

# Transformerless Off Grid Solar Inverter Charger User's Manual

For Model:  
M3048BP  
M5000H-48BP



**Version 2.1 (PN:M35202111222)**

## Manufacturer Information

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**Please record the Sigineer Power unit's model and serial number in case you need to provide this information in the future. It is much easier to record this information now than try to gather it after the unit has been installed.**

**Order Number:** \_\_\_\_\_

**Model Number:** \_\_\_\_\_ **/ Serial Number:** \_\_\_\_\_

## 1 Important Safety Information

**Save This Manual! Read this manual before installation, it contains important safety, installation and operating instructions. Keep it in a safe place for future reference.**

**All wiring must follow the National Electric Code, Provincial or other codes in effect at the time of installation, regardless of suggestions in this manual. This off grid solar inverter should be connected to a grounded wiring system. If the system ground is floating, please follow the codes in effect.**

### **MISTAKES TO AVOID**

**1 Don't reverse the PV input polarity.**

**2 Don't use any third-party accessories, communication cables on the inverter.**

**3 Don't wire the AC input power to the AC output terminals.**

**4 Don't install the inverter without AC input surge protection device (SPD) or lightning protection.**

## 1.1 General Safety Precautions

1.1.1 Before installing and using the M Series Off Grid Solar Inverter Charger, read the manual and cautionary markings on the Inverter/Charger enclosure. Be sure to read all instructions and cautionary markings for any equipment attached to this unit. Installers must be certified technicians or electricians.

1.1.2 This product is designed for indoor/compartment installation. Do not expose the inverter/charger to rain, snow, spray, bilge or dust. To reduce the risk of hazard, do not cover or obstruct the ventilation openings. Do not install the inverter/charger 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.

1.1.3 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.

1.1.4 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.

1.1.5 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.

1.1.6 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 INVERTER/CHARGER SHOULD NOT BE USED IN CONNECTION WITH LIFE SUPPORT SYSTEMS OR OTHER MEDICAL EQUIPMENT OR DEVICES. WE MAKE NO WARRANTY OR REPRESENTATION IN CONNECTION WITH THEIR PRODUCTS

FOR SUCH USES. USING THE INVERTER/CHARGER WITH THESE PARTICULAR EQUIPMENTS IS AT YOUR OWN RISK.

## 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 the 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 or 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 accepted by our inverter 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. NEVER charge a frozen battery.

1.2.6 Don't install the inverter near batteries, the inverter may heat battery electrolyte and cause corrosive fumes to vent and damage/corrode nearby electronics or metals.

## 1.3 Target Group

This document is intended for qualified persons and end users. Tasks that do not require any particular qualification can also be performed by end users. Qualified persons must have the following skills:

Knowledge of how an inverter works and is operated

Training in how to deal with the dangers and risks associated with installing and using electrical devices and installations

Training in the installation and commissioning of electrical devices and installations

Knowledge of the applicable standards and directives

Knowledge of and compliance with this document and all safety information

## 2 Introduction

### 2.1 General Information

Thank you for purchasing the M3048BP & M5000H-48BP Off Grid Solar Inverter/Chargers.

The M3048BP & M5000H-48BP transformerless Off Grid Solar Inverter/Charger is a combination of 4 products:

1. **Transformerless DC to AC power inverter**
2. **AC to DC utility battery charger**
3. **80A(M3048BP) and 100A(M5000H-48BP) MPPT Solar Charger Controller**
4. **High Speed DC/AC Transfer Switch.**

It is a very technically advanced off grid solar inverter on the market.

Some solar inverter on the market physically includes a solar charger which has no communication with the

circuit of the inverter.

Our MPPT charger is electrically integrated into the inverter design and is able to harness the PV production to charge batteries when the inverter is powered off.

Its powerful DSP (digital signal processor) makes them very versatile and almost all of its specifications can be adjusted via its top cover LCD or remote LCD panel, such as AC output voltage, frequency, power priority, low/high battery cutoff, charging profiles & amperage, DC/AC transfer conditions, etc.

The M3048BP & M5000H-48BP model with 48V DC input and output pure sine wave single phase output.

You can get split phase or three phase power by stacking them up to 6 pcs.

The single unit can operate without batteries connected.

The timer built in the inverter enables the inverter to use utility power for the loads and battery charging at preset time.

It supports different types of remote monitoring with Remote LCD Panel (Sold separately), Wi-Fi or GPRS module or computer.

The BMS port communicates with lithium battery for optimal operation of batteries.

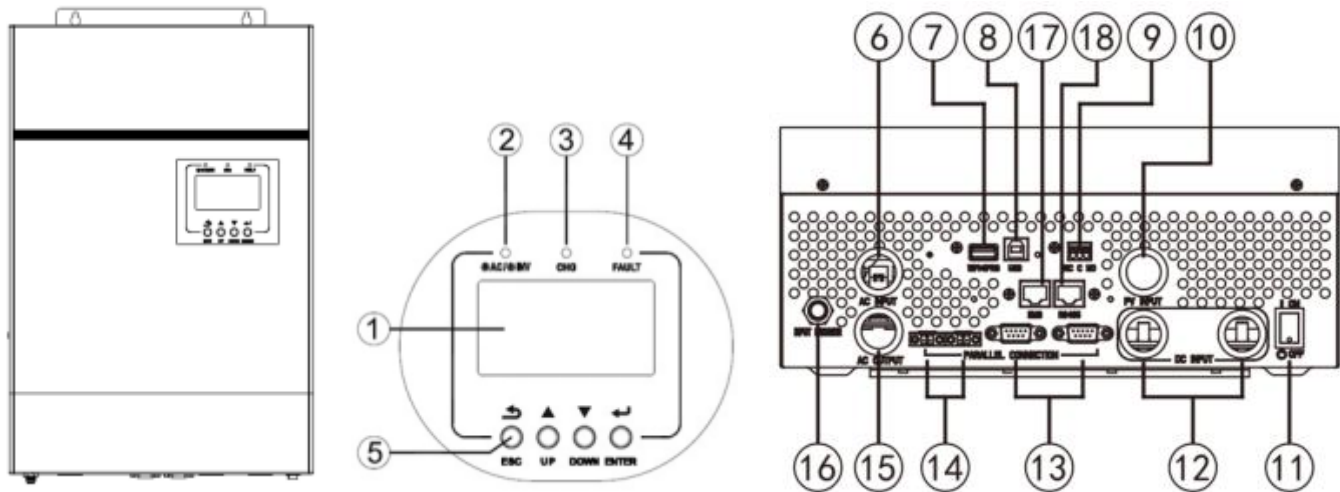
It also has a programmable “US2” setting which works with lithium batteries without BMS communication with the inverter.

The 200% surge capacity of 5 seconds makes it possible to support demanding inductive loads.

Thus the M Series Solar Inverter/Charger is suitable for a myriad of applications including renewable energy systems, utility, truck, RV and emergency vehicles etc.

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 Mechanical Design



|                                 |   |   |
|---------------------------------|---|---|
| 1.LCD Display                   | 2.Status Indicator                                | 3.Charging Indicator                        |
| 4.Fault Indicator               | 5. Function Buttons                               | 6. AC Input Terminal                        |
| 7. Wi-Fi/GPRS Port              | 8. USB Port(connects to computer)                 | 9. Dry Contact                              |
| 10. PV Input Terminal           | 11. ON/OFF Power Switch                           | 12. Battery Terminals                       |
| 13 Parallel Communication Ports | 14 Current Sharing Ports                          | 15 AC Output Terminal                       |
| 16 AC Breaker                   | 17 BMS Communication Port(For RS485/CAN Protocol) | 18 RS485 Communication Port (For Expansion) |

## 2.3 Features

- \*Automatic Solar Charging When the Inverter is Powered Off
- \*Auto Generator Start
- \*Batteryless Operation
- \*Advanced Utility Charging & Bypass Control with Timer
- \*Overload Bypass
- \*Battery Polarity Reverse Protection
- \*Smart remote monitor with WIFI or GPRS Module
- \*Remote LCD Panel with Adjustable Parameters
- \*80A/100A MPPT Solar Charger
- \*Maximum THD: 3% at nominal battery voltage
- \*Powerful 4-stage power factor corrected battery charger
- \*High surge output capability, 200% peak load for 5 seconds
- \*Low quiescent current, low power 'Power Saver Mode' to conserve energy
- \*Equalization Charging
- \*20ms transfer time from AC to battery for the continuous load operation
- \*Thermally controlled variable speed fan for more efficient cooling
- \*Extensive protections against various harsh situations
- \*Solar Priority or SBU developed for renewable energy systems
- \*Parallel operation up to 6 units, capable of forming three phase or split phase output

## 2.4 Electrical Performance

### 2.4.1 DC to AC Invert

#### Overload Capacity

The M3048BP & M5000H-48BP inverter/charger has different overload capacities, making it ideal to handle demanding loads.

- 1 For  $110\% < \text{Load} < 150\%$ , Fault (Power off) after 10 seconds.
- 2 For  $150\% < \text{Load} \leq 200\%$ , Fault (Power off) after the 5 seconds.

#### Caution:

After the inverter is switched on, it takes a finite time for it to self diagnose and get ready to deliver full power. Hence, the user should always switch on the load(s) after a few seconds of switching on the inverter to avoid switching on the load before the inverter is powered on. This may prematurely trigger the overload protection. When a load is switched on, it may require a higher initial power surge to start. If multiple loads are being powered, they should be switched on one by one so that the inverter is not overloaded by the higher starting surge.

### 2.4.2 AC & MPPT Charger

The M Series pure sine wave inverter/charger 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.

The M Series pure sine wave inverter/charger has a very rapid charge current available, and the max charge current can be adjusted from 10% to 100% in small increments on the LCD of the inverter. This will be



helpful if this powerful charger applies charging on a small capacity battery bank.

The max charging current decreases according to the input AC voltage.

There are three main charging 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.

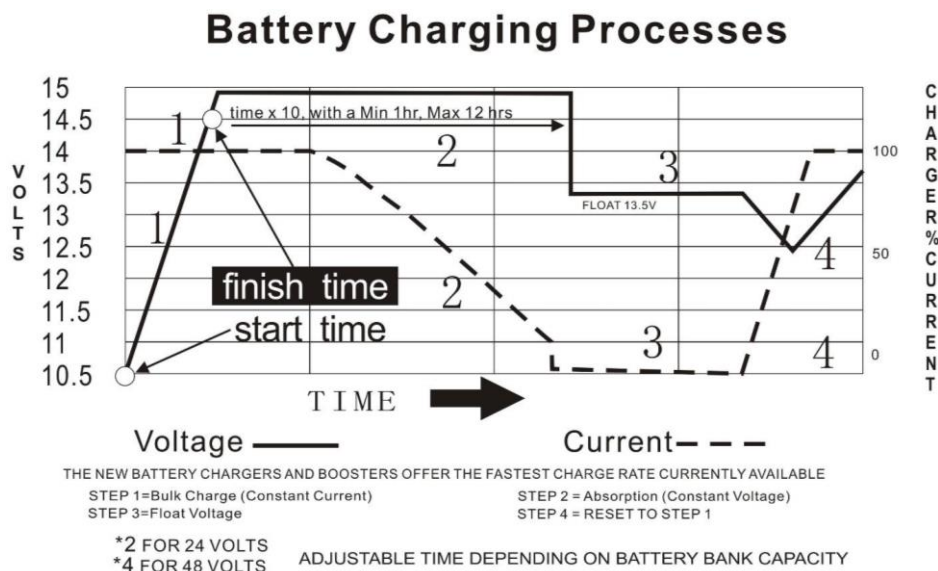
Software timer will measure the time from charger start until the battery charger reaches 0.3V below the boost voltage, then take this time as T0 and  $T0 \times 10 = T1$ .

**Absorb Charging:** This is the second charging stage and begins after the absorb voltage has been reached. Absorb Charging provides the batteries with a constant voltage and reduces the DC charging current in order to maintain the absorb voltage setting.

In this period, the inverter will start a T1 timer; the charger will keep the boost voltage in Boost CV mode until the T1 timer has run out. Then drop the voltage down to the float voltage. The timer has a minimum time of 1 hour and a maximum time of 12 hours. When charging current reduces to below 0.01C, the charger will go to the float charge.

**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 float 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 battery type is selected as “lithium battery”, our charger will drastically reduce the charging current to zero once float voltage is reached.



The charging capacity will go to peak in around 3 seconds, this may probably 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.



### Caution:

**To guarantee the best performance of AC charger when the AC input is from a generator, the standby generator should be of at least 150% higher capacity than the inverter.**

**Warning! Operation with an under-rated generator or generator with unqualified wave form may cause premature failure which is not under warranty.**

### Battery Equalization

Equalization function is added into the M series inverter charge controller. It reverses the buildup of negative chemical effects like stratification, a condition where acid concentration is greater at the bottom of the battery than at the top. Equalization also helps to remove sulfate crystals that might have built up on the plates. If left unchecked, this condition, called sulfation, will reduce the overall capacity of the battery. Therefore, it's recommended to equalize battery periodically.

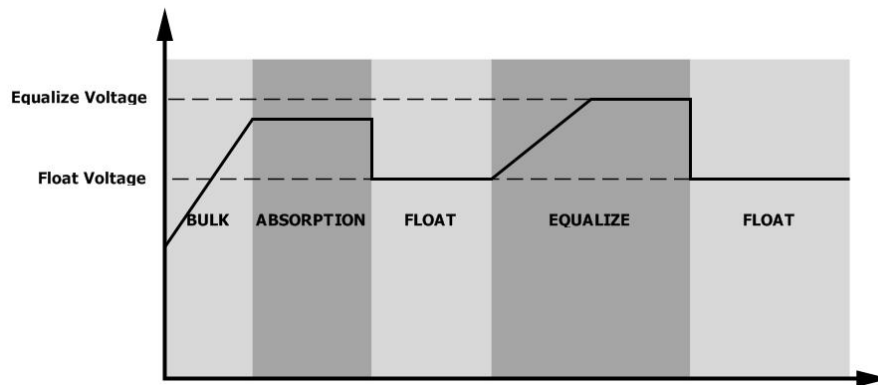
#### How to Apply Equalization Function

You must enable battery equalization function in monitoring LCD setting program 43 first. Then, you may apply this function in device by either one of following methods:

1. Setting equalization interval in program 47.
2. Active equalization immediately in program 48.

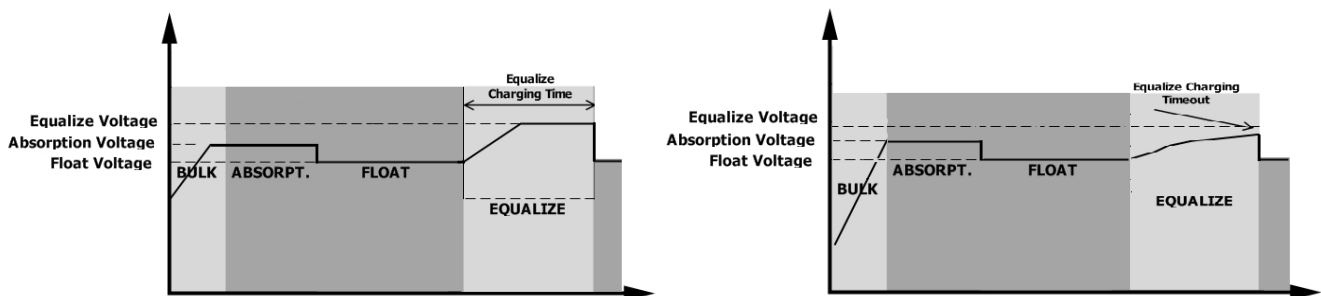
#### When to Equalize

In float stage, when the setting equalization interval (battery equalization cycle) is arrived, or equalization is active immediately, the controller will start to enter Equalize stage.



#### Equalize charging time and timeout

In Equalize stage, the controller will supply power to charge battery as much as possible until battery voltage raises to battery equalization voltage. Then, constant-voltage regulation is applied to maintain battery voltage at the battery equalization voltage. The battery will remain in the Equalize stage until setting battery equalized time is arrived.



However, in Equalize stage, when battery equalized time is expired and battery voltage doesn't rise to battery equalization voltage point, the charge controller will extend the battery equalized time until battery voltage achieves battery equalization voltage. If battery voltage is still lower than battery equalization voltage when battery equalized timeout setting is over, the charge controller will stop equalization and return to float stage.

The M Series pure sine wave inverter/charger is built with MPPT solar charging modules up to 100A.

| Model #     | AC Charging Current | MPPT Solar Charger | Max Charging Current |
|-------------|---------------------|--------------------|----------------------|
| M3048BP     | 40A                 | 80A                | 80A                  |
| M5000H-48BP | 80A                 | 100A               | 100A                 |

The MPPT Solar Charger will automatically work when the inverter is powered off.

Even when the power switch is in unit off position, the built-in solar charger will automatically work when



PV input voltage and battery voltage is qualified, this is to optimize solar production for battery charging. But the inverter will not convert battery power to AC output. When the battery is fully charged, the inverter will keep the battery capacity at 100%, and convert the extra PV power directly from DC to AC to power loads.

When the battery is fully charged, the voltage has to drop by 2 volts (or below 95% of SOC when BMS communication is established) to activate the charger.

### 2.4.3 DC&AC Transfer

While in the Standby Mode, the AC input of the inverter is continually monitored. Whenever AC power falls out of the trip voltages, the inverter automatically transfers back to the Invert Mode with minimum interruption to your appliances.

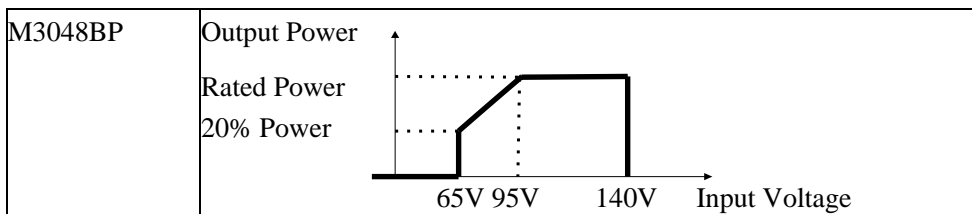
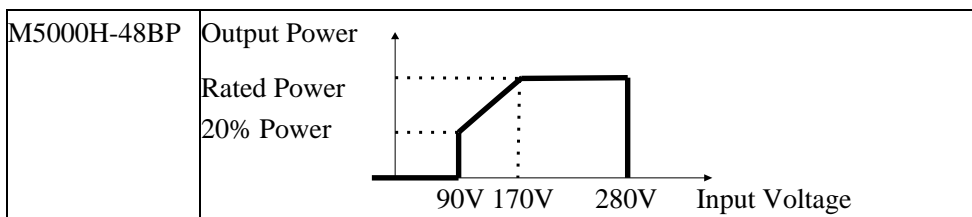
The transfer from AC mode to Inverter mode occurs in approximately 10 milliseconds, with the worst case of 20 milliseconds. And it is the same time from Inverter mode to Standby mode.

Though it is not designed as a computer UPS system, this transfer time is usually fast enough to hold them up as devices like computers can generally tolerate a max power loss of 20ms.

When the inverters are paralleled, the transfer time is <30ms.

#### Bypass output power derating:

When AC input voltage drops below 170Vac, the output power will be de-rated linearly to as long as 20% at 90Vac.



### 2.4.4 Power Saver

There are two working statuses for the inverters: “Power On” and “Power Off”.

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

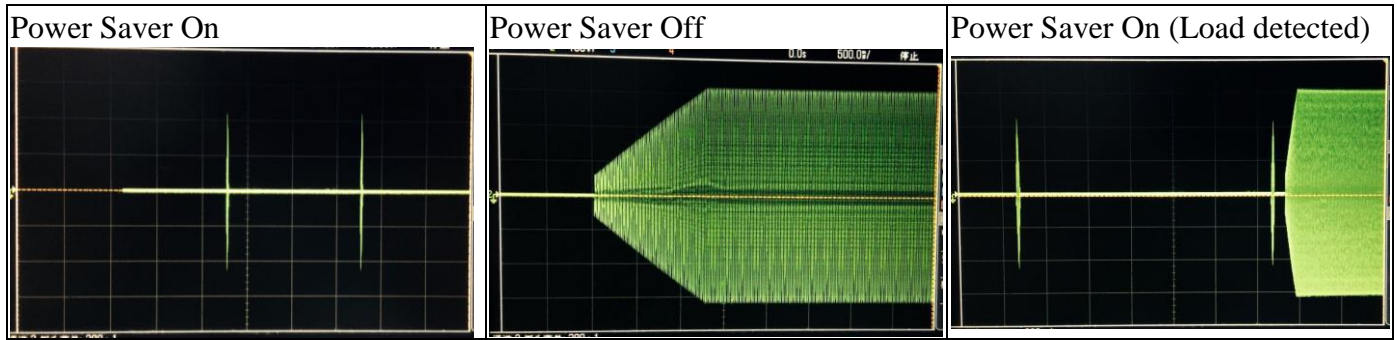
When power switch is turned to “Power ON”, the inverter is powered on.

When the inverter is powered on, users can activate “power saver” in the program 04 of the software.

The “Power Saver” function is dedicated to conserve battery power when AC power demand is either minimal or not required at all by the loads.

In this mode, the inverter pulses the AC output in every 30 seconds looking for an AC load (i.e., electrical appliance). Whenever an AC load (greater than 100 watts) is turned on, the inverter recognizes the need for power and automatically starts inverting and output goes to full voltage. When there is a small load (less than 100 watts) detected, the inverter automatically goes back into search mode to minimize energy consumption from the battery bank.

In “Power saver” mode, the inverter will draw power mainly in sensing moments, thus the idle consumption is reduced from 60 watts to 30 watts.



**Note: The minimum power of a load to take inverter out of sleep mode (Power Saver On) is 100 Watts.**

**When the inverter is in idle, even there is AC input power, the inverter will discharge the battery as the LCD, relay, fans are powered by DC.**

For more detailed technical information, please contact us.

In the “search sense” mode, the LED will blink and the inverter will make a ticking sound. At full output voltage, the inverter will make a steady humming sound. When the inverter is used as an “uninterruptible” power supply the search sense mode 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 operating at full output voltage.

## 2.4.5 Protections

The M Series inverter/charger 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)
- Battery Polarity Reverse Protection

Users can customize whether the inverter should automatically restart or not after some of these protections.

### Warning !

**The below mistakes will damage the inverter permanently and must be avoided:**

**\*Reverse the PV input polarity.**

**\*Use any third-party accessories, communication cables on the inverter.**

**\*Wire the AC input power to the AC output terminals.**

## 2.4.6 Remote Monitoring

The M series inverter (produced after 2021 Nov) can be remotely monitored and controlled.

It supports 4 different types of remote monitoring

1. Plug in the remote LCD panel to the RS485 port.
2. Connects it to a computer via the USB port and monitor the inverter on the software.
3. Plugs a Wi-Fi or GPRS module into Wi-Fi port, monitor it on a computer or cellphone APP.
4. Connect to the RS485 port, it allows customer to monitor on their own software programmed with the same protocol.

To monitor the inverter on a computer, please download the software (**SG Solar Power Monitor**) from our website in the Support>Software Download section.

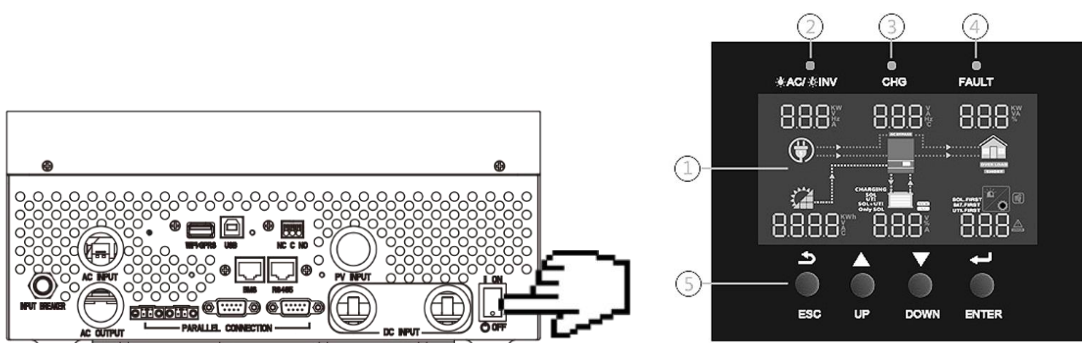
The M series inverters can be remotely monitored by a Wi-Fi or GPRS module plugged into its USB port. The Wi-Fi / GPRS module is a plug-and-play monitoring device which allows users to monitor the status of the PV system from a mobile phone APP or from the website anytime anywhere. The inverter's AC output power can be powered on and off via APP.

The Sigineer Monitor APP will automatically refresh the data in every 5 minutes. To access real date, please roll down the screen to refresh.

To monitor the inverter via both WiFi and USB port, the RMT-WiFi module can be connected via a short extension cable.


## 2.4.7 LCD & Specification Setup



Press the On/Off switch to turn on the unit.

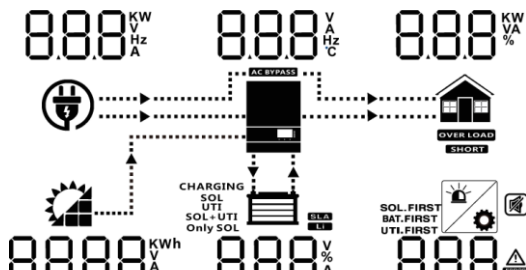



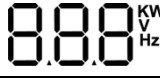














The operation and display panel area includes three LED indicators, four function keys and a LCD display. It shows very rich operating info.





1 LCD display    2 Status indicator    3 Charging indicator    4 Fault indicator    5 Function buttons

| LED Indicator   |       |          | Operation Status                                    |
|---|-------|----------|---|
|  <b>AC / INV</b> | Green | Solid On | Output is powered by utility in AC mode.            |
|   |       | Flashing | Output is powered by battery or PV in battery mode. |




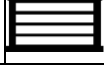
|  |       |          |   |
|--|-------|----------|---|
|  <b>CHG</b>   | Green | Solid On | Battery is fully charged.                 |
|  |       | Flashing | Battery is being charged.                 |
|  <b>FAULT</b> | Red   | Solid On | Fault occurs in the inverter.             |
|  |       | Flashing | Warning condition occurs in the inverter. |







|   | Button | Description   |
|---|--------|---|
|  | ESC    | To exit setting mode  |
|   | UP     | To go to previous selection                                       |
|   | DOWN   | To go to next selection   |
|   | ENTER  | To confirm the selection in setting mode or to enter setting mode |






| Icon  | Description   |
|---|---|
| <b>AC Input Information</b>   |   |
|    | AC input icon   |
|    | Indicate AC input power, AC input voltage, AC input frequency, AC input current                               |
|    | Indicate AC power loads in bypass   |
| <b>PV Input Information</b>   |   |
|  | PV input icon   |
|  | Indicate PV power, PV voltage, PV current, etc  |
| <b>Output Information</b>   |   |
|  | Inverter icon   |
|  | Indicate output voltage, output current, output frequency, inverter temperature                               |
| <b>Load Information</b>   |   |
|  | Load icon   |
|  | Indicate power of load, power percentage of load  |
|  | Indicate overload happened  |
|  | Indicate short circuit happened   |
| <b>Battery Information</b>  |   |
|  | Indicate battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode. |
|  | Indicate battery voltage, battery percentage, battery current   |
|  | Indicate SLA battery  |
|  | Indicate lithium battery  |
|  | Indicate charging source priority: solar first, solar and utility, or only solar                              |

| Other Information   |   |
|---|---|
| <b>SOL.FIRST</b><br><b>BAT.FIRST</b><br><b>UTI.FIRST</b>                          | Indicate output source priority: solar first, utility first, SBU mode or SUB mode |
|  | Indicate warning code or fault code   |
|  | Indicate a warning or a fault is happening  |
|  | Indicate it's during setting values   |
|  | Indicate the alarm is disabled  |

| In AC mode, battery icon will present Battery Charging Status |                 |  |
|---|-----------------|--|
| Status  | Battery voltage | LCD Display  |
| Constant Current mode /<br>Constant Voltage mode              | <48V            | 4 bars will flash in turns.  |
|   | 48 ~ 50V        | Bottom bar will be on and the other three bars will flash in turns.    |
|   | 50 ~ 52V        | Bottom two bars will be on and the other two bars will flash in turns. |
|   | > 52V           | Bottom three bars will be on and the top bar will flash.               |
| Floating mode. Batteries are fully charged.                   |                 | 4 bars will be on.   |

| CC&CV Charge Mode | Battery Voltage @<br>Load >50% | Battery Voltage @50%><br>Load > 20% | Battery Voltage @<br>Load < 20% | Icon  |
|-------------------|--------------------------------|-------------------------------------|---------------------------------|---|
| <48V              | < 41.2V                        | < 43.6V                             | <44.8V                          |  |
| 48-50V            | 41.2-43.2V                     | 43.6-45.6V                          | 44.8-46.8V                      |  |
| 50-52V            | 43.2-45.2V                     | 45.6-47.6V                          | 46.8-48.8V                      |  |
| >52V              | > 45.2V                        | > 47.6V                             | >48.8V                          |  |

| Load Information   |   |   |   |   |
|--|---|---|---|---|
| <b>OVER LOAD</b>   | Indicates overload.   |   |   |   |
|   100%<br>25% | Indicates the load level by 0-24%, 25-49%, 50-74% and 75-100%.                      |   |   |   |
|  | 0%~24%  | 25%~49%   | 50%~74%   | 75%~100%  |
|  |  |  |  |  |
| Mode Operation Information   |   |   |   |   |

|   |  |
|---|--|
|  | Indicates unit connects to the mains.  |
|  | Indicates unit connects to the PV panel.   |
| <b>BYPASS</b>   | Indicates load is supplied by utility power.   |
|  | Indicates the utility charger circuit is working.  |
|  | Indicates the DC/AC inverter circuit is working.   |
| <b>SOL.FIRST<br/>BAT.FIRST<br/>UTI.FIRST</b>                                      | These three signs indicate the output priority. SOL.FIRST indicates solar first. BAT.FIRST indicates battery first. UTI.FIRST indicates utility first. |
| <b>Mute Operation</b>   |  |
|  | Indicates unit audible alarm is disabled.  |

## LCD SETTING

The M 5KW inverter LCD allows users to virtually change all of its specs. It will enter setting mode if the ENTER button is held for 3 seconds. Press “UP” or “DOWN” button to select setting programs, and then press “ENTER” button to confirm the selection or ESC button to exit.

### Program 01: Power Priority for AC Loads

#### 01 UEI: Utility Priority (Default)

In this mode, the utility will provide power to the AC loads as the first power source. Solar and battery energy will provide power to the loads only when utility power is not available. This mode works for applications with cheap utility power or using battery in power outages.

#### 01 SOL: Solar Priority

In this mode, the solar energy provides power to the loads as the first power source. If solar energy is insufficient, battery energy will be consumed. Utility power will engage when one of below conditions happens:

- 1 Solar energy is not available (No PV production).
- 2 Battery voltage drops to either low-level warning voltage or the setting point in program 12 (DC to AC Transfer Voltage in “SOL Priority”).

Once the solar power is lost, the utility will have higher priority than battery. This mode can be regarded as “SUB”(Solar>Utility>Battery).

In this mode, the inverter will transfer between DC and AC as per the settings of program 12 and 13. Users can set it to utility priority to stop the cycling.

#### 01 SbU: SBU Priority

As indicated by the abbreviation, the power priority comes as solar>battery>utility. Solar energy provides power as the first priority. If solar energy is insufficient, battery energy will be consumed. Utility provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting point in program 12(DC to AC Transfer Voltage in “SBU Priority”).



When solar is gone in SBU mode, the power priority becomes battery>utility, battery priority is higher than utility priority.

In this mode, the inverter will transfer between DC and AC as per the settings of program 12 and 13. Users can set it to utility priority to stop the cycling.

### **01 SUB Priority**

Solar energy provides power to the loads as the first priority.

If solar energy is not sufficient to power all connected loads, solar and utility will power loads at the same time.

Battery provides power to the loads only when solar energy is not sufficient and there is no utility.

### **Program 02: Maximum Charging Current**

M3048BP model: default 40A, 10A~80A Settable

M5000H-48BP model: default 60A, 10A~100A Settable

(If Li is selected in program 5, this program can't be set up)

The MPPT charger will stop when charging is completed. To activate the charger, the battery voltage must drop at least 2 voltages below the lower value in program 19 and 20.

### **Program 03: AC Input Voltage Range**

#### **03 APL: Appliance Mode**

In Appliance Mode, the acceptable AC input voltage range is

|             |                      |
|-------------|----------------------|
| M3048BP     | 65-140Vac $\pm 7V$   |
| M5000H-48BP | 90~280VAC $\pm 7V$ . |

#### **03:UPS**

In UPS Mode, the acceptable AC input voltage range:

|             |                       |
|-------------|-----------------------|
| M3048BP     | 95-140Vac $\pm 7V$    |
| M5000H-48BP | 170~280VAC $\pm 7V$ . |

#### **03: GEN**

In Generator Mode, the acceptable AC input voltage range:

|             |                    |
|-------------|--------------------|
| M3048BP     | 65-140Vac $\pm 7V$ |
| M5000H-48BP | 90~280VAC $\pm 7V$ |

Note: When the inverter is connected to a generator, the generator should be more than twice the inverter nominal power.

### **Program 04: Power Saving Mode Enable/Disable**

#### **04: SdS**

When the power saver mode is disabled, the inverter will output full voltage, and the idle power is about 50-60 watts.

#### **04: SEN**

If the power saver mode is enabled, the output of inverter will be off when connected load is low or not detected.

The threshold for load detection is 100W. The idle power in power saver mode is about 30 watts.

## **Program 05: Battery Type**

### **05: AGN**

AGM Battery (Default) : CV :56.4V, Float 54V.

### **05: FLd**

Flood Battery: CV :58.4V, Float 56V.

### **05: USE**

User-Defined

If “User-Defined” is selected, battery charge voltage and low DC cut-off voltage can be set up in program 19, 20 and 21. This setting works for GEL batteries etc.

### **05: US2**

User-Defined 2

This US2 setting is designed for the inverter to work with lithium battery without communication via BMS. As floating charging is not required for lithium batteries, in US2 mode, the program 19&20 will be interlocked and set to the same value whenever one of them is changed.

Compared with USE, the charger in US2 will immediately reduce charging current when the preset voltage in 19 is reached.

NOTE: The US2 will not optimally charge the lithium battery due to the lack of BMS communication. The battery capacity icon bar doesn't reflect the actual battery capacity; it is converted from battery voltage. For more details, please refer to page 13.

When the inverter is in US2, it could not correctly display the accurate SOC of the lithium batteries.

The displayed SOC is converted from battery voltage. The SOC will change only when the battery voltage changes big enough.

Due to the ripple current from the utility charger, when “US2” is set for charging lithium batteries, it is recommended to set the max utility charging current at 30% of the nominal charge current.

### **05: LI**

Lithium

This setting only works when inverter communicates with lithium battery BMS built with the same protocol. The program is set to “LI”, the LCD will show a hidden program of 36 about BMS protocol types.

There are many lithium battery BMS communication protocols, L01, L02 to L99.

For Sigineer Power LFP power walls, the protocol is L01.

When the battery type set as “LI”, the maximum charge current can be modified by the user.

**Note:** When the communication fails, the inverter will cut off output.

RS485 communication protocol is L01 to L50.

The CAN communication protocol is L51 to L99.

## **Program 06: Automatic Overload Restart**

### **06: LFd**

Disabled.

### **06: LFE**

When this feature is enabled, the inverter will attempt to restart 3 times after overloads, if it still fails to start the load after 3 attempts, it will show warning code 07.

### **Program 07: Automatic OverTemp Restart**

### **Program 08: AC Output Voltage**

The AC output voltage between hot and neutral can be set to 208V, 220V, 230V and 240V for M5000H-48BP and 100/110/120Vac for M3048BP.

### **Program 09: AC Output Frequency**

The AC Output Frequency can be set to 50Hz or 60Hz.

### **Program 10: Number of 12V Batteries Connected In Series**

The default value is 4. This program is only a reminder about the 12V battery quantity.

### **Program 11: Maximum Utility Charging Current**

| Model #     | Default Value | Resettable Range |
|-------------|---------------|------------------|
| M3048BP     | 30A           | 0-40A            |
| M5000H-48BP | 30A           | 0-80A            |

The solar charger has higher priority than the utility charger, if the max charging current and utility charger is set to the same value, the solar charger will still work.

If setting value in Program 02 is smaller than that in Program 11, the final charging current is set according to Program 02 for utility charger.

### **Program 12 DC to AC Transfer Voltage**

The setting works when program 01 is in “SBU Priority” or “Solar Priority” Mode.

| Model #                | Default Value | Resettable Range |
|------------------------|---------------|------------------|
| M3048BP<br>M5000H-48BP | 46V/50%       | 44V~51.2V/6%-95% |

The battery SOC will be displayed when BMS communication is established.

### **Program 13 AC to DC Transfer Voltage**

The setting works when program 01 is in “SBU Priority” or “Solar Priority” Mode.

| Model #                | Default Value | Resettable Range |
|------------------------|---------------|------------------|
| M3048BP<br>M5000H-48BP | 54V/95%       | 48V~58V/10%-100% |

The battery SOC will be displayed when BMS communication is established.

### **Program 14 Charge Power Source Priority**

#### **14:CSO**

Solar Priority

Solar energy will charge battery as the first priority.

Utility will charge battery only when solar energy is not available (lost).

#### **14:SNU**

Solar and Utility (Default)

Solar energy and utility will both charge battery.

## **14:OSO**

### **Solar Only**

Solar energy will be the only charger source no matter utility is available or not.

But when the battery voltage drops below the setting of 21(Low DC Cut-off Voltage) , the utility power will be used to force a charging cycle to avoid battery over discharging.

If this off grid solar inverter is working in DC to AC invert mode, only solar energy can charge the battery. Solar energy will charge battery if it's available and sufficient.

### **Program 15 Alarm On/Off Control**

### **Program 16 Backlight On/Off Control**

When off is set, the LCD will go dim after 60 seconds left unattended.

### **Program 17 Beeps once between AC and DC Transfer**

### **Program 18 Overload Bypass**

When enabled, the unit will transfer to line mode if overload occurs in battery mode.

### **Program 19 C.V. Charging Voltage**

| Model #     | Default Value | Resetable Range |
|-------------|---------------|-----------------|
| M3048BP     | 56.4V         | 48V~58.4V       |
| M5000H-48BP |               |                 |

If user-defined setting (USE/US2) is selected in program 5, this program can be set up.

When the battery is charged to CV setting, the voltage has to drop by 2 volts to activate the charger.

### **Program 20 Float Charging Voltage**

| Model #     | Default Value | Resetable Range |
|-------------|---------------|-----------------|
| M3048BP     | 54V           | 48V~58.4V       |
| M5000H-48BP |               |                 |

If user-defined setting (USE/US2) is selected in program 5, this program can be set up

### **Program 21 Low DC Cut-Off Voltage**

| Model #     | Default Value | Resetable Range |
|-------------|---------------|-----------------|
| M3048BP     | 42V/20%       | 40V~48V/5%-50%  |
| M5000H-48BP |               |                 |

The battery SOC will be displayed when BMS communication is established.

After User-defined (USE/US2) setting is selected in program 5, this program can be set up

Low DC cut-off voltage will be fixed to setting value regardless of load percentage.

When low DC Cut-Off voltage is reached:

1. If battery is the only power source, inverter will shut down.
2. If PV energy and battery power are available, inverter will charge battery without AC output.
3. If PV energy, battery power and utility are all available, inverter will transfer to line mode and provide output power to loads and charge the battery at the same time.

When low battery voltage protection occurs and qualified PV or AC power inputs, the inverter will automatically charge and invert DC to AC when the battery voltage reach 54V Or 10% more SOC than low battery cut off in Lithium mode).

To make it work, the power switch must remain in the original “ON” position.

### **Program 23 AC Output Mode**

This setting is only available when the inverter is in standby mode (Switch off).

Power saving function will be automatically disabled when in parallel operation.

#### **23:SIG**

Single Unit Operation.

When unit operates separately and is not in parallel operation.

#### **23:PAL**

Parallel in Single Phase

When the units are used in parallel with single phase

#### **23: 3P1/3P2/3P3**

Parallel in Three Phase: 3P1, 3P2, 3P2

It requires at least 3 inverters to support three-phase equipment, 1 inverter in each phase.

Please select “3P1” for the inverters connected to L1 phase, “3P2” for the inverters connected to L2 phase and “3P3” for the inverters connected to L3 phase.

23: 2P0+2P1: split phase 120V/208V; 2P0+2P2: split phase 120V/240V

Parallel in Split Phase(only for M3048BP)

**Do NOT connect current sharing cable between units on different phases.**

### **Program 28 Address setting**

Default 001. 001-255. Settable. It is for external solar charger expansion.

### **Program 36 Lithium BMS Protocol**

For Sigineer Power LFP power walls, the protocol is L01.

Please refer to “05: LI” for details.

### **Program 37 Real time setting---Year**

Default 2018, range 2018~2099

### **Program 38 Real time setting---Month**

Default 01, range 01~12

### **Program 39 Real time setting---Date**

Default 01, range 01~31

### **Program 40 Real time setting---Hour**

Default 00, range 00~23

### **Program 41 Real time setting---Minute**

Default 00, range 00~59

**Program 42 Real time setting---Second**

Default 00, range 00~59

**Program 43 Battery Equalization**

If “Flooded” or “User-Defined” is selected in program 05, this program can be set up. The Equalization is banned for AGM batteries.

**Program 44 Battery Equalization Voltage**

| Model #     | Default Value | Resettable Range |
|-------------|---------------|------------------|
| M3048BP     | 58.4V         | 48-58.4V         |
| M5000H-48BP |               |                  |

**Program 45 Battery Equalized Time**

Default 60min, 5min~900min Settable

**Program 46 Battery Equalized Timeout**

Default 120min, 5min~900min Settable

**Program 47 Equalization Interval**

Default 30days, 1 day~90 days Settable

**Program 48 Equalization Activated Immediately**

If equalization function is enabled in program 43, this program can be set up. If “Enable” is selected in this program, it’s to activate battery equalization immediately and LCD main page will shows “**Eq**”. If “Disable” is selected, it will cancel equalization function until next activated equalization time arrives based on program 47 setting. At this time, “Eq” will not be shown in LCD main page

**Program 49 Utility charging time**

Allow utility to charge the battery all day run.

0000(default)

The timer allows utility to charge the battery at preset time.

Use 4 digits to represent the time period, the upper two digits represent the time when utility start to charge the battery, setting range from 00 to 23, and the lower two digits represent the time when utility end to charge the battery, setting range from 00 to 23.

(eg: 2320 represents the time allows utility to charge the battery is from 23:00 to the next day 20:59, and the utility charging is prohibited outside of this period)

**Program 50 AC output time**

Allow inverter to power the load all day run.

0000(default)

The timer allows inverter to power the load at preset time.

Use 4 digits to represent the time period, the upper two digits represent the time when inverter start to power the load, setting range from 00 to 23, and the lower two digits represent the time when inverter end to power the load, setting range from 00 to 23.

(eg: 2320 represents the time allows inverter to power the load is from 23:00 to the next day 20:59, and the inverter AC output power is prohibited outside of this period)



| Program #                                      | Description  | ICON   |
|--|--|--|
| 01 Power Priority for AC Loads                 | Utility Priority   | <div> <div>0PPR</div> <div>UTL</div> <div> <small>UTL.FIRST</small><br/> 001 </div> </div>                               |
| 01 Power Priority for AC Loads                 | Solar Priority   | <div> <div>0PPR</div> <div>SOL</div> <div> <small>SOL.FIRST</small><br/> 001 </div> </div>                               |
| 01 Power Priority for AC Loads                 | SBU Priority   | <div> <div>0PPR</div> <div>SBU</div> <div> <small>BAT.FIRST</small><br/> 001 </div> </div>                               |
| 01 Power Priority for AC Loads                 | SUB Priority   | <div> <div>0PPR</div> <div>SUB</div> <div> <small>SOL.FIRST</small><br/> <small>UTL.FIRST</small><br/> 001 </div> </div> |
| 02 Maximum Charging Current                    | Max PV+Utility Charging Current                              | <div> <div>CHG1</div> <div>60<sup>A</sup></div> <div>002</div> </div>  |
| 03 AC Input Voltage Range                      | Appliance Mode (Default)                                     | <div> <div>ACV</div> <div>APL</div> <div>003</div> </div>  |
| 03 AC Input Voltage Range                      | UPS Mode   | <div> <div>ACV</div> <div>UPS</div> <div>003</div> </div>  |
| 03 AC Input Voltage Range                      | Generator mode   | <div> <div>ACV</div> <div>GEN</div> <div>003</div> </div>  |
| 04: Power Saving Mode                          | Saving mode disable (Default)                                | <div> <div>SAVE</div> <div>DIS</div> <div>004</div> </div>   |
| 04: Power Saving Mode                          | Saving mode enable   | <div> <div>SAVE</div> <div>ENA</div> <div>004</div> </div>   |
| 05 Battery Type                                | AGM Battery (Default)  | <div> <div>BATT</div> <div>AGM</div> <div>005</div> </div>   |
| 05 Battery Type                                | Flood Battery  | <div> <div>BATT</div> <div>FLD</div> <div>005</div> </div>   |
| 05 Battery Type                                | User-Defined   | <div> <div>BATT</div> <div>USE</div> <div>005</div> </div>   |
| 05 Battery Type                                | User-Defined 2   | <div> <div>BATT</div> <div>US2</div> <div>005</div> </div>   |
| 05 Battery Type                                | Lithium  | <div> <div>BATT</div> <div>LI</div> <div>005</div> </div>  |
| 06 Automatic Overload Restart                  | Restart Disable (Default)                                    | <div> <div>LDRS</div> <div>DIS</div> <div>006</div> </div>   |
| 06 Automatic Overload Restart                  | Restart Enable   | <div> <div>LDRS</div> <div>ENA</div> <div>006</div> </div>   |
| 07 Automatic OverTemp Restart                  | Restart Disable (Default)                                    | <div> <div>OTRS</div> <div>DIS</div> <div>007</div> </div>   |
| 07 Automatic OverTemp Restart                  | Restart Enable   | <div> <div>OTRS</div> <div>ENA</div> <div>007</div> </div>   |
| 08 AC Output Voltage                           | 230V (Default)   | <div> <div>OUTV</div> <div>230</div> <div>008</div> </div>   |
| 09 AC Output Frequency                         | 50Hz (Default)   | <div> <div>OUTF</div> <div>50</div> <div>009</div> </div>  |
| 10 Number of 12V Batteries Connected In Series | The default value is 4 for 48V model, and 2 for 24Vdc model. | <div> <div>BATN</div> <div>4</div> <div>010</div> </div>   |

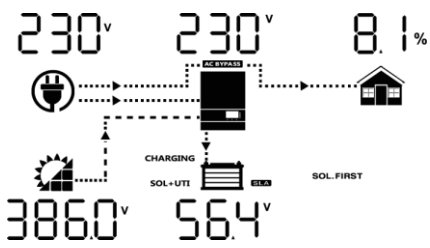
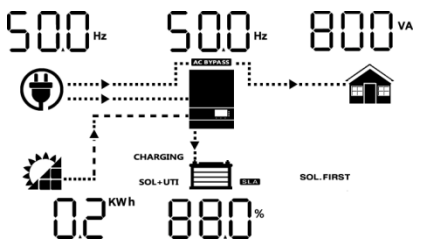
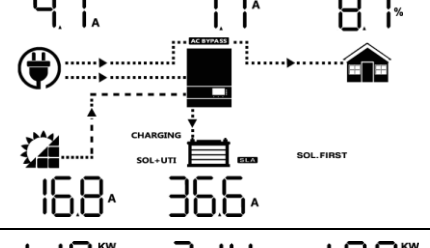
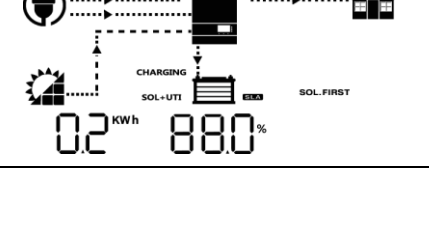
|   |  |   |
|---|--|---|
| 11 Maximum Utility Charging Current         | 10A to Max(default 30A)                              | AC1 30 <sup>A</sup> 011 <sup>°</sup>                |
| 12 DC to AC Transfer Voltage                | Default 46.0V,<br>44.0V~51.2V resettable,            | b2AC 46.0 <sup>V</sup> 012 <sup>°</sup>             |
| 12 DC to AC Transfer Voltage                | Lithium mode: default<br>40%, 5%~50% resettable      | b2AC 50 <sup>%</sup> 012 <sup>°</sup>               |
| 13 AC to DC Transfer Voltage                | Default 54.0V,<br>48.0V~58.0V resettable,            | AC2b 54.0 <sup>V</sup> 013 <sup>°</sup>             |
| 13 AC to DC Transfer Voltage                | Li mode: default 80%,<br>60%~100% resettable         | AC2b 95 <sup>%</sup> 013 <sup>°</sup>               |
| 14 Charger Power Source Priority            | Solar Priority                                       | <sup>SOL</sup> CC.PF C50 014 <sup>°</sup>           |
| 14 Charger Power Source Priority            | Solar and Utility<br>(Default)                       | <sup>SOL + UTI</sup> CC.PF 5NU 014 <sup>°</sup>     |
| 14 Charger Power Source Priority            | Solar Only   | <sup>Only SOL</sup> CC.PF 050 014 <sup>°</sup>      |
| 15 Alarm On/Off Control                     | Audible Alarm on<br>(default)                        | bU22 ON 015 <sup>°</sup>                            |
| 15 Alarm On/Off Control                     | Audible Alarm off(Mute)                              | bU22 OFF 015 <sup>°</sup>                           |
| 16 Backlight On/Off Control                 | Backlight on (default)                               | LCdb ON 016 <sup>°</sup>                            |
| 16 Backlight On/Off Control                 | Backlight off  | LEdb OFF 016 <sup>°</sup>                           |
| 17 Beeps once between AC<br>and DC Transfer | Alarm on (default)                                   | ALAr ON 017 <sup>°</sup>                            |
| 17 Beeps once between AC<br>and DC Transfer | Alarm off  | ALAr OFF 017 <sup>°</sup>                           |
| 18 Overload Bypass                          | Bypass Disable<br>(default)                          | bYP dI S 018 <sup>°</sup>                           |
| 18 Overload Bypass                          | Bypass enable  | bYP ENR 018 <sup>°</sup>                            |
| 19 C.V. Charging Voltage                    | 48V model: default<br>56.4V, 48.0V~58.4V<br>Settable | C.V. 56.4 <sup>V</sup> 019 <sup>°</sup>             |
| 20 Float Charging Voltage                   |  | FLt <sup>V</sup> 54.0 <sup>V</sup> 020 <sup>°</sup> |
| 21 Low DC Cut-Off Voltage                   | Without BMS<br>communication                         | CUE <sup>V</sup> 42.0 <sup>V</sup> 021 <sup>°</sup> |
| 21 Low DC Cut-Off Voltage                   | With BMS<br>communication                            | CUE <sup>V</sup> 20 <sup>%</sup> 021 <sup>°</sup>   |
| 23 AC Output Mode                           | Single Unit Operation                                | PrLL SI G 023 <sup>°</sup>                          |
| 23 AC Output Mode                           | Parallel in Single Phase                             | PrLL PAR 023 <sup>°</sup>                           |
| 23 AC Output Mode                           | Three phase: 3P1, 3P2,<br>3P2                        | PrLL 3P I 023 <sup>°</sup>                          |

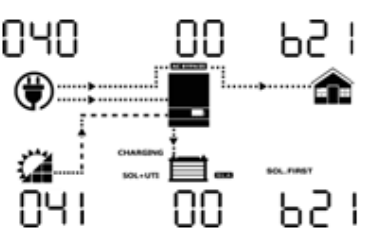
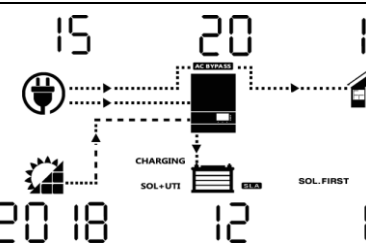
|                                       |   |                |
|---------------------------------------|---|----------------|
| 23 AC Output Mode                     | Split phase   | PRLL 2PO 023°  |
| 28 RS485 Communication Address        | Default 001. 001-255 Settable. For external solar charger expansion.    | Addr 1 028°    |
| 36 Lithium BMS Protocol               | Default L01   | PtCL L01 036°  |
| 37 Real time setting---Year           |   | 2018 037°      |
| 38 Real time setting---Month          |   | 1001 12 038°   |
| 39 Real time setting---Date           |   | day 13 039°    |
| 40 Real time setting---Hour           |   | hour 13 040°   |
| 41 Real time setting---Minute         |   | 11 50 041°     |
| 42 Real time setting---Second         |   | SEC 50 042°    |
| 43 Battery Equalization               | Disabled (Default)  | EQ d15 043°    |
| 43 Battery Equalization               | Enable  | EQ ENA 043°    |
| 44 Battery Equalization Voltage       | Default 58.4V, 48~60V settable  | EQV 58.4V 044° |
| 45 Battery Equalization Time          | Setting range is from 5min to 900min. Increment of each click is 1min.  | 11 60 045°     |
| 46 Battery Equalization Timeout       | Setting range is from 5min to 900min. Increment of each click is 1 min. | 11 120 046°    |
| 47 Equalization Interval              | Setting range is from 1 to 90 days. Increment of each click is 1 day.   | day 30 047°    |
| 48 Equalization Activated Immediately | Disabled (Default)  | EQ OFF 048°    |
| 48 Equalization Activated Immediately | Enable  | EQ ON 048°     |

|                          |  |                                   |
|--------------------------|--|-----------------------------------|
| 49 Utility charging time |  | CHG 61.7<br>0000 049 <sup>0</sup> |
| 50 AC output time        |  | OUT 61.7<br>0000 050 <sup>0</sup> |

## LCD Display Setting

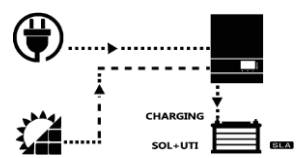
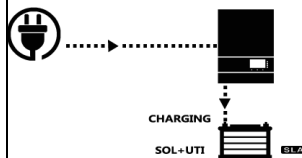
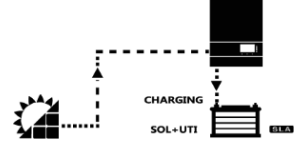

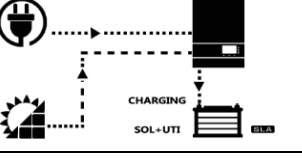
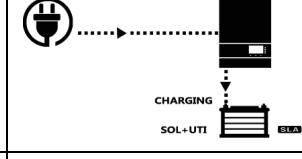
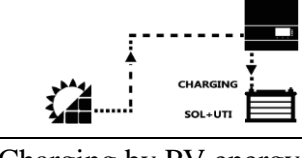

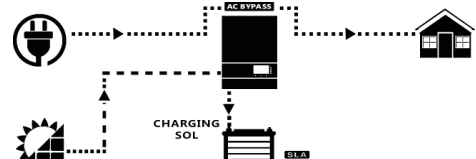
The LCD display information will be switched in turns by pressing “UP” or “DOWN” key. The selectable information is switched in below order: input voltage, output voltage, load percentage, PV input voltage, MPPT charging current, MPPT charging power, battery voltage, output voltage, output frequency, load percentage, load in VA, load in Watt, DC discharging current, main CPU Version and second MCU Version.

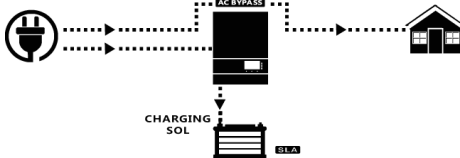
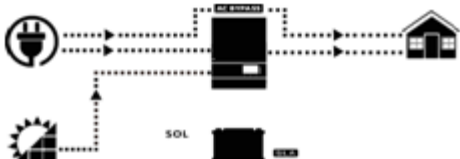
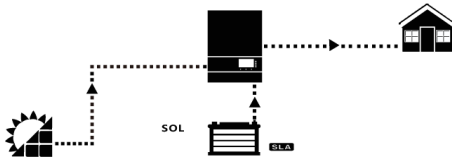

| Setting Information   | LCD display  |
|---|--|
| ① AC Input voltage<br>② Output voltage<br>③ Load percentage<br>④ PV input voltage<br>⑤ Battery voltage<br>⑥ Warning or Fault code<br>(Default Display Screen) |   |
| ① AC Input frequency<br>② Output frequency<br>③ Load power in VA<br>④ PV energy sum in KWH<br>⑤ Battery percentage<br>⑥ Warning or Fault code                 |  |
| ① AC Input current<br>② Output current<br>③ Load percentage<br>④ PV input current<br>⑤ Battery charging current<br>⑥ Warning or Fault code                    |  |
| ① AC input power in Watts<br>② Inverter temperature<br>③ Load power in Watts<br>④ PV energy sum in KWH<br>⑤ Battery percentage<br>⑥ Warning or Fault code     |  |

|  |  |
|--|--|
| Firmware Version of Inverter PCB and MPPT PCB<br>(CPU1: 040-00-b21; CPU2:041-00-b21) |  |
| Time<br>(15:20:10, December 15, 2018)  |  |

The LCD will display different inverter status when the up or down button is pressed.  
 The last page of LCD shows the software version of the inverter PCB. There are 8 digits.

### Operating Mode Description

| Operation mode   | Description   | LCD display  |  |
|--|---|--|--|
| <b>Standby mode / Power saving mode</b><br>Note: *Standby mode: The inverter is not turned on yet but at this time, the inverter can charge battery without AC output.<br>*Power saving mode: If enabled, the output of inverter will be off when connected load is too low or not detected. | No output is supplied by the unit but it still can charge batteries.              | Charging by utility and PV energy.<br> | Charging by utility<br> |
|  |   | Charging by PV energy<br>              | No charging<br>         |
| <b>Fault mode</b><br>Note:<br>*Fault mode: Errors are caused by inside circuit error or external reasons such as over temperature, output short circuited and so on.   | PV energy and utility can charge batteries.                                       | Charging by utility and PV energy<br>  | Charging by utility<br> |
|  |   | Charging by PV energy<br>              | No charging<br>         |
| <b>Line Mode</b>   | The unit will provide output power from the mains. It can also charge the battery | Charging by PV energy<br>              |  |

|              |   |  |
|--------------|---|--|
|              | at line mode.   | <p>Charging by utility</p>               |
|              |   | <p>No battery connected</p>              |
| Battery Mode | The unit will provide output power from battery and PV power. | <p>Power from battery and PV energy</p>  |
|              |   | <p>Power from battery only</p>          |

The inverter is built with automatic PV and utility power wakeup feature.

When the power switch is in power off, and qualified PV input, the PV charger will be activated, and the rest part of the inverter will remain powered off.

In this mode, the utility power can only illuminate the LCD, it can't charge batteries.

When the inverter shuts off due to low battery voltage, and the switch is kept on “on” position, the inverter will use qualified utility power or PV power to charge batteries and wake up at “cold start voltage” to discharge the battery to provide AC output.

If the inverter is set in SOL or SUB, the automatic wake up feature will charge battery close to “Utility to Battery switch” voltage, and then cut off utility charger, switch to DC to AC model.

## 2.4.8 Audible Alarm

The inverter also gives audible alarms when the following situations occur.

|                |  |
|----------------|--|
| <b>Warning</b> | Buzzer beeps 0.5s every second.  |
| <b>Error</b>   | Long Beep. Beeps 0.5s every 1s for 10s, shut off, then long beep for 60 seconds. |

## 2.4.9 FAN Operation

For M Series 5KW models, there are two DC fans.

The DC fans will just the fan speed in a linear proportion according to load and charger wattage.

It will slow down after 1 minute when the triggering condition disappears.

Allow at least 30CM of clearance around the inverter for air flow. Make sure that the air can circulate freely around the unit.

Fan noise level <60db at a distance of 1 meter.



## 2.4.10 Auto Generator Start Dry Contact

The solar inverter is built with a very versatile 3-pin dry contact rated at 3A/250VAC on the rear panel.



The internal relays of the dry contact will give out either “close” or “open” signals.

These signals can be used to indicate the low battery voltage alarm or control a generator.

The NC & C pins are constantly close, they will open when battery voltage reaches low alarm or the setting in Program 12 (DC to AC Transfer).

The NO & C pins are constantly open, they will close when battery voltage reaches low alarm or the setting in Program 12 (DC to AC Transfer) to start the generator. Once the generator is started and battery voltage increases with charging, the dry contact pins will open at the setting of Program 13 (AC to DC Transfer) to avoid overcharging.

| Unit Status | Operation                    |   | NC & C   | NO & C |
|-------------|------------------------------|---|--|--------|
| Power Off   | Inverter off ( no AC output) |   | Close  | Open   |
| Power On    | Inverter in AC Bypass Mode   |   | Close  | Open   |
|             | Inverter in DC to AC Mode    | Program 01 set to Utility Priority      | Battery Level < Low Battery Alarm              | Open   |
|             |                              |   | Battery Level > Program 13 (AC to DC Transfer) | Close  |
|             |                              | Program 01 set to SBU or Solar Priority | Battery Level < Program 12 (DC to AC Transfer) | Open   |
|             |                              |   | Battery Level > Program 13 (AC to DC Transfer) | Close  |

For low battery alarm, when battery setting is not in “LI” mode, it is 2 volts higher than Low DC Cut-off Voltage for 48Vdc model and 1 volt higher than Low DC Cut-off Voltage for 24Vdc model.

When the battery setting is in “LI” mode, low battery alarm is 5% higher than Low DC Cut-off Soc.

## 2.4.11 Automatic Recovery Operation

For the M3048BP & M5000H-48BP, it is designed with automatic recovery from:

- **Overloads shutoff**
- **Over temperature shutoff**
- **Low battery voltage cutoff.**

Pls to “Program 06 Automatic Overload Restart ” “Program 07: Automatic OverTemp Restart ”and “Program 21 Low DC Cut-Off Voltage” for more details.

## 2.4.12 Batteryless Operation

The M5000H-48BP inverter can operate without batteries.

It can convert DC solar power to AC and/or bypass AC input power to power loads.

This function is designed to save battery investment.

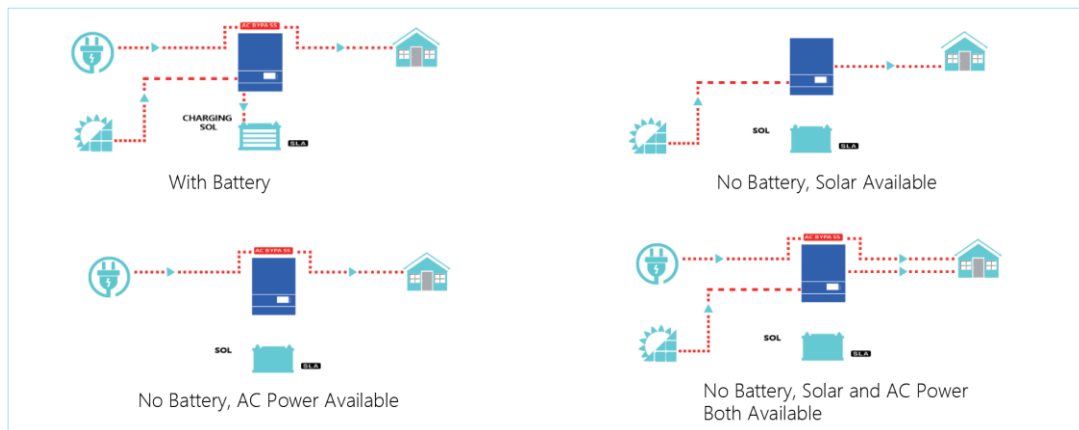
In DC to AC mode, the AC output voltage and power will fluctuate with the PV input power.

If the AC input power supply is unstable, the AC output of the inverter will be unstable as well.

The batteryless operation mode only works with loads that can tolerate voltage fluctuations and can work at

different power supply levels.

Users can also use utility power as to supplement the load consumption to save power.



### 2.4.13 Advanced Utility Charging & Bypass Control With Timer

The M3048BP and M5000H-48BP inverters are designed with a timer to control its AC output power and AC charger at preset time frame.

This will enable the inverter to use utility power at off peak hours to save the electricity bills.

### 2.4.14 Automatic Neutral-to-Ground Bonding

The automatic neutral-to-ground bonding feature uses an internal relay that automatically connects the AC neutral output to the vehicle/boat's safety ground ("bonding" it) in Inverter Mode and disconnects it ("un-bonding" it) when they have connected to a qualified external AC source.

This design avoids two neutral-to-ground connections from existing at the same time, thereby preventing an electrical shock hazard between the vehicle/boat's neutral and the external AC source's neutral.

**Note: This feature is standard for M3048BP.**

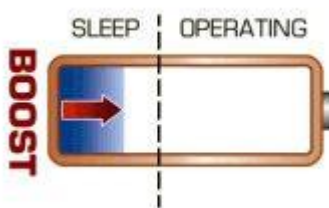
**Our regular M5000H-48BP doesn't have this feature, it is optional for volume order at the time of production.**

### 2.4.15 Lithium Battery Wakeup

Lithium-ion battery will enter sleep mode when it is overdischarged. When the protection circuit is triggered, the voltage could drop to 0Vdc.

Such batteries are assumed to be useless for most inverters which require a minimal DC voltage to be powered on.

It makes it possible for a charger to charge ordinarily.



The M3048BP and M5000H-48BP inverters will use solar or AC input power to wake up overdischarged lithium battery by a boost circuitry.

When they detect a 0V battery, the charger will output a small current of 48Vdc voltage to awaken the lithium batteries.

Once the lithium battery voltage is charged back to normal (over 48Vdc), the charger will proceed with the charging settings of program 19 and 20.

## 2.4.16 Other Features

### Conformal Coating

The entire line of M series 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 of Dry, Clean, Cool with good ventilation.

Working temperature: -10°C to 55°C(14°F to 131°F)

Storage temperature: -15°C to 60°C(5°F to 140°F)

Relative Humidity: 5% to 95%, non-condensing

Cooling: Forced air

**Warning! Operation in a condensing environment will invalid warranty.**

### 3.2 Unpacking and Inspection

Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items in the package:

- \*The inverter x 1
- \*User manual x 1
- \*Communication cable x 1
- \*Current sharing cable x 1
- \*Parallel communication cable x 1

#### Mounting the Unit

Before connecting all wiring, please take off bottom cover by removing two screws as shown below.

Consider the following points before selecting where to install:

Do not mount the inverter on flammable construction materials.

Mount on a solid surface

Install this inverter at eye level in order to allow the LCD display to be read at all times.

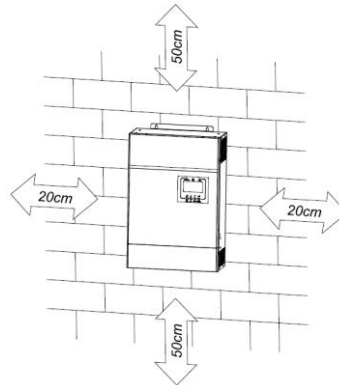
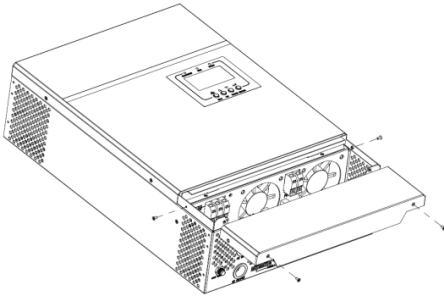
The ambient temperature should be between 0°C and 55°C to ensure optimal operation.

The recommended installation position is to be adhered to the wall vertically.

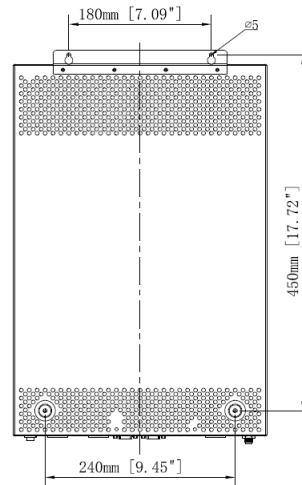
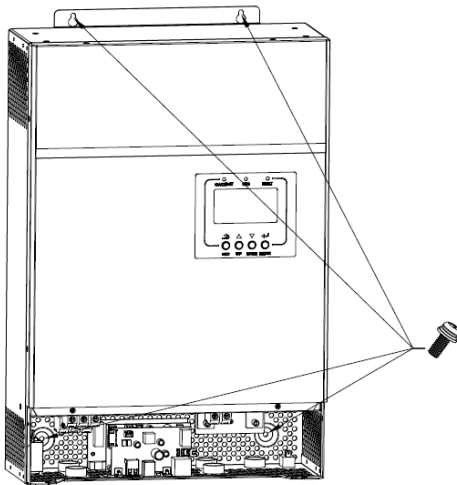
Be sure to keep other objects and surfaces as shown in the right diagram to guarantee sufficient heat dissipation and to have enough space for removing wires.

**SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY**

Install the unit by screwing the six sets of screws.



Install the unit by screwing three screws. It's recommended to use M4 or M5 screws.



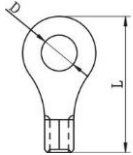
Note: For proper air circulation to dissipate heat, allow a clearance of approx. 20cm to the side and approx. 50 cm above and below the unit. Be sure to install each unit in the same level.

### 3.3 Battery Wiring

Before connecting all wiring, please take off the DC and AC terminal cover by removing their screws.

The DC terminal bolt size is M6 and the diameter of the DC cable holes on the box is 18mm.

It is suggested the battery bank be kept as close as possible to the inverter. The following table is a suggested wiring option for DC cable with length from 1 meter to 5 meters.



Ring terminal:

| Model#      | Maximum Amperage | Battery capacity | Wire Size | Ring Terminal |            |        | Torque value |
|-------------|------------------|------------------|-----------|---------------|------------|--------|--------------|
|             |                  |                  |           | Cable mm2     | Dimensions |        |              |
|             |                  |                  |           |               | D (mm)     | L (mm) |              |
| M3048BP     | 71A              | 100AH            | 1*4 AWG   | 35            | 6.4        | 39.2   | 2-3Nm        |
| M5000H-48BP | 117A             | 200AH            | 1 x 2AWG  | 35            | 6.4        | 39.2   | 2-3Nm        |

Recommended breaker specification of battery for each inverter:

| Model       | 1 unit       |
|-------------|--------------|
| M3048BP     | 100A/60VDC   |
| M5000H-48BP | 150A / 60VDC |

\*If you want to use only one breaker at the battery side for the whole system, the rating of the breaker should be X times current of 1 unit. “X” indicates the number of inverters connected in parallel.

Recommended breaker specification of AC input with single phase:

| Model       | 2 units     | 3 units     | 4 units     | 5 units     | 6 units     |
|-------------|-------------|-------------|-------------|-------------|-------------|
| M3048BP     | 100A/120VAC | 150A/120VAC | 200A/120VAC | 250A/120VAC | 300A/120VAC |
| M5000H-48BP | 100A/230VAC | 150A/230VAC | 200A/230VAC | 250A/230VAC | 300A/230VAC |

Note1: Also, you can use 50A breaker for only 1 unit, and each inverter has a breaker at its AC input.

Note2: Regarding three phase system, you can use 4 poles breaker, the rating is up to the current of the phase which has the maximum units. Or you can follow the suggestion of note 1.

Recommended battery capacity

| Inverter Parallel Quantity     | 2     | 3     | 4     | 5      | 6      |
|--------------------------------|-------|-------|-------|--------|--------|
| Battery Capacity (M3048BP)     | 200AH | 300AH | 400AH | 500AH  | 600AH  |
| Battery Capacity (M5000H-48BP) | 400AH | 600AH | 800AH | 1000AH | 1200AH |

**WARNING!** Be sure that all inverters will share the same battery bank. Otherwise, the inverters will transfer to fault mode.

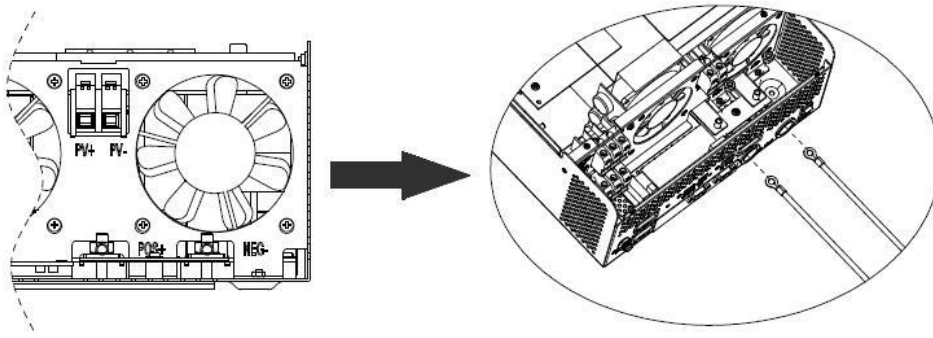
Please follow the above minimum wire size requirement.

One cable is always best, but if there is a problem obtaining for example 100mm<sup>2</sup> cable, use 2\*50mm<sup>2</sup> or 3\*35mm<sup>2</sup> instead, as long as the square area adds up. Performance of any product can be improved by thicker cable and shorter runs, so if in doubt round up and keep the length as short as possible.

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

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

Note: for lead acid battery, the recommended charge current is 0.2C(C-battery capacity)





Please follow below steps to implement battery connection:

Assemble battery ring terminal based on recommended battery cable and terminal size.

Connect all battery packs as units requires. It is suggested to connect at least 200AH capacity battery for 5kva inverter.

Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the bolts are tightened with torque of 2-3 Nm. Make sure polarity at both the battery and the inverter/charge is correctly connected and ring terminals are tightly screwed to the battery terminals.

|  |   |
|--|---|
|  | <p><b>WARNING: Shock Hazard</b><br/>Installation must be performed with care due to high battery voltage in series.</p> |
|--|---|

|   |   |
|---|---|
|  | <p><b>CAUTION!!</b> Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur.<br/><b>CAUTION!!</b> Do not apply anti-oxidant substance on the terminals before terminals are connected tightly.<br/><b>CAUTION!!</b> Before making the final DC connection or closing DC breaker/disconnector, be sure positive (+) must be connected to positive (+) and negative (-) must be connected to negative (-).</p> |
|---|---|


### Reducing RF interference

To reduce the effect of radiated interference, twist the DC cables. To further reduce RF interference, shield the cables with sheathing /copper foil / braiding.

### Taping battery cables together to reduce inductance

Do not keep the battery cables far apart. In case it is not convenient to twist the cables, keep them taped together to reduce their inductance. Reduced inductance of the battery cables helps to reduce induced voltages. This reduces ripple in the battery cables and improves performance and efficiency.

**CAUTION:** For safety operation and regulation compliance, it's requested to install a separate DC over-current protector or disconnect device between battery and inverter. It may not be requested to have a disconnect device in some applications, however, it's still requested to have over-current protection installed. Please refer to typical amperage in below table as required fuse or breaker size.

|   |   |
|---|---|
|  | <p>Over torqueing may cause the bolt to break.<br/><b>Equipment Damage</b><br/>The inverter is not reverse polarity protected. Reversing the battery polarity on the DC</p> |
|---|---|



|                |   |
|----------------|---|
| <b>WARNING</b> | input connections will cause permanent damage to the inverter which is not covered under warranty. Always check polarity before making connections to the inverter. |
|                | The inverter contains capacitors that may produce a spark when first connected to battery. Do not mount in a confined a battery or gas compartment.                 |
|                | Ensure the inverter is off before disconnecting the battery cables, and that AC power is disconnected from the inverter input.                                      |

### 3.4 PV Wiring

**CAUTION: Before connecting to PV modules, please install separately a DC circuit breaker between the inverter and PV modules.**

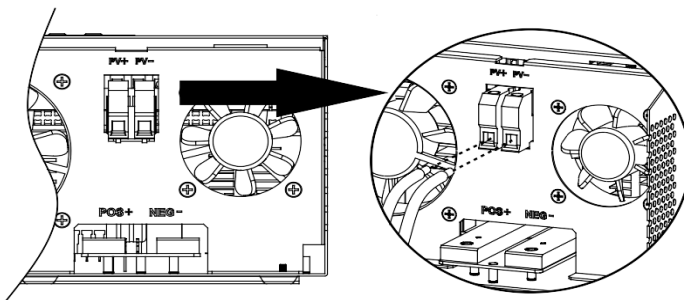
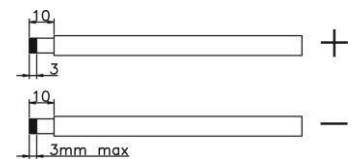
The PV terminal pins can accept cable size up to 8AWG, and the torque for the screws is 1.6Nm.

Max. PV Array Open Circuit Voltage is 450Vdc, pls make sure Open circuit Voltage (Voc) of PV modules does not exceed 450V.

| INVERTER MODEL                     | M3048BP    | M5000H-48BP |
|------------------------------------|------------|-------------|
| Max. PV Array Open Circuit Voltage | 250VDC     | 450Vdc      |
| PV Array MPPT Voltage Range        | 120-250Vdc | 120~430Vdc  |
| Start-up Voltage                   | 150Vdc     | 150Vdc      |

Please follow below steps to implement PV module connection:

1. Remove insulation sleeve 10 mm for positive and negative conductors.
2. Check correct polarity of connection cable from PV modules and PV input connectors. Then, connect positive pole (+) of connection cable to positive pole (+) of PV input connector. Connect negative pole (-) of connection cable to negative pole (-) of PV input connector.



3. Make sure the wires are securely connected.

**Don't reverse the PV input polarity or damage will occur.**

### 3.5 AC Wiring

**CAUTION!!** Before connecting to AC input power source, please install a separate AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during

maintenance and fully protected from over current of AC input. The recommended spec of AC breaker is 50A for 5KVA.

CAUTION!! There are two terminal blocks with “IN” and “OUT” markings. Please do NOT mis-connect input and output connectors.

WARNING! All wiring must be performed by a qualified personnel.

WARNING! It's very important for system safety and efficient operation to use appropriate cable for AC input connection. To reduce risk of injury, please use the proper recommended cable size as below.

Suggested cable requirement for AC wires

| Model       | Gauge | Torque Value |
|-------------|-------|--------------|
| M3048BP     | 8 AWG | 1.2~ 1.6Nm   |
| M5000H-48BP | 8 AWG | 1.2~ 1.6Nm   |

Please follow below steps to implement AC input/output connection:

\*Before making AC input/output connection, be sure to open DC protector or disconnecter first.

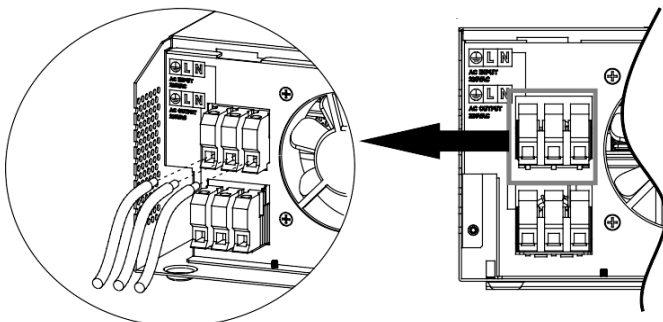
\*Remove insulation sleeve 10mm for six conductors. And shorten phase L and neutral conductor N 3 mm.

\*Insert AC input wires according to polarities indicated on terminal block and tighten the terminal screws.

Be sure to connect PE protective conductor  first.


→Ground (yellow-green)


L→LINE (brown or black)



N→Neutral (Blue)

Be sure that AC power source is disconnected before attempting to hardwire it to the unit.

\*Then, insert AC output wires according to polarities indicated on terminal block and tighten terminal screws. Be sure to connect PE protective conductor  first.

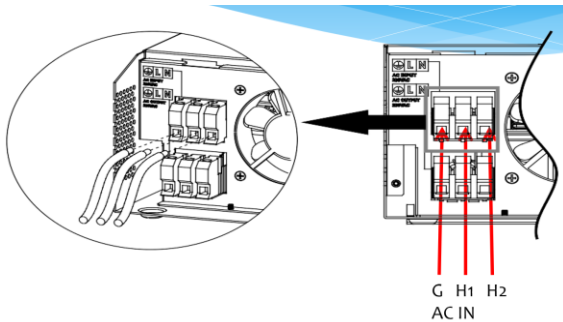
|  |                       |                |
|--|-----------------------|----------------|
|  | L                     | N              |
| Ground (yellow-green)  | LINE (brown or black) | Neutral (blue) |

\*Make sure the wires are securely connected.

### Wiring Instruction for M5000H 230V Single Phase inverter in 120/240 split phase system

Sigineer Power's M5000H-48BP 230V single phase inverter is an international model which can be used in 120/240V Split phase systems in America and also 230Vac single phase systems.

Users from 120/240Vac 60Hz split phase phase electricity system( 120VL+120V L+ N+G) must strictly follow our wiring instructions, or damage to inverter will occur.



- 1 Connect Ground wire to Ground terminal.
- 2 Connect AC input Hot1 to Input Hot.
- 3 Connect AC input Hot2 to Input Neutral.
- 4 Connect Output Hot to AC output Hot1.
- 5 Connect output Neutral to AC output Hot2.
- 6 DON'T CONNECT AC INPUT NEUTRAL or load neutral to the inverter.**

NOTE: The M5000H-48BP can work with Sigineer Power transformer to split the 240Vac into 120/240Vac voltages.

#### CAUTION: Important

Be sure to connect AC wires with correct polarity. If L and N wires are reverseed, it may cause utility short-circuited when these inverters are worked in parallel operation.

CAUTION: Appliances such as air conditioner are required at least 2~3 minutes to restart because it's required to have enough time to balance refrigerant gas inside of circuits. If a power shortage occurs and recovers in a short time, it will cause damage to your connected appliances. To prevent this kind of damage, please check with manufacturer of air conditioner that if it's equipped with time-delay function before installation. Otherwise, this off grid solar inverter will trigger overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

#### Preventing Paralleling of the AC Output

The AC output of the unit should never be connected to the utility power / generator.

Such a connection may result in parallel operation of the different power sources and AC power from the utility / generator will be fed back into the unit which will instantly damage the inverter and may also pose a fire and safety hazard.

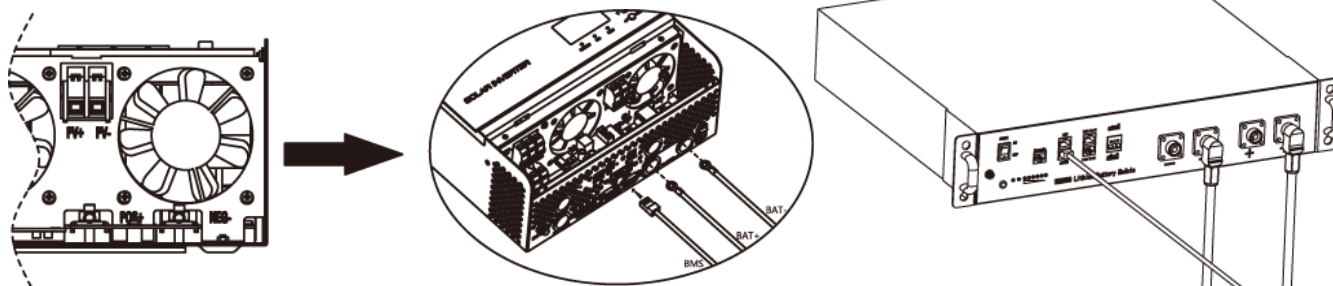
### 3.6 Communication With Lithium Batteries

The BMS port allows the M series inverters to communicate with lithium batteries BMS with the same protocol. Our M series inverters support a growing number of lithium batteries from the big brands.

To get more details of our BMS protocol and the compatible lithium battery models, pls email us at [info@sigineer.com](mailto:info@sigineer.com).

Please follow below steps to implement lithium battery connection:

Connect one end of RJ45 of battery to BMS communication port of inverter. Connect the other end of RJ45 cable to battery communication port.



### Lithium Battery Connection (optional)

If choose lithium battery for the inverter, you are allowed to use the lithium battery which has been configured. There're two connectors on the lithium battery, RJ45 port of BMS and power cable.

Please follow below steps to implement lithium battery connection:

Assemble battery ring terminal based on recommended battery cable and terminal size (same as Lead acid, see section Lead-acid Battery connection for details) .

Insert the ring terminal of battery cable flatly into battery connector of inverter and make sure the bolts are tightened with torque of 2-3Nm. Make sure polarity at both the battery and the inverter/charge is correctly connected and ring terminals are tightly screwed to the battery terminals.

Connect the end of RJ45 of battery to BMS communication port of inverter.

The other end of RJ45 insert to battery communication port.

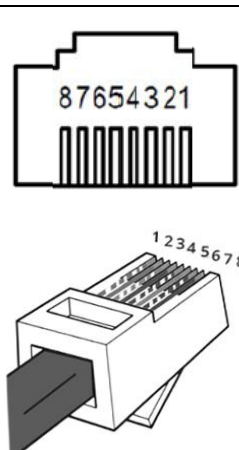
Note: if you choose lithium battery, make sure to connect the BMS communication cable between the battery and the inverter. You need to choose battery type as “lithium battery”

### Lithium battery communication and setting

In order to communicate with battery BMS, you should set the battery type to “LI” in Program 5. Then the LCD will switch to Program 36, which is to set the protocol type. There are several RS485 protocols in the inverter which can match some customized battery, Please consult with supplier first before you choosing the battery model.

Connect the end of RJ45 of battery to BMS communication port of inverter

Make sure the lithium battery BMS port connects to the inverter is Pin to Pin, the inverter BMS port and RS485 port pin assignment shown as below:

|  | PCB Type | CAN PROTOCOL |            |
|---|----------|--------------|------------|
|   | Pinout   | BMS port     | RS485 port |
|   | Pin#1    | RS485B       | RS485B     |
|   | Pin#2    | RS485A       | RS485A     |
|   | Pin#3    | --           | --         |
|   | Pin#4    | CANH         | --         |
|   | Pin#5    | CANL         | --         |
|   | Pin#6    | --           | --         |
|   | Pin#7    | --           | --         |
|   | Pin#8    | --           | --         |

### LCD setting For Lithium Batteries

To make the inverter communicate with the battery BMS, the battery type should be set to “LI” in Program

05.

Please refer to “05: LI” for details.

Note:

When multiple inverters are paralleled with multiple lithium batteries, please follow the below setup.

1 Out of the lithium batteries, set one unit as the master and the rest as slave as per the lithium DIP/ADS switches.

2 Connect the master battery to the inverter which shows “Host”.

If the user connects the master battery to one of the rest the slave inverters in the group, the inverter can automatically work as the master unit, but the communication will be slower.

## 3.7 Inverter Parallel Operation

The M5000H-48BP inverters can be stacked up to 6 pcs to expand output power in 230Vac or create 230/400Vac three phase.

The M3048BP can be stacked up to 6 pcs to expand output power in 120Vac or create 120/208Vac three phase.

When they are stacked, all the inverters will share the loads evenly. Each will be ready output full power even the load is under nominal power, none of them will go into power saver mode.

This is designed to handle sudden loads fluctuations.

Note:

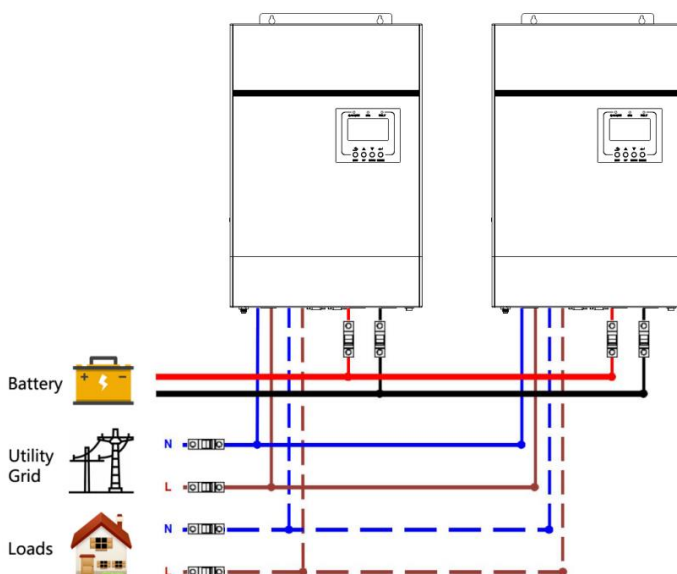
When there is more than one inverter paralleled in one phase, if the slave unit shut off, the rest inverters in the system will continue operate.

If the master unit shuts off, all the rest inverters will shut off.

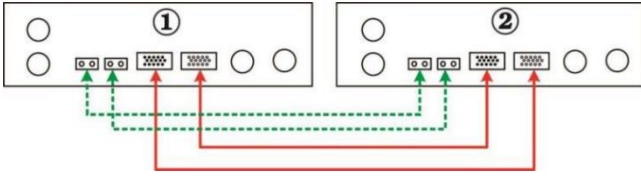
### 3.7.1 Parallel in Single Phase to Expand Power

Two inverters in parallel:

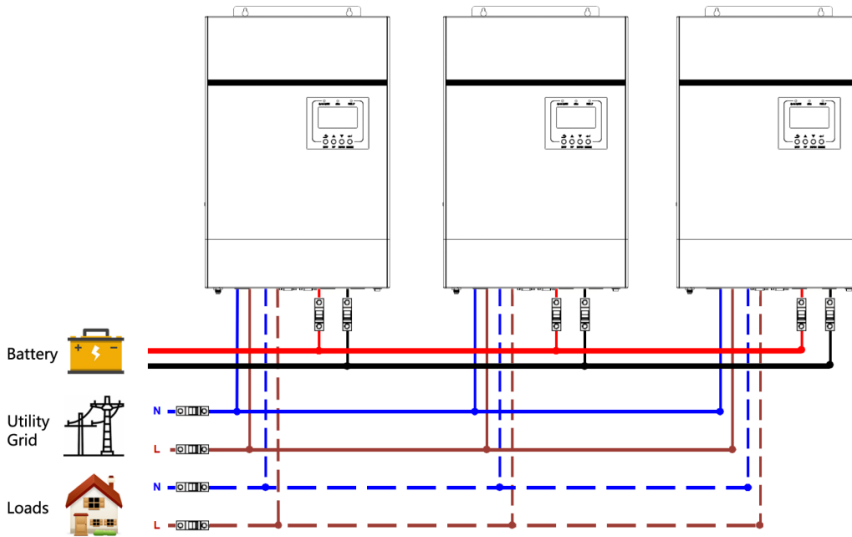
Power Wire Connection



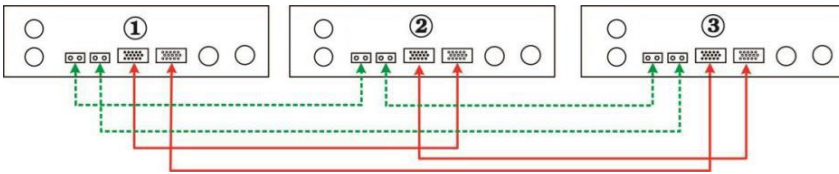
Communication Wire Connection



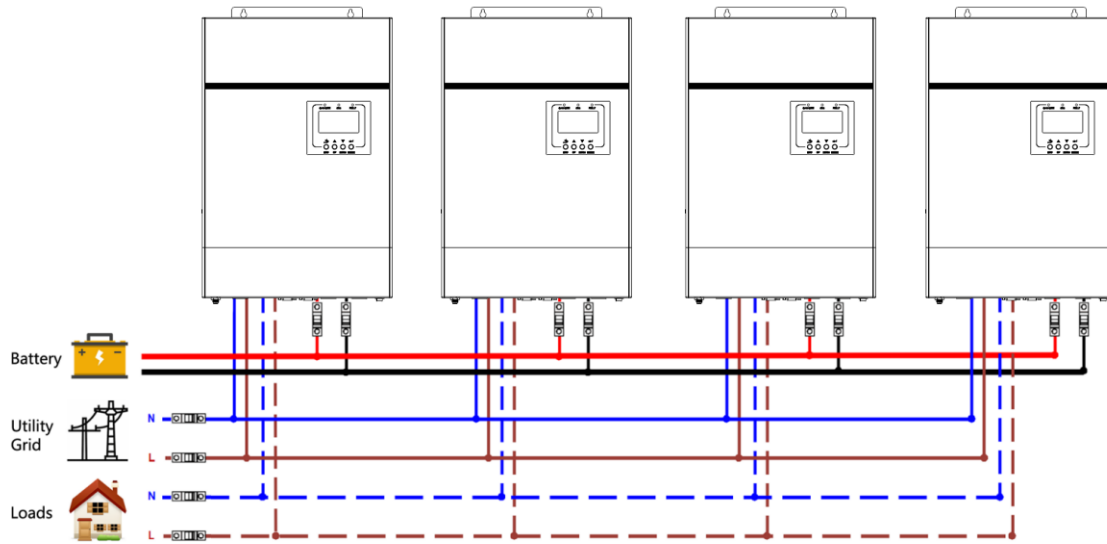
### Three inverters in parallel: Power Wire Connection



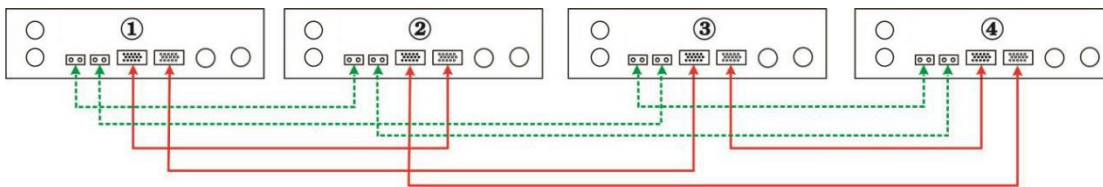
### Communication Wire Connection



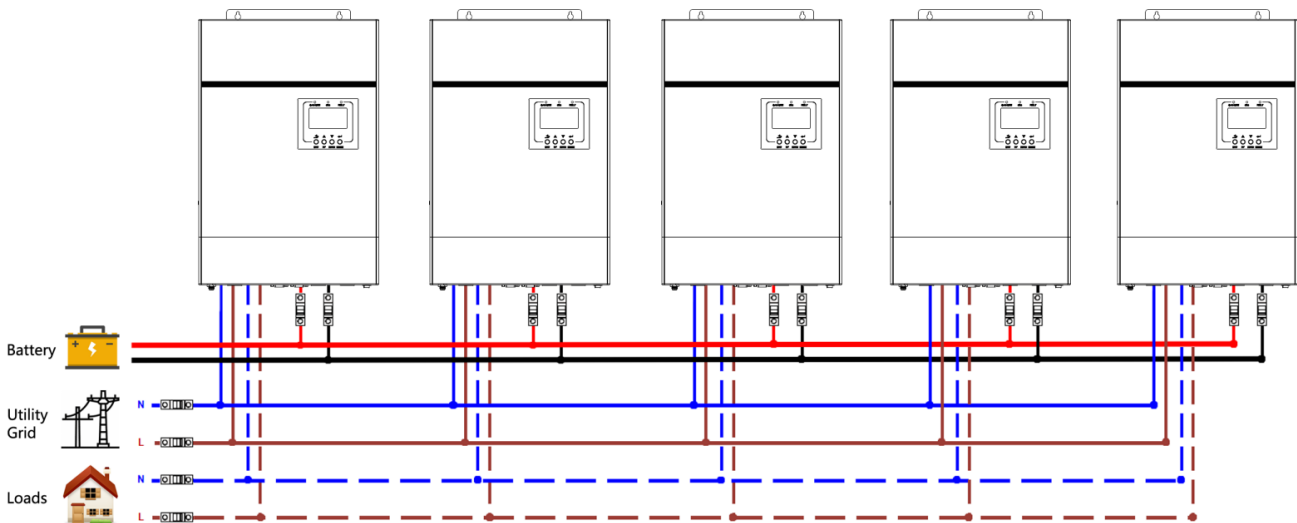
### Four inverters in parallel: Power Wire Connection



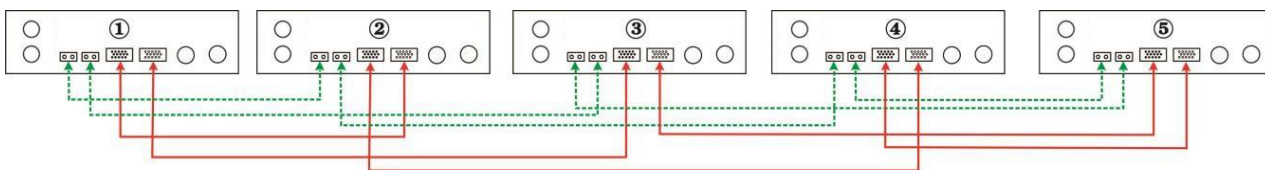
### Communication Wire Connection



### Five inverters in parallel: Power Wire Connection

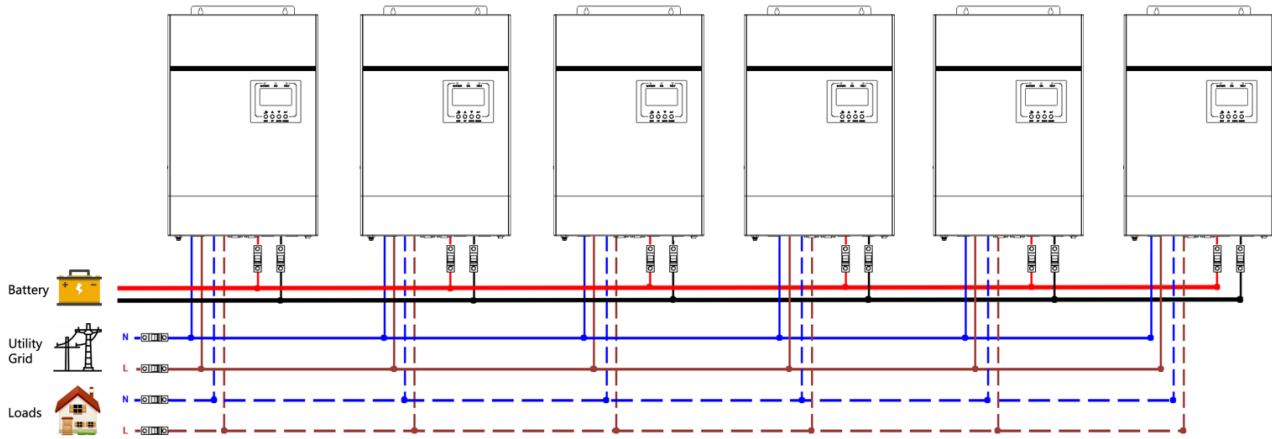


### Communication Wire Connection

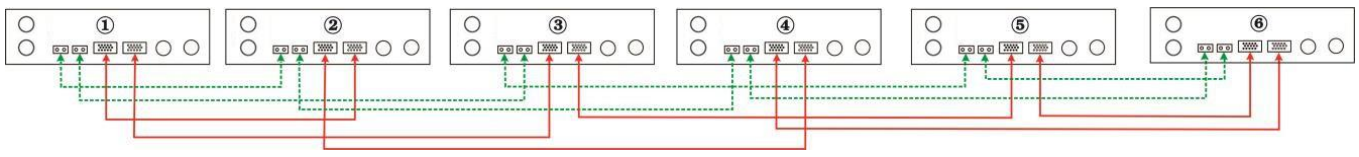


### Six inverters in parallel: Power Wire Connection





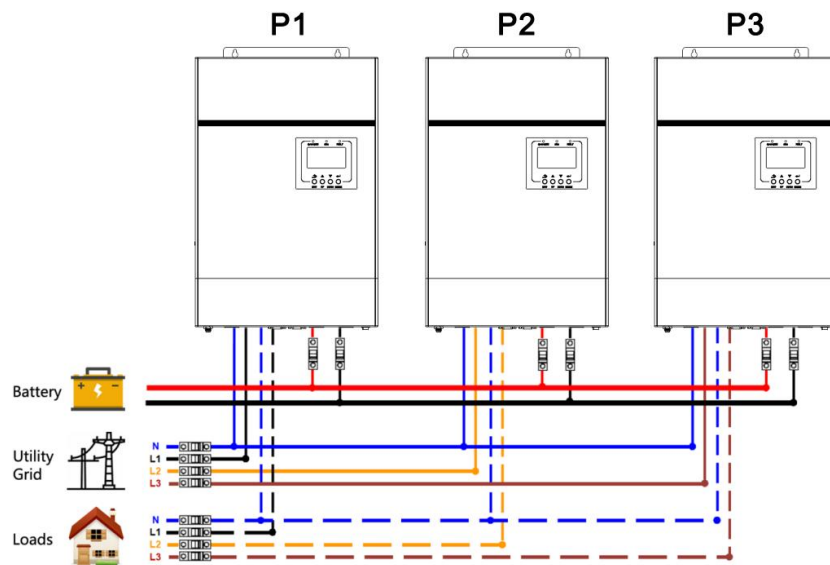
### Communication Wire Connection



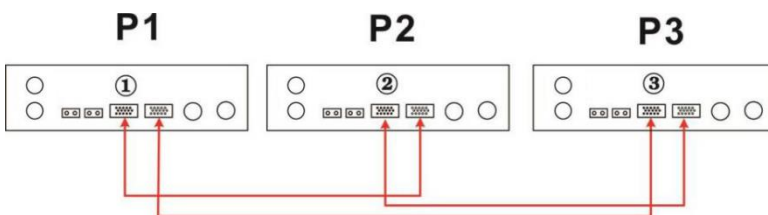
## 3.7.2 Parallel To Form Three Phase

One inverter in each phase:

Power Wire Connection

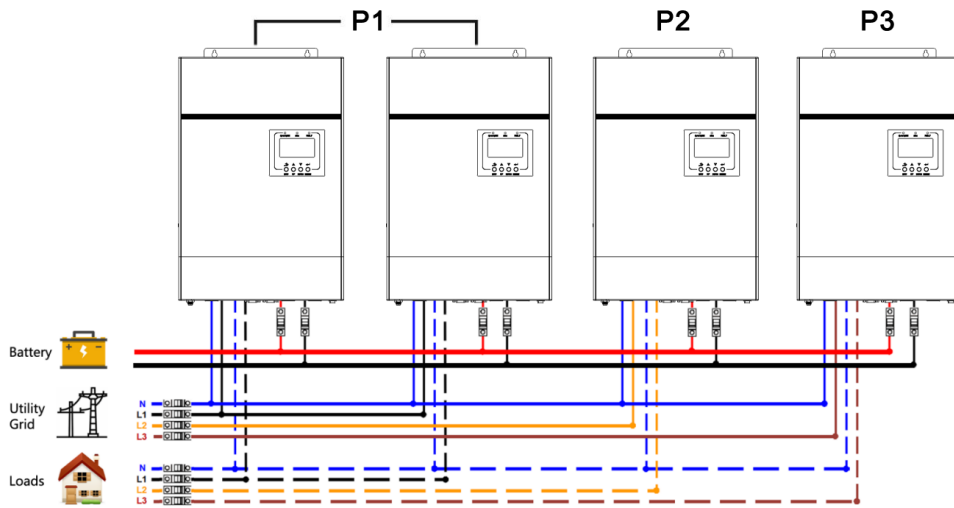


### Communication Wire Connection

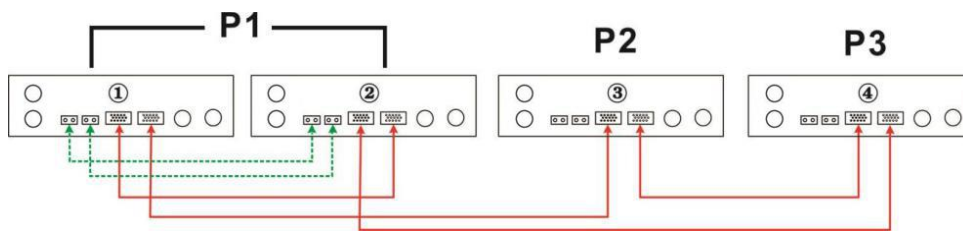


Two inverters in one phase and only one inverter for the remaining phases:

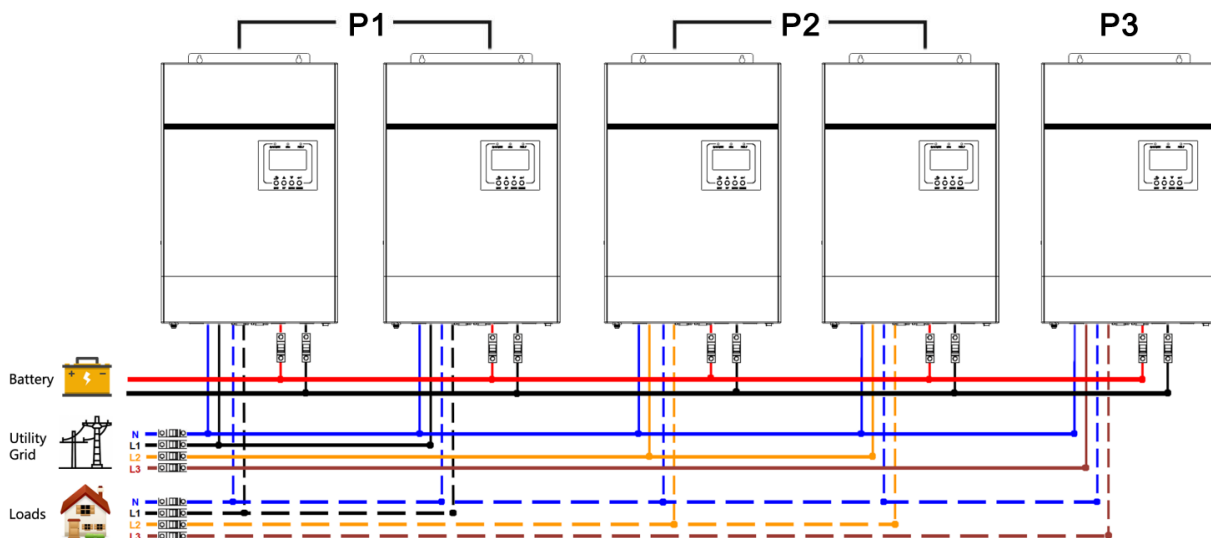
Power Wire Connection



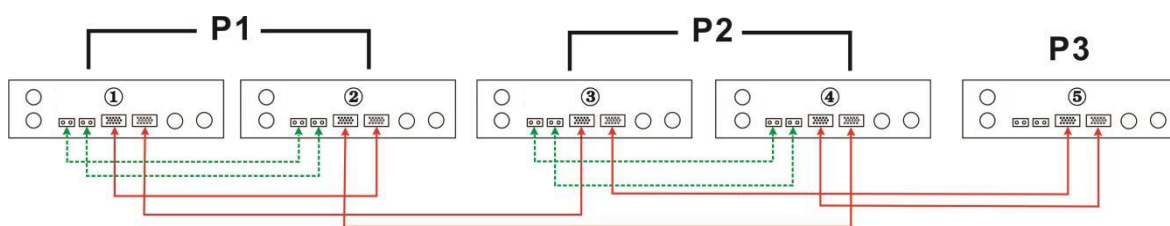
Communication Wire Connection



Two inverters in two phases and only one inverter for the remaining phase:  
Power Wire Connection

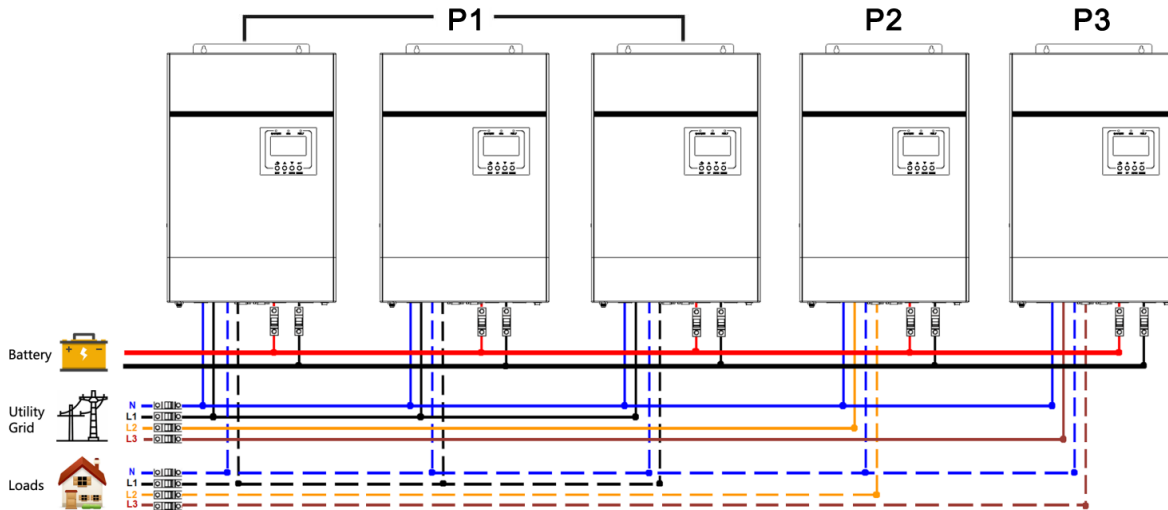


Communication Wire Connection

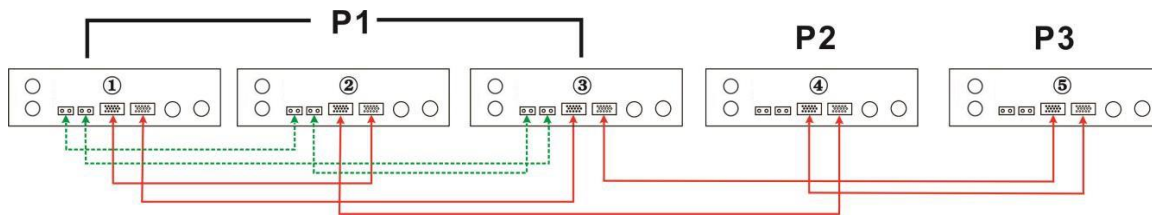


Three inverters in one phase and only one inverter for the remaining two phases:

Power Wire Connection

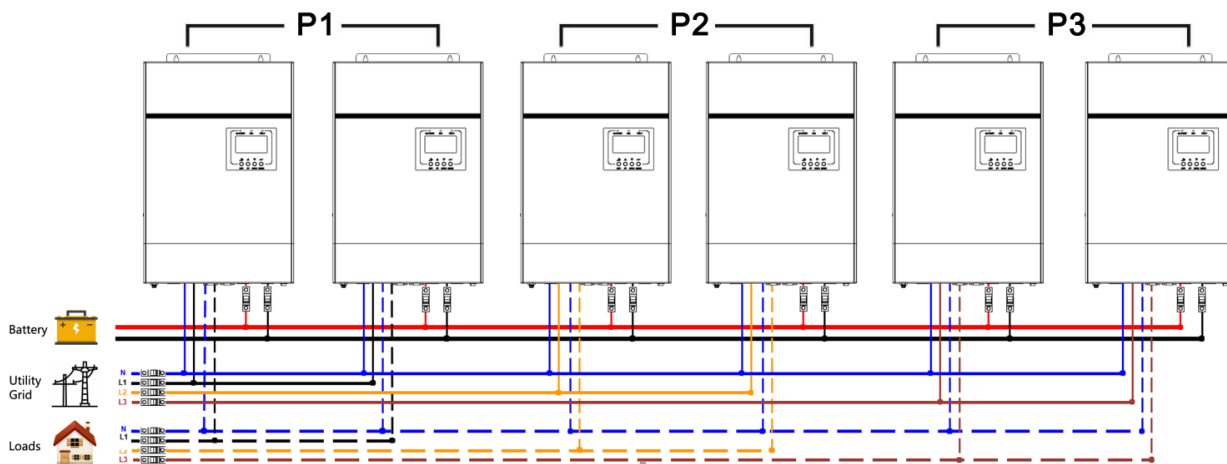


Communication Wire Connection

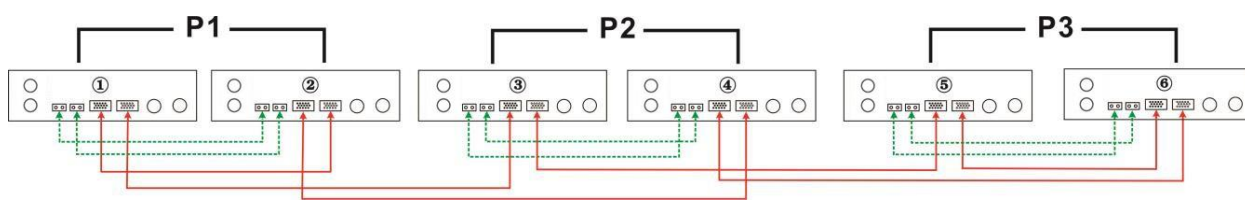


Two inverters in each phase:

Power Wire Connection

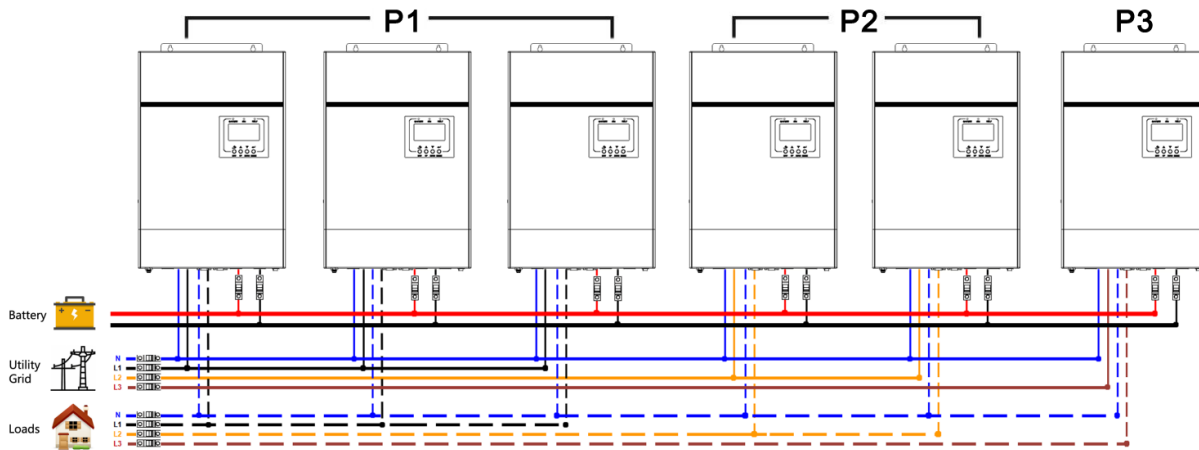


Communication Wire Connection

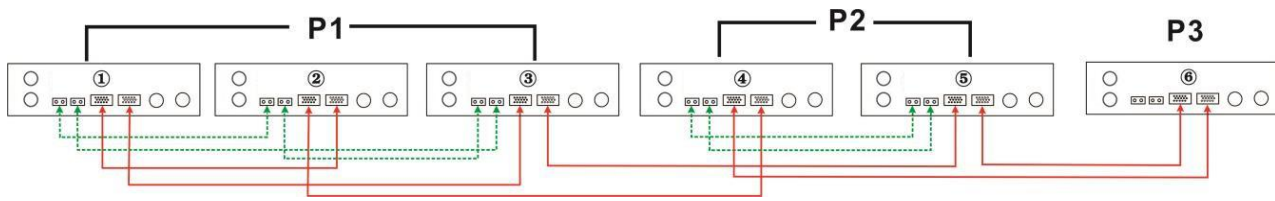


Three inverters in one phase, two inverters in second phase and one inverter for the third phase:

## Power Wire Connection

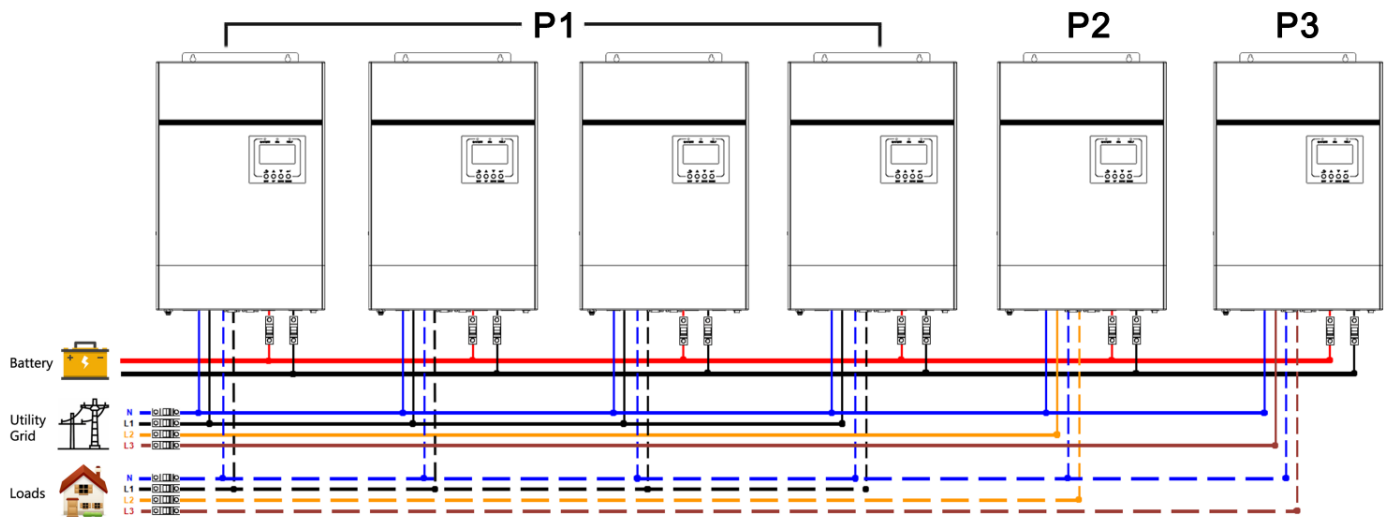


## Communication Wire Connection

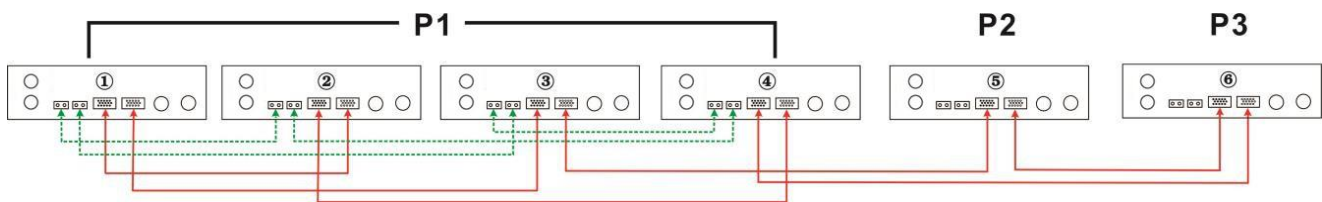


Four inverters in one phase and one inverter for the other two phases:

## Power Wire Connection



## Communication Wire Connection

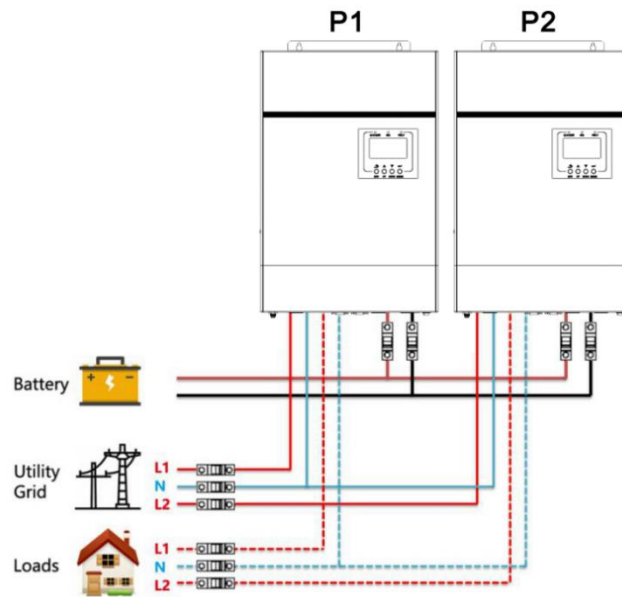


**WARNING:** Do not connect the current sharing cable between the inverters which are in different phases.

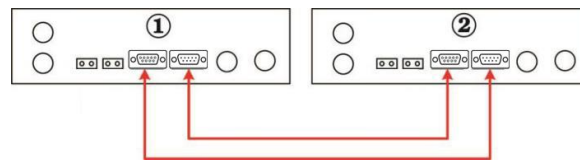
### 3.7.2 Parallel To Form Split Phase

One inverter in each phase:

**Power Connection**

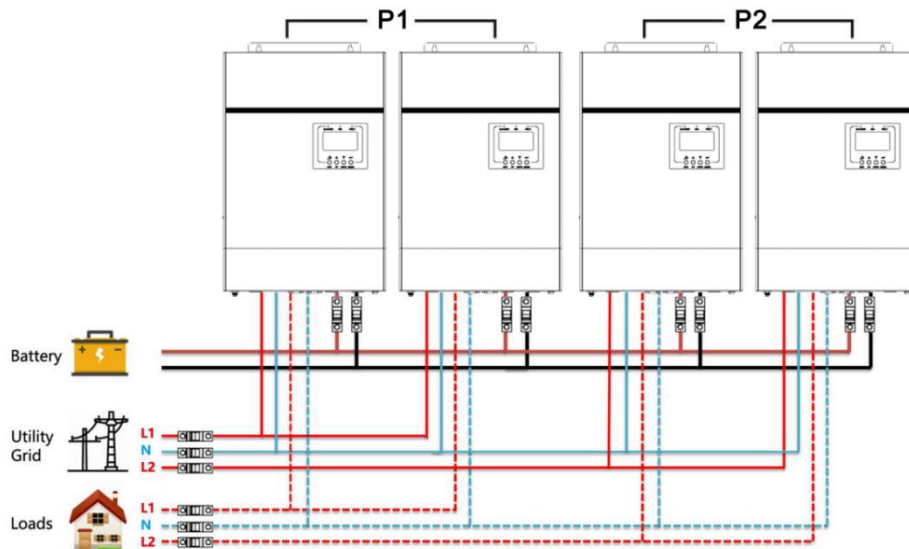


**Communication Connection**

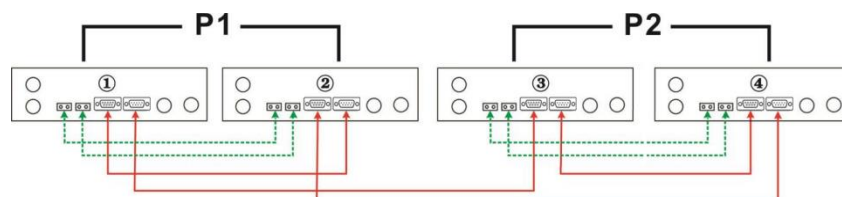


Two inverters in each phase:

**Power Connection**

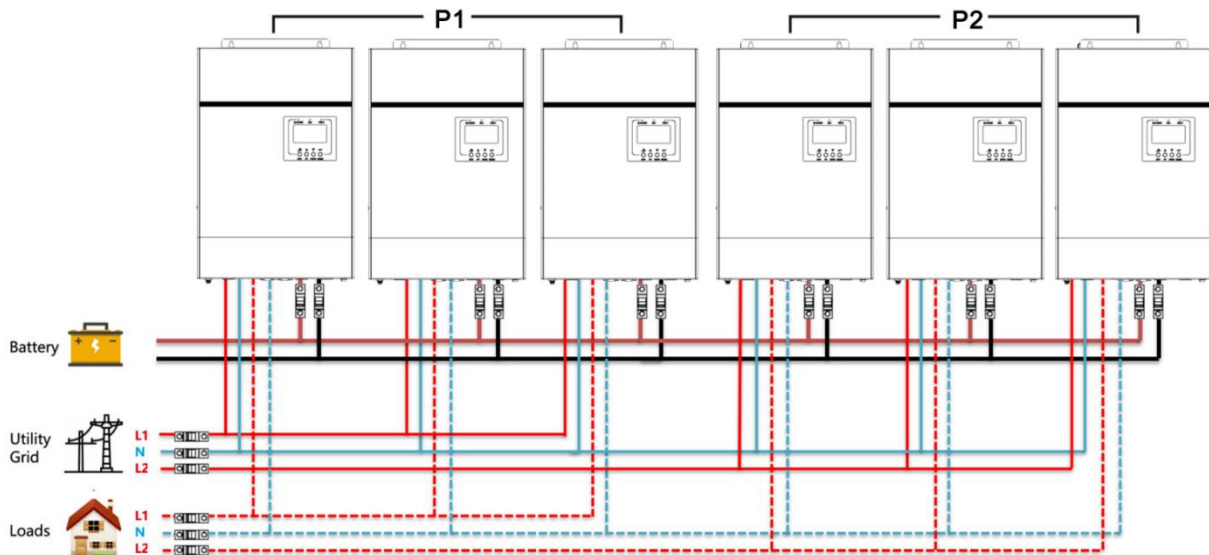


**Communication Connection**

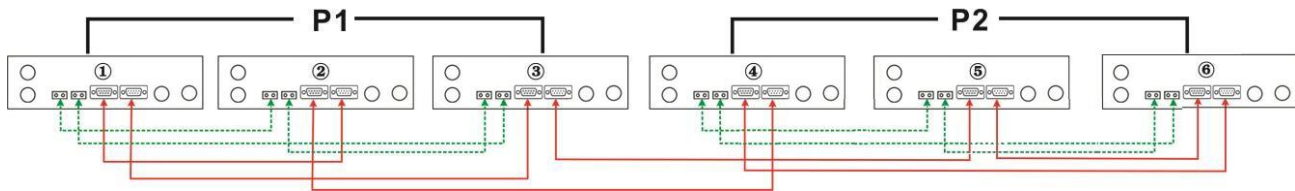


Three inverters in each phase:

## Power Connection



## Communication Connection



## 3.7.4 LCD Setting For Parallel Operation

Setting Program: Please refer to program 23

Commissioning

Parallel in single phase

Step 1: Check the following requirements before commissioning:

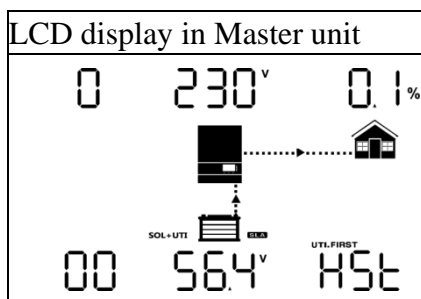
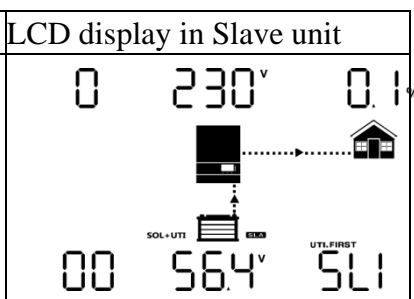
Correct wire connection

Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

Step 2: Turn on each unit and set “PAL” in LCD setting program 23 of each unit. And then shut down all units.

Note: It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

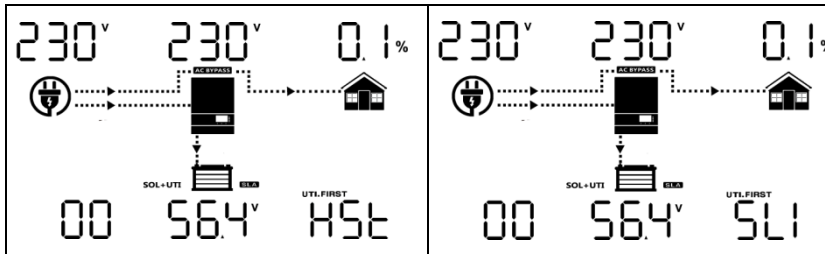
Step 3: Turn on each unit.

| LCD display in Master unit  | LCD display in Slave unit   |
|---|---|
|  |  |

Note: Master and slave units are randomly defined.

Step 4: Switch on all AC breakers of Line wires in AC input. It's better to have all inverters connect to utility at the same time. If not, it will display warning 15.

| LCD display in Master unit | LCD display in Slave unit |
|----------------------------|---------------------------|
|----------------------------|---------------------------|



Step 5: If there is no more fault alarm, the parallel system is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

### Parallel in three phase

Step 1: Check the following requirements before commissioning:

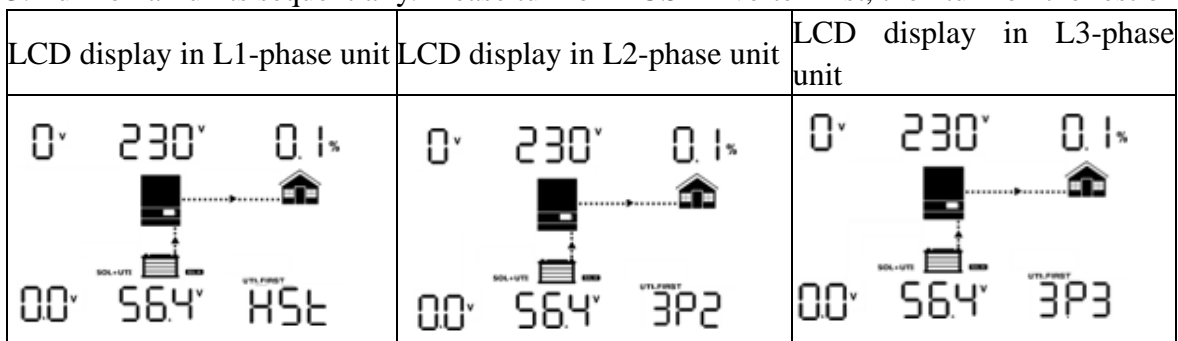
Correct wire connection

Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

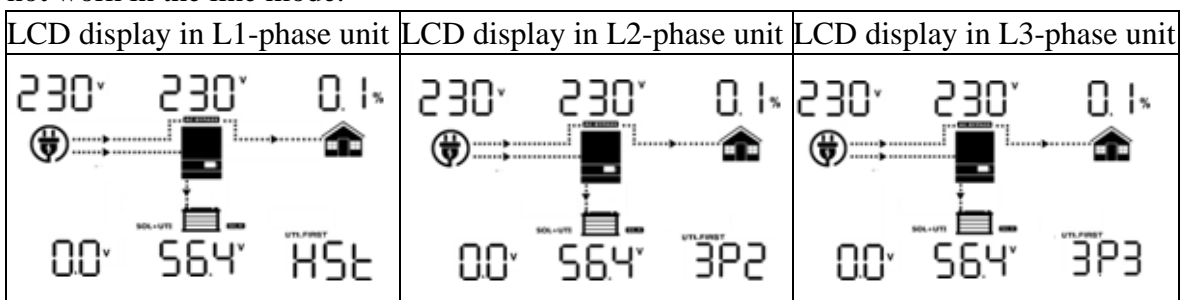
Step 2: Turn on all units and configure LCD program 23 as 3P1, 3P2 and 3P3 sequentially. Then shut down all units.

Note: It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on all units sequentially. Please turn on HOST inverter first, then turn on the rest one by one.



Step 4: Switch on all AC breakers of Line wires in AC input. If AC connection is detected and three phases are matched with unit setting, they will work normally. Otherwise, they will display warning 15/16 and will not work in the line mode.



Step 5: If there is no more fault alarm, the system to support 3-phase equipment is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

Note 1: If there's only one inverter in L1-phase, the LCD will show as "HS". If there is more than one inverter in L1-phase, the LCD of the HOST inverter will show as "HS", the rest of L1-phase inverters will show as "3P1".

Note 2: To avoid overload occurring, before turning on breakers in load side, it's better to have whole system in operation first.

Note 3: Transfer time for this operation exists. Power interruption may happen to critical devices, which cannot bear transfer time.



### Parallel in Split Phase

Step 1: Check the following requirements before commissioning:

Correct wire connection

Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected together.

Step 2: Turn on all units and configure LCD program 23 as 2P0 on phase1 units, then set as 2P2(or 2P1) on phase2 units:

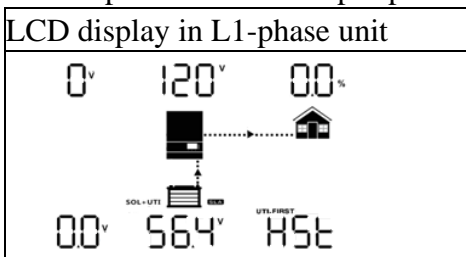
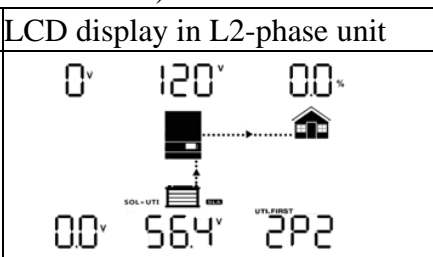
2P0+2P1: split phase 120V/208V

2P0+2P2: split phase 120V/240V

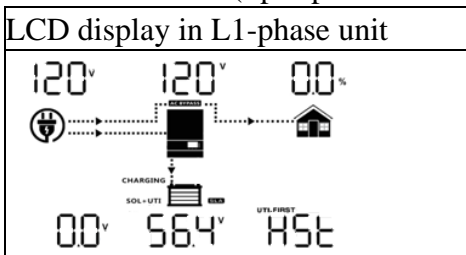
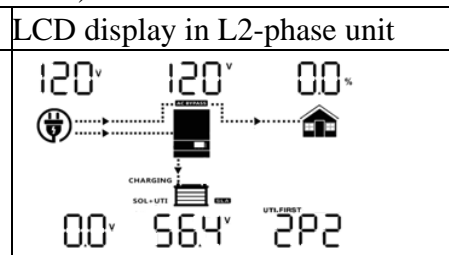
Note: It's necessary to turn off switch when setting LCD program. Otherwise, the setting can not be programmed.

Step 3: Turn on all units sequentially. Please turn on HOST inverter first, then turn on the rest one by one.

(The below pictures show as split phase 120V/240V)

| LCD display in L1-phase unit  | LCD display in L2-phase unit   |
|---|--|
|  |  |

Step 4: Switch on all AC breakers of Line wires in AC input. If AC connection is detected and split phases are matched with unit setting, they will work normally. Otherwise, they will display warning 15/16 and will work in the line mode. (Split phase 120V/240V)

| LCD display in L1-phase unit  | LCD display in L2-phase unit   |
|---|--|
|  |  |

Step 5: If there is no more fault alarm, the system with split phase output is completely installed.

Step 6: Please switch on all breakers of Line wires in load side. This system will start to provide power to the load.

Note 1: If there's only one inverter in L1-phase, the LCD will show as "HST". If there is more than one inverter in L1-phase, the LCD of the HOST inverter will show as "HST", the rest of L1-phase inverters will show as "2P0".

Note 2: To avoid overload occurring, before turning on breakers in load side, it's better to have whole system in operation first.

Note 3: Transfer time for this operation exists. Power interruption may happen to critical devices, which cannot bear transfer time.

## 3.8 Communication with Computer

The inverter can be monitored on the computer.

Please use the communication cable to connect to inverter and PC. Install the "SG Solar Power Monitor" on a computer and follow on-screen instruction to install the monitoring software. For the detailed software operation, please check user manual of software.

## 3.9 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.



## 4 Maintenance & Troubleshooting

This troubleshooting guide contains information about how to troubleshoot possible error conditions while using the M3048BP and M5000H-48BP Solar Power Inverter/Chargers.

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

### Indicator and Buzzer

| Fault Code | Fault Event                  | Icon on   |
|------------|------------------------------|---|
| 01         | Fan is locked                |    |
| 02         | Over temperature             |    |
| 03         | Battery voltage is too high  |    |
| 04         | Battery voltage is too low   |    |
| 05         | Output short circuited       |    |
| 06         | Output voltage is too high.  |   |
| 07         | Overload time out            |  |
| 08         | Bus voltage is too high      |  |
| 09         | Bus soft start failed        |  |
| 51         | Over current or surge        |  |
| 52         | Bus voltage is too low       |  |
| 53         | Inverter soft start failed   |  |
| 55         | Over DC voltage in AC output |  |
| 56         | Battery connection is open   |  |
| 57         | Current sensor failed        |  |
| 58         | Output voltage is too low    |  |
| 60         | Negative power fault         |  |
| 61         | PV voltage is too high       |  |
| 62         | Internal communication error |  |

|    |           |   |
|----|-----------|---|
| 80 | CAN fault |  |
| 81 | Host loss |  |

## Warning Indicator

| Warning Code | Warning Event                              | Audible Alarm              | Icon flashing   |
|--------------|--|----------------------------|-----------------|
| 01           | Fan is locked                              | Beep 3 times every second  | 01 <sup>△</sup> |
| 02           | Over temperature                           | Beep once every second     | 02 <sup>△</sup> |
| 03           | Battery is over-charged                    | Beep once every second     | 03 <sup>△</sup> |
| 04           | Low battery                                | Beep once every second     | 04 <sup>△</sup> |
| 07           | Overload                                   | Beep once every 0.5 second | 07 <sup>△</sup> |
| 10           | Output power derating                      | Beep twice every 3 seconds | 10 <sup>△</sup> |
| 12           | Solar charger stops due to low battery     | Beep once every second     | 12 <sup>△</sup> |
| 13           | Solar charger stops due to high PV voltage | Beep once every second     | 13 <sup>△</sup> |
| 14           | Solar charger stops due to overload        | Beep once every second     | 14 <sup>△</sup> |
| 15           | Parallel input utility grid different      | Beep once every second     | 15 <sup>△</sup> |
| 16           | Parallel input phase error                 | Beep once every second     | 16 <sup>△</sup> |
| 17           | Parallel output phase loss                 | Beep once every second     | 17 <sup>△</sup> |
| 18           | Buck over current                          | Beep once every second     | 18 <sup>△</sup> |
| 19           | Battery disconnect                         | No beep                    | 19 <sup>△</sup> |
| 20           | BMS communication error                    | Beep once every second     | 20 <sup>△</sup> |
| 21           | PV power insufficient                      | Beep once every second     | 21 <sup>△</sup> |
| 22           | Parallel forbidden without battery         | Beep once every second     | 22 <sup>△</sup> |
| 25           | Parallel inverters' capacity different     | Beep once every second     | 25 <sup>△</sup> |
| 33           | BMS communication loss                     | Beep once every second     | 33 <sup>△</sup> |

|    |                            |                        |                 |
|----|----------------------------|------------------------|-----------------|
| 34 | Cell over voltage          | Beep once every second | 34 <sup>△</sup> |
| 35 | Cell under voltage         | Beep once every second | 35 <sup>△</sup> |
| 36 | Total over voltage         | Beep once every second | 36 <sup>△</sup> |
| 37 | Total under voltage        | Beep once every second | 37 <sup>△</sup> |
| 38 | Discharge over current     | Beep once every second | 38 <sup>△</sup> |
| 39 | Charge over current        | Beep once every second | 39 <sup>△</sup> |
| 40 | Discharge over temperature | Beep once every second | 40 <sup>△</sup> |
| 41 | Charge over temperature    | Beep once every second | 41 <sup>△</sup> |
| 42 | Mosfet over temperature    | Beep once every second | 42 <sup>△</sup> |
| 43 | Battery over temperature   | Beep once every second | 43 <sup>△</sup> |
| 44 | Battery under temperature  | Beep once every second | 44 <sup>△</sup> |
| 45 | System shut down           | Beep once every second | 45 <sup>△</sup> |

## TroubleShooting

| Problem   | LCD/LED/Buzzer  | Explanation   | What to do   |
|---|---|---|--|
| Unit shuts down Automatically during startup process.                   | LCD/LEDs and buzzer will be active for 3 seconds and then complete off. | The battery voltage is too low . (<1.91V/Cell)  | 1.Re-charge battery.<br>2.Replace battery.   |
| No response after power on.   | No indication.  | 1.The battery voltage is far too low. (<1.4V/Cell)<br>2.Battery polarity is connected reversed. | 1. Check if batteries and the wiring are connected well.<br>2.Re-charge battery.<br>3.Replace battery.   |
| Mains exist but the unit works in battery mode.                         | Input voltage is 0 on the LCD and green LED is flashing.                | Input protector is tripped.   | Check if AC breaker is tripped and AC wiring is connected well.  |
|   | Green LED is flashing.  | Insufficient quality of AC power. (Shore or Generator)  | 1. Check if AC wires are too thin and/or too long.<br>2. Check if generator (if applied) is working well or if input voltage range setting is correct. (UPS→Appliance) |
|   | Green LED is flashing.  | Set “Battery First” or “Solar First” as the priority of output source.                          | Change output source priority to Utility first.  |
| When it's turned on, internal relay is switching on and off repeatedly. | LCD display and LEDs are flashing                                       | Battery is disconnected.  | Check if battery wires are connected well.   |
| Buzzer beeps  | Fault code 01   | Fan fault.  | 1.Check whether all fans are working properly.   |

|   |                     |   |   |
|---|---------------------|---|---|
| <p>continuously and red LED is on.(Fault code)</p> <p>Buzzer beeps once every second, and red LED is flashing.<br/>(Warning code)</p> |                     |   | 2.Replace the fan.  |
|   | Fault code 02       | Internal temperature of component is over 100°C.                  | 1.Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.<br>2.Check whether the thermistor plug is loose.  |
|   | Fault code 03       | Battery is over-charged.  | Restart the unit, if the error happens again, please return to repair center.   |
|   |                     | The battery voltage is too high.                                  | Check if spec and quantity of batteries are meet requirements.  |
|   | Warning code 04     | The battery voltage/SOC is too low.                               | 1.Measure battery voltage in DC input.<br>2.Check battery SOC in LCD when use Li battery.<br>3.Recharge the battery.  |
|   | Fault code 05       | Output short circuited.   | Check if wiring is connected well and remove abnormal load.   |
|   | Fault code 06/58    | Output abnormal (Inverter voltage is over 150Vac or below 40Vac). | 1.Reduce the connected load.<br>2. Restart the unit, if the error happens again, please return to repair center.  |
|   | Fault code 07       | The inverter is overload 110% and time is up.                     | Reduce the connected load by switching off some equipment.  |
|   | Fault code 08       | Bus voltage is too high.  | 1.If you connect to a lithium battery without communication, check whether the voltage points of the program 19 and 21 are too high for the lithium battery.<br>2. Restart the unit, if the error happens again, please return to repair center.  |
|   | Fault code 09/53/57 | Internal components failed.                                       | Restart the unit, if the error happens again, please return to repair center.   |
|   | Warning code 15     | The input status is different in parallel system.                 | Check if AC input wires of all inverters are connected well.  |
|   | Warning code 16     | Input phase is not correct.                                       | Change the input phase S and T wiring.  |
|   | Warning code 17     | The output phase not correct in parallel.                         | 1.Make sure the parallel setting are the same system(single or parallel; 3P1,3P2,3P3).<br>2.Make sure all phases inverters are power on.  |
|   | Warning code 20     | Li battery can't communicate to the inverter.                     | 1.Check whether communication line is correct connection between inverter and battery.<br>2.Check whether BMS protocol type is correct setting.   |
|   | Fault code 51       | Over current or surge.  | Restart the unit, if the error happens again, please return to repair center.   |
|   | Fault code 52       | Bus voltage is too low.   |   |
|   | Fault code 55       | Output voltage is unbalanced                                      |   |
|   | Fault code 56       | Battery is not connected well or fuse is burnt.                   | If the battery is connected well, please return to repair center.   |
|   | Fault code 60       | Negative power fault  | 1. Check whether the AC output connected to the grid input.<br>2. Check whether Program 8 settings are the same for all parallel inverters<br>3. Check whether the current sharing cables are connected well in the same parallel phases.<br>4. Check whether all neutral wires of all parallel units are connected together.<br>5. If problem still exists, contact repair center. |
|   | Fault code 80       | CAN fault   | 1. Check whether the parallel communication cables are connected well.  |
|   | Fault code 81       | Host loss   | 2. Check whether Program 23 settings are right for the parallel system.<br>3. If problem still exists, contact repair center  |

**Note:** To restart the inverter, all power sources need to be disconnected. After the LCD screen light is off, only use the battery to restart the inverter.

## 5 Warranty

We warrant this product against defects in materials and workmanship for a period of one year from the date of purchase and will repair or replace any defective M Series Inverter when directly returned, postage prepaid, to manufacturer. This warranty will be considered void if the unit has suffered any obvious physical damage or alteration either internally or externally and does not cover damage arising from improper use such as plugging the unit into an unsuitable power sources, attempting to operate products with excessive power consumption requirements, reverse polarity, or use in unsuitable climates.

WARRANTY DOES NOT INCLUDE LABOR, TRAVEL CHARGES, OR ANY OTHER COSTS INCURRED FOR REPAIR, REMOVAL, INSTALLATION, SERVICING, DIAGNOSING OR HANDLING OF EITHER DEFECTIVE PARTS OR REPLACEMENT PARTS. THE WARRANTOR ASSUMES NO LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND.

LOSS OR DAMAGE: Loss or damage in transit is the responsibility of the carrier. Any claim should be filed with the delivering transport company. Invoice, Bill of Lading and Delivery receipt with damage noted therein must accompany any claims for freight damage. Claims for shortage and lost shipments must be made in writing to the shipper within 3 days of the receipt of shipment. Claims not reported within this time frame will not be honored.

This warranty does not apply to and we will not be responsible for any defect in or damage to:

- the product if it has been misused, neglected, improperly installed, physically damaged or altered, either internally or externally, or damaged from improper use or use in an unsuitable environment; violations of the warnings in the manual will invalid the warranty.
- the product if it has been subjected to fire, water, generalized corrosion, biological infestations, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in the product specifications including high input voltage from generators and lightning strikes;
- the product if repairs have been done to it other than by us or its authorized service centers;

## Appendix 1 : M3048BP M5000H-48BP Solar Inverter Spec Sheet

|         | MODEL #                    | M3048BP                                | M5000H-48BP                             |
|---------|----------------------------|--|---|
| AC Mode | Nominal AC Output Power    | 3000VA/3000W                           | 5000VA/5000W                            |
|         | AC Input Waveform          | Sinusoidal (Utility or Generator)      | Sinusoidal (Utility or Generator)       |
|         | Max AC Input Voltage       | 150Vac                                 | 300Vac                                  |
|         | Low AC Voltage Trip        | 95Vac±7V (UPS); 65Vac±7V (Appliances)  | 170Vac±7V (UPS); 90Vac±7V (Appliances)  |
|         | Low AC Voltage Return      | 100Vac±7V (UPS); 70Vac±7V (Appliances) | 180Vac±7V (UPS); 100Vac±7V (Appliances) |
|         | High AC Voltage Trip       | 140Vac±7V                              | 280Vac±7V                               |
|         | High AC Voltage Return     | 135Vac±7V                              | 270Vac±7V                               |
|         | Nominal AC Input Frequency | 50Hz / 60Hz (Auto Detection)           | 50Hz / 60Hz (Auto Detection)            |
|         | Low Frequency Trip         | 40±1Hz                                 | 40±1Hz                                  |
|         | Low Frequency Return       | 42±1Hz                                 | 42±1Hz                                  |
|         | High Frequency Trip        | 65±1Hz                                 | 65±1Hz                                  |
|         | High Frequency Return      | 63±1Hz                                 | 63±1Hz                                  |
|         | Efficiency (Line Mode)     | >95% ( Under full Linear Loads)        | >95% ( Under full Linear Loads)         |



|               |  |   |   |
|---------------|--|---|---|
|               | Transfer Time  | 10 ms(Typical) ; 20 ms Max; <30ms<br>Parallel         | 10 ms(Typical) ; 20 ms Max; <30ms<br>Parallel         |
|               | AC Input Breaker   | 40A   | 40A   |
| Inverter Mode | Battery Voltage  | 48 VDC  | 48 VDC  |
|               | Output Waveform  | Pure Sine Wave  | Pure Sine Wave  |
|               | AC Voltage Regulation (Batt. Mode)                         | 120 VAC $\pm$ 5%                                      | 230 VAC $\pm$ 5%                                      |
|               | Surge AC Output Power                                      | 6000W (5 secs)  | 10000W (5 secs)                                       |
|               | Output Frequency   | 50Hz/60Hz(default)                                    | 50Hz/60Hz(default)                                    |
|               | Max. Output Fault Current/ Duration                        | 80A/ 300 $\mu$ s                                      | 80A/ 300 $\mu$ s                                      |
|               | Max. Output Overcurrent Protection                         | 76A   | 65A   |
|               | DC To AC Efficiency (Peak)                                 | 90%   | 93%   |
|               | Overload Protection  | 5s@ $\geq$ 150% load; 10s@110%~150% load              | 5s@ $\geq$ 150% load; 10s@110%~150% load              |
|               | Cold Start Battery Voltage* (Without PV or AC)             | 46.0Vdc/Li Mode(Default 30%, Low DC Cut-off SOC +10%) | 46.0Vdc/Li Mode(Default 30%, Low DC Cut-off SOC +10%) |
|               | Minimal Battery Voltage To Activate AC Charger(Without PV) | 40.8Vdc   | 40.8Vdc   |
|               | Low DC Warning Voltage (Lead-Acid Mode)                    | 44.0Vdc @ load < 20%                                  | 44.0Vdc @ load < 20%                                  |
|               |  | 42.8Vdc @ 20% $\leq$ load < 50%                       | 42.8Vdc @ 20% $\leq$ load < 50%                       |
|               |  | 40.4Vdc @ load $\geq$ 50%                             | 40.4Vdc @ load $\geq$ 50%                             |
|               | Low DC Warning Return Voltage(Lead-Acid Mode)              | 46.0Vdc @ load < 20%                                  | 46.0Vdc @ load < 20%                                  |
|               |  | 44.8Vdc @ 20% $\leq$ load < 50%                       | 44.8Vdc @ 20% $\leq$ load < 50%                       |
|               |  | 42.4Vdc @ load $\geq$ 50%                             | 42.4Vdc @ load $\geq$ 50%                             |
|               | Low DC Cut-off Voltage (Lead-Acid Mode)                    | 42.0Vdc @ load < 20%                                  | 42.0Vdc @ load < 20%                                  |
|               |  | 40.8Vdc @ 20% $\leq$ load < 50%                       | 40.8Vdc @ 20% $\leq$ load < 50%                       |
|               |  | 38.4Vdc @ load $\geq$ 50%                             | 38.4Vdc @ load $\geq$ 50%                             |
|               | Low DC Cut-off Voltage (Li Mode)                           | 42.0Vdc   | 42.0Vdc   |
|               | Low DC Warning SOC (Li Mode)                               | Low DC Cut-off SOC +5%                                | Low DC Cut-off SOC +5%                                |
|               | Low DC Warning Return SOC (Li Mode)                        | Low DC Cut-off SOC +10%                               | Low DC Cut-off SOC +10%                               |
|               | Low DC Cut-off SOC (Li Mode)                               | Default 20%, 5%~50% settable                          | Default 20%, 5%~50% settable                          |
|               | High DC Recovery Voltage                                   | 56.4Vdc(C.V. charging voltage)                        | 56.4Vdc(C.V. charging voltage)                        |
|               | High DC Cut-off Voltage                                    | 60.8Vdc   | 60.8Vdc   |
|               | Idle Power   | <60W  | <60W  |
| Charge Mode   | CV & Float Charge voltage                                  | 48.0V~58.4V Settable                                  | 48.0V~58.4V Settable                                  |
|               | Maximum PV Array Power                                     | 4000W   | 6000W   |
|               | Max PV Input Current                                       | 22A   | 22A   |
|               | MPPT Efficiency  | 98.0% max.  | 98.0% max.  |
|               | PV Open Circuit Voltage                                    | 250Vdc  | 450Vdc  |
|               | PV Charger Start-up Voltage                                | 150Vdc $\pm$ 10Vdc                                    | 150Vdc $\pm$ 10Vdc                                    |
|               | MPPT Range @ Operating Voltage                             | 120-250VDC  | 120-430VDC  |
|               | Overcharge Protection                                      | 60Vdc   | 60Vdc   |
|               | Maximum Solar Charge Current                               | 80 A  | 100 A   |
|               | Maximum AC Charge Current                                  | 40 A  | 80 A  |
|               | Maximum Charge Current(PV+AC)                              | 80A   | 100 A   |
|               | Battery Voltage Accuracy                                   | +/-0.3%   | +/-0.3%   |

|                        | PV Voltage Accuracy      | +/-2V   | +/-2V   |
|------------------------|--------------------------|---|---|
| General Specifications | Inverter Dimension DxWxH | 455*295*130mm/17.9*11.6*5.1"                    | 455*295*130mm/17.9*11.6*5.1"                    |
|                        | Pack Dimension DxWxH     | 580*380*220mm/23*15*9"                          | 580*380*220mm/23*15*9"                          |
|                        | Net Weight               | 12KG/25.3lbs                                    | 12KG/25.3lbs                                    |
|                        | Gross Weight             | 13.5KG/29.8lbs                                  | 13.5KG/29.8lbs                                  |
|                        | Humidity                 | 5% to 95% Relative Humidity<br>(Non-condensing) | 5% to 95% Relative Humidity<br>(Non-condensing) |
|                        | Operating Temperature    | -10°C to 55°C(-14°Fto 131°F)                    | -10°C to 55°C(-14°Fto 131°F)                    |
|                        | Storage Temperature      | -15°C to 60°C(5°Fto 140°F)                      | -15°C to 60°C(5°Fto 140°F)                      |
|                        | Altitude                 | <2000m  | <2000m  |

\*Cold start voltage is the minimal battery voltage for the inverter to power on without PV or AC input.

※Errors and omissions reserved. Specifications in this manual are subject to change without prior notice.

**SAVE THIS MANUAL!**

**READ THIS MANUAL BEFORE INSTALLATION, IT  
CONTAINS IMPORTANT SAFETY, INSTALLATION AND  
OPERATING INSTRUCTIONS. KEEP IT IN A SAFE PLACE  
FOR FUTURE REFERENCE.**

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