## Monocrystalline Module Models

SG-100WM

## Electrical Specifications

*STC : Irradiance 1000W/m², AM1.5 spectrum, module temperature 25℃

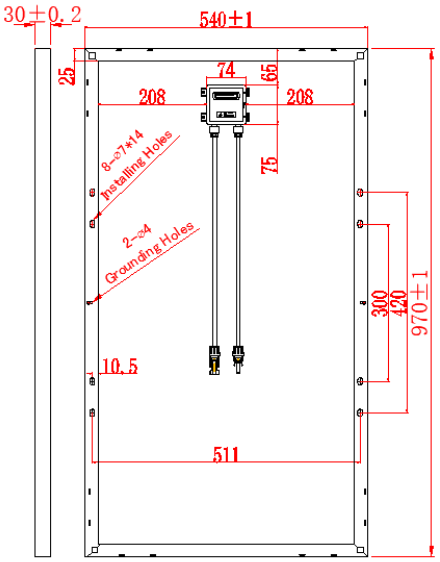
| | |
|---|---|
| Model type | SG-100WM |
| Peak power (Pmax) | 100W |
| Cell Efficiency | 22.80% |
| Maximum power voltage (Vmp) | 19.1V |
| Maximum power current (Imp) | 5.24A |
| Open circuit voltage (Voc) | 22.1V |
| Short circuit current (Isc) | 5.57A |
| Power Tolerance | ±3% |
| Maximum system voltage | 600V |
| Series fuse rating (A) | 8 |
| Number of bypass diode | 1 |

## Temperature Coefficients

| | |
|---|---|
| | 0.03%/℃ |
| Voltage Temperature Coefficient β(Voc) | - 0.32%/℃ |
| Power Temperature Coefficient | -0.42%/℃ |
| Nominal Temperature Of Cells(NOTC) | 46±2℃ |
| Application Temperature Range | -40~+85℃ |

## Mechanical Characteristics

| | |
|---|---|
| Dimensions： | 970 x 540 x 30mm (38.19x21.26x1.18 inch) |
| Weight: | 5.88kg (13.05lbs) |
| Solar Cells: | 33cells in series(3x 11) |
| Construction: | High-transmission low-iron tempered glass , EVA, TPE |
| Frame: | Anodized aluminum is mainly for improving corrosion resistance. Color: silver |

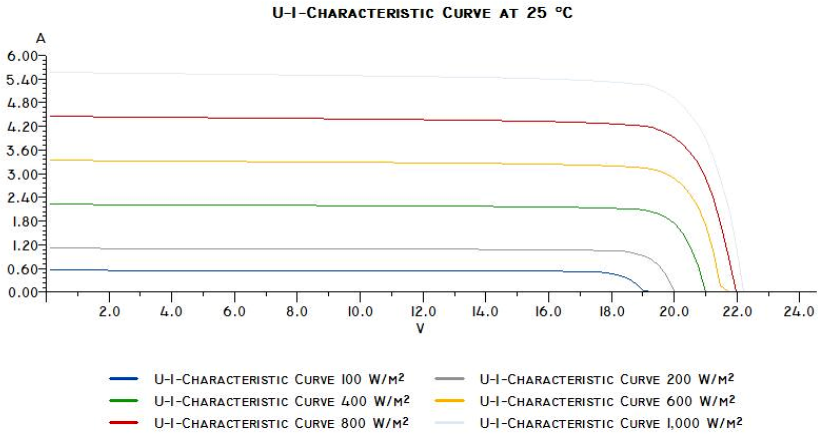



Frame thickness: 0.9±0.12MM
Treatment for frame: Anodized.

## Module Diagram

## Output

| | |
|---|---|
| Cable | LAPP(4mm²) |
| Lengths | 900(＋) and 900(－) |
| Connector | MC IV Plug |




## Electrical Performance

## Module Warranty:

25-year limited warranty of 80% power output;

10-year limited warranty of 90% power output;

5-year limited warranty of materials and workmanship.

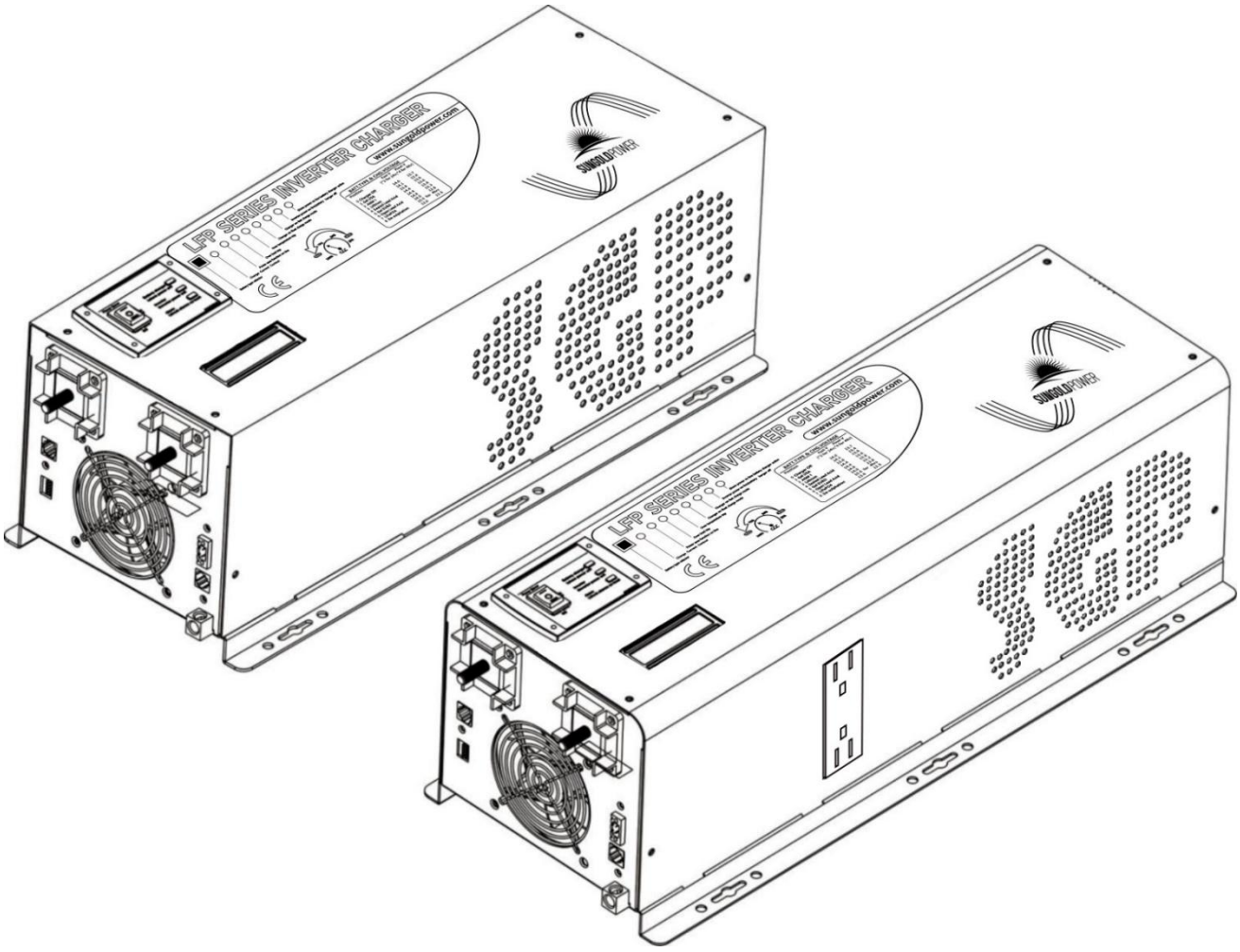
**Note:** This publication summarizes product warranty and Specifications which are subject to change without notice

**Product photos are for reference only, on behalf of actual product.**

# LFP Series

## Pure Sine Wave Inverter/Charger

## User's Manual



# Table of Contents

# 1 Important Safety Information

**WARNING!**

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

## 1.1 General Safety Precautions

1-1-1.Do not expose the Inverter to rain, snow, spray, bilge or dust. To reduce risk of hazard, do not cover or obstruct the ventilation openings. Do not install the Inverter in a zero-clearance compartment. Overheating may result. Allow at least 30CM(11.81 inches) of clearance around the inverter for air flow. Make sure that the air can circulate freely around the unit. A minimum air flow of 145CFM is required.

1-1-2. To avoid a risk of fire and electronic shock. Make sure that existing wiring is in good electrical condition; and that wire size is not undersized. Do not operate the Inverter with damaged or substandard wiring.

1-1-3. This equipment contains components which can produce arcs or sparks. To prevent fire or explosion do not install in compartments containing batteries or flammable materials or in locations which require ignition protected equipment. This includes any space containing gasoline-powered machinery, fuel tanks, or joints, fittings, or other connection between components of the fuel system.

See Warranty for instructions on obtaining service.

1-1-4. Do not dis-assemble the Inverter/Charger. It contains no user serviceable parts. Attempting to service the Inverter/Charger yourself may result in a risk of electrical shock or fire. Internal capacitors remain charged after all power is disconnected.

1-1-5. To reduce the risk of electrical shock, disconnect both AC and DC power from the Inverter/Charger before attempting any maintenance or cleaning. Turning off controls will not reduce this risk

**CAUTION: Equipment damage**

The output side of the inverter's AC wiring should at no time be connected to public power or a generator. This condition is far worse than a short circuit. If the unit survives this condition, it will shut down until corrections are made.

Installation should ensure that the inverter's AC output is, at no time, connected to its AC input.

**Warning: Limitations On Use**

SPECIFICALLY, PLEASE NOTE THAT THE LFP SERIES INVERTER/CHARGER SHOULD NOT BE USED IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES.

## 1.2 Precautions When Working with Batteries

1-2-1. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 20 minutes and get medical attention immediately.

1-2-2. Never smoke or allow a spark or flame in vicinity of battery or engine.

1-2-3. Do not drop a metal tool on the battery. The resulting spark or short-circuit on the battery of other electrical part may cause an explosion.

1-2-4. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery produces a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.

1-2-5. To reduce the risk of injury, charge only rechargeable batteries such as deep-cycle lead acid, lead antimony, lead calcium gel cell, absorbed mat, NiCad/NiFe or Lithium battery. Other types of batteries may burst, causing personal injury and damage.

# 2 Introduction

## 2.1 General Information

This Series Pure Sine Wave Inverter is a combination of an inverter, battery charger and AC auto-transfer switch into one complete system with a peak conversion efficiency of 88%.
It is packed with unique features and it is one of the most advanced inverter/chargers in the market today. 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.
For the regular model, 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.
The LFP Series Inverter is equipped with a powerful charger of up to110Amps (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 LFP Series Pure Sine Wave Inverter is suitable for Renewable energy system,Utility, RV, Marin 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

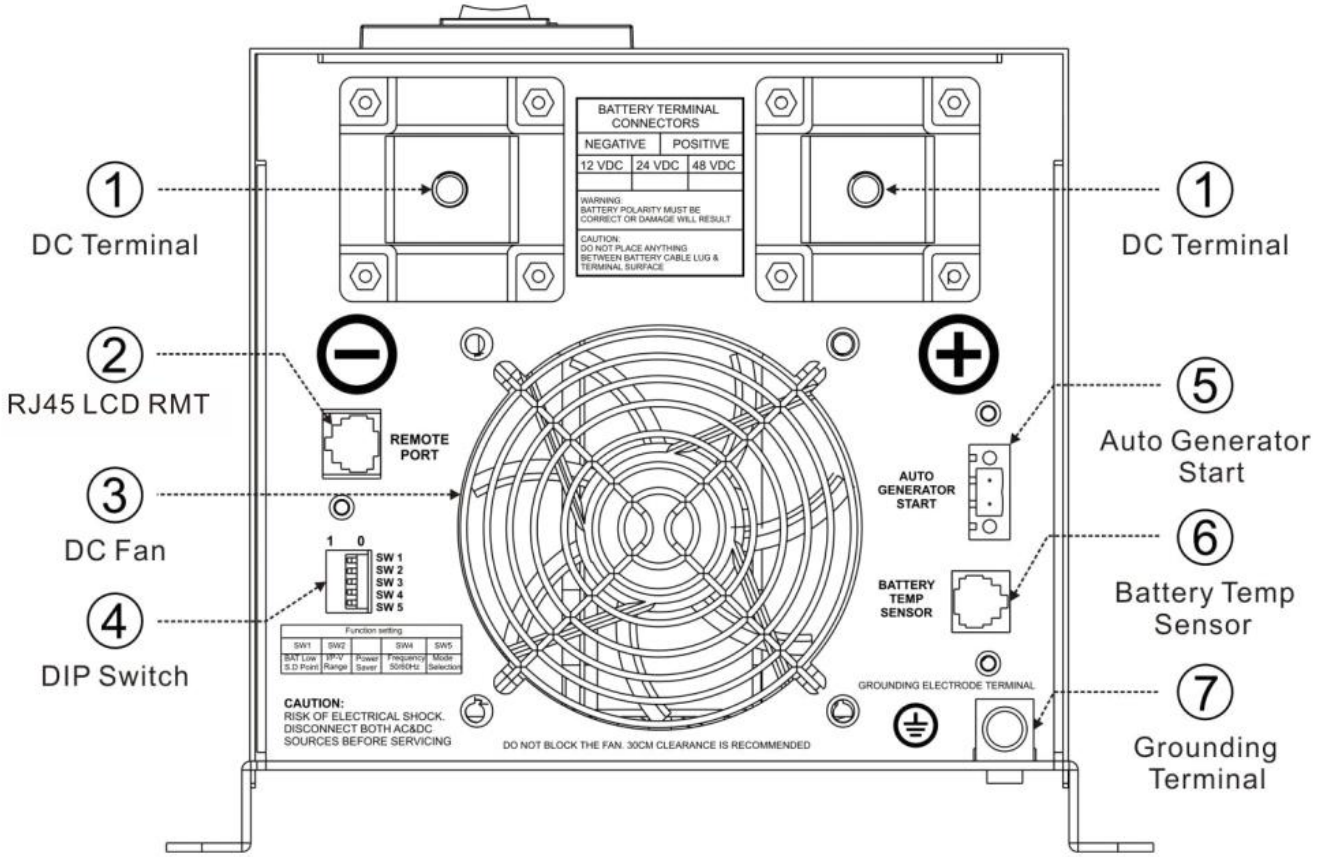
Power tools–circular saws, drills, grinders, sanders, buffers, weed and hedge trimmers, air compressors.
Office equipment – computers, printers, monitors, facsimile machines, scanners.
Household items – vacuum cleaners, fans, fluorescent and incandescent lights, shavers, sewing machines.
Kitchen appliances – 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.

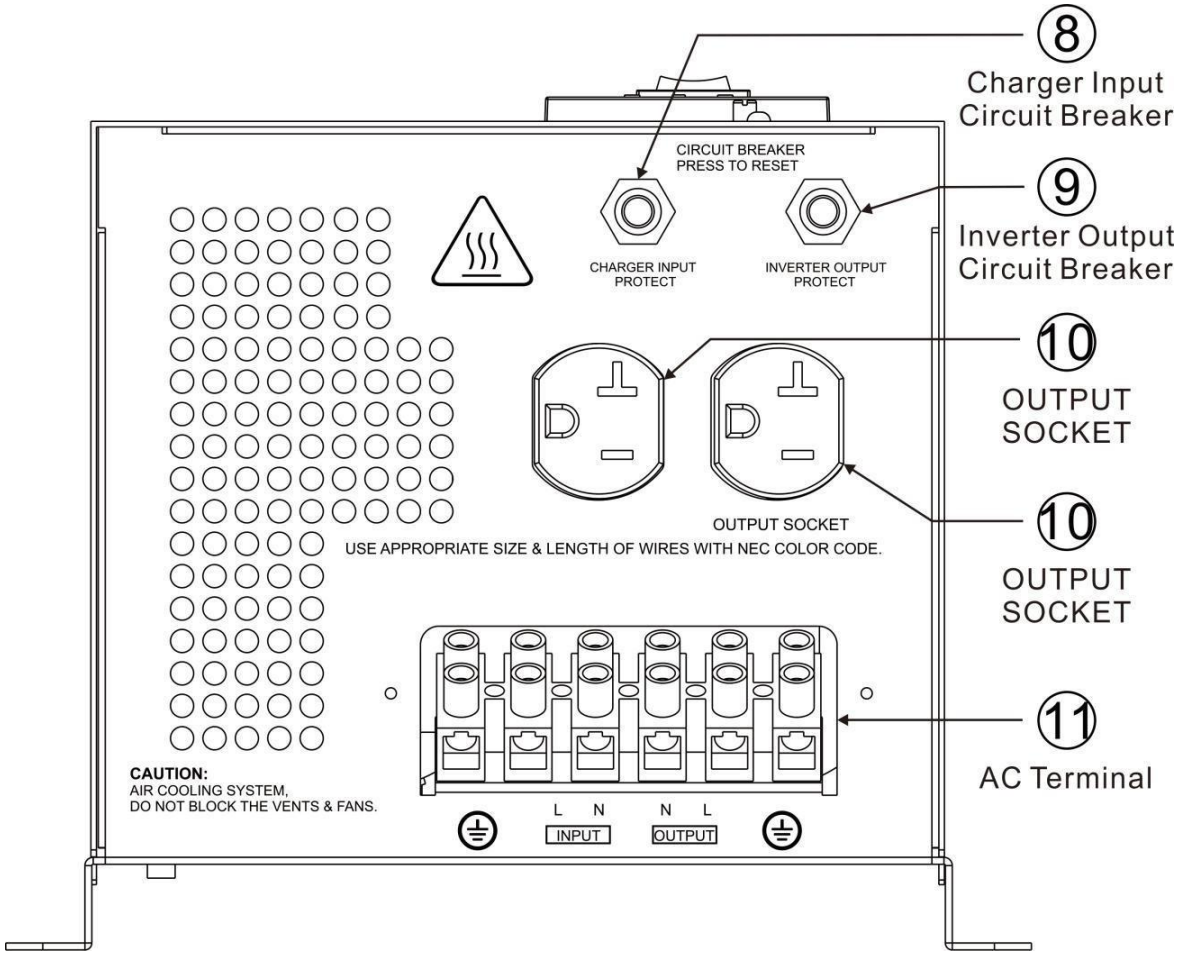
## 2.3 Features

- **Smart Remote Control (RMT)**
- **Designed to Operate under Harsh Environment**
- **DC Start & Automatic Self-Diagnostic Function**
- **Compatible with Both 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 Resumes, Protection for Load when Used with Generator**

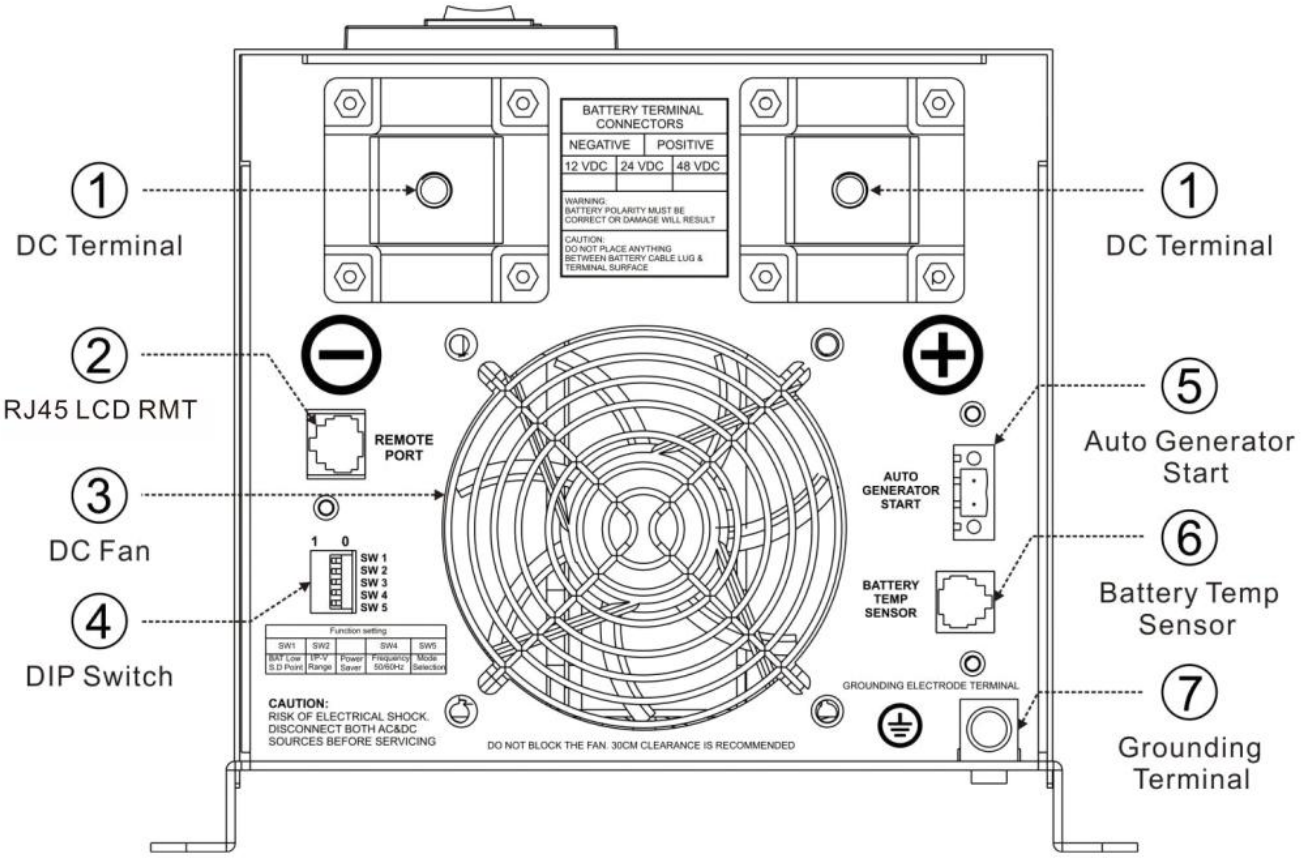
# 2.4 Mechanical Drawing

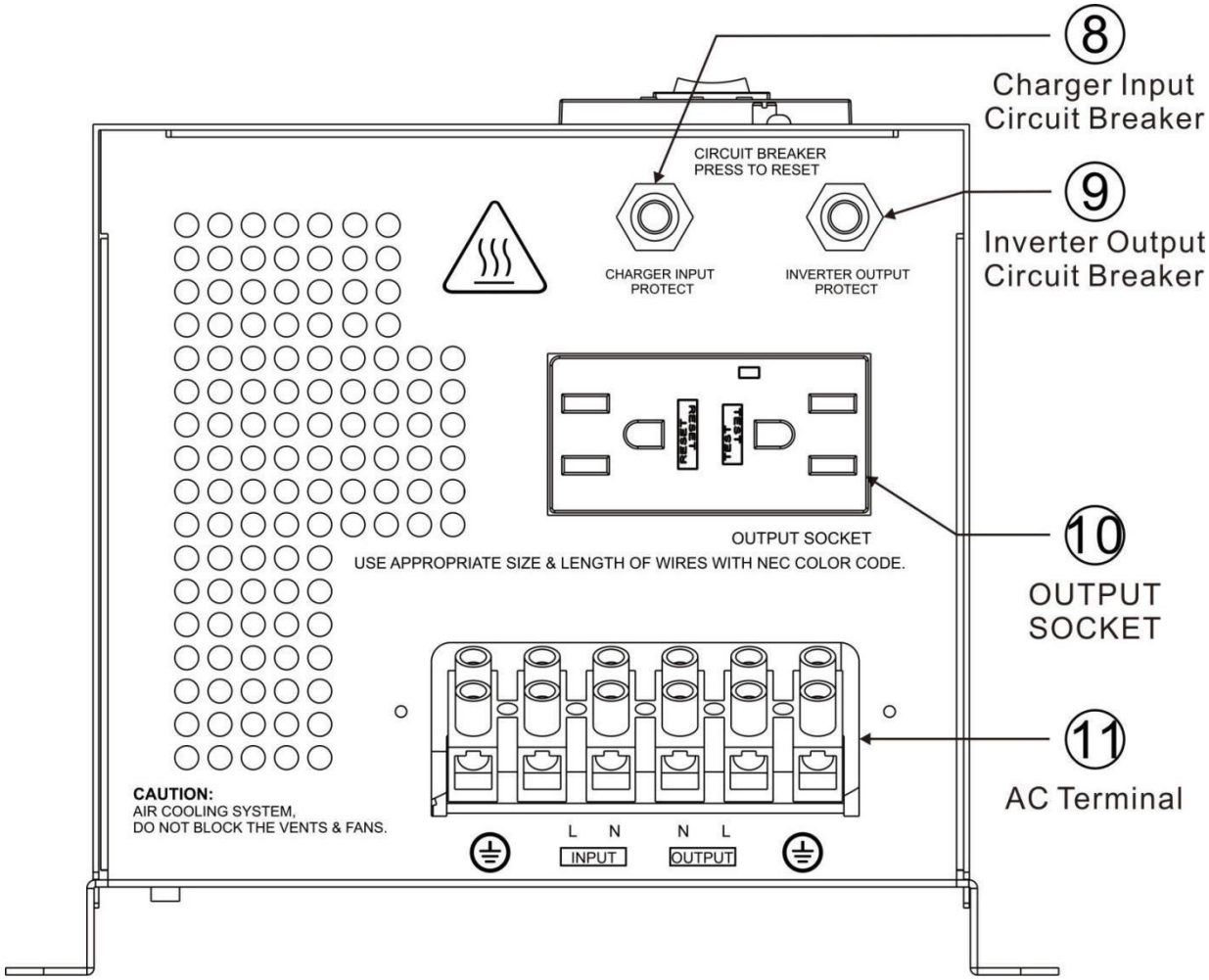
**LFP 1KW to 1.5KW Models**



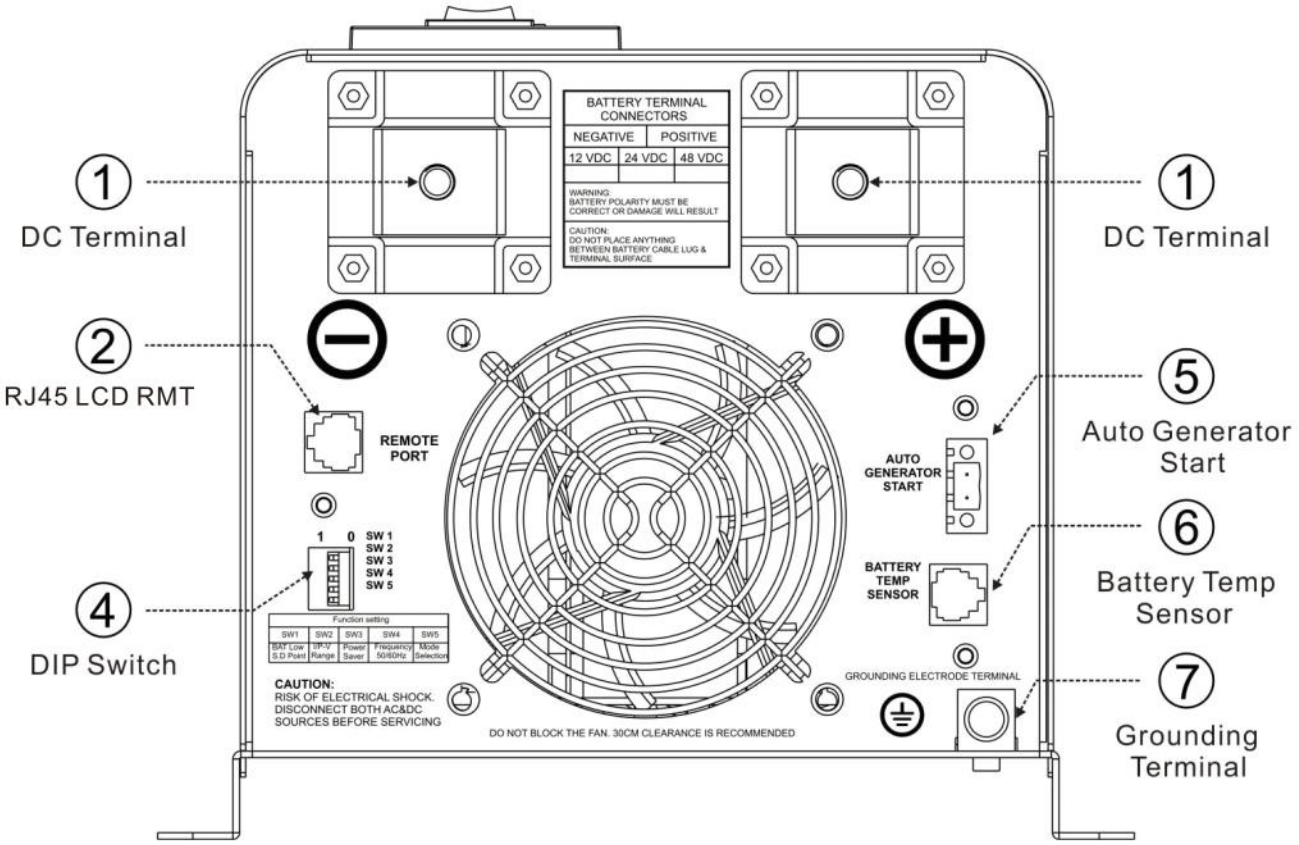



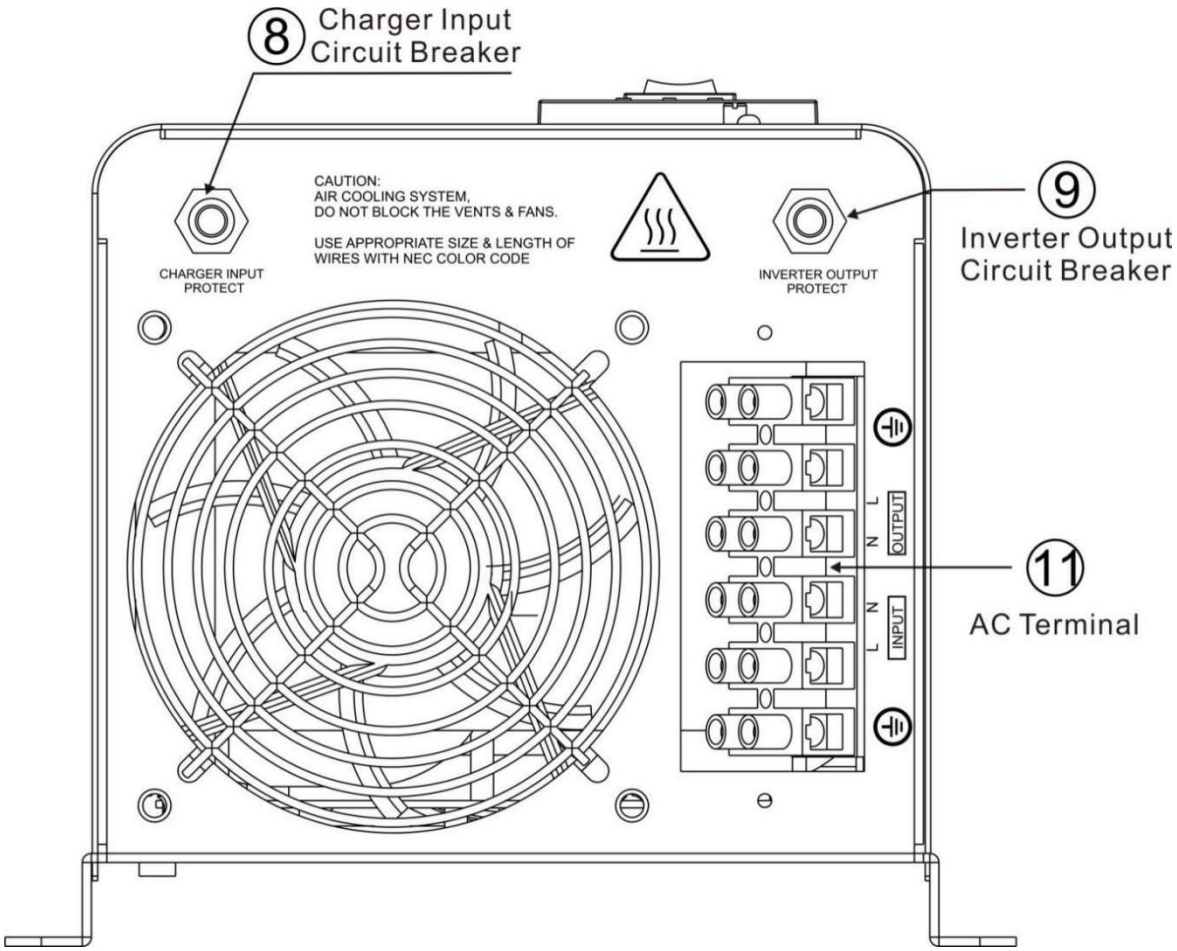
## LFP 2KW to 4KW Models



**LFP 5KW to 6KW Models**



# 2.5 Electrical Performance

## 2.5.1 AC Charger

LFP 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, LFP 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 LFP 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 liner 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 liner 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 CVmode 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**

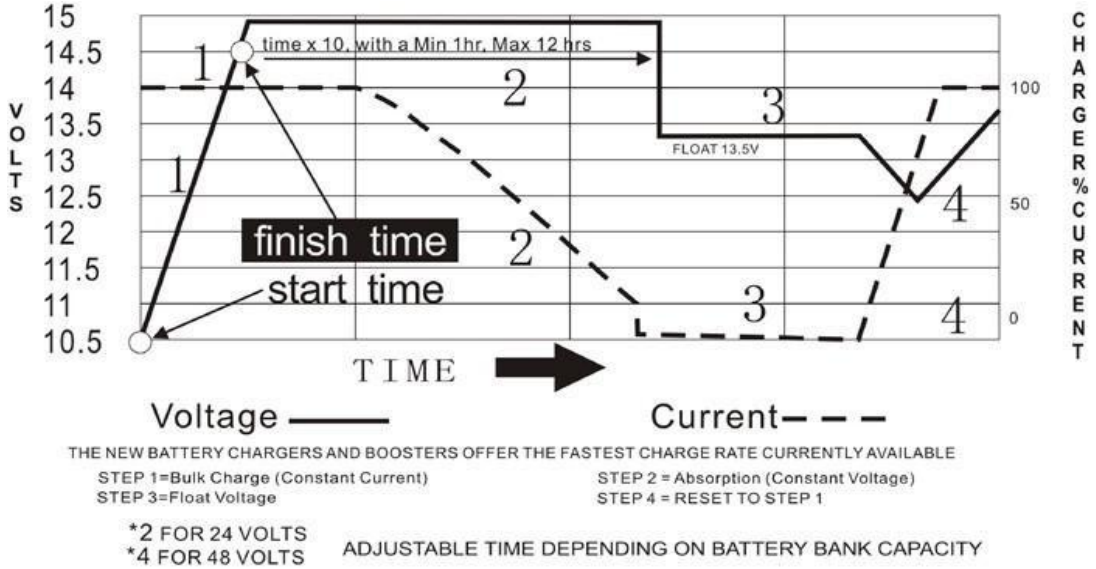


**Table 2.5.2 Battery Type Selector**

| 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/AGM2 | 14.6 | 13.6 |
| 4 | Lithium/Sealed Lead Acid | 14.4 | 13.6 |
| 5 | Gel EURO | 14.4 | 13.8 |
| 6 | Lithium | 12.6 | 12.0 |
| 7 | LiFePO4 | 14.0 | 13.8 |
| 8 | De-sulphation | 15.5 for 4hrs | |
| 9 | Classic LFP | 13.6 | 13.5 |

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

**Use with Lithium Ion Battery Packs**

Our inverter charger can work with various lithium batteries like LiFePO4, LFP battery. Please check the battery specification to make sure the charging setting of inverter suits your lithium battery charge voltage and cut off voltages.

If the charging setting of the inverter don' t match your lithium battery, please email your requirement to sales@sungoldpower.com for customization.

**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 sulphated 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 LFP 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 OIS model**

| Model Watt | Battery Voltage | AC Charger Current Max | Model Watt | Battery Voltage | AC Charger Current Max |
|---|---|---|---|---|---|
| **1.000 ~ 1.500** | 12 Vdc | 45 ± 5 Amp | **2.000** | 12 Vdc | 70 ± 5 Amp |
| | 24 Vdc | 25 ± 5 Amp | | 24 Vdc | 25 ± 5 Amp |
| | 48 Vdc | 15 ± 5 Amp | | 48 Vdc | 20 ± 5 Amp |
| **3.000** | 12 Vdc | 90 ± 5 Amp | **4.000** | 12 Vdc | 120 ± 5 Amp |
| | 24 Vdc | 40 ± 5 Amp | | 24 Vdc | 50± 5 Amp |
| | 48 Vdc | 30 ± 5 Amp | | 48 Vdc | 40 ± 5 Amp |
| **5.000** | 24 Vdc | 80 ± 5 Amp | **6.000** | 24 Vdc | 90 ± 5 Amp |
| | 48 Vdc | 50 ± 5 Amp | | 48 Vdc | 60 ± 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.

## 2.5.2 Inverter

**Topology**

The LFP inverter/charger is built according to the following topology.
Inverter: Full Bridge Topology.
AC Charger: Isolate Boost Topology
Because of high efficiency Mosfets and 16bit, 4.9MHz microprocessor and heavy transformers, it outputs PURE SINE WAVE AC with an average THD of 10% (Min5%, Max 15%) depending of load connected and battery voltage.
The peak efficiency of LFP series is 88%.

**Overload Capacity**

The LFP 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.

## 2.5.3 Auto frequency adjust

The inverter is with Auto Frequency adjust function.
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.
If you want to get 60Hz from a 50Hz inverter, just input 60Hz power, and the inverter will automatically adjust the output freq to 60Hz and vice versa.

## 2.5.4 DIP Switches

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

**Dip Switch Function Setting**

| Switch NO | Switch Function | Position: 0 | Position: 1 |
|---|---|---|---|
| SW1 | Low Battery Trip Volt | 10.0VDC | 10.5VDC |
| | | *2 for 24VDC, *4 for 48VDC | |
| SW2 | AC Input Range | 184-253VAC<br>100-135VAC | 140-270VAC<br>90-135VAC |
| SW3 | Power Saver Auto Setting | Night charger Function | Detect load Per 3Secs |
| SW4 | O/P Frequency Setting | 50HZ | 60HZ |
| SW5 | Battery/AC Priority | 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 154-253VAC (90-135V for 120VAC model), this helps to power loads with the most AC input power without frequent switches to the battery bank.

**SW3:Power Saver Auto Setting :**
The inverter is factory defaulted to detect load for 250ms in every 30 seconds. This cycle can be customized to 3 seconds through the SW3 on the DIP switch.

**SW4: Adjust 50hz/60hz**
The output frequency of the inverter can be set at either 50Hz or 60Hz by SW4.
Kindly reminder: 4000W/12V machine doesn't have this function.

**SW5:Solar/AC 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 cycle normal charging and 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, charges battery, and switches back to battery when battery is charged full. This function is mainly for wind/solar systems taking utility power as back up.

## 2.5.5 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 Invert 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.

## 2.5.6 Power Saver Mode

There are 3 different working status for LFP 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.

The inverter is factory defaulted to detect load for 250ms every 30 seconds. This cycle can be customized to 3 seconds turn SW3 on the DIP switch.

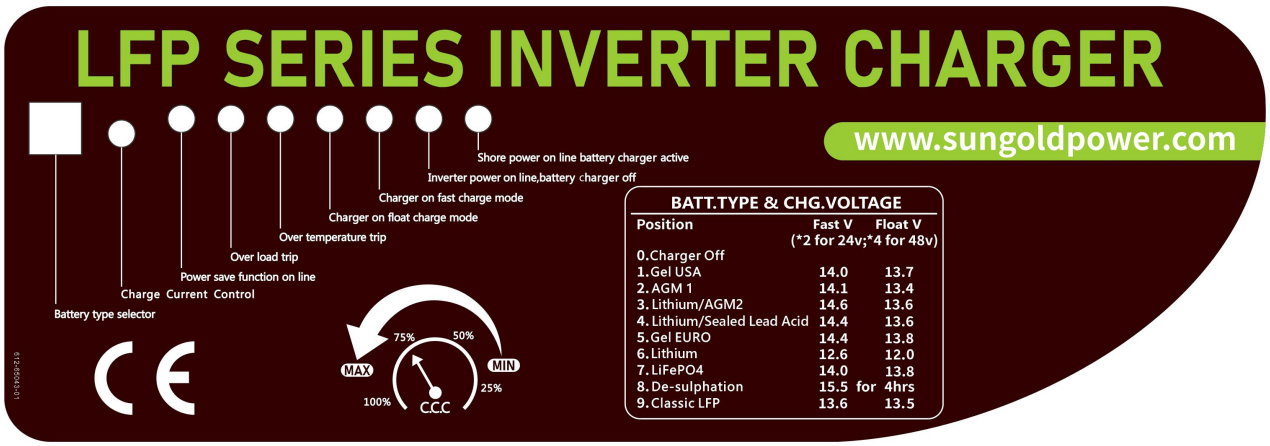
| Power saver on | Power saver off | Power saver on (Load detected) |
|---|---|---|
|  |  |  |

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

## 2.5.7 Protections

The LFP 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 (1s 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 thru 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 LFP 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.

## 2.5.8 LED Indicator & LCD




| | |
|---|---|
| SHORE POWER ON | GREEN LED lit in AC Mode |
| INVERTER ON | GREEN LED lit in Inverter Mode |
| FAST CHARGE | Yellow LED lit in Fast Charging Mode |
| FLOAT CHARGE | GREEN LED lit in Float Charging Mode |
| 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 (Power Saver Load ≦25W) |

**Table 2.5.8 LCD Indicator**

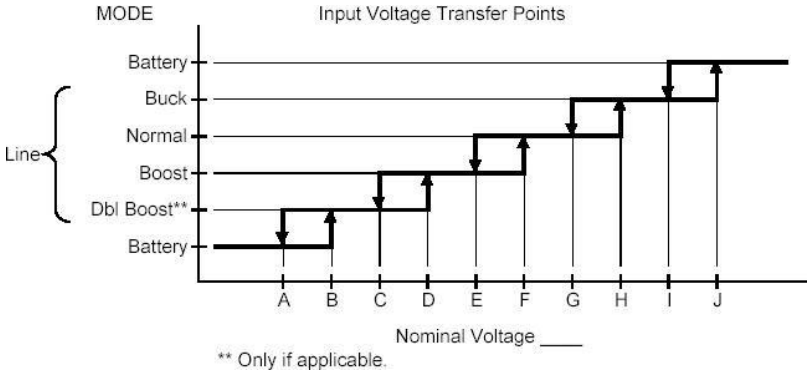
| | |
|---|---|
| 1 Greeting message<br>Welcome To<br>xxxxx | 2 AC Status & Input Voltage<br>AC: normal<br>I/P-V:230V<br>"AC: abnormal"<br>will be displayed when AC input is not qualified. |
| 3 Output Voltage/Frequency and Battery voltage<br>O/P-V:230V F:50HZ<br>BAT-V:12.5V | 4 Output Current( in percentage)<br>O/P Current:100% |

## 2.5.9 Automatic Voltage Regulation(Optional)

The automatic voltage regulation function is for full series of LFP Pure Sine Wave Inverter/ Charger except split phase models including LFP 1000W~6000W.
Instead of simply bypassing the input AC to power the loads, the LFP series inverter stabilizes the input AC voltage to a range of 230V/120V±10%.
Connected with batteries, the LFP 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**

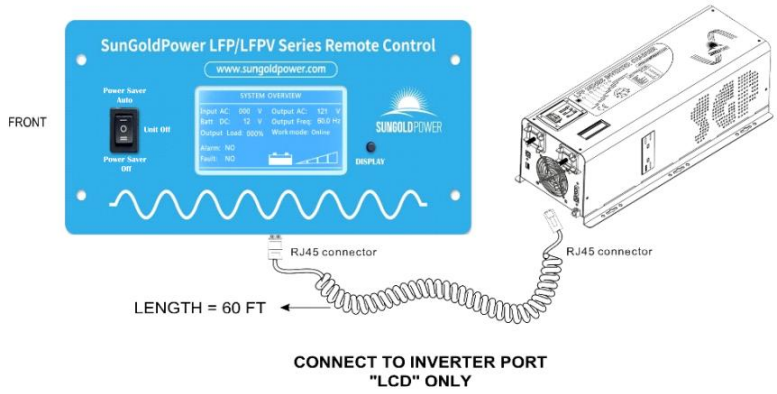
**Table 2.5.5 Input Voltage Transfer Points**



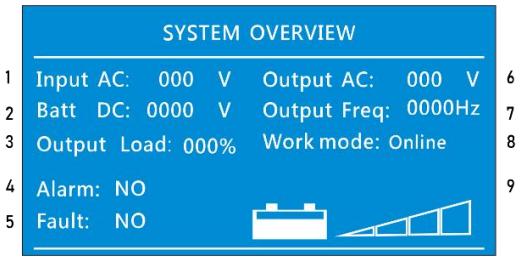

| OIS Function | OIS | | | | | |
|---|---|---|---|---|---|---|
| | LV (NA/JPN) | | | HV (INTL) | | |
| **Acceptable Input Voltage Range (Vac)** | **0-160** | | | **0-300** | | |
| **Nominal Input Voltages (Vac)** | **100** | **110** | **120** | **220** | **230** | **240** |
| (A) Line low loss N/W (On 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 |

## 2.5.10 LCD Display Details

Connection Diagram




LCD Display Detail




(1) Shore/ Generator voltage
(2) DC voltage on inverter
(3)Load when inverting %
(4)Low/high voltage, over temp, overload
(5)Fault condition
(6) AC Output voltage
(7) Output frequency
(8) Bypass (online) / inverter mode
(9) Battery state of charge graph

**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.

## 2.5.11 Audible Alarm

**Table 2.5.9 OIS 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;<br>(2) 125% <load<150%(±10%), Beeps 0.5s every 1s and Fault after 60s;<br>(3) Load>150%(±10%), Beeps 0.5s every 1s and Fault after 20s; |
| **Over Temperature** | Heatsink temp. ≥105ºC, Over temp red LED Lighting, beeps 0.5s every 1s; |

## 2.5.12 FAN Operation

For 1-3KW,4KW 24V/48V there is one multiple controlled DC fan which starts to work according to the following logic. For 4KW 12V and 6KW , there is two multiple controlled DC fan, the DC fan at the DC terminal side will work in the same way as the one on 1-3KW.

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 OIS 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 invert 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 Other features

**Battery Temperature Sensing**

Applying the proper charge voltage is critical for achieving optimum battery performance and longevity. The ideal charge voltage required by batteries changes with battery temperature.

The battery temperature sensor allows the charge controller to continuously adjust charge voltage based on actual battery temperature.

Temperature compensation of charge voltage assures that the battery receives the proper charge voltage as battery temperature varies.

The entire line is equipped with Battery Temperature Sensing for increased charging precision.

It sends precise information to the charger, which automatically adjusts voltage to help ensure full battery charge depending on the ambient temperature of your battery installation.

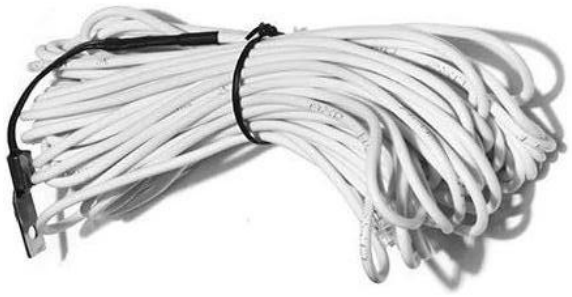
When the battery voltage is over 40℃(104℉), it will reduce the charging voltage by 0.1Vdc with every degree of temperature rise.

We recommend that you install Battery Temperature Sensors on all banks to protect your batteries and to provide optimal charging of each bank.

The battery temperature sensor mounts on the side of a battery.

The specification is as below

| Inverter Condition | Temp on BST | Operation |
|---|---|---|
| Charger Mode | BTS ≥ 122℉ | Automatically turns off charger |
| | BTS ≤ 104℉ | Automatically turns on charger |
| Inverter Mode | 104℉ ≤ BTS ≤ 122℉ | Increases the low voltage shut down point by 0.5Vdc |
| | BTS ≥ 122℉ | Over Temp Fault |

| | |
|---|---|
| A Battery Temperature Sensor has been provided as a separate accessory. It comes with 32.8'/10m cable. |  |

**Battery voltage recover 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 Gen Start**

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. (Generator must have auto start function.)

The auto gen start feature will only work with generators designed to work with this feature. There is an open/close 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.

**Conformal Coating**

The entire line of inverters have been processed with a conformal coating on the PCB, making it water, rust, and dust resistant.

While these units are designed to withstand corrosion from the salty air, they are not splash proof

# 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 3 meter DC cable.

Please find the following minimum wire size. In case of DC cable longer than 3m, please increase the cross section of cable to reduce the loss.

| Power | DC Input voltage | Wire Gage |
|---|---|---|
| 1KW | 12V | AWG 1/0 |
| 1KW | 24V | AWG 4 |
| 1.5KW | 12V | AWG 1/0 |
| 1.5KW | 24V | AWG 4 |
| 2KW | 12V | AWG 1/0 |
| 2KW | 24V | AWG 1/0 |
| 2KW | 48V | AWG 4 |
| 3KW | 12V | AWG 4/0 |
| 3KW | 24V | AWG 1/0 |
| 3KW | 48V | AWG 4 |
| 4KW | 24V | AWG 1/0 |
| 4KW | 48V | AWG 1/0 |
| 5KW | 24V | AWG 4/0 |
| 5KW | 48V | AWG 1/0 |
| 6KW | 24V | AWG 4/0 |
| 6KW | 48V | AWG 1/0 |

Please follow the above minimum wire size requirement.

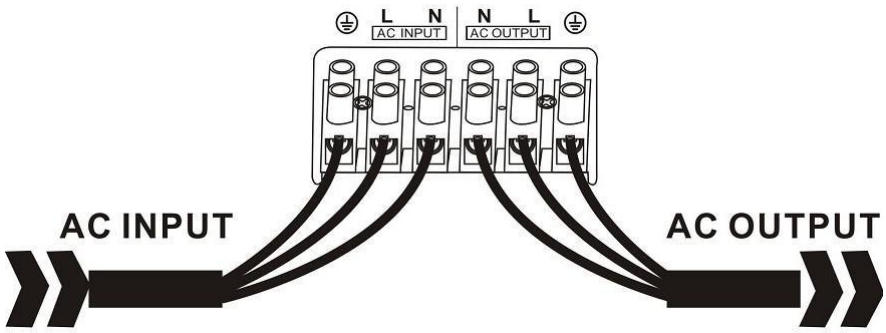
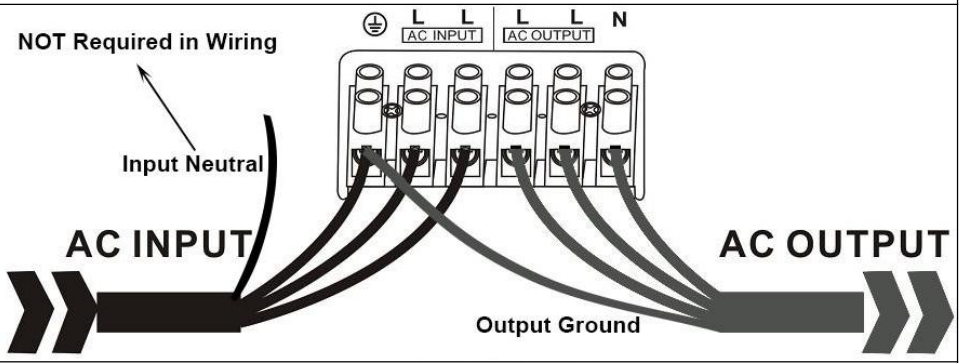
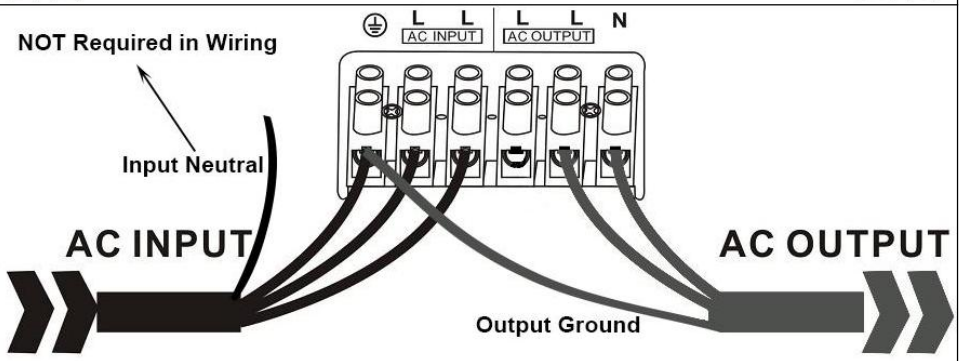
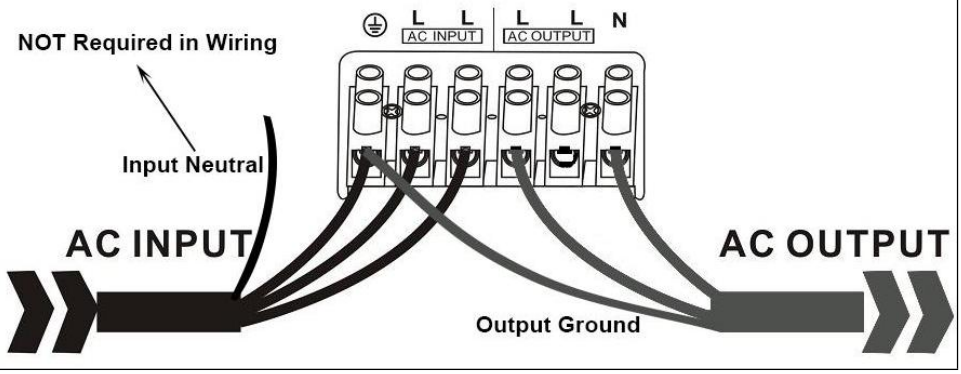
One cable is always best, but if there is a problem obtaining the recommended size or larger cable, multiple smaller cables will work. Performance of any product can be improved by thicker cable and shorter runs, so if in doubt round up and keep the length as short as possible.

## 3.3 AC Wiring

We recommend using 10 to 6Awg wire to connect to the AC terminal block.

When in AC mode the AC input power will supply both the loads and AC charger, a thicker wire gauge for AC Input is required. Please consult a qualified electrician about the specific wire gauge required in terms of wire material and inverter power.

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.

| | |
|---|---|
| **Wiring Option 1**<br><br>230V single phase/120V single phase<br>Input: Hot line+Neutral+Ground<br>Output: Hot line+Neutral+Ground |  |
| **Wiring Option 2**<br><br>230V split phase<br>Input: Hot line+ Hot line +Ground Output: Hot line+ Hot line +Neutral |  |
| **Wiring Option 3**<br><br>230V split phase<br>Input: Hot line+ Hot line +Ground Output: Hot line +Neutral<br><br>Remark: In such cases, each output hotline can only carry a max of half the rated capacity. |  <br>  |

**WARNING**

**For split phase models, AC input neutral is not required in wiring. Never Connect Input Neutral to Output Neutral. Damage will result which is not covered under warranty.**

**WARNING**

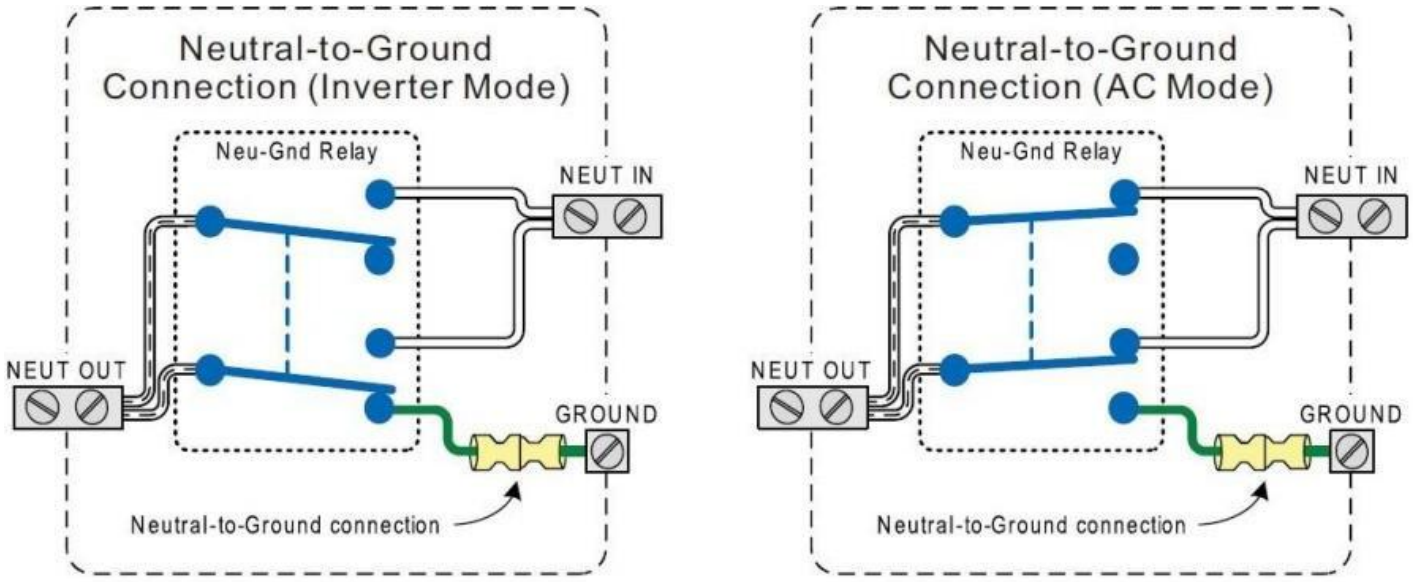
**The output voltage of this unit must never be connected in its input AC terminal, overload or damage may result.**
**Always switch on the inverter before plugging in any appliance.**

## 3.4 Grounding

Connect an AWG 8 gauge or greater copper wire between the grounding terminal on the inverter and the earth grounding system or the vehicle chassis.

### 3.4.1 Automatic Neutral-to-Ground Connection

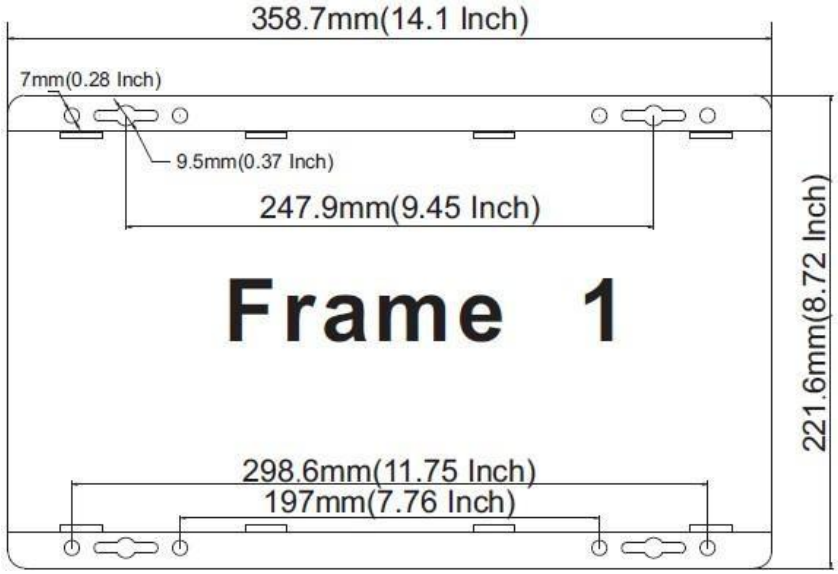
All single-phase 120Vac inverters are equipped with an automatic neutral-to-ground switch.
These inverters use an internal relay that automatically connects the AC neutral output to the vehicle/ship's safety ground in inverter mode and cuts off when it is connected to a qualified external AC power source. This design avoids the simultaneous existence of two neutral-to-ground connections, thereby avoiding the risk of shock hazard between the vehicle/boat's neutral and the external AC source's neutral.



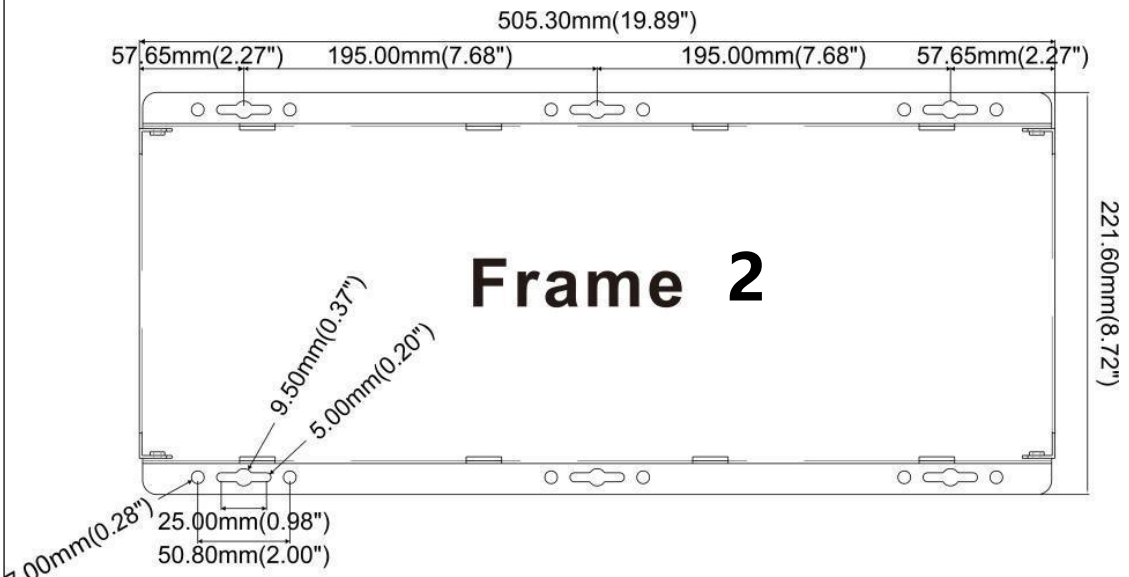

### 3.4.2 Disabling the Automatic Neutral-to-Ground Connection

In some installations, this function must be disabled.
In order to accommodate to these situations, the automatic neutral-to-ground system can be defeated, so the neutral will not be bonded in any operating mode.
If you are not sure whether you must disable this function, please refer to the local code requirements.
There is a section of green wire with insulated connector at the left side of the AC terminal block. The insulated connector connects the neutral wire and the ground wire inside the inverter during inverting.
Pull two ends of the insulated connector apart to separate the green wire; this will prevent the neutral and ground wires from being connected to the inside of the inverter.
If possible, please use tape to insulate the disconnected ends, separate the ends from each other and push back out of the way. Typically when connecting to the house panel (after disconnecting city power from it), it is when you want to disconnect this connection as the house panel already has the neutral to ground bond. Normally in a standalone system or in a vehicle, you need to maintain this connection.

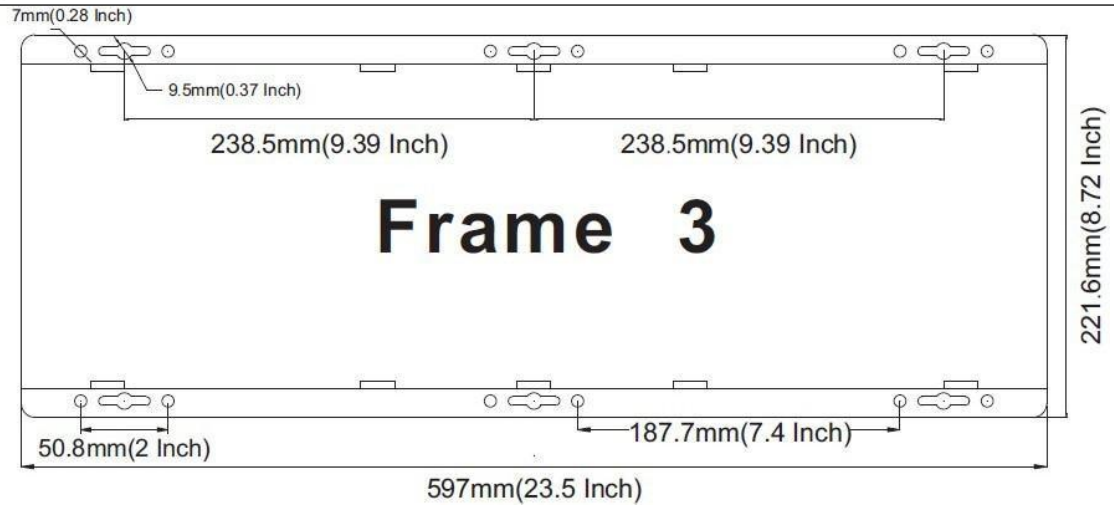
## 3.5 Install Flange




1000W to 1500W Models




2000W to 4000W Models




5000W to 6000W Model

Side View For LFP

# 4 Troubleshooting Guide

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

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

### Indicator and Buzzer For LFP

| | | Indicator on top cover | | | | | | | LED on Remote Swit | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Status** | **Item** | SHORE POWER ON | INVERTER ON | FAST CHG | FLOAT CHG | OVER TEMP TRIP | OVER LOAD TRIP | POWER SAVER ON | BATT CHG | INVERTER | Alarm | Buzzer |
| Line Mode | CC | √ | × | √ | × | × | × | × | √ | × | × | × |
| | CV | √ | × | √, blink | × | × | × | × | √ | × | × | × |
| | Float | √ | × | × | √ | × | × | × | √ | × | × | × |
| | Standby | √ | × | × | × | × | × | × | × | × | × | × |
| Inverter Mode | Inverter On | × | √ | × | × | × | × | × | × | √ | × | × |
| | Power Saver | × | × | × | × | × | × | √ | × | × | × | × |
| Inverter Mode | Battery Low | × | √ | × | × | × | × | × | × | √ | √ | Beep 0.5s every 5s |
| | Battery High | × | √ | × | × | × | × | × | × | √ | √ | Beep 0.5s every 1s |
| | Overload On Invert Mode | × | √ | × | × | × | √ | × | × | √ | √ | Refer to “Audible alarm” |
| | Over-Temp On Invert 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 |
| | Back Feed Short | × | × | × | × | × | × | × | × | × | × | Beep continuous |

## Indicator and Buzzer For LFP

| | | LED Indicators on top cover | | | | | | | | LEDs on Remote Switch | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Status** | **Item** | POWER SAVER | OVER LOAD | OVER TEMP | UNIT ALARM | FLOAT CHG | FAST CHD | INVERTER MODE | LINE MODE | BATT CHG | INVERTER | Alarm | Buzzer |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | |
| Line Mode | CC | | | | | | √ | | √ | √ | | | |
| | CV | | | | | | √, Flash | | √ | √ | | | |
| | Float | | | | | √ | | | √ | √ | | | |
| | Standby | | | | | | | | √ | | | | |
| Inverter Mode | Inverter On | | | | | | | √ | | | √ | | |
| | Power Saver | √ | | | | | | | | | | | |
| Inverter Mode | Battery Low | | | | √ | | | √ | | | √ | √ | Beep 0.5s every 5s |
| | Battery High | | | | √ | | | √ | | | √ | √ | Beep 0.5s every 1s |
| | Overload On Invert Mode | | √ | | √ | | | √ | | | √ | √ | Refer to “Audible alarm” |
| | Over-Temp On Invert 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 |
| | Back Feed Short | | | | | | | | | | | | Beep continuous |

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

| Symptom | Possible Cause | Recommended Solution |
|---|---|---|
| Inverter will not turn on during initial power up. | Batteries are not connected, loose battery-side connections.<br>Low battery voltage. | Check the batteries and cable connections. Check DC fuse and breaker.<br>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.<br>Low AC input voltage.<br>Loose battery or AC input connections. | Refer to the section on adjusting the "Charger Rate".<br>Source qualified AC power..<br>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.<br>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 |

When in inverter mode and the transformer and/or case of the inverter sometimes may vibrate and make noise.
The noise may come from transformer.
According to the characteristics of our inverter, there is one type of load which will most likely to cause rattles of transformer, that is a half-wave load, load that uses only a half cycle of the power(see figure 1).
This trends to cause imbalance of magnetic field of transformer, reducing its rated working freq from 20KHz to, say, maybe 15KHz (it varies according to different loads). This way, the freq of noise falls exactly into the range (200Hz-20KHz) that human ear can sense.
The most common load of such kind is hair drier.

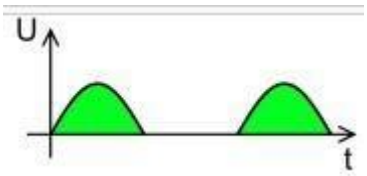


Figure 1

If the noise comes from case.
Normally when loaded with inductive loads, the magnetic field generated by 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.

# Appendix 1

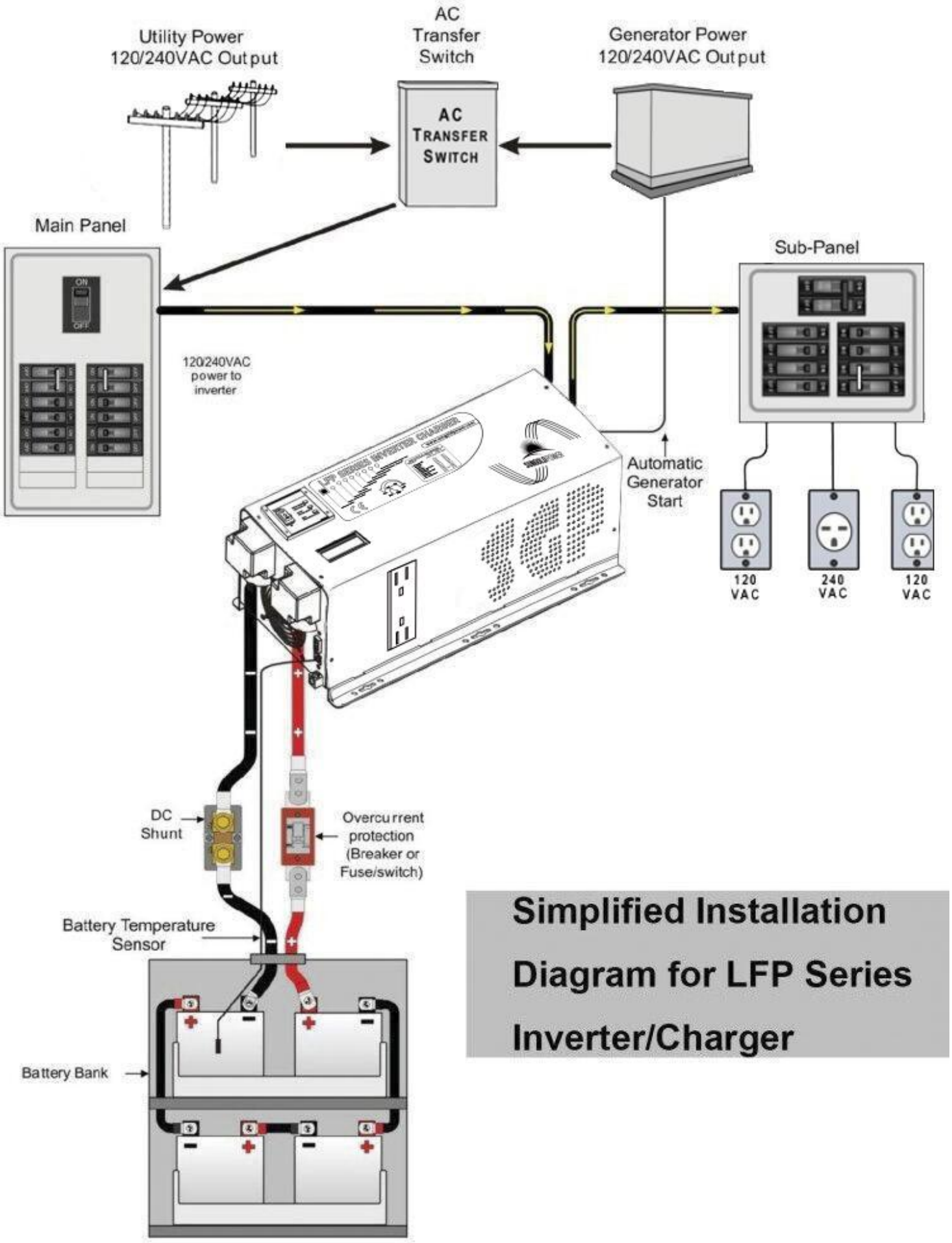
## Inverter & AC Charger

## Electrical Specifications

| | Model | 1KW | 1.5KW | 2KW | 3KW | 4KW | 5KW | 6KW |
|---|---|---|---|---|---|---|---|---|
| Inverter Output | Continuous Output Power | 1000W | 1500W | 2000W | 3000W | 4000W | 5000W | 6000W |
| | Surge Rating(20s) | 3000W | 4500W | 6000W | 9000W | 12000W | 15000W | 18000W |
| | Capable of Starting Electric Motor | 1HP | 1.5HP | 2HP | 3HP | 4HP | 5HP | 6HP |
| | 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 | 50/60Hz ± 0.3Hz | | | | | | |
| | Short Circuit Protection | Yes, Current Limit Function (Fault after 1sec) | | | | | | |
| | Typical transfer Time | 10ms(Max) | | | | | | |
| | THD | < 10% | | | | | | |
| DC Input | Nominal Input Voltage | 12.0Vdc | | | | | | |
| | | ( *2 for 24Vdc, *4 for 48Vdc) | | | | | | |
| | Minimum Start Voltage | 10.0Vdc | | | | | | |
| | Low Battery Alarm | 10.5Vdc / 11.0Vdc | | | | | | |
| | Low Battery Trip | 10.0Vdc / 10.5Vdc | | | | | | |
| | High Voltage Alarm & Fault | 16.0Vdc | | | | | | |
| | High DC Input Recovery | 15.5Vdc | | | | | | |
| | Low Battery voltage recover | 13.0Vdc | | | | | | |
| | Idle Consumption-Search Mode | < 25 W when Power Saver On | | | | | | |
| | Input Voltage Range | Narrow: 100~135VAC / 194~243VAC;<br>Wide: 90~135VAC / 164~243VAC; | | | | | | |
| | Input Frequency Range | Narrow: 47-55±0.3Hz for 50Hz, 57-65±0.3Hz for 60Hz<br>Wide:43±0.3Hz plus for 50Hz/60Hz | | | | | | |
| | Output Voltage | Depends on battery type | | | | | | |
| | Charger Breaker Rating (230Vac) | 10A | 10A | 10A | 20A | 20A | 30A | 30A |
| | Charger Breaker Rating (120Vac) | 10A | 20A | 20A | 30A | 40A | N/A | N/A |
| | Over Charge Protection Shutdown | 15.7V for 12Vdc ( *2 for 24Vdc, *4 for 48Vdc) | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Charge | Battery type | Fast Vdc | | | | Float Vdc | | |
| | Gel U.S.A | 14.0 | | | | 13.7 | | |
| | A.G.M 1 | 14.1 | | | | 13.4 | | |
| | Lithium | 13.8 | | | | 13.6 | | |
| | Sealed Lead Acid | 14.4 | | | | 13.6 | | |
| | Gel Euro | 14.4 | | | | 13.8 | | |
| | Open Lead Acid | 14.8 | | | | 13.3 | | |
| | LiFePO4 | 14.0 | | | | 13.8 | | |
| | De-sulphation | 15.5 for 4hrs | | | | | | |
| | Classic LFP | 13.6 | | | | 13.5 | | |
| | Remote Control | Yes. Optional | | | | | | |
| Bypass & Protection | Input Voltage Waveform | Sine wave (Grid or Generator) | | | | | | |
| | Nominal Voltage | 120Vac | | | | 230Vac | | |
| | Low Voltage Trip | 80V/90V±4% | | | | 184V/154V±4% | | |
| | Low Voltage re engage | 90V/100V±4 % | | | | 194V/164V±4% | | |
| | High Voltage Trip | 140V±4% | | | | 253V±4% | | |
| | High Voltage re engage | 135V±4% | | | | 243V±4% | | |
| | Max Input AC Voltage | 150VAC | | | | 270VAC | | |
| | Nominal Input Frequency | 50Hz or 60Hz (Auto detect) | | | | | | |
| | Low Freq Trip | Narrow: 47±0.3Hz for 50Hz, 57±0.3Hz for 60Hz<br>Wide:40±0.3Hz for 50Hz/60Hz | | | | | | |
| | Low Freq re engage | Narrow: 48±0.3Hz for 50Hz, 58±0.3Hz for 60Hz<br>Wide:45±0.3Hz for 50Hz/60Hz | | | | | | |
| | High Freq Trip | Narrow: 55±0.3Hz for 50Hz, 65±0.3Hz for 60Hz<br>Wide: No up limit for 50Hz/60Hz | | | | | | |
| | High Freq re engage | Narrow: 54±0.3Hz for 50Hz, 64±0.3Hz for 60Hz<br>Wide: No up limit for 50Hz/60Hz | | | | | | |
| | Baypass Breaker Rating (230Vac) | 10A | 15A | 20A | 30A | 30A | 40A | 40A |
| | Baypass Breaker Rating (120Vac) | 20A | 20A | 30A | 30A | 40A | N/A | N/A |
| | Output Short circuit protection | Circuit breaker | | | | | | |
| Mechanical Specification | Mounting | Wall mount | | | | | | |
| | Inverter Dimensions(L*W*H) | 362*242*198mm | | 505*242*198mm | | | 597*242*198mm | |
| | Inverter Weight | 16KG | 17KG | 20KG | 24KG | 35KG | 45KG | 45KG |
| | Shipping Dimensions(L*W*H) | 520x320x310mm | | 670x320x310mm | | | 760x320x310mm | |
| | Shipping Weight | 18KG | 19KG | 22KG | 26KG | 37KG | 47KG | 47KG |
| | Display | Status LEDs | | | | | | |
| | Standard Warranty | 1 Year | | | | | | |

# Appendix 2 - Installation Diagram

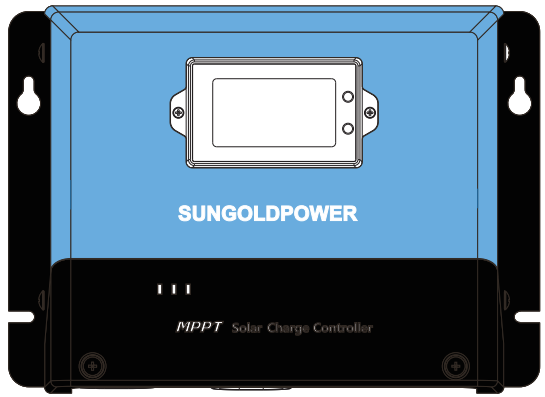



**Sun Gold Power Co.,Ltd**
**Email: sales@sungoldpower.com**

# MPPT Solar Charge Controller

SGC481560A/SGC481570A/SGC482560A/SGC482570A

# User Manual




Version: 1.04

Any change shall not be otherwise notified.

Mode : 108867

# Dear Users:
# Thank you for choosing our products!

## Safety Instruction

1) The applicable voltage of the controller is beyond safety voltage of personnel. Before operation, please read the instruction manual carefully and start operating only after receiving safe operation training.

2) There is no parts requiring repair or maintenance within the controller, so please don't disassemble or repair the controller without authorization.

3) Please install the controller indoors and prevent water against entering into the controller.

4) Please install the controller in a well-ventilated place and the cooling fans in operation have high temperature.

5) It is suggested to install a suitable fuse or breaker outside of the controller.

6) Before installing and adjust the controller wiring, please break the connecting wire of the solar panel battery and the fuse or breaker close to the battery terminal.

7) After installation, inspect whether all wires are connected firmly to avoid any hazard caused by accumulated heat owing to poor contact.

**Warning:**
**Indicating that the operation is hazardous, please fully prepared for safety before operation.**

**Notice:**
**Indicating that the operation is destructive.**

**Tips:**

Our main sales MPPT controller product model is SGC482560A, please note the content of the parameters in the user manual when you use.





## Table of Contents

# 1. Introduction to Product

## 1.1 Product Overview

The controller adopts the leading PowerCatcher maximal power Tracking technology in the industry to achieve maximal energy Tracking for solar panel, so that it can quickly and accurately trace the maximal power point of the solar battery, acquire the maximal energy of the solar panel and significantly improve the energy utilization ratio of the solar system. Widely applied to solar off-line photovoltaic system for managing solar panel and storage battery in operation, the controller is the core control component of off-line photovoltaic system.

The inside of the controller possesses sound electronic failure detecting and protection function to avoid the product component damage caused by installation error and system failure.

The controller is equipped with an LCD display screen to simultaneously support data interaction, setting and other operations with mobile phone APP, PC upper computer and other devices.

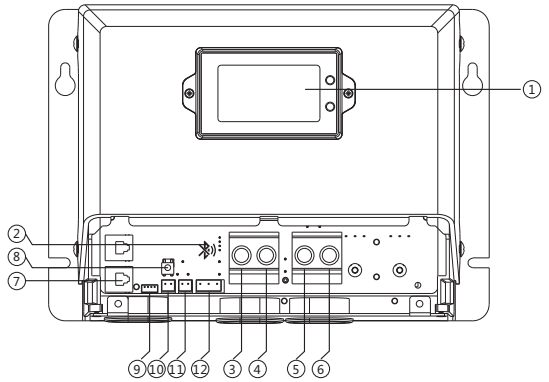
## 1.2 Product Characteristics

- PowerCatcher maximal power Tracking technology can still trace the maximal power point of solar battery in the complicated environment. Compared with traditional MPPT Tracking technology, it enjoys higher response speed and higher Tracking efficiency.
- MPPT charge efficiency is greater than traditional PWM charge efficiency by about 15% ~20%.
- MPPT Tracking efficiency can be as much as 99.9%.
- Adopting advanced digital power technology, the circuit energy conversion efficiency can be as much as 98%.
- The products support lithium batteries, charging output has active voltage stabilization function. In case of open circuit of lithium batteries or BMS overcharging protection, the storage battery end of the controller shall output stable target voltages in time, thereby possessing good lithium electric activation function.
- Preset a variety of battery types: lithium batteries, sealed batteries, colloidal batteries, open batteries and self-definition.
- Lead-acid batteries support temperature compensation function.
- With charging line loss compensation, the voltage of the battery terminal can be accurately controlled.
- With current-limiting charging, in case of too much battery panel power (charging current is greater than rated current), the controller automatically reduces the charging power so that it can operate within the rated charging current.
- With built-in overtemperature protection mechanism, when the temperature exceeds the set temperature value, the charging power shall decline in a linear way with the temperature.
- It supports parallel function and breaks through the power limit of single unit. Therefore, combination of several units can meet greater charging power.
- With built-in bluetooth 4.0BLE module, it can achieve mobilephone APP data interaction.
- Supporting standard Modbus protocol, it provides protocol technology support to facilitate secondary development and application by users.
- Programmable relay output





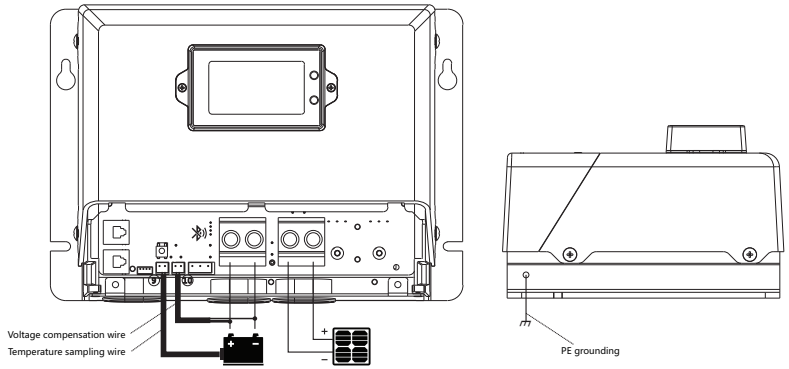
## 1.3 Description of Appearance and Interface




| No. | Name | No. | Name |
|---|---|---|---|
| ① | Liquid crystal display (LCD) | ⑦ | RS485 communication interface |
| ② | Bluetooth 4.0BLE module | ⑧ | Key |
| ③ | Positive interface of battery | ⑨ | TTL communication interface |
| ④ | Negative interface of battery | ⑩ | Battery temperature sampling interface |
| ⑤ | Negative interface of solar panel | ⑪ | Battery voltage sampling interface |
| ⑥ | Positive interface of solar panel | ⑫ | Relay output interface |

**Note: Negative poles of storage battery and solar battery are a common negative pole design.**

## 1.4 System Wiring Schematic Diagram



## 1.5 Introduction to Maximal Power Tracking Technology

Maximal power point tracing system is an advanced charge technology where the operation state of the electric module is adjusted so that the solar battery can output more electric energy. Owing to the nonlinear characteristics of solar battery array, there is an array of maximal energy output point (maximal power point), the traditional controller (on-off charging technology and PWM charging technology) cannot maintain storage battery charging at this point. Therefore, it is unable acquire the maximal energy of battery panel. However, the solar controller with MPPT control technology can trace the maximal power point of the array to acquire the maximal energy to charge the storage battery.

Taking 12V system as the example, the peak voltage (Vpp) of solar battery is about 17V, but the storage battery voltage is about 12V, when general charge controller is charging, the voltage of the solar battery is about 12V, the maximal power is not fully exerted. MPPT controller can overcome the problem and adjust the input voltage and current of the battery panel from time to time so that the input power can be the maximal value.

Comparing with traditional PWM controller, MPPT controller can exert the maximal power of solar battery.

Therefore, bigger charge current can be provided. Generally speaking, compared with PWM controller, MPPT can improve energy utilization ratio by 15%~20%.

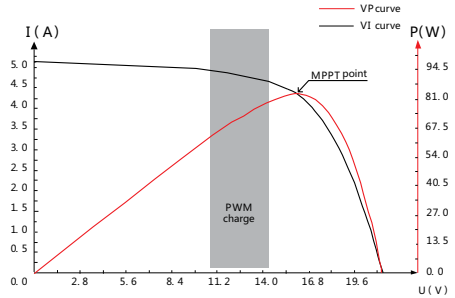
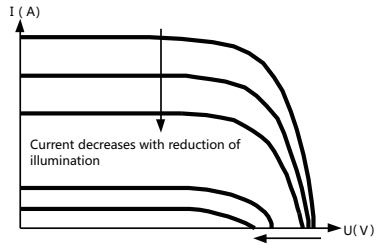


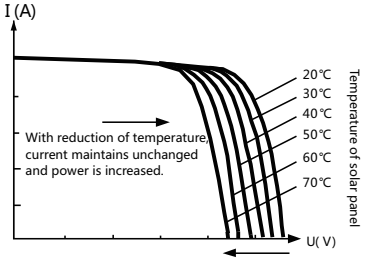

**Fig.1-2 Output Characteristic Curve for Solar Battery**

Owing to different ambient temperature and illumination conditions, maximal power point can change frequently. Our MPPT controller can adjust parameters according to different conditions so that the system can be close to the maximal operation points at any time. The whole process is completed fully automatically without any adjustment by users.




Open circuit voltage decreases with reduction of illumination

**Fig.1-3 Relation Between Solar Battery Output Characteristics and Illumination**




Open voltage decrease with temperature rise

**Fig.1-4 Relation Between Solar Battery Output Characteristics and Illumination**

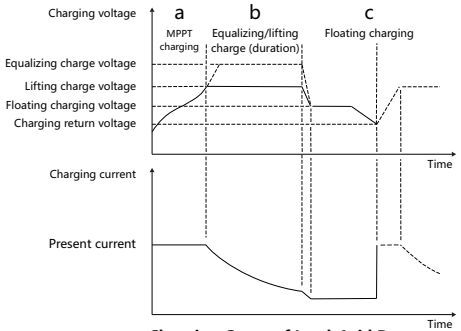




## 1.6 Introduction to Charging Stage (MPPT, Constant Voltage and Current)

### 1.6.1 Charging process of lead-acid battery

As one of the charging processes of lead-acid batteries, MPPT usually needs to be combined with equalizing charge/lifting charge, floating charging and other charging methods to jointly complete the charging management for storage batteries.




**Charging Curve of Lead-Acid Battery**

**The charging stages of lead-acid batteries include MPPT charging, constant voltage charging (equalizing/lifting/floating charging) and current limiting charging.**

### a)MPPT charge

In MPPT charging stage, the battery voltage has not reached the target constant voltage value, so the controller will perform MPPT charging to maximize the charge amount from solar energy quantity to the storage battery. After the storage battery voltage reaches the constant voltage value, it shall automatically change to constant voltage charging.

### b) Constant voltage charge

When the storage voltage reaches the target constant voltage value, the controller shall exit from MPPT charging and enter into constant voltage charging. With the progress of constant voltage charging, charging current shall drop gradually with time lapse. Constant voltage charging is divided into two stages, namely equalizing charge and lifting charge respectively. These two charging process shall not repeated (the equalizing charge interval is 30 days at a time by default).

### c) Equalizing charge

**Warning: Explosion Risk!**

Equalizing open-head lead-acid batteries can produce explosive gases and battery compartments must be well ventilated.

**Note: Device Damage!**

Equalizing may increase battery voltage, but damage the level of sensitive DC load. Therefore, it is necessary to validate that the allowable input voltage of all loads is greater than the set equalizing charge value.

**Note: Device Damage!**

Excessive charging and gas evolution may damage polar board of storage and result in peeling of active substances on the battery plate. Too high equalizing charge voltage or too long charging time may damage batteries. Please set related parameters according to the specification requirements of the batteries used in the system.

Some types of batteries benefit from periodic equalizing charge, which mainly increases the charging voltage of batteries so that it is higher than the standard supply voltage. Equalizing charge can gasify the battery electrolyte, balance the battery voltage and complete the chemical reaction. Equalizing charge and lifting charge are not repeated in a charging process to avoid too much precipitated gas or overheated battery.

### ➢ Lifting charge

Generally, it is considered that the lifting charge stage lasts for 2h by default. When the duration reaches the set value, the system shall turn to the floating charge (lifting charge duration: only the self-defined battery type can be changed).

### ➢ Floating charge

Floating charge is the last stage for constant voltage of lead-acid storage. The controller keeps the charging voltage at the floating charge voltage. At this stage, weak current charge is performed for the battery at this stage to guarantee that the battery maintains at the full charging state.

At floating charge stage, when the battery voltage drops to the lifting charge return voltage, after a period of time, the system shall exit from the floating charge stage and then enter into MPPT charge stage again.

### 1.5.21.5.2 Charging Process of Lithium Battery/Customized Lithium Battery

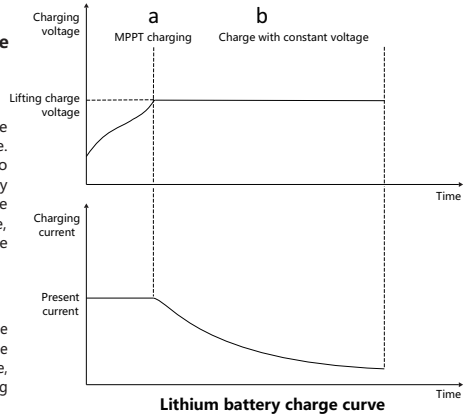
**The charging stages of lithium batteries contain MPPT charging, constant voltage charging, and current-limiting charging**

**a)MPPT charging**

In MPPT charging stage, the battery voltage has not yet reached the target constant voltage. The controller will perform MPPT charging to maximize the charge amount from solar energy quantity to the storage battery. After the storage battery voltage reaches the constant voltage value, it shall automatically change to b) constant voltage charging.

**b) Constant Voltage Charging**

Lifting charge is the unique constant voltage charge state. Therefore, only when the storage voltage drops to the set value for lifting and recovering charge, the system can exit from the constant voltage charging stage and then enter into MPPT charging stage again.




**Lithium battery charge curve**

### 1.5.3 Current-limiting charge over rated current

Current-limiting charge runs through the whole charging cycle. In any charging stage, as long as it is detected that the current is beyond the rated current, it shall enter into the current-limiting charge automatically and the charging current is limited to the rated current.

### 1.5.4 Overtemperature and Current-Limiting Charge of Device

Overtemperature and current-limiting charge of device runs through the whole charging cycle. In any charging stage, as long as overtemperature of device is detected, it will automatically enter into linear current-limiting charge.





# 2. Technical Parameter

## 2.1 Electrical parameter

| Name of Parameter | Parameter Value | | | |
|---|---|---|---|---|
| Type | SGC481560A | SGC481570A | SGC482560A | SGC482570A |
| System Voltage | 12V/24V/36V/48V | | | |
| No-load loss | 0.54W | | | |
| Battery voltage | 9V~64V | | | |
| Maximal PV open-circuit voltage | 150V | | 250V | |
| Maximum PV short-circuit current | 50A | | 40A | |
| Maximal voltage range at power point | Battery voltage +2~120V | | Battery voltage +2~180V | |
| Rated charging current | 60A | 70A | 60A | 70A |
| Settable charging current | 0-60A | 0-70A | 0-60A | 0-70A |
| Power of solar panel (12V) | 800W | 920W | 800W | 920W |
| Power of solar panel (24V) | 1600W | 1840W | 1600W | 1840W |
| Power of solar panel (48V) | 3200W | 3680W | 3200W | 3680W |
| Charging conversion efficiency | ≤98% | | | |
| MPPT tracing efficiency | >99% | | | |
| Temperature compensation coefficient | -3mV/℃/2V (default, settable lead-acid); no temperature compensation for lithium battery. | | | |
| Communication way | TTL/Isolated RS485; baud rate 9600, digital bit 3, stop bit 1, no check bit | | | |
| Bluetooth | Built-in bluetooth 4.0BLE module, achieving mobilephone APP monitoring | | | |
| Internal temperature protection | When interior temperature of controller is higher than the set value, it shall perform linear power reduction operation | | | |
| External temperature sampling of battery | The temperature is used for battery temperature compensation and battery temperature protection | | | |
| Programmable relay | DPST 10A/250VAC ; 10A/30VDC | | | |
| Protection function | Battery overcharging protection, battery over discharge protection, PV anti-reverse protection, reverse charge protection at night, interior overtemperature protection of controller and over-current protection in charge | | | |
| Operation temperature | -35℃~+65℃(No derating within 40 ℃) | | | |
| Elevation | ≤3000m | | | |
| Protection grade | IP32 | | | |
| Weight | 3.6kg | | | |
| Product size | Conventional : 266*194*119mm<br>MC4 : 266*226*119mm | | | |

## 2.2 Battery Type Parameter by Default

| Parameter Contrast of Different Types of Battery | | | | | |
|---|---|---|---|---|---|
| Battery type / Set Voltage | Sealed lead-acid battery | Colloidal lead-acid battery | Open-head lead-acid battery | Lithium battery | Self-defined User (12V by default) |
| Overvoltage breaking voltage | 16.0V | 16.0V | 16.0V | 16.0V | 9~17V |
| Equalizing voltage | 14.6V | —— | 14.8V | —— | 9~17V |
| Lifting voltage | 14.4V | 14.2V | 14.6V | 14.4V | 9~17V |
| Floating voltage | 13.8V | 13.8V | 13.8V | —— | 9~17V |
| Lifting recovery voltage | 13.2V | 13.2V | 13.2V | 13.2V | 9~17V |
| Overdischarge recovery voltage | 12.6V | 12.6V | 12.6V | 12.6V | 9~17V |
| Undervoltage alarm | 12.0V | 12.0V | 12.0V | 12.0V | 9~17V |
| Overdischarge voltage | 11.1V | 11.1V | 11.1V | 11.1V | 9~17V |
| Overdischarge cutoff | 10.6V | 10.6V | 10.6V | 10.6V | 9~17V |
| Overdischarge delay | 6S | 6S | 6S | 6S | 1-30S |
| Equalizing charge interval | 30days | 0days | 30days | —— | 0~250days (0 indicate closing and equalizing charge function) |
| Equalizing duration | 120 minutes | —— | 120 minutes | —— | 10~600 minutes |
| Lifting duration | 120 minutes | 120 minutes | 120 minutes | —— | 10~600 minutes |
| Temperature compensation mV/℃/2V | -3 | -3 | -3 | —— | Automatic removing temperature compensation for lithium |

# 3. State instruction for indicator light

### 3.1 Charge state indication

| No. | State of Indicator Light | Charge State |
|---|---|---|
| ① | Normal on | MPPT Charge |
| ② | Slow flash (on 1s, off 1s, period 2s) | Lifting charge |
| ③ | Single flash (on 0.1s, off 1.9s, period 2s) | Floating charge |
| ④ | Quick flash (on 0.1s, off 0.1s, period 0.2s) | Equalizing charge |
| ⑤ | Double flash (on 0.1s, off 0.1s, on once again 0.1s, off once again 1.7s, period 2s) | Current limiting charge |
| ⑥ | Off | No charge is started |





### 3.2 State Display of Battery

| Color of Indicator Light | State of Indicator Light | State of Battery |
|---|---|---|
| Green | Normal on | Full battery voltage |
| Yellow | Normal on | Normal battery voltage |
| Red | Normal on | Battery voltage is below the undervoltage point |
| | Quick flash (on 0.1s, off 0.1s, period 0.2s) | Battery overvoltage or overtemperature |

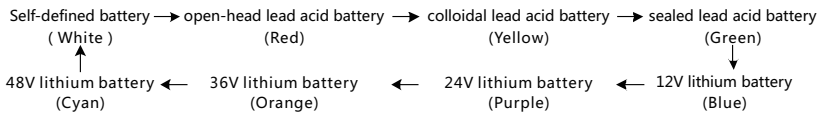
### 3.3 Type Indication of Battery

| Color of Indicator Light | Type of Battery |
|---|---|
| Red | Open-head lead acid battery FLD |
| Yellow | Colloidal lead acid battery GEL |
| Green | Sealed lead acid battery SLD |
| Blue | 12V lithium battery LI (lithium iron phosphate by default) |
| Purple | 24V lithium battery LI (lithium iron phosphate by default) |
| Orange | 36V lithium battery LI (lithium iron phosphate by default) |
| Cyan | 48V lithium battery LI (lithium iron phosphate by default) |
| White | Self-defined USE (12V sealed lead acid by default) |

# 4. Key

### 4.1 Key function I: set battery type

Press the key for 8s and the battery type indicator light starts flickering (the controller can turn off the charge at this time). At this time, after each press, the battery type indicator light turns to another color and there is a corresponding battery type. After the battery type is selected, press the key for 8s once again or 15s after no operation, the controller shall automatically save the battery type set at present and exit from the setting mode and enter into the normal operation mode; (LCD is the standard configuration. Generally, this method is not used for setting).




### 4.2 Key function II: recover factory default parameter

Press the key for 20s and the red indicator light of the three ones on the controller flickers and the controller is restored to the factory default parameters.

# 5. Parameter Setting and Special Function Use

## 5.1 Monitoring Use of Mobile Phone APP (Standard Configuration)

Blue tooth 4.0BLE module is integrated in the controller and users can use the mobile phone APP developed by our corporation to achieve data monitoring, setting and other operations to the controller.

Please contact business personnel to get related software and operation instruction.

## 5.2 Application of Lead Acid Battery

1) The LCD screen on the controller (see 6.3 set system parameters via the LCD screen) or mobile phone APP can be used to select the battery type matched with the battery. The changed system voltage can be effective only upon restart.

2) If the preset lead-acid battery parameters are not suitable for the battery used by users and users can use customization. All parameters customized can be set only through communication, such as mobile phone APP, PC client software, or perform communication setting via other user system in accordance with communication protocol and controller.

(At delivery: the self-defined default values are same as the sealed lead acid battery parameters. The system voltage is 12V)

## 5.3 Application of Lithium Battery

Preset LI for controller containing lithium iron phosphate of specifications 12V/24V/36V/48V. If the preset values for the lithium battery are not suitable for users, you can perform communication setting with the controller via mobile phone APP, LCD screen of the device, external LCD screen and other systems according to the communication protocol through other systems of the user.

Customization may be lead-acid batteries or lithium batteries. To apply lithium batteries in the self-defined battery type, it is required to meet the following conditions:

1) Set a fixed voltage for the system voltage, one of 12V/24V/36V/48V.

2) Equalizing charging time interval is set as 0;

3) Equalizing charging time is set as 0;

4) Temperature compensation is set as 0.

**Meeting the above four conditions, the system automatically identifies the batteries as lithium batteries. Therefore, the system possesses lithium battery activation, charging and other charge control logic.**

## 5.4 Setting of Charging Current

The rated current of the controller is 100A, which supports the setting of communication instructions, ranging from 0.00 A to 100.00A. Via mobile phone APP or the user system provided by our company, communication setting is performed for specified register E001H with the controller via the mobile phone APP or the user system according to the protocol. Please refer to our Modbus protocol for setting and analysis.





## 5.5 Definition of RS485 Communication Interface

● 5.5.1 Set as communication mode

Users can utilize Modbus protocol to perform data monitoring, parameter setting and other operations via the port for the controller via the port.

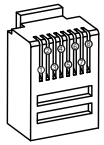
● 5.5.2 Set as parallel operation mode

The parallel operation mode can be used only after the device is set as parallel operation mode,

● 5.5.3 Remote on/off of charger

Two pieces of remote on/off input signal are integrated in 485 communication wire.

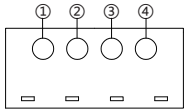
The charging can be broken only by short circuit of pins ⑤ and ⑥ in the communication wire.



| No. | Definition | No. | Definition |
|---|---|---|---|
| ① | NC | ⑤ | Isolate power ground |
| ② | NC | ⑥ | D- |
| ③ | Remote on/off of charger | ⑦ | D+ |
| ④ | Remote on/off of charger | ⑧ | Isolate positive power supply |

## 5.6 TTL Communication

Users can utilize Modbus protocol to perform data monitoring, parameter setting and other operations for the controller via the port.

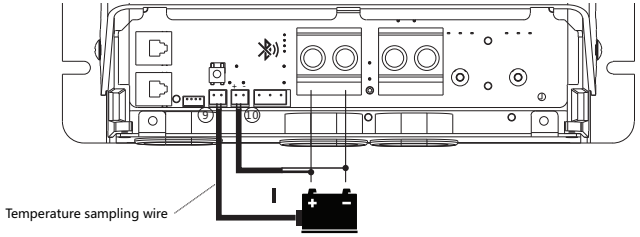



| No. | Definition |
|---|---|
| ① | Controller supplies +12.8V outwards. |
| ② | Data receiving terminal RX of controller |
| ③ | Data sending terminal TX of controller |
| ④ | GND |

## 5.7 Temperature Sampling of Battery

Not connected to temperature sensor, it is 25℃ by default; After the temperature sensor is connected, high and low temperature protection is performed or charging temperature compensation is performed for the battery (there is no temperature compensation for lithium battery).

Wiring method: the wiring terminal of the temperature sensor is connected to (9) and the temperature sensor is fixed thereon.

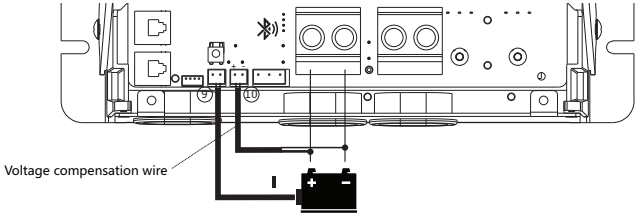


### 5.8 Voltage Compensation Wire of Battery

Owing to the configuration, the charging power is great and the diameter of wire from battery to the controller is small. Therefore, the voltage collected by the controller terminal is greater than the practical voltage of the battery terminal and the battery cannot be fully charged. In certain degree, the voltage of the battery terminal can be more accurately collected via the voltage sampling wire of the battery and the voltage difference can be output in a compensated way, so that the battery terminal can get more reasonable charging voltage.

The positive and negative poles of the battery are respectively connected to the positive and negative poles of the battery voltage sampling terminal (10) via the voltage compensation wire. Please note that the left is the positive terminal and the right is the negative terminal.

**The wiring way is shown in the figure below:**

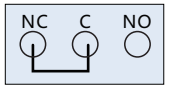



### 5.9 Programmable Relay Output

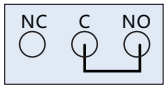
- Single-pole double-throw (DPST) relay
- Relay contact specification 250VAC/10A, 30VDC/10A
- From left to right, there are NC contacts, common points and NO contacts.

Relay triggering condition:

1) When battery voltage is normal,the relay coil doesn't operate in NC state (C and NC are conducted)




2) In case of overvoltage or over discharge of the battery, relay coil operates in NO state (C and NO are conducted)




### 5.10 Use of Parallel Operation Function

5.10.1 Parallel operation function:

Parallel operation function means that several controllers charge one battery pack one to one uniformly. Each controller has one independent solar panel; these controllers are connected via RS485 communication wires and the host system uniformly synchronizes the charge state stage, constant voltage value and other parameters to the slave. In this way, the device can break through the power limit of single device. In addition, parallel operation of several devices can meet greater charging power demands.

5.10.2 Setting parallel operation method:

① Press and hold two buttons "ENTER" and "SELECT" on the LCD screen at the same time to pop up the parallel operation menu. At this time, the menu can only be used for viewing and displaying P-XX or C-XX;

② Press and hold "ENTER" for 2s to enter the setting mode. At this time, icon ⚙ flickers;

③ Press "ENTER" to switch to the parallel operation function P-XX;

④ Then press "SELECT" to set the equipment address, and "SELECT" to add 1. At this time, immediately press "ENTER" to decrease 1 from the address;

⑤ After the setting is completed, 5s after no button is pressed, the setting is automatically stored and the device exit to the main interface.

**Remark: P: =Parallel: indicating that RS485 communication terminal is set as the parallel operation function for use;**



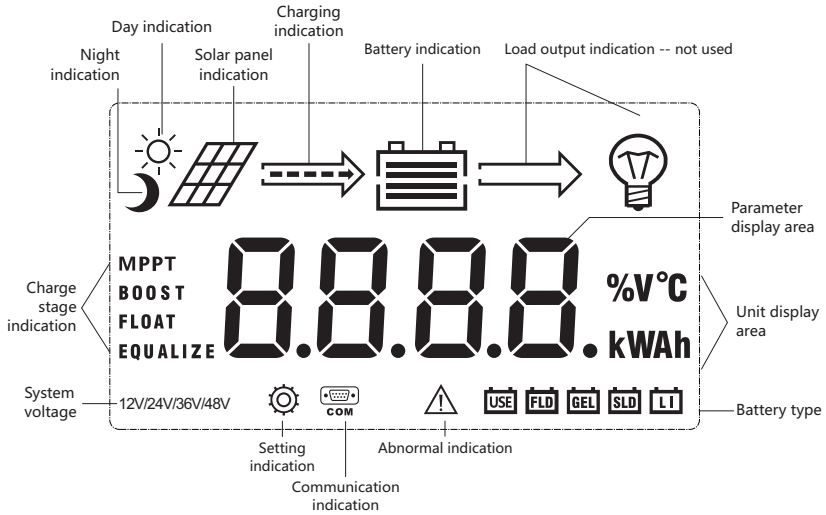


RS485 communication terminal is set as the parallel operation function;
C:=Communication: indicating that RS485 communication terminal is set as common communication function for use;
XX: indicating equipment address range 00~99.

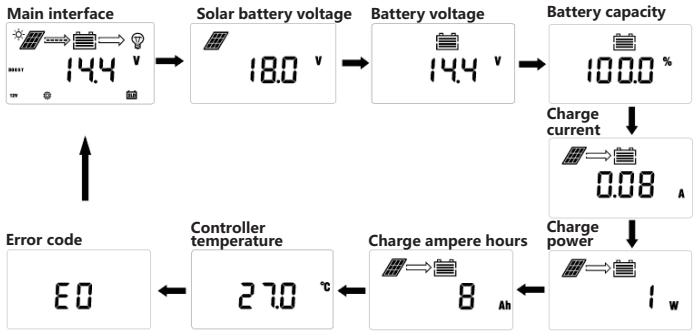
## 6. Liquid Crystal Display

LCD module as the standard configuration of the controller can be installed on the controller surface or in other places via DB9 extension wire in accordance with practical conditions.

### 6.1 Menu Schematic Diagram



## 6.2 Menu Browse




## 6.3 Set System Parameter via LCD

**Setting method:**

1). Under any menu, press key "ENTER" for long time to enter into "Parameter Setting" menu:

(1) Press key "ENTER" for short time and adjust the parameter value;

(2) Press key "SELECT" for short time and select setting item;

(3) Press key "ENTER" for 2 seconds, save and exit from setting mode;

(4) Select "FLD/GEL/SLD/LI" battery type and press key "SELECT" to only perform switching between "system voltage" and "battery type".

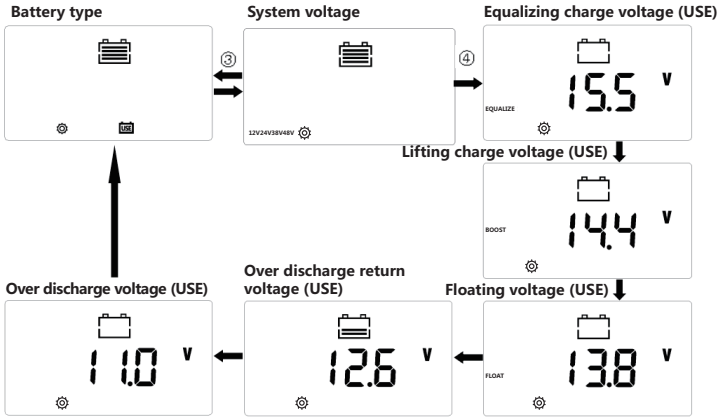
(5) After selecting "USE" for customizing battery type, press key "SELECT" for switchover among "system voltage /equalizing charging voltage/lifting charging voltage/floating voltage/over discharge return voltage/over discharge voltage".

**Note:**

(1) The changed "system voltage" can be effective only after poweron again.

(2) Users must be careful while customizing parameters. The system may not operate normally owing to inaccurate parameter!

2) Customized USE menu








| No. | Liquid Crystal Display | Set Item | Parameter Range | Remark |
|---|---|---|---|---|
| 1 | USE | Battery type | -- | Customizing battery type |
| 2 | 12V/24/36V/48V | System voltage | 12V/24/36V/48V | "12V/24/36V/48V" simultaneous on indicates automatic identification |
| 3 | EQUALIZE | Equalizing charging voltage (USE) | 9.0～17.0V | -- |
| 4 | BOOST | Lifting charging voltage (USE) | 9.0～17.0V | -- |
| 5 | FLOAT | Floating charging voltage (USE) | 9.0～17.0V | -- |
| 6 | | Over discharge recovery voltage (USE) | 9.0～17.0V | -- |
| 7 | | Over discharge voltage (USE) | 9.0～17.0V | -- |

## 6.4 Abnormal Code Display

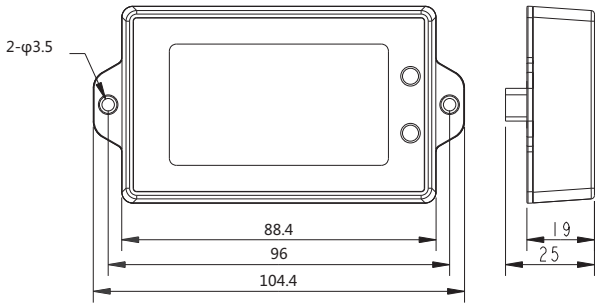
| No. | Error Code Displayed by LCD | Note | Implementation Result |
|---|---|---|---|
| 1 | E0 | No abnormity | Normal system |
| 2 | E1 | Battery over discharge | Battery voltage rises to over discharge return voltage and over discharge prompt is released. |
| 3 | E2 | Battery over voltage | No charging |
| 4 | E3 | Under voltage alarm of battery | Battery voltage is lower than undervoltage alarm threshold value, it is only prompted that the system is normal. |
| 7 | E6 | Interior over temperature of controller | Excessive internal temperature of controller, MPPT controller starts linear power charge; it shall recover automatically after reducing to certain value. |
| 8 | E7 | Battery over temperature | Turn off the charging and then recover the charging automatically after the voltage is lower than certain value. |
| 9 | E8 | Excessive charge current of input power of solar panel | MPPT controller is limited within rated current range |
| 10 | E10 | Over voltage of solar panel | Over voltage of solar panel, turn off the charging and recover the charging when the voltage is lower than the set value. |
| 12 | E15 | Battery not connected or feedback electricity of lithium battery | As long as the solar panel voltage meets the charging condition, lithium battery has constant voltage output, lead-acid battery has no voltage output, and it shall recover to normal after the battery is connected. |
| 13 | E16 | Over temperature of battery | No charging |
| 15 | E18 | BMS over charge protection | No charging |
| 16 | E19 | Low temperature of battery | No charging |

### 6.5 Common Problem and Treatment Method

| Phenomenon | Treatment Method |
|---|---|
| Indicator light or LCD is not on | Please check whether battery and solar panel are correctly connected. |
| No datum on LCD | Poor communication; check the communication wire. |
| There is voltage on the solar panel, no voltage output at battery end, display code E1 | No battery can be detected at the lead-acid battery terminal. There is no voltage output from both ends of the battery. It shall return to normal state after battery is connected. |
| Connected with 12V/24V/36V/48V normal voltage battery and the battery icon on the LCD flashes slowly, display error E1 | Check whether it is set as corresponding system voltage or automatic identification, restart the controller; After setting the system voltage, it is designed for safety and can be effective only after restart. |
| Battery icon indicator light flashes quickly without charging. Display code E1 | Overvoltage of system; inspect the overvoltage reason of the battery. It shall restore after reduction of voltage. |
| The device cannot be searched by mobile phone Bluetooth. | Inspect whether other mobile phones are connected with the Bluetooth setting. |
| No charging by controller. | Inspect whether wires are correctly connected, whether solar panel voltage exceeds the rated value, whether battery exceeds the voltage, check LCD error code. Inspect whether there is interior overtemperature, exterior overtemperature, low temperature of exterior lithium, or whether the lead-acid battery is open, etc. |
| Other problem or insoluble abnormity | Try to restore the factory setting and then set related parameters in accordance with system configuration. Take care in the operation! |

### 6.6 Installation Size of LCD

Product size:104.5*55.5*11.8mm
Installation size: 96*φ3.5mm








## 7. Product Installation

**7.1 Installation Notice**

- Please be careful in battery installation. To open the open-head lead-acid battery, it is required to wear a pair of goggles. Once contacting the acid liquid of the battery, please flush with clear water immediately.
- Avoid placing metal articles close to the battery to prevent short circuit of battery.
- The battery in charging may generate acid gas, so please guarantee well-ventilated ambient.
- The battery may generate flammable gas, please keep away from spark.
- Please avoid direct sunlight and rain water in outdoor installation.
- The virtually connected points and corrosive wires may generate heat and melt the insulation layer of the electric wire, burn surrounding materials and even cause fire. Therefore, it is required to guarantee that all connectors are tightened. The electric wires shall be fixed with wire ties to avoid connector looseness in mobile application.
- To connect the system, the voltage at the output terminal of the component may exceed safe body voltage. Therefore, it is required to use insulation tools in operation and guarantee dry hands.
- The wiring terminal of the battery on the controller can be connected with only one battery, or with a set of battery. In the manual, the instructions are only for one battery. However, they are applicable to a set of batteries.
- Please observe the safe suggestion of the battery manufacturer.
- The system connecting wire is selected based on the current density no less than 4A/mm2.
- The ground terminal of the controller shall be grounded.
- In installation, the battery shall not be reversely connected, which may cause irreversible damage!

### 7.2 Wiring Specification

It is required to observe national and local electrical specification requirements for wiring and installation ways. PV and battery wiring specification must be selected based on rated current. Please refer to the table below for the wire specification.

| Type | Maximal input current of PV | Maximal wire size at PV terminal ($mm^2$/AWG) | Rated charge current | Wire size of battery ($mm^2$/AWG) |
|---|---|---|---|---|
| SGC481560A | 50A | 13/6 | 60A | 15/5 |
| SGC481570A | 50A | 13/6 | 70A | 18/4 |
| SGC482560A | 40A | 10/7 | 60A | 15/5 |
| SGC482570A | 40A | 10/7 | 70A | 18/4 |

### 7.3 Installation and Wiring

**Warning :** Explosion hazard! Never install the controller and open-head battery into an enclosed space or in an enclosed room with possible gathering of battery gas.

**Warning :** High voltage is hazardous! Photovoltaic array may generate high open voltage. Before wiring, please break the breaker or fuse. Please be careful during the connection process.

**Note :** To install the controller, please guarantee that there is enough air flowing through the cooling fin of the controller. At least leave 150mm space above or below the controller so as to guarantee natural and convective heat dissipation. If installed in an enclosed box, please guarantee reliable heat dissipation via the box.

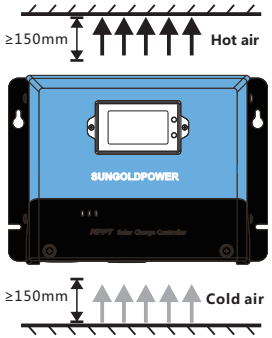



Fig. 2.1 Installation and Heat Dissipation

**Step 1: select an installation place**

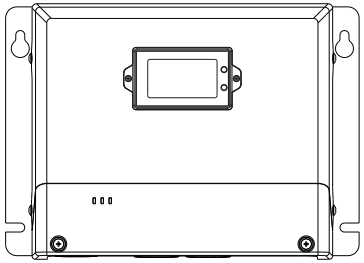
It is prevented to install the controller to a place with direct sunlight, high temperature and possible water inlet. In addition, it is required to guarantee well ventilation around the controller.

**Step 2: fix screw**

Mark a sign at the installation position in accordance with the installation size of the controller. Drill four installation holes with proper size at 4 marking positions. Afterwards, fix the screws to the upper two installation holes.

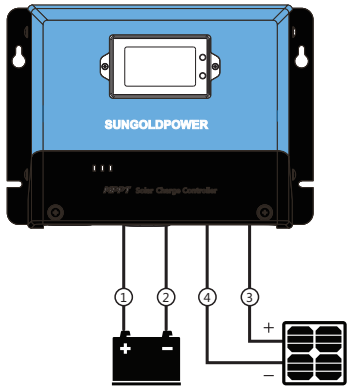
**Step 3: fix controller**

Align the fixing hole of the controller with two screws fixed in advance, then hang the controller and fix the lower two screws.



**Step 4: Wiring**

In order to guarantee safety in installation, we recommend a wiring sequence for the main circuit; it is prohibited to connect the positive and negative poles of the battery reversely!!!!!








**Warning: :** Danger of electric shock! We strongly recommend to connect the fuse or breaker at the photovoltaic array and the battery terminals to prevent electric shock hazard in wiring or inaccurate operation. Furthermore, before wiring, it is required to guarantee that the fuse or breaker is in open state.

**Warning: :** Danger of high voltage! Photovoltaic array may generate high open voltage. Before wiring, please open the breaker or fuse,

Warning : Danger of explosion! Short circuit of positive and negative terminals of battery and wires connected to the positive and negative poles may cause fire or explosion. Please take care in operation.

Please connect the battery at first and then the battery panel. Please observe the connecting way of pole "+" before pole "-".

When all power lines are connected firmly and reliably, inspect whether the wires are correct once again and whether the positive and negative poles are connected reversely. After it is confirmed that all are correct, connect the battery fuse or breaker at first and then observe whether LED indicator light is on. If the light is not on, please immediately cut the fuse or breaker, and then inspect whether the wires are correctly connected.

If the battery is connected normally, connect the battery panel. If the sunlight is sufficient, charging indicator light of the controller shall be normally on or flickers, start charging the battery.

**Note: install the battery fuse close to the battery terminal as far as possible. It is suggested that the installation distance shall not exceed 150mm.**

# 8. Protection Function

## 8.1 Introduction to Protection Function

- **Waterproof**

Waterproof grade: IP32

- **Overtemperature protection inside device**

When interior temperature of the controller is beyond the set value, the controller shall reduce the charging power or even break automatically in charging to further slow down temperature rise in the controller.

- **Overtemperature protection of battery**

To achieve overtemperature protection of battery, it is required to connect the temperature sampling sensor of battery externally. When it is detected that the battery temperature is high, stop charging. When the battery temperature is reduced to be lower than the set value by 5℃, charge shall be restored automatically after two seconds.

- **Overpower protection for input**

When the battery panel power is greater than the rated power, the controller shall limit the charge power within the rated power range to prevent controller damage caused by excessive current. At this time, the controller shall enter into the current limiting charge.

- **Overvoltage of photovoltaic input terminal**

In case of excessive voltage at photovoltaic array input terminal, the controller shall automatically cut the photovoltaic input.

- **Reverse protection for photovoltaic input**

When the photovoltaic array polarity is connected reversely, the controller shall not damage and shall further operate after wiring error is corrected.

- **Anti-reverse charge protection at night**

It is required to prevent the accumulator against discharge via solar battery.

**Special notice: there is no reverse wiring protection function for battery.**

## 9. System Maintenance

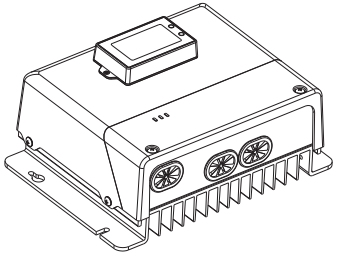
**In order to guarantee that the controller can maintain the optimum operation performance for long time, it is suggested to inspect following items regularly.**

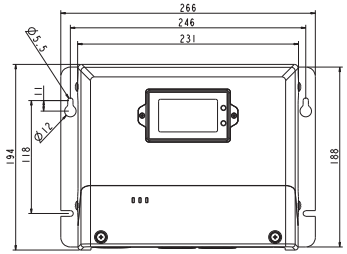
- Confirm that air flow around the controller cannot be blocked and clear away the dirt or sundries on the radiator.
- In case of abnormal failure or error prompt, adopt corrective measures in time.
- Inspect whether there is corrosion, insulation damage, high temperature, burning/discolor sign on the wiring terminal, whether the shell is deformed. If any, perform repair or replacement in time.
- Any wire with exposure, damage, poor insulation performance shall be repaired or replaced in time.
- Any dirt, nesting, insect or corrosive phenomenon shall be cleared in time.

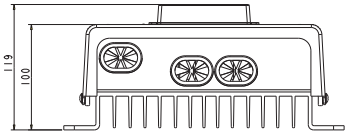
**Warning :** Danger of electric shock! To carry out above operation, please ensure that all power of the controller has been broken. Afterwards, perform corresponding inspection and operation! Any non-professional shall not operate without authorization.

## 10. Product Dimension

**①Common size :**





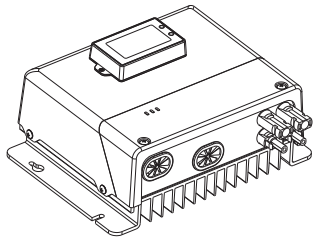



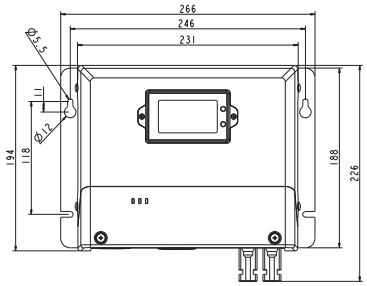

Product size:266*194*119mm
Installation size:246*118mm
Fixing hole position: Φ5.5mm
Wire specification:20-2AWG



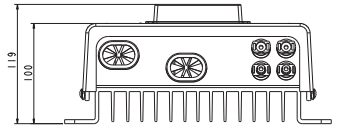


**②-MC4 size :**



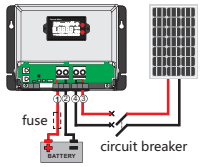



Product size：266*226*119mm
Installation size：246*118mm
Fixing hole position：Φ5.5mm
Wire specification：20-2AWG

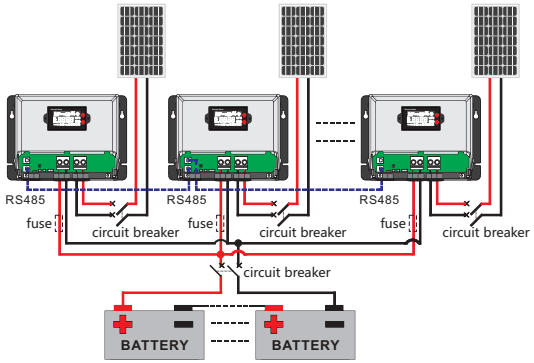



## 11、System wiring diagram

Stand-alone




Parallel operation



## 12、Solar Controller : Solar APP

| Download | Google Play（Android） | APP Store （iOS） | Android |
|---|---|---|---|
| Kewword download | Keywords: Solar APP | Keywords: Solar APP | N/A |
| Download Link | https://play.google.com/store/apps/details?id=com.srne.commonapp | https://apps.apple.com/us/app/solars-app/id6444056453 | http://srneobg.haizeihuang.cn/1688001411800solarapp_20230422092155.apk |
| Scan | | | |





## 13、Controller Input Voltage Specifications

| Model | MC4860N15 | SGC482560A | SGC4825100A |
|---|---|---|---|
| Maximum PV open-circuit voltage | 150VDC | 250VDC | 250VDC |
| Minimum PV input voltage(12V system) | 18VDC | 18VDC | 18VDC |
| Minimum PV input voltage(24V system) | 36VDC | 36VDC | 36VDC |
| Minimum PV input voltage(48V system) | 72VDC | 72VDC | 72VDC |
| Minimum battery input voltage(12V system) | 9VDC | 9VDC | 9VDC |
| Minimum battery input voltage(24V system) | 9VDC | 9VDC | 9VDC |
| Minimum battery input voltage(48V system) | 9VDC | 9VDC | 9VDC |

# User Manual


## 12/24V

## LiFePO4 Battery

# Instructions for Use of 12/24V $LiFePO_4$ Battery

## 1 Overview

This manual is meant for the installer and the user of the Li-ion battery. Only qualified, certified personnel may install and perform maintenance on the Li-ion battery.

This manual contains instructions of Vision's 12V/24V lithium iron phosphate battery connection methods, precautions for use and storage, troubleshooting, and general guidelines for the convenience of customers.

## 2 Features

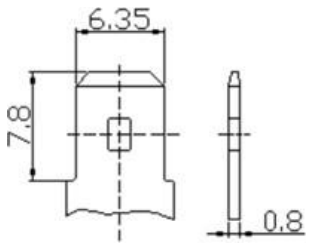
**Blue tooth** **BMS** **Fast charge** **LCD** **Heating** **IP grade**


## 3 Operating conditions

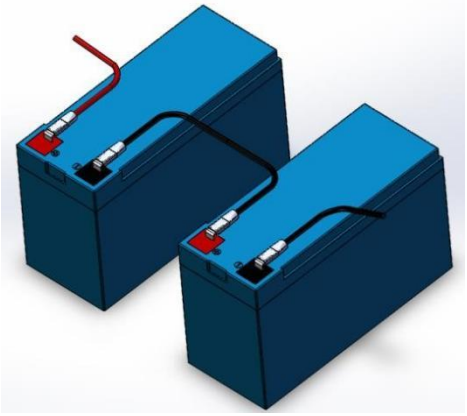
| | |
|---|---|
| Operating temperature | Charge: -4°F—113°F (-20℃—45℃) |
| | Discharge: -4°F—131°F (-20℃—55℃) |
| Storage temperature | 20℃~30℃(68°F~86°F) |
| Heating function | Charging heating |
| | ＜33.8°F，ON；＞42.8°F，OFF |
| Voltage window | 12V series: 10.8-14.6V |
| | 24V series: 21.6-29.2V |

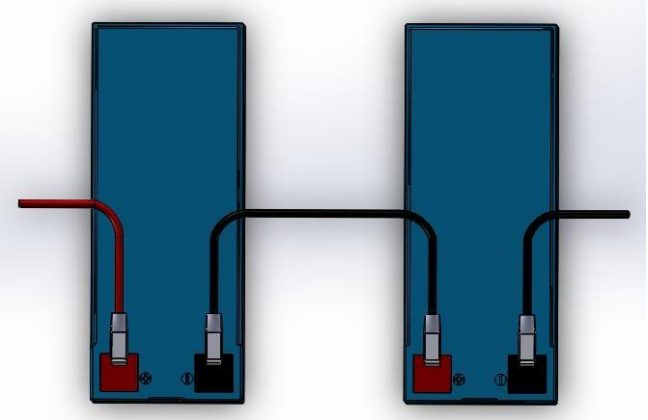
# 4 12V/24V battery F2 (0.250) terminal products

Terminal diagram

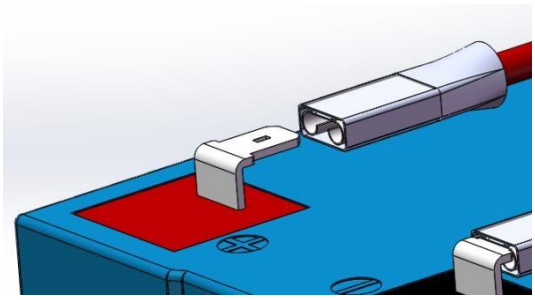


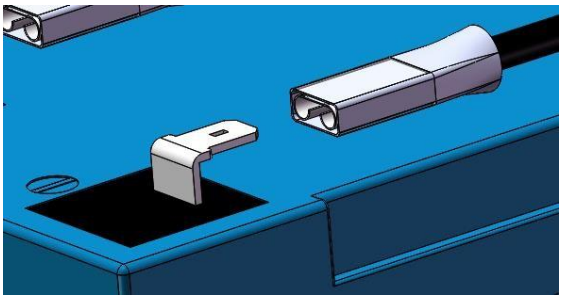

① Wiring diagram for series connection



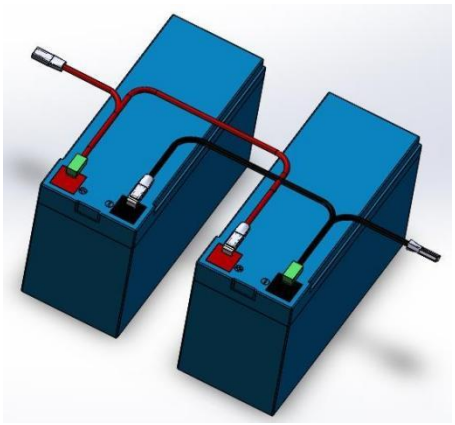


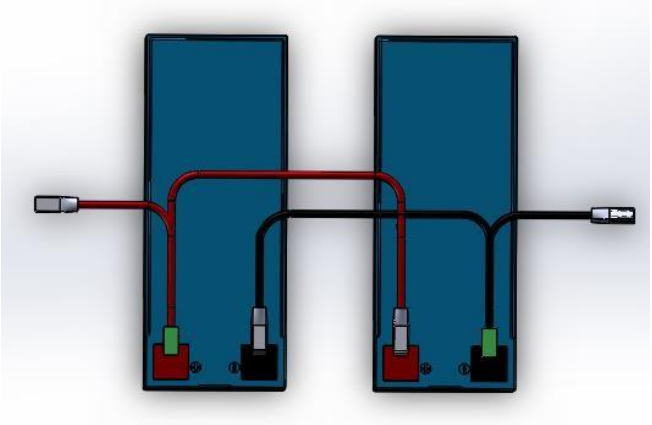
When battery is fixed in series, it is recommended to use the plug-in method for the connection. If the vibration is relatively large during use, it is recommended to use welding to connect.



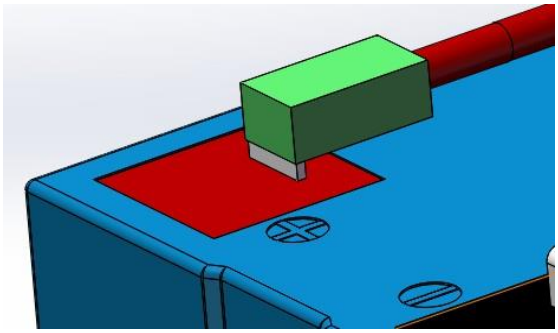


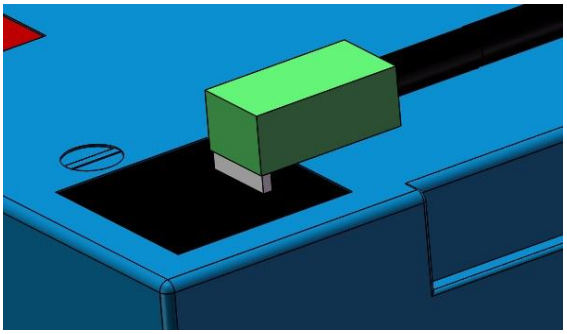
② Wiring diagram for parallel use





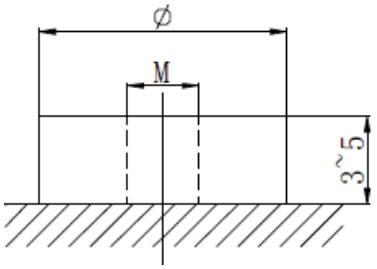
In parallel, it is recommended to use welding to connect.



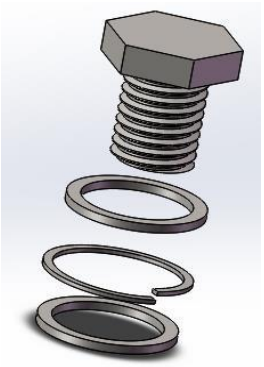


# 5 12V/24V battery M5/M6/M8 terminal products

Terminal diagram

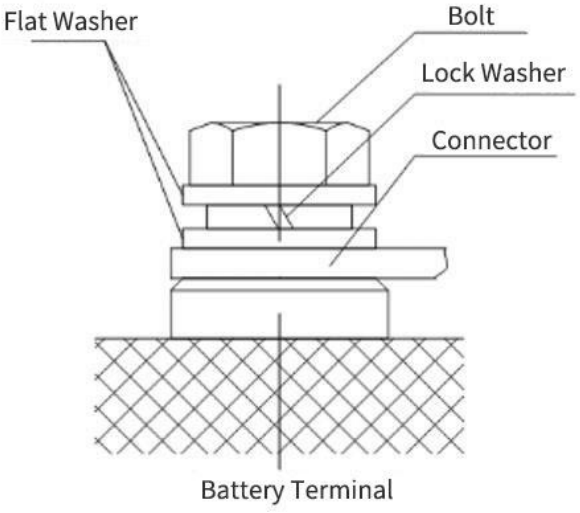



Locking bolt assembly: 1 screw + 2 flat washers + 1 Lock Washer

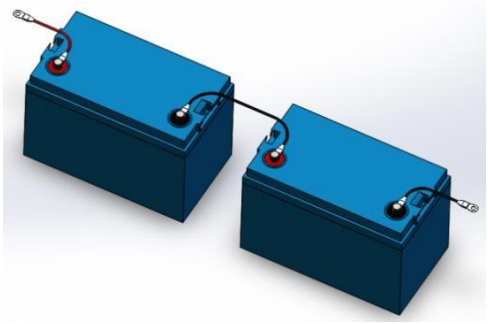


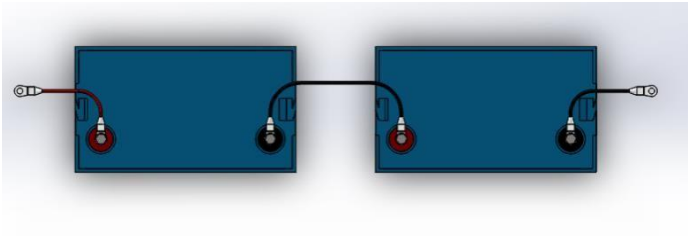
| TYPE | F11 | F12 | F13 |
|---|---|---|---|
| M | 6 | 8 | 5 |
| ϕ | 14 | 16 | 12 |
| Tightening torque | 8N•m | 10N•m | 6N•m |

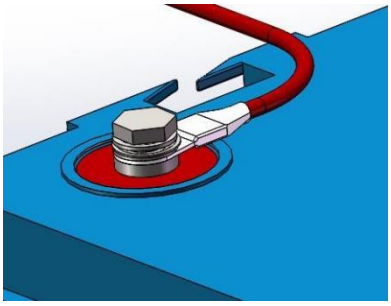
Schematic diagram of the bolt-locking-connector, the flat washer and the Lock Washer cannot be placed between the connector and the battery terminal.

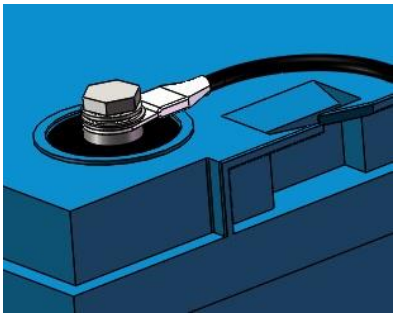


Wiring diagram for series connection



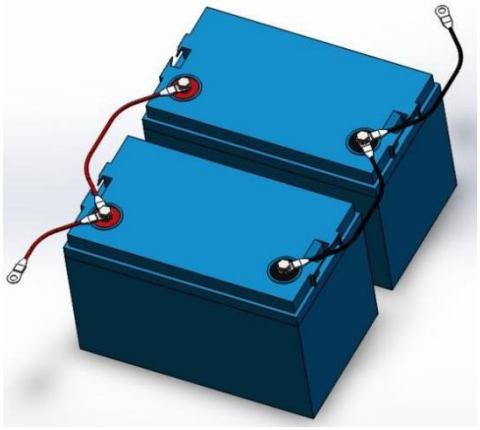


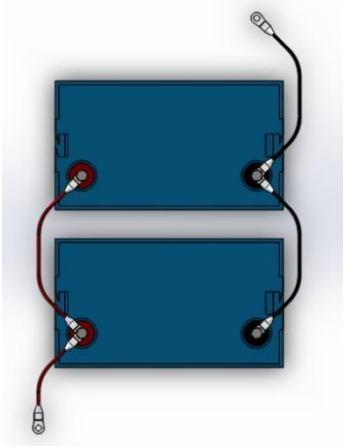


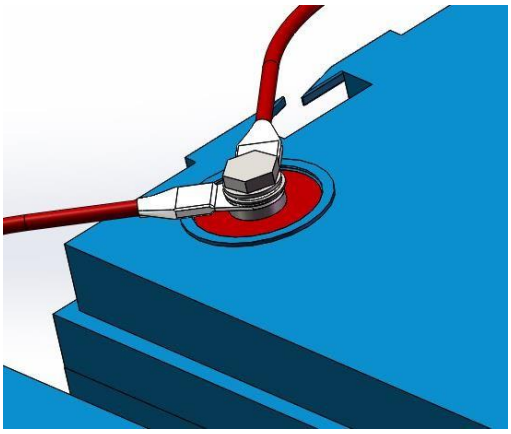


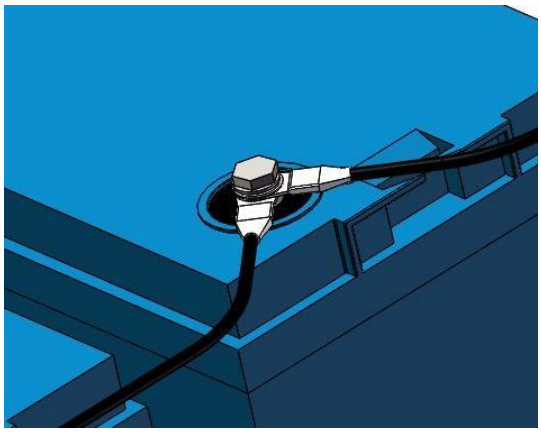
IMPORTANT: Maximum serial connection Voltage CANNOT exceed $58.4$V. So up to four 12V batteries can be connected in Serial.

② Wiring diagram for parallel use







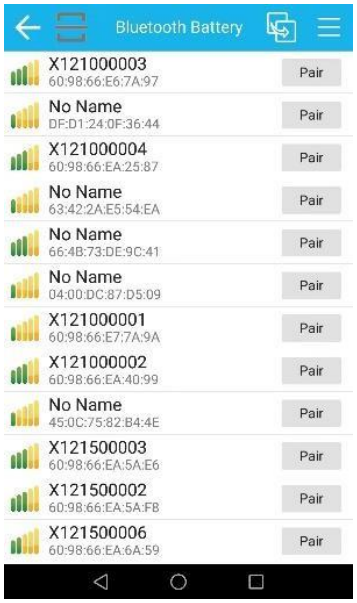


# 6 Bluetooth function

Bluetooth APP support both iOS and Android system. iOS users can download and install “LL Battery Monitor” from APPSTORE, Android users download and install “LL Battery Monitor” from Google Play Store.

① Install “LL Battery Monitor” APP, enable Bluetooth on cell phone, click “LL Battery Monitor” icon to enter program.

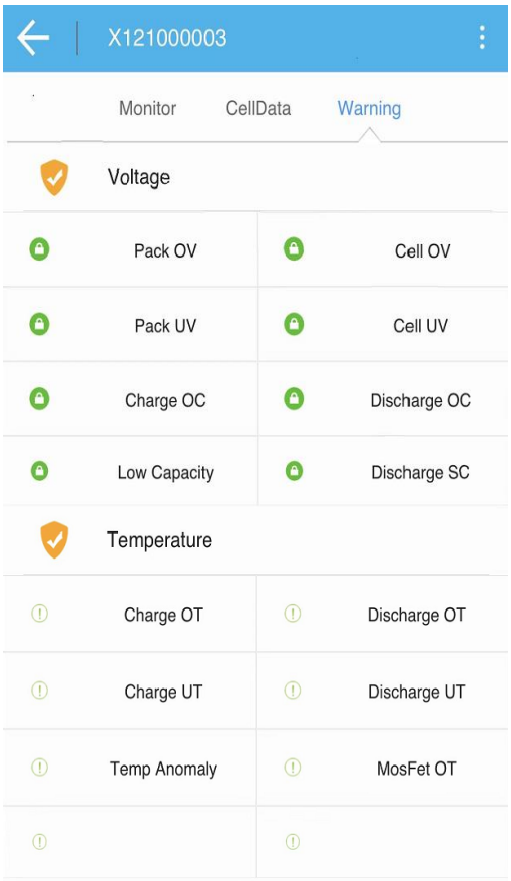
② All batteries with Bluetooth in the available range will be indicated as below, match battery by the Bluetooth ID that pasted on cover of battery.



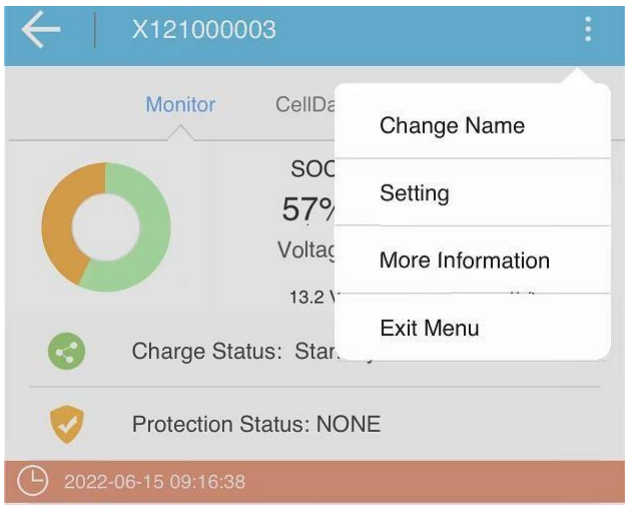

③ Choose the battery that need be checked, enter monitoring interface, also can switch to celldata

interface and warming interface.





④ From drop-down menu, can go the interface of “changing name”, “Setting”, “More information”, “Exit menu”.




Change Name: Can change name of the battery.

Setting: Here only indicates parameter of protection of voltage, current and temperature, information only can be viewed, but not be modified.

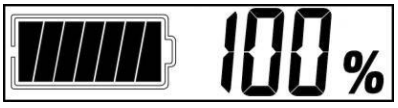
More information: Include voltage, current and temperature information.

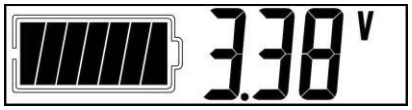
Exit Menu: to exit APP.

**Note:** In case the APP fails to connect to the Bluetooth of battery, please completely exit the APP and try to reconnect.

# 7 LCD Display

Press the button on LCD, first indicates voltage of battery, press second time indicates SOC, then indicates voltage of each battery cell by each pressing. Those information will loop in order.

# 8 Cautions

The battery is in half-charged state when leaving the factory, please fully charge it before use.

When battery is stored for a long time, ensure that it is half-charged. In order to ensure the best performance of the battery, it should be charged and discharged every three months.

Before the batteries are used in series or in parallel, they need to be fully charged separately with a special charger for lithium iron phosphate batteries, and the voltage difference should not exceed 0.1V. The recommended charging voltage is 14.4V~14.6V for 12V batteries, 28.8V~29.2V for 24V batteries, and the recommended charging current is 0.2C~0.5C.

Do not mix batteries made by different manufacturers, different types of batteries, and mix new and old batteries.

When installing, it is best to ensure a certain heat dissipation gap between the batteries, and the recommended gap is ≥20mm.

It is strictly forbidden to immerse the battery in water. When not in use, it should be stored in a cool and dry environment.

It is strictly forbidden to throw the battery into the fire to avoid explosion or other dangers.

It is strictly forbidden to use the battery with the positive and negative poles reversed. It is strictly forbidden to connect the battery directly to the power socket, and it is forbidden to short-circuit the positive and negative poles of the battery.

Do not charge or discharge the battery with heat, swelling, deformation or leakage.

It is forbidden to pierce the battery with nails or other sharp objects, and it is forbidden to throw, step on, knock, hit the battery, etc.

# Appendix

Common Issue and Solution During Use of $LiFePO_4$ Battery

| Issue | Reason | Solution |
|---|---|---|
| The battery cannot be charged | The charger is connected reversely. | Connect the charger correctly. |
| | Charger has low voltage disable function. | Connect a fully charged lead-acid battery or lithium iron phosphate battery with the same rated voltage in parallel for boost charging.<br>Switch to another lithium iron phosphate battery charger without low voltage disable function. |
| | Battery is in high voltage. | Charging over-voltage protection: disconnect the circuit and wait, when cell voltage is ≤3.50 and the battery voltage drops to 13.8~14.0V, the protection will be automatically released or release the protection by 5A discharge. |
| | High temperature inside the battery. | High temperature charging protection: the protection will be released when battery inside temperature drops to 50~60℃. |
| | Low temperature inside the battery. | Low temperature charging protection: the protection will be released when battery inside temperature rises to above 5°C. |
| | The charging current is too high. | Charging over-current protection: disconnect the circuit, wait for about 1 minute for self-recovery or release the protection by 5A discharge. |
| | Long-term storage after the battery is discharged will cause the BMS to fail to activate under low-voltage conditions. | The battery must be charged within 6 days after fully discharged, otherwise the battery needs to be returned to the factory for dismantling and repair. |
| | BMS failure. | The battery needs to be returned to the factory for |

| | | |
|---|---|---|
| | | dismantling and repair. |
| The battery cannot be discharged | Battery is in low voltage. | Discharge low voltage protection: disconnect the circuit and wait, when the cell voltage rises to 2.60V~3.00V and the battery voltage rises to 10.8~12V, the protection will be automatically released or release the protection by 5A charge. |
| | High temperature inside the battery. | High temperature discharging protection: the protection will be released when battery inside temperature drops to 50~60℃(122°F~140°F) |
| | Low temperature inside the battery. | Low temperature discharging protection: the protection will be released when battery inside temperature rises to above -15℃ (-59°F). |
| | The discharging current is too high. | Discharging over-current protection: disconnect the circuit, wait for about 1 minute for self-recovery or release the protection by 5A charge. |
| | The external load is short-circuited. | Automatically recover about 1 minute after the load is removed |
| | BMS failure. | The battery needs to be returned to the factory for dismantling and repair. |
| Battery discharge time is short | The cells in the battery pack are short-circuited slightly, resulting in large self-discharge. | The battery needs to be returned to the factory for disassembly, and the bad battery cell needs to be replaced with new one. |
| | There are big differences in cells consistency, and BMS detects the low voltage of the backward cells and terminates discharge early. | The battery needs to be returned to the factory for disassembly, and the backward cell needs to be replaced with new one. |
| The battery can't be fully charged | There are big differences in cells consistency, and BMS detects the high-voltage of individual cells, and terminates charge early. | The battery needs to be returned to the factory for disassembly, and the backward cell needs to be replaced with new one. |

| | | |
|---|---|---|
| Low voltage after the battery is stored for a short time | The cells in the battery pack are short-circuited slightly, resulting in large self-discharge. | The battery needs to be returned to the factory for disassembly, and the backward cell needs to be replaced with new one. |
| Charging voltage range | / | 12V：14.4-14.6V 24V：28.8-29.2V |
| Discharge cut-off voltage | / | 12V：≥10.8V 24V：≥21.6V |