transfers to AC Input, charge battery, and switch back to battery when battery is charged full. This function is mainly for wind/solar systems taking utility power as back up.

2.5.14 Output Socket

The inverter is either equipped with a dual GFCI socket (rated at 30Amps) or an universal socket (rated at 10Amps) for more convenient wiring.

2.5.15 Other features

Battery voltage recovery start

After low battery voltage shut off (10V for 12V model/20V for 24V model/40V for 48V model), the inverter is able to restore operation after the battery voltage recovers to 13Vdc/26Vdc/52Vdc (with power switch still in the “On” position). This function helps to save the users extra labor to reactivate the inverter when the low battery voltage returns to an acceptable range in the renewable energy systems. The built in battery charger will automatically reactivate as soon as city/generator ac has been stable for 15 seconds.

WARNING

Never leave the loads unattended, some loads (like a Heater) may cause accident in such cases.
It is better to shut everything down after low voltage trip than to leave your load on, due to the risk of fire.

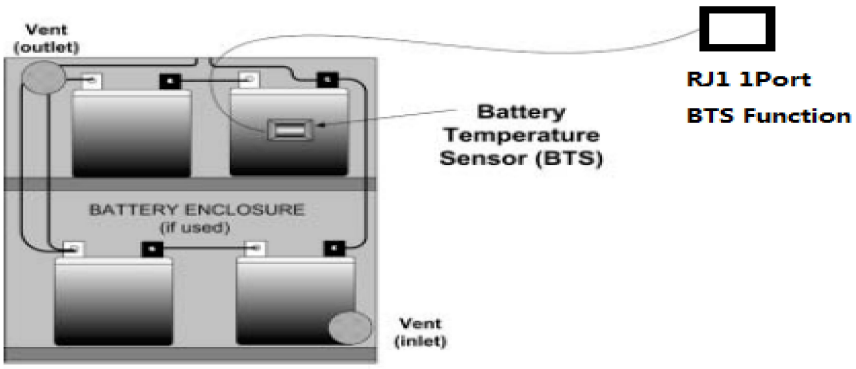
Auto Generator Start (AGS)

The inverter can be customized to start up a generator when battery voltage goes low.
When the inverter goes to low battery alarm, it can send a signal to start a generator, and turn the generator off after battery charging is finished.
The auto generator start feature will only work with generators designed to work with this feature. There is an open/closed relay that will short circuit the positive and negative cable from a generator. The input DC voltage can vary, but the Max current the relay can carry is 16Amp.

Battery temperature sensor (BTS)

A battery temperature sensor (BTS) option can easily be installed in the system to ensure proper charging of the batteries based on temperature. Installing a BTS extends battery life by preventing overcharging in warm temperatures and undercharging in cold temperatures.

To install the Battery Temperature Sensor:
1. Run the battery temperature sensor wire in the DC conduit (if used) and route the RJ11 connector end to the BATTERY SENSE port located on the front of the inverter.
2. Secure the sensor to one of the batteries located in the center of the battery pack.



Conformal Coating

Entire line of LF-PV inverters have been processed with a conformal coating on the PCB making it water, rust, and dust resistant.

3 Installation

3.1 Location

Follow all the local regulations to install the inverter.

Please install the equipment in a location that is Dry, Clean, Cool and that has good ventilation.

Working temperature: - 10℃ - 40℃

Storage temperature: - 40 - 70℃

Relative Humidity: 0% - 95%, non-condensing

Cooling: Forced air

3.2 DC Wiring recommendation

It is suggested the battery bank be kept as close as possible to the inverter. The following able is a suggested wiring option for 1m DC cable.

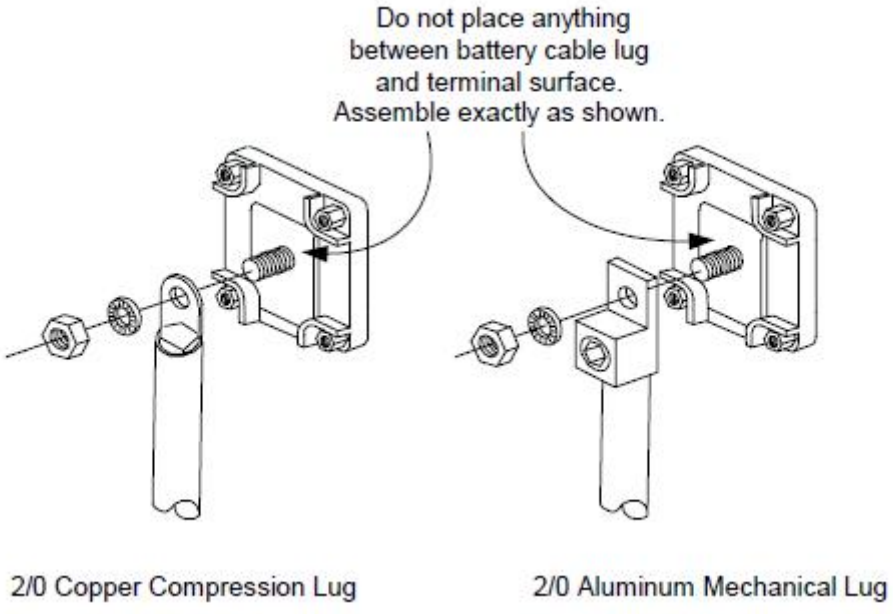
Please find the following minimum wire size. In case of DC cable longer than 1m, please increase the cross section of cable to reduce the loss.

Model Watt	Battery Voltage	Wire Gage /Min		Model Watt	Battery Voltage	Wire Gage /Min	
		0~1.0m	1.0~5.0m			0~1.0m	1.0~5.0m
1.000 ~ 1.500	12 Vdc	30mm²	40mm²	2.000	12 Vdc	60mm²	75mm²
	24 Vdc	15mm²	20mm²		24 Vdc	30mm²	45mm²
	48 Vdc	10mm²	15mm²		48 Vdc	15mm²	25mm²
3.000	12 Vdc	90mm²	120mm²	4.000	12 Vdc	120mm²	150mm²
	24 Vdc	45mm²	60mm²		24 Vdc	60mm²	75mm²
	48 Vdc	25mm²	30mm²		48 Vdc	30mm²	40mm²
5.000	24 Vdc	75mm²	95mm²	6.000	24 Vdc	90mm²	120mm²
	48 Vdc	40mm²	50mm²		48 Vdc	45mm²	60mm²
8.000	24 Vdc	120mm²	150mm²	10.000	48 Vdc	75mm²	95mm²
	48 Vdc	60mm²	75mm²	12.000	48 Vdc	90mm²	120mm²
15.000	48 Vdc	120mm²	150mm²	18.000	48 Vdc	150mm²	180mm²

Please note that if there is a problem obtaining for example 100mm²cable, use 2*50mm²or 3*35mm². One cable is always best , but cable is simply copper and all you require is the copper, so it does not matter if it is one cable or 10 cables as long as the square area adds up. Performance of any product can be improved by thicker cable and shorter runs, so if in doubt round up and keep the length as short as possible.

Battery cables must have crimped (or preferably, soldered and crimped) copper compression lugs unless aluminum mechanical lugs are used. Soldered connections alone are not acceptable. High quality, UL-listed battery cables are available .These cables are color-coded with pressure crimped, sealed ring terminals.

Figure 3.2.1 Battery Cable Connections



CAUTION: Equipment Damage

The inverter is not reverse polarity protected. Reversing the battery polarity on the DC input connections will cause permanent damage to the inverter which is not covered under warranty. Always check polarity before making connections to the inverter.

WARNING: Shock Hazard

Ensure the inverter is off before disconnecting the battery cables, and that AC power is disconnected from the inverter input.

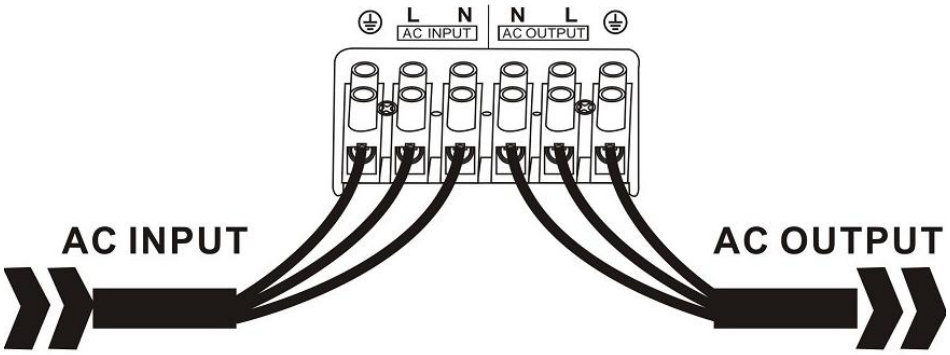
Battery terminal must be clean to reduce the resistance between the DC terminal and cable connection. A buildup of dirt or oxidation may eventually lead to the cable terminal overheating during periods of high current draw. Use a stiff wire brush and remove all dirt and corrosion from the battery terminals and cables.

3.3 AC Wiring

We recommend using 10-5AWG wire to connect to the AC terminal block.
There are 3 different ways of connecting to the terminal block depending on the model. All the wirings are CE compliant, Call our tech support if you are not sure about how to wire any part of your inverter.

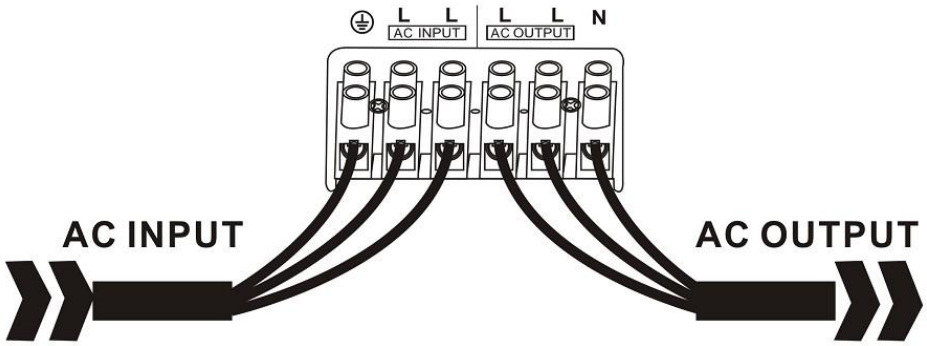
Single-Phase Wiring Mode

230Vac or 120Vac
Input: Hot line+Neutral+Ground
Output: Hot line+Neutral+Ground



Daul-Phase Wiring Mode

240Vac split phase
Input: Hot line+ Hot line +Ground
Output: Hot line+ Hot line +Neutral



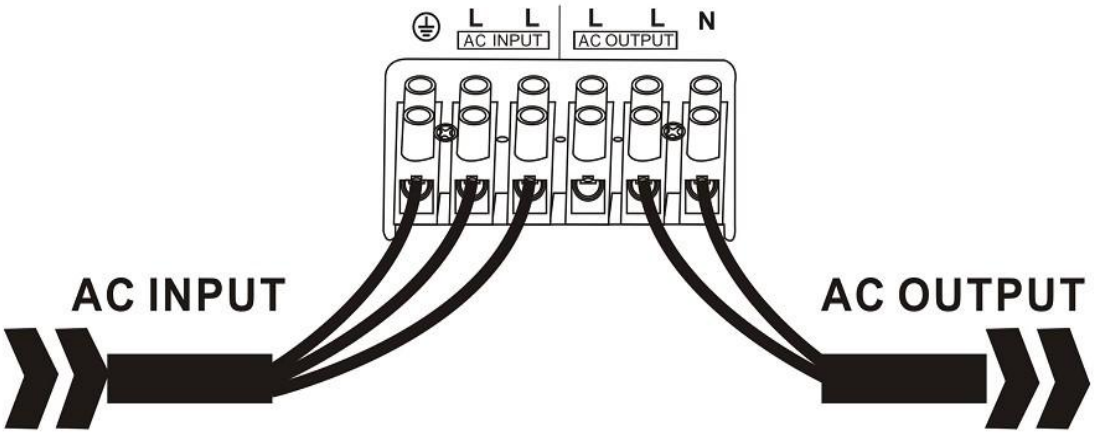
Wiring Option 3

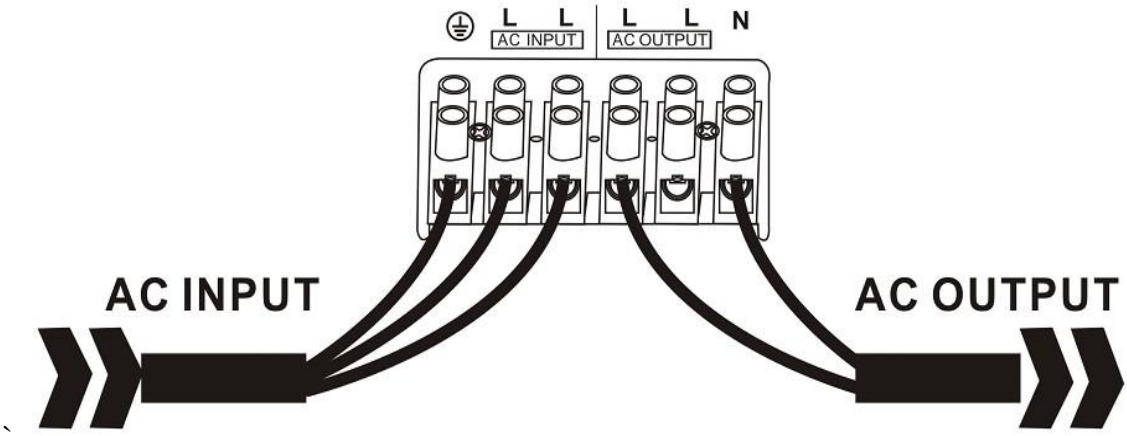
120Vac split phase

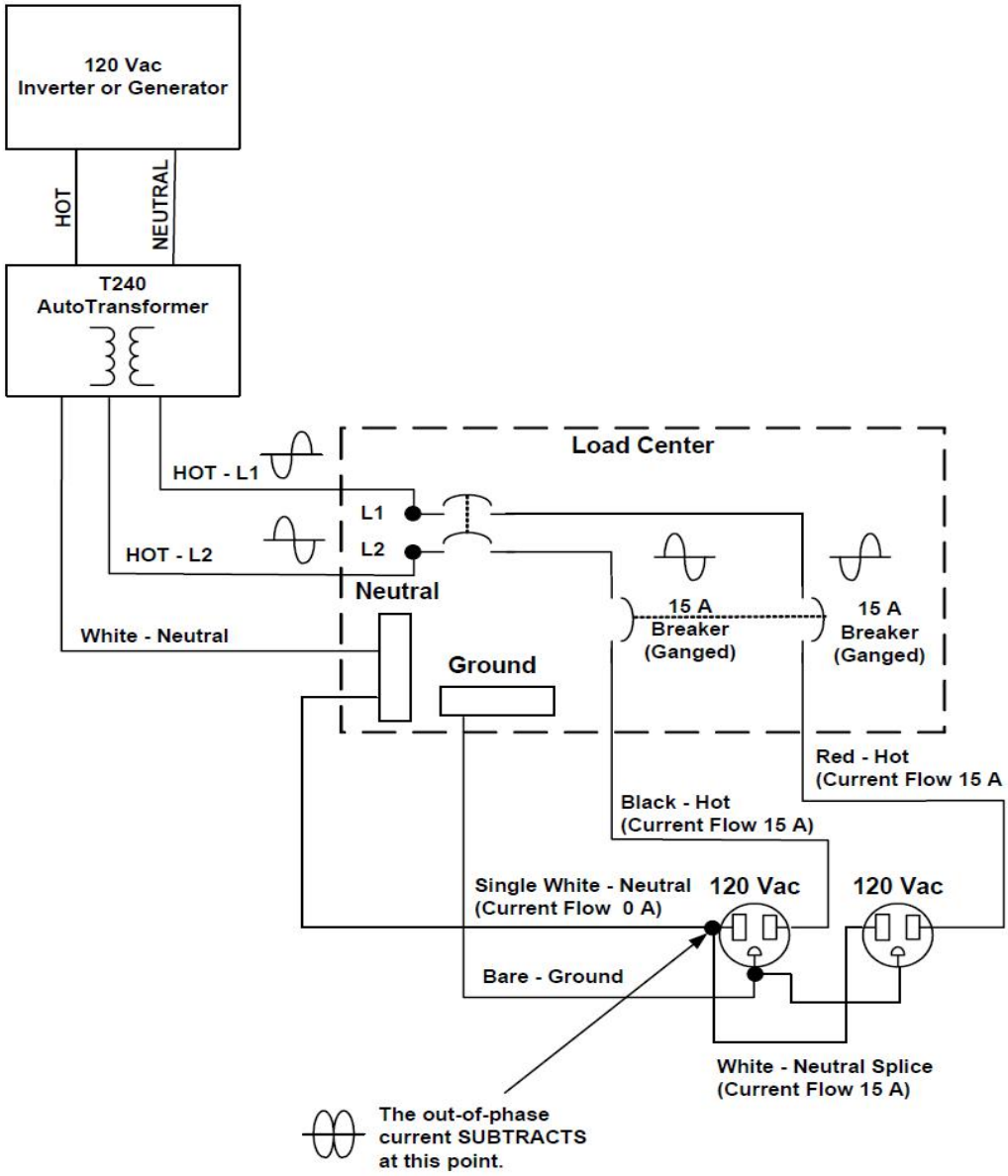
Input: Hot line+ Hot line +Ground

Output: Hot line +Neutral+Ground

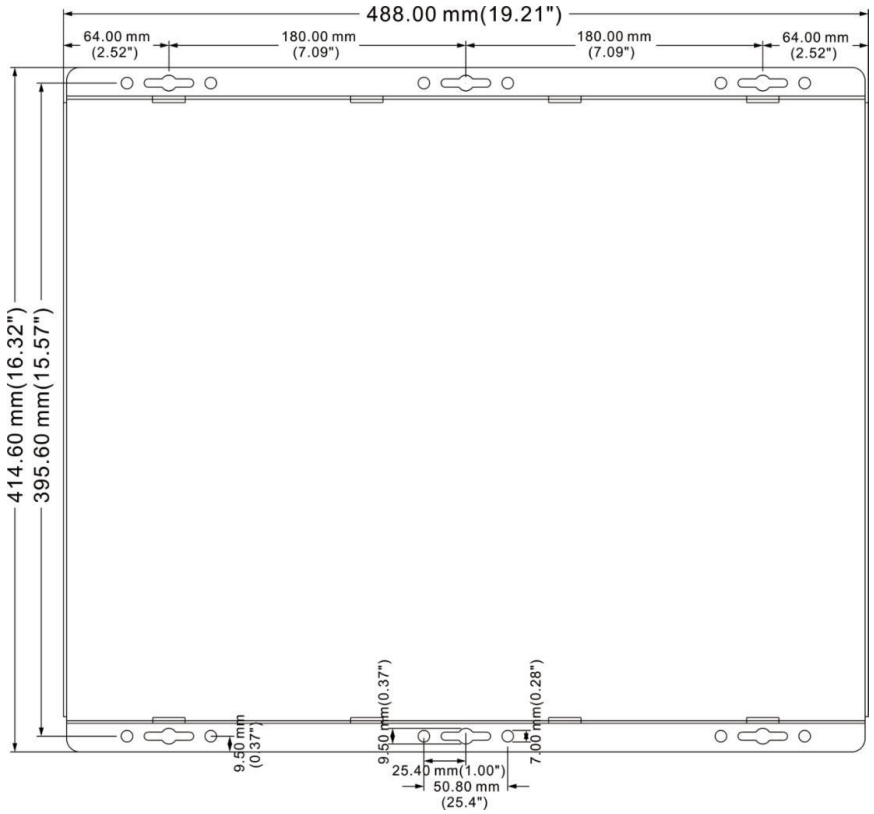
Remark: In such cases, each output hot line can only carry a half the rated capacity Max.



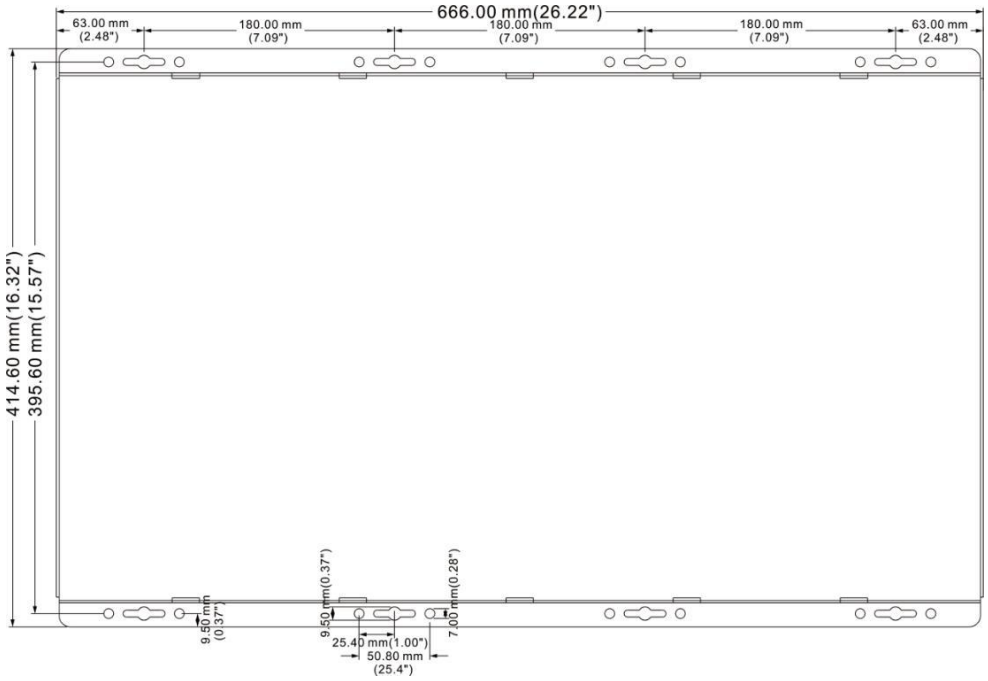



120 Vac
Inverter or Generator
HOT
NEUTRAL
T240
AutoTransformer
Load Center
HOT - L1
L1
L2
HOT - L2
Neutral
15 A
Breaker
(Ganged)
15 A
Breaker
(Ganged)
White - Neutral
Ground
Red - Hot
(Current Flow 15 A
Black - Hot
(Current Flow 15 A)
Single White - Neutral
(Current Flow 0 A)
120 Vac
120 Vac
Bare - Ground
White - Neutral Splice
(Current Flow 15 A)
The out-of-phase
current SUBTRACTS
at this point.

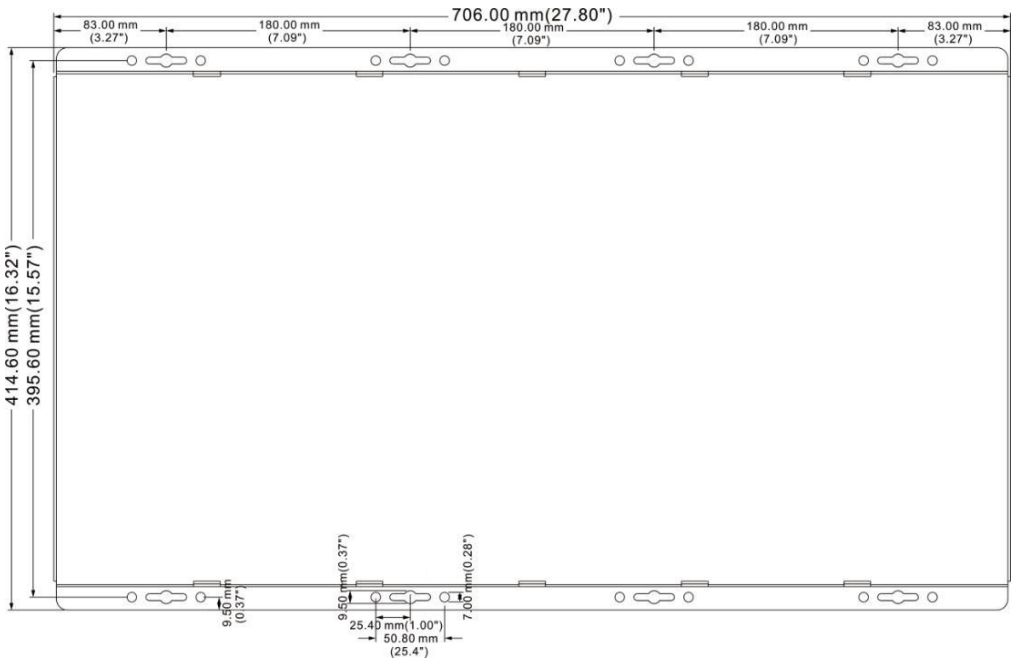
3.4 Install Flange



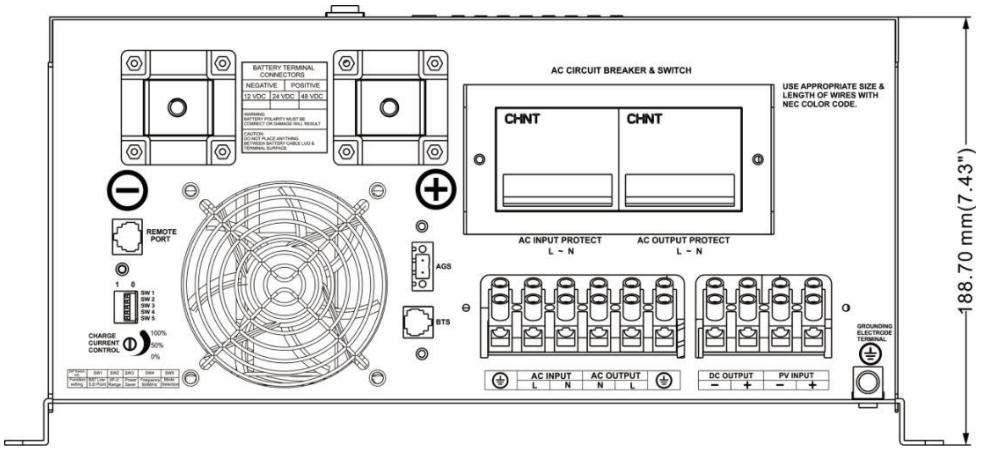
LF 4-6KW Model
LF 1-6KW Model



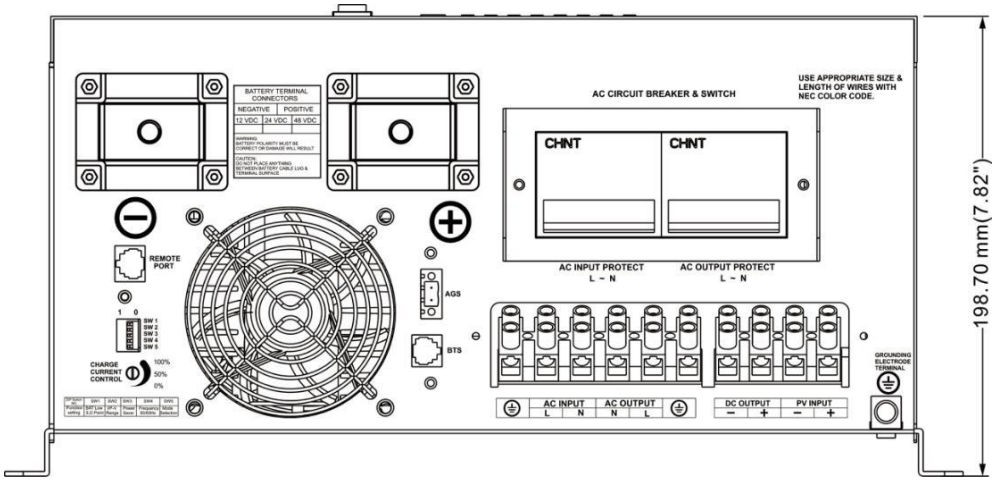
LF 8-12KW Model
LF 8-12KW Model



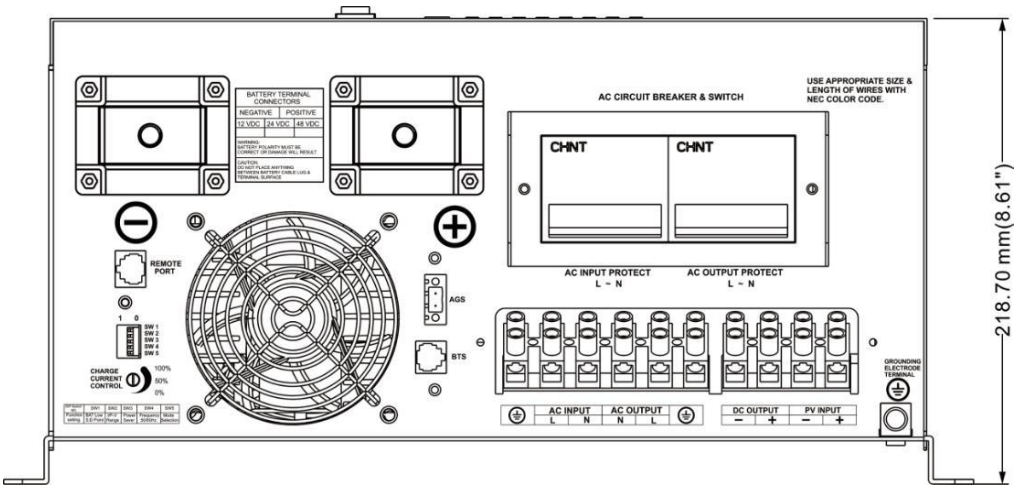
LF 15-18KW Model
LFV 15-18KW Model



LF 4-12KW Model
LFV 1-12KW Model



LF 15KW Model
LFV 15KW Model



LF 18KW Model
LFV 18KW Model

4 Battery Information

4.1 Battery Type

There are two principal types of batteries: Starting type and Deep-Discharge type. Batteries can be either sealed or non-sealed(Vented).

A. Starting type: Automotive(Starting type) batteries are designed to provide high starting current for short periods of time and are not appropriate for solar system.

B. Deep-Discharge type: The battery types recommended for use in the inverter system are Flooded Lead Acid

* Sealed construction, safety and no leakage
* Maintenance-free, convenient for installation
* Broad operating temperature range
* High capacity, high energy density
* Long service life, Excellent recharge and discharge performance
* Low self-discharge rate, more deep cycle times

4.2 Battery Capacity Rating

4.2.1 Battery Discharge Rate

Deep cycle batteries have their amp-hour rating expressed as “at the x-hour rate”.

The hour rating refers to the time it takes to discharge the batteries. A faster hour rate (10 hour rate) means more current is withdrawn from the batteries during their discharge period. There is an inevitable amount of heat associated with the flow of current through a battery and the higher amount of current the greater the amount of heat will be generated. The heat is energy which is no longer available to the battery to power loads. a relatively long discharge rate (120 hour rate) will result in a larger number of amp-hours being available for electrical loads.

4.2.2 Depth of Discharge

The battery bank`s size determines the length of time the inverter can supply AC output power. The larger the bank, the longer the inverter can run.
In general, the battery bank should be designed so the batteries do not discharge more than 60% of their capacity on a regular basis. Discharging up to 80% is acceptable on a limited basis, such as a prolonged utility outage. Totally discharging a battery can reduce its effective life or permanently damage it.

4.2.3 Understanding Amp-Hour Requirements

To estimate the battery bank requirements, you must first calculate the amount of power you will draw from the batteries during your period of autonomy. This power draw is then translated into Amp-Hours (Ah) the unit of measure to express deep-cycle battery capacity.
Amp Hours are calculated multiplying the current drawn by the load by the length of time it will operate.
To calculate amps when the power consumption is expressed in watts, use the following equation:

A = P/V
P = Watts ; V = Volts DC ;

For example:
A 60 watt light bulb will draw approximately 5.0 Amps.
5.0 = 60 /12
If the light runs for three hours it will consume (5.0 x 3) or 15 Ah of power.
The length of time a load is operated will affect the power draw. In some cases, an appliance which draws a large wattage may not consume as many amp hours as a load drawing fewer watts but running for a longer period of time.
For Example:
A circular saw draws 1500 watts or 125 amps. It takes 5 seconds to complete a cross cut. Twelve such cuts would take a minute and you would consume 125A x 0.016* hour = 2 Ah. (*0.016 = 1/60)
Suggestion :
All electrical appliances have labels which state their energy consumption. Look for an amps rating on motors and a watts rating on other appliances. If the label plate has expressed power consumption in amps, multiply by volts for the watts required. (watts = volts x amps).

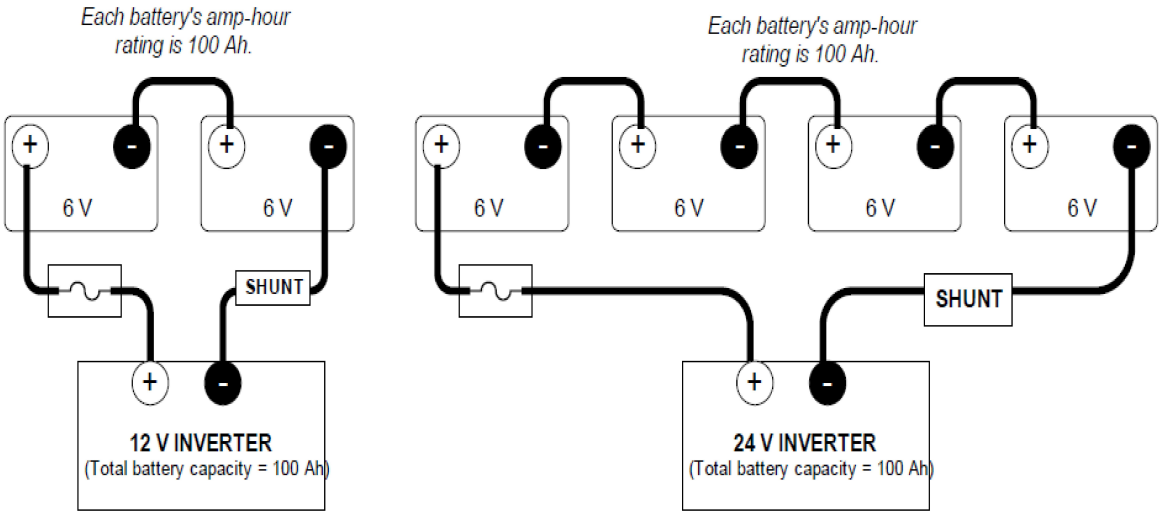
When calculating battery bank size, consider the following:
Motors typically require 3 to 6 times their running current when starting. Check the manufacturer's data sheets for their starting current requirements. If you will be starting large motors from the inverter, increase the battery bank size to allow for the higher start-up current.

4.2.4 Battery Configurations

The battery bank must be wired to match the inverter's DC input voltage specifications (12 or 24 or 48Vdc). In addition, the batteries can be wired to provide additional run time.
Series: Wiring batteries in series increases the total bank output voltage. This voltage MUST match the DC requirements of the inverter or inverter and/or battery damage may occur.
Parallel: Wiring the batteries in parallel increases the total run time the batteries can operate the AC loads. The more batteries connected in parallel the longer the loads can be powered from the inverter.
Series-Parallel: Series-parallel configurations increase both the battery voltage (to match the inverter's DC requirements) and run-time for operating the AC loads. This voltage must match the DC requirements of the inverter.
Batteries with more than two or three series strings in parallel often exhibit poor performance characteristics and shortened life.

4.2.5 Wiring Batteries

Table 4.2.1 Battery Wiring In Series Configuration



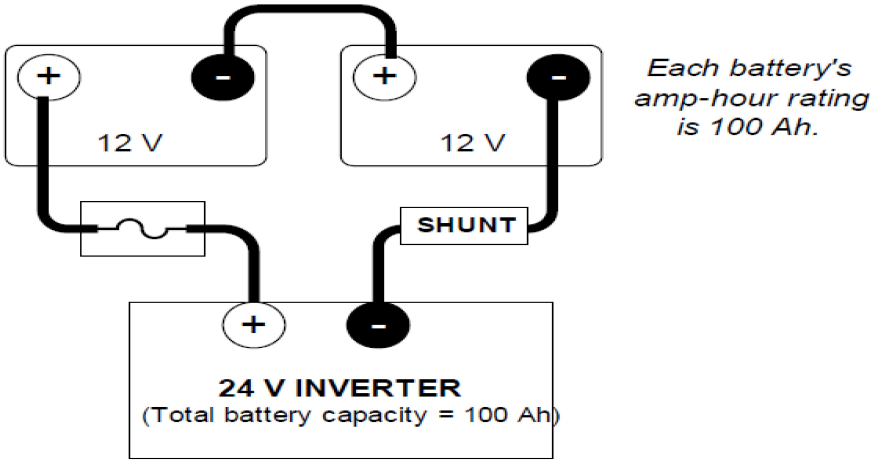


Table 4.2.2 Battery Wiring In Parallel Configuration

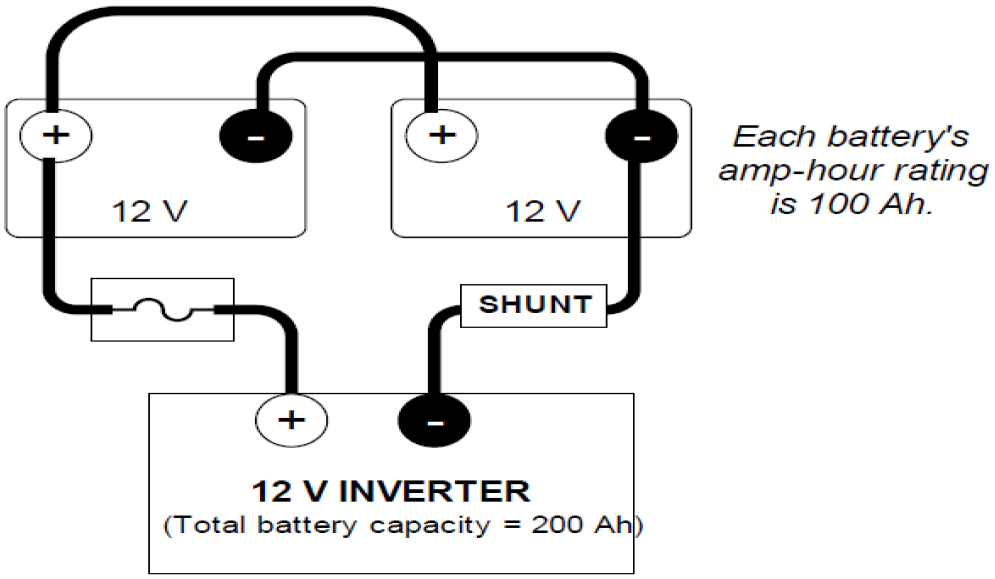
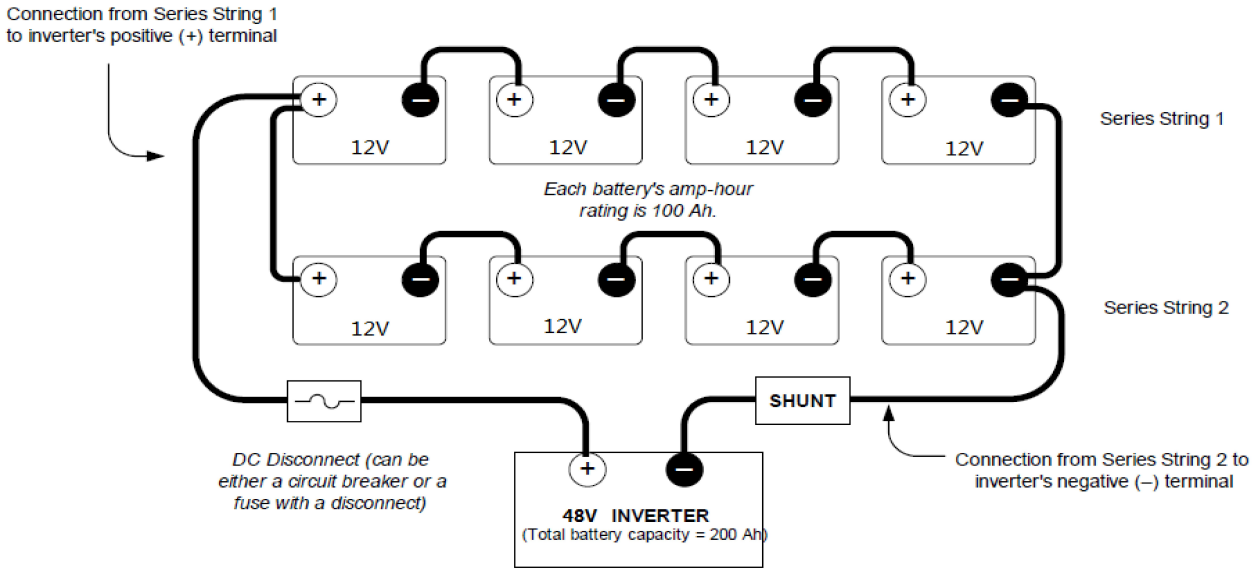


Table 4.2.3 Battery Wiring In Series-Parallel Configuration



Important: Connecting the positive and negative wires to the inverter from different strings ensures a balanced charge/discharge through the batteries, resulting in longer run times and improved battery life.

4.2.6 Batteries Maintenance

To get the best performance from an inverter system, the batteries must be properly setup and maintained. This includes setting the proper voltages for Bulk and Float charging. See the "**CAUTIONS**" in the section on Equalization Charging that follows. In addition, the battery terminals should be inspected,cleaned, and re-torqued if necessary.

Battery posts must be clean to reduce the resistance between the battery post and cable connection. A buildup of dirt or oxidation may eventually lead to the cable terminal overheating during periods of high current draw.
Use a stiff wire brush and remove all dirt and corrosion from the battery terminals and cables. Use an alkaline solution of baking soda and water to clean the terminals and neutralize any battery acid on the terminals or cable lugs.

Charge Rate

The maximum safe charge rate is related to the size and type of the batteries. Flooded lead acid batteries (with removable caps) can be charged at a high rate. Small batteries may require a lower charge rate. Check with your battery vendor for the proper battery charging rate for the batteries used in the system.

Bulk Voltage

This is the maximum voltage the batteries will be charged to during a normal charge cycle. Gel cell batteries are set to a lower value and non-sealed batteries are set to a higher voltage setting.

Float Voltage

The Float voltage is set lower than the Bulk voltage and provides a maintenance charge on the batteries to keep them in a ready state.

Temperature Compensation

For optimal battery charging, the Bulk and Float charge rates should be adjusted according to the temperature of the battery. This can be accomplished automatically by using a BTS. The sensor attaches directly to the side of one of the batteries in the bank and provides precise battery temperature information. When battery charging voltages are compensated based on temperature, the charge voltage will vary

depending on the temperature around the batteries. The following table describes approximately how much the voltage may vary depending on the temperature of the batteries.

If you have liquid lead acid batteries (non-sealed), you may need to periodically equalize your batteries. Check the water level monthly to maintain it at the appropriate level.

Important: If the battery temperature is allowed to fall to extremely cold temperatures, the inverter with a BTS may not be able to properly recharge cold batteries due to maximum voltage limits of the inverter. Ensure the batteries are protected from extreme temperatures.

5 Troubleshooting Guide

Troubleshooting contains information about how to troubleshoot possible error conditions while using the LF Series Inverter & Charger.

The following chart is designed to help you quickly pinpoint the most common inverter failures.

Indicator and Buzzer

Status	Item	Indicator On Front Panel								Indicator On Remote Module			Buzzer
		Utility Power On	Inverter On	Fast Charge	Float Charge	Alarm	Over-Temp Trip	Over-Load Trip	Power Save On	CHARGER ON	INVERTER ON	ALARM	
Line Mode	C.C	√	×	√	×	×	×	×	×	√	×	×	×
	C.V	√	×	√, Blink	×	×	×	×	×	√	×	×	×
	Float	√	×	×	√	×	×	×	×	√	×	×	×
	Standby	√	×	×	×	×	×	×	×	×	×	×	×
Inv Mode	Inverter On	×	√	×	×	×	×	×	×	×	√	×	×
	Power Saver	×	×	×	×	×	×	×	√	×	×	×	×
Inv Mode	Battery Low	×	√	×	×	√	×	×	×	×	√	√	Beep 0.5s every 5s
	Battery High	×	√	×	×	√	×	×	×	×	√	√	Beep 0.5s every 1s
	Overload On Inverter Mode	×	√	×	×	√	×	√	×	×	√	√	Refer to “Audible alarm”
	Over-Temp On Inverter Mode	×	√	×	×	√	√	×	×	×	√	√	Beep 0.5s every 1s
	Over-Temp On Line Mode	√	×	√	×	√	√	×	×	√	×	√	Beep 0.5s every 1s
	Over Charge	√	×	√	×	√	×	×	×	√	×	√	Beep 0.5s every 1s
Fault Mode	Fan Lock	×	×	×	×	×	×	×	×	×	×	×	Beep continuous
	Battery High	×	√	×	×	×	×	×	×	×	√	×	Beep continuous
	Inverter Mode Overload	×	×	×	×	×	×	√	×	×	×	×	Beep continuous
	Output Short	×	×	×	×	√	×	√	×	×	×	√	Beep continuous
	Over-Temp	×	×	×	×	×	√	×	×	×	×	×	Beep continuous
	Over Charge	×	×	√	×	×	×	×	×	√	×	×	Beep continuous
Fault Mode	Back Feed Short	×	×	×	×	×	×	×	×	×	×	×	Beep continuous

Symptom	Possible Cause	Recommended Solution
Inverter will not turn on during initial power up.	Batteries are not connected, loose battery-side connections. Low battery voltage.	Check the batteries and cable connections. Check DC fuse and breaker. Charge the battery.
No AC output voltage and no indicator lights ON.	Inverter has been manually transitioned to OFF mode.	Press the switch to Power saver on or Power saver off position.
AC output voltage is low and the inverter turns loads OFF in a short time.	Low battery.	Check the condition of the batteries and recharge if possible.
Charger is inoperative and unit will not accept AC.	AC voltage has dropped out-of-tolerance	Check the AC voltage for proper voltage and frequency.
Charger is supplying a lower charge rate.	Charger controls are improperly set. Low AC input voltage. Loose battery or AC input connections.	Refer to the section on adjusting the "Charger Rate". Source qualified AC power.. Check all DC /AC connections.
Charger turns OFF while charging from a generator.	High AC input voltages from the generator.	Load the generator down with a heavy load. Turn the generator output voltage down.
Sensitive loads turn off temporarily when transferring between grid and inverting.	Inverter's Low voltage trip voltage may be too low to sustain certain loads.	Choose narrow AC voltage in the DIP switch, or Install a UPS if possible.
Noise from Transformer/case*	Applying specific loads such as hair drier	Remove the loads

***The reason for the noise from transformer and/or case**

When in inverter mode sometimes the transformer and/or case of the inverter may vibrate and make noise.

If the noise comes from transformer:

According to the characteristics of our inverter, mainly there is one type of load which most likely may cause rattles of transformer.

That is half wave load: A load that uses only half cycle of the power (see figure 1). This tends to cause an imbalance of the magnetic field of the transformer, reducing its rated working freq from 20KHz to maybe 15KHz (it varies according to different loads). In such a case the frequency of noise falls exactly into the range (200Hz-20KHz) that human ears can hear.

The most common load of such kind is a hair drier.

If the noise comes from the case:

Normally when loaded with inductive loads, the magnetic field generated by the transformer keeps attracting or releasing the steel case at a specific freq, this may also cause noise.

Reducing the load power or using an inverter with bigger capacity will normally solve this problem.

The noise will not do any harm to the inverter or the loads.

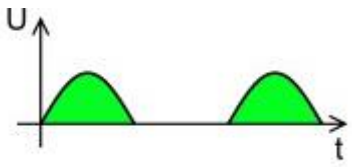


Figure 1 Half Cycle Load Waveform

6 Warranty

We offer a 1 year limited warranty.
The following cases are not covered under warranty.
1 DC polarity reverse.
The inverter is designed without DC polarity reverse protection. A polarity reverse may severely damage the inverter.
2 Wrong AC wiring
3 Operating in a wet environment.
4 Operating with an undersized generator or generator with unqualified wave form.

7 Ordering Information

Model Identification and Numbering Conventions

The LF Inverter is identified by the model/serial number labels. The Serial Number can be located on the mounting rail or inside the top cover. Model Number labels may be located on the bottom side of the front cover or possibly inside the front cover. All the necessary information is provided on the label such as AC output voltage, power and frequency (punch holes).

The inverter also has a letter designator followed by 4-6 digits (depending on revision). The model number describes the type of inverter, the output specifications, the required battery voltage and the output voltage and frequency.

Typcial Part Number	HP Basic Series	20 Power Rating	12 Battery Voltage	E Output Voltage
1.Basic Series HP:Inverter & Charger HP-PV: Inverter & Charger & Solar Controller				
2.Power Rating 10=1000W 15=1500W 20=2000W 30=3000W 40=4000W 50=5000W 60=6000W 80=8000W 100=10KW 120=12KW				
3.Battery Volatge 12=12VDC 24=24VDC 48=48VDC				
4.Output Voltage No Letter=LV120VAC E=HV230VAC D=120/230VAC				

Figure 6-1 Product Identification

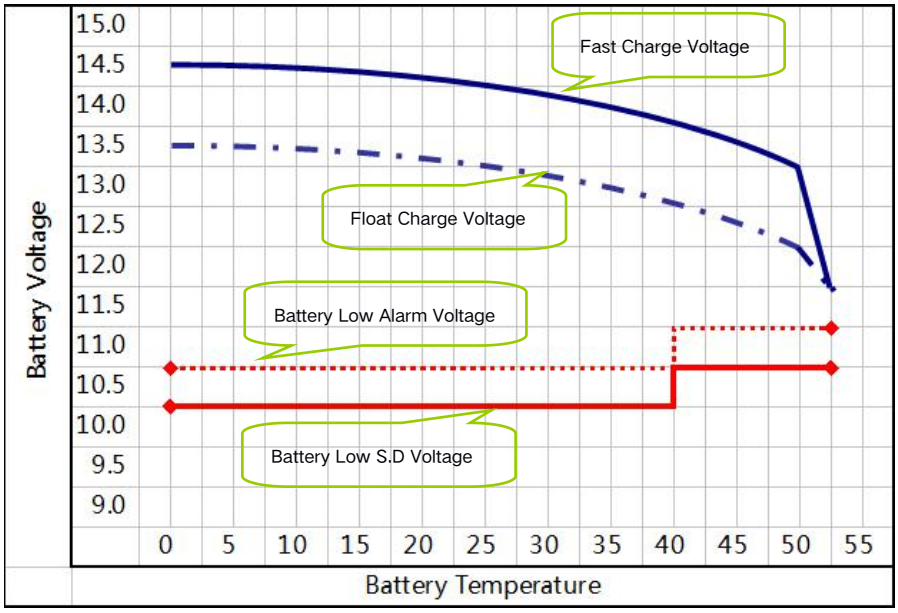
Appendix 1

Electrical Specifications													
	Model	1.0KW	1.5KW	2.0KW	3.0KW	4.0KW	5.0KW	6.0KW	8.0KW	10.0KW	12.0KW	15.0KW	18.0KW
Inverter Output	Continuous Output Power	1.0KW	1.5KW	2.0KW	3.0KW	4.0KW	5.0KW	6.0KW	8.0KW	10.0KW	12.0KW	15.0KW	18.0KW
	Surge Rating(20Secs)	3.0KW	4.5KW	6.0KW	9.0KW	12.0KW	15.0KW	18.0KW	24.0KW	30.0KW	36.0KW	45.0KW	54.0KW
	Output Waveform	Pure Sine wave/Same as input(Bypass Mode)											
	Nominal Efficiency	>88%(Peak)											
	Line Mode Efficiency	>95%											
	Power Factor	0.9-1.0											
	Nominal Output Voltage rms	100-110-120Vac / 220-230-240Vac											
	Output Voltage Regulation	±10% RMS											
	Output Frequency	50Hz ± 0.3Hz/60Hz ± 0.3Hz											
	Short Circuit Protection	Yes(1sec after fault)											
	Typical transfer Time	10ms(Max)											
	THD	< 10%											
DC Input	Nominal Input Voltage	12.0Vdc / 24.0Vdc / 48.0Vdc					24.0Vdc / 48.0Vdc		48.0Vdc				
	Minimum Start Voltage	10.0Vdc / 10.5Vdc for 12Vdc Mode					*2 for 24Vdc, *4 for 48Vdc;						
	Low Battery Alarm	10.5Vdc / 11.0Vdc for 12Vdc Mode											
	Low Battery Trip	10.0Vdc / 10.5Vdc for 12Vdc Mode											
	High Voltage Alarm	16.0Vdc for 12Vdc Mode											
	Low Battery voltage recover	15.5Vdc for 12Vdc Mode											
	Idle Consumption-Search Mode	< 25 W when Power Saver On.(Refer to Table)											
Charger	Output Voltage	Depends on battery type (Refer to Table 2.5.2)											
	Charger Breaker Rating	20A	20A	20A	25A	32A	40A	40A	50A	80A	80A	100A	100A
	Max Charge Power Rate	1/3 Rating Power (Refer to Table 2.5.3)											
	Battery Initial Voltage for Start	10-15.7Vdc for 12Vdc Mode					*2 for 24Vdc, *4 for 48Vdc;						
	Over Charge Protection S.D.	15.7Vdc for 12Vdc Mode											
BTS	Battery Temperature Sensor (Optional)	Yes(Refer to the table) Variances in Charging Voltage & S.D Voltage Base on the Battery Temperature.											
Bypass & Protection	Input Voltage Waveform	Sine wave (Grid or Generator)											
	Nominal Voltage	100-110-120Vac / 220-230-240Vac											

	Max Input AC Voltage	150VAC For 120Vac LV Mode；300VAC For 230Vac HV Mode；											
	Nominal Input Frequency	50Hz or 60Hz											
	Low Freq Trip	47±0.3Hz for 50Hz, 57±0.3Hz for 60Hz											
	High Freq Trip	55±0.3Hz for 50Hz, 65±0.3Hz for 60Hz											
	Overload protection(SMPS load)	Circuit Breaker											
	Output Short circuit protection	Circuit Breaker											
	Bypass breaker rating	20A	20A	20A	25A	32A	40A	40A	50A	80A	80A	100A	100A
	Transfer switch rating	30Amp for UL & TUV				40Amp for UL			80Amp for UL			100Amp for UL	
	Bypass without battery connected	Yes (Optional)											
	Max bypass current	30Amp				40Amp			80Amp			80Amp	
Solar Charger (Optional)	Rated Voltage	12Vdc / 24Vdc / 48Vdc											
	Solar Input Voltage Range	15-145Vdc / 30-145Vdc / 60-145Vdc											
	Rated Charge Current	80A											
	Rated Output Current	15A											
	Self Consumption	< 10mA											
	Bulk Charge(Default)	14.5Vdc for 12Vdc Mode				(*2 for 24Vdc, *4 for 48Vdc)							
	Floating Charge(Default)	13.5Vdc for 12Vdc Mode											
	Equalization Charge(Default)	14.0Vdc for 12Vdc Mode											
	Over Charge Disconnection	14.8Vdc for 12Vdc Mode											
	Over Charge Recovery	13.6Vdc for 12Vdc Mode											
	Over Discharge Disconnection	10.8Vdc for 12Vdc Mode											
	Over Discharge Reconnection	12.3Vdc for 12Vdc Mode											
	Temperature Compensation	-13.2mV/℃ for 12Vdc Mode											
	Ambient Temperature	0 ~ 40℃(Full load) 40 ~ 60℃(Derating)											
Mechanical Specifications	Mounting	Wall Mount											
	Inverter Dimensions(L*W*H)	388*415*200mm				488*415*200mm			666*415*200mm			706*415*230mm	
	Inverter Weight(Solar Chg)KG	21+2.5	22+2.5	23+2.5	27+2.5	38+2.5	48+2.5	49+2.5	60+2.5	66+2.5	70+2.5	75+2.5	78+2.5
	Shipping Dimensions(L*W*H)	550*520*310mm				650*520*310mm			828*520*310mm			868*520*350mm	
	Shipping Weight(Solar Chg)KG	23+2.5	24+2.5	25+2.5	29+2.5	40+2.5	50+2.5	51+2.5	62+2.5	68+2.5	72+2.5	78+2.5	81+2.5
	Display	Status LEDs / Status LEDs+LCD											
	Standard Warranty	1 Years											

Appendix 2 Battery Temperature Compensation (BTS)

Condition	INV/CHG Status	Transfer Point
Charger Mode	CHG On >>>CHG Off	BTS ≥ 50℃
	CHG Off >>> CHG On	BTS ≤ 40℃
Inverter Mode	S.D Point + 0.5Vdc	40℃ ≤ BTS ≤ 50℃
	Over Temp Fault	BTS ≥ 50℃



Default output voltage for Float and Absorption are at 25℃.
Reduce Float voltage follows Float voltage and Raised Absorption voltage follows Absorption voltage.
In a adjust mode temperature compensation does not apply.

Note: Specifications subject to change without notice.

Important: The battery charger control circuit operates from the battery voltage. If the battery voltage falls below 7 Volts, the inverter/charger will not operate. The battery must first be recharged using a stand-alone charger to bring the voltage up to a level where the inverter/charger can operate.

Rechargeable Lithium battery

Operation and Maintenance manual

Product Model: SGH48100T

Product Specifications: 51.2V 100Ah

Version: V-00

Content

1. Information

1.1 Validity

This document is valid for: SGH48100T Battery Pack.

1.2 Target Group

This document is intended for qualified persons and operators. Only qualified persons are allowed to perform the activities marked in this document with a warning symbol and the caption "Qualified person". Qualified persons must have the following skills:

- Knowledge of how lithium iron phosphate batteries work and are operated.
- Knowledge of how an energy storage system (including PV/battery/hybrid inverter, MPPT, Meter, Distribution box etc.) works and is operated.
- Knowledge of local applicable connection requirements, standards, and directives.
- Training in the installation and commissioning of electrical devices, batteries.
- Training in how to deal with the dangers and risks associated with installing, repairing and using electrical devices, batteries.

1.3 Levels of warning messages

The following levels of warning messages may occur when handling the product

⚠ DANGER
Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury or product permanent damage.

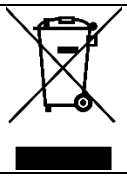
⚠NOTICE

Indicates a situation which, if not avoided, can result in property damage or product not work or accelerated product damage

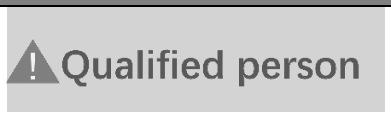
1.4 Symbol Description

1.4.1 Symbols on products label

Label	Definition
	Beware of electrical shock
	Do not place the battery within children/pet touchable area.
	Do not place the battery near heat source and flammable material
	Do not expose the battery to direct sunlight, rain and snow.
	Do not short circuit the battery

	Recycle label
	WEEE designation

1.4.2 Other symbols

Label	Definition
	Indicates activities that can only be performed by qualified persons
	Grounding point

1.5 Abbreviation Description

Abbreviation	Definition
Battery/battery pack/battery module	Single SGH48100T rechargeable lithium iron phosphate battery pack including cells, BMS and enclosure etc.
Battery system/cluster	Multiple SGH48100T battery pack connected in parallel with power, communication and grounding cables and installation auxiliaries.
BMS	Battery management system Electronical Unit to ensure lithium cells' safety and display information or control the battery work mode.
SOC	State of charge The battery state of charge refers to the percentage of the remaining capacity and rated capacity of the battery.
SOH	State of health The battery health status refers to the percentage between the full charged capacity and the rated capacity of the battery.
DIP switch	Dual in-line package switch
COCP	Charge over current protection
DOCP	Discharge over current protection
COVP	Cell over voltage protection
POVP	Pack over voltage protection
CHTP	Charge high temperature protection
DHTP	Discharge high temperature protection

CUVP	Cell under voltage protection
PUVP	Pack under voltage protection
CLTP	Charge high temperature protection
DLTP	Discharge high temperature protection
SCP	Short circuit protection

2. Safety

2.1 Safety precautions

DANGER

Explosion risk

- Do not impact the battery with heavy objects.
- Do not squeeze or pierce the battery pack.
- Do not throw the battery pack into the fire.

WARNING

Fire risk

- Do not expose the battery pack to the condition over 80°C.
- Do not put the battery near a heat source, such as a fireplace.
- Do not expose the battery pack to direct sunlight or raining.

CAUTION

Electric shock risk

- Do not allow non-qualified person to disassemble the battery pack.
- Do not touch the battery pack with wet hands.
- Do not expose the battery pack to moisture or liquid environment.

NOTICE

Damage risk

- Do not short-circuit or reverse connect the battery.
- Do not use chargers or charging devices unapproved by the manufacturer to charge the battery.
- Do not mix batteries from different manufacturers or different kinds, types or brands.

2.2 Safety instructions

The battery has been designed and tested in accordance with international (such as UN38.3 etc.) safety requirements. However, due to various factors during the whole lifetime process, Manufacturer cannot guarantee absolute safety, in order to prevent personal injury and property damage and ensure long-term operation of the battery, please do read the below section carefully to operate the battery and handle emergency situations.

2.2.1 Safety gear

It is required to wear the following safety gear when installing and handling the battery pack.

Insulated gloves

Safety Glasses

Safety Shoes

2.2.2 Emergency safety measures

Water invasion

Please cut off the AC power supply of the system first and then disconnect all switched under the premise of ensuring safety.

Electrolyte or gas 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.

- Gas Inhalation: Evacuate the people in the contaminated area and seek medical aid immediately.

- Eye Contact: Flush your eye with clean and flowing water for 15 min, and seek medical aid immediately.
- Skin Contact: Thoroughly rinse the exposed area with soap and water to be sure no chemical or soap is left on them, and seek medical aid immediately.
- Ingestion: Induce vomiting, and seek medical help immediately.

> **⚠ WARNING**
>
> In case of fire situations, please use carbon dioxide fire extinguisher rather than liquid to put out fires.

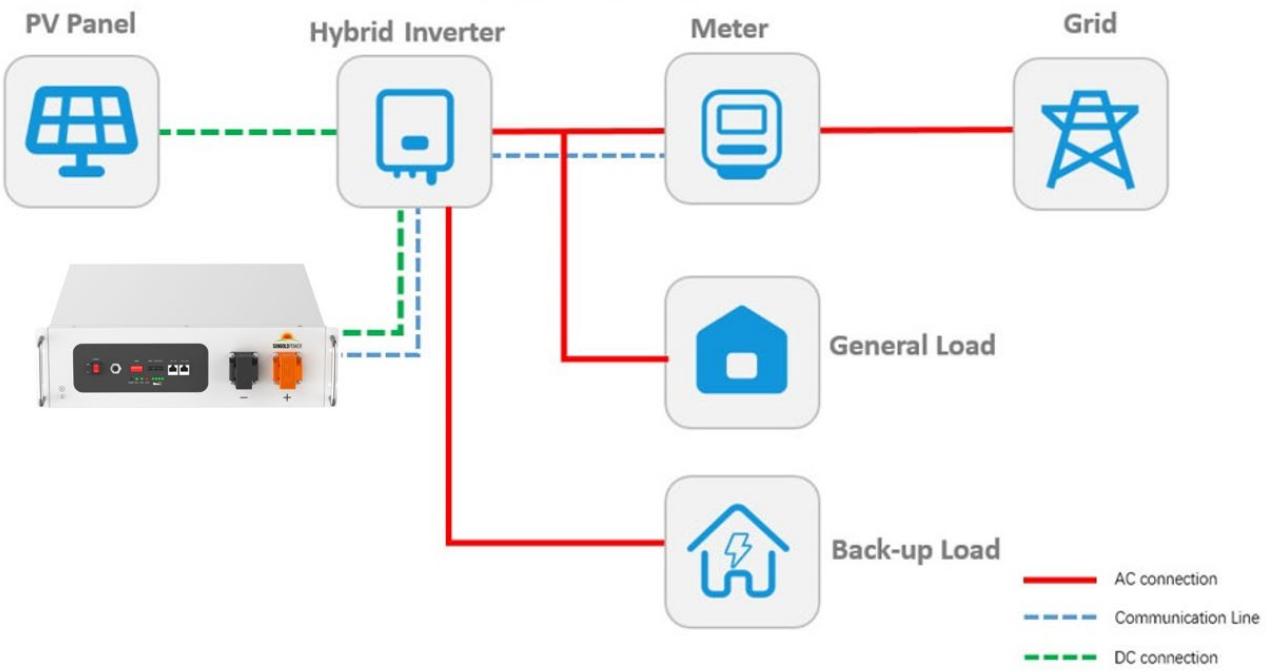
2.2.3 Other Tips

- All the product are strictly inspected before shipment, please contact your supplier for replacement if you notice there's any defectives such as swelling.
- Do not disassemble batteries and components, otherwise the manufacturer will not be responsible for any damage caused by unauthorized disassembly or repair.
- Do enable the battery to be safely grounded before use to make sure the system in safe and normal operation.
- Please ensure that the electric parameters of these devices are compatible mutually before connecting the battery to other devices.
- Please take the environmental factors into careful considerations to ensure that the system can work in a suitable condition as the environment and storage methods have a certain impact on the service life and reliability of this product.

3. Product Overview

3.1 Introduction

The SGH48100T battery is designed for residential application and works as a storage unit in the photovoltaic system. It is a 51.2V lithium battery system, with BMS inside. It could be operated in both on-grid, back-up and off-grid modes with compatible inverters. Below is the general schematic of an ac-coupled system with the batteries.



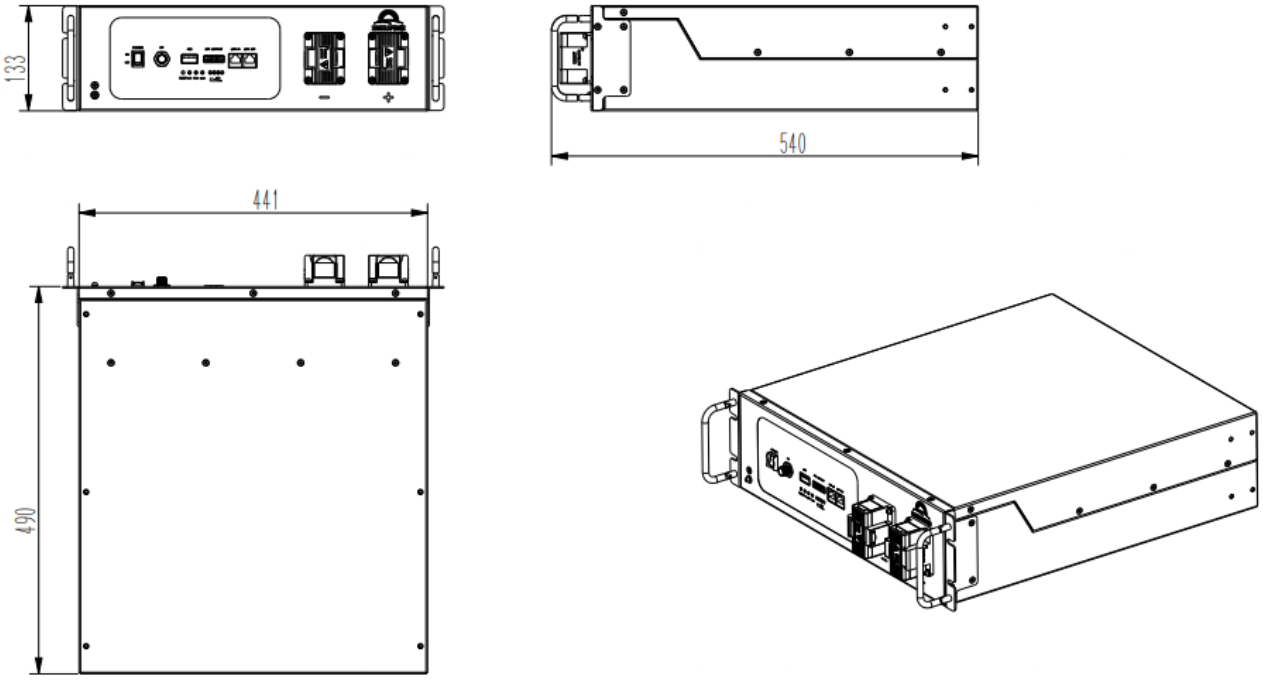
⚠ CAUTION
This electrical connection in this diagram is only for illustration, please follow the Manual suggestions of related devices and operate in accordance with locally

3.2 Features

- Highest safety, battery is made from LiFePO4 chemistry and comply with highest international safety and transport standard.
- Modular and flexible, support up to 32 batteries connect together to expand the system energy.
- Built-in pre-charge circuit to avoid rush current when connecting with different inverter/chargers.
- Automatic dynamic addressing function when connected multiple batteries together.
- Support a maximum of 96% DOD under off-grid and back-up application
- Built in BMS provide warning and protection functions including over-discharged, over-charged, over-current, short-circuit and high/low temperature.
- LiFePO4 as cathode material and automatic balancing function to meet longer cycle life
- Compact size and light weight for easy installation and maintenance.
- Multiple installation bracket to adopt with different customers' requirement.
- LED display, CAN/RS485 port for external communication and upgrade the BMS firmware.
- Rapid shutdown function for North American market.

3.3 Specification

3.3.1 Dimension



3.3.2 Parameters

Items	SGH48100T
Rated voltage	51.2V
Max. voltage range	44.8~57.6V, Shipping voltage>51.2V
Charge voltage	56.0V
Float charge voltage	54.6V
Nominal energy@0.5C	5.12KWh
Usable energy@0.5C	4.92kWh
Nominal capacity@0.5C	100Ah
Dimension	490*441*133mm（19.3*17.3*5.2 inch）
Weight	~47kg（103lb）
Standard charge current	≤50A
Max. charge current	70A
Standard discharge current	≤50A

Max. discharge current	100A (initial temp. ≤86°F（30℃）)	
Peak discharge current	101~119A@5mins | 120~200A@15S	
Communication	RS485 /CAN	
Max parallel number	32pcs	
Operation temperature [1]	Charge: 14°F to 122°F(-10~50℃) Discharge:-4°F to 122°F(-20~50℃)	
Heating opening condition[2]	-13°F(-25℃)≤T≤41°F(5℃)@I≥0.08C	
Heating completion condition[3]	T≥53.6°F(12℃)	
Storage temperature @off mode	32°F(0℃)<T<86°F(30℃)	< 6 months
	14°F(-10℃)<T<113°F(45℃)	< 3 months
	Recommended environment	59°F to 95°F (15~35℃), 5~75%RH

NOTICE

1. The optimum operating temperature range is from 59° F to 86° F(15°C to 30°C), Frequent exposure to the harsh temperatures may worsen the performance of the battery pack and cycle life.

2. The current of the heating film is calculated in addition and is not added to the current detected by the BMS.

3. If the battery system is fully charged for the first time, the heating is stopped after a delay of 1 hour.

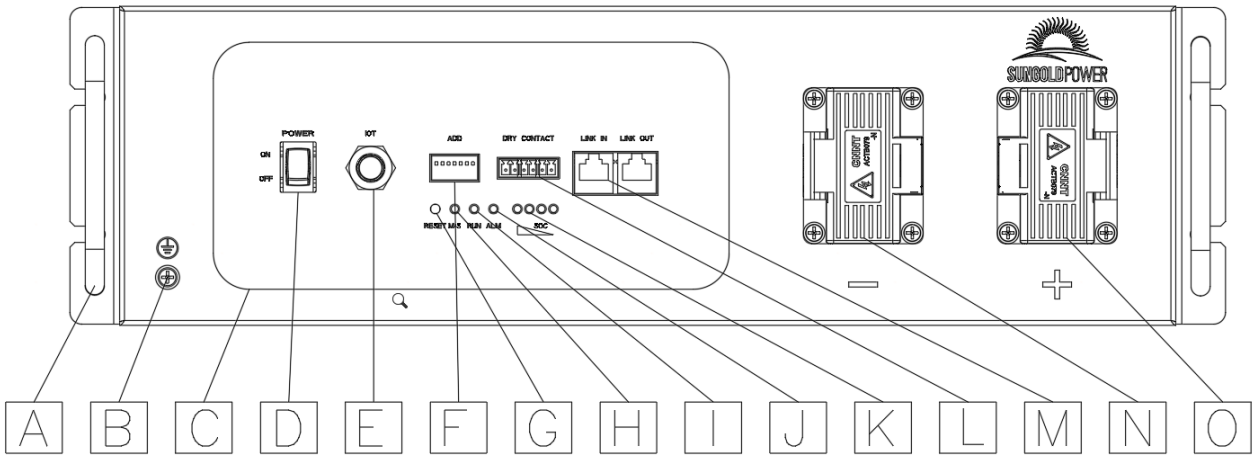
4. The heater operates within a temperature range of -13°F to 41°F (-25°C to 5°C).

Condition 1: When the battery temperature falls between 14°F to 41°F (-10°C to 5°C), the heater activates, initiating a low-current charging process. The heater will be off at 53.6°F (12°C), but regular charging of the battery continues.

Condition 2: In cases where the battery temperature is below 14°F (<-10°C), the charging current is exclusively directed to the heating system until the battery temperature rises above 14°F (-10°C). Once this threshold is reached, the heater operates as described in Condition 1.

Please note that the heating system operation does not impact the State of Charge (SOC) of the battery.

3.3.3 Panel Interface



No.	Items	Usage description	Remark
A	Handles	For handling, installation and disassembly of battery	
B	Ground	Used to connect battery with ground	
C	PET	Decorative film	
D	Power switch	Used to Power on/off battery	
E	IOT	Used to connect with cloud platforms	
F	DIP	Used to set the RS485 baud rate and inverter protocol choosing	
G	Reset	Used to sleep(3s)/awake(3s)/reset(6~10s) BMS in power on mode.	
H	M/S	Used to indicate the module is Master or Slave battery	**Single mode**:OFF **Parallel mode:** ON-Master battery OFF-Slave battery
I	RUN	Used to show battery is in running status when lighting or flashing	
J	ALM	Used to show battery Alarm/Protection status	
K	SOC	Used to show battery real-time SOC	
L	Dry contact	1 channel input signal 2 channels output signal	
M	Link IN Link OUT	For internal and external communication	
N	Negative terminal	Used to connect the inverter/charger	
O	Positive terminal	Used to connect the inverter/charger	

3.3.3.1 L: Dry contact

PIN	Type
1	NO Output1, Charge enable/disable signal
2	
3	NO Output2, discharge enable/disable signal
4	
5	Passive INPUT signal.
6	Rapid Shutdown function for US

3.3.3.2 M: Link IN / Link OUT

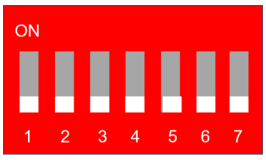
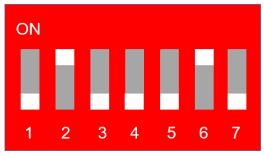
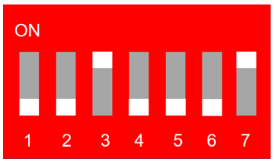
Port	Pin No.	Definition	Remarks
Link IN	1	RS485-B1	1.Used to connect with external devices to establish communication. 2.Used to connect with upper battery pack Link OUT.
	2	RS485-A1	
	3	SGND	
	4	CAN-H	
	5	CAN-L	
	6	SGND	
	7	RS485-A1	
	8	RS485-B1	
Link OUT	1	RS485-B2	Used to connect with downward battery pack Link IN.
	2	RS485-A2	
	3	SGND	
	4	CAN-H	
	5	CAN-L	
	6	SGND	
	7	RS485-A2	
	8	RS485-B2	

3.3.3.3: DIP addressing

DIP							Remarks
RS485 baud rate	Undefined				Protocol		
1	2	3	4	5	6	7	
ON: 115200	Reserved for multiple cluster parallel and other future function				0	0	Protocol ID0
OFF: 9600					1	0	Protocol ID1
					0	1	Protocol ID2
					1	1	reserved
Keep all batteries the same setting	**Keep default setting**				**Master: according to inverter Brand Slave: keep default setting**		

Note:

Only the master battery needs to set the Protocol ID and keep all slave battery default settings after choosing the protocol ID, the battery will auto-detect the inverter information and corresponding to get into running, restart to take effect after setting a new DIP sequence.

CANbus Connection		RS485 Connection		DIP setting (Master battery)
Protocol ID	INVERTER	Protocol ID	INVERTER	
CAN 1	Victron/SMA/Studer Innotec/Sofar	RS485 1	SUNGOLDPOWER SPH/Voltronic/RCT/ MPP/Alpha outback/ Phocos	 X000000
CAN 2	SUNGOLDPOWER SG /SolArk/Solis/Goodwe/Deye/ Growatt/SAJ/LUXPOWER/M egarevo/INVT/Sermatec/MU ST/Sunsynk	RS485 2	SUNGOLDPOWER SPH	 X100010
CAN 3	Schneider	RS485 3	LUX POWER	 X010001

NOTICE

Fail to follow the DIP switch setting will cause the communication fault between battery and inverter, for more detail setting with different inverter/charger, please contact your supplier for consultation.

3.3.3.4 RUN/ALM/SOC

Mode	Status	RUN	ALM	LED indicator				Description
		●	●	●	●	●	●	
Power off	-	OFF	OFF	OFF	OFF	OFF	OFF	All OFF
Standby	Normal	FLASH1	OFF	According to battery SOC				See note
	Warning	FLASH1	FLASH3					
Charge	Normal	ON	OFF	According to battery SOC (highest SOC LED: FLASH2)				See note
	Warning	ON	FLASH3					
	COCP	FLASH1	OFF	According to battery SOC				Stop charging
Discharge	Normal	FLASH3	OFF	According to battery SOC				See note
	Warning	FLASH3	FLASH3					
	CUVP/PUVP	OFF	FLASH3	OFF	OFF	OFF	OFF	Stop discharging
	DOCP	OFF	ON	OFF	OFF	OFF	OFF	Stop discharging
Temperature	CHTP/DHTP CLTP/DLTP	OFF	ON	OFF	OFF	OFF	OFF	Stop charging/discharging
Failure	Cell/NTC failure Sensor failure MOS failure Reversed polarity /SCP	OFF	ON	OFF	OFF	OFF	OFF	Stop charging/discharging

Note: 'Warning' including items of cell imbalanced/low voltage/high current/high&low temperature.

FLASH Type	ON	OFF
FLASH1	0.25S	3.75S
FLASH2	0.5S	0.5S
FLASH3	0.5S	1.5S

3.4 Protection function

Items	Description	Remark
Charge end COVP POVP	The BMS will stop charging if any cell or PACK voltage reach the protection value and it will be auto-released only when both Pack and cell voltage back to the release voltage range or there is efficient discharge current.	
Discharge end CUVP	The BMS will stop discharging if any cell or PACK voltage is under the protection value and it will be released only when all	Can Automatic recovery. Please charge

PUVP	the cell voltage back to the release voltage range or there is efficient charge current.	timely, otherwise it may be in Low-power mode to be over-discharged and damage battery.
CHTP DHTP	The BMS will stop charging or discharging or both if any cell/environment/MOS temperature is beyond the range.	Automatic recovery when temperature falls.
CLTP DLTP	The BMS will stop charging or discharging or both if any cell/environment/MOS temperature is under the range.	Automatic recovery when temperature rise.
COCP	The BMS will stop charging when the charging current is higher than the protection value. And it will release from the protection when the system delays time is met.	Automatic recovery. If locked after three consecutive times, manual intervention is required.
DOCP	The BMS will stop discharging when the discharging current is higher than the protection value. And it will release from the protection when the system delays time is met	Automatic recovery. If locked after three consecutive times, manual intervention is required.
SCP Reversed polarity	The BMS will stop charging when detect short circuit or reversed polarity.	Charge to release. Manual press reset.
Temperature, Voltage, Current sensor failure	Enter the failure mode, manual intervention is required no charging and discharging.	Manual intervention.
Sleep mode	After reaching a certain condition, BMS will enter dormancy mode to reduce BMS consumption	Charge, press reset or restart to activate.

⚠ CAUTION

Please re-charge the battery via MPPT, grid/generator or other energy source within 24h if the battery is over discharged, otherwise, it may be damaged.

⚠ NOTICE

Manually short-circuit and reverse the battery will void the warranty.

4 Installation

4.1 Preparation

4.1.1 Safety Compliance

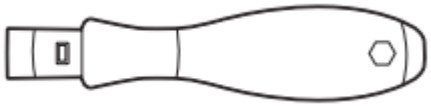
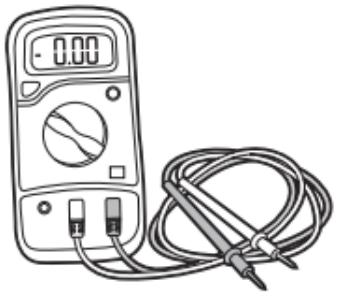
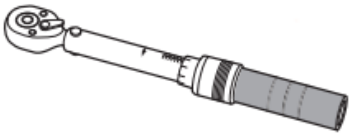
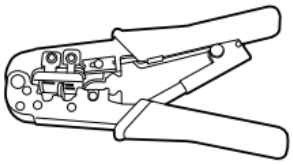
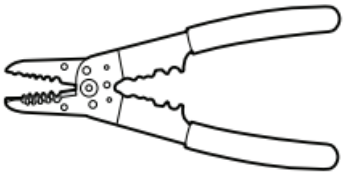
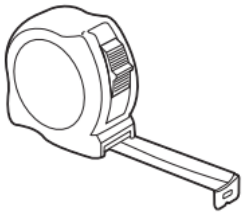
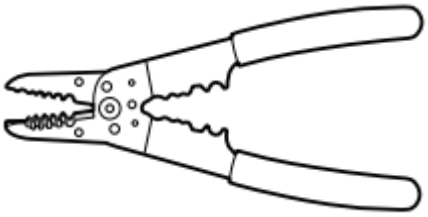
The system installation must be finished by qualified person(s), During the whole installation process, please strictly follow the local safety regulations and related operating procedures.

4.1.2 Environment

The operating environment shall meet the following requirements:

Category	Description
Working temperature	14 to 122° F(-10℃-50℃)(maximum operating range) 59 to 86° F(15℃-30℃) (optimal temperature)
Relative humidity	5%~90%, No condensation
Altitude	<3000m
Safety requirement	• Do not expose the battery to direct sunlight, rain and snow. • Do not place the battery within children/pet touchable area. • Do not place the battery near heat source and flammable material • Do not drop, deform, impact, cut or spearing with a sharp object. • Do not put heavy things on battery. • Do not disassemble the battery without Manufacturer's permission. • No conductive dust and water or other liquid to contact battery. • Follow the emergency measure if there is water invasion or electrolyte and gas leakage. • Contact your supplier within 24 hours if any product failure happens.

4.1.3 Tools

Tools	
Torque screwdriver 	Multi-meter 
Torque wrench 	Cable crimper 
Wire stripper 	Tape measure 
Flat-head screwdriver 	Phillips-head screwdriver 
Wire stripper 	Drill 
Phillips-screwdriver bit 	

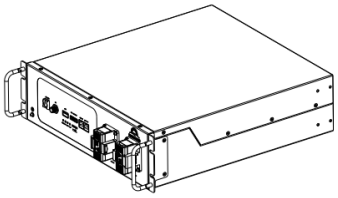
4.2 Inspection

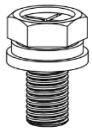
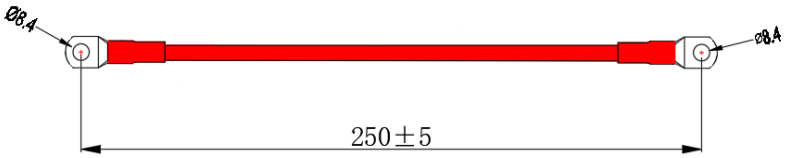
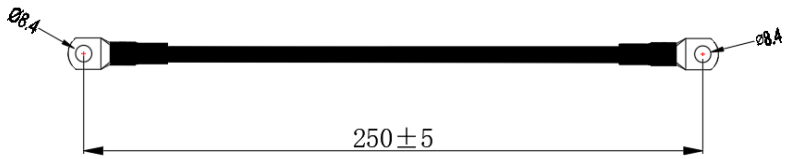
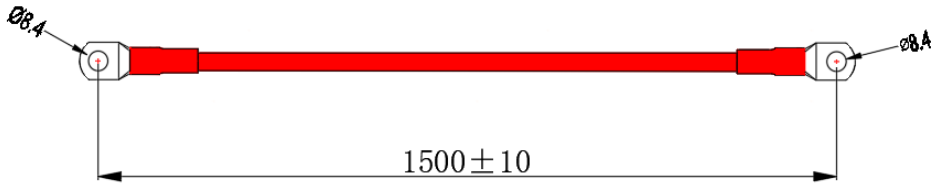
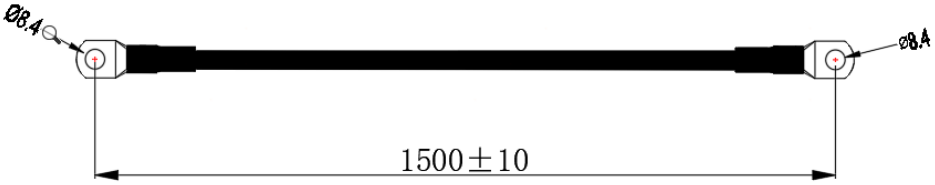
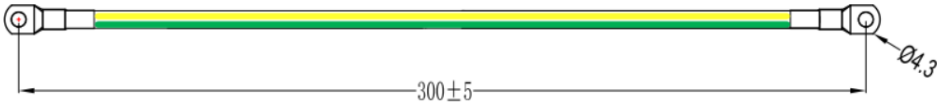
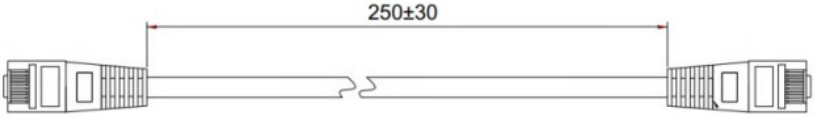
4.2.1 Unpacking

- Please load and unload it in accordance with the specified requirements to prevent sun and rain when you receive the equipment.
- Please check and confirm the goods (such as quantity, appearance, etc.) according to the "scope of delivery " before unpacking.
- Do light take and put during unpacking process to protect the surface coating of the object;
- Please record and feedback to the manufacturer if the inner packing is damaged after unpacking.

4.2.2 Scope of delivery

Check the scope of delivery for completeness and any externally visible damage. Contact your supplier for supplementary delivery if the listed material is incomplete or damaged.

General materials *(Battery unit)*		
 Battery Pack *1pcs	 Manual *1pcs	
Type	Detail	Qty.
Rack mounted kits	A：Float nuts M6 	6pcs

	B：Combination Screw C：Hexagon bolt M8 	4pcs 2pcs
		1pcs
		1pcs
Power cable		1pcs
		1pcs
Grounding cable		1pcs
Battery to battery communication cable		1pcs

For inverter communication PIN definition detail, please check **Appendix I**

NOTICE
Keep the unused cable pins NULL to avoid affecting the closed loop communication.
NOTICE
A ground connection of communication cable may be required from some inverters, please follow the rules from inverter manufacture.

4.3 Start Installation

Qualified person

4.3.1 Remainder

Please check again the following conditions or equipment whether meet the requirements before installation:

- Check if there's enough space for installation, and if the load-bearing capacity of the bracket or cabinet meets the weight requirements.
- Check whether the power cable pair(s) used meets the maximum current requirement for operation.
- Check whether the overall layout of power supply equipment and batteries at the construction site is reasonable.
- Check whether the installer is wearing anti-static wristband.
- Check whether there're two people on the construction site for installation work.
- Check if there's potential risks at location of installation site, e.g flooding, sun exposure, corrosion, and salt spray.

4.3.2 Procedures

⚠ CAUTION
Injuries may result if the product is lifted incorrectly or dropped while being transported or mounted. Wear suitable personal protective equipment for all work on the product.

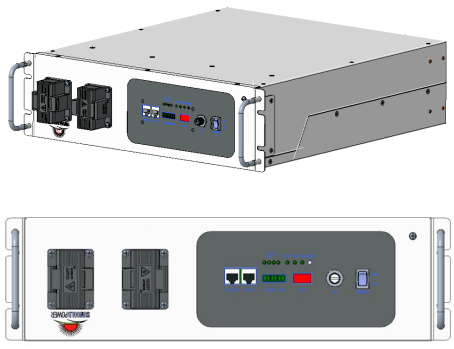
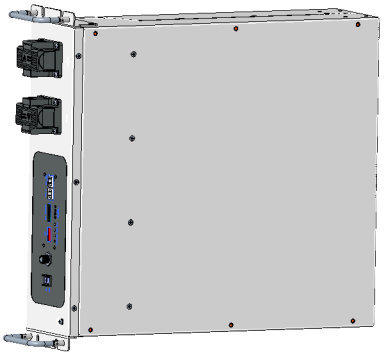
⚠ CAUTION
Ensure that no lines are laid in the wall which could be damaged when drilling holes.

4.3.2.1 Rack mounted

i. Take the battery pack out from carton.
ii. Get the Rack or cabinet ready and place it horizontally at a reasonable location.
iii. Place the battery on the rack or cabinet tray via manual-lift, Insert the screws and fasten the battery to the rack or cabinet
iv. Finish the cable connection

4.3.3 Tips

4.3.3.1 Installation not allowed

Direct upside down	Left side flip	Right side flip
 X	 X	 X

5. Cable connection and commissioning

5.1 Get battery ready

5.1.1 Ensure all the battery is in OFF mode, check and confirm the installation is tighten and stable.

5.1.2 Check the number and specification of cable kit accessories are correct according to the Scope of delivery item, if you are making cable yourself, please follow manufacturer's requirements.

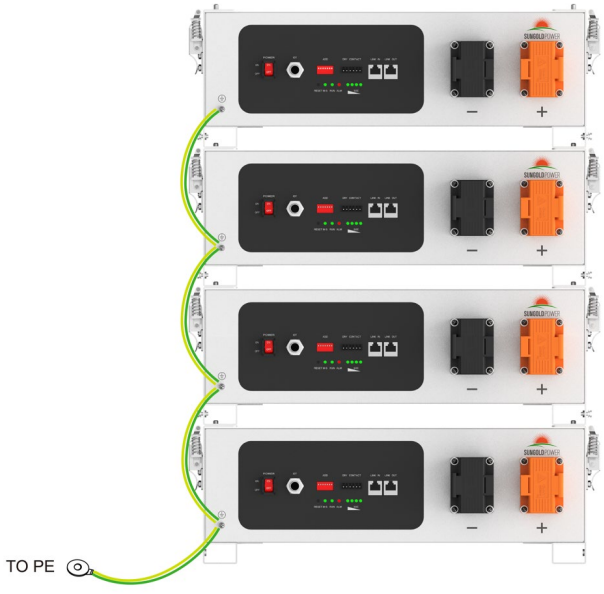
5.1.3 Switch on all battery individually before wiring, check whether there is any alarm/protection information, if yes, turns to troubleshooting. Then switch off all batteries.

5.2 Grounding cable connection

5.2.1 Take out the grounding screw on the battery panel, and get the cable conductor through it.

5.2.2 Fix them together, with a cylinder screwdriver and tighten it.

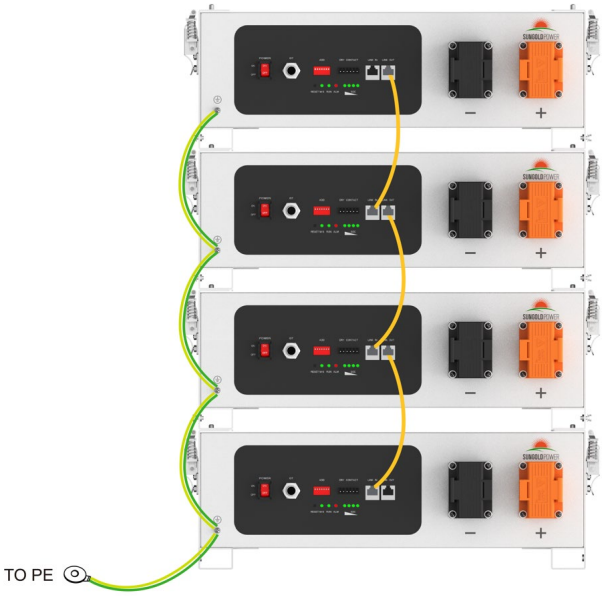
5.2.3 Connect the grounding cable with next battery module.



5.3 Communication cable connection

5.3.1 Take out battery to battery communication cable.

5.3.2 Confirm the location of Master battery, insert the RJ45 plug into the Link Out port and connect the other side to next battery Link IN port, daisy chained all batteries.



Note: the module with empty Link IN port is Master battery

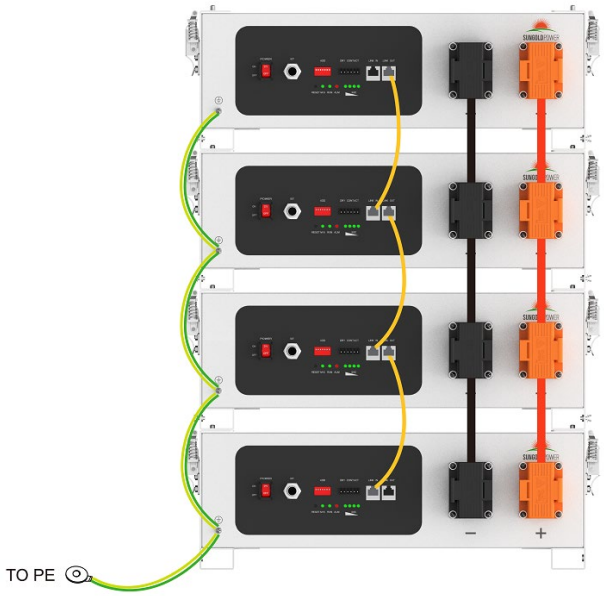
NOTICE

The BMS inside the battery pack will automatically terminate BOTH end of CANBUS pins, DO NOT need to plug the 120Ω terminator again.

5.4 DC power cable connection

5.4.1 Take out battery to battery power parallel cable.

5.4.2 Lock the terminals on the battery terminals and secure tightly with nuts.



5.5 Connecting with inverter

CAUTION

Confirm inverter AC input and PV input is disconnected before wiring connection, and the DC/ signal switch of inverter/charger is in off status.

5.5.1 Connecting Master battery Link IN port with inverter CAN or RS485 communication port via inverter communication cable (*Version I/II/III or customized*).

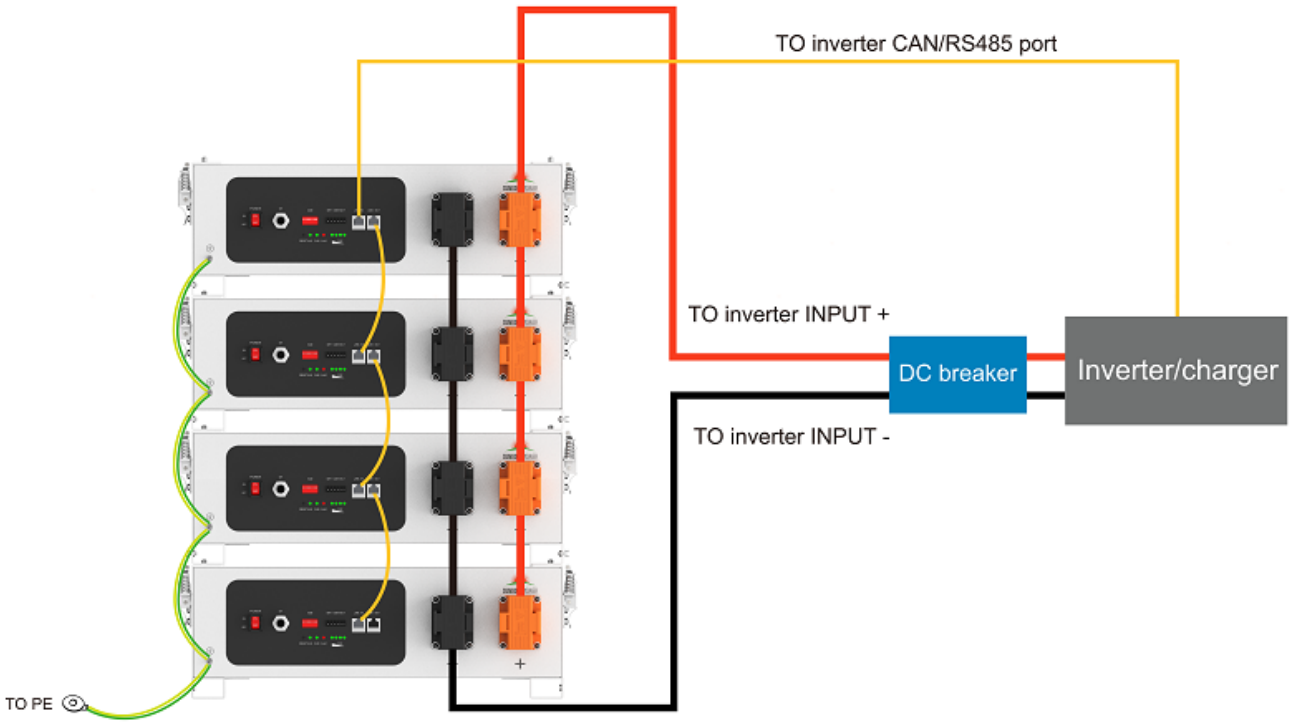
5.5.2 Connecting battery OUTPUT (+) with inverter battery INPUT (+), battery OUTPUT (-) with inverter battery INPUT (-), an external disconnection breaker between battery system and inverter is recommended, choose the corresponding power cable pair and wiring them correctly.

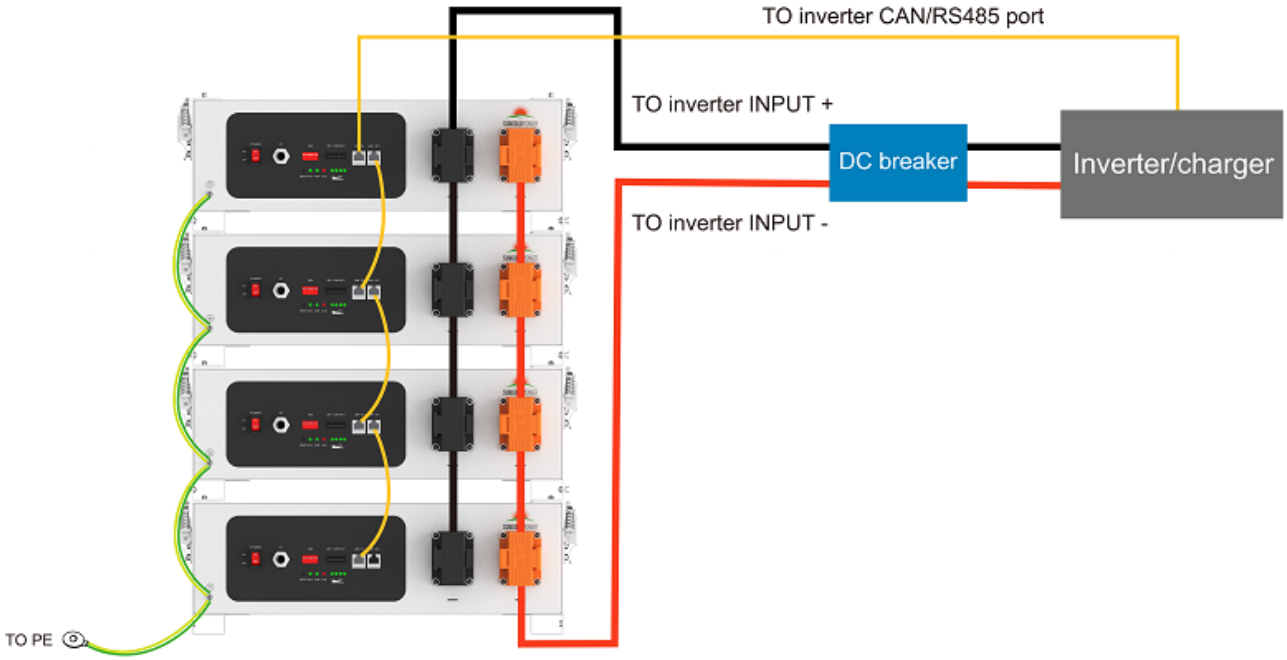
Note:

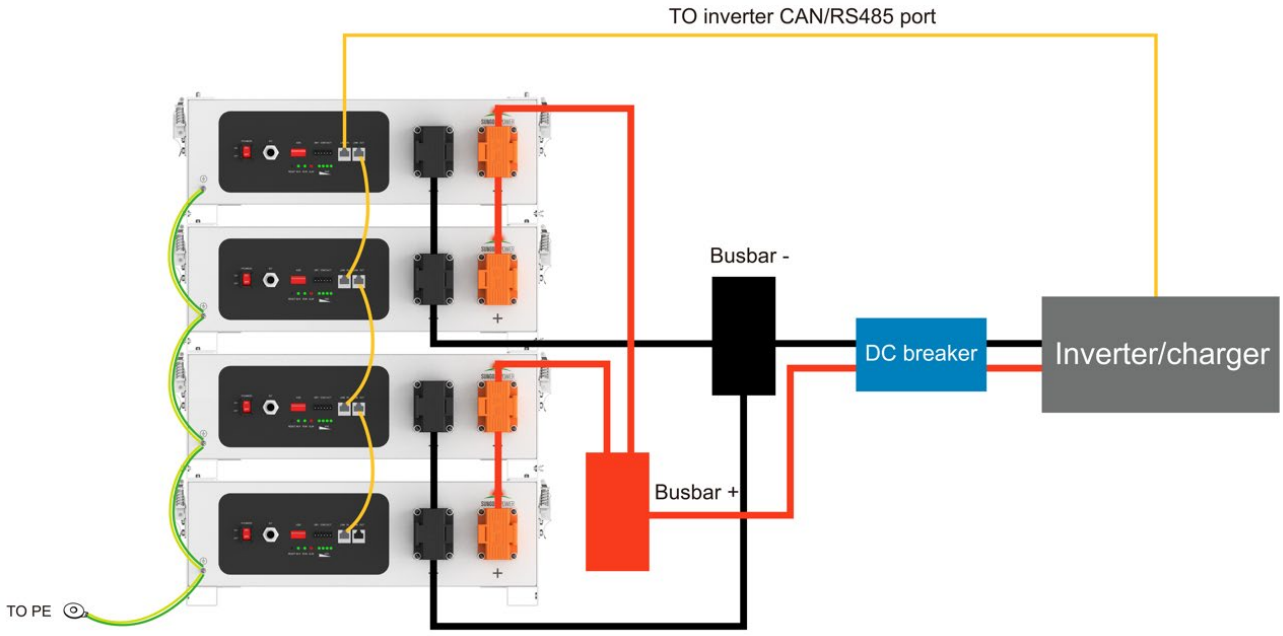
NOTICE

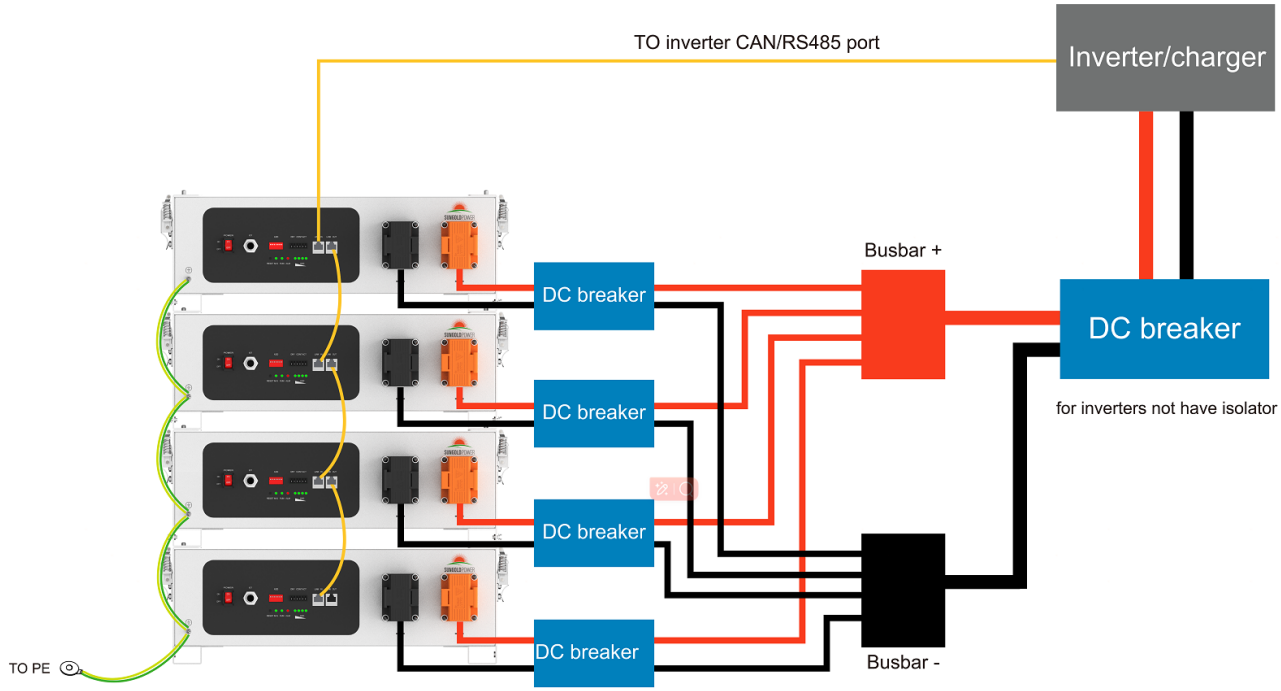
Choose the suitable disconnection breaker considering the inverter power/current, rated voltage, tripping characteristic etc.

Wiring diagram allowed:

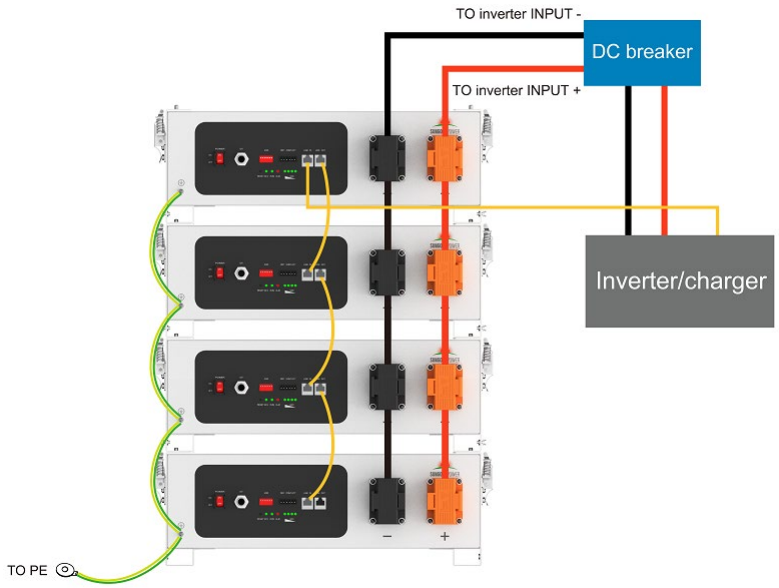



TO inverter CAN/RS485 port
TO inverter INPUT +
DC breaker
Inverter/charger
TO inverter INPUT -
TO PE


TO inverter CAN/RS485 port
Busbar -
DC breaker
Inverter/charger
Busbar +
TO PE



Wiring diagram not allowed:



When multiple batteries are connected in parallel, the wires connecting the positive and negative electrodes of the inverter cannot come from the same battery. This connection mode will cause the current to be unevenly distributed among the batteries, resulting in differences in the SOC of the batteries.

NOTICE

The maximum communication cable length is required to be less than 15m between inverter/charge and battery. The maximum power cable length is suggested to be less than 10m between inverter/charge and battery.

⚠ CAUTION

The maximum tolerance current of each power cable and terminal is 125A, 100A for continuously is suggested, please use corresponding number of power cable pairs according to the field configuration and local connection requirements, standards, and directives..

5.6 Commissioning

5.6.1 Set the DIP address of the Master battery (and the Slave battery if there is any RS485 baud rate changed).

5.6.2 Switch on all battery modules, wait for 10s, make sure that only M/S led is on Master battery.

5.6.3 Turn on the breaker between the inverter and battery if there is any, then turn on the inverter/charger isolator.

5.6.4 Finish the setting on inverter/charger or any other control devices, if everything is correct, you are ready to use the system.

No.	Inverter setting parameters	Detail
1	Absorption voltage	56.0V
2	Float voltage	54.6V
3	Re-charge/Generator start voltage	⩾50V
4	Re-start voltage	52V
3	Low SOC limit (Grid-tied)	10/20% (differ from inverter brand)
5	Low SOC cut-off (Off-grid)	4%
6	Low Voltage cut-off	48.0V
7	Rated charging current limited value	100A*N (N is the Quantity of the battery pack)
8	Rated discharging current limited value	100A*N (N is the Quantity of the battery pack)
9	Max. charging current limited value	200A*N (N is the Quantity of the battery pack)
10	Max. discharging current limited value	200A*N (N is the Quantity of the battery pack)
11	Force charge/ Activate	Enable

For more information to connect with different inverter/charger, please contact your supplier for technical support.

⚠ CAUTION

If your system is a back-up or off-grid system, make sure your configuration can cover the worst situation to avoid battery to be over-discharged.

5.7 Switch off battery

5.7.1 Turn off the inverter.

5.7.2 Turn off the disconnection breaker if there is any.

5.7.3 Turn off all batteries signal switch.

5.8 Troubleshooting and FAQ

Items	Solution	Measure
Unable to start	1. Power on battery and press RESET 6s to observe whether the battery can be started. 2. Charge the battery use a charger or inverter to provide 54~57.6V voltage and observe it can be started.	If the abnormal status still alive after above steps, please contact your supplier. If there is any other situation(s) excluding in this table, turn off the fault battery, contact your supplier.
Unable to charge	1. Check whether the cable connection between the battery and the inverter/charger is correct. 2. Check whether the inverter/charger setting is correct. 3. Check whether the battery is in charge protection mode, if yes, try to discharge the battery.	
Unable to discharge	1. Check whether the cable connection between the battery and the inverter/charger is correct 2. Check whether the battery occurs short circuit, reverse connection, pre-charge failure during connection inverter etc. 3. Check whether the battery is in discharge protection mode, if yes, try to charge the battery.	
High/Low temperature	1. Stop the battery system for a while, check whether the installation location temperature meet the requirement. 2. Avoid continuous full charging and discharging.	
High current	Check the configuration and parameters setting on the inverter/charger is correct.	
ALM always on	1. Check the fault information on the inverter APP or display if possible. 2. Ask your supplier to offer BMS monitoring software to locate the reason and back to them for solution.	
Communication fail	1. Check the communication cable type is correct and is contacted well. 2. Check the DIP switch setting is correct. 3. Check the inverter protocol related setting is correct. 4. Check both battery and inverter are working properly.	

Q1: ***Battery maximum SOC is 98~99% and never goes to 100% SOC during daily cycle use, why?***

This is normal and have no influence on capacity, usually BMS will calibrate the SOC to 100% when

reached cut-off current or trigger HVP, however, to avoid battery from being overcharged and to extend the cycle life as longer as possible, we left a room and set a charging profile to let battery charge slowly near full, please float the battery about 0.5~1 hour to calibrate the SOC.

Q2: ***'High voltage' and 'cell unbalance' warning and alarm in rare cases, does it mean battery is damaged?***

No. This is not unusual and happened on new batteries that are not balanced yet, please lower the maximum charge voltage (54.6V) and float the battery via grid or generator. If not solved, please contact your supplier.

Q3: ***When having multiple batteries in parallel connection, the battery on the end can't be fully charged.***

Pay attention to your wiring diagram, please always follow the manual wiring advises and choose proper cable size and pair.

Q4: The current is 0A when connecting with a very small load at the situation that having multiple batteries in parallel connection, how to solve it?

Each BMS has a threshold current of 0.5A (~25W) before it begins to report, this leads the inaccurate display of the current.

Q5: SOC is not accurate or suddenly jumps to 100% during charging.

This mostly happen in off-grid applications on batteries that have not been calibrated SOC for a long time or situations that are similar to Q4 that with inverter in Idle mode or a small DC load or store the battery for a long time, we suggest fully charging at once the batteries per month refer to Q1.

Q6: The system is still running when the inverter log shows 'internal failure' warning.

This is our logic and this warning flag indicates there is 1 or more module(s) is in communication offline from the system, the system will derating and until communication is recovered.

Q7: Inverter pulling power from Grid to charge batteries in self-consumption mode.

When reached certain conditions such as low state of charge etc., battery will send charge request to ask inverter to charge the batteries, to avoid this, please discharge DOD as manual suggested.

6. Transport, Storage

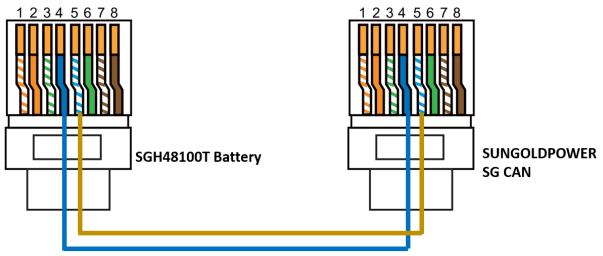
- Do not violently shake, impact or squeeze, and prevent sun and rain during the transportation.
- Do light take and put and strictly prevent falling, rolling, and heavy pressure during loading and unloading.
- The battery should be placed in a dry, clean, dark, and well-ventilated indoor environment for long-term storage, and the recommended storage temperature range is 15~30℃.
- No harmful gases, flammable and explosive products and corrosive chemical substances in the storage location.
- The batteries should be stored and transported in close to 50% SOC, do not store over 80% SOC for long time.
- If do not use for a long time, the battery needs to be charged every 6 months.
- No fall down, no pile up over 6 layers, and keep face up.

7. Disposal of battery

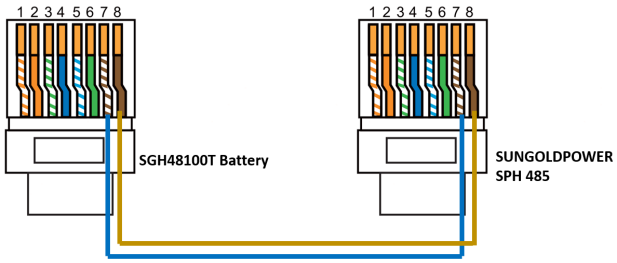
Disposal of battery must comply with the local applicable disposal regulations for electronic waste and used batteries, please review your local Battery recycling or management regulations or contact your supplier for more information.

Appendix I

Connect with SUNGOLDPOWER SPH/SG inverter/charger

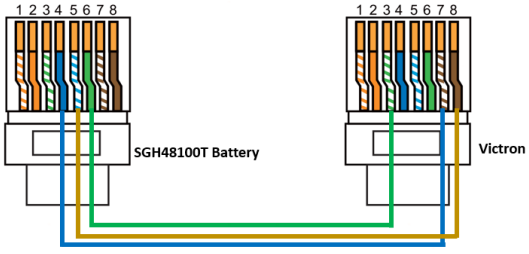


Battery CAN port	SUNGOLDPOWER SG CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	



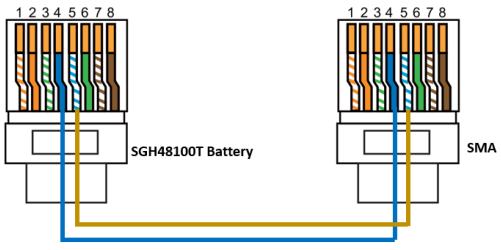
Battery RS485 port	SUNGOLDPOWER SPH 485	Cable suggest
Pin7	Pin7	Version-II(485)
Pin8	Pin8	

Connect with Victron GX & inverter/charger



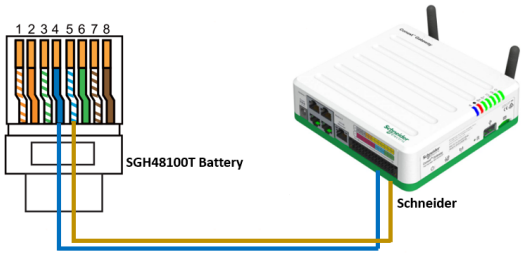
Battery CAN port	Victron VE.CAN/BMS CAN	Cable suggest
Pin4	Pin7	Version-I(CAN)
Pin5	Pin8	
Pin6	Pin3	

Connect with SMA inverter/charger



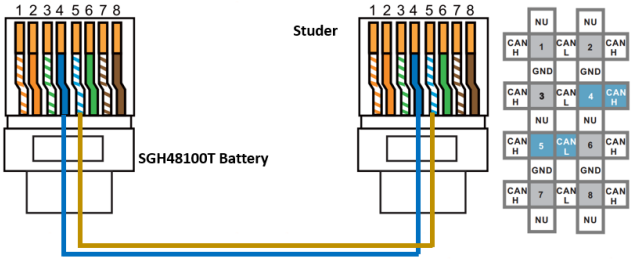
Battery 485 port	SMA sunny island	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	
Pin6 (optional)	Pin2 (optional)	

Connect with Schneider inverter/charger



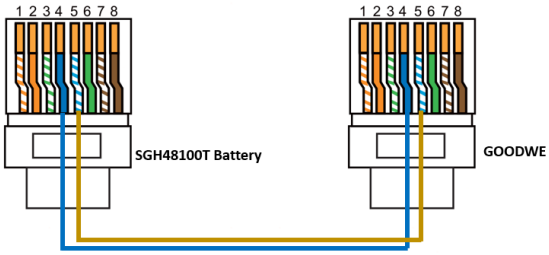
Battery CAN port	Conext Gateway	Cable suggest
Pin4	Pin14	customized
Pin5	Pin12	
Pin6 (optional)	Pin10 (optional)	

Connect with Studer inverter/charger



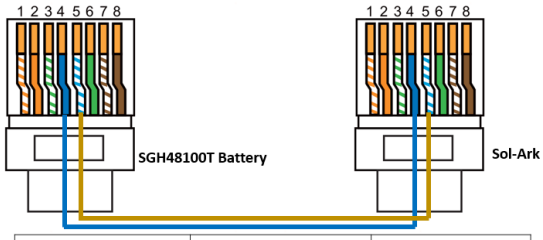
Battery CAN port	X-Com CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with GOODWE hybrid inverter



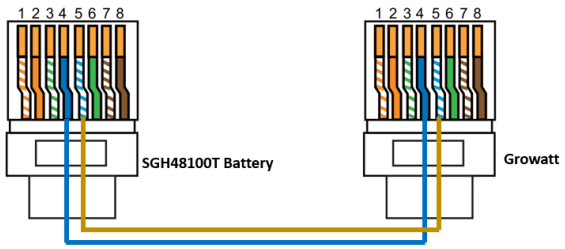
Battery CAN port	GOODWE BMS CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with Sol-Ark hybrid inverter



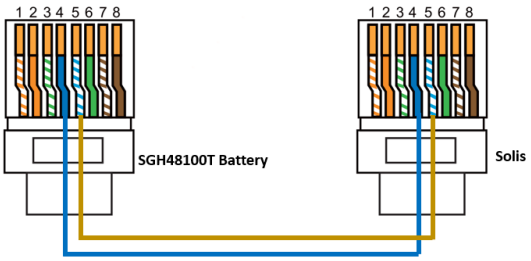
Battery CAN port	Sol-Ark CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	
Pin6 (optional)	Pin6 -outdoor Pin2 –indoor (optional)	

Connect with Growatt inverter



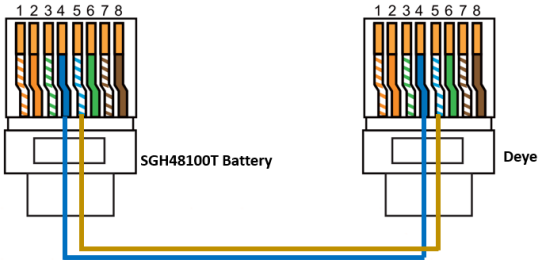
Battery CAN port	Growatt BMS communication port	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with Solis inverter



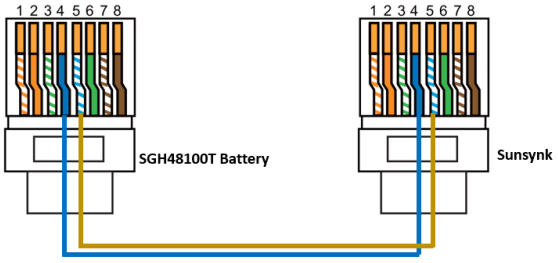
Battery 485 port	SMA sunny island	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with Deye hybrid inverter



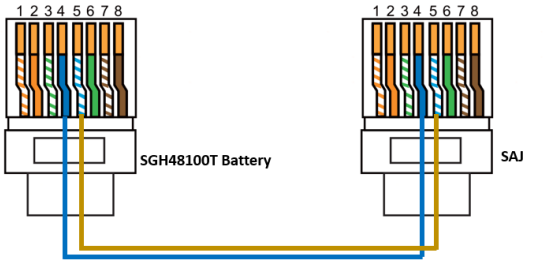
Battery CAN port	Deye CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with SUNSYNK hybrid inverter



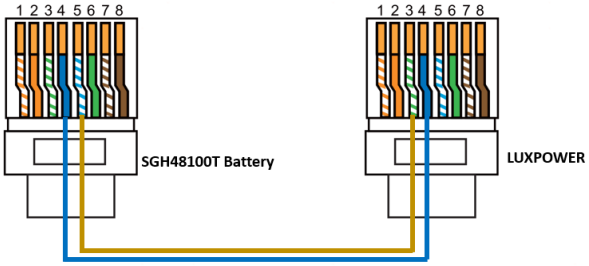
Battery CAN port	Sunsynk CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with SAJ hybrid inverter



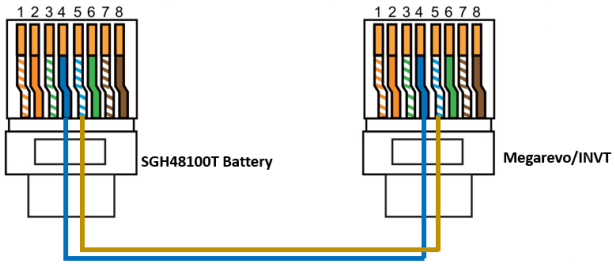
Battery CAN port	SAJ CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with LUXPOWER inverter



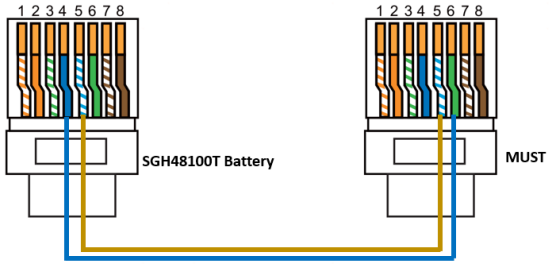
Battery CAN port	LUXPOWER CAN	Cable suggest
Pin4	Pin4	customized
Pin5	Pin3	

Connect with Megarevo/INVT inverter



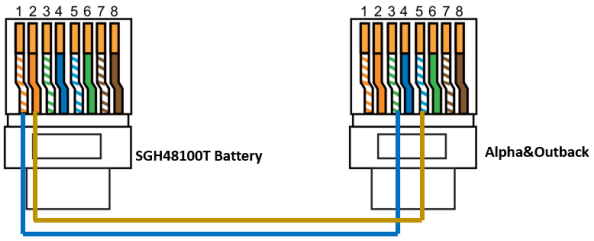
Battery CAN port	Megarevo CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with MUST inverter



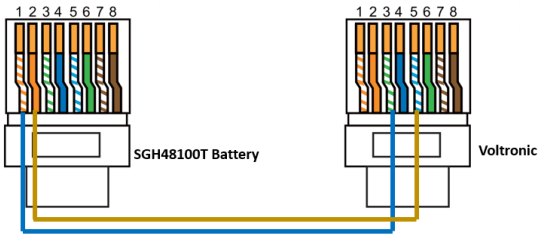
Battery CAN port	MUST CAN	Cable suggest
Pin4	Pin6	customized
Pin5	Pin5	

Connect with Alpha & Outback energy inverter



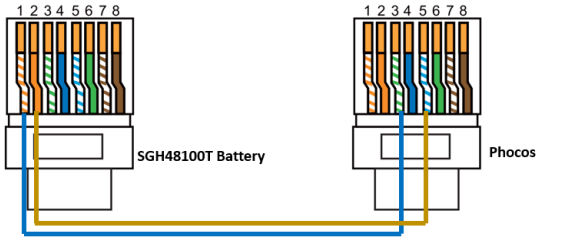
Battery RS485 port	Alpha&Outback BMS communication	Cable suggest
Pin1	Pin3	Version-III(RS485)
Pin2	Pin5	

Connect with Voltronic inverter



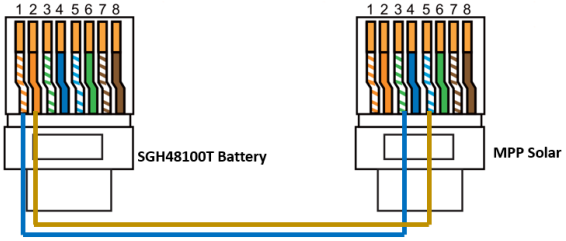
Battery RS485 port	Voltronic BMS communication	Cable suggest
Pin1	Pin3	Version-III(RS485)
Pin2	Pin5	

Connect with Phocos inverter



Battery RS485 port	Phocos BMS communication	Cable suggest
Pin1	Pin3	Version-III(RS485)
Pin2	Pin5	

Connect with Mpp solar inverter



Battery RS485 port	MPP BMS communication	Cable suggest
Pin1	Pin3	Version-III(RS485)
Pin2	Pin5	

Battery system home storage series

User Manual

Product Name:48V100Ah Lithium Battery

Product Model:SG48100P

Product Specifications:51.2V 100Ah

Catalogue

1.Document description

This specification covers the performance indexes, technical requirements and safety issue of the 48V100Ah.

2.Definition of Terms

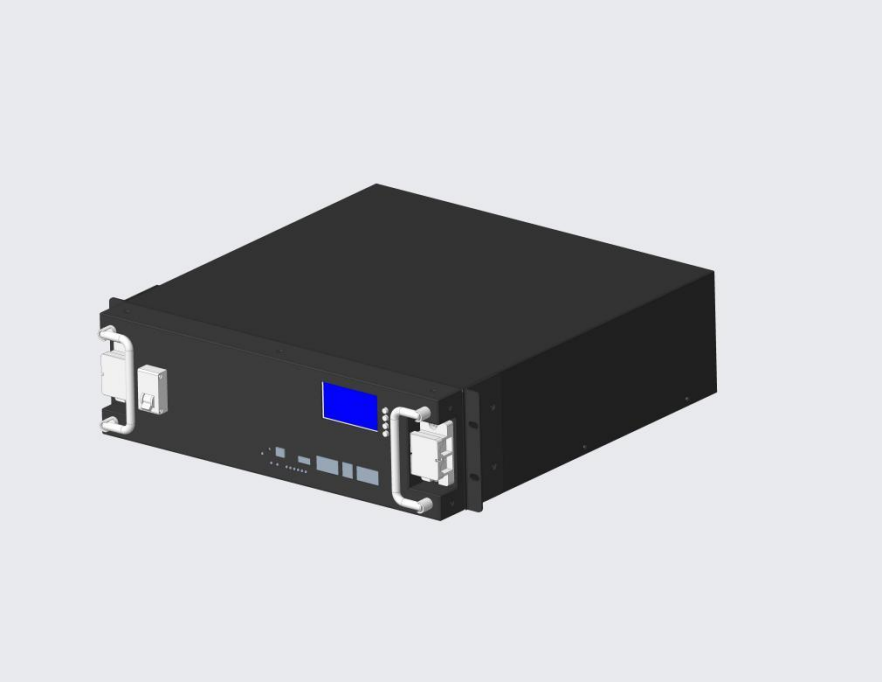
BMS	Battery Management System
DOD	Depth Of Discharge
EOL	End Of Life
OCV	Open Circuit Voltage
SOC	State Of Charge
SOH	State Of Health
EMC	Electro Magnetic Compatibility
Nominal voltage	Appropriate voltage approximation to identify or identify a cell or an electrochemical system.
Capacity	(The amount of power a battery can provide when fully charged under specified conditions. Usually expressed in Ah.)
Energy	The energy that can be provided by a fully charged battery under specified conditions. Usually expressed in Wh or kWh.
Unit	"V" (Volt) (Voltage unit) "A" (Ampere) (Current unit) "Ah" (Ampere-Hour) (unit of charge) "Wh" (Watt-Hour) (electrical energy unit) "Ω" (Ohm) (resistance unit) "℃" (degree Celsius) (temperature unit) "mm" (millimetre) (length unit) "s" (second) (Time unit) "kg" (kilogram) (Weight unit) "Hz" (Hertz) (Frequency unit)

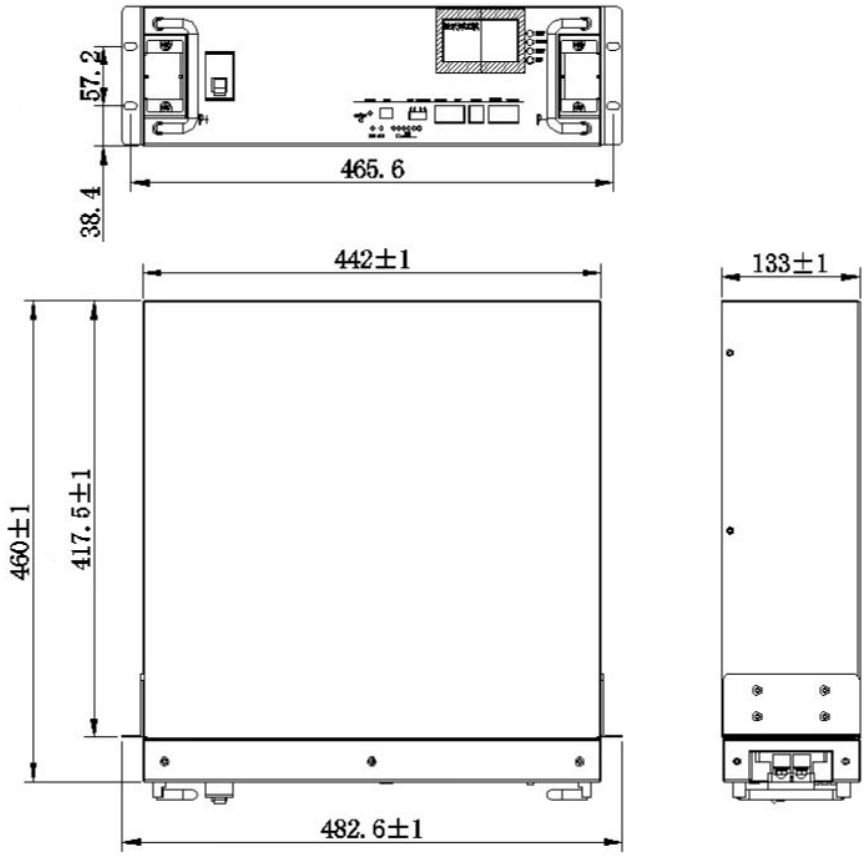
3.Battery system performance parameters

No.	Item	Technical parameter	Note
1	Battery Type	Lithium iron phosphate battery	/
2	Rated capacity	100Ah	@25℃±2，0.2C，100%DOD

3	Nominal voltage	51.2V	
4	Recommended charging voltage	54.5V	
5	Charging Limited Voltage	57.6V	
6	SOC working range	0~100%	Recommended range of use：20%~95%
7	Standard discharge current	50A	
8	Maximum continuous discharge current	100A	
9	Standard charging current	50A	
10	Maximum continuous charge current	100A	
11	Maximum cut-off voltage for charging	57.6V	
12	Charge cut-off current	5A	0.05C magnification
13	Discharge cut-off voltage	43.2V	
14	PACK cycle life	≥ 7000	80%DOD 25℃±2℃, 0.5C charge/0.5C discharge
15	Thermal management method	Natural heat dissipation	
16	IP protection class	IP31 battery box	
17	Flammability rating	plastic parts UL94 V-0	
18	Total system mass	Around 43KG	
19	Battery system shell material	BLACK Q235A	Color can be customized
20	Shipping SOC	SOC45-55%	
21	Dimension（L*W*H mm）	☑442*460*133（3U）±1mm	
22	Design life	15 Year	
23	Parallel function	Supports up to 63 batteries in parallel	
24	Display function	English smart display	
25	Charging current limit function	Current limit 20A	Charging current limit can be set according to customer requirements
26	Communication mode	☑RS232	Communication mode can be set according to customer requirements
		☑RS485	
		☑CAN	
27	communication protocol	Support multiple protocols	Communication protocol can be set according to customer requirements
28	Storage ambient temperature	-10~+45℃	Recommended storage temperature：0~+30℃
29	Working temperature	Battery charging：0～ 45℃ Battery discharging:-20～ +60℃	
30	Relative humidity of working environment	≤ 95	Best Use Relative Humidity：≤85%

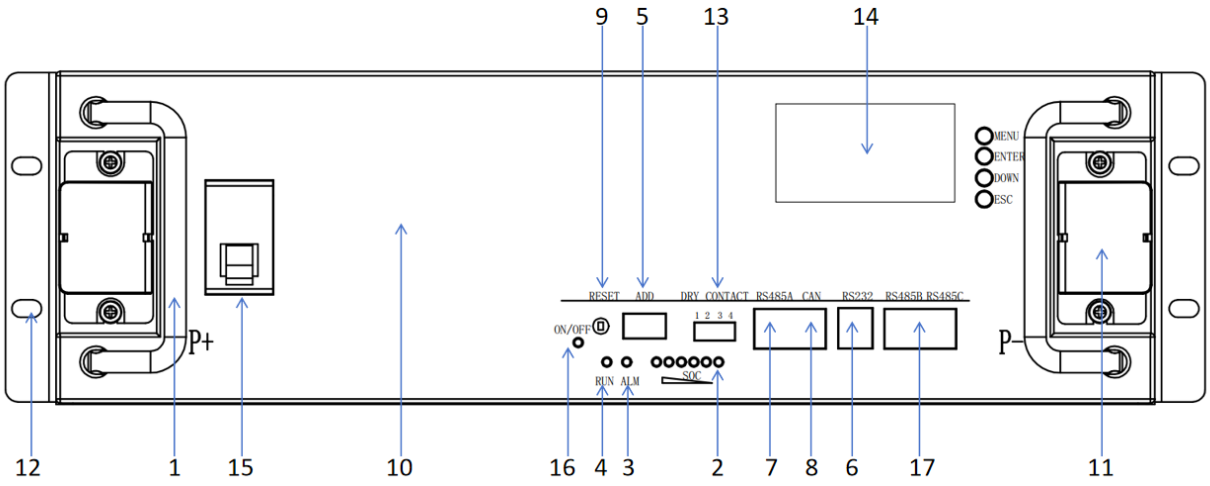
4. Outline and Structural Dimensions of Battery System





5.Definition of battery system interface

5.1.Panel Schematic



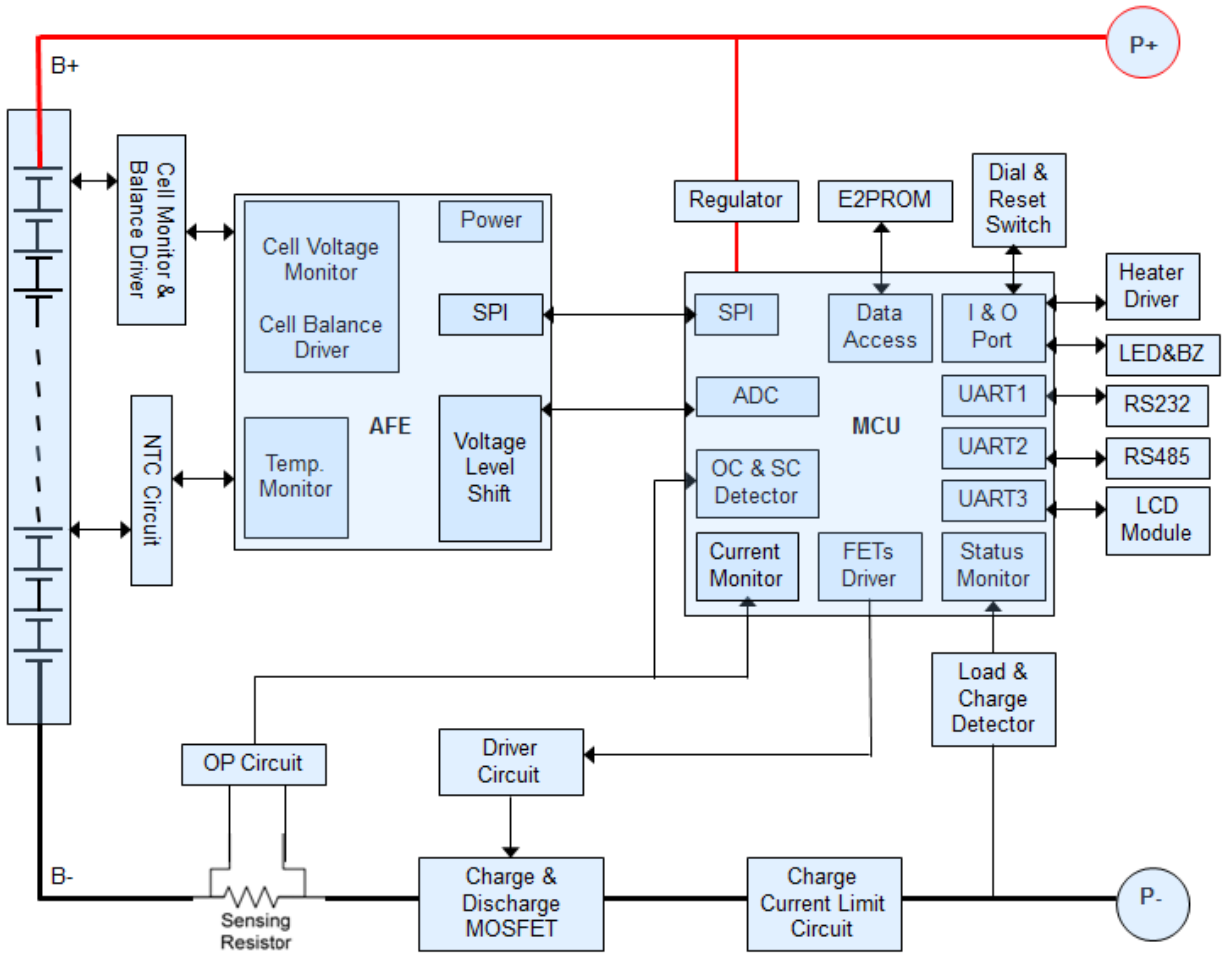
5.2.Module Panel Description

NO	Function definition	Function Description	Note
1	Handle	Carrying handle	
2	SOC	Capacity status light	Six green LED lights to show the current charge of the lithium battery pack
3	ALM	Alert	Red LED light, normally off under normal conditions, always on under fault conditions, and a voice prompt
4	RUN	Run	Green light, always on when the product is running
5	ADD	DIP switch	Use 6 bit binary DIP switch to set address allocation when products are used in parallel
6	RS232	RS232 communication	Uplink communication port, RS232 communication mode when uploading data, data content includes system parameters, system status and alarm information. The rate of 9600bps is generally used. Note: Wiring definitions are implemented in accordance with BMS product specifications
7	RS485	RS485 communication	RS485 communication method
8	CAN	CAN communic	CANcommunication method
9	RESET	Reset	When the product is in an abnormal state or in a hibernation state, the product can be restarted and woken up through the reset button to ensure the stable operation of the system
10	Main panel	Shell	Sheet metal thickness 1.5mm, galvanized frosted paint, color: black

11	Terminals	Input and output terminals	Battery positive and negative output terminals
12	Hanging ears	Mounting ears	The spacing is implemented according to the national standard
13	dry contact terminal	Load output port	example: definition: Dry contact 1-PIN1 to PIN2: normally open, closed during fault protection Dry contacts 2-PIN3 to PIN4: normally open, SOC<5%, closed for low battery alarm.
14	Display	Display screen	Battery information can be viewed on the display
15	Air breaker	Breaker	For controlling battery output
16	ON/OFF	ON/OFF	Battery switch status indicator
17	Parallel dual RS485	RS485B RS485C	For battery parallel RS485 communication

6. Functional block diagram

The functional block diagram is shown in the figure below



7.Battery Management System Specifications

7.1.Basic parameter settings

NO.	Indicator item		Factory default parameters	Is it possible to set	Note
1	Cell overcharge protection	Cell overcharge alarm voltage	3600mV	Can be set	
		Cell overcharge protection voltage	3700mV	Can be set	
		Cell overcharge protection delay	4.0S	Can be set	
	Single Over voltage Protection Released	overcharge protection release voltage Cell	3380mV	Can be set	
		Capacity release	SOC < 96%	Can be set	
		Discharge release	discharge current ＞ 2A		
2	Cell over discharge protection	Cell over-discharge alarm voltage	2700mV	Can be set	After 30 seconds of over-discharge protection, if it still cannot recover, it will enter low power consumption mode
		Cell over-discharge protection voltage	2500mV	Can be set	
		Monomer over-discharge protection delay	1.0S	Can be set	
	Cell over-discharge protection released	Cell over-discharge protection release voltage	2800mV	Can be set	
		(Release when charging)	Plug into the charger to activate		
3	Overall overcharge protection	Overall overcharge warning voltage	57.6V	Can be set	
		Overall overcharge protection voltage	58.4V	Can be set	
		Overall overcharge protection delay	1.0S	Can be set	
	Overall overvoltage protection released	Overall overcharge protection release voltage	54.1V	Can be set	
		Capacity release	SOC < 96%	Can be set	
		Discharge release	discharge current > 2A		
4		Overall over-discharge warning voltage	43.2V	Can be set	After 30 seconds of over-discharge

	Overall over discharge protection	Overall over-discharge protection voltage	40V	Can be set	protection, if it still cannot recover, it will enter low power consumption mode
		Overall over-discharge protection delay	1.0S	Can be set	
	Overall over-discharge protection released	Overall over-discharge protection release voltage	44.8V	Can be set	
		Release when charging	Plug into the charger to activate		
5	Charging current limit function	Charging current limit	20A		
6	Charge over current protection	Charge over current alarm current	105A	Can be set	Appearing 10 times in a row will lock the status and will no longer automatically release
		Charge over current protection current	110A	Can be set	
		Charge over current protection delay	1.0S	Can be set	
	Charging over current protection released	Automatic release	Automatically cancel after 1min		
		Discharge release	Discharge current > 1A		
7	Discharge over current 1 protection	Discharge over current 1 alarm current)	105A	Can be set	Appearing 10 times in a row will lock the status and will no longer automatically release
		Discharge over current 1 protection current)	110A	Can be set	
		Discharge over current 1 protection delay	1.0S	Can be set	
	Discharge over current 1 protection released	Automatic release	Automatically cancel after 1min		
		Charge release	Charge current > 1A		
8		Discharge over current 2 protection current	≥150A	Can be set	Appearing 10 times in a row will lock

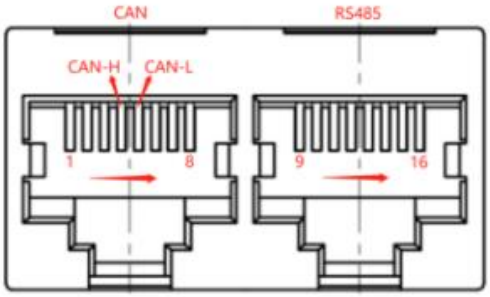
	Discharge over current 2	Discharge over current 2 protection delay	500mS	Can be set	the status and will no longer automatically release	
	Discharge over current 2 protection released	Automatic release	Automatically cancel after 1min			
		charge release	Charge current > 1A			
9	Short circuit protection	Short circuit protection function		(Have)		
		Short circuit protection released		When there is charging, the short circuit protection is released		
				After the load is removed, it will automatically disarm		
10	MOS high temperature protection	MOS over temperature alarm temperature)		90℃	Can be set	
		MOS over temperature protection temperature)		115℃	Can be set	
		MOS protection release temperature)		85℃	Can be set	
11	Cell temperature protection	Charging low temperature warning temperature)		0℃	Can be set	
		Charging low temperature protection temperature)		-5℃	Can be set	
		Charging low temperature protection release temperature		0℃	Can be set	
		Charging high temperature alarm temperature	55℃		Can be set	
		Charging high temperature protection temperature)	60℃		Can be set	
		Charging high temperature protection release temperature	50℃		Can be set	
		Discharge low temperature alarm temperature	-15℃		Can be set	
		Discharge low temperature protection temperature	-20℃		Can be set	
		(Discharge low temperature protection release temperature	-15℃		Can be set	

		Discharge high temperature alarm temperature	60℃		Can be set	
		Discharge high temperature protection temperature	65℃		Can be set	
		Discharge high temperature protection release temperature	55℃		Can be set	
12	Ambient temperature alarm	Ambient low temperature alarm temperature	-15℃		Can be set	
		Ambient low temperature protection temperature	-20℃		Can be set	
		Ambient cryogenic protection release temperature	-15℃		Can be set	
		Ambient high temperature alarm temperature	65℃		Can be set	
		Ambient high temperature protection temperature	75℃		Can be set	
		Ambient high temperature protection release temperature	65℃		Can be set	
13	Current consumption	Self-consumption current during operation	≤55mA（with display）			
			≤45mA(without display)			
		Low power mode current	≤200μA			
14	Equalization function	Equalization turn-on voltage	3500mV	Can be set		
		Open differential pressure	30mV	Can be set		
15	Capacity default settings	Low battery warning	SOC＜5%	Can be set	(No alarm when charging)	
		Full capacity setting	100AH		Can be set	
16	Sleep function	Sleep voltage	3150mV		Can be set	
		Delay	5min		Can be set	
		Over pressure recovery	500mV			
17	Cell failure protection	Monomer differential pressure	Voltage difference>1V		Charge and discharge are not allowed	
18	Full charge judgment	Full charge voltage	56V	Can be set	After simultaneously satisfying, Stop	
		Cut off current	5A	Can be set		

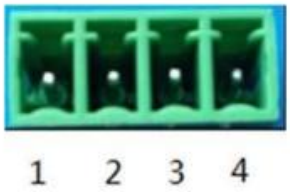
					charging and update SOC to 100%

7.2.Interface

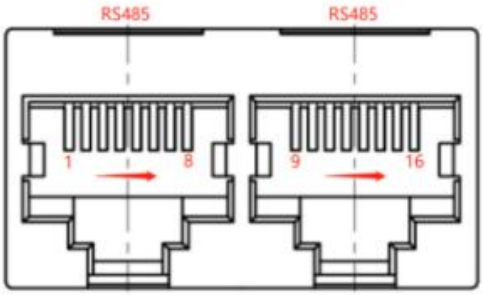
7.2.1.Interface diagram



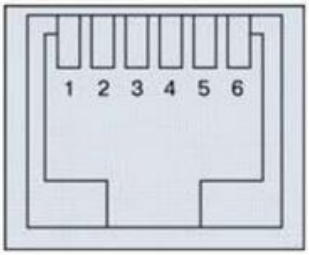
CAN and RS485 interface



dry contact



Parallel communication port



RS232 communication interface

7.2.2. Interface Definition

RS232--Using 6P6C vertical RJ11 socket	
RJ11	Definition description
2	NC
3	TX
4	RX
5	GND

RS485 and CAN interface

RS485--Using 8P8C vertical RJ45 socket		CAN--Using 8P8C vertical RJ45 socket	
RJ45 Pin	Definition description	RJ45 Pin	Definition description
9、16	RS485-B1	1、3、6、7、8	NC
10、15	RS485-A1	4	CAN-H
11、14	GND	5	CAN-L
12、13	NC	2	GND

Parallel communication port

RS485--Using 8P8C vertical RJ45 socket		RS485--Using 8P8C vertical RJ45 socket	
RJ45Pin	Definition description	RJ45 Pin	Definition description
1、8	RS485-B	9、16	RS485-B
2、7	RS485-A	10、15	RS485-A
3、6	GND	11、14	GND
4、5	NC	12、13	NC

7.3.Communication description

7.3.1. RS232 communication

The BMS can communicate with the host computer through the RS232 interface, so as to monitor various information of the battery on the host computer side, including battery voltage, current, temperature, status, SOC, SOH and battery production information, etc. The default baud rate is 9600bps.

7.3.2.RS485 communication

With dual RS485 interface, you can view the information of PACK, the default baud rate is 9600bps. To communicate with the monitoring device through RS485, the monitoring device is used as the host to poll data according to the address, and the address setting range is 2~63

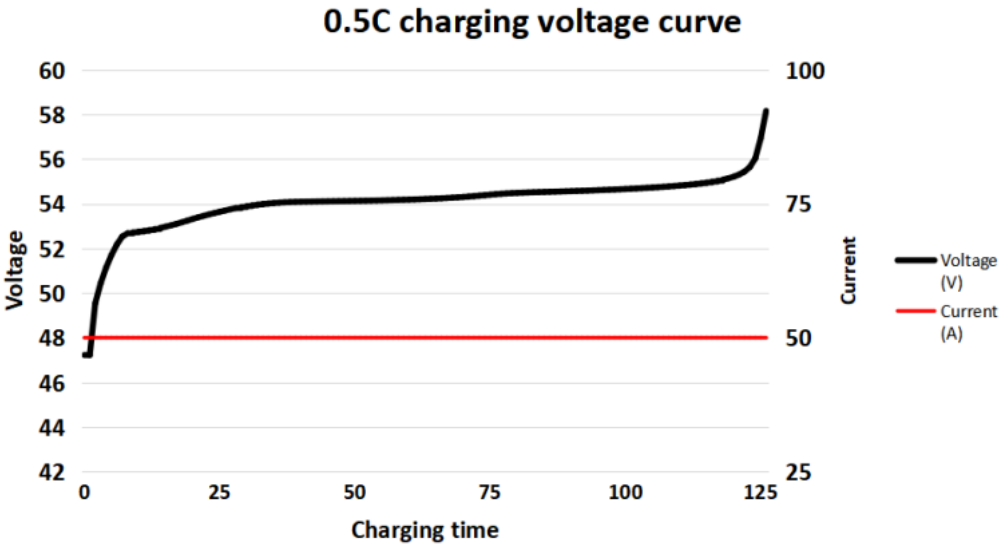
7.3.3. CAN communication

CAN communication, baud rate 500K.

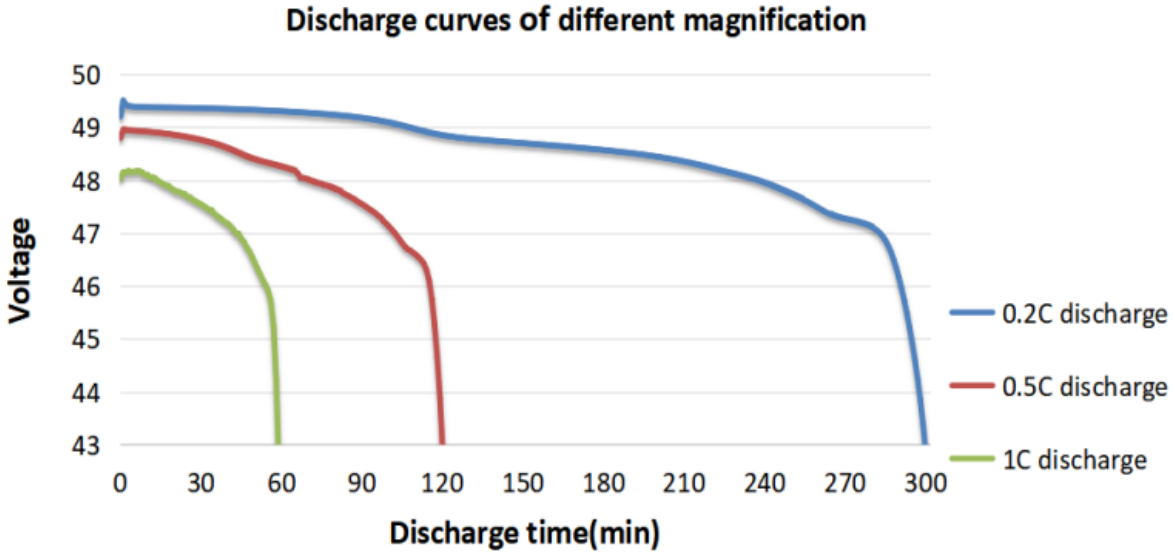
8.Product function and performance description

8.1.Charging performance

- Standard charging current (25℃)
- Standard charging voltage：57.6V
- Standard charging mode and charging curve：



8.2.Discharge curve at different magnification



9.Using & Maintenance Suggestions

9.1.LED indication description

Table 1 LED working status indication

Condition		Charging						Discharging					
Capacity indicator		L6●	L5●	L4●	L3●	L2●	L1●	L6●	L5●	L4●	L3●	L2●	L1●
Electricity (%)	0 ~ 17%	black	black	black	black	black	flash2	black	black	black	black	black	Always bright
	17 ~ 33%	black	black	black	black	flash 2	Always bright	black	black	black	black	Always bright	Always bright
	33 ~ 50%	black	black	black	flash 2	Always bright	Always bright	black	black	black	Always bright	Always bright	Always bright
	50 ~ 66%	black	black	flash 2	Always bright	Always bright	Always bright	black	black	Always bright	Always bright	Always bright	Always bright
	66-83%	black	flash 2	Always bright	Always bright	Always bright	Always bright	black	Always bright	Always bright	Always bright	Always bright	Always bright
	83-100%	flash 2	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright
Running lights●		Always bright						flash3					

Table 2 Description of capacity indication

Condition	Normal/Alarm/Protect	RUN	ALM	LED						Illustrate
				Battery indicator LED						
		●	●	●	●	●	●	●	●	
Shutdown	Hibernate	black	black	black	black	black	black	black	black	Annihilate
Standby	Normal	flash1	black	According to the battery indicator						Standby mode
	Alarm	flash1)	flash3							Module low voltage
Charging	Normal	Always bright)	black	According to the battery indicator (battery indication maximum LED flashes 2)						(The highest power LED flashes (flashing 2), the overcharge alarm ALM does not flash)
	Alarm	Always bright	3 flash3							
	Overcharge protection	Always bright	black	Always bright	Always bright	Always bright	Always bright	Always bright	Always bright	(If there is no utility power, the indicator light is in standby state)
	Temperature, overcurrent, fail safe	black	Always bright	black	black	black	black	black	black	Stop charging
Discharging	Normal	flash3	black	(According to the battery indicator)						
	Alarm	flash3)	flash3							
	Undervoltage protection	black	black	black	black	black	black	black	black	Stop discharge

	Temperature, overcurrent, short circuit, reverse connection, fail safe	black	Always bright	black	black	black	black	black	black	Stop discharge
Invalid		black	Always bright	black	black	black	black	black	black	Stop charging and discharging

Table 3 LED flashing description

Flashing method	Bright	Black
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, and the factory default is enabled.

9.2. Buzzer action description

1）In case of failure, it will beep for 0.25S every 1S;

2）During protection, it will beep for 0.25S every 2S (except for overvoltage protection);

3）When alarming, it will beep every 3S for 0.25S (except overvoltage alarm);

4）The buzzer function can be enabled or disabled by the host computer, and the factory default is disabled.

9.3. Key Description

1）When the BMS is in the dormant state, press the button (3~6S) and release it, the protection board will be activated, and the LED indicators will light up in sequence from "RUN" for 0.5 seconds.

2）When the BMS is activated, press the button (3~6S) and release it, the protection board is put to sleep, and the LED indicators light up sequentially for 0.5 seconds from the lowest battery light.

3）When the BMS is activated, press the button (6~10S) and release it, the protection board will be reset, and all the LED lights will light up at the same time for 1.5 seconds.

After the BMS is reset, it still retains the parameters and functions set by the host computer. If it is necessary to restore the initial parameters, it can be achieved through the "restore default value" of the host computer, but the relevant operation records and stored data remain unchanged (such as power, cycle times, etc.). , protection records, etc.).

9.4.Sleep and wake up

9.4.1. Hibernate

When any of the following conditions are met, the system enters a low-power mode:

- The single or overall over-discharge protection has not been released within 30 seconds.
- Release the button after pressing the button for 3 seconds.
- The minimum cell voltage is lower than the sleep voltage, and the duration reaches the sleep delay time (at the same time, no communication, no protection, no balance, and no current are satisfied).
- The standby time is more than 24 hours (no communication, no charging and discharging, no mains power).
- Forced shutdown through the host computer software.

Before entering the sleep mode, make sure that the input terminal is not connected to an external voltage, otherwise it will not be able to enter the low power consumption mode.

9.4.2. wake

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

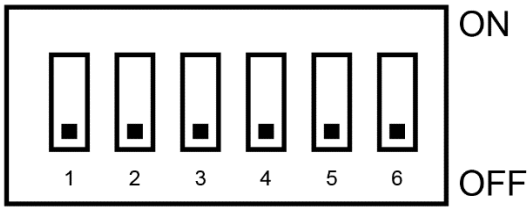
- Connect the charger, the output voltage of the charger must be greater than 48V.
- Press the button for 3S and release the button.
- Connect to the communication line and open the software of the upper computer (it enters the sleep state due to over-discharge protection, this method cannot wake up the protection board).

Remarks:

- After the single or overall over-discharge protection, it enters the low-power mode, wakes up regularly every 4 hours, and turns on the charge and discharge MOS. If it can be charged, it will exit the dormant state and enter normal charging; if it cannot be charged after 10 consecutive automatic wake-ups, it will no longer automatically wake up.
- When the system is defined as the end of charging, the recovery voltage is not reached after 2 days of standby (standby time setting value), and the charging is forced to resume until the end of charging again.

9.5.DIP switch settings

When the battery packs are used in parallel, different PACK can be distinguished by their hardware addresses, and the hardware address of each PACK in the entire battery stack is unique. The hardware addresses can be set in sequence through the DIP switches on the board. Refer to the following for the definition of the switches. surface.



ADD	Dip switch position					
□	#1	#2□	#3□	#4□	#5□	#6
1	ON	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF
4	OFF	OFF	ON	OFF	OFF	OFF
5	ON	OFF	ON	OFF	OFF	OFF
6	OFF	ON	ON	OFF	OFF	OFF
7	ON	ON	ON	OFF	OFF	OFF
8	OFF	OFF	OFF	ON	OFF	OFF
9	ON	OFF	OFF	ON	OFF	OFF
10	OFF	ON	OFF	ON	OFF	OFF
11	ON	ON	OFF	ON	OFF	OFF
12	OFF	OFF	ON	ON	OFF	OFF
13	ON	OFF	ON	ON	OFF	OFF
14	OFF	ON	ON	ON	OFF	OFF
15	ON	ON	ON	ON	OFF	OFF
16	OFF	OFF	OFF	OFF	ON	OFF

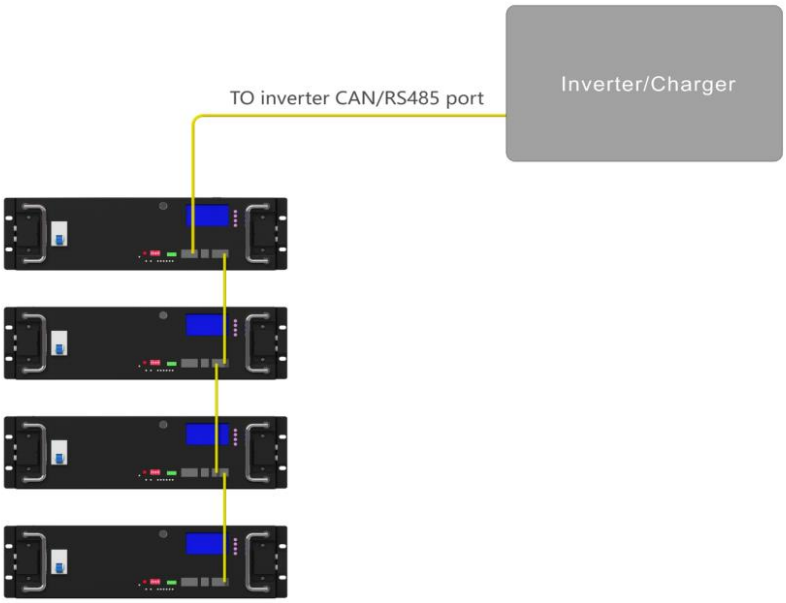
17	ON	OFF	OFF	OFF	ON	OFF
18	OFF	ON	OFF	OFF	ON	OFF
19	ON	ON	OFF	OFF	ON	OFF
20	OFF	OFF	ON	OFF	ON	OFF
21	ON	OFF	ON	OFF	ON	OFF
22	OFF	ON	ON	OFF	ON	OFF
23	ON	ON	ON	OFF	ON	OFF
24	OFF	OFF	OFF	ON	ON	OFF
25	ON	OFF	OFF	ON	ON	OFF
26	OFF	ON	OFF	ON	ON	OFF
27	ON	ON	OFF	ON	ON	OFF
28	OFF	OFF	ON	ON	ON	OFF
29	ON	OFF	ON	ON	ON	OFF
30	OFF	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON	OFF
32	OFF	OFF	OFF	OFF	OFF	ON
33	ON	OFF	OFF	OFF	OFF	ON
34	OFF	ON	OFF	OFF	OFF	ON
35	ON	ON	OFF	OFF	OFF	ON
36	OFF	OFF	ON	OFF	OFF	ON
37	ON	OFF	ON	OFF	OFF	ON
38	OFF	ON	ON	OFF	OFF	ON
39	ON	ON	ON	OFF	OFF	ON
40	OFF	OFF	OFF	ON	OFF	ON
41	ON	OFF	OFF	ON	OFF	ON
42	OFF	ON	OFF	ON	OFF	ON
43	ON	ON	OFF	ON	OFF	ON
44	OFF	OFF	ON	ON	OFF	ON
45	ON	OFF	ON	ON	OFF	ON
46	OFF	ON	ON	ON	OFF	ON
47	ON	ON	ON	ON	OFF	ON
48	OFF	OFF	OFF	OFF	ON	ON
49	ON	OFF	OFF	OFF	ON	ON
50	OFF	ON	OFF	OFF	ON	ON
51	ON	ON	OFF	OFF	ON	ON
52	OFF	OFF	ON	OFF	ON	ON
53	ON	OFF	ON	OFF	ON	ON
54	OFF	ON	ON	OFF	ON	ON
55	ON	ON	ON	OFF	ON	ON
56	OFF	OFF	OFF	ON	ON	ON
57	ON	OFF	OFF	ON	ON	ON
58	OFF	ON	OFF	ON	ON	ON
59	ON	ON	OFF	ON	ON	ON
60	OFF	OFF	ON	ON	ON	ON
61	ON	OFF	ON	ON	ON	ON
62	OFF	ON	ON	ON	ON	ON
63	ON	ON	ON	ON	ON	ON

9.6.The routine maintenance of the battery part can be carried out by referring to the table

Period	Item	Treatment measures
Per month	(Operating environment)	Keep away from heat sources and avoid direct sunlight
	Visual inspection	If the appearance is damaged, leaked or deformed, the faulty battery pack should be disconnected, photographed and replaced.
Each quarter	Clean appearance	Clean the exterior with a cotton cloth. Due to the high voltage of the battery pack, care should be taken when cleaning.
	Connection Status	● Check the bolts at each terminal and retighten them if they are loose. ● If the temperature of the connection line exceeds 40°C (feeling hot), check the cause
Every half year	Voltage detection	● At the end of charging, measure and record the busbar voltage and the positive and negative terminal voltages of the battery pack. The voltages of the two are consistent. Otherwise, check whether the cable at the corresponding connection is faulty. ● In the first year, real-time data collection at the end of discharge was performed at least every six months. ● Beginning in the second year, on-site capacity determination will be conducted every three months. If a certain battery cell is frequently overcharged and over-discharged in the historical alarm information viewed through the RS232 interface, it means that the battery cell has touched the charging protection point and the discharging protection point for a long time. This situation may lead to insufficient backup time, it is recommended to replace it in time

The final state of charge and discharge can be judged by the capacity light, refer to the definition of LED light capacity status light.

9.7.Battery pack communication parallel wiring



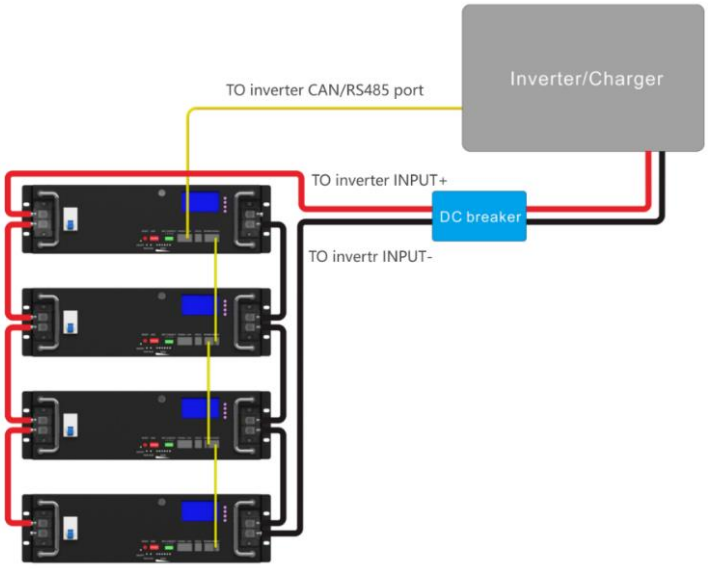
9.8 .Battery pack power cable wiring

Please note：

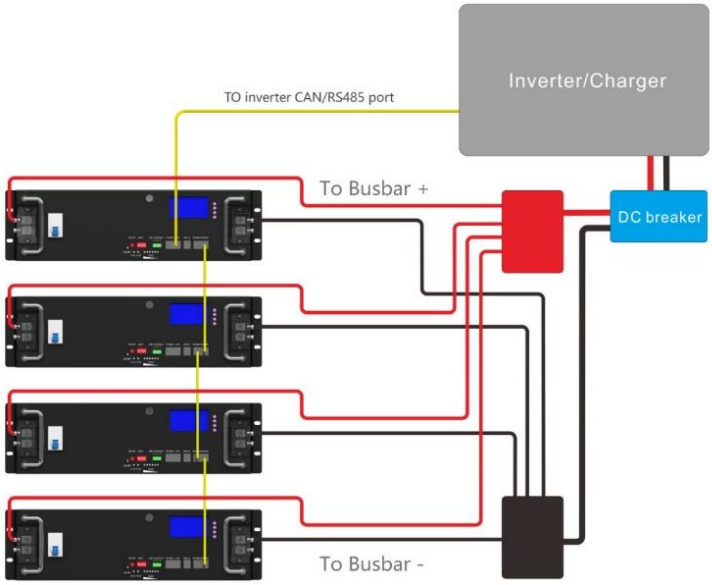
1. Batteries cannot be used in series.
2. When connecting in parallel, it is necessary to pay attention to the SOC,the SOC must be the consistent before connecting in parallel.
3. Please turn off the inverter and turn off the battery before connecting the battery system in parallel, and then turn on the battery and inverter again after capacity expansion.
4. The connecting cables between battery and battery should be the same length, and the connecting cables between battery and inverters should be the same length.
5. The wire gauge of the connecting cable between batteries and the cable between battery and inverter is related to the volume of charing current and discharging current and the wiring connection method, etc., so it can not be standardized， If there are any questions, please consult the supplier.

6. It is recommended to have the system installed by a qualified professional.

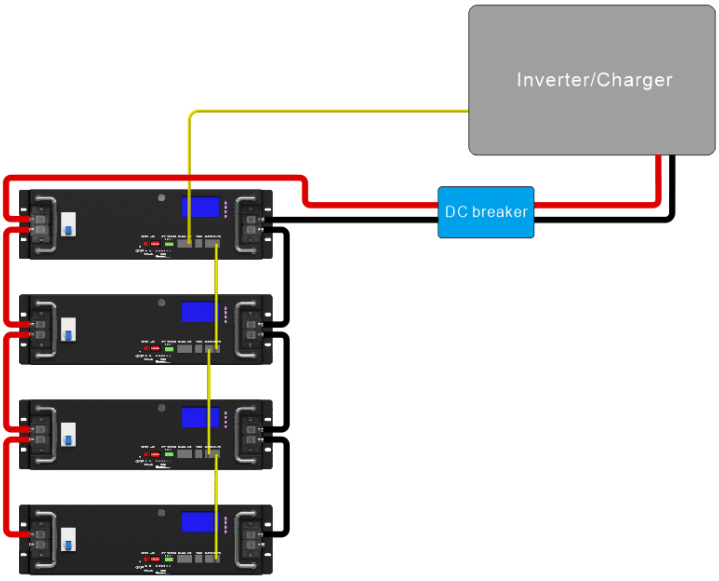
Suggested option 1（example:4 batteries）:



Suggested option 2（example:4 batteries）:



Wiring diggram not allowed:



9.9.LCD Display Detailed Explanation

Menu					
First level column		Secondary Column		Level three column	
Name	Meaning	Name	Meaning	Name	Meaning
Analog Info	Analog Info	PackV	Pack Voltage		
		Im	Current		
		Temperature	Temperature	T1	Temperature T1
				T2	Temperature T2
				T3	Temperature T3
				T4	Temperature T4
				PCB_T	MOS Temperature
				ENV_T	Environment Temperature
		Cell Voltage	Cell Voltage	Cell01:	Cell Voltage 01:
				Cell02:	Cell Voltage 02:
				……	.....
				Cell15:	Cell Voltage 15:
				Cell16:	Cell Voltage 16:
		CellCapacity	CellCapacity	SOC	State Of Charge
				FCC	Full Charge Capacity
				Rm	Remain Capacity
				CC	Cycle Count
BMS Status	BMS Status	Status	BMS Status		
		Record	Fault Record	SCP	Short Circuit Protection
				O/UTP	Over / Under Temperature Protection
				OCP	Over Current Protection
				UVP	Under Voltage Protection
				OVP	Over Voltage Protection
		BMS Status	BMS Status	OT	Over Temperature Warning
				OTP	Over Temperature Protection
				OV	Over Voltage Warning
				OVP	Over Voltage Protection
				UV	Under Voltage Warning
				UVP	Under Voltage Protection
				OC	Over Current Warning
				OCP	Over Current Protection
				SCP	Short Circuit Protection
				Failure	Failure
Para Setting	Para Setting	Non-Production manufacturer can not use			
Sys Setting	Sys Setting	Baud rate	Baud rate		

10.Packing List

See below for packing list

NO.	Material name	Specification/Module	Number
1	48100Ah lithium iron phosphate battery	48100	1 set/box
2	Positive and negative output lines	25mm2 flame retardant cable, length 0.5m, crimp 25-8 copper noses at both ends, one red and one black.	1 set/1 module
3	RS485 cascade communication line	0.5 meters long, with RJ45 crystal heads at both ends.	1root/1 modules
4	RS232 USB	1.2 meters long, one end is the corresponding crystal head, and the other end is the USB interface.	optional
5	Product manual	/	1
6	Certificate	/	1
7	Hanging ear screw	M6*16(stud 16mm)	4
8	Dry contact terminal	Matching according to the number of dry nodes of the BMS	1

11.Storage, maintenance and transportation

11.1.Storage

- The battery pack is usually stored at a state of charge of 20% to 40% in a clean, dry, ventilated and rain-proof room with an ambient temperature of -5°C to 35°C and a relative humidity of not more than 75%, and should be placed flat. Pad height, not less than 100MM from the ground;
- Batteries cannot be stored with active chemicals or dusting items;
- The battery cannot be subjected to any mechanical shock or heavy pressure;
- The battery should avoid direct sunlight, keep away from the fire source, and the distance from the heat source should not be less than 2M;
- From the date of manufacture, every 3 months of storage should be charged with a current of 0.2~0.5C for 30~60min, and the temperature range is 25℃±5℃.5）.

11.2. Transportation

The battery pack should be packaged and shipped. During transportation, avoid severe vibration, shock or extrusion, and avoid sun and rain. Batteries can be transported by vehicles such as cars, trains, ships, and planes.

12. Maintain

The battery pack should remain at 40% - 60% of state of charge;

When the battery is not in use for a long time, it is recommended to charge it with 0.2c current every three months or so.

During the maintenance process, do not install or remove the battery in the battery pack by yourself, otherwise the battery performance will be reduced;

Any battery in the battery pack shall not be disassembled or replaced without authorization, and dissection of the battery is strictly prohibited.

13.Battery usage precautions

Please read the instruction manual and precautions carefully before use. When used correctly according to the product characteristics, the battery will be a safe, reliable and convenient storage battery.

Warn! Improper use of lithium-ion batteries can result in personal injury or fire!

1. When charging the battery, pay attention to ensure that the polarity is correct, and do not reverse the charging of the battery;
2. Do not expose the battery to adverse environments, such as extreme temperatures, deep cycling, frequent overcharge/overdischarge;
3. If you find that the battery is abnormal, please stop using it immediately and report it to a

professional for treatment;

4. Ensure that batteries and battery management systems are kept away from dangerous goods or dangerous materials;
5. It isforbidden to short-circuit the battery;
6. It is forbidden to burn or destroy the battery, which may cause the release or burning of harmful gases;
7. Do not disassemble, squeeze, pierce or burn.
8. Rain is prohibited;
9. It is forbidden to be directly exposed to sunlight;
10. Prohibit exposure to temperatures above 60°C;
11. It is forbidden to discard the battery in the garbage;
12. It is forbidden to use other types of batteries in series or in parallel with lithium-ion batteries;
13. It is forbidden to use new and old batteries (groups) in series or in parallel.

14. Product Liability

Consumers must strictly abide by the requirements of this product specification to use this product. Misuse may lead to serious accidents.The company is not responsible for any accidents caused by the operation and use that are not strictly in accordance with this product specification.The company reserves the right to change the contents of this specification without prior notice; the final interpretation right of this information belongs to the company.

Rechargeable Lithium battery

Operation and Maintenance manual

Product Model: SG48200T

Product Specifications: 51.2V 200Ah

Version: V-00

Content

1. Information

1.1 Validity

This document is valid for: SG48200T Battery Pack.

1.2 Target Group

This document is intended for qualified persons and operators. Only qualified persons are allowed to perform the activities marked in this document with a warning symbol and the caption "Qualified person". Qualified persons must have the following skills:

- Knowledge of how lithium iron phosphate batteries work and are operated.
- Knowledge of how an energy storage system (including PV/battery/hybrid inverter, MPPT, Meter, Distribution box etc.) works and is operated.
- Knowledge of local applicable connection requirements, standards, and directives.
- Training in the installation and commissioning of electrical devices, batteries.
- Training in how to deal with the dangers and risks associated with installing, repairing and using electrical devices, batteries.

1.3 Levels of warning messages

The following levels of warning messages may occur when handling the product

DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury or product permanent damage.

NOTICE

Indicates a situation which, if not avoided, can result in property damage or product not work or accelerated product damage

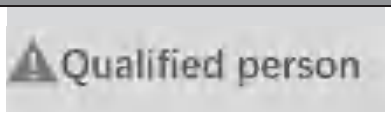
1.3 Symbol Description

1.4.1 Symbols on products label

Label	Definition
	Beware of electrical shock
	Do not place the battery within children/pet touchable area.
	Do not place the battery near heat source and flammable material

	Do not expose the battery to direct sunlight, rain and snow.
	Do not short circuit the battery
	Recycle label
	WEEE designation

1.4.2 Other symbols

Label	Definition
	Indicates activities that can only be performed by qualified persons
	Grounding point

1.5 Abbreviation Description

Abbreviation	Definition
Battery/battery pack/battery module	Single SG48200T rechargeable lithium iron phosphate battery pack including cells, BMS and enclosure etc.
Battery system/cluster	Multiple SG48200T battery pack connected in parallel with power, communication and grounding cables and installation auxiliaries.
BMS	Battery management system Electronical Unit to ensure lithium cells' safety and display information or control the battery work mode.
SOC	State of charge The battery state of charge refers to the percentage of the

	remaining capacity and rated capacity of the battery.
SOH	State of health The battery health status refers to the percentage between the full charged capacity and the rated capacity of the battery.
DIP switch	Dual in-line package switch
COCP	Charge over current protection
DOCP	Discharge over current protection
COVP	Cell over voltage protection
POVP	Pack over voltage protection
CHTP	Charge high temperature protection
DHTP	Discharge high temperature protection
CUVP	Cell under voltage protection
PUVP	Pack under voltage protection
CLTP	Charge low temperature protection
DLTP	Discharge low temperature protection
SCP	Short circuit protection
LCD	Liquid Crystal Display

2. Safety

2.1 Safety precautions

DANGER

Explosion risk

- Do not impact the battery with heavy objects.
- Do not squeeze or pierce the battery pack.
- Do not throw the battery pack into the fire.

WARNING

Fire risk

- Do not expose the battery pack to the condition over 80°C.
- Do not put the battery near a heat source, such as a fireplace.
- Do not expose the battery pack to direct sunlight or raining.

CAUTION

Electric shock risk

- Do not allow non-qualified person to disassemble the battery pack.
- Do not touch the battery pack with wet hands.
- Do not expose the battery pack to moisture or liquid environment.

NOTICE

Damage risk

- Do not short-circuit or reverse connect the battery.
- Do not use chargers or charging devices unapproved by the manufacturer to charge the battery.
- Do not mix batteries from different manufacturers or different kinds, types or brands.

2.2 Safety instructions

The battery has been designed and tested in accordance with international (such as UN38.3 etc.) safety requirements. However, due to various factors during the whole lifetime process, Manufacturer cannot guarantee absolute safety, in order to prevent personal injury and property damage and ensure long-term operation of the battery, please do read the below section carefully to operate the battery and handle emergency situations.

2.2.1 Safety gear

It is required to wear the following safety gear when installing and handling the battery pack.

Insulated gloves

Safety Glasses

Safety Shoes

2.2.2 Emergency safety measures

Water invasion

Please cut off the AC power supply of the system first and then disconnect all switched under the premise of ensuring safety.

Electrolyte or gas 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.

- Gas Inhalation: Evacuate the people in the contaminated area and seek medical aid immediately.

- Eye Contact: Flush your eye with clean and flowing water for 15 min, and seek medical aid immediately.
- Skin Contact: Thoroughly rinse the exposed area with soap and water to be sure no chemical or soap is left on them, and seek medical aid immediately.
- Ingestion: Induce vomiting, and seek medical help immediately.

⚠WARNING

In case of fire situations, please use carbon dioxide fire extinguisher rather than liquid to put out fires.

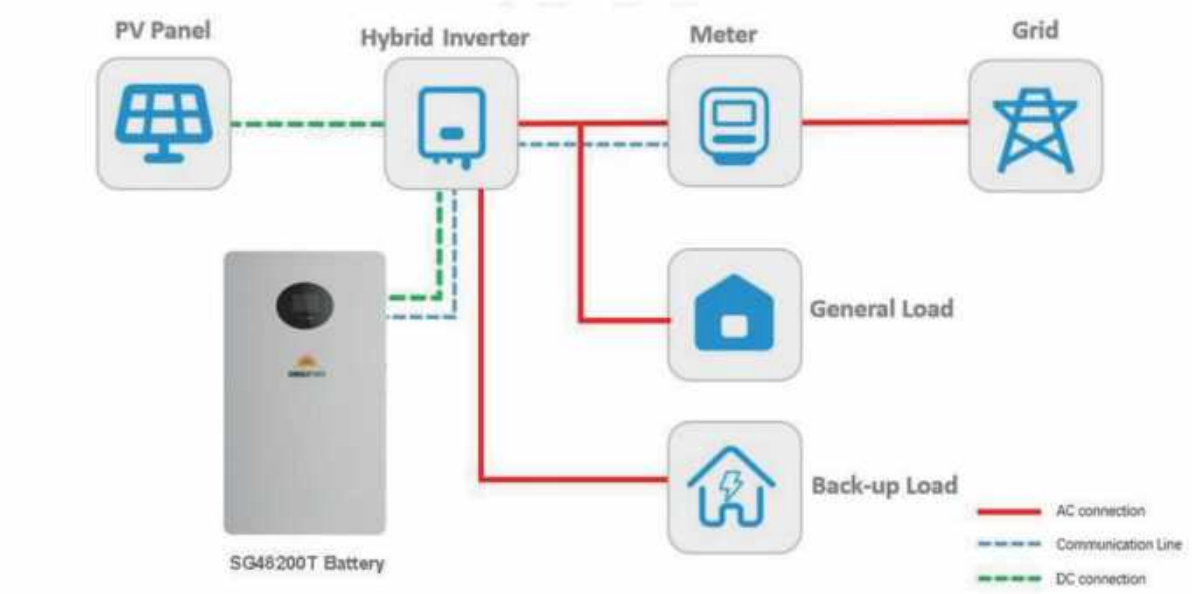
2.2.3 Other Tips

- All the product are strictly inspected before shipment, please contact your supplier for replacement if you notice there's any defectives such as swelling.
- Do not disassemble batteries and components, otherwise the manufacturer will not be responsible for any damage caused by unauthorized disassembly or repair.
- Do enable the battery to be safely grounded before use to make sure the system in safe and normal operation.
- Please ensure that the electric parameters of these devices are compatible mutually before connecting the battery to other devices.
- Please take the environmental factors into careful considerations to ensure that the system can work in a suitable condition as the environment and storage methods have a certain impact on the service life and reliability of this product.

3. Product Overview

3.1 Introduction

The SG48200T battery is designed for residential application and works as a storage unit in the photovoltaic system. It is a 51.2V lithium battery system, with BMS inside. It could be operated in both on-grid, back-up and off-grid modes with compatible inverters. Below is the general schematic of an ac-coupled system with the batteries.



CAUTION

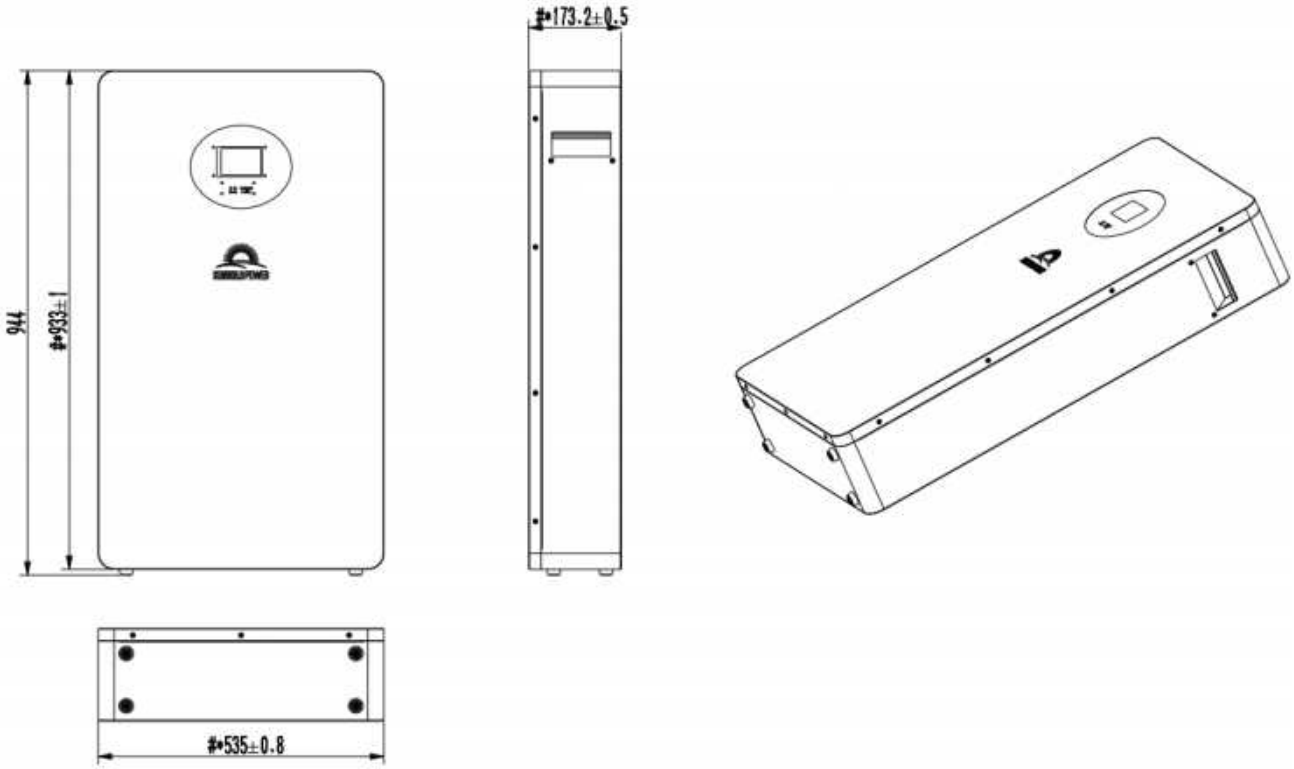
The electrical connections in this diagram are for illustration purposes only. Please follow the recommendations in the relevant equipment manual and operate by personnel with professional qualifications.

3.2 Features

- Highest safety, battery is made from LiFePO4 chemistry and comply with highest international safety and transport standard.
- Modular and flexible, support up to 32 batteries connect together to expand the system energy.
- Built-in pre-charge circuit to avoid rush current when connecting with different inverter/chargers.
- Automatic dynamic addressing function when connected multiple batteries together.
- Support a maximum of 96% DOD under off-grid and back-up application
- Built in BMS provide warning and protection functions including over-discharged, over-charged, over-current, short-circuit and high/low temperature.
- LiFePO4 as cathode material and automatic balancing function to meet longer cycle life
- Compact size and light weight for easy installation and maintenance.
- Multiple installation bracket (optional) to adopt with different customers' requirement.
- LED display, CAN/RS485 port for external communication and upgrade the BMS firmware.
- Rapid shut down function for North American market.
- Equipped with LCD to view battery information.

3.3 Specification

3.3.1 Dimension



3.3.2 Parameters

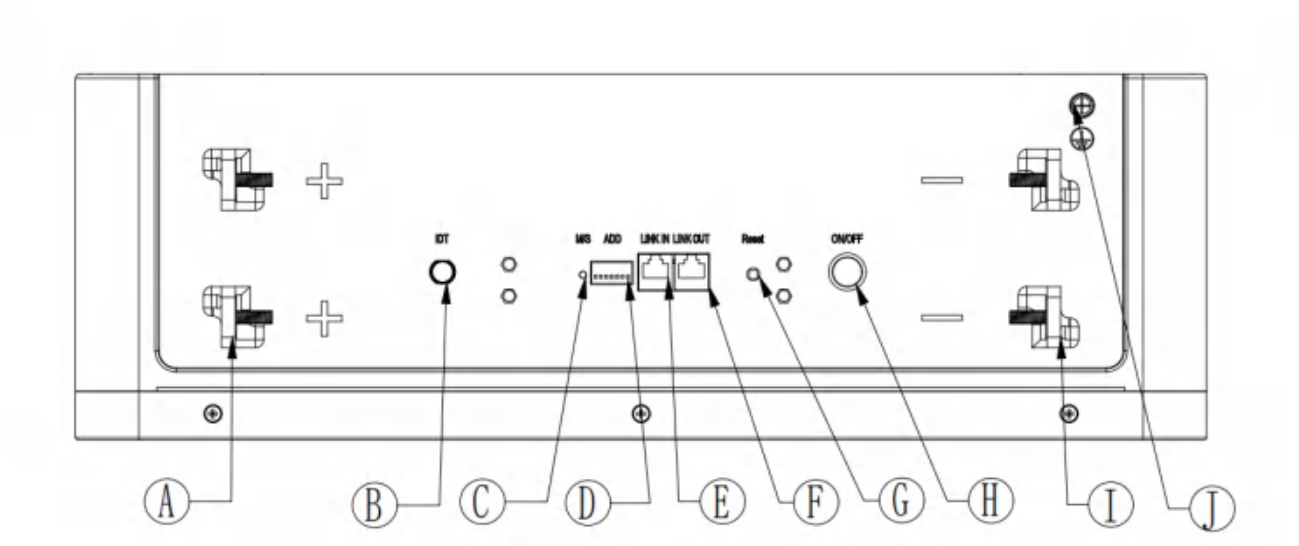
Items	SG48200T
Rated voltage	51.2V
Max. voltage range	44.8~57.6V, Shipping voltage>51.2V
Charge voltage	56.0V
Float charge voltage	54.6V
Nominal energy@0.5C	10.24KWh
Usable energy@0.5C	9.84kWh
Nominal capacity@0.5C	200Ah
Dimension	535*944*173mm
Weight	~90kg
Standard charge current	≤100A
Max. charge current	140A
Standard discharge current	≤100A

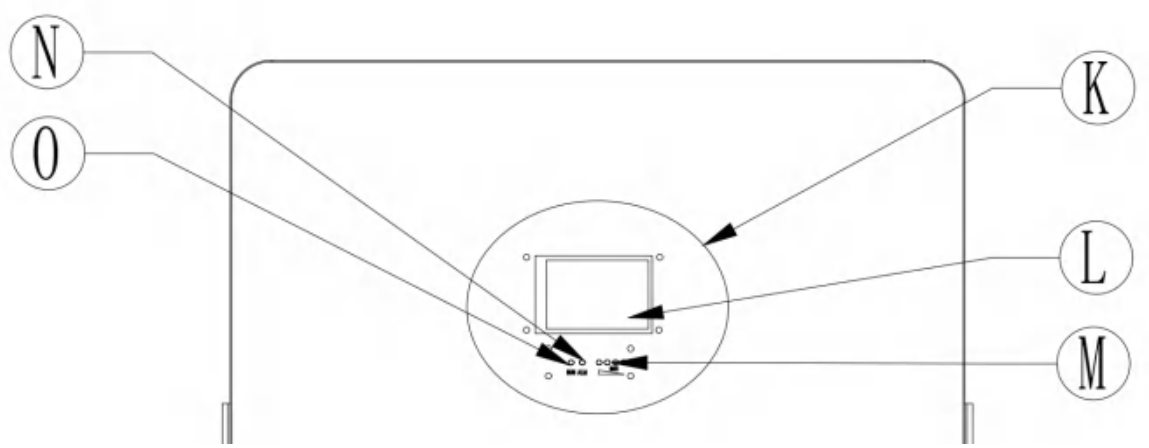
Max. discharge current	200A (initial temp. ≤86℉（30℃）)	
Peak discharge current	200~240A@5mins | 240~300A@15S	
Communication	RS485 /CAN	
Max parallel number	32pcs	
Operation temperature [1]	Charge: 0~50℃ Discharge:-10~50℃	
Storage temperature @off mode	32℉(0℃)<T<86℉(30℃)	< 6 months
	14℉(-10℃)<T<113℉(45℃)	< 3 months
	Recommended environment	59℉ to 95℉ (15~35℃), 5~75%RH

NOTICE

The optimum operating temperature range is from 15°C to 30°C, Frequent exposure to the harsh temperatures may worsen the performance of the battery pack and cycle life.

3.3.3 Panel Interface





No.	Items	Usage description	Remark
A	Positive terminal	Used to connect the inverter/charger	
B	IOT	Used to connect with cloud platforms	
C	M/S	Used to indicate the module is Master or Slave battery	**Single mode**:OFF **Parallel mode:** ON-Master battery OFF-Slave battery
D	DIP	Used to set the RS485 baud rate and inverter protocol choosing	
E	Link IN	For internal and external communication	
F	Link OUT		
G	Reset	Used to sleep(3s)/awake(3s)/reset(6~10s) BMS in power on mode.	
H	Power switch	Used to Power on/off battery	
I	Negative terminal	Used to connect the inverter/charger	
J	Ground	Used to connect battery with ground	
K	PET	Decorative film	
L	LCD	Used to show battery information	
M	SOC	Used to show battery real-time SOC	Please see 3.3.3.3 for flashing specifications
N	ALM	Used to show battery Alarm/Protection status	
O	RUN	Used to show battery is in running status when lighting or flashing	

3.3.3.1 G: Link IN / Link OUT

Port	Pin No.	Definition	Remarks
Link IN	1	RS485-B1	1.Used to connect with external devices to establish communication. 2.Used to connect with upper battery pack Link OUT.
	2	RS485-A1	
	3	SGND	
	4	CAN-H	
	5	CAN-L	
	6	SGND	
	7	RS485-A1	
	8	RS485-B1	
Link OUT	1	RS485-B2	Used to connect with downward battery pack Link IN.
	2	RS485-A2	
	3	SGND	
	4	CAN-H	
	5	CAN-L	
	6	SGND	
	7	RS485-A2	
	8	RS485-B2	

3.3.3.2: DIP addressing

<table>
<tr><th colspan="7">DIP</th><th rowspan="2">Remarks</th></tr>
<tr><th>RS485 baud rate</th><th colspan="4">Undefined</th><th colspan="2">Protocol</th></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td></td></tr>
<tr><td>ON: 115200</td><td colspan="4" rowspan="4">Reserved for multiple cluster parallel and other future function</td><td>0</td><td>0</td><td>Protocol ID0</td></tr>
<tr><td>OFF: 9600</td><td>1</td><td>0</td><td>Protocol ID1</td></tr>
<tr><td></td><td>0</td><td>1</td><td>Protocol ID2</td></tr>
<tr><td></td><td>1</td><td>1</td><td>reserved</td></tr>
<tr><td>Keep all batteries the same setting</td><td colspan="4">Keep default setting</td><td colspan="2">Master: according to inverter
Brand Slave: keep default setting</td></tr>
</table>

Note:

Only master battery needs to set the Protocol ID, keep all slave battery default setting, after choose the protocol ID, the battery will **detect automatically** the inverter **information** and corresponding to get into running, restart to take effect after setting new DIP sequence.

CANbus Connection		RS485 Connection		DIP setting (Master battery)
Protocol ID	INVERTER	Protocol ID	INVERTER	
CAN 1	Victron/SMA/Studer Innotec/Sofar	RS4851	SUNGOLDPOWER SPH/Voltronic/RCT/ MPP/Alpha outback/ Phocos	 X000000
CAN 2	SUNGOLDPOWER SG/ Sol-Ark/Solis/Goodwe/Deye/ Growatt/SAJ/LUXPOWER/ Megarevo/INVT/Sermatec/ MUST/Sunsynk	RS485 2	SUNGOLDPOWER SPH	 X100010
CAN 3	Schneider	RS485 3	LUX POWER	 X010001

NOTICE

Fail to follow the DIP switch setting will cause the communication fault between battery and inverter, for more detail setting with different inverter/charger, please contact your supplier for consultation.

3.3.3.3 RUN/ALM/SOC

Mode	Status	RUN	ALM	LED indicator				Description
		●	●	●	●	●	●	
Power off	-	OFF	OFF	OFF	OFF	OFF	OFF	All OFF
Standby	Normal	FLASH1	OFF	According to battery SOC				See note
	Warning	FLASH1	FLASH3					
Charge	Normal	ON	OFF	According to battery SOC (highest SOC LED: FLASH2)				See note
	Warning	ON	FLASH3					

	COCP	FLASH1	OFF	According to battery SOC				Stop charging
Discharge	Normal	FLASH3	OFF	According to battery SOC				See note
	Warning	FLASH3	FLASH3					
	CUVP/PUVP	OFF	FLASH3	OFF	OFF	OFF	OFF	Stop discharging
	DOCP	OFF	ON	OFF	OFF	OFF	OFF	Stop discharging
Temperature	CHTP/DHTP CLTP/DLTP	OFF	ON	OFF	OFF	OFF	OFF	Stop charging/discharging
Failure	Cell/NTC failure Sensor failure MOS failure Reversed polarity /SCP	OFF	ON	OFF	OFF	OFF	OFF	Stop charging/discharging

Note: 'Warning' including items of cell imbalanced/low voltage/high current/high&low temperature.

FLASH Type	ON	OFF
FLASH1	0.25S	3.75S
FLASH2	0.5S	0.5S
FLASH3	0.5S	1.5S

3.4 Protection function

Items	Description	Remark
Charge end COVP POVP	The BMS will stop charging if any cell or PACK voltage reach the protection value and it will be auto-released only when both Pack and cell voltage back to the release voltage range or there is efficient discharge current.	
Discharge end CUVP	The BMS will stop discharging if any cell or PACK voltage is under the protection value and it will be released only when all	Can Automatic recovery. Please charge

PUVP	the cell voltage back to the release voltage range or there is efficient charge current.	timely, otherwise it may be in Low-power mode to be over-discharged and damage battery.
CHTP DHTP	The BMS will stop charging or discharging or both if any cell/environment/MOS temperature is beyond the range.	Automatic recovery when temperature falls.
CLTP DLTP	The BMS will stop charging or discharging or both if any cell/environment/MOS temperature is under the range.	Automatic recovery when temperature rise.
COCP	The BMS will stop charging when the charging current is higher than the protection value. And it will release from the protection when the system delays time is met.	Automatic recovery. If locked after three consecutive times, manual intervention is required.
DOCP	The BMS will stop discharging when the discharging current is higher than the protection value. And it will release from the protection when the system delays time is met	Automatic recovery. If locked after three consecutive times, manual intervention is required.
SCP Reversed polarity	The BMS will stop charging when detect short circuit or reversed polarity.	Charge to release. Manual press reset.
Temperature, Voltage, Current sensor failure	Enter the failure mode, manual intervention is required no charging and discharging.	Manual intervention.
Sleep mode	After reaching a certain condition, BMS will enter dormancy mode to reduce BMS consumption	Charge, press reset or restart to activate.

⚠ CAUTION

Please re-charge the battery via MPPT, grid/generator or other energy source within 24h if the battery is over discharged, otherwise, it may be damaged.

⚠ NOTICE

Manually short-circuit and reverse the battery will void the warranty.

4 Installation

4.1 Preparation

4.1.1 Safety Compliance

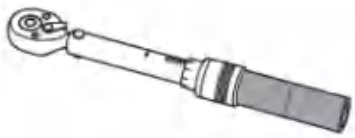
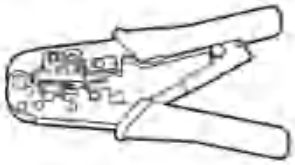
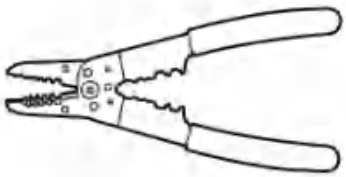
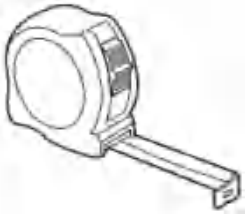
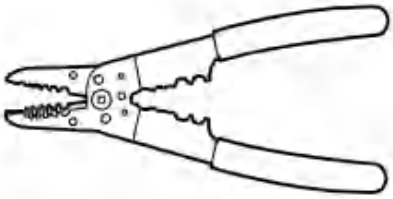
The system installation must be finished by qualified person(s), During the whole installation process, please strictly follow the local safety regulations and related operating procedures.

4.1.2 Environment

The operating environment shall meet the following requirements:

Category	Description
Working temperature	14℉（-10℃）-122℉（50℃）(maximum operating range) 59℉（15℃）-86℉（30℃） (optimal temperature)
Relative humidity	5%~90%, No condensation
Altitude	<3000m
Safety requirement	• Do not expose the battery to direct sunlight, rain and snow. • Do not place the battery within children/pet touchable area. • Do not place the battery near heat source and flammable material • Do not drop, deform, impact, cut or spearing with a sharp object. • Do not put heavy things on battery. • Do not disassemble the battery without Manufacturer's permission. • No conductive dust and water or other liquid to contact battery. • Follow the emergency measure if there is water invasion or electrolyte and gas leakage. • Contact your supplier within 24 hours if any product failure happens.

4.1.3 Tools

Tools	
Torque screwdriver 	Multi-meter 
Torque wrench 	Cable crimper 
Wire stripper 	Tape measure 
Flat-head screwdriver 	Phillips-head screwdriver 
Wire stripper 	Drill 
Phillips-screwdriver bit 	

4.2 Inspection

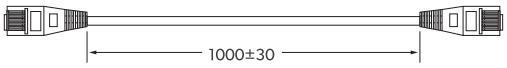
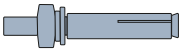
4.2.1 Unpacking

- Please load and unload it in accordance with the specified requirements to prevent sun and rain when you receive the equipment.
- Please check and confirm the goods (such as quantity, appearance, etc.) according to the "scope of delivery " before unpacking.
- Do light take and put during unpacking process to protect the surface coating of the object;
- Please record and feedback to the manufacturer if the inner packing is damaged after unpacking.

4.2.2 Scope of delivery

Check the scope of delivery for completeness and any externally visible damage. Contact your supplier for supplementary delivery if the listed material is incomplete or damaged.

General materials *(Battery unit)*	
	
Battery Pack *1pcs	Manual *1pcs

Type	Detail	Qty.
Power cable		1PCS
		1PCS
Grounding cable		1PCS
Battery to battery communication cable		1PCS
Floor to wall fixed bracket		2PCS
Expansion screw	 M6*50	2PCS
Wall mounted installation (optional)		
Wall mounted bracket		1PCS
Battery Wall mounted bracket		2PCS
Wall mounted limit bracket		2PCS
Expansion screw	 M10*80	4PCS
Screw	 M6*16	12PCS

For inverter communication PIN definition detail, please check **Appendix I**

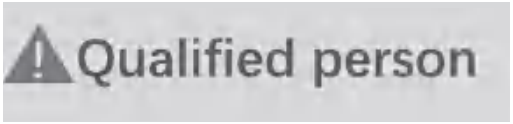
NOTICE

Keep the unused cable pins NULL to avoid affecting the closed loop communication.

NOTICE

A ground connection of communication cable may be required from some inverters, please follow the rules from inverter manufacture.

4.3 Start Installation



4.3.1 Remainder

Please check again the following conditions or equipment whether meet the requirements before installation:

- Check if there's enough space for installation, and if the load-bearing capacity of the bracket or cabinet meets the weight requirements.
- Check whether the power cable pair(s) used meets the maximum current requirement for operation.
- Check whether the overall layout of power supply equipment and batteries at the construction site is reasonable.
- Check whether the installer is wearing anti-static wristband.
- Check whether there're two people on the construction site for installation work.
- Check if there's potential risks at location of installation site, e.g flooding, sun exposure, corrosion, and salt spray.

4.3.2 Procedures

⚠ CAUTION
Injuries may result if the product is lifted incorrectly or dropped while being transported or mounted. Wear suitable personal protective equipment for all work on the product.

⚠ CAUTION
Ensure that no lines are laid in the wall which could be damaged when drilling holes.

4.3.2.1 Floor mounted installation

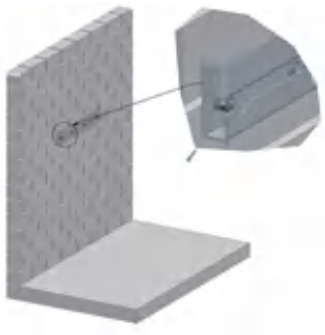
i. Take the battery pack out from package.	
ii. Fasten the two wall mount brackets together iii. Fix the assembled bracket in the corresponding position of the battery as shown in the figure iv. Attach the battery with the assembled stand to the wall	

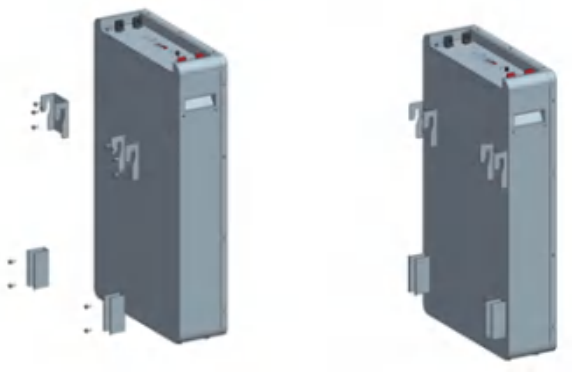
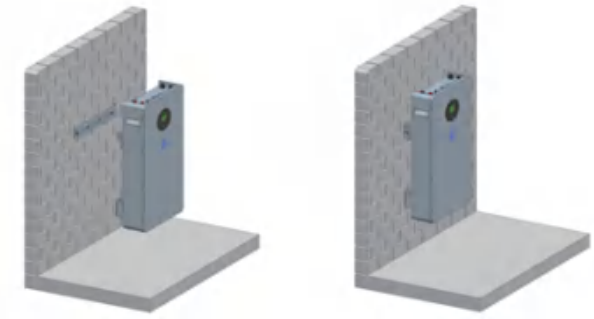
v. The installation is completed and the final minor changes are shown on the right	
vi. Finish the cable connection	

CAUTION

Please fix the parallel cable between batteries with the wall or other part to avoid enduring the gravity of conductor for long time, resulting in an increase in the internal resistance of the connection.

4.3.2.2 Wall mounted installation(optional)

i. Take the battery pack out from carton.	
ii. Take out the wall mounting bracket, place it onto the wall horizontally and mark the hole position on the panel. iii. Drill holes in the wall for the M10 expansion bolt. The drilling depth should be at least 60 mm, insert the bolt.	  

iv. Fix the breaket with the nut v. Use combination screws to secure wall mount components to the battery	
vi. Hang the battery on the wall bracket	
vii. Finish the cable connection	

4.3.3 Tips

4.3.3.1 Installation not allowed

Direct upside down	Left/Right side flip	Floor side flip
 X	  X	 X
Direct upside down	side flip	Front side down

5. Cable connection and commissioning

5.1 Get battery ready

5.1.1 Ensure all the battery is in OFF mode, check and confirm the installation is tighten and stable.

5.1.2 Check the number and specification of cable kit accessories are correct according to the Scope of delivery item, if you are making cable yourself, please follow manufacturer's requirements.

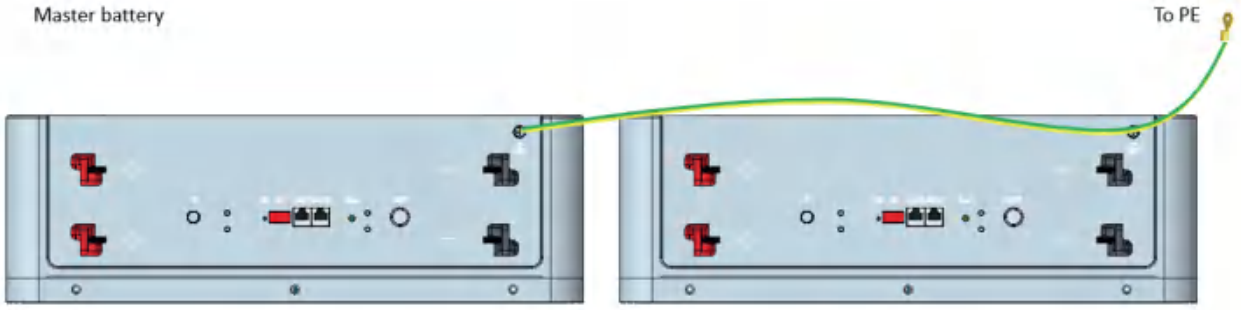
5.1.3 Switch on all battery individually before wiring, check whether there is any alarm/protection information, if yes, turns to troubleshooting. Then switch off all batteries.

5.2 Grounding cable connection

5.2.1 Take out the grounding screw on the battery panel, and get the cable conductor through it.

5.2.2 Fix them together, with a cylinder screwdriver and tighten it.

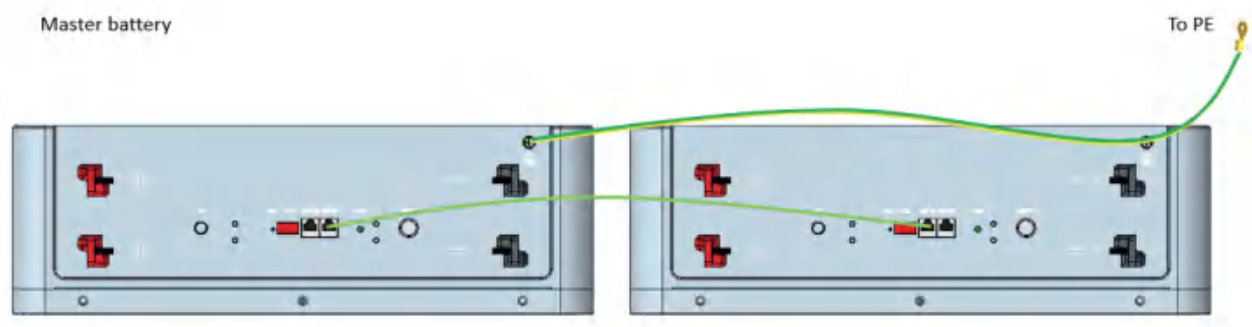
5.2.3 Connect the grounding cable with next battery module.



5.3 Communication cable connection

5.3.1 Take out battery to battery communication cable.

5.3.2 Confirm the location of Master battery, insert the RJ45 plug into the Link Out port and connect the other side to next battery Link IN port, daisy chained all batteries.



Note: the module with empty Link IN port is Master battery

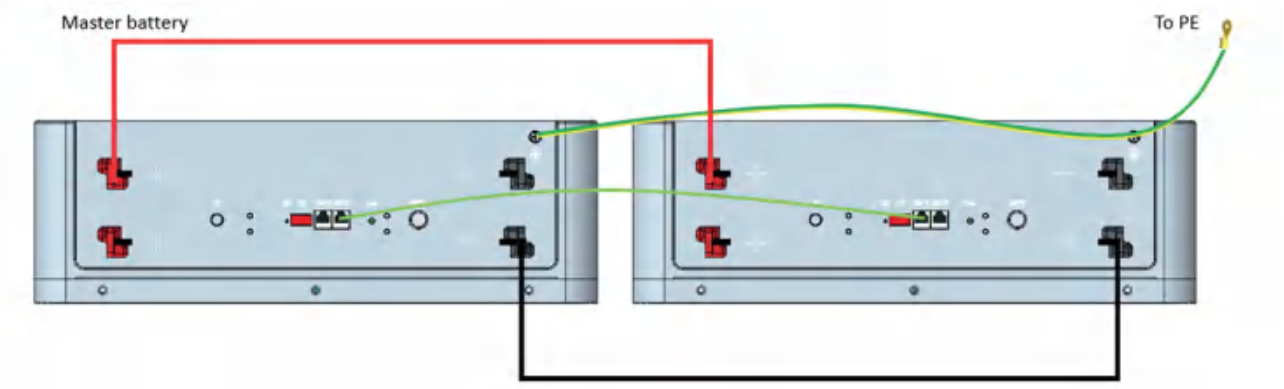
NOTICE

The BMS inside the battery pack will automatically terminate BOTH end of CANBUS pins, DO NOT need to plug the 120Ω terminator again.

5.4 DC power cable connection

5.4.1 Take out battery to battery power parallel cable.

5.4.2 Lock the terminals on the battery terminals and secure tightly with nuts.



5.5 Connecting with inverter

CAUTION

Confirm inverter AC input and PV input is disconnected before wiring connection, and the DC/ signal switch of inverter/charger is in off status.

5.5.1 Connecting Master battery Link IN port with inverter CAN or RS485 communication port via inverter communication cable (*Version I/II/III or customized*).

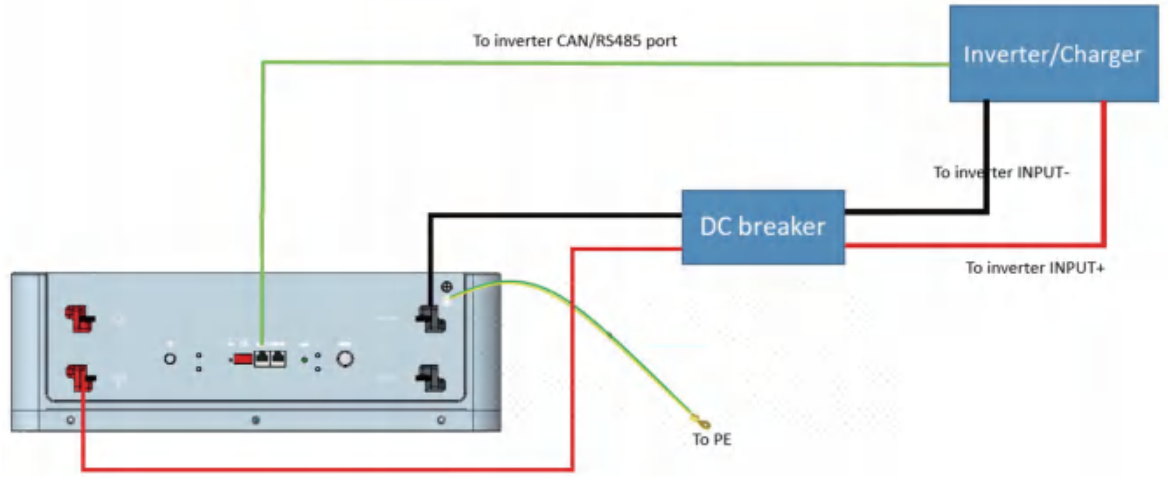
5.5.2 Connecting battery OUTPUT (+) with inverter battery INPUT (+), battery OUTPUT (-) with inverter battery INPUT (-), an external disconnection breaker between battery system and inverter is recommended, choose the corresponding power cable pair and wiring them correctly.

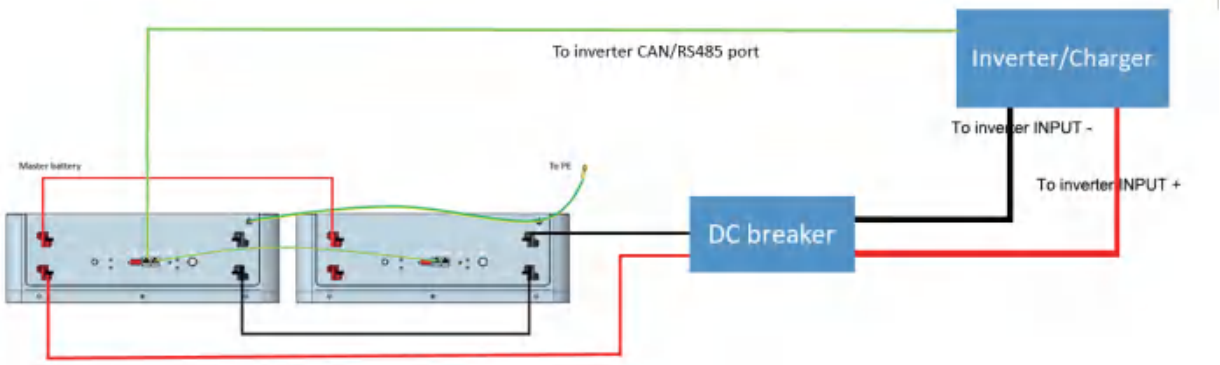
Note:

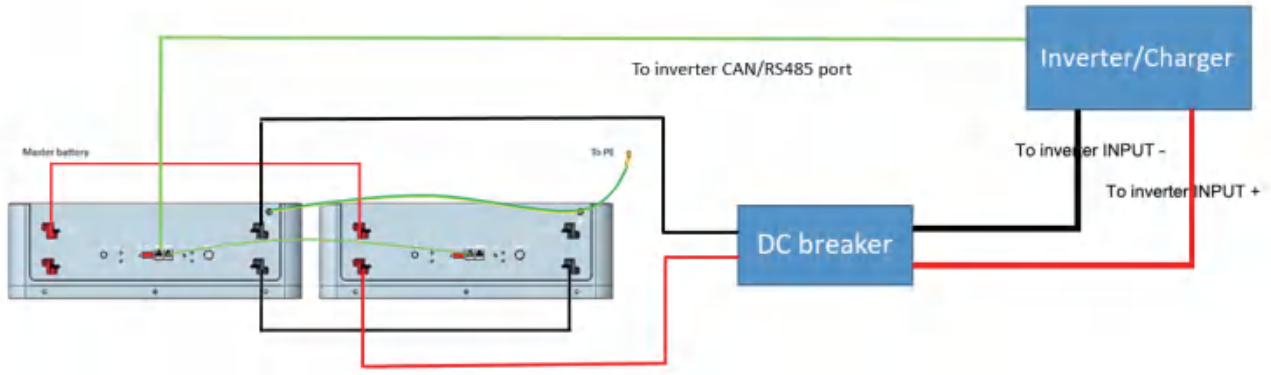
NOTICE
Choose the suitable disconnection breaker considering the inverter power/current, rated voltage, tripping characteristic etc.

Wiring diagram allowed:

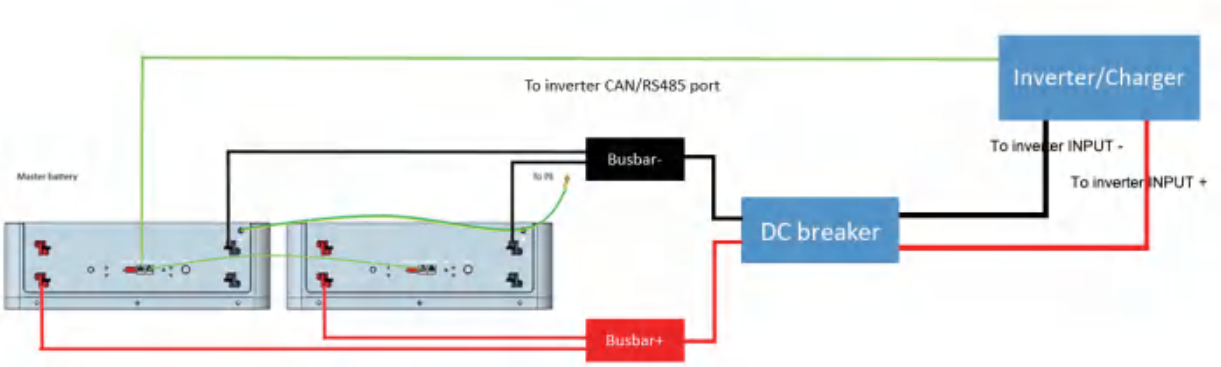
i. **Single pair cable wiring----*200A, 10KW rating***



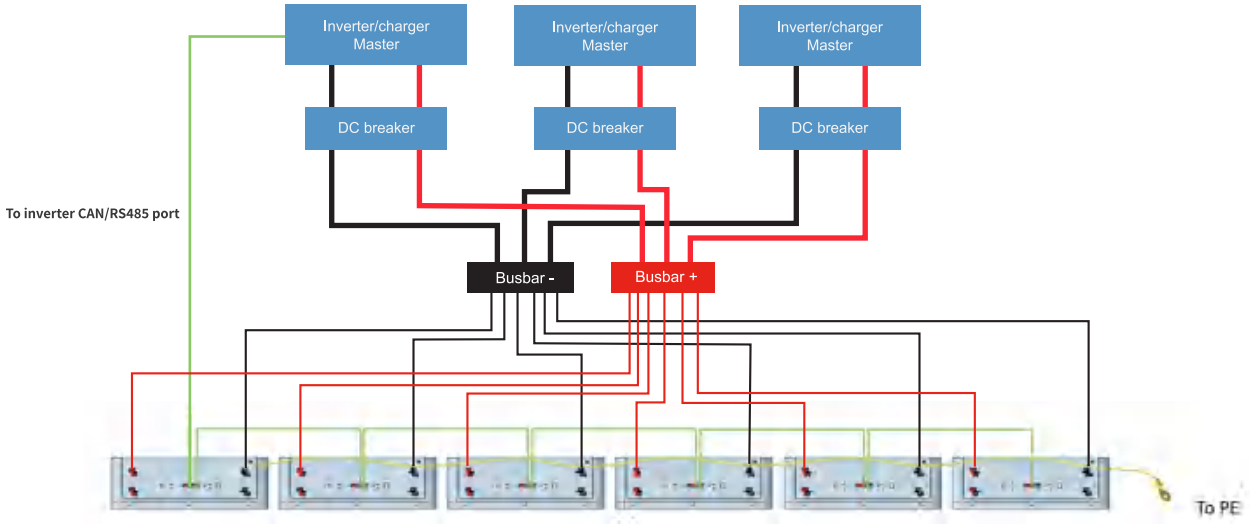




ii. Double pairs cable wiring----*300A, above 10KW*



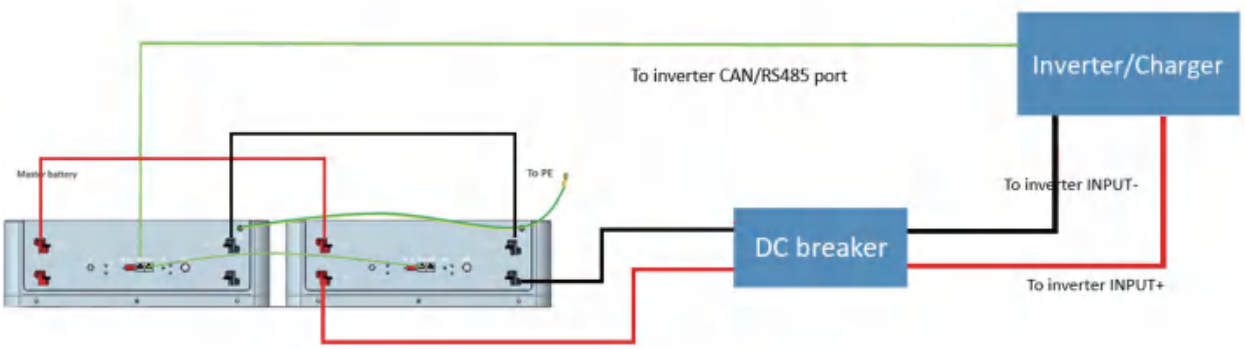
iii. Multiple towers and inverters cable wiring



Considering system stability, when you install multiple batteries, please always keep a certain capacity

margin of 30~50%. it is recommended to configure the inverter capacity with battery energy in 1: 2 proportion, for instance, if you have a 10KW rated inverter, connect 2 pieces(20KWh) or more batteries.

Wiring diagram not allowed:



NOTICE

The maximum communication cable length is required to be less than 15m between inverter/charge and battery.

The maximum power cable length is suggested to be less than 10m between inverter/charge and battery.

CAUTION

The maximum allowable current per power cord is 200A, with 150A recommended for continuous use, and the maximum allowable current for the battery terminals is 200A, with 150A recommended for continuous use. Please use the appropriate number of power cord pairs according to the site configuration and local connection requirements, standards and directives.

5.6 Commissioning

5.6.1 Set the DIP address of the Master battery (and the Slave battery if there is any RS485 baud rate changed).

5.6.2 Switch on all battery modules, wait for 10s, make sure that only M/S led is on Master battery.

5.6.3 Turn on the breaker between the inverter and battery if there is any, then turn on the inverter/charger isolator.

5.6.4 Finish the setting on inverter/charger or any other control devices, if everything is correct, you are ready to use the system.

No.	Inverter setting parameters	Detail
1	Absorption voltage	56.0V
2	Float voltage	54.6V
3	Re-charge/Generator start voltage	≥50V
4	Re-start voltage	52V
5	Low SOC limit (Grid-tied)	10/20% (differ from inverter brand)
6	Low SOC cut-off (Off-grid)	4%
7	Low Voltage cut-off	48.0V
8	Rated charging current limited value	100A*N (N is the Quantity of the battery pack)
9	Rated discharging current limited value	100A*N (N is the Quantity of the battery pack)
10	Max. charging current limited value	200A*N (N is the Quantity of the battery pack)
11	Max. discharging current limited value	200A*N (N is the Quantity of the battery pack)
12	Force charge/ Activate	Enable

For more information to connect with different inverter/charger, please contact your supplier for technical support.

⚠ CAUTION

If your system is a back-up or off-grid system, make sure your configuration can cover the worst situation to avoid battery to be over-discharged.

5.7 Switch off battery

5.7.1 Turn off the inverter.

5.7.2 Turn off the disconnection breaker if there is any.

5.7.3 Turn off all batteries signal switch.

6 Troubleshooting and FAQ

Items	Solution	Measure
Unable to start	1. Power on battery and press RESET 6s to observe whether the battery can be started. 2. Charge the battery use a charger or inverter to provide 54~57.6V voltage and observe it can be started.	If the abnormal status still alive after above steps, please contact your supplier. If there is any other situation(s) excluding in this table, turn off the fault battery, contact your supplier.
Unable to charge	1. Check whether the cable connection between the battery and the inverter/charger is correct. 2. Check whether the inverter/charger setting is correct. 3. Check whether the battery is in charge protection mode, if yes, try to discharge the battery.	
Unable to discharge	1. Check whether the cable connection between the battery and the inverter/charger is correct 2. Check whether the battery occurs short circuit, reverse connection, pre-charge failure during connection inverter etc. 3. Check whether the battery is in discharge protection mode, if yes, try to charge the battery.	
High/Low temperature	1. Stop the battery system for a while, check whether the installation location temperature meet the requirement. 2. Avoid continuous full charging and discharging.	
High current	Check the configuration and parameters setting on the inverter/charger is correct.	
ALM always on	1. Check the fault information on the inverter APP or display if possible. 2. Ask your supplier to offer BMS monitoring software to locate the reason and back to them for solution.	
Communication fail	1. Check the communication cable type is correct and is contacted well. 2. Check the DIP switch setting is correct. 3. Check the inverter protocol related setting is correct. 4. Check both battery and inverter are working properly.	
LCD Display		
●HV	1. Stop charging the battery. 2. Try to discharge the battery.	
●LV	1. Stop discharging the battery. 2. Try to charge the battery.	
●COC	1. Lower the charge current	
●DOC	1. Lower the discharge current	
●CHT& ●DHT	1. Stop the battery system for a while, check whether the installation location temperature meet the requirement. 2. Avoid continuous full charging and discharging.	

•SL	1. Stop discharging the battery. 2. Try to charge the battery.	
•AFE	1. please contact your supplier to replace the BMS.	

Q1: ***Battery maximum SOC is 98~99% and never goes to 100%SOC during daily cycle use, why?***

This is normal and have no influence on capacity, usually BMS will calibrate the SOC to 100% when reached cut-off current or trigger HVP, however, to avoid battery from being overcharged and to extend the cycle life as longer as possible, we left a room and set a charging profile to let battery charge slowly near full, please float the battery about 0.5~1 hour to calibrate the SOC.

Q2: ***'High voltage' and 'cell unbalance' warning and alarm in rare cases, does it mean battery is damaged?***

No. This is not unusual and happened on new batteries that are not balanced yet, please lower the maximum charge voltage (54.6V) and float the battery via grid or generator. If not solved, please contact your supplier.

Q3: ***When having multiple batteries in parallel connection, the battery on the end can't be fully charged.***

Pay attention to your wiring diagram, please always follow the manual wiring advises and choose proper cable size and pair.

Q4: The current is 0A when connecting with a very small load at the situation that having multiple batteries in parallel connection, how to solve it?

Each BMS has a threshold current of 0.5A (~25W) before it begins to report, this leads the inaccurate display of the current.

Q5: SOC is not accurate or suddenly jumps to 100% during charging.

This mostly happen in off-grid applications on batteries that have not been calibrated SOC for a long time or situations that are similar to Q4 that with inverter in Idle mode or a small DC load or store the battery for a long time, we suggest fully charging at once the batteries per month refer to Q1.

Q6: The system is still running when the inverter log shows 'internal failure' Warning.

This is our logic and this warning flag indicates there is 1 or more module(s) is in communication offline from the system, the system will derating and until communication is recovered.

Q7: Inverter pulling power from Grid to charge batteries in self-consumption mode.

When reached certain conditions such as low state of charge etc., battery will send charge request to ask inverter to charge the batteries, to avoid this, please discharge DOD as manual suggested.

7. Transport, Storage

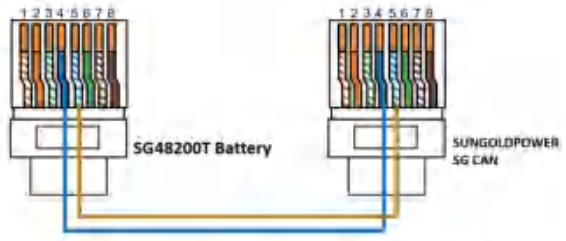
- Do not violently shake, impact or squeeze, and prevent sun and rain during the transportation.
- Do light take and put and strictly prevent falling, rolling, and heavy pressure during loading and unloading.
- The battery should be placed in a dry, clean, dark, and well-ventilated indoor environment for long-term storage, and the recommended storage temperature range is 15~30℃.
- No harmful gases, flammable and explosive products and corrosive chemical substances in the storage location.
- The batteries should be stored and transported in close to 50% SOC, do not store over 80%SOC for long time.
- If do not use for a long time, the battery needs to be charged every 6 months.
- No fall down, no pile up over 6 layers, and keep face up.

8. Disposal of battery

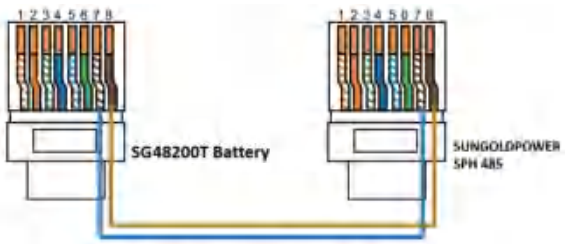
Disposal of battery must comply with the local applicable disposal regulations for electronic waste and used batteries, please review your local Battery recycling or management regulations or contact your supplier for more information.

Appendix I

Connect with SUNGOLDPOWER SPH/SG inverter/charger

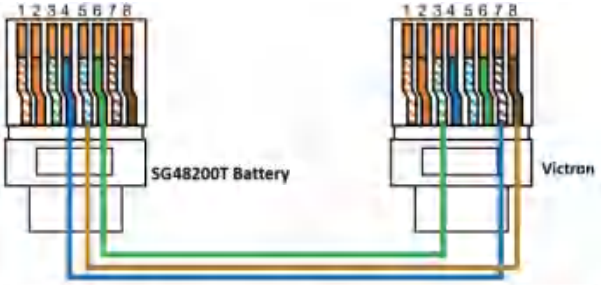


Battery CAN port	SUNGOLDPOWER SG CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	



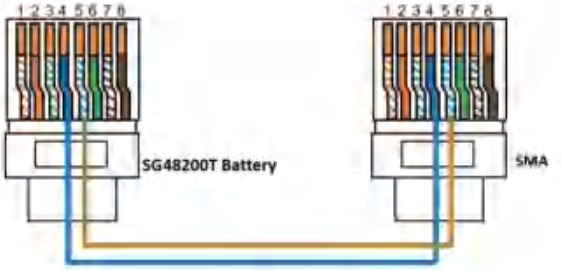
Battery RS485 port	SUNGOLDPOWER SPH 485	Cable suggest
Pin7	Pin7	Version-II(485)
Pin8	Pin8	

Connect with Victron GX & inverter/charger



Battery CAN port	Victron VE.CAN/BMS CAN	Cable suggest
Pin4	Pin7	Version-I(CAN)
Pin5	Pin8	
Pin6	Pin3	

Connect with SMA inverter/charger

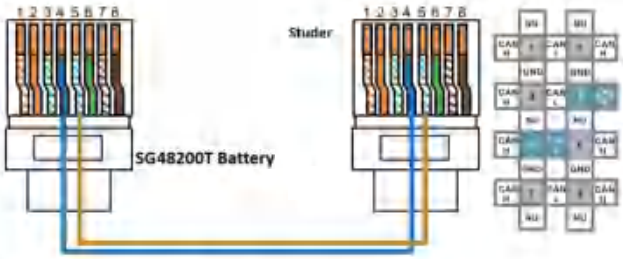


Battery 485 port	SMA sunny island	Cable suggest
Pin4	Pin4	Version II(CAN)
Pin5	Pin5	
Pin6 (optional)	Pin2 (optional)	

Connect with Schneider inverter/charger

Battery CAN port	Conext Gateway	Cable suggest
Pin4	Pin14	customized
Pin5	Pin12	
Pin6 (optional)	Pin10 (optional)	

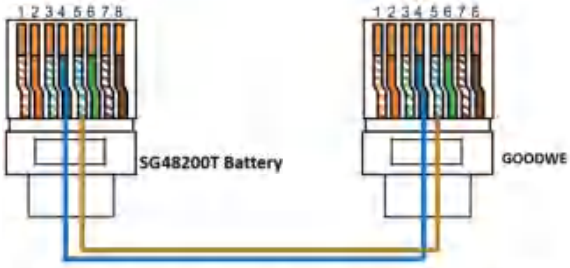
Connect with Studer inverter/charger



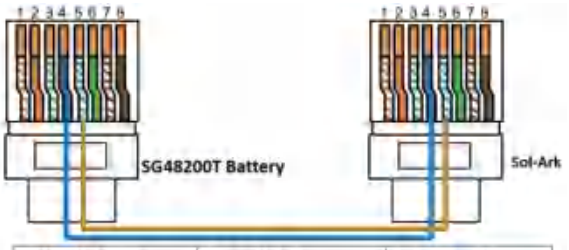
Battery CAN port	X-Com CAN	Cable suggest
Pin4	Pin4	Version-I(CAN)
Pin5	Pin5	

Connect with GOODWE hybrid inverter

Connect with Sol-Ark hybrid inverter

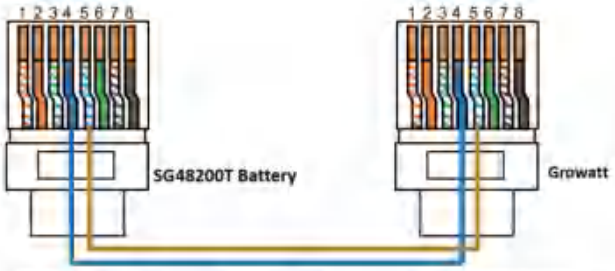


Battery CAN port	GOODWE BMS CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	



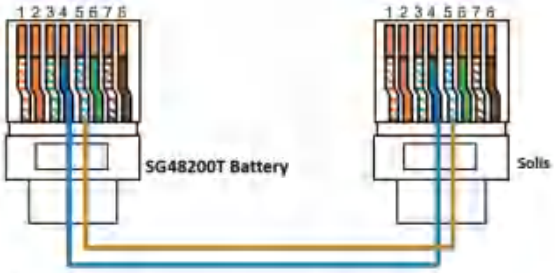
Battery CAN port	Sol-Ark CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	
Pin6 (optional)	Pin6 -outdoor Pin2 –indoor (optional)	

Connect with Growatt inverter



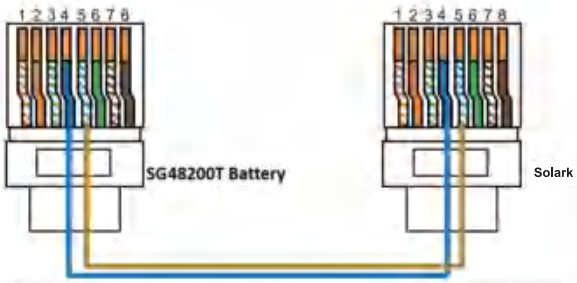
Battery CAN port	Growatt BMS communication port	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with Solis inverter



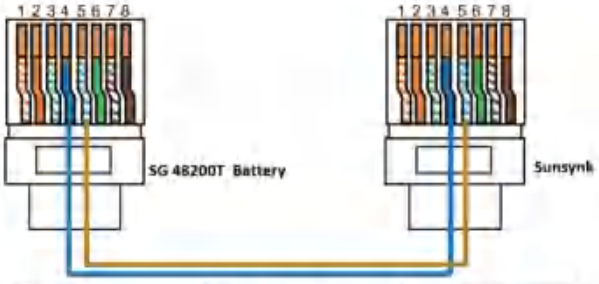
Battery 485 port	SMA sunny island	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with Solark hybrid inverter



Battery CAN port	Solark CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

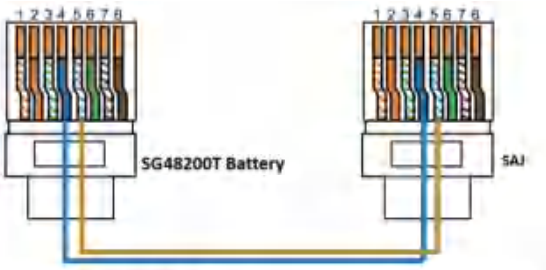
Connect with SUNSYNK hybrid inverter



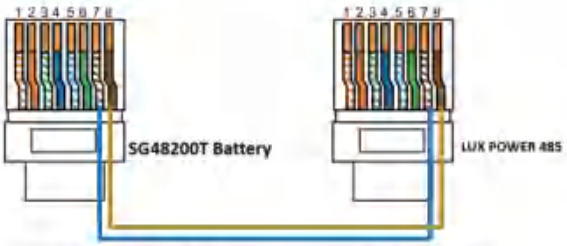
Battery CAN port	Sunsynk CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with SAJ hybrid inverter

Connect with LUXPOWER inverter

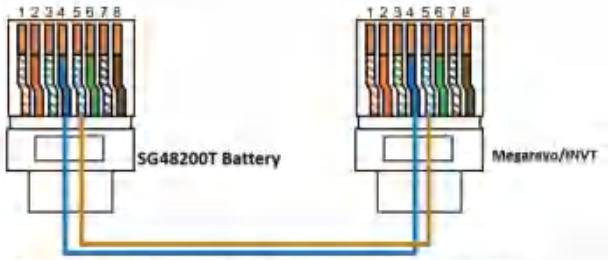


Battery CAN port	SAJ CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	



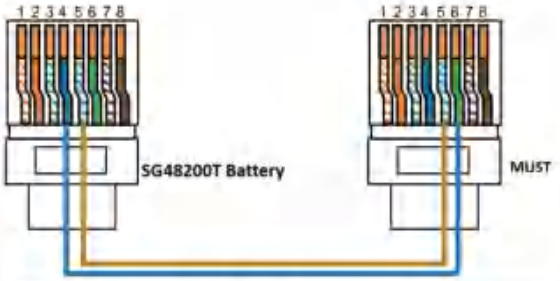
Battery RS485 port	LUX 485	Cable suggest
Pin7	Pin7	Version-II(485)
Pin8	Pin8	

Connect with Megarevo/INVT inverter



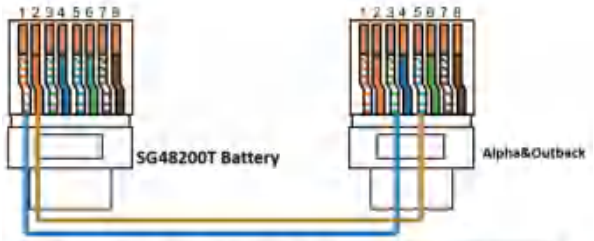
Battery CAN port	Megarevo CAN	Cable suggest
Pin4	Pin4	Version-II(CAN)
Pin5	Pin5	

Connect with MUST inverter



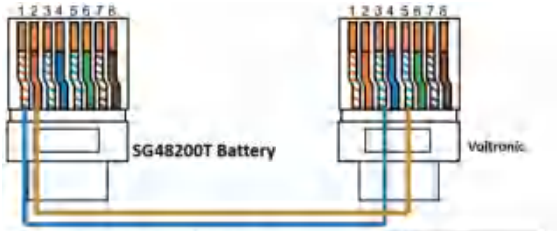
Battery CAN port	MUST CAN	Cable suggest
Pin4	Pin6	customized
Pin5	Pin5	

Connect with Alpha & Outback energy inverter



Battery RS485 port	Alpha&Outback BMS communication	Cable suggest
Pin1	Pin3	Version-III(RS485)
Pin2	Pin5	

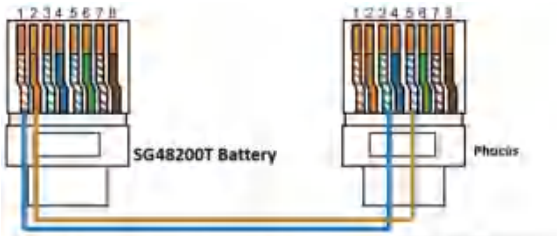
Connect with Voltronic inverter



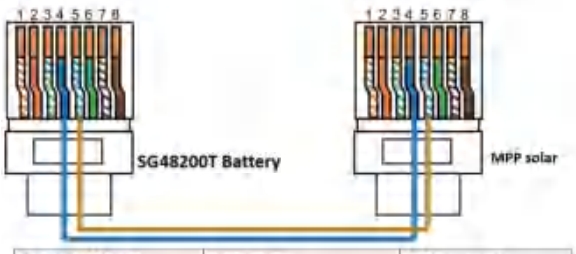
Battery RS485 port	Voltronic BMS communication	Cable suggest
Pin1	Pin3	Version-III(RS485)
Pin2	Pin5	

Connect with Phocos inverter

Connect with Mpp solar inverter



Battery RS485 port	Phocos BMS communication	Cable suggest
Pin1	Pin3	Version-II(RS485)
Pin2	Pin5	



Battery CAN port	MPP BMS communication	Cable suggest
Pin1	Pin3	Type B
Pin2	Pin5	

PowerMax 314 Outdoor Series

Energy Storage Battery User Manual

V3.0

1. Instructions

Thank you very much for choosing the PowerMax 314 Outdoor series household energy storage system developed and produced by our company. Please read and understand all contents of the Manual carefully

before installing and using the product. If you have any suggestions during the use, please do not hesitate to give us feedback.

The product must be used in compliance with all local standards, laws, and regulations. Any non-compliant use may lead to personal injury and property loss.

The drawings provided in this Manual are used to explain the concepts related to the product, including product information, installation guide, electrical connection, system debugging, safety information, common problems and maintenance, etc.

The internal parameters of this product have been adjusted before delivery. No internal parameters can be changed without permission. Any unauthorized changes to the settings will invalidate the warranty, and the Company will not be liable for any loss resulting therefrom.

This Manual and other related documents are an integral part of the product and should be kept properly for onsite installation personnel and related technical personnel to consult.

In order to continuously improve customer satisfaction, both this product and the Manual are continuously being improved and upgraded. If there is a discrepancy between the received manual and the product, it may be due to a product version upgrade. Please refer to the actual product.

The Manual will be continuously updated and revised, but it is inevitable that there may be slight discrepancies or errors with the actual product. Please refer to the actual product purchased by the user. The pictures mentioned in this document are for reference only and the actual product shall prevail.

1.1 Meaning of Abbreviations

AC	*Alternating Current*
DC	*Direct Current*
PV	*Photovoltaic*
BMS	*Battery Management System*
PCS	*Power Conversion System*
RJ45	*Registered Jack 45*
SOC	*State Of Charge*
C	*Charge C-rate*
RS485	*RS485 Communication Interface*
CAN	*Controller Area Network*

1.2 Symbol Stipulations

There may be following symbols herein, and their meanings are as follows.

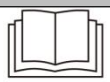
Symbols	Description

	*Indicate a hazard with a high level of risk which, if not avoided, will result in death or serious injury.*
	*Indicate a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.*
	*Indicate a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.*
	*Warning information about device or environment safety. If not avoided, equipment damage, data loss, performance degradation or other unanticipated results may be resulted in. The "NOTICE" does not involve any personal injury.*

2 Safety Precautions

2.1 Safety Symbols

This product contains the following symbols, please pay attention to identifying.

Symbols	Description
	*Observe enclosed documentation*
	*Danger.* *Risk of electric shock!*
	*Danger of high voltages.* *Danger to life due to high voltages in the Energy storage system*
	*Hot surface*
	*CE certification*
	*Do not touch the product in 5mins after shutdown*
	*Comply with RoHS standard*
	*The Energy storage system should not be disposed together with the household waste.*
	*Flammability risk*
	*Electric shock hazard*
	*Keep the battery away from open flame or ignition sources*

	*Keep the battery away from electric sparks*
	*Recycling*
	*Rainproof and moisture-proof*

2.2 General Safety

2.2.1 Important Notice

Before installing, operating, and maintaining the device, please read this Manual first and follow the symbols on the device and all the safety precautions in this Manual.

The "DANGER", "CAUTION", "ATTENTION", and "NOTICE" indicators in this manual are not exhaustive of all safety considerations but serve as supplements to all safety precautions. The Company will not be liable for any violation of general safety operating requirements, or any violation of safety standards for the design, production, and use of the device. The device must be used in an environment that meets the requirements of the design specifications. Otherwise, the device may fail, and the abnormal device function or component damage, personal safety accident, and property loss arising from this are not covered within the quality assurance scope of the device. When installing, operating, and maintaining the device, the local laws, regulations, and codes shall be followed. The safety precautions in this Manual are only supplements to local laws, regulations, and codes. The Company shall not be liable for any of the following circumstances.

- *The device is not run under the conditions of operating described in this Manual.*
- *The installation and operating environment is beyond the requirements of relevant international or national standards.*
- *The product is disassembled or changed, or the software code is modified without authorization.*
- *The operation instructions and safety warnings related with the product and in the documents are not followed.*
- *Damage of the device is caused by abnormal natural environment (force majeure, such as earthquake, fire, and storm).*
- *Transportation damage is caused during customer's own transportation.*
- *The storage condition does not meet the requirements of the product related documents and causes damage.*

2.2.2 General Requirements

	*Operating while powered on during installation is strictly prohibited.*
	*It is strictly prohibited to install, use, and operate any outdoor equipment or cables (including but*

	not limited to transporting equipment, operating equipment and cables, plugging and removing signal ports connected to the outdoor, working at altitude, and outdoor installation) in severe weather, such as thunder, rain, snow, and gale level 6.
	*In case of any fire, evacuate the building or equipment area and press the fire alarm bell or dial the fire call. Under any circumstances, re-entry into a burning building is strictly prohibited.*
	*Under no circumstances should the structure and installation sequence of the device be changed without the manufacturer's permission.*
	*The battery terminal components shall not be affected during transportation. And, the battery terminal bolts shall not be lifted or transported.*
	*It is strictly prohibited to alter, damage or block the marks and nameplates on the device.*
	*The composition and working principle of the entire photovoltaic power generation system, as well as the relevant standards of the country/region where the project is located shall be known fully.*
	*After the device is installed, the empty packing materials, such as cartons, foam, plastics, and cable ties, shall be removed from the device area.*

2.2.3 Personnel Safety

- *When operating the device, appropriate personal protective equipment shall be worn. If any fault that may lead to personal injury or damage of the device is found, immediately terminate the operation, report to the responsible person, and take effective protective measures.*
- *Before using any tools, learn the correct method of using the tool to avoid injuries and damage of the device.*
- *When the device is running, the temperature of the case is high, which may cause burns. Therefore, do not touch the case.*
- *In order to ensure personal safety and normal use, reliable grounding should be carried out before use.*
- *Do not open or damage the battery. The electrolyte released is harmful to skin and eyes, so avoid touching it.*
- *Do not place irrelevant items on the top of the device or insert them into any part of the device.*
- *Do not place flammable items around the device.*
- *Never place the battery in the fire to avoid explosion and prevent the personal safety from being endangered.*
- *Do not place the battery module in water or other liquids.*
- *Do not short-circuit the battery terminals, because short-circuiting of the battery may cause combustion.*
- *The battery may pose electric shocks and large short-circuit currents. When using the battery, the following precautions should be paid attention to:*

  a) The metal objects, such as watch and rings, shall be removed.

b) Tools with insulated handles should be used.

c) Rubber gloves and shoes should be worn.

d) The charging power supply shall be disconnected before connecting or disconnecting terminals of the battery.

e) Check whether the battery is accidentally grounded. If the battery is accidentally grounded, remove the power supply from the ground.

- *Do not clean the internal and external electrical components of the cabinet with water or detergent.*
- *Do not stand, lean or sit on the device.*
- *Do not damage any modules of the device.*

2.3 Personnel Requirements

- *The personnel in charge of installation and maintenance must be strictly trained to understand all safety precautions and master proper operation methods.*
- *Only qualified professionals or trained personnel are allowed to install, operate and maintain the device.*
- *The personnel who operate the device, including the operators, trained personnel and professionals, must have special operation qualifications required by the local country, such as high voltage operation, working high above the ground, and special equipment operation qualification.*
- *The replacement of device or components (including software) must be carried out by professionals or authorized personnel.*

2.4 Electrical Safety

2.4.1 General Requirements

Before making electrical connections, ensure that the device is not damaged; otherwise, electric shock or fire may occur.

Never install or remove any power cables when the power is on. The electric arcs or sparks may be generated at the moment when the power cable contacts with the conductor, which may cause fire or personal injuries.

- *All the electrical connections must meet the electrical standards of the country/region where the project is located.*
- *The cables prepared by users themselves shall comply with local laws and regulations.*
- *Special insulating tools should be used in high-voltage operations.*
- *Before connecting the power cord, ensure that the label identification on the power cord is correct.*
- *Operations on the device are allowed only five minutes after the device is completely powered off.*
- *The insulation layer of the cable may be aged or damaged when the cable is used in a high temperature environment. Therefore, the distance between the cable and the heat source must be at least 30mm.*

- *Cables of the same type should be bundled together. Whereas the cables of different types should be routed at least 30mm apart, and shall not be wrapped together or crossed.*

2.4.2 Grounding Requirements

- *When installing the device to be grounded, the protective grounding wire must be installed first; when removing the device, the protective grounding wire must be removed at last.*
- *It is forbidden to destroy the grounding conductor.*
- *It is forbidden to operate the device without a grounding conductor installed.*
- *The device shall be permanently connected to the protective grounding wire. Before operating the device, electrical connection of the device shall be checked to ensure that the device is reliably grounded.*

2.5 Installation Environment Requirements

- *Do not install or use this product in an environment where the temperature is lower than -10 ℃ or higher than 50 ℃.*
- *It should be installed in a dry and well-ventilated environment to ensure good heat dissipation performance.*
- *The product can be installed at a maximum altitude of 2,000m(6561ft).*
- *The installation position should be away from the fire source.*
- *The product should be installed and used away from children and animals.*
- *The installation position should be far away from water sources, such as faucets, sewer pipes, and sprinklers, to avoid entering of water.*
- *The device should be placed on a firm and flat supporting surface.*
- *Do not place any inflammable or explosive items around the device.*
- *When the device is running, do not block the ventilation vent or heat dissipation system to prevent fire caused by high temperature.*

The operation and service life of the energy storage is related to the operating temperature. The energy storage should be installed at a temperature equal to or better than the ambient temperature.

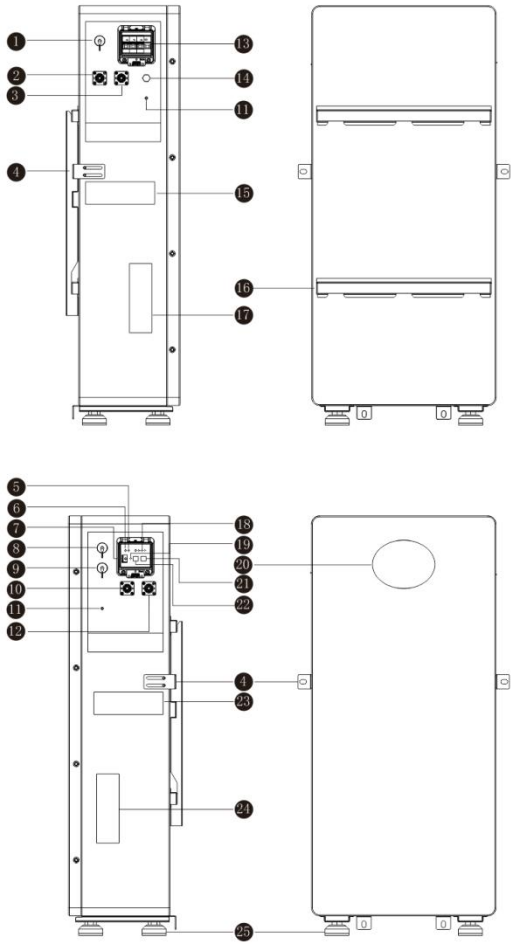
3 Product Introduction

3.1 Battery Specifications

Product model	PowerMax 314 Outdoor
Rated voltage	*51.2V*
Voltage Range	*44.8~57.6Vdc*

Rated capacity	*314Ah*
Rated energy	*16.07kWh*
Nameplate Energy Capacity	*16.07kWh*
Usable Energy	*15.42kWh*
Max.Depth of discharge	*＞96%*
Rated DC power	*7.68kW*
Maximum continuous Discharge Rate	*7.68kW*
Weight	*123kg（271lb）*
Dimensions（L*W*H）	*1048*460*271mm（41.26*18.11*10.67inch）*
Standard charge / discharge current	*150A/150A*
Max. Charging / discharging current	*190A/190A*
Peak charging current	*220A（3S）*
Peak discharging current	*220A（3S）*
Breaker Current	*240A*
Screen	*Touch Screen*
Battery type	*LFP*
Life cycle（80% DOD,0.5C,25℃）	*8000 Cycles*
Max. charging voltage	*57.6V*
Over discharge voltage	*44.8V*
Max. number of parallel	*16*
Communication interfaces	*CAN/RS485/USB/WIFI/Bluetooth*
Lithium Battery Standard	*UN38.3, MSDS, EN55032, EN55024, EN61000-3-2, EN61000-3-3，UL1973,UL9540A*
Storage time / temperature	*6 months @25℃(77℉）;3 months @35℃(95℉）;1 months @45℃(113℉）;*
Charging temperature range	*0～55℃（32～131℉）*
Discharging temperature range	*-10～55℃（14～131℉）*
Cooling method	*Natural cooling*
Enclosure protection rating	*IP65*
Operation Environment	*Indoor & Outdoor*

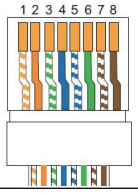
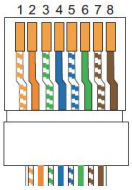
3.2 Appearance Description



1, RS485 (Connect other battery)	*2, Battery Negative*	*3, Battery Positive*	*4, Fixed accessories*
5, LED(ALM)	*6, LED(RUM)*	*7,Turn On/Off*	*8, RS485/CAN (Connect inverter)*
9, RS485 (Connect other battery)	*10, Battery Positive*	*11, Grounding screw*	*12, Battery Negative*
13, Breaker	*14, vent valve*	*15, Handle (15) plus (23) are used simultaneously*	*16, Mounting Frame*
17, Handle (17) plus (24) are used simultaneously	*18, SOC (State of Capacity)*	*19, Reset*	*20, LCD Touch Screen*
21,USB (Connect PC)	*22,Address*	*23,Handle(15) plus (23) are used simultaneously*	*24, (17) plus (24) are used simultaneously*
25,Foot cup			

Communication interface definition

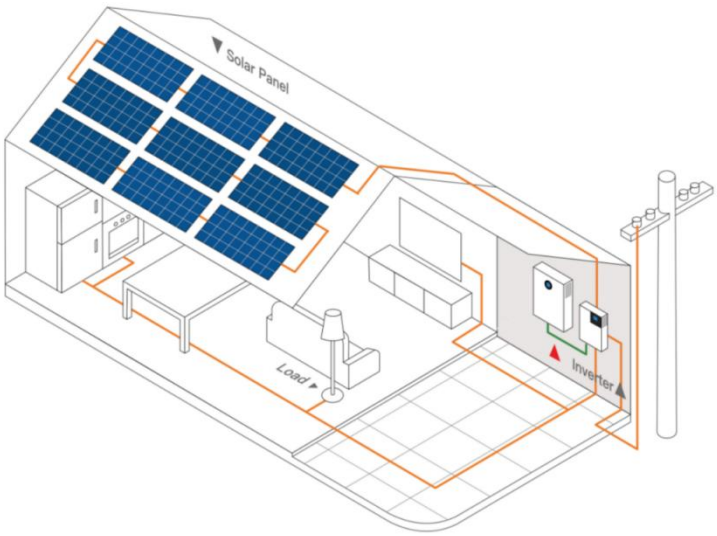
Number	Communication	Interface Type	Picture	instruction

①⑬	*RS485* *(Connect other battery)*	*RJ45*		*1-RS485-B* *2-RS485-A* *7-RS485-A* *8-RS485-B*
⑩	*RS485/CAN* *(Connect inverter)*	*RJ45*		*1-RS485-B* *2-RS485-A* *3-GND* *4-CAN-H* *5-CAN-L* *6-GND* *7-RS485-A* *8-RS485-B*

4 Application Scenarios

The lithium iron phosphate batteries with high performance and long service life are used in the energy storage module. Meanwhile, the modular structure design is adopted. Each energy storage module is internally integrated with the intelligent BMS system, which can be easily expanded and can be combined into 60Kwh battery pack at most.

The battery storage can be combined with inverter to form an off-grid photovoltaic system, which can solve the problem of electricity consumption in areas without electricity.



5 System Installation

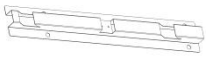
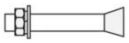
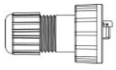
5.1 Inspections before Installation

Inspection of outer package

Before opening outer package of the energy storage, check if there is any visible damage on the outer package, such as holes, cracks or other signs of possible internal damage, and check the type of energy storage. If there is any abnormality on the package or model of the energy storage is inconsistent, do not open it and contact us as soon as possible.

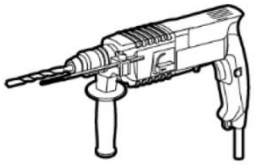
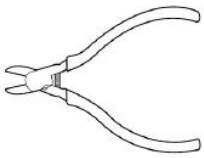
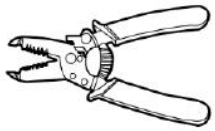
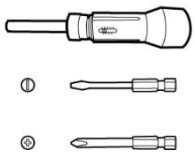
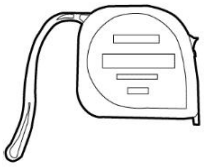
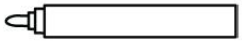
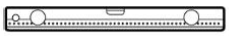
Inspection of deliverables

After opening outer package of the energy storage, check if the deliverable is complete and whether there is any visible external damage. If any items are missing or damaged, please contact us.

NO.	Picture	Item	Quantity	Specification
1		Battery Pack	1	16.07kWh
2		Mounting Frame	3	580*85.8*30mm
3		Mounting Frame Connecting Strip	1	375*39*12mm
4		Screw	6	M4*10
5		Mounting Frame Screw	12	M8*60 expansion bolt
6		Side fastener	2	80*40*36mm
7		Screw	4	M5*12
8		Power Cable	2	1.5m
9		Signal cable	1	RJ45,1.5m
10		RJ45 waterproof connector	1	M25*37mm
11		Installation auxiliary board	1	500*500mm
12		Grounding Wrie	1	1.5m

5.2 Preparation of Tools and Meters

Types	Tools and meters

Installation tool			
			
			
Personal protective equipment			
			

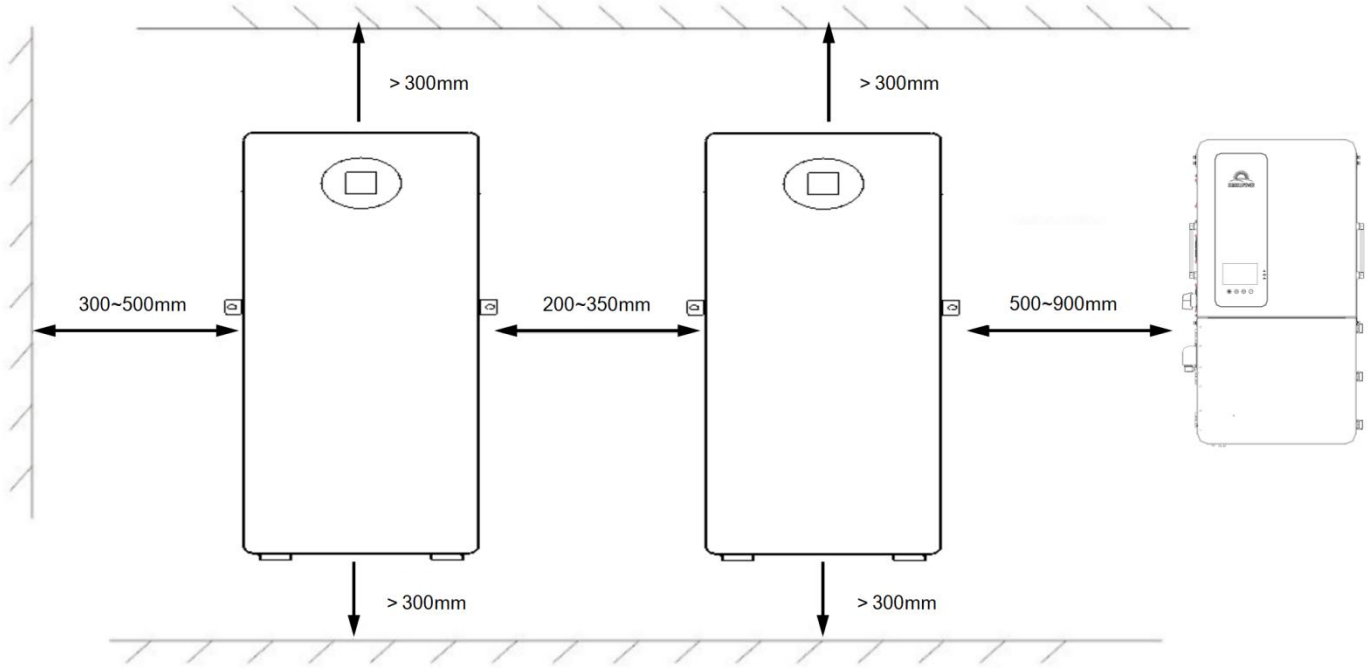
5.3 Selection of Installation Location

5.3.1 Basic Requirements

- *When the energy storage is running, the temperature of the case and the radiator will be high. Therefore, do not install them in a place that is easy to touch.*
- *Do not install in areas where flammable and explosive materials are stored.*
- *If the energy storage is installed in areas with salt damage, it will be corroded and may cause fire. Therefore, do not install it outdoors in areas with salt damage. The areas with salt damage are defined as the areas which are not 500m away from shore or will be affected by sea breezes. The areas affected by the sea breezes vary depending on meteorological conditions (e.g. typhoons, monsoons) or topographical conditions (dams, hills).*
- *Do not install in the place where children can touch.*
- *The energy storage cannot be installed forwardly, horizontally, inversely, backwardly or sideways.*
- *When drilling holes on walls or ground, the goggles and protective gloves shall be worn.*
- *During drilling, the device should be shielded to prevent debris from falling into the device. After drilling, the debris shall be cleaned up in time.*
- *When handling any heavy objects, you should be prepared to bear loads to avoid being crushed or sprained.*
- *When handling the device by hand, wear protective gloves to avoid injury.*

5.3.2 Installation Space Requirements

Floor Mount: *The battery should be placed in the right position first, and the installation site should be smooth, and the wall should be solid, and the distance between the batteries should be greater than 200-350mm.*



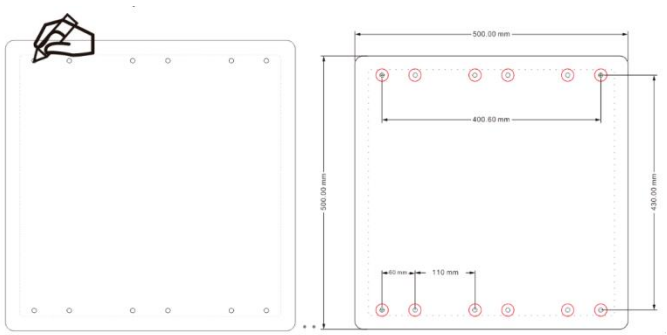
Wall mount: *The battery should be placed in the right position first, and the installation site should be smooth, and the wall should be solid, and the device is 200mm away from the ground, the distance between the batteries should be greater than 200-350mm.*

5.4 Device Installation

5.4.1 Wall mount

5.4.1.1 Installation Location Selection

Determine the installation position, put the installation auxiliary board in the proper position, and mark the place where the holes need to be punched.

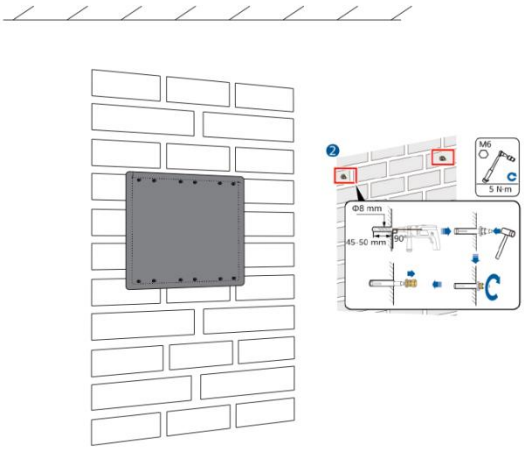


5.4.1.2 Install Expansion Bolts

To avoid electrical shock or other injury, inspect existing electronic or plumbing installations before drilling holes.

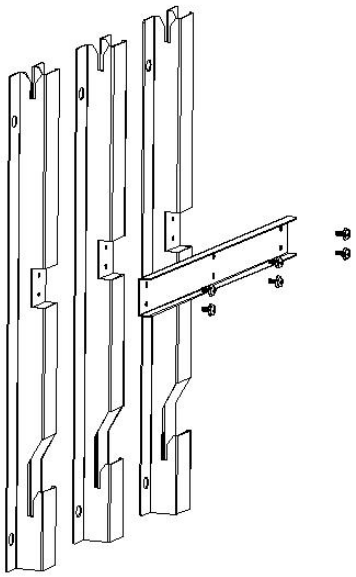
Choose suitable firm wall with thickness greater than 80mm.

Drill 12 holes according to the hole position, it is φ10 with depth of 45~50mm.Hammer the M8 screws to the above holes, and screw the nut.



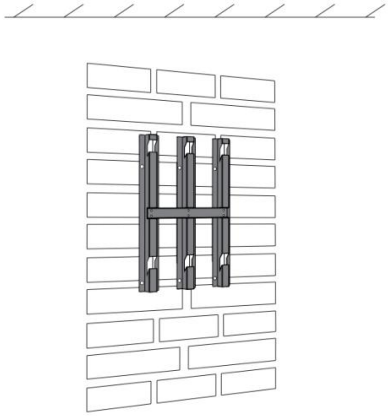
5.4.1.3 Install Bracket Screws

Secure the mounting bracket with 6 screws.



5.4.1.4 Fix Mounting Frame

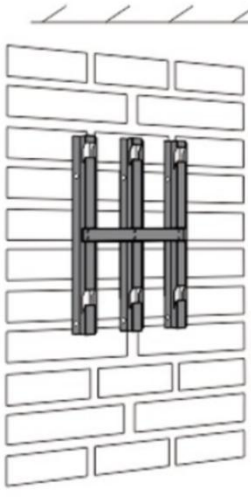
Make the convex side outward and fix the mounting frame to the 12 screws.

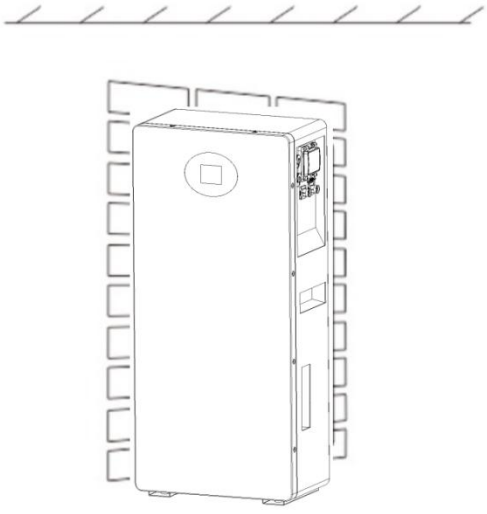


5.4.1.5 Install Battery Pack

The battery pack is very heavy, which requires multiple people to install.

Keep the battery balanced, and then slowly hang the battery on the frame through the match hooks.



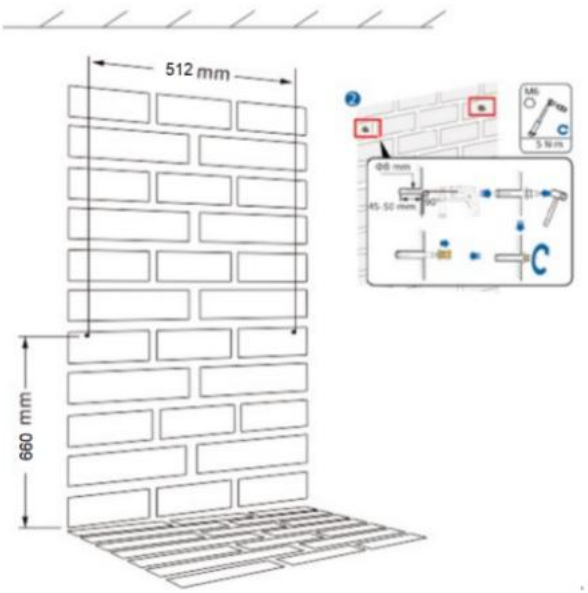


5.4.2 Floor Mount

5.4.2.1 Install Expansion Bolts

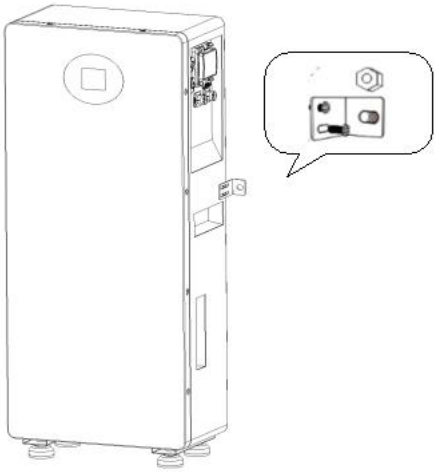
To avoid electrical shock or other injury, inspect existing electronic or plumbing installations before drilling holes.

Drill 2 holes according to the hole position, it is φ10 with depth of 45~50mm.Hammer the M8 screws to the above holes, and screw the nut.



5.4.2.2 Install Battery Pack

Place the battery on a flat, firm floor and install the fixing accessories.



6 Electrical Connection

Before electrical connection, please ensure that the switches of the energy storage are in the "OFF" state. Otherwise, the high voltage of the device may cause electric shock.

The operations related to electrical connections must be carried out by professional electrical technicians. When carrying out electrical connections, the operator must wear personal protective articles.

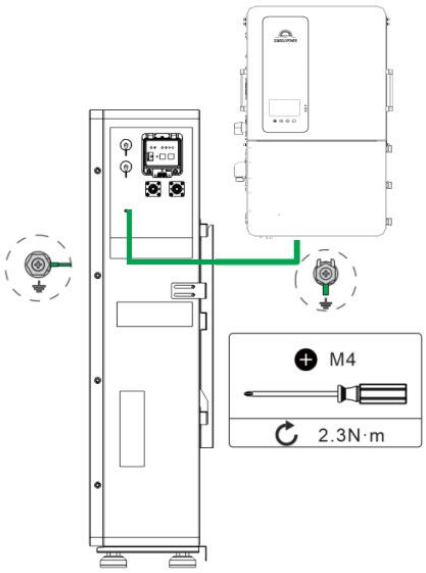
6.1 Preparation of Cables

No.	Cables	Description	Recommended specifications	Source
1	*Power Cable*	*Power cable between the storage battery and inverter*		*Provide with the product together*
2	*Signal line*	*Signal cable between battery modules or between battery and inverter*		*Provide with the product together*
3	*Ground wire*	*Ground cable between the storage battery modules*		*Provide with the product together*
4	*Photovoltaic input line*	*Cable between the photovoltaic panel and power module*	*Cable diameter 6mm^2/10AWG*	*Prepare by the user*

6.2 Electrical Connection of One Battery Module

6.2.1 Connecting Grounding Wire

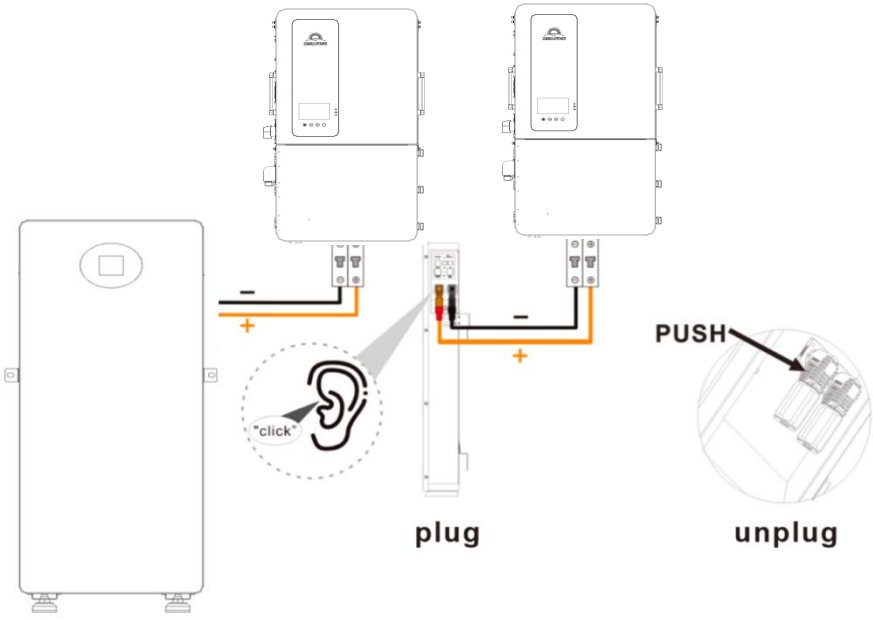
Each energy storage battery module shall relate to the grounding wire provided with the product together.



6.2.2 Connecting Power Cord

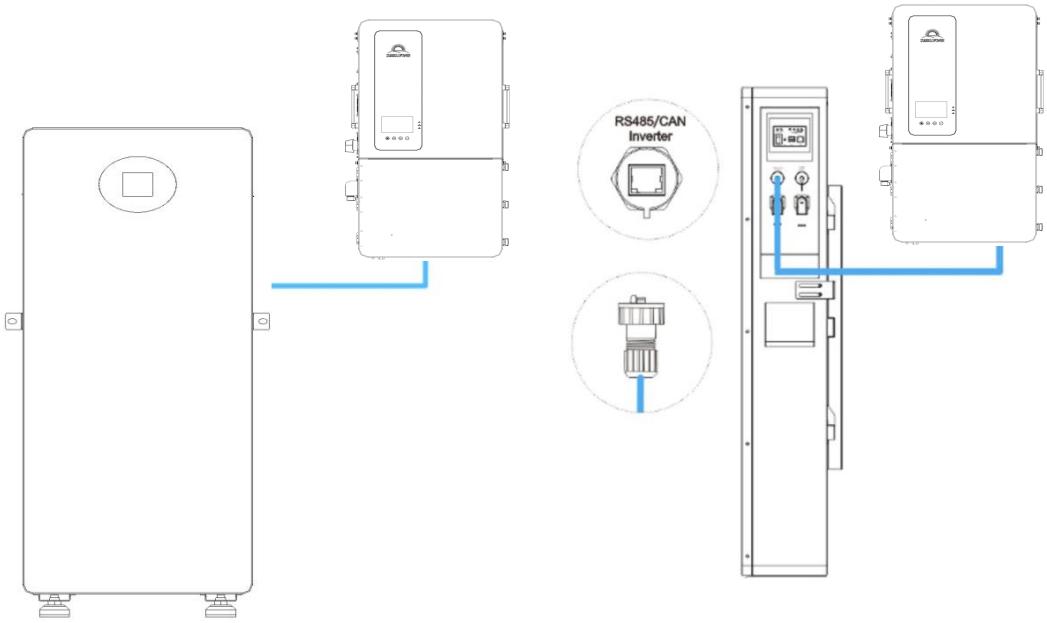
When connecting the battery wiring, please make sure that the battery switch is off and the indicator light is off. If the plug is connected properly, you will hear a "click" sound.

If you need to unplug the plug, you need to first turn off all devices and battery switches, and then wait for 5 minutes before proceeding,then press the self-locking clasp and unplug.



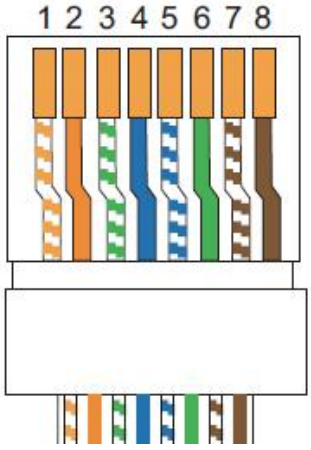
6.2.3 Connecting Signal Line

The signal line shall be used to connect RS485-Inverter interface for battery module and inverter.



When connecting the inverter, the communication line must be connected, and the communication protocol must be consistent.

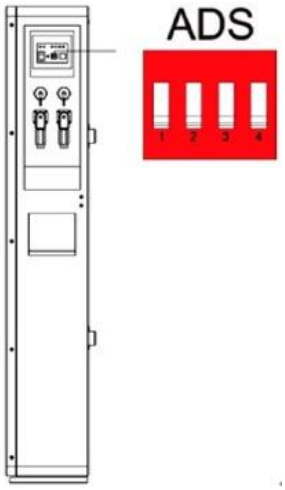
If you use a standard network cable, please cut off pins 1 and 2 for connection.



If you use a standard network cable to connect the inverter		
PIN1	*White-orange*	*RS485-B*
PIN2	*Orange*	*RS485-A*
PIN3	*White-green*	
PIN4	*Blue*	*CAN-H*
PIN5	*White-blue*	*CAN-L*
PIN6	*Green*	
PIN7	*White-brown*	*RS485-A*
PIN8	*Brown*	*RS485-B*

6.2.4 Energy Storage Battery Module Address Setting

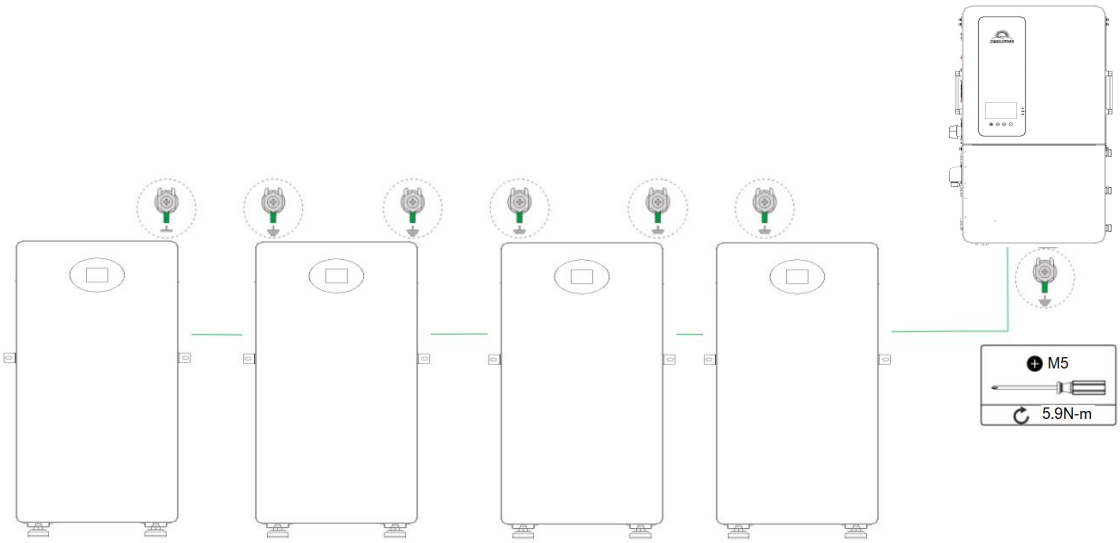
When using a single battery, please set the address to 0.



6.3 Electrical Connection of Multiple Battery Modules

6.3.1 Connecting Grounding Wire

Each energy storage battery module shall be connected with the grounding wire provided with the product together. If there are multiple batteries, you need to connect the ground wire of each battery.



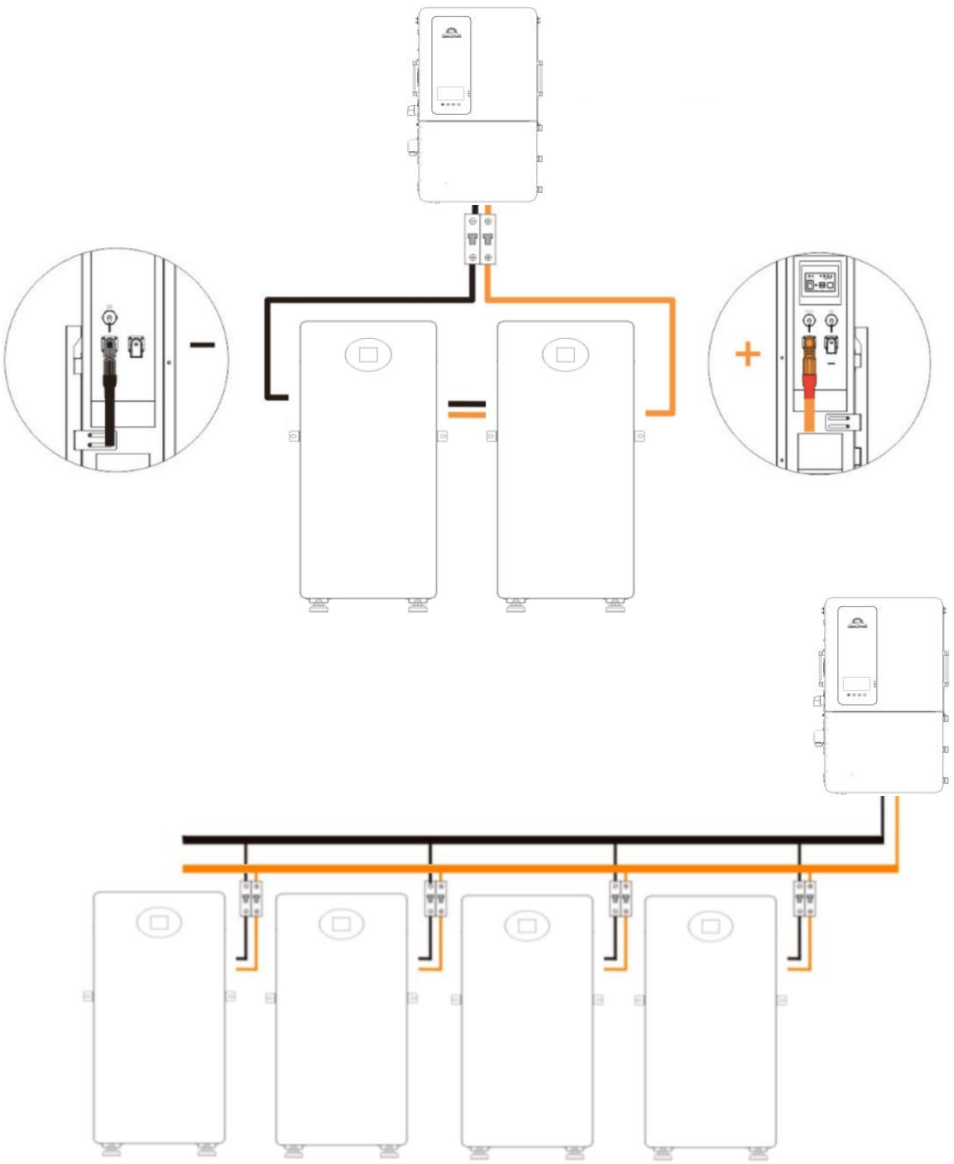
6.3.2 Connecting Power Cord

If there are 2 batteries used in parallel, you need to connect the power cord of each battery.

Parallel connection cable of battery modules are optional products. If necessary, please contact your local dealer.

If the current of the inverter exceeds the rated current of the battery, a busbar must be used and parallel connection cable cannot be used.Parallel connection cable can only expand capacity, not power.

Batteries can only be connected in parallel and cannot be used in series

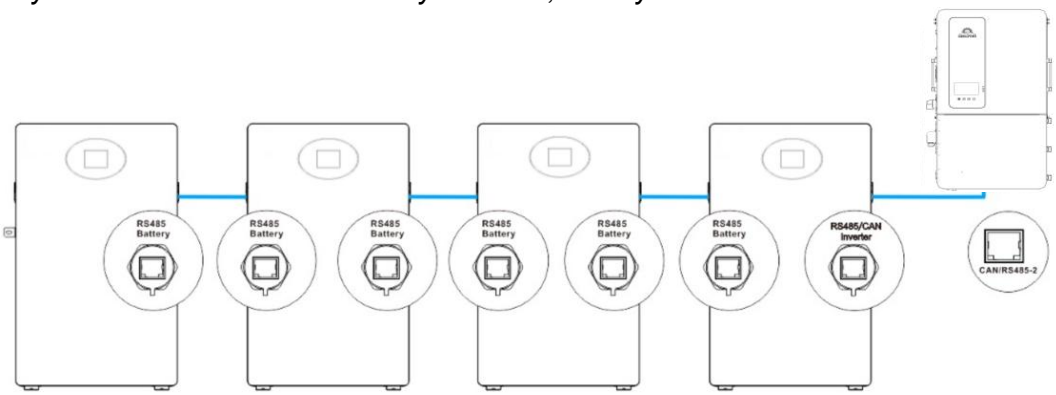


If multiple batteries are used in parallel，Bus bar is required.

6.3.3 Connecting Signal Line

If there are multiple batteries connected in parallel, the slave switch must be turned on first, and then the master switch should be turned on last.

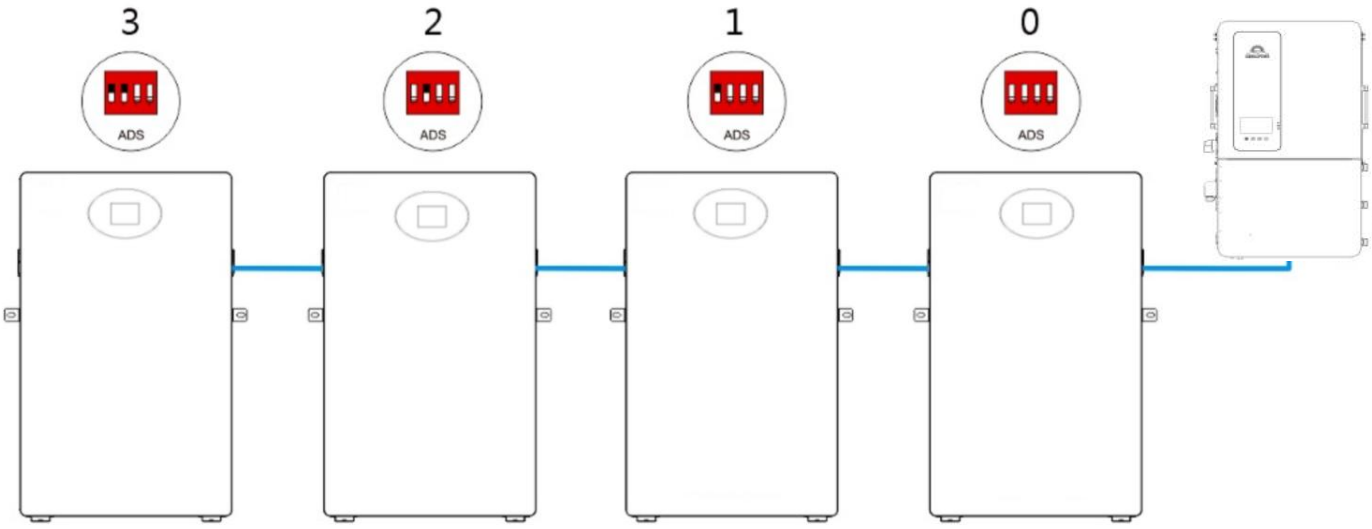
If there are multiple batteries, you need to connect the communication line of each battery. Battery and battery connection use RS485-Battery interface, battery and inverter connection need RS485-Inverter interface.



Multiple battery connections require assembly of the RJ45's waterproof connector, exploded view of RJ45 waterproof connector:

6.3.4 Energy Storage Battery Module Address Setting

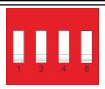
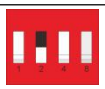
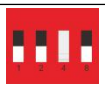
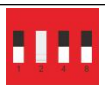
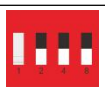
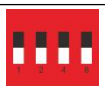
If multiple energy storage battery modules are used in parallel, the address of the energy storage battery module needs to be set. The address should be set as 0~8, and the address of each module cannot be repeated.



The address of the battery connected to the inverter must be set as 0.

Multiple batteries parallel DIP switch location description, up to 16 batteries can be used in parallel.

Addr.	DIP Switch Position	Master or Slave Battery	Connect the inverter

0		Master	√
1		Slave1	×
2		Slave2	×
3		Slave3	×
4		Slave4	×
5		Slave5	×
6		Slave6	×
7		Slave7	×
8		Slave8	×
9		Slave9	×
10		Slave10	×
11		Slave11	×
12		Slave12	×
13		Slave13	×
14		Slave14	×
15		Slave15	×
 : off  : on			

7 System Debugging

7.1 Inspections Before Power-On

No.	Inspection items	Acceptance criteria	Validation
1	The energy storage is installed in place	The installation is correct, secure and reliable.	□Yes □No
2	The installation environment meets requirements	The installation space is reasonable, and the environment is clean and tidy without any construction	□Yes □No
3	The power cord is correctly connected	The positive and negative terminals are connected correctly without any missing.	□Yes □No
4	The signal line is correctly connected	The signal line is connected reliably, and there is no wrong position	□Yes □No
5	The grounding is reliable	The grounding wire is correctly and reliably connected.	□Yes □No
6	The switch of the energy storage battery module is off	All switches connected to the energy storage are in the "OFF" state.	□Yes □No

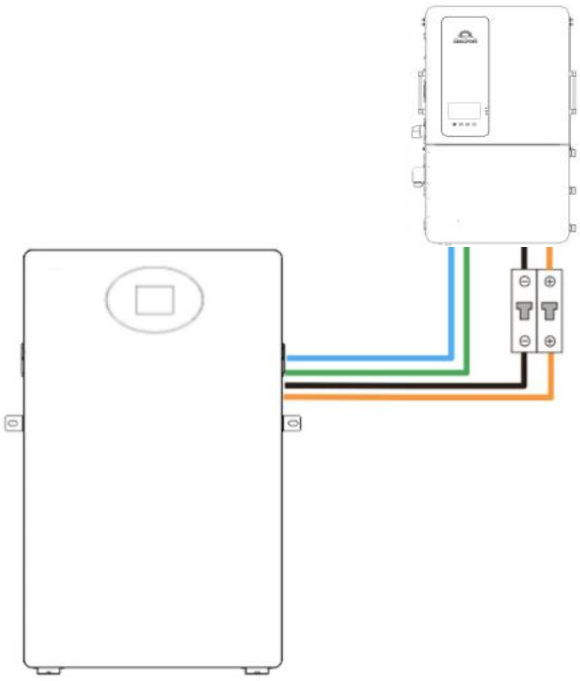
7.2 Power-On of Battery Module

7.2.1 Power-up Sequence

After the battery is connected to the inverter, please power on in the following order.

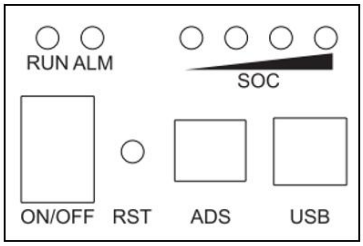
First, turn on the breaker switch, if there are multiple battery modules, turn on all the breaker switches.

Secondly, turn on the battery switch button and the battery start to work. If there are multiple modules, please turn on the power switch one by one according to the address sequence.



7.2.2 System Status Indication

After the battery switch button is turned on, the LED indicator will light up or flash. The meaning of the LED indicator is as follows.



System Status	Events	RUN	ALM
POWER OFF	Power Off	OFF	OFF
Steady	Normal	Blinking1	OFF
	Alarm	Blinking1	Blinking3
Charging	Normal	ON	OFF
	Alarm	ON	Blinking3
	Over Charge Protection	ON	OFF
	High temperature, Over Current	OFF	ON
Discharging	Normal	Blinking3	OFF
	Alarm	Blinking3	Blinking3
	Over Discharge Protection	OFF	OFF
	Over Current，Short Current	OFF	ON

LED blinking description

Blinking	LED ON	LED OFF
Blinking1	0.25S	3.75S
Blinking2	0.5S	0.5S
Blinking3	0.5S	1.5S

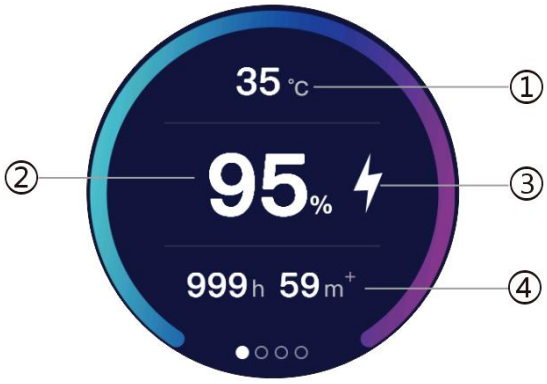
7.2.3 Capacity indicator

Capacity indicator LED	SOC
	0～25%
	25～50%
	50～75%
	75～100%

7.2.4 LCD Touch Screen

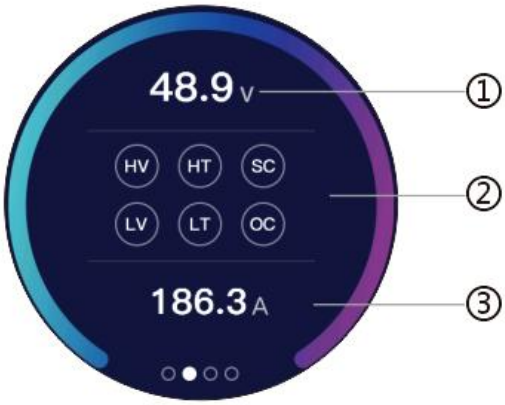
7.2.4.1 Main Page

ID	Value



①	*Battery temperature*
②	*SOC*
③	*Charging indication*
④	*Discharge remain time*

7.2.4.2 Warning Page



ID	Value
①	*Battery voltage*
②	*Warning and Protection*
③	*Battery current*

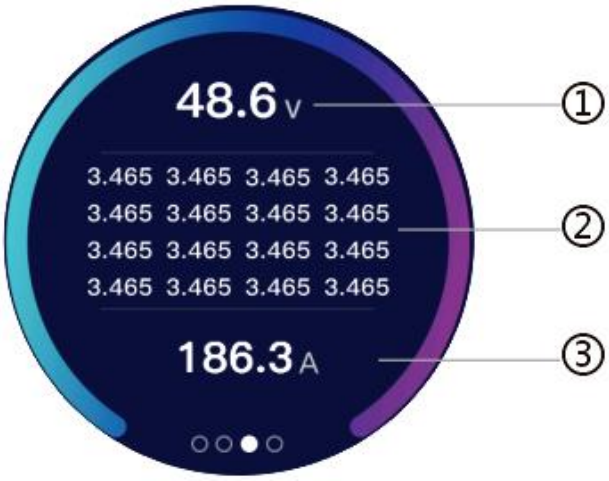
Warning and protection information is as follows.

1	HV	*Normal*	
	HV	*Over voltage Warning*	*The battery voltage exceeds the warning value, but the BMS will not stop charging, and the inverter needs to actively stop charging.*
	HV	*Over voltage Protection*	*The battery voltage exceeds the protection value, the BMS will actively stop charging.*
2	LV	*Normal*	
	LV	*Over discharge Voltage Warning*	*The battery voltage is lower than the warning value, but the BMS will not stop discharging, and the inverter needs to actively stop discharging.*
	LV	*Over discharge Voltage Protection*	*The battery voltage is lower than the protection value, the BMS will actively stop discharging.*
3	HT	*Normal*	

	HT	Over Temperature Warning	The battery temperature is higher than the warning value, but the BMS will not stop charging and discharging, and the inverter needs to actively stop charging and discharging.
	HT	Over Temperature Protection	The battery temperature is higher than the protection value, the BMS will actively stop charging and discharging.
4	LT	Normal	
	LT	Low Temperature Warning	The battery temperature is lower than the warning value, but the BMS will not stop charging and discharging, and the inverter needs to actively stop charging and discharging.
	LT	Low Temperature Protection	The battery temperature is lower than the protection value, the BMS will actively stop charging and discharging.
5	SC	Normal	
	SC	Short Circuit Protection	The battery output is short-circuit protected, and the BMS stops discharging.
6	OC	Normal	
	OC	Overcurrent Protection	The charging current or discharging current is too large, the BMS stops charging or discharging
7	HV HT SC LV LT OC		Hardware failure, please stop using immediately, and contact a professional maintenance personnel to deal with.

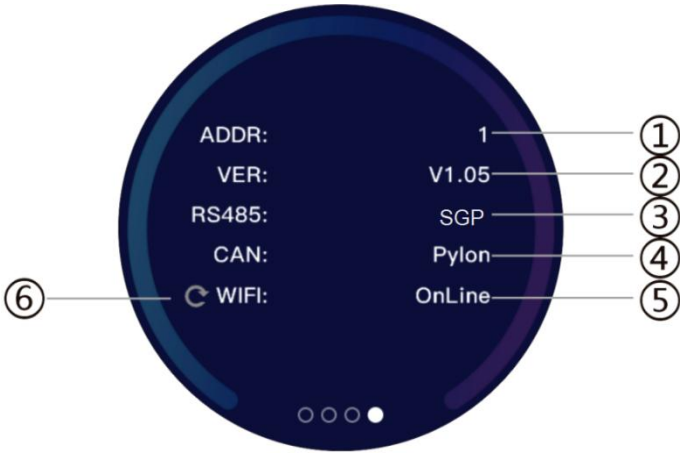
7.2.4.3 Cell Voltage Page

ID	Value
①	Battery voltage



②	*Cell voltage*
③	*Battery current*

7.2.4.4 Information Page



ID	Value
①	*Battery address*
②	*Version*
③	*485 protocol connected with inverter*
④	*CAN protocol connected with inverter*
⑤	*WIFI status*
⑥	*Reset WIFI*

If you can't connect to the network or need to change the network environment, please reset the WIFI.

7.3 Battery Communication Protocol

The supported inverter and battery manufacturer communication protocols are as follows, and will be continuously updated.

Battery /Inverter brand	CAN protocol	485 protocol
Pylon	√	√
SUNGOLDPOWER	√	√
Growatt	√	√
Victron	√	
Goodwe	√	
Solis	√	
Luxpower	√	
Sofar	√	
KStar	√	
SMA	√	
MEGAREVO	√	
Afore	√	
Solark	√	
Voltronic		√
Paceic		√

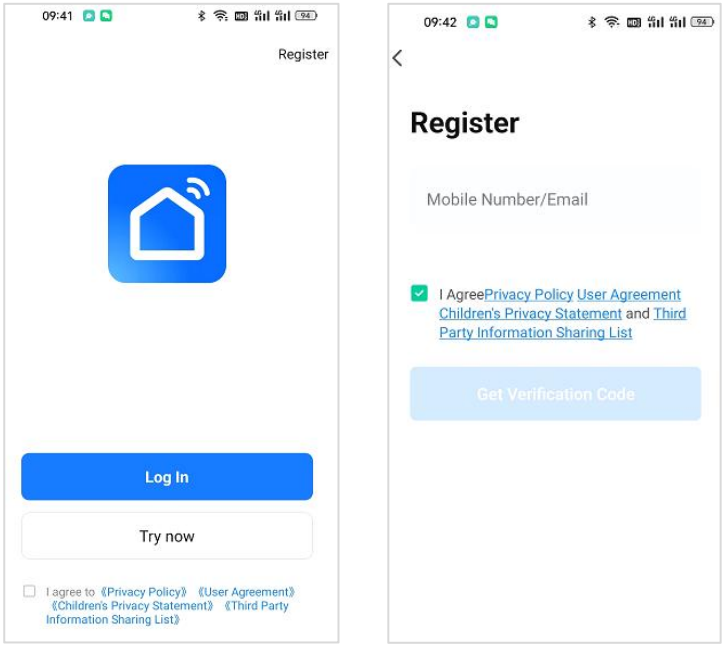
7.4 WIFI Function

7.4.1 Download App

Scan the QR code to download the APP.

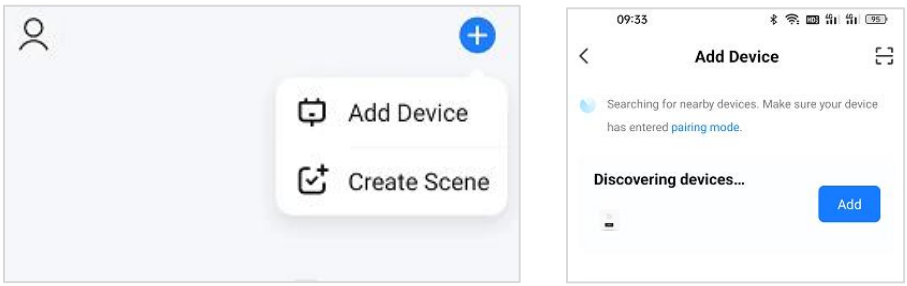
7.4.2 Register and Login

You need to register an account for the first time.



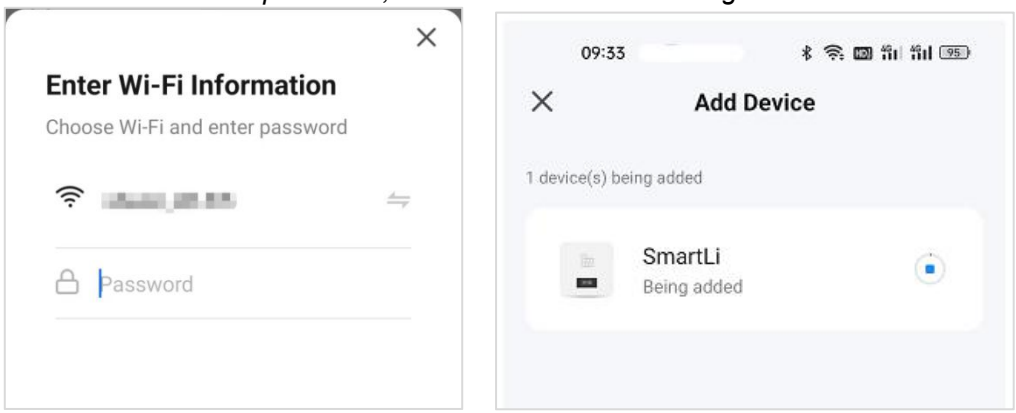
7.4.3 Add Device

Connecting the device requires turning on Bluetooth, WIFI, and location permissions.



7.4.4 Connect Network

Choose WIFI and enter the password,the device starts connecting to the network.



7.4.5 Reset WIFI

If you can't connect to the network or need to change the network environment, please reset the WIFI.

Only supports 2.4G band's WiFi , not supports 5G band's WiFi , please make sure that the 2.4G band of the router is turned on.

7.5 Sleep Mode

If the battery is neither charged nor discharged, it will automatically enter sleep mode after a period of time.After entering sleep mode, BMS will turn off LCD and WiFi module to save power.If you want to continue using it, please turn the power button on and off again.

8 System Maintenance

8.1 System Power-Off

After the system is powered off, the case still has residual power and heat, which may cause electric shocks or burns. Therefore, protective gloves should be worn before operating the energy storage 5 minutes after the system is powered off. Maintenance operations on energy storage should be performed only after ensuring that all indicator lights of the energy storage are off.

Power-off operation steps of the system:

Step 1 Turn off the breaker switch between the inverter and AC output (If installed).

Step 2 Turn off the breaker switch between the inverter unit and AC input(If installed).

Step 3 Turn off the breaker switch between the inverter unit and the PV string(If installed).

Step 4 Turn off the breaker switch between the inverter and battery.

Step 5 Turn off button on all storage battery modules, the energy storage is powered off successfully.

8.2 Routine Maintenance

To ensure the long-term and good operation of the energy storage system, it is recommended to perform the routine maintenance as described in this section.

Items	Methods	Maintenance interval
System cleanliness	*Check if the radiator is covered or dirt on a regular basis.*	*Once every six months to one year.*
Running status of system	● *Observe whether the energy storage appearance is damaged or deformed.* ● *Listen to whether the energy storage has any abnormal sound during running.* ● *When the energy storage is running, check whether the indicator of the energy storage battery is correct.*	*Once every six months.*
Electrical connection	● *Check if any cable connection is off or loose.* ● *Check if any cable is damaged, and especially if there are cuts on the sheath where the cable contacts with the metal surface.* ● *Check if the unused DC input terminals, energy storage terminals, COM ports, and covers are locked.*	*Half a year after first debugging and testing, and once every six months to one year thereafter.*

Grounding reliability	Check if the grounding cable is grounded reliably.	Half a year after first debugging and testing, and once every six months to one year thereafter.

8.3 Common Faults and Handling Methods

Faults	Handling measures
The indicator light and LCD does not work	Check whether battery is sleeping mode.If the battery is neither charged nor discharged, it will automatically enter sleep mode after a period of time.
All indicators of the battery are off	If the battery power is low, you need to charge it before using it. If the battery is not used for a long time, it will automatically sleep, and it can be used normally after restarting.
Battery overcurrent protection fault	Check whether there is a short circuit in the battery wiring. Check whether the load power exceeds the maximum
The battery cannot be charged	Check if the battery is fully charged Check whether the ambient temperature is below -10 degrees.
Communication error with inverter	Check whether the communication interface is incorrectly plugged in and Whether the wiring is secure. Whether the battery address is set correctly. Whether the protocol is secure.
WIFI communication error	Check if the router settings are correct Check whether the routing network is normal Check whether the router's 2.4G frequency band is turned on

8.4 Battery Storage and Maintenance

8.4.1 Battery Storage Requirements

Do not put the battery into fire. The battery may explode.
Do not open or damage the battery. The electrolyte flowing out from the battery is harmful to the skin and eyes. The electrolyte may also be toxic;

1. When being stored, the batteries shall be placed correctly in accordance with the marks on the packing case. Do not put them upside down or on the side.

2. When stacking up the battery packing cases, the stacking requirements on the outer package shall be met.

3. The batteries should be handled with care, and damage to batteries should be strictly prohibited.

4. Requirements for the storage environment:

- *Ambient temperature: -10℃ to 55 ℃, recommended storage temperature: 20℃ to 30℃.*
- *Relative humidity: 5%RH-80%RH.*
- *Dry, well ventilated, and clean.*
- *The corrosive organic solvents, gases and other substances shall be kept away.*
- *Exposing to direct sunlight shall be avoided.*

– *The distance from the heat source should not be less than two meters.*

5. When being stored, the battery shall be disconnected from the external connection. If there is an indicator light on the battery panel, the indicator light shall be off.

6. When the stored batteries are going to be delivered, the first-in first-out principle should be followed.

7. After the battery is produced and tested, it shall be recharged to at least 50% SOC before being stored. If the device will not be used for a long period of time, discharge the battery to 45% to 60% of the battery capacity and disconnect the battery output to avoid the battery runs out.

8. Do not touch the battery pack with wet hands.

9. Do not squeeze, drop, or pierce the battery.

10. The battery should always be disposed in accordance with local safety regulations.

11. The battery should be stored and recharged in accordance with this User's Manual.

12. Do not reverse polarity of the battery when storing or transporting the batteries, the batteries shall not be stacked up without protective packaging, and the number of stacked packed batteries should not exceed the number specified on the packaging.

13. All operators of the energy storage system shall comply with the user manual, installation and service manual, and quality assurance requirements. Any damage to the device resulting from neglecting or misreading of the user's manual, installation and service manual, and the quality assurance requirements will invalidate the product warranty.

8.4.2 Requirements for Charging of Battery

The batteries to be stored for a long period of time (unused, for more than 3 months) must be kept in a dry and cool place. The storage voltage is 51V~53V. The batteries should be stored in a clean environment of 23± 2℃ and humidity of 45%~75%. If the battery will be shelved and not used for a long period of time, it should be recharged every 3 months to ensure that the battery voltage is within the above range.

As for batteries and long-term storage, routine maintenance is required. Please charge the battery to 40% SOC at a current of 0.2C according to the requirements in the table below.

Ambient temperature for storage	Relative humidity for storage environment	Storage Time	SOC
<-10℃	/	Prohibited	/
-10~25℃	5%~70%	≤12 months	30%≤SOC≤60%
25~35℃		≤6 months	
35~45℃		≤3 months	
>45℃	/	Prohibited	/

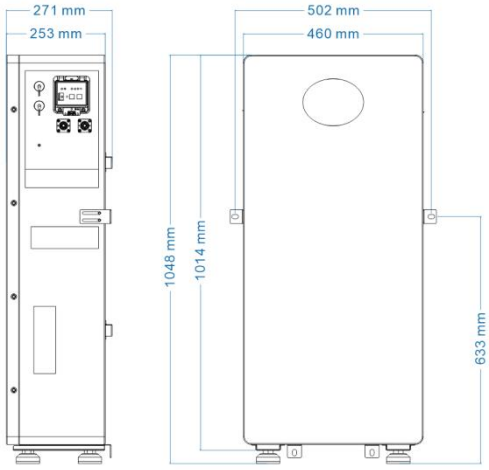
8.5 Device Cleaning

It is recommended to clean and maintain the product from time to time. When cleaning, the dust and stains on the product shall be removed with a piece of soft dry cloth or vacuum cleaner. The product shall not be cleaned with organic solvents, corrosive liquids and other cleaning products.

9 Product Dimensions and Packaging

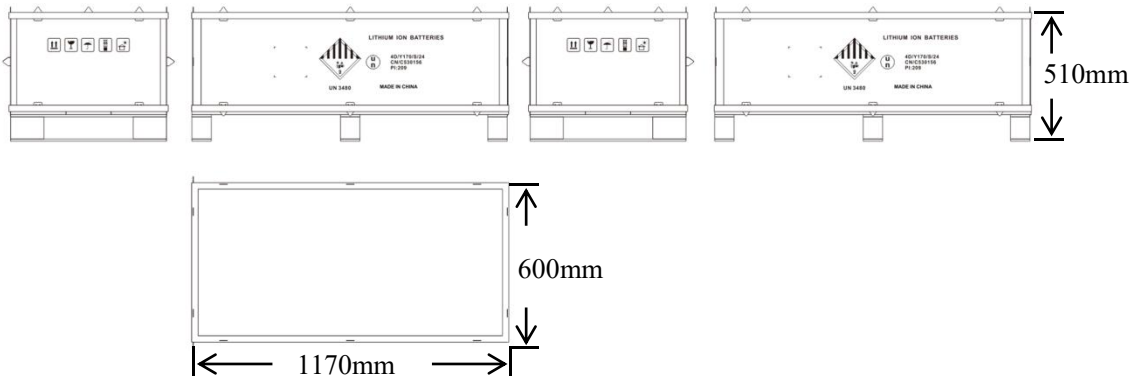
9.1 Product Dimensions

*The external dimensions of the energy storage battery module , PowerMax 314 Outdoor is 1048*460*271mm.*



9.2 Package Dimensions

*A single energy storage battery module，The packaging size of Power Max 314 Outdoor is 1170*600*510mm.*



CONTACT US

(833)761-6080
support@sungoldpower.com

Dimensions：2278*1134*35mm
Mono Power：550W

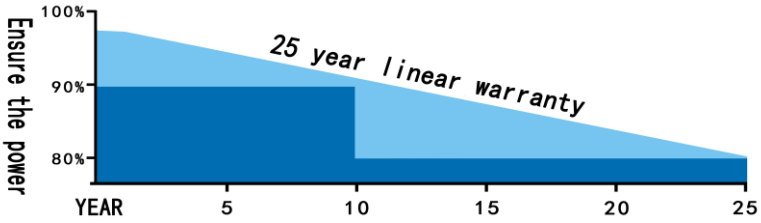
Characteristics

- High efficiency solar cell to keep the modules efficiency reach to 21.3%.
- Positive tolerance to ensure higher output.
- Excellent performance under weak light conditions.
- Modules withstand extremely (temperature, load and impact) TUV certification.
- All modules combination and packing through stepping current to keep effectively reduce mismatch loss.
- 100% EL test to keep higher quality.

Anodized aluminum frame withstand corrosion and damage, Special osculum can reduce destruction by water freeze.

Warranty

- *5 year 95% output warranty, 10 year 90% output warranty, 25 year 80% output warranty.*
- *12 years material and workmanship warranty.*



Quality and safety

- ISO9001:2015 certified supplier, we provide world first class solar products for clients.
- TUV,IEC,CEC,CE,CB CA 92618 approved.
- *UL61730, CEC Listed*

IP68 junction box long-term weather endurance.

Electrical Characteristics

Model No.	SG550WM
Maximum Power (Pmax)	550W
Max-power Voltage (Vmp)	41.00V
Max-power Current (Imp)	13.45A
Open-circuit Voltage (Voc)	49.70V
Short-circuit Current (Isc)	14.03A
Module Efficiency	21.3%
Operating Temperature	-40℉to 185℉(-40℃~+85℃)
Maximum System Voltage	1500Vdc
Maximum Series Fuse Rating	25A
Power Tolerance	±3%

*STC condition：1000 W/m²,1.5AM and 25℃ cell temperature.

Temperature Characteristics

NMOT	44℃±2℃
Temperature Co-efficient of Pmax	-0.38%/℃
Temperature Co-efficient of Voc	-0.35%/℃
Temperature Co-efficient of Isc	0.06%/℃

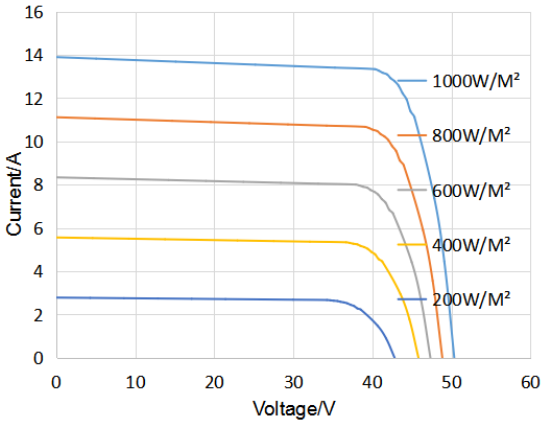
Mechanical Characteristics

Mono Power	550W
Cell Type	Mono 182*91mm
Cell Arrangement	144(6*24)
Dimensions	89.7*44.8*1.4inch (2278*1134*35mm)
Weight	62.4lbs (28.3kg)
Front Cover	3.2mm tempered glass
Frame Material	Anodized aluminium alloy
Junction Box	IP68 rated
Output Cables	4mm²,Length：（+）300mm/（-）300mm

Packing

Packing	40'HC
Pieces/Pallet	32
Pieces/container	600

I-V Curve



Dimensions