Transformerless Off Grid Solar Inverter Charger User's Manual

For Models:
M3024NC
M3048NC

Version 2.1 (PN:60M3211222)

Manufacturer Information

Sigineer Power Limited
Email: info@sigineer.com
TEL: +86 769 82817616
US Warehouse: 4415 S 32nd St, Phoenix AZ 85040

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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 of other electrical part may cause an explosion.
1.2.4. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery produces a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.
1.2.5 To reduce the risk of injury, charge only rechargeable batteries 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 M 3KW Off Grid Solar Inverter/Charger.

The M 3KW 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 MPPT Solar Charger Controller**
4. **High Speed DC/AC Transfer Switch.**

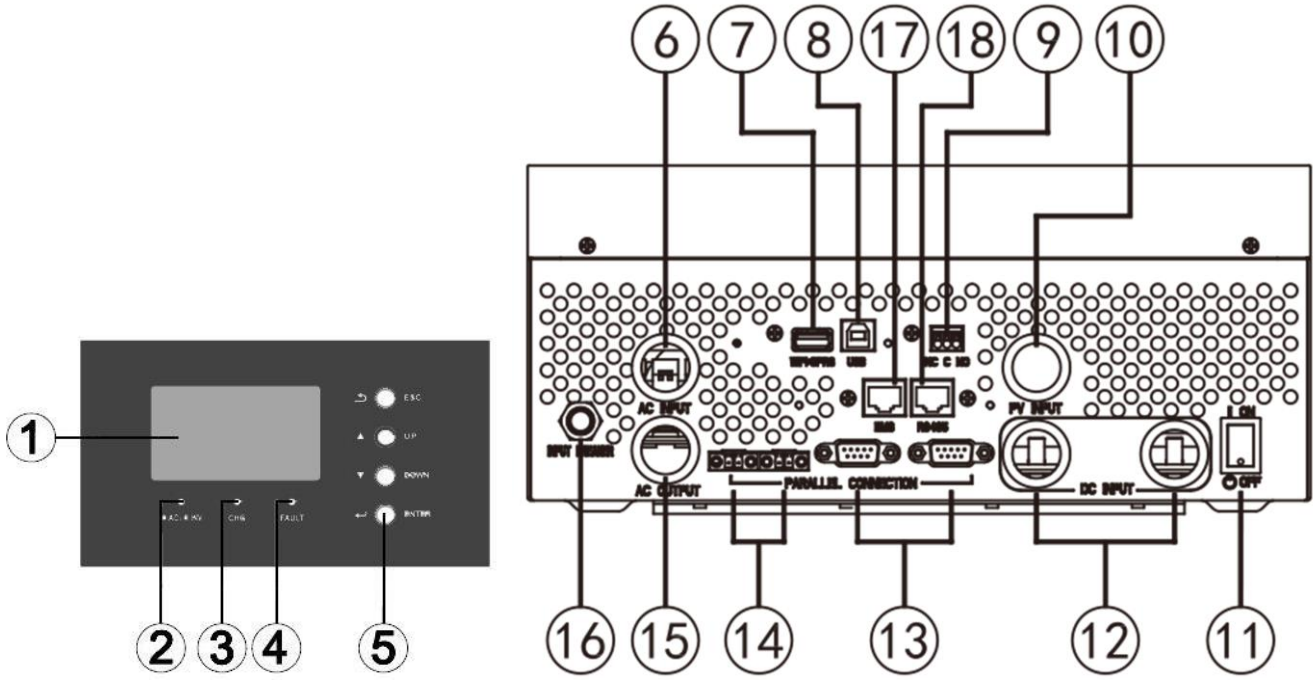
Packed with unique features, it is one of the most technically advanced off grid solar inverter on the market. Some solar inverter on the market physically includes a solar charger which has no communication with the circuit of the inverter.

Our MPPT charger is electrically integrated into the inverter design and is able to harness the PV production to charge batteries when the the inverter is powered off.
Its powerful DSP (digital signal processor) makes the M3KW solar inverter 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 voltage, etc.
The M 3KW models are available in 24V and 48V DC input, and 120V AC output.
You can get the 120/240V split phase power or 120/208Vac by stacking them up to 6 pcs.

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
*Overload Bypass
*Battery Polarity Reverse Protection
*Smart remote monitor with WIFI or GPRS Module
*Remote LCD Panel with Adjustable Parameters
*80A 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 120/240V split phase or 120/208V 3 phase output

2.4 Electrical Performance

2.4.1 DC to AC Invert

Overload Capacity
The M 3KW inverter/charger has different overload capacities, making it ideal to handle demanding loads.
1 For 110%<Load<150%, Fault (Power off) after 10 seconds.
2 For 150%<Load≤200%, Fault (Power off) after the 5 seconds.

Soft Start in Inverter Mode
The inverter is engineered with a "Soft Start" feature.
When the inverter is turned on, the output voltage gradually ramps up from 0VAC to rated voltage in about 1.2 sec. This effectively reduces otherwise very high starting inrush current drawn by AC loads such as Switched Mode Power Supplies and inductive loads. This will result in lower motor inrush current, which means less impact on the loads and inverter.

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.

Unlike other inverters whose max charging current decreases according to the input AC voltage, the Sigineer Power M Series pure sine wave inverter/charger is able to output max charge current as long as input AC voltage is in the range of 65~140VAC, and AC frequency is qualified.

The M Series pure sine wave inverter/charger has a very rapid charge current available, and the max charge current can be adjusted from 10A 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.

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.

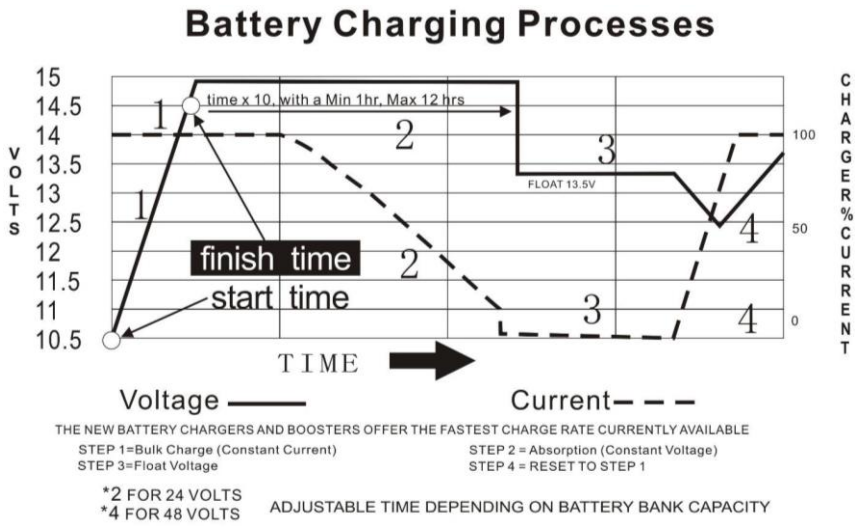
Software timer will measure the time from charger start until the battery charger reaches 0.3V below the boost voltage, then take this time as T0 and T0×10 = T1.

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.

	**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.**

Caution:	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.

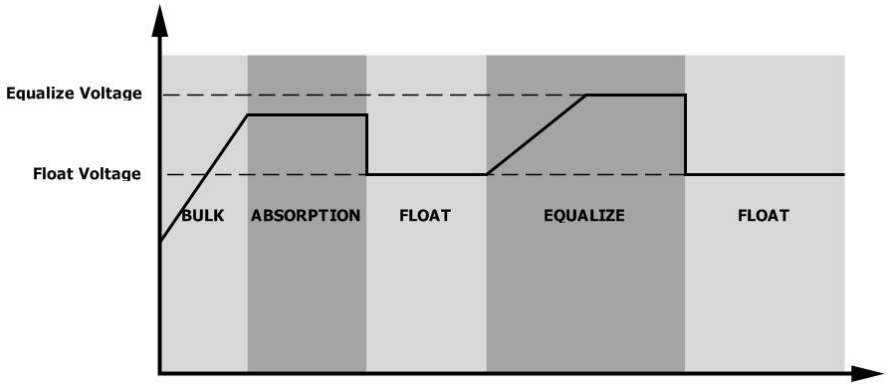
How to Apply Equalization Function

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.

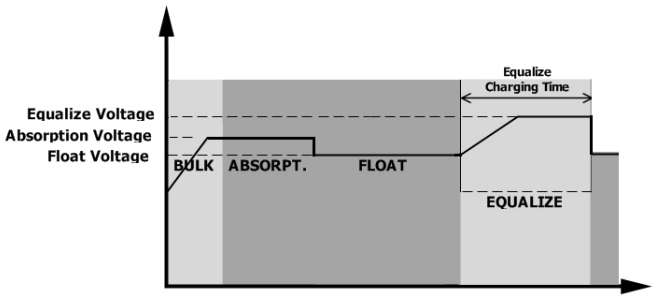
When to Equalize

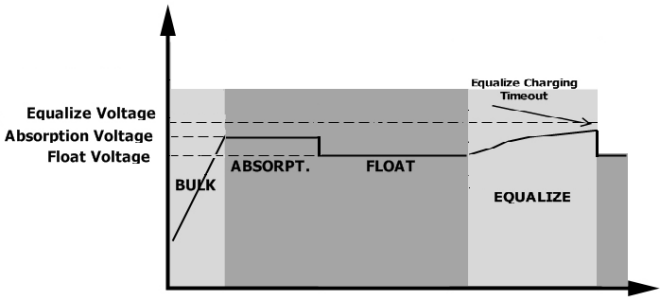
In float stage, when the setting equalization interval (battery equalization cycle) is arrived, or equalization is active immediately, the controller will start to enter Equalize stage.



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 80A.

Model #	AC Charging Current	MPPT Solar Charger	Max Charging Current
M3024NC	60A	80A	140A
M3048NC	40A	80A	120A

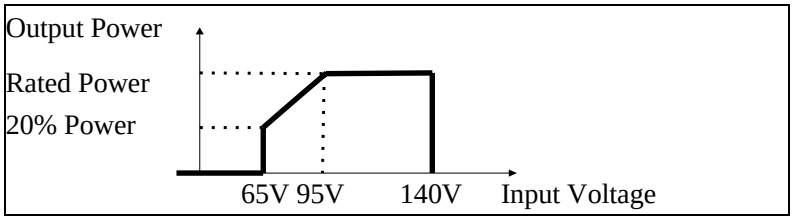
The MPPT Solar Charger will automatically work when the inverter is powered off.
Even when the power switch is in unit off position, the built-in solar charger will automatically work when PV input voltage and battery voltage is qualified, this is to optimize solar production for battery charging. But the inverter will not convert battery power to AC output.

When the battery is fully charged, the 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.

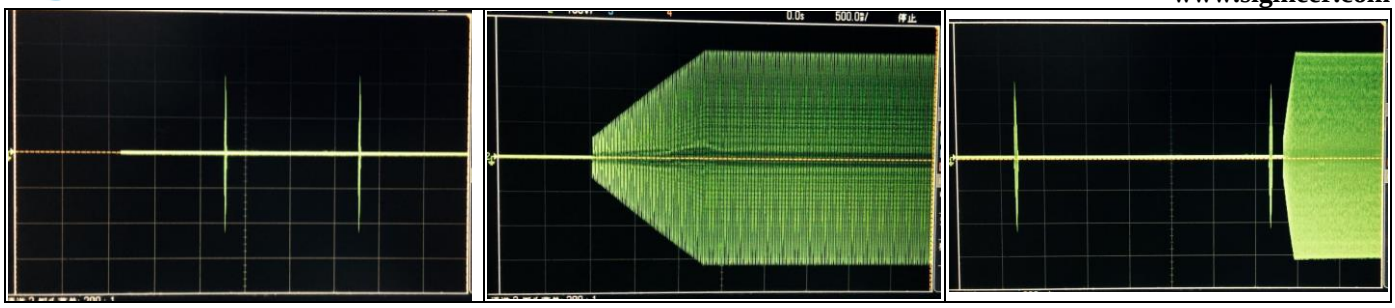
Bypass output power derating:
When AC input voltage drops below 95Vac, the output power will be de-rated linearly to as low as 20% at 65Vac.



2.4.4 Power Saver

There are two working statuses for M3024NC and M3048NC 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 50 watts to 30 watts.

Power Saver On	Power Saver Off	Power Saver On (Load detected)



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.

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/Overload 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

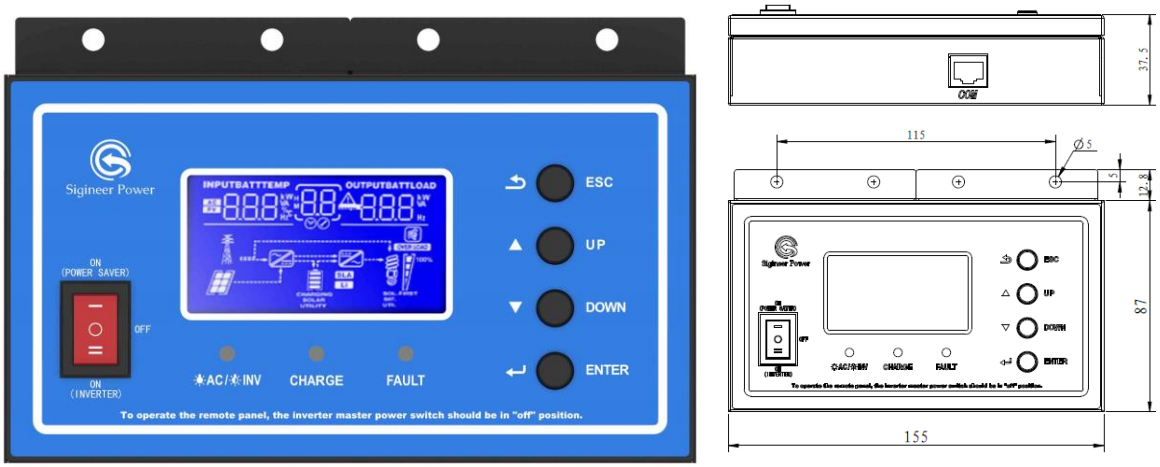
The M series inverter (produced after 2021 May with P/N: DV06.CR07602) can be remotely monitored and controlled.
It supports 4 different types of remote monitoring

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.

If an extra LCD switch panel is connected to the inverter via “RS485” port, together with the power switch on the inverter top cover, the two panels will be connected and operated in parallel.
Whichever first switches from “Off” to “On” or “Power Saver On”, it will power the inverter on.
Only when both panels are turned to “Unit Off” position, will the inverter be powered off.
Note: The “Inverter On” position on the remote LCD panel doesn’t work. To power on the inverter, the remote panel must be turned to “Power Saver On” position.

- The suggested length between the LCD switch panel and inverter is 20 meters.
- The LCD panel allows users to customize the inverter specifications on it.



Warning:
Our cables are designed with special pinouts on the connectors, so don’t use other cables, or the remote LCD panel will not be powered on.

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

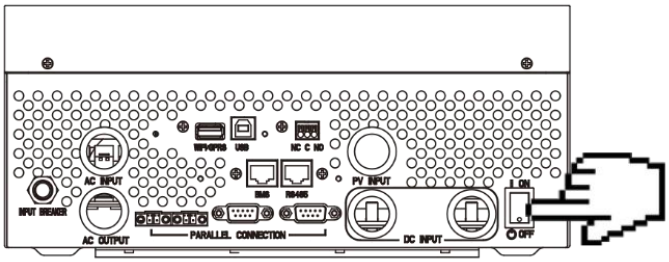
The M series inverters can be remotely monitored by a Wi-Fi or GPRS module plugged into its USB port.
The Wi-Fi / GPRS module is a plug-and-play monitoring device which allows users to monitor the status of the PV system from a mobile phone APP or from the website anytime anywhere.
The inverter’s AC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

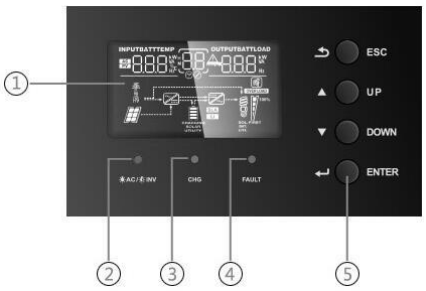
The PV Butler APP will automatically refresh the data in every 5 minutes. To access real date, please roll down the screen to refresh.

To monitor the inverter via both WIFI and USB port, the CUBEWiFi 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.

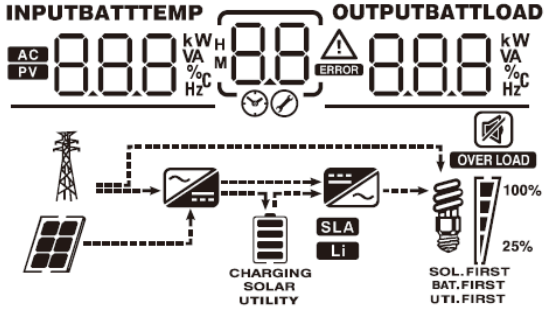




The operation and display panel area includes three LED indicators, four function keys and an LCD display. It shows very rich operating info.

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

LED Indicator			Operation Status
AC / INV	Green	Solid On	Output is powered by utility in AC mode.
		Flashing	Output is powered by battery or PV in battery mode.
CHG	Green	Solid On	Battery is fully charged.
		Flashing	Battery is being charged.
⚠ FAULT	Red	Solid On	Fault occurs.
		Flashing	Warning condition occurs.

	Button	Description
	ESC	Exit setting mode
	UP	Go to previous selection
	DOWN	Go to next selection
	ENTER	Enter setting mode or confirm the selection in setting mode.

Icon	Function Description
Input Information	
AC	Indicates the AC input.
PV	Indicates the PV input
INPUTBATT 888 kW VA %C Hz	Indicate input AC voltage, input frequency, PV voltage, battery voltage and charger current.
Configuration Program and Fault Information	
88	Indicates the setting programs.
88 ERROR	Indicates the warning and fault conditions. 88 Warning Code: Flashing. 88 ERROR Error Code: Constantly On.
Output Information	
OUTPUTBATTLOAD 888 kW VA %C Hz	Indicate output voltage, output frequency, load percent, load in VA, load in Watt and discharging current.
Battery Information	
CHARGING	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100% in battery mode and charging status in line mode.
SOLAR UTILITY	These two signs indicate the charge priority. SOLAR indicates solar first. UTILITY indicate utility first. SOLAR blinking indicates solar only; SOLAR and UTILITY both on indicates combined charging.

CC&CV Charge Mode	Battery Voltage @ Load >50%	Battery Voltage @50%> Load > 20%	Battery Voltage @ 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	

For model# M3024NC, the value is half of above value.

Load Information	
OVER LOAD	Indicates overload.
100% 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 AC input is available.			
	Indicates PV Input is available.			
BYPASS	Indicates load is supplied by AC power.			
	Indicates the AC to DC charging.			
	Indicates the DC to AC conversion.			
SOL.FIRST BAT.FIRST UTI.FIRST	These three signs indicate the AC output priority. SOL.FIRST indicates solar Priority. BAT.FIRST indicates battery priority. UTI.FIRST indicates utility priority.			
Mute Operation				
	Indicates unit audible alarm is disabled.			

LCD SETTING

The M 3KW inverter LCD allows users to virtually change all its specs. It will enter setting mode if the ENTER button is held for over 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 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.

Note: When the inverter power priority mode is changed between the three different modes, the setting of other programs will be saved with the associated power priority mode.

Program 02: Maximum Charging Current

24V model: default 60A, 10A~140A Settable
48V model: default 60A, 10A~120A 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 65~140VAC±5V.

03:UPS

In UPS Mode, the acceptable AC input voltage range: 95~140VAC±5V.

03: GEN

In Generator Mode, the acceptable AC input voltage range: 65~140VAC±5V. In this mode, the max charging current is 30A.
Note: When the inverter is connected to a generator, the generator should be no less than 10KVA (no less than 20KVA for three phase parallel system), and the inverters should be no more than 2 units in one phase.

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 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(M3048NC). CV :28.2V, Float 27V(M3024NC).

05: FLd
Flood Battery: CV :58.4V, Float 56V(M3048NC)/ CV :19.2V, Float 28V(M3024NC).

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 100V, 110V and 120V(default).

Program 09: AC Output Frequency

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

Program 10: Number of 12V Batteries Connected in Series

The default value is 4 for model # M3048NC, and 2 for model # M3024NC. This program is only a reminder about the 12V battery quantity.

Program 11: Maximum Utility Charging Current

Model #	Default Value	Resettable Range
M3024NC	30A	0-60A
M3048NC	30A	0-40A

The solar charger always has higher priority than the utility charger.
If the max charging current (Program 02) and utility charger (Program 11) is set to the same value, the solar charger will still work before utility charger engages.
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
M3024NC	23V/50%	22V~25.6V/6%-95%
M3048NC	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
M3024NC	27V/95%	24V~29V/10%-100%
M3048NC	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 (Default)
Solar energy will charge battery as first priority.
Utility will charge battery only when solar energy is not available (lost).

14:CUT

Utility Priority
Utility will charge battery as first priority.
Solar energy will charge battery only when utility power is not available (lost).

14:SNU

Solar and Utility

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 Constant Voltage Charging Voltage

Model #	Default Value	Resettable Range
M3024NC	28.2V	24V~28.2V
M3048NC	56.4V	48V~58.4V

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

Program 20 Float Charging Voltage

Model #	Default Value	Resettable Range
M3024NC	27V	24.0V~28.2V
M3048NC	54V	48V~58.4V

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	Resettable Range
M3024NC	21V/20%	20V~24V/5%-50%
M3048NC	42V/20%	40V~48V/5%-50%

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 for M3048NC or 27V for M3024NC (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.
The minimal voltage for the LCD to illuminate is 30Vdc for M3048NC, and 15V for M3024NC.

Program 22 Solar Power Balance
When enabled, the solar input power will be automatically adjusted according to the load wattage.
Max solar input power = Max battery charging power +Connected load power.

If disabled, the solar input power will be the same to the max battery charging power no matter how much loads are connected. The max battery charging power will be based on the setting current in program 2.
(Max. solar power = Max. battery charging power)

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
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.
Do NOT connect share current cable between units on different phases.

23:2P0/2P1/2P2
Split Phase: 2P0, 2P1, 2P2
Select "2P0" for the inverters connected to L1 phase;
If connect split phase 120V/208V, select "2P1" for inverters connected to L2 phase;
If connect split phase 120V/240V, select "2P2" for inverters connected to L2 phase
Do NOT connect share current 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 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
M3024NC	29.2V	24V~29.2V
M3048NC	58.4V	48-58.4V

Program 45 Battery Equalized Time

Default 60min, 5min~900min Settable

Program 46 Battery Equalized Timeout

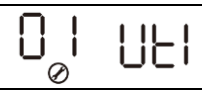
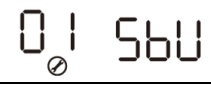
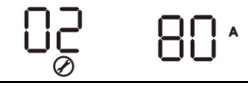
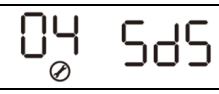
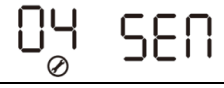
Default 120min, 5min~900min Settable

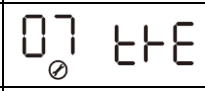
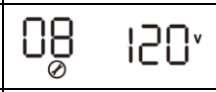
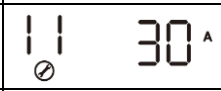
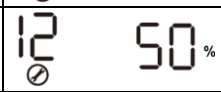
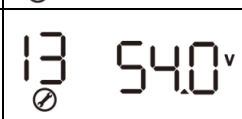
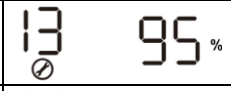
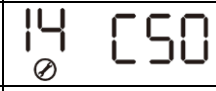
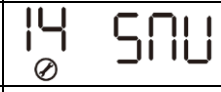
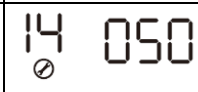
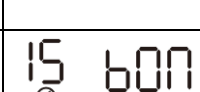
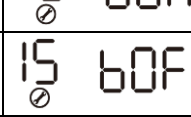
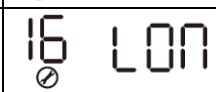
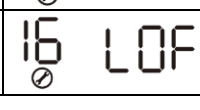
Program 47 Equalization Interval

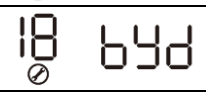
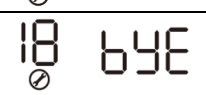
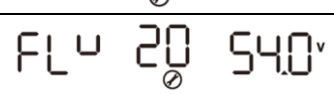
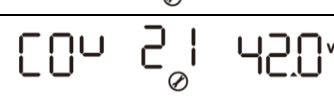
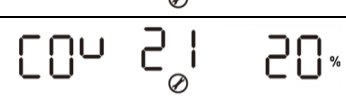
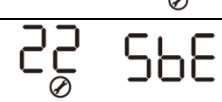
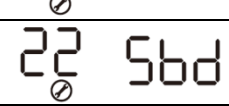
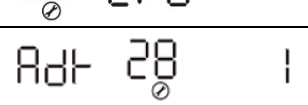
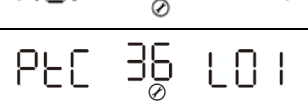
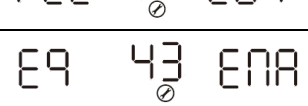
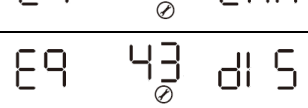
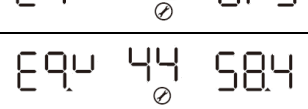
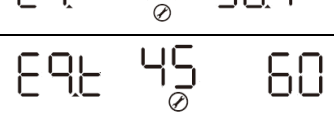
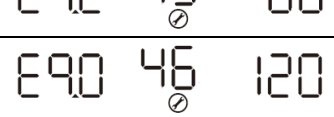
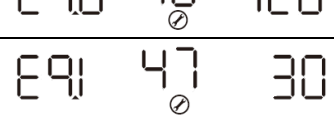
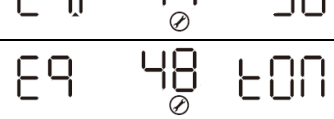
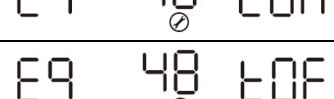
Default 30days, 1 day~90 days Settable

Program 48 Equalization Activated Immediately

If equalization function is enabled in program 23, 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 27 setting. At this time, “Eq” will not be shown in LCD main page

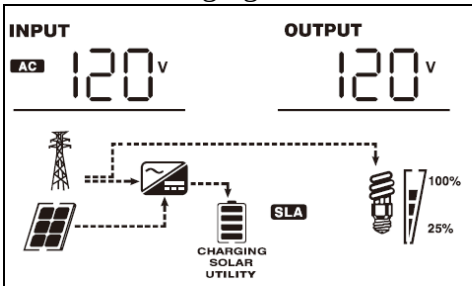
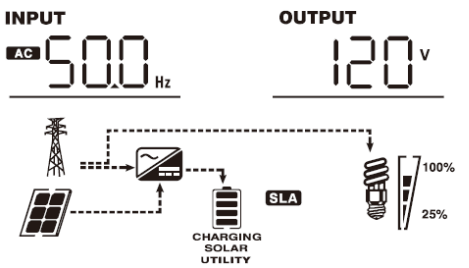
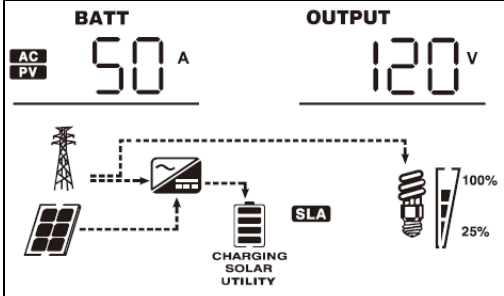
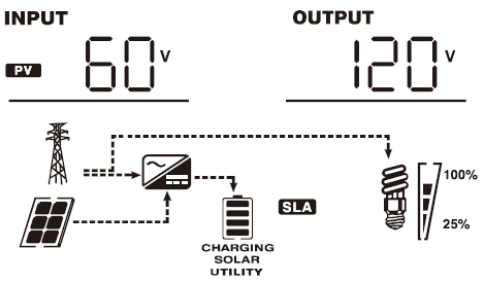
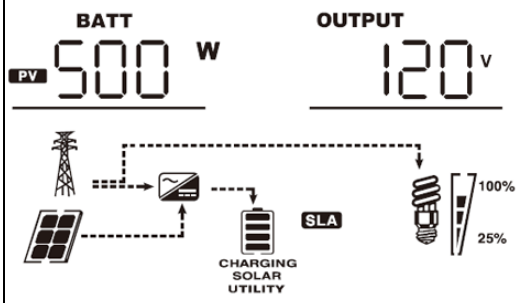
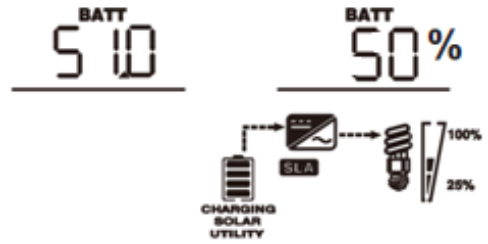
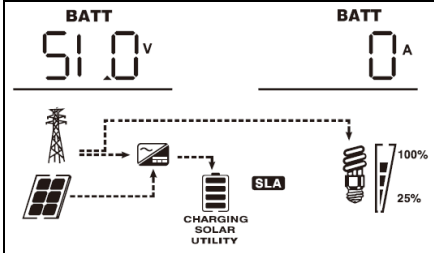
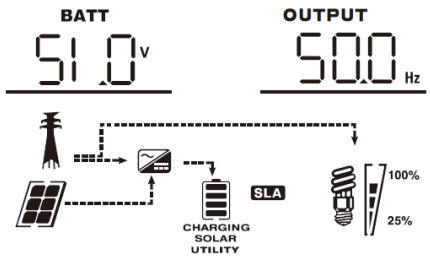
Program #	Description	ICON
01 Power Priority for AC Loads	Utility Priority	
01 Power Priority for AC Loads	Solar Priority	
01 Power Priority for AC Loads	SBU Priority	
02 Maximum Charging Current	Max PV+Utility Charging Current	
03 AC Input Voltage Range	Appliance Mode (Default)	
03 AC Input Voltage Range	UPS Mode	
03 AC Input Voltage Range	Generator mode	
04: Power Saving Mode	Saving mode disable (Default)	
04: Power Saving Mode	Saving mode enable	
05 Battery Type	AGM Battery (Default)	
05 Battery Type	Flood Battery	
05 Battery Type	User-Defined	

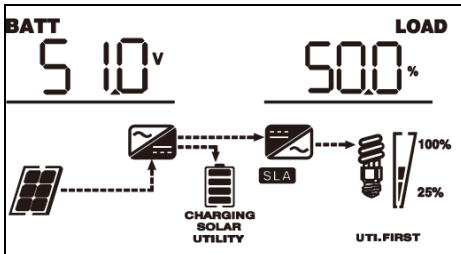
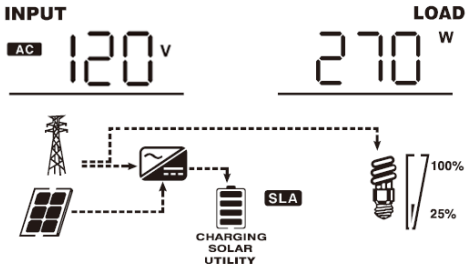
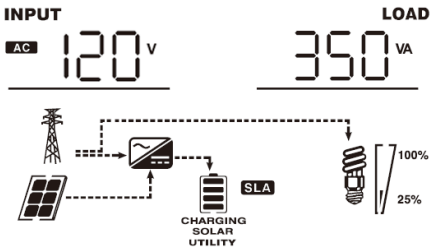
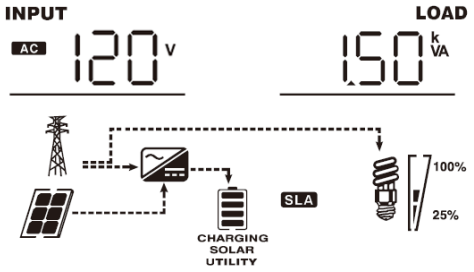
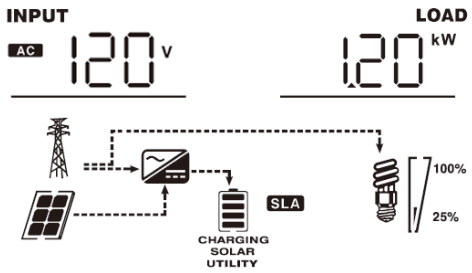
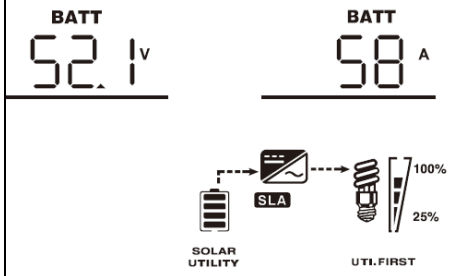
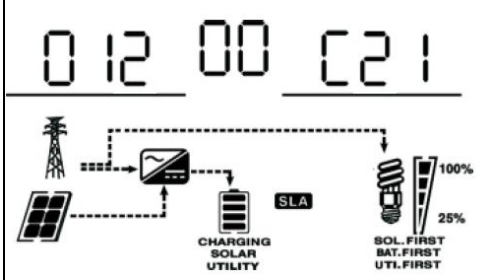
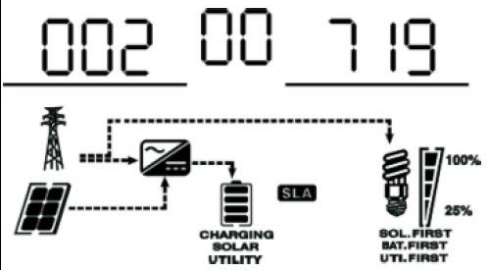
05 Battery Type	User-Defined 2	
05 Battery Type	Lithium	
06 Automatic Overload Restart	Restart Disable (Default)	
06 Automatic Overload Restart	Restart Enable	
07 Automatic OverTemp Restart	Restart Disable (Default)	
07 Automatic OverTemp Restart	Restart Enable	
08 AC Output Voltage	120V (Default)	
09 AC Output Frequency	60Hz (Default)	
10 Number of 12V Batteries Connected In Series	The default value is 4 for 48V model, and 2 for 24Vdc model.	
11 Maximum Utility Charging Current	10A to Max(default 30A)	
12 DC to AC Transfer Voltage	Default 46.0V, 44.0V~51.2V resettable,	
12 DC to AC Transfer Voltage	Lithium mode: default 50%, 5%~50% resettable	
13 AC to DC Transfer Voltage	Default 54.0V, 48.0V~58.0V resettable,	
13 AC to DC Transfer Voltage	Li mode: default 95%, 60%~100% resettable	
14 Charger Power Source Priority	Solar Priority (Default)	
14 Charger Power Source Priority	Utility Priority	
14 Charger Power Source Priority	Solar and Utility	
14 Charger Power Source Priority	Solar Only	
15 Alarm On/Off Control	Audible Alarm on (default)	
15 Alarm On/Off Control	Audible Alarm off(Mute)	
16 Backlight On/Off Control	Backlight on (default)	
16 Backlight On/Off Control	Backlight off	

17 Beeps once between AC and DC Transfer	Alarm on (default)	
17 Beeps once between AC and DC Transfer	Alarm off	
18 Overload Bypass	Bypass Disable (default)	
18 Overload Bypass	Bypass enable	
19 Constant Voltage Charging Voltage	48V model: default 56.4V, 48.0V~58.4V Settable	
20 Float Charging Voltage		
21 Low DC Cut-Off Voltage	Without BMS communication	
21 Low DC Cut-Off Voltage	With BMS communication	
22 Solar Power Balance	Solar power balance enable (Default)	
22 Solar Power Balance	Solar power balance disable:	
23 AC Output Mode	Single Unit Operation	
23 AC Output Mode	Parallel in Single Phase	
23 AC Output Mode	Three phase: 3P1, 3P2, 3P2	
23 AC Output Mode	Split phase: 2P0, 2P1, 2P2	
28 RS485 Communication Address	Default 001. 001-255 Settable. For external solar charger expansion.	
36 Lithium BMS Protocol	Default L01	
43 Battery Equalization	Disabled (Default)	
43 Battery Equalization	Enable	
44 Battery Equalization Voltage	Default 58.4V, 48~60V settable	
45 Battery Equalization Time	Setting range is from 5min to 900min. Increment of each click is 1min.	
46 Battery Equalization Timeout	Setting range is from 5min to 900min. Increment of each click is 1 min.	
47 Equalization Interval	Setting range is from 1 to 90 days. Increment of each click is 1 day.	
48 Equalization Activated Immediately	Disabled (Default)	
48 Equalization Activated Immediately	Enable	

LCD Display Setting

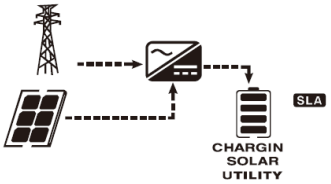
The LCD display information will be switched in turns by pressing “UP” or “DOWN” key. The selectable information is switched as below order: input voltage, input frequency, PV voltage, MPPT charging current, MPPT charging power, battery voltage, output voltage, output frequency, load percentage, load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

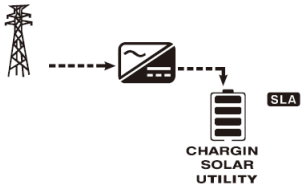
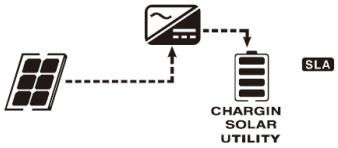
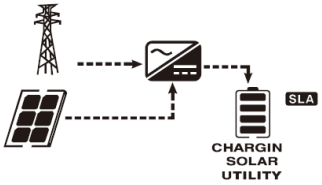
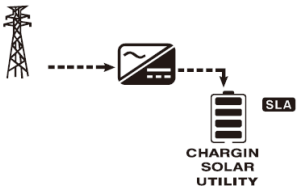
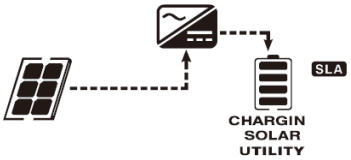
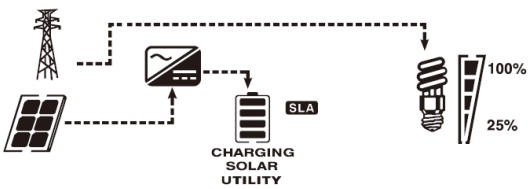
 Input voltage/Output voltage (Default Screen)	 Input frequency 50Hz
 Charging current	 PV voltage 60V
 PV Charging power	 Battery SOC Level
 Battery voltage/ DC discharging current Battery voltage=51.0V, discharging current=0A	 Output frequency

 Load percentage	 Load in Watt
Load< 1kVA, displayed in xxx VA  Load in VA	Load ≧1KVA, displayed in x.x kVA.  Load in VA
 Load in Watt (≧1KW)	 DC discharging current
 Inverter PCB Software Version	 MPPT PCB Software Version

The LCD will display different inverter status when the up or down button is pressed.
The last two pages of LCD show the software version of the inverter PCB and MPPT PCB. There are 8 digits.
If the MPPT PCB is not activated, it will display 000-00-000.

Operating Mode Description

Operation mode	Description	LCD display
Standby mode / Power saving mode. Note: *Standby mode: The inverter is not powered on but it can charge battery without AC	No AC output is supplied by the unit but it still can charge batteries.	Charging by AC and PV energy. 

output. *Power saving mode: When enabled, the output of inverter will be off when connected load is under 100w.		Charging by AC. 
		Charging by PV energy. 
		No charging. 
Fault mode Note: *Fault mode: Errors are caused by circuit error or external reasons such as over temperature, output short circuit and so on.	PV energy and AC can charge batteries.	Charging by AC and PV energy. 
		Charging by AC. 
		Charging by PV energy. 
		No charging. 
AC Bypass Mode	The unit will provide output power from the AC input and charge the battery at AC Bypass mode.	Charging by PV energy 

The inverter is built with automatic PV and AC power wakeup feature.
When the power switch is in power off, and qualified PV voltage inputs, the PV charger will be activated, and the rest part of the inverter will remain powered off.
In this mode, the AC power can only illuminate the LCD, it can’t charge batteries.

When the inverter shuts off due to low battery voltage protection, and the switch is kept on “on” position, the inverter will use qualified AC 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 SBU, the automatic wake up feature will charge battery close to “AC to DC switch” voltage, and then cut off AC charger, switch to DC to AC invert mode.

2.4.8 Audible Alarm

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

Warning	Buzzer beeps 0.5s every second.
Error	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 3KW 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 M 3KW 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	Close
			Battery Level > Program 13 (AC to DC Transfer)	Close	Open
		Program 01 set to SBU or Solar Priority	Battery Level < Program 12 (DC to AC Transfer)	Open	Close
			Battery Level > Program 13 (AC to DC Transfer)	Close	Open

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

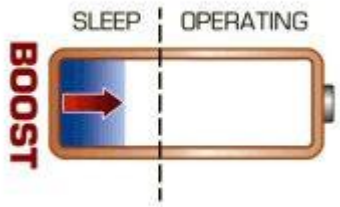
For the M3024NC and M3048NC, it is designed with automatic recovery from:

- **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 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 M3048NC inverter will use solar power to wake up overdischarged lithium battery by a boost circuitry. When they detect a 0V battery, the solar 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.

Note: The AC charger doesn’t have lithium battery wakeup feature.

2.4.13 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℃ to 55℃(14℉ to 131℉)
Storage temperature: -15℃ to 60℃(5℉to 140℉)
Relative Humidity:　5% to 95%，non-condensing
Cooling: Forced air
Warning! Operation in a condensing environment will invalid warranty.

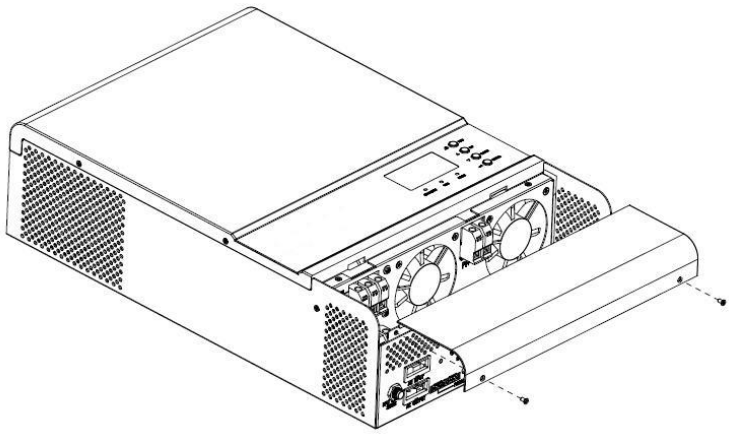
3.2 Unpacking and Inspection

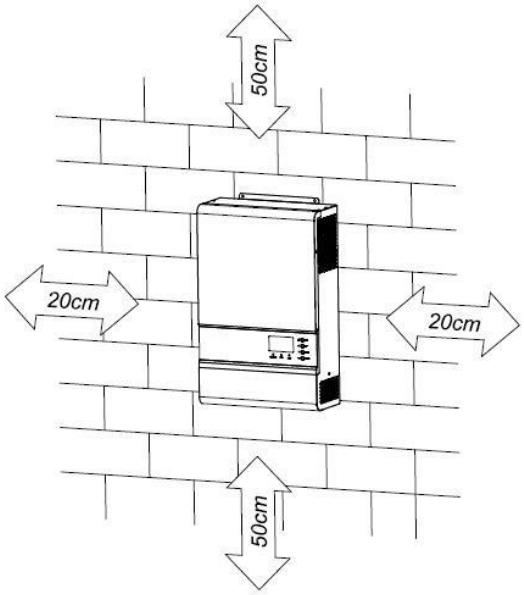
Before installation, please inspect the unit. Be sure that nothing inside the package is damaged. You should have received the following items in the package:
*The inverter x 1
*User manual x 1
*Communication cable x 1
*Current sharing cable x 1
*Parallel communication cable x 1

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:

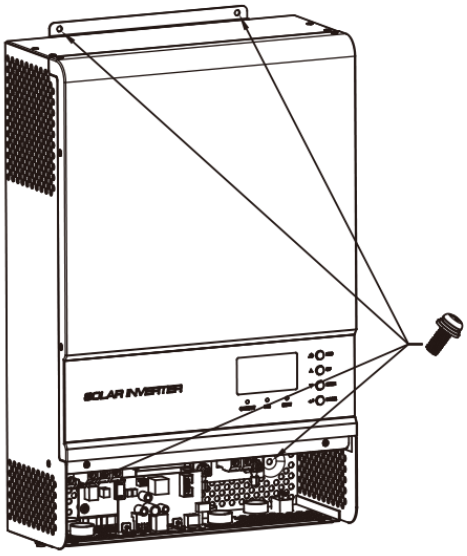
Do not mount the inverter on flammable construction materials.
Mount on a solid surface
Install this inverter at eye level in order to allow the LCD display to be read at all times.
The ambient temperature should be between 0°C and 55°C to ensure optimal operation.
The recommended installation position 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.

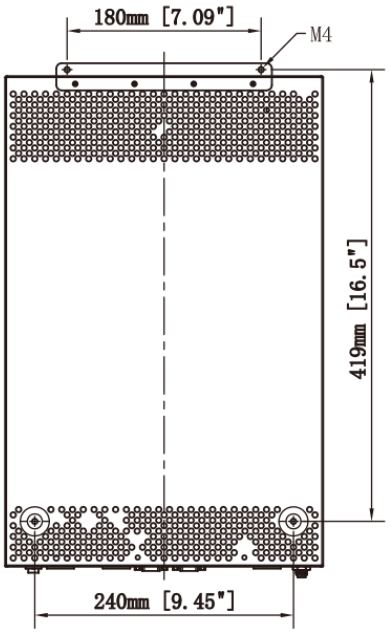
SUITABLE FOR MOUNTING ON CONCRETE OR OTHER NON-COMBUSTIBLE SURFACE ONLY
Install the unit by screwing the six sets of screws.





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

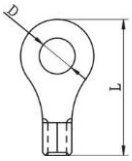




Note: For proper air circulation to dissipate heat, allow a clearance of approx. 20cm to the side and approx. 50 cm above and below the unit. Be sure to install each unit in the same level.

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)	
M3024NC	164A	200AH	1*2AWG	38	6.4	39.2	2~ 3 Nm
			2*6AWG	28	6.4	33.2	
M3048NC	82A	100AH	1*4AWG	22	6.4	39.2	2~ 3 Nm
		200AH	2*8AWG	16	6.4	33.2	

Recommended breaker specification of battery for each inverter:

Model	1 unit
M3024NC	150A/32VDC
M3048NC	100A/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
3KVA	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	400AH	600AH	800AH	1000AH	1200AH

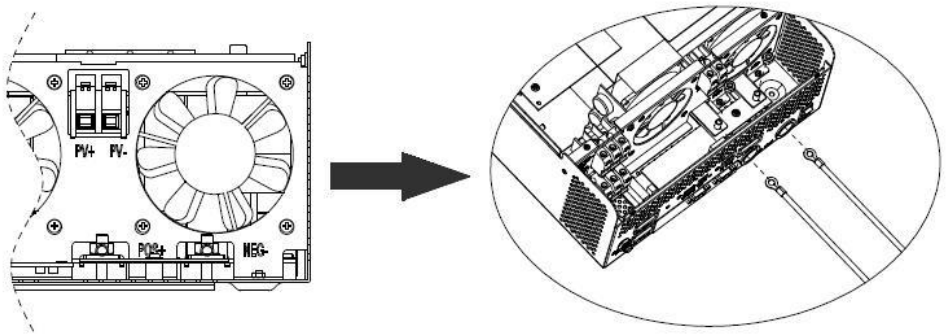
WARNING! Be sure that all inverters will share the same battery bank. Otherwise, the inverters will transfer to fault mode.

Please follow the above minimum wire size requirement.
One cable is always best, but if there is a problem obtaining for example 100mm²cable, use 2*50mm²or 3*35mm² 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's suggested to connect at least 100Ah capacity battery for 3KVA/48V model and at least 200Ah capacity battery for 3KVA/24V model.
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.

	WARNING: Shock Hazard Installation must be performed with care due to high battery voltage in series.

⚠	

⚠	CAUTION!! Do not place anything between the flat part of the inverter terminal and the ring terminal. Otherwise, overheating may occur. CAUTION!! Do not apply anti-oxidant substance on the terminals before terminals are connected tightly. CAUTION!! 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 (-).

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.

WARNING	Over torqueing may cause the bolt to break.
	Equipment Damage The inverter is not reverse polarity protected. Reversing the battery polarity on the DC input connections will cause permanent damage to the inverter which is not covered under warranty. Always check polarity before making connections to the inverter.
	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 6AWG, and the torque for the screws is 1.6Nm.

Max. PV Array Open Circuit Voltage is 150Vdc, pls make sure Open circuit Voltage (Voc) of PV modules does not exceed 150V and higher than 34Vdc

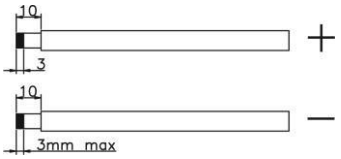
The PV voltage must be higher than battery voltage to activate charging. There is no voltage boost in the MPPT module.

INVERTER MODEL	M3024NC	M3048NC

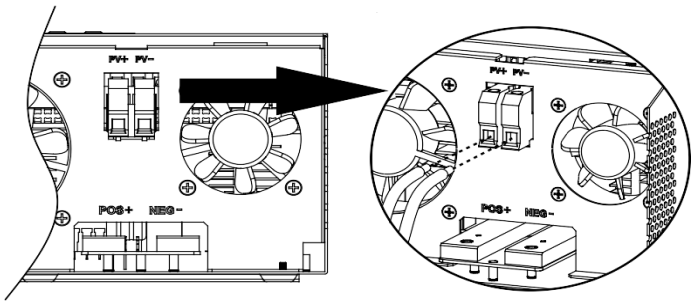
Max. PV Array Open Circuit Voltage	145Vdc	145Vdc
PV Array MPPT Voltage Range	30~115Vdc	60~115Vdc
Min. battery voltage for PV charge	17Vdc	34Vdc

The PV input will automatically wake up the LCD when PV voltage is over 3 volts higher than battery voltage, the PV charger will charge the battery when the PV voltage is over 5 volts higher than battery voltage.
If the PV voltage is only 3-5 voltage higher than the battery, the LCD will be power on, the PV charger will not work and the inverter will give an alarm in every 30 seconds.

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 40A for 3KVA.
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
3KVA	8 AWG	1.4~ 1.6Nm

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

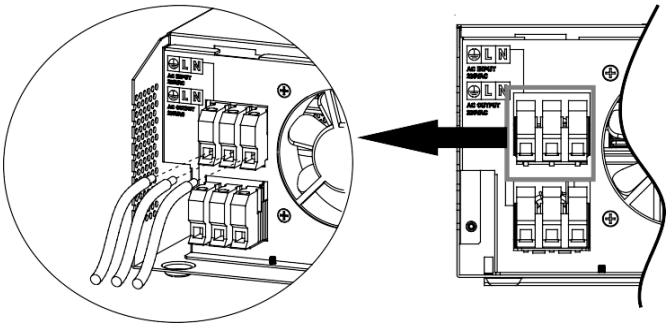
*Before making AC input/output connection, be sure to open DC protector or disconnector first.

*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.

CAUTION: Important

Be sure to connect AC wires with correct polarity. If L and N wires are reversed, 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.

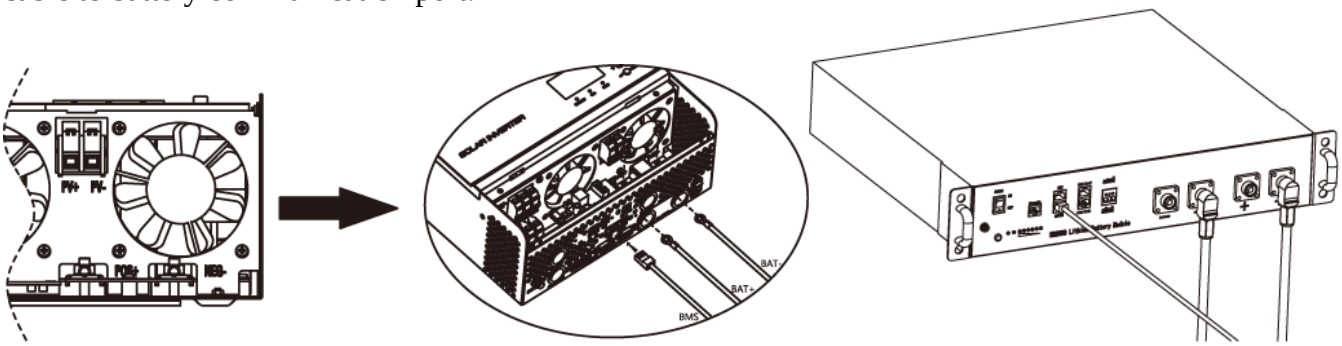
3.6 Communication With Lithium Batteries

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.

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.

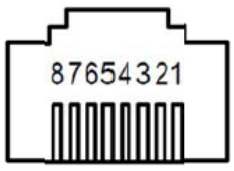
Note: if you choose lithium battery, make sure to connect the BMS communication cable between the battery and the inverter. You need to choose battery type as “lithium battery”

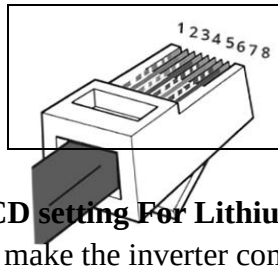
Lithium battery communication and setting

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 switches.

2 Connect the master unit with 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 will can automatically work as the master unit, but the communication will be slower.

3.7 Inverter Parallel Operation

The M3KW 120Vac inverters can be stacked up to 6 pcs to

- expand output power in 120Vac
- create 120/240Vac split phase
- create 120/208Vac three phase

When they are stacked, all the inverters will share the loads evenly. Each will be ready to output full power even the load is under 3KW, none of them will go into power saver mode.

This is designed to handle sudden loads fluctuations.

Note:

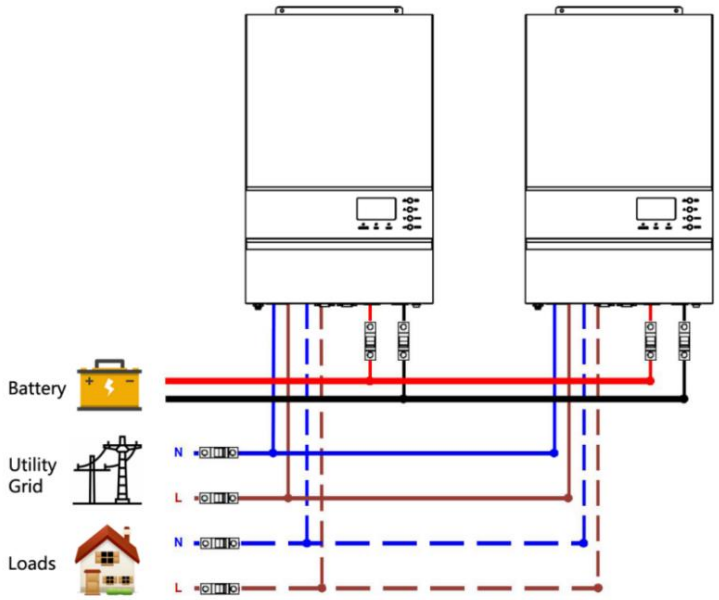
When there is more than one inverter paralleled in one phase, if the slave unit shut off, the rest inverters in the system will continue operate.

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

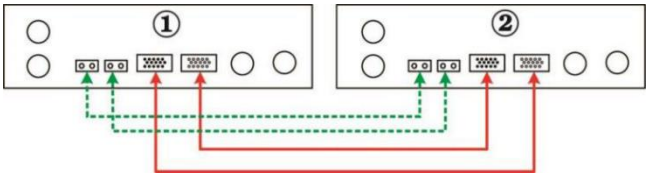
3.7.1 Parallel in Single Phase to Expand Power

Two inverters in parallel:

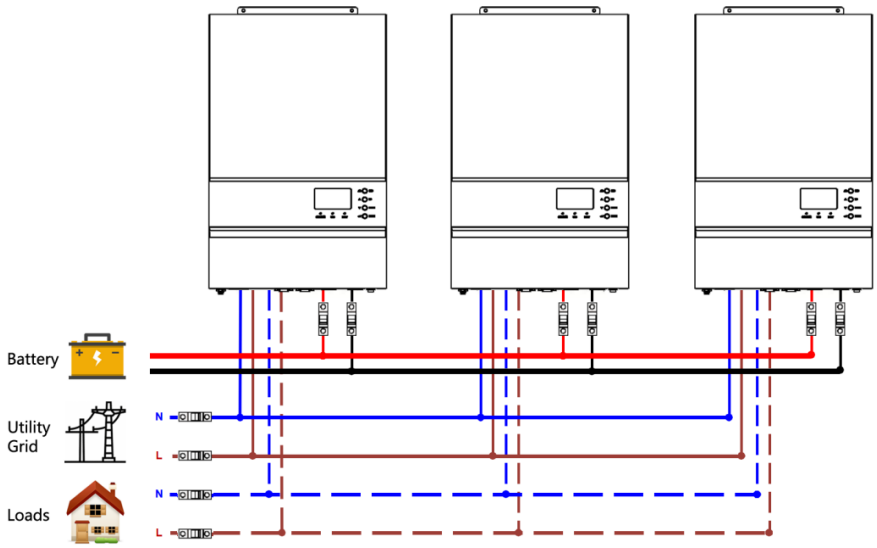
Power Wire Connection



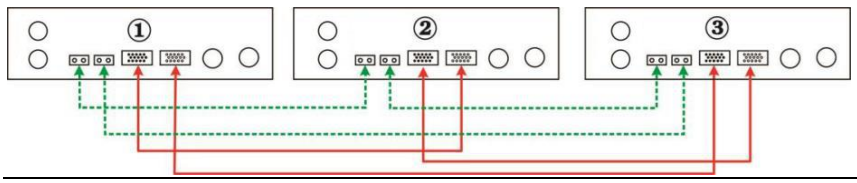
Communication Wire Connection



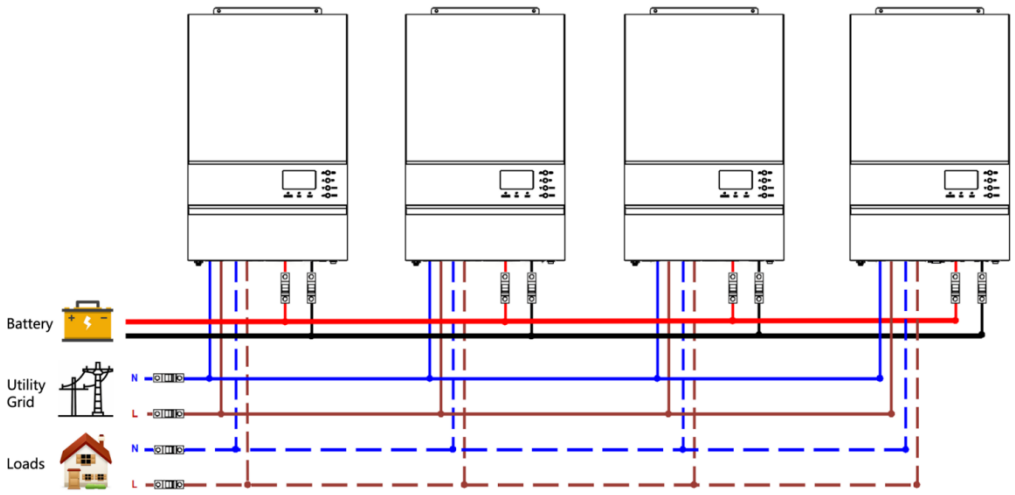
Three inverters in parallel:
Power Wire Connection



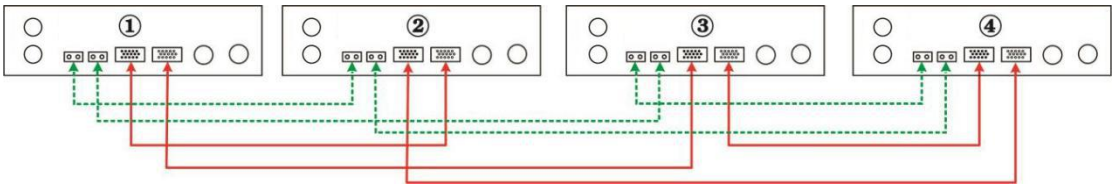
Communication Wire Connection



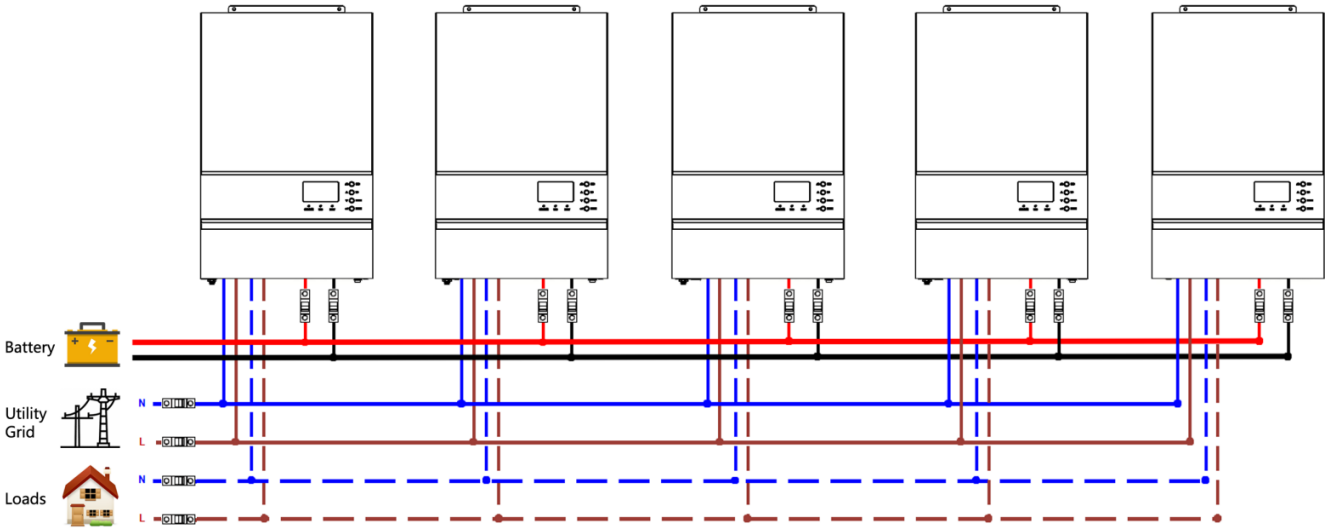
Four inverters in parallel:
Power Wire Connection



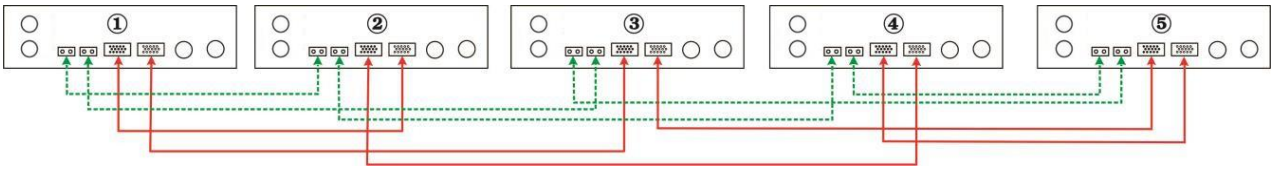
Communication Wire Connection



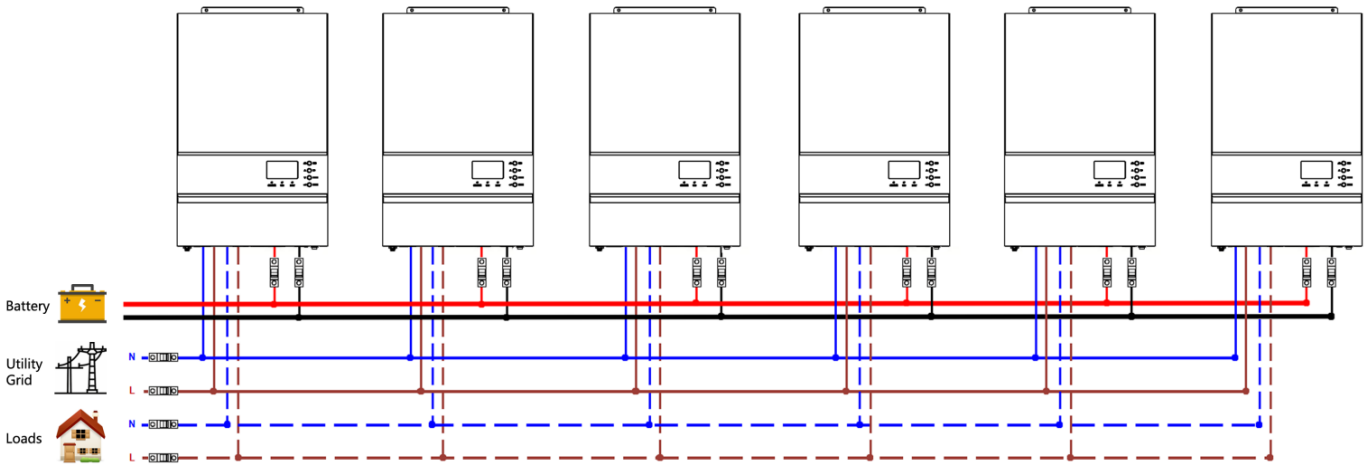
Five inverters in parallel:
Power Wire Connection



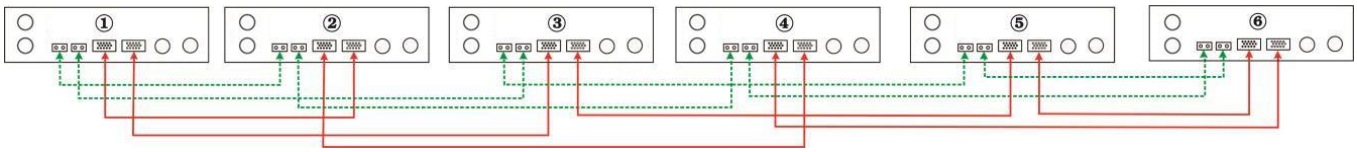
Communication Wire Connection



Six inverters in parallel:
Power Wire Connection

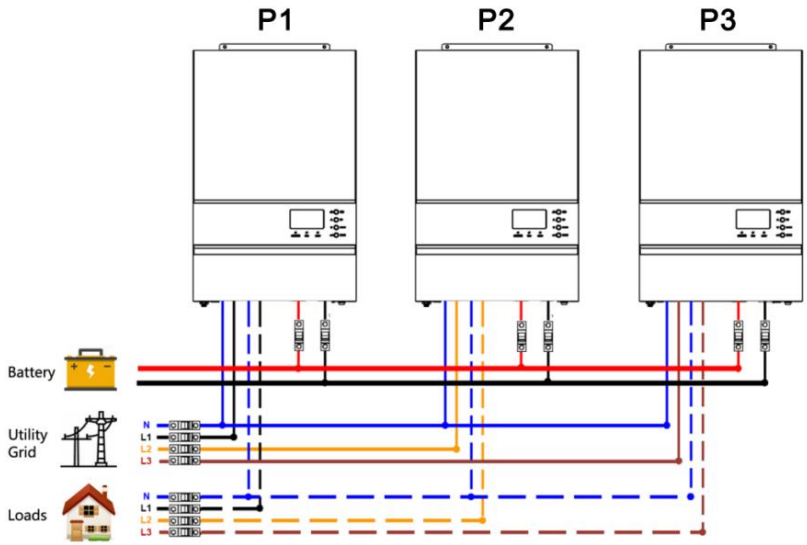


Communication Wire Connection

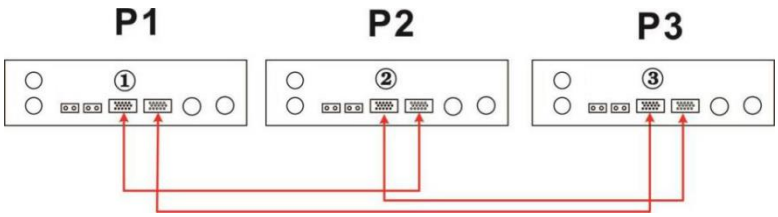


3.7.2 Parallel To Form Three Phase

One inverter in each phase:
Power Wire Connection

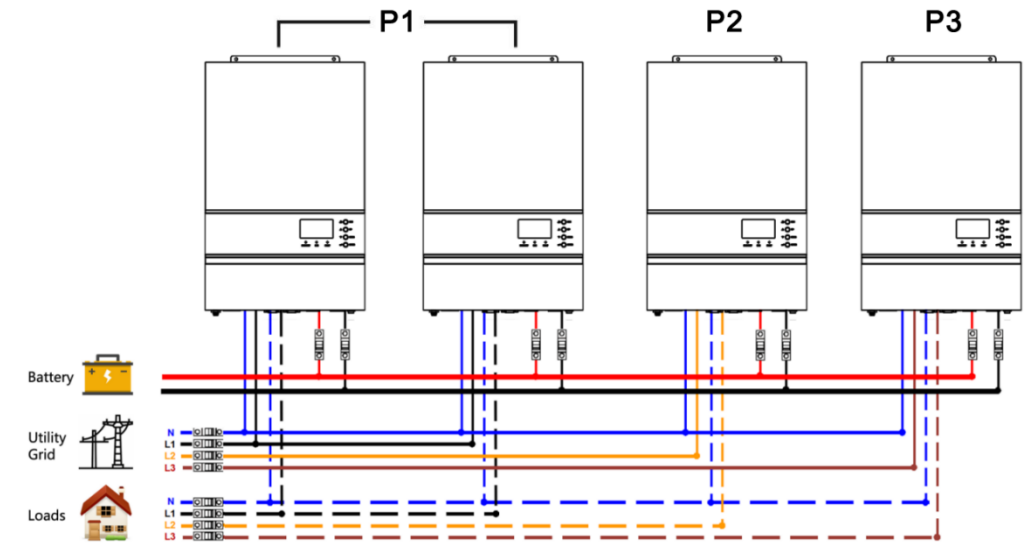


Communication Wire Connection

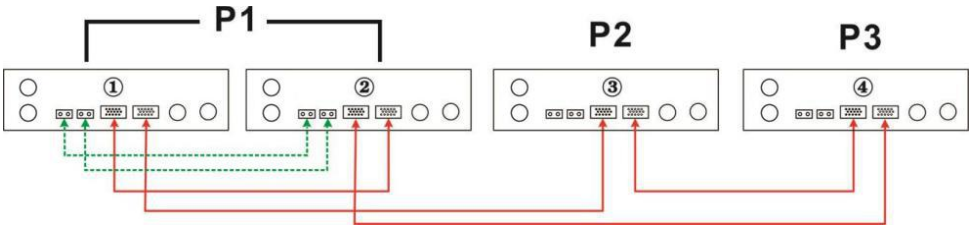


Two inverters in one phase and only one inverter for the remaining phases:

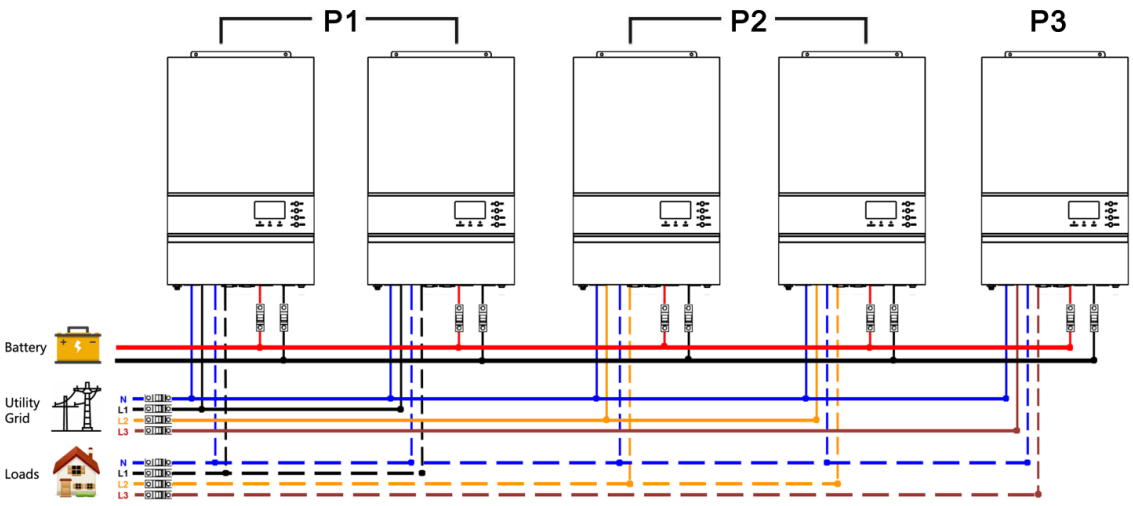
Power Wire Connection



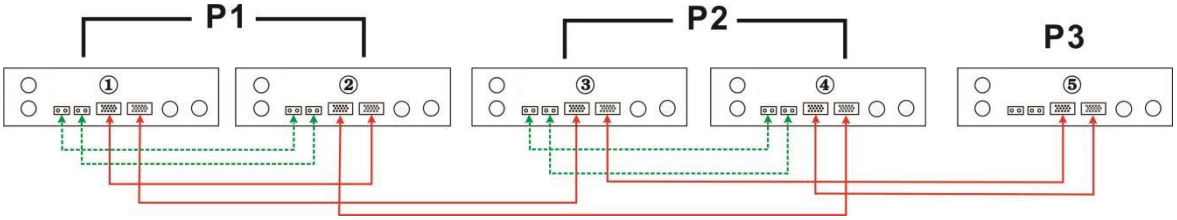
Communication Wire Connection



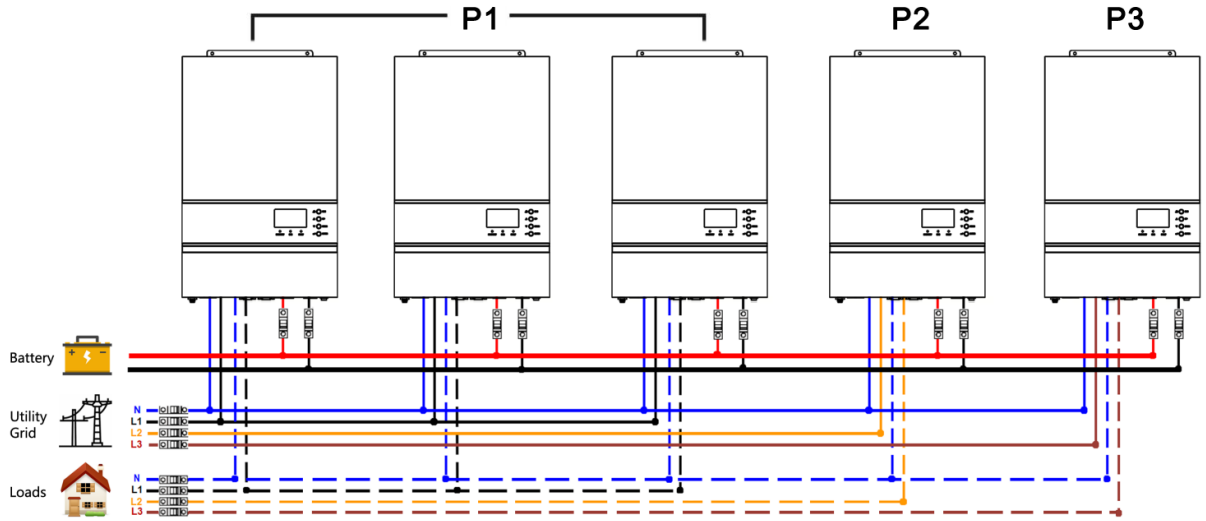
Two inverters in two phases and only one inverter for the remaining phase:
Power Wire Connection



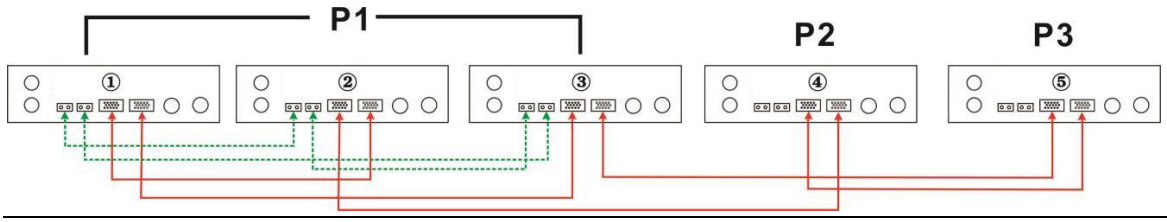
Communication Wire Connection



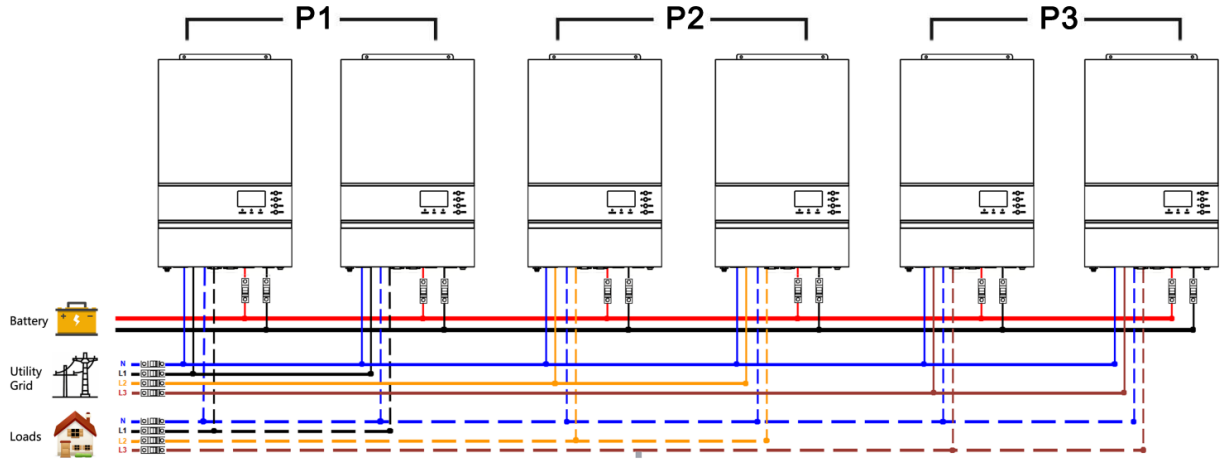
Three inverters in one phase and only one inverter for the remaining two phases:
Power Wire Connection



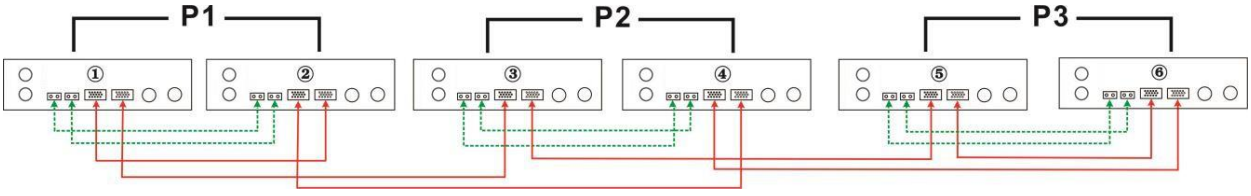
Communication Wire Connection



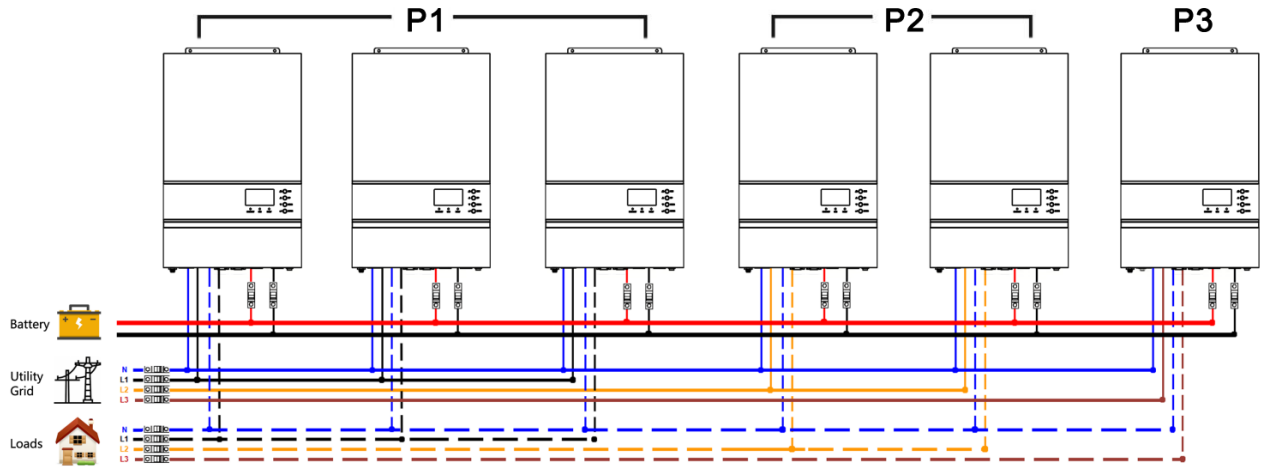
Two inverters in each phase:
Power Wire Connection



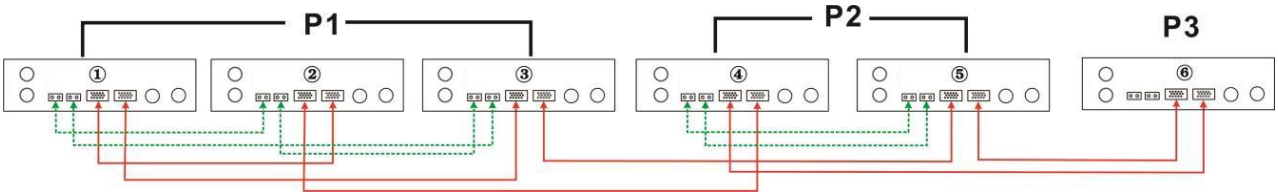
Communication Wire Connection



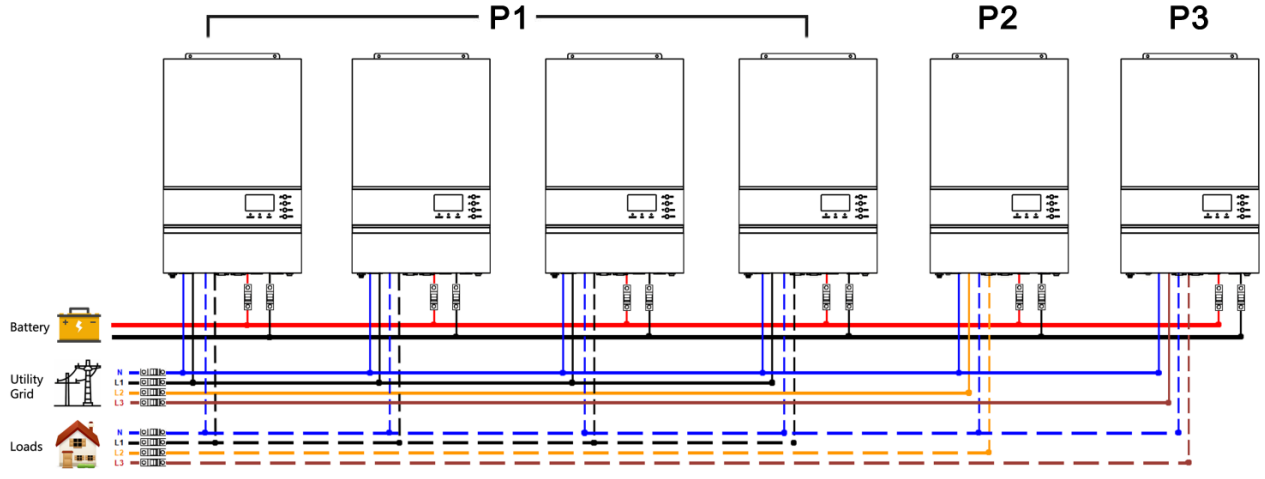
Three inverters in one phase, two inverters in second phase and one inverter for the third phase:
Power Wire Connection



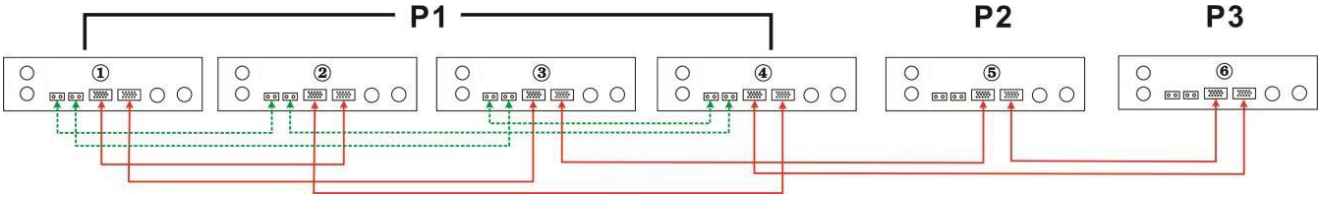
Communication Wire Connection



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



Communication Wire Connection

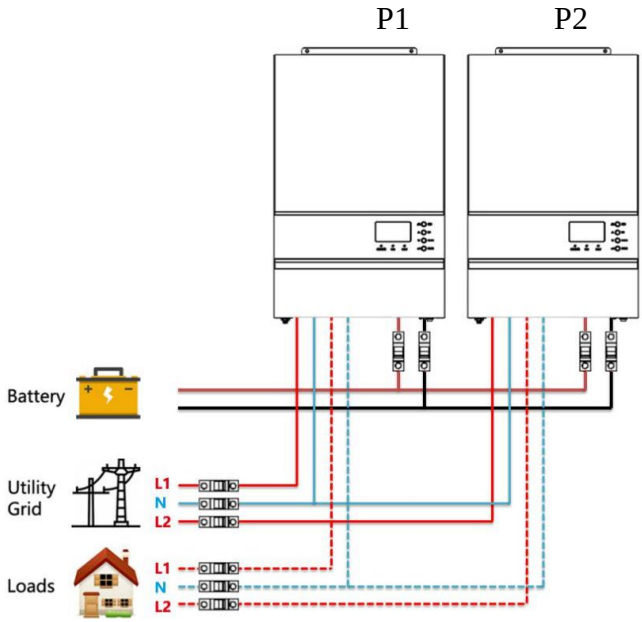


WARNING: Do not connect the current sharing cable between the inverters which are in different phases.

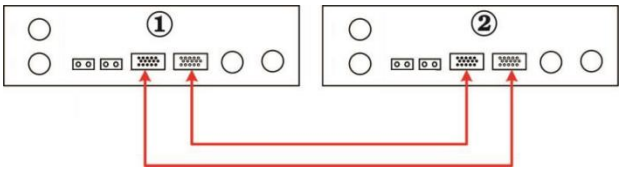
3.7.3 Parallel to Form Split Phase

One inverter in each phase:

Power Wire Connection

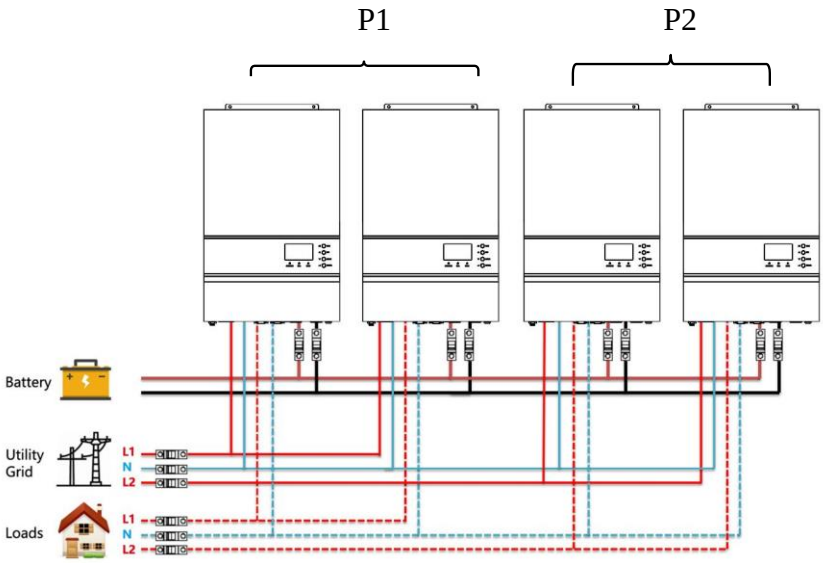


Communication Wire Connection

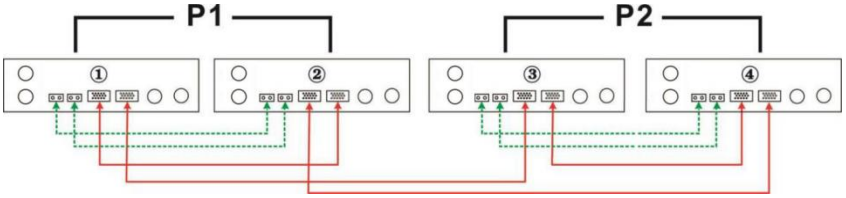


Two inverters in each phase:

Power Wire Connection

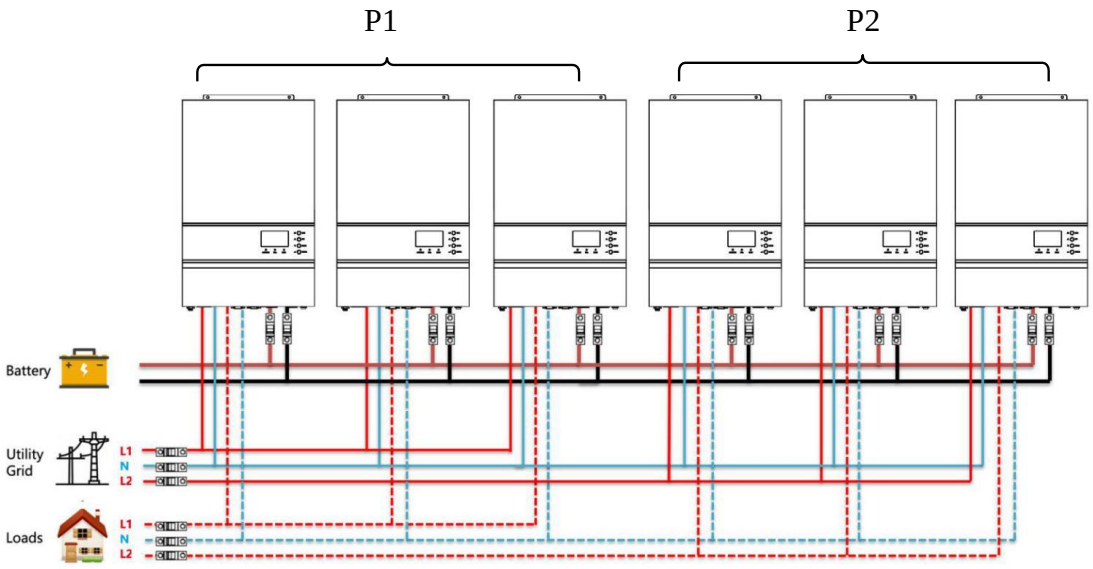


Communication Wire Connection

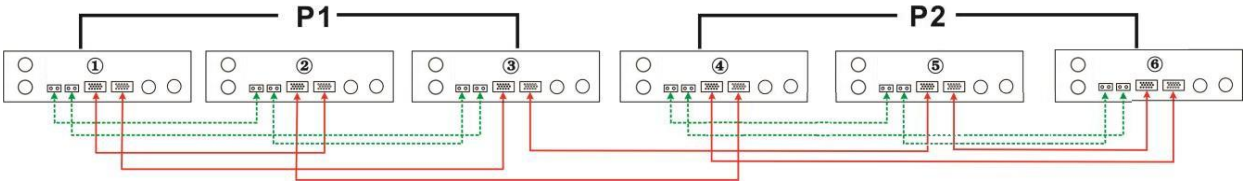


Three inverters in each phase:

Power Wire Connection



Communication Wire Connection



WARNING: Do not connect the current sharing cable between the inverters which are in different phases. Otherwise, it may damage the inverters.

CAUTION: For parallel operation， each inverter should connect to PV modules separate

3.7.4 LCD Setting For Parallel Operation

Setting Program: Please refer to program 23 for details.

To set up program 23, users have to power the inverter from on to unit off.

Then press any of the four LCD buttons within 40 seconds before the inverter shuts off completely.

Once the button is pressed, the LCD will stay on for another 40 seconds.

The setting should be done in this time frame.

Note: When setting LCD program, the inverter must be powered off. Otherwise, the setting cannot be saved.

The new setting will work when the inverters are restarted.

Make sure all the inverters are built with the same version of software before they are set up in parallel.

The software version can be found on the last two pages of the LCD.

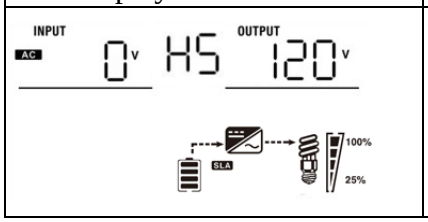
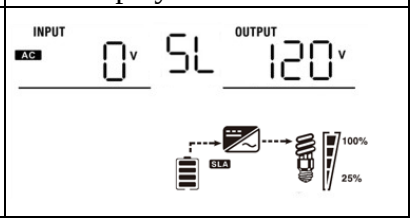
Parallel in single phase

Step 1: Check the wire connection

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

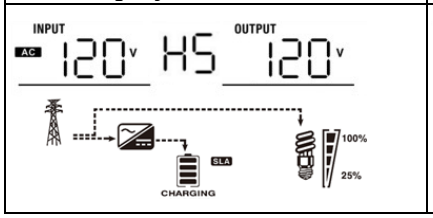
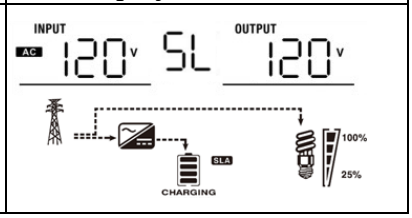
Step 2: Power the inverter on then off, set “PAL” in program 23.

Step 3: Power 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 connected to the utility at the same time. If not, warning 15 will be displayed.

LCD display in Master unit	LCD display in Slave unit
	

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

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

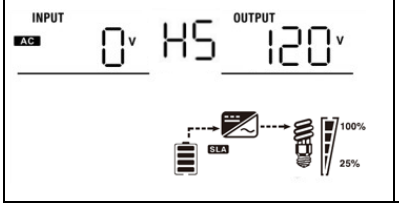
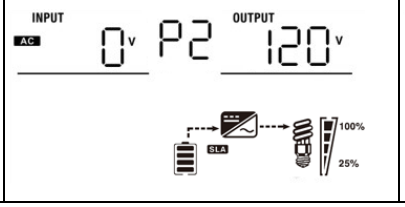
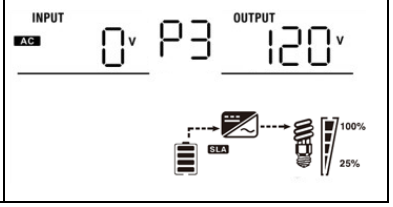
Parallel in three phase

Step 1: Check the wire connection

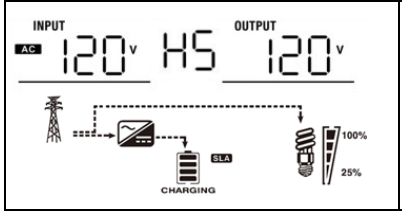
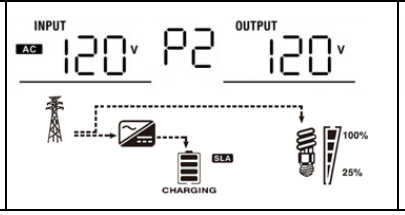
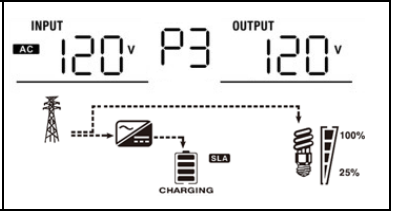
Ensure all breakers in Line wires of load side are open and each Neutral wires of each unit are connected.

Step 2: Power the inverters on then off, configure LCD program 23 as 3P1, 3P2 and 3P3 sequentially. Then power off all units.

Step 3: Power on all units sequentially. Turn on the HOST inverter(3P1) first, then turn on the rest one by one.

LCD display in L1-phase unit	LCD display in L2-phase unit	LCD display in L3-phase unit
		

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.

LCD display in L1-phase unit	LCD display in L2-phase unit	LCD display in L3-phase unit
		

Step 5: If there is no 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 "P1".

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 wire connection

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

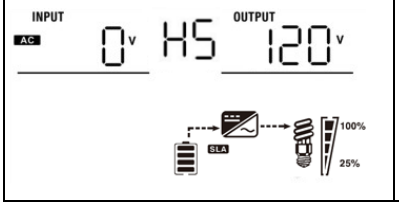
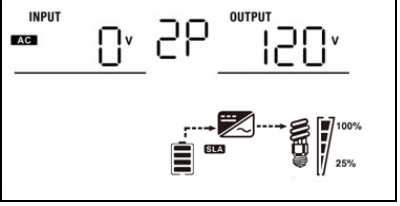
Step 2: Power the inverters on then off, configure LCD program 23 as 2P0 on phase1 units, then set as 2P2 (or 2P1) on phase2 units

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

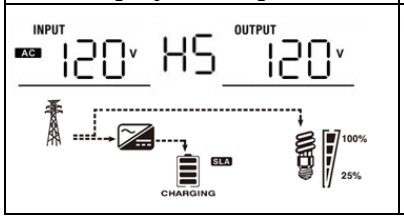
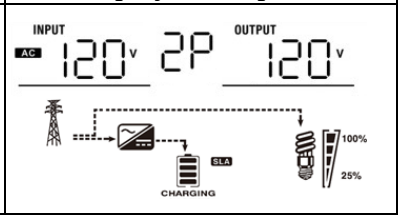
2P0 + 2P2: split phase 120V/240V

Then power off all units.

Step 3: Power on all units sequentially. Please turn on HOST inverter(2P0) first, then turn on the rest one by one.

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 not work in the line mode.

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

Step 5: If there is no fault alarm, the system to support split-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 "P1".

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.

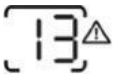
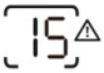
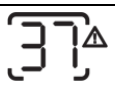
4 Maintenance & Troubleshooting

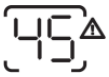
This troubleshooting guide contains information about how to troubleshoot possible error conditions while using the M 3KW Solar Power Inverter/Charger.
The following chart is designed to help you quickly pinpoint the most common inverter failures.

Indicator and Buzzer

Fault Code	Fault Event	Icon on
01	Fan locke	
02	Over temperature	
03	High Battery voltage	
04	Low Battery voltag	
05	Output short circuit	
06	High Output voltage	
07	Overload time out	
08	High DC Bus voltage	
09	DC Bus soft start failed	
51	Over current or surge	
52	Low DC Bus voltage	
53	Inverter soft start failed	
55	Over DC voltage in AC output	
56	Battery Connection Open	
57	Current sensor failed	
58	Output voltage is too low	
60	Negative power fault	
80	CAN fault	
81	Host Unit Loss	

Warning Indicator

Warning Code	Warning Event	Audible Alarm	Icon flashing
01	Fan Lock	Beep three times every second	
02	Over temperature	Beep once every second	
03	Battery over-charge	Beep once every second	
04	Low battery	Beep once every second	
07	Overload	Beep once every 0.5 second	
10	Output power derating	Beep twice every 3 seconds	
12	Solar charger stops due to low battery	Beep once every second	
13	Solar charger stops due to high PV voltage	Beep once every second	
14	Solar charger stops due to overload	Beep once every second	
15	Parallel input utility grid difference	Beep once every second	
16	Parallel input phase error	Beep once every second	
17	Parallel output phase loss	Beep once every second	
20	BMS communication error	Beep once every second	
33	BMS communication loss	Beep once every second	
34	Battery Cell over voltage	Beep once every second	
35	Battery Cell under voltage	Beep once every second	
36	Battery Total over voltage	Beep once every second	
37	Battery Total under voltage	Beep once every second	
38	Discharge over current	Beep once every second	
39	Charge over current	Beep once every second	

40	Discharge over temperature	Beep once every second	
41	Charge over temperature	Beep once every second	
42	Mosfet over temperature	Beep once every second	
43	Battery over temperature	Beep once every second	
44	Battery under temperature	Beep once every second	
45	System shut down	Beep once every second	

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. 2.Replace battery.
No response after power on.	No indication.	1.The battery voltage is far too low. (<1.4V/Cell) 2.Battery polarity is connected reversed.	1.Check if batteries and the wiring are connected well. 2.Re-charge battery. 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. 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 Priority” or “Solar Priority” 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 continuously and red LED is on.(Fault	Fault code 01	Fan fault.	1.Check whether all fans are working properly. 2.Replace the fan.
	Fault code 02	Internal temperature of component is over 100℃.	1.Check whether the air flow of the unit is blocked or whether the ambient temperature is too high.

code)			2.Check whether the thermistor plug is loose.
Buzzer beeps once every second, and red LED is flashing. (Warning code)	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. 2.Check battery SOC in LCD when use Li battery. 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. 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 lithum battery without communication, check whether the voltage points of the program 19 and 21 are too high for the lithum battery. 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(sigle or paralle; 3P1,3P2,3P3). 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. 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. 2. Check whether Program 8 settings are the same for all parallel inverters 3. Check whether the current sharing cables are

			connected well in the same parallel phases. 4. Check whether all neutral wires of all parallel units are connected together. 5. If problem still exists, contact repair center.
	Fault code 80	CAN fault	1. Check whether the parallel communication cables are connected well. 2. Check whether Program 23 settings are right for the parallel system. 3. If problem still exists, contact repair center
	Fault code 81	Host loss	

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:
a) 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.
b) 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;
c) the product if repairs have been done to it other than by us or its authorized service centers;

Appendix 1 : M 3KW Solar Inverter Spec Sheet

	MODEL #	M3024NC	M3048NC
AC Mode	Nominal AC Output Power	3000VA/3000W	3000VA/3000W
	AC Input Waveform	Sinusoidal (Utility or Generator)	Sinusoidal (Utility or Generator)
	AC Input Voltage	100/110/120 VAC	100/110/120 VAC
	Max AC Input Voltage	150Vac	150Vac
	Low AC Voltage Trip	95Vac±5V (UPS); 65Vac±5V (Appliances)	95Vac±5V (UPS); 65Vac±5V (Appliances)
	Low AC Voltage Return	100Vac±5V (UPS); 70Vac±5V (Appliances)	100Vac±5V (UPS); 70Vac±5V (Appliances)
	High AC Voltage Trip	140Vac±5V	140Vac±5V
	High AC Voltage Return	135Vac±5V	135Vac±5V
	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 Parallel	10 ms(Typical) ; 20 ms Max; <30ms Parallel
	AC Input Breaker	40A	40A
	AC Output Bypass Breaker	40A	40A
Inverter Mode	Battery Voltage	24 VDC	48 VDC
	Output Waveform	Pure Sine Wave	Pure Sine Wave
	AC Voltage Regulation (Batt. Mode)	100/110/120 VAC ± 5%	100/110/120 VAC ± 5%
	Surge AC Output Power	6000W (5 secs)	6000W (5 secs)
	Output Frequency	50Hz/60Hz(Adjustable)	50Hz/60Hz(Adjustable)
	DC To AC Efficiency (Peak)	90%	90%
	Overload Protection	5s@≥150% load; 10s@110%~150% load	5s@≥150% load; 10s@110%~150% load
	Cold Start Battery Voltage* (Without PV or AC)	23.0Vdc	46.0Vdc
	Minimal Battery Voltage To Activate AC Charger(Without PV)	20.4Vdc	40.8Vdc
	Low DC Warning Voltage (Lead-Acid Mode)	22.0Vdc @ load < 20%	44.0Vdc @ load < 20%
		21.4Vdc @ 20% ≤ load < 50%	42.8Vdc @ 20% ≤ load < 50%
		20.2Vdc @ load ≥ 50%	40.4Vdc @ load ≥ 50%
	Low DC Warning Return Voltage(Lead-Acid Mode)	23.0Vdc @ load < 20%	46.0Vdc @ load < 20%
		22.4Vdc @ 20% ≤ load < 50%	44.8Vdc @ 20% ≤ load < 50%
		21.2Vdc @ load ≥ 50%	42.4Vdc @ load ≥ 50%
	Low DC Cut-off Voltage (Lead-Acid Mode)	21.0Vdc @ load < 20%	42.0Vdc @ load < 20%
		20.4Vdc @ 20% ≤ load < 50%	40.8Vdc @ 20% ≤ load < 50%
		19.2Vdc @ load ≥ 50%	38.4Vdc @ load ≥ 50%
	Low DC Cut-off Voltage (Li Mode)	21.0Vdc	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	Low DC Cut-off SOC +10%	Low DC Cut-off SOC +10%

	Mode)		
	Low DC Cut-off SOC (Li Mode)	Default 20%, 5%~50% settable	Default 20%, 5%~50% settable
	High DC Recovery Voltage	28.2Vdc(C.V. charging voltage)	56.4Vdc(C.V. charging voltage)
	High DC Cut-off Voltage	30.4Vdc	60.8Vdc
	Idle Power	50W	50W
Charge Mode	CV & Float Charge voltage	24.0V~29.2V Settable	48.0V~58.4V Settable
	Maximum PV Array Power	4500W	4500W
	PV Open Circuit Voltage	145Vdc	145Vdc
	MPPT Efficiency	98.0% max.	98.0% max.
	MPPT Range @ Operating Voltage	30~115 VDC	60~115 VDC
	Min battery voltage for PV charge	17Vdc	34Vdc
	Overcharge Protection	30Vdc	60Vdc
	Maximum Solar Charge Current	80 A	80 A
	Maximum AC Charge Current	60 A	40 A
	Maximum Charge Current(PV+AC)	140 A	120 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	11.5KG/25.3lbs	11.5KG/25.3lbs
	Gross Weight	13.5KG/29.8lbs	13.5KG/29.8lbs
	Humidity	5% to 95% Relative Humidity (Non-condensing)	5% to 95% Relative Humidity (Non-condensing)
	Operating Temperature	-10℃ to 55℃(-14℉to 131℉)	-10℃ to 55℃(-14℉to 131℉)
	Storage Temperature	-15℃ to 60℃(5℉to 140℉)	-15℃ to 60℃(5℉to 140℉)
	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.

Sigineer Power Limited
Email: info@sigineer.com
TEL: +86 769 82817616
US Warehouse: 4415 S 32nd St, Phoenix AZ 85040