



THREE-PHASE HYBRID INVERTER



INSTALLER MANUAL

SUN-8K-SG04LP3 / SUN-10K-SG04LP3 /
SUN-12K-SG04LP3

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PREFACE

This Installer Manual contains information for proper installation, operation, maintenance, and care of the Sunsynk Three-Phase Hybrid Inverter. A deep understanding of the instructions described in this document will help you get the most out of your new inverter.

This document should be read thoroughly, and all the procedures described in this manual should be followed carefully. If you have questions or concerns about this product's operation and maintenance, please get in touch with our customer support.

All personnel involved in this machine's installation, setup, operation, maintenance, and repair should read and understand this manual, mainly its safety instructions. Substandard performance and longevity, property damage, and personal injury may result from not knowing and following these instructions.

In order to ensure long product life, Sunsynk recommends that you utilize the product and perform maintenance by correctly following the instructions described in this guide. The manufacturer's warranty does not cover any damage resulting from the neglect of these instructions.

Sunsynk assumes no liability for damage caused by the operation contrary to what is specified in this operating manual.

All information in this User Guide is based on the latest product information available at the time of printing approval. Sunsynk reserves the right to make changes at any time without notice and without incurring any obligation.

Please always keep this manual with the inverter as a reference for everyone using this product.

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1. SAFETY

1.1. General Safety

- This device should only be used in accordance with the instructions within this manual and in compliance with local, regional, and national laws and regulations. Only allow this device to be installed, operated, maintained, and repaired by other person(s) who have read and understood this manual. Ensure the manual is included with this device should it be passed to a third party.
- DO NOT allow minors, untrained personnel, or person(s) suffering from a physical or mental impairment that would affect their ability to follow this manual, install, maintain or repair this device.
- Any untrained personnel who might get near this device while it is in operation MUST be informed that it is dangerous and instructed carefully on how to avoid injury.



1.2. Symbols

 WARNING	This symbol indicates information that if ignored, could result in personal injury or even death due to incorrect handling.
 CAUTION	This symbol indicates information that if ignored, could result in personal injury or physical damage due to incorrect handling.
PLEASE NOTE	Indicates information that is considered important, but not hazard-related.

1.3. Safety Instructions



WARNING

HIGH LIFE RISK DUE TO FIRE OR ELECTROCUTION.

Sunsynk Three-Phase Hybrid Inverter can only be installed by a qualified licensed electrical contractor. This is not a DIY product.

- Be sure to read this manual thoroughly before installation.
- Do not attempt to install the inverter by yourself. Installation work must be carried out in compliance with national wiring standards and by suitably qualified personnel only. Do not turn on the power until all installation work is complete.
- Do not disassemble the inverter. If you need repair or maintenance, contact a professional service centre.
- Always use an individual power supply line protected by a circuit breaker and operating on all wires with a distance between contacts of at least 3mm for this unit.
- The unit must be correctly grounded, and the supply line must be equipped with a suitable breaker and RCD to protect people.
- Disconnect all wires/cables before performing any maintenance or cleaning to reduce the risk of electrical shock.
- The unit is not explosion-proof, so it should not be installed in an explosive atmosphere.
- Never touch electrical components immediately after the power supply has been turned off since the system can still have residual energy, so an electric shock may occur. Therefore, after turning off the power, always wait 5 minutes before touching electrical components.
- This unit contains no user-serviceable parts. Always consult an authorised contractor for repairs.

1.4. Disposal Remarks

DO NOT dispose this product with domestic waste!

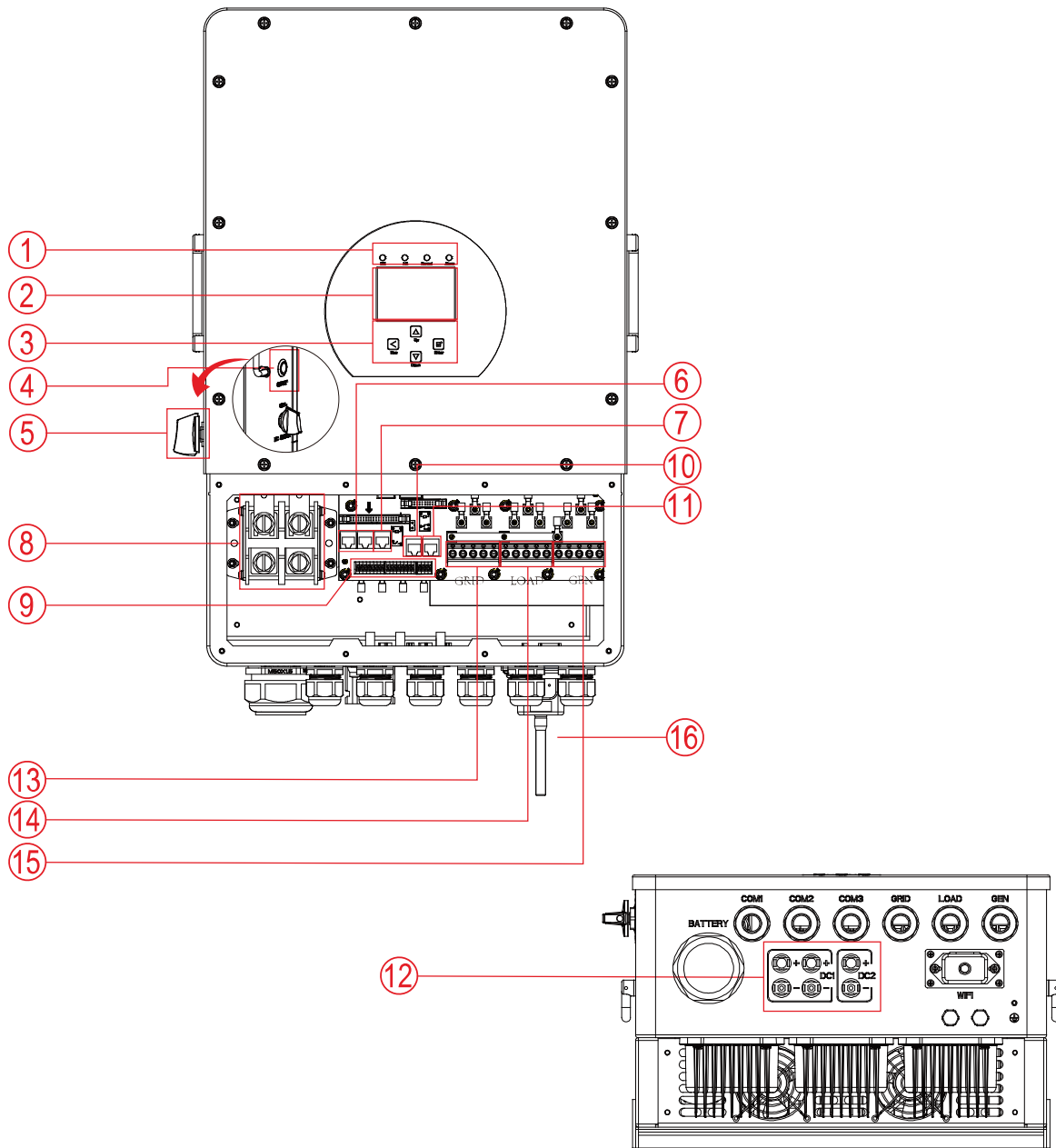
Electrical devices should be disposed of in accordance with regional directives on electronic and/ or electronic-waste disposal. In case of further questions, please consult your supplier. In some cases, the supplier can take care of proper disposal.

2. PRODUCT INTRODUCTION

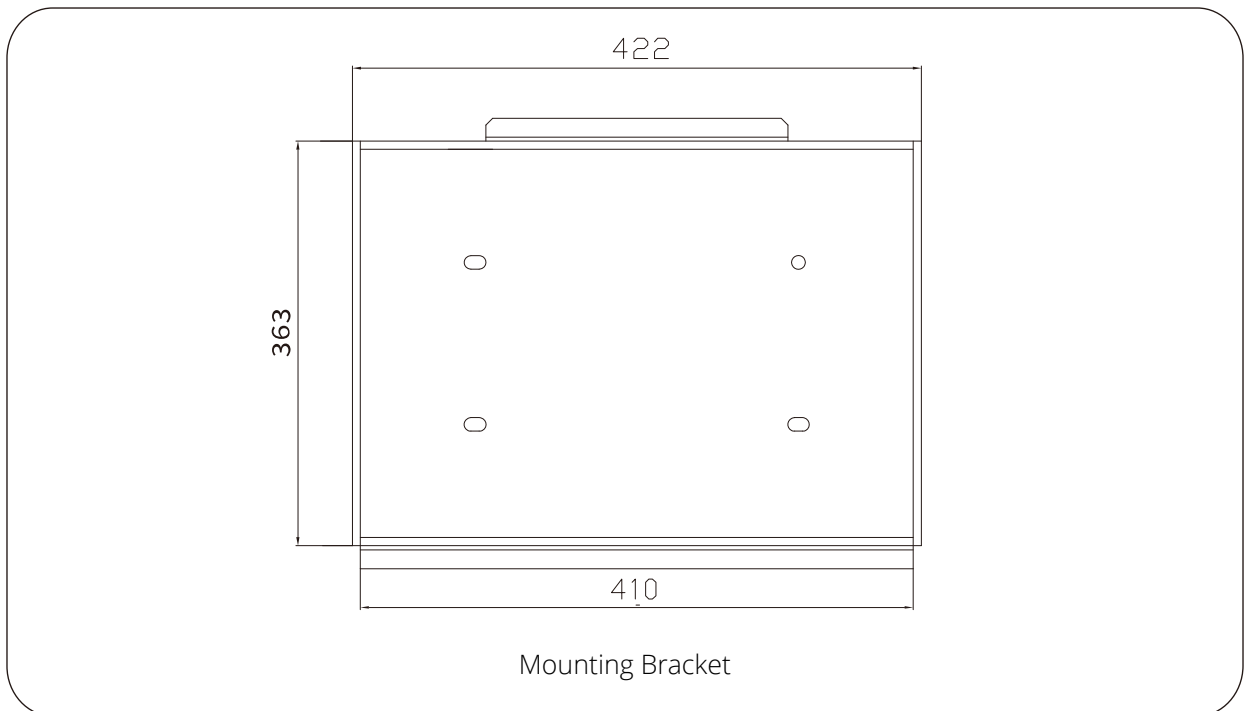
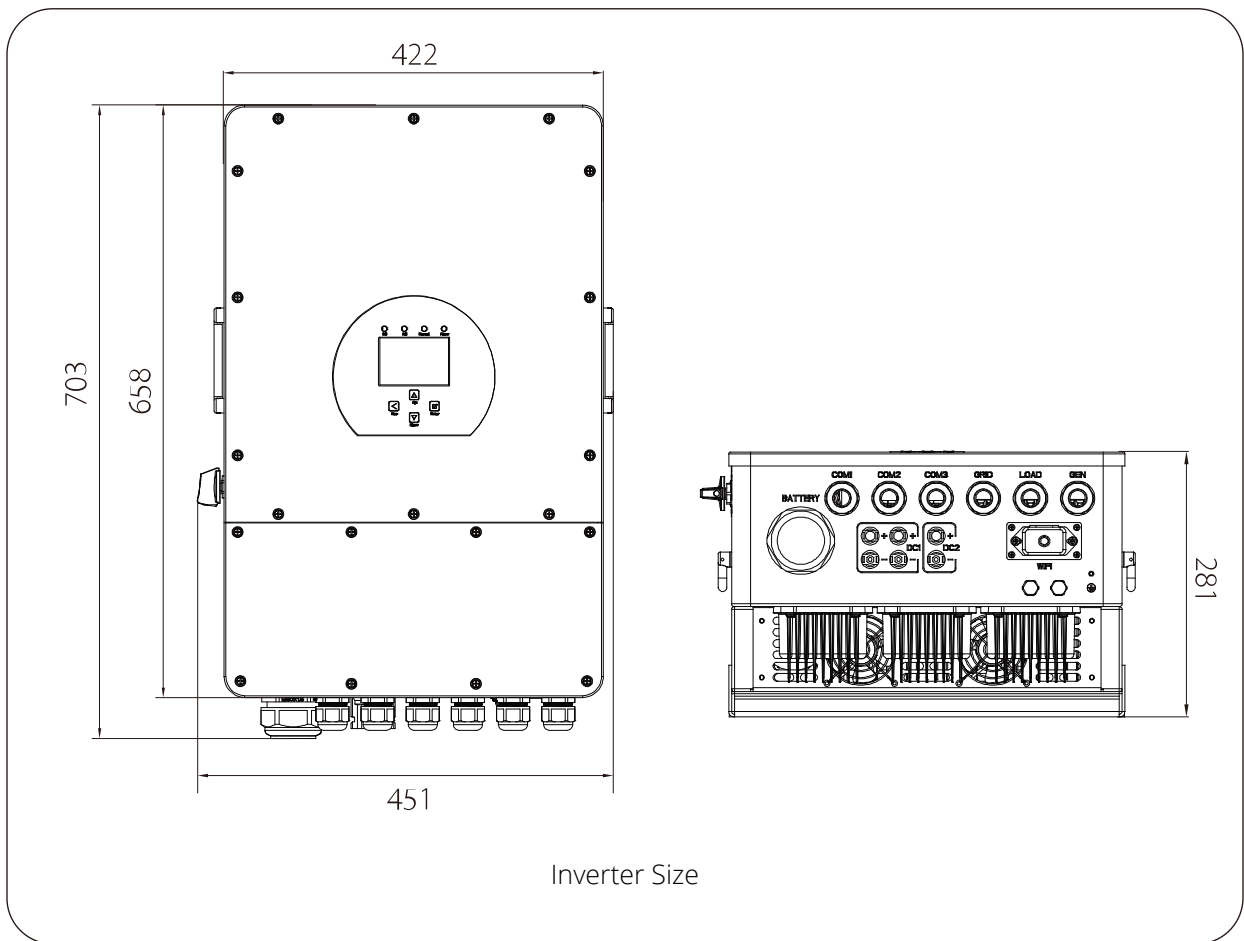
The Sunsynk Three-Phase Hybrid Inverter is a highly efficient power management tool that allows the user to hit those 'parity' targets by managing power-flow from multiple sources such as solar, mains power (grid) and generators, and then effectively storing and releasing power as and when utilities require.

2.1. System Overview

- | | | |
|------------------------|-----------------------------|---------------------|
| 1. Inverter Indicators | 7. Meter-485 port | 13. Grid |
| 2. LCD Display | 8. Battery input connectors | 14. Load |
| 3. Function Buttons | 9. Function Port | 15. Generator input |
| 4. Power on/off button | 10. Modbus Port | 16. Wi-Fi Interface |
| 5. DC switch | 11. BMS Port | |
| 6. Parallel port | 12. PV input with two MPPT | |



2.2. Product Size



2.3. Features

INTERACTIVE

- Easy and straightforward to understand LCD display;
- Supporting Wi-Fi or GSM monitoring;
- Visual power flow screen;
- Built-in 2 strings for 1 MPP tracker and 1 string for 1 MPP tracker;
- Smart settable 3-stage MPPT charging for optimised battery performance;
- Auxiliary load function;
- Multi-inverter function: grid-tied and off-grid;

COMPATIBLE

- Compatible with mains electrical grid voltages or power generators;
- Compatible with wind turbines;
- 230V/400V Three-phase Pure Sine-wave Inverter;
- It can power up both single-phase and 3-phase loads;
- Self-consumption and feed-in to the grid;
- Auto restart while AC is recovering;
- Maximum charging/discharging current of 190A (8kW), 210A (10kW), and 240A (12kW);
- DC and AC coupled to retrofit existing solar system;
- Compatible with a 48V low-voltage battery;

CONFIGURABLE

- Fully programmable controller;
- Programmable supply priority for battery or grid;
- Programmable multiple operation modes: on-grid/off-grid & UPS;
- Configurable battery charging - current/voltage based on applications by LCD setting;
- Configurable AC / solar / generator charger priority by LCD setting;
- 6 time periods for battery charging/discharging;

SECURE

- Overload/over-temperature/short-circuit protection;
- Smart battery charger design for optimised battery protection;
- Limiting function installed to prevent excess power overflow to the grid;
- Isolation transformer design;

APPLICATIONS

- Marine (vessel power management);
- Power shedding (home/office/factory);
- UPS (fuel-saving systems);
- Remote locations with solar and wind generators;
- Building sites;
- Telecommunication;

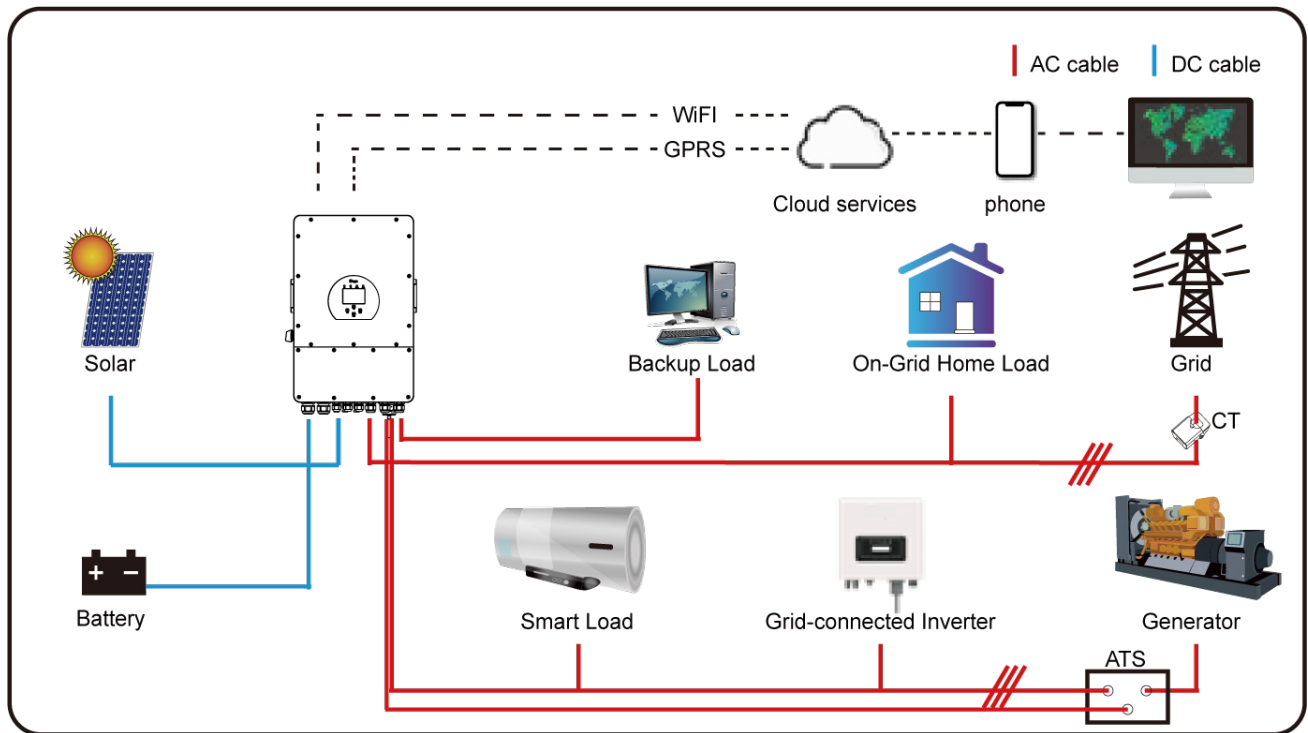
2.4. Basic System Architecture

The following diagram explains the basic application and architecture of this 3-Phase Inverter. It also includes the following devices to have a Complete running system.

- Generator or Utility
- PV modules
- Batteries
- Normal and smart loads
- Monitoring system

Consult with your system integrator for other possible system architectures depending on your requirements.

This inverter can power all kinds of appliances in the home or one environment, including motor-type appliances such as refrigerators and air conditioners.



3. TECHNICAL SPECIFICATIONS

Model	SUNSYNK-8K-SG04LP3
Product Type	Hybrid Inverter
Enclosure	IP65
Ambient Temperature	-45°C ~ 60°C (>45°C derating)
Protection Level	Class I
Charge Mode	
Battery Voltage	48Vd.c (40Vd.c ~ 60Vd.c)
Battery Current	190Ad.c (max.)
AC Input Voltage	3L/N/PE 220/380Va.c, 230/400Va.c
AC Input Frequency	50/60Hz
AC Input Rated Current	12.1Aa.c
Max. AC Input Current	18.2a.c (max.)
Max. AC Input Power	8800W
Max. Apparent Output Power	8800VA
PV Input Voltage	550Vd.c (160Vd.c ~ 800Vd.c)
MPPT Input Voltage	200Vd.c ~ 650Vd.c
PV Input Current	13Ad.c + 13Ad.c
Max. PV Input Power	10400W
Max. PV Isc	17Ad.c + 17Ad.c
Utility-Interactive	
AC Output Voltage	3L/N/PE 220/380Va.c, 400Va.c
AC Output Frequency	50/60Hz
AC Output Rated Current	12.1Aa.c
Max. AC Output Current	18.2a.c (max.)
Max. AC Output Power	8800W
AC Output Rated Power	8800W
AC Output Power Factor	0.95 leading to 0.95 lagging
Max. AC Isc	75Aa.c
Battery Discharge Voltage	40Vd.c ~ 60Vd.c
Battery Discharge Current	190Ad.c (max.)
Battery Discharge Power	8000W
Stand Alone	
AC Output Voltage	3L/N/PE 220/380Va.c, 230/400Va.c
AC Output Frequency	50/60Hz
AC Output Rated Current	12.1Aa.c
AC Output Rated Power	8000W
Max. Continuous AC Pass-through Current	45Aa.c
Battery Discharge Voltage	40Vd.c ~ 60Vd.c
Max. Discharge Current	190A (max.)
Compliance	VDE-AR-N 4105:1028-11; DINVDE V 0124-100:2020-06; IEC/EN62109-1/2:2010; IEC/EN62109-1/2:2011

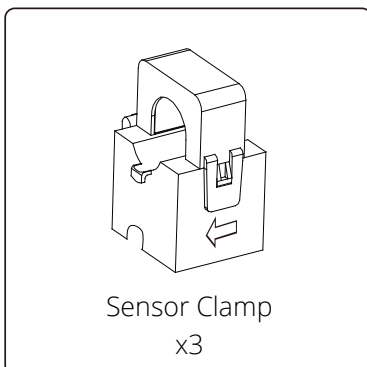
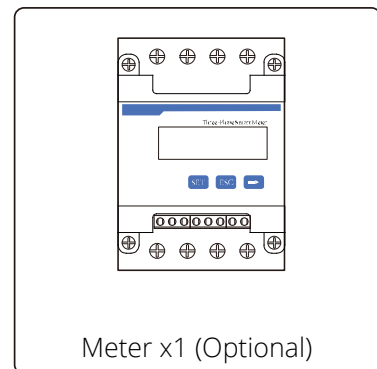
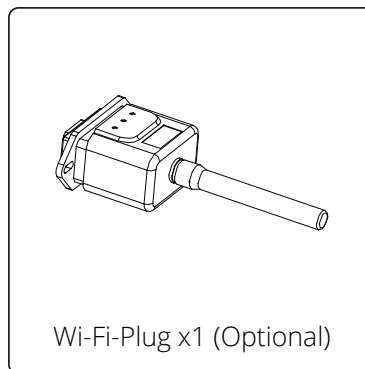
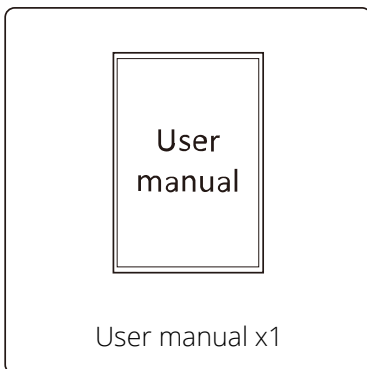
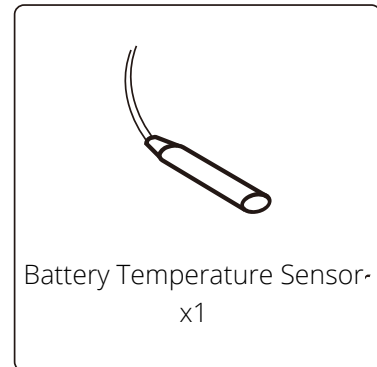
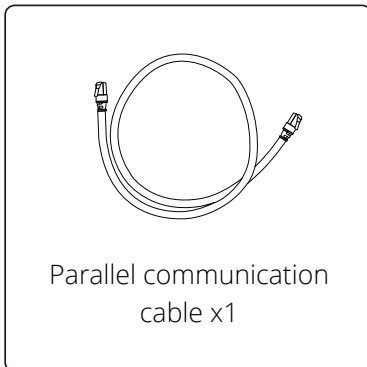
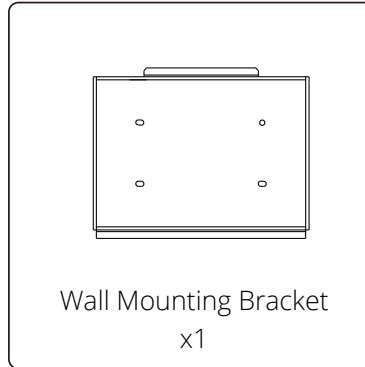
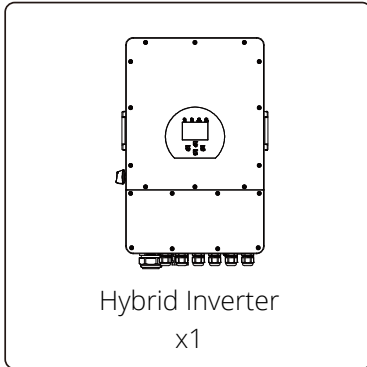
Model	SUNSYNK-10K-SG04LP3
Product Type	Hybrid Inverter
Enclosure	IP65
Ambient Temperature	-45°C ~ 60°C (>45°C derating)
Protection Level	Class I
Charge Mode	
Battery Voltage	48Vd.c (40Vd.c ~ 60Vd.c)
Battery Current	210Ad.c (max.)
AC Input Voltage	3L/N/PE 220/380Va.c, 400Va.c
AC Input Frequency	50/60Hz
AC Input Rated Current	15.2Aa.c
Max. AC Input Current	22.7Aa.c (max.)
Max. AC Input Power	11000W
Max. Apparent Output Power	11000VA
PV Input Voltage	550Vd.c (160Vd.c ~ 800Vd.c)
MPPT Input Voltage	200Vd.c ~ 650Vd.c
PV Input Current	26Ad.c + 13Ad.c
Max. PV Input Power	13000W
Max. PV Isc	34Ad.c + 17Ad.c
Utility-Interactive	
AC Output Voltage	3L/N/PE 220/380Va.c, 400Va.c
AC Output Frequency	50/60Hz
AC Output Rated Current	15.2Aa.c
Max. AC Output Current	22.7Aa.c (max.)
Max. AC Output Power	11000W
AC Output Rated Power	11000W
AC Output Power Factor	0.95 leading to 0.95 lagging
Max. AC Isc	75Aa.c
Battery Discharge Voltage	40Vd.c ~ 60Vd.c
Battery Discharge Current	210Ad.c (max.)
Battery Discharge Power	10000W
Stand Alone	
AC Output Voltage	3L/N/PE 220/380Va.c, 400Va.c
AC Output Frequency	50/60Hz
AC Output Rated Current	15.2Aa.c
AC Output Rated Power	10000W
Max. Continuous AC Pass-through Current	45Aa.c
Peak Output Power	20000W (10 seconds)
Battery Discharge Voltage	40Vd.c ~ 60Vd.c
Max. Discharge Current	210A (max.)
Compliance	VDE-AR-N 4105:1028-11; DINVDE V 0124-100:2020-06; IEC/EN62109-1/2:2010; IEC/EN62109-1/2:2011

Model	SUNSYNK-12K-SG04LP3
Product Type	Hybrid Inverter
Enclosure	IP65
Ambient Temperature	-45°C ~ 60°C (>45°C derating)
Protection Level	Class I
Charge Mode	
Battery Voltage	48Vd.c (40Vd.c ~ 60Vd.c)
Battery Current	240Ad.c (max.)
AC Input Voltage	3L/N/PE 220/380Va.c, 400Va.c
AC Input Frequency	50/60Hz
AC Input Rated Current	18.2Aa.c
Max. AC Input Current	27.3Aa.c (max.)
Max. AC Input Power	13200W
Max. Apparent Output Power	13200VA
PV Input Voltage	550Vd.c (160Vd.c ~ 800Vd.c)
MPPT Input Voltage	200Vd.c ~ 650Vd.c
PV Input Current	26Ad.c + 13Ad.c
Max. PV Input Power	15600W
Max. PV Isc	34Ad.c + 17Ad.c
Utility-Interactive	
AC Output Voltage	3L/N/PE 220/380Va.c, 400Va.c
AC Output Frequency	50/60Hz
AC Output Rated Current	18.2Aa.c
Max. AC Output Current	27.3Aa.c (max.)
Max. AC Output Power	13200W
AC Output Rated Power	12000W
AC Output Power Factor	0.95 leading to 0.95 lagging
Max. AC Isc	75Aa.c
Battery Discharge Voltage	40Vd.c ~ 60Vd.c
Battery Discharge Current	240Ad.c (max.)
Battery Discharge Power	12000W
Stand Alone	
AC Output Voltage	3L/N/PE 220/380Va.c, 400Va.c
AC Output Frequency	50/60Hz
AC Output Rated Current	18.2Aa.c
AC Output Rated Power	12000W
Max. Continuous AC Pass-through Current	45Aa.c
Peak Output Power	24000W (10 seconds)
Battery Discharge Voltage	40Vd.c ~ 60Vd.c
Max. Discharge Current	240A (max.)
Compliance	VDE-AR-N 4105:1028-11; DINVDE V 0124-100:2020-06; IEC/EN62109-1/2:2010; IEC/EN62109-1/2:2011

4. INSTALLATION

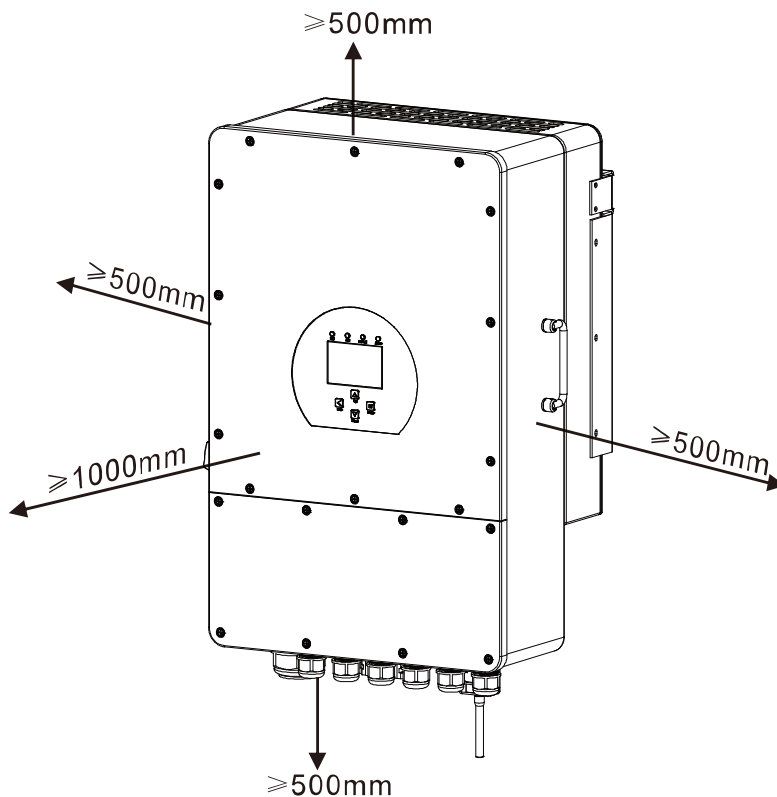
4.1. Parts List

Check the equipment before installation. Please make sure nothing is damaged in the package. You should have received the items in the following package:



4.2. Selecting the Mounting Area

For proper heat dissipation, allow a clearance of approximately 500mm to the side, 500mm above and below the unit, and 1000mm to the front of the unit.



DO NOT install the inverter in the following areas:

- Areas with high salt content, such as the marine environment. It will deteriorate the metal parts and possibly lead to water/dampness penetrating the unit.
- Areas filled with mineral oil or containing splashed oil or steam, such as those found in kitchens. It will deteriorate plastic parts of the unit, causing those parts to fail or allowing water/damp to penetrate the unit.
- Areas that generate substances that adversely affect the equipment, such as sulphuric gas, chlorine gas, acid, or alkali. These can cause the copper pipes and brazed joints to corrode and fail to conduct electricity reliably.
- Areas that can cause combustible gas to leak, which contains suspended carbon-fibre or flammable dust, or volatile inflammable such as paint thinner or gasoline.
- Areas where there may be gas leaks and where gas may settle around the unit as this is a fire risk.
- Areas where animals may urinate on the unit or ammonia may be generated.
- High altitude areas (over 4000 metres above sea level).
- Environments where precipitation or humidity is above 95%
- Areas where the air circulation is too low.

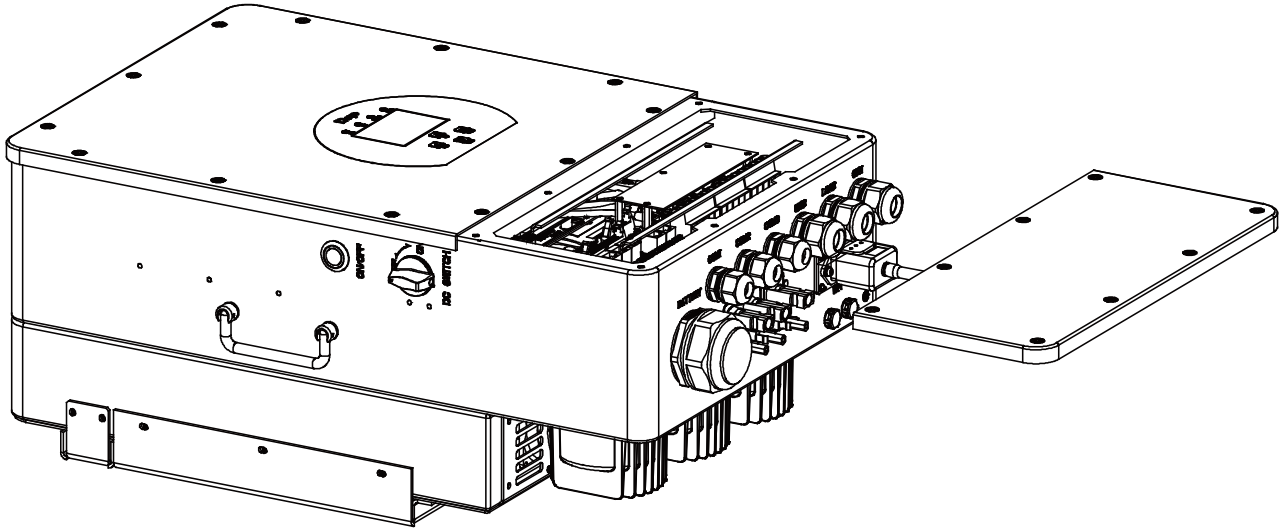
ALSO CONSIDER:

- Installing the indoor unit, outdoor unit, power supply cable, transmission cable, and remote control cable at least 1 metre away from any television or radio receiver. This will prevent TV reception interference or radio noise. This will prevent radio signal interference from external units that might interfere with the

Wi-Fi or GSM monitoring.

- If children under 10 years old may approach the unit, take preventive measures so they cannot reach and touch the unit.
- Install the indoor unit on the wall where the floor height is higher than 1600mm.

Before connecting all wires, please take the metal cover off, removing the screws as shown below:



4.3. Mounting the Inverter

- Select installation locations that are adequate to support the weight of the converter.
- Install this inverter at eye level to allow the LCD to be read anytime.
- To ensure optimal operation, an appropriate ambient temperature is between -25 and 60°C.
- Be sure to keep other objects and surfaces, as shown in the figure to guarantee sufficient heat dissipation and have enough space to remove wires.
- For proper air circulation to dissipate heat, allow a clearance of approximately 50cm to the side.

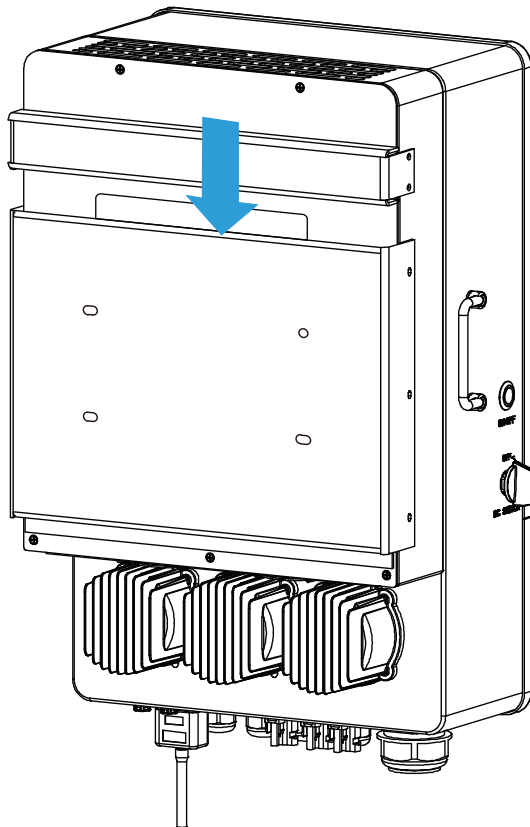
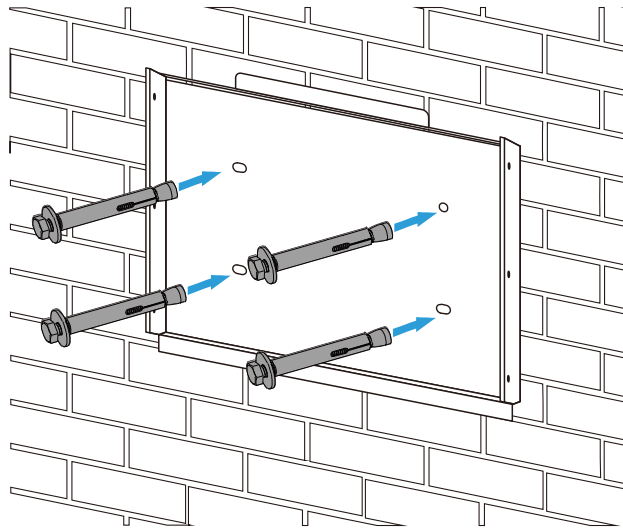
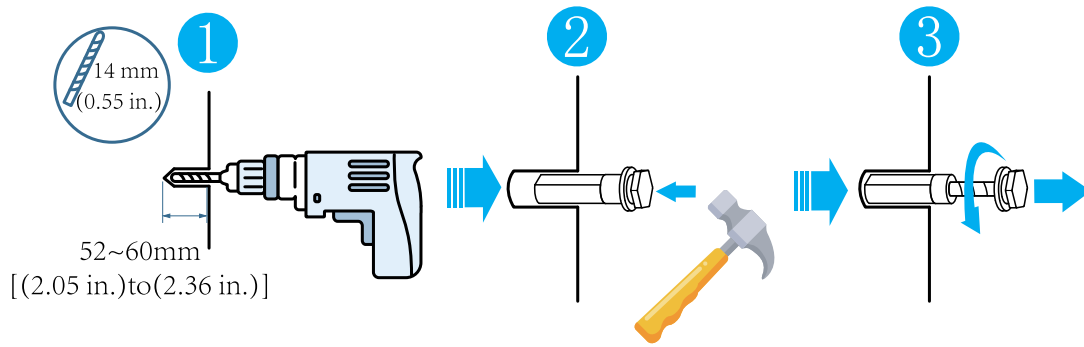
WARNING

Risk of injury (Heavy Object).

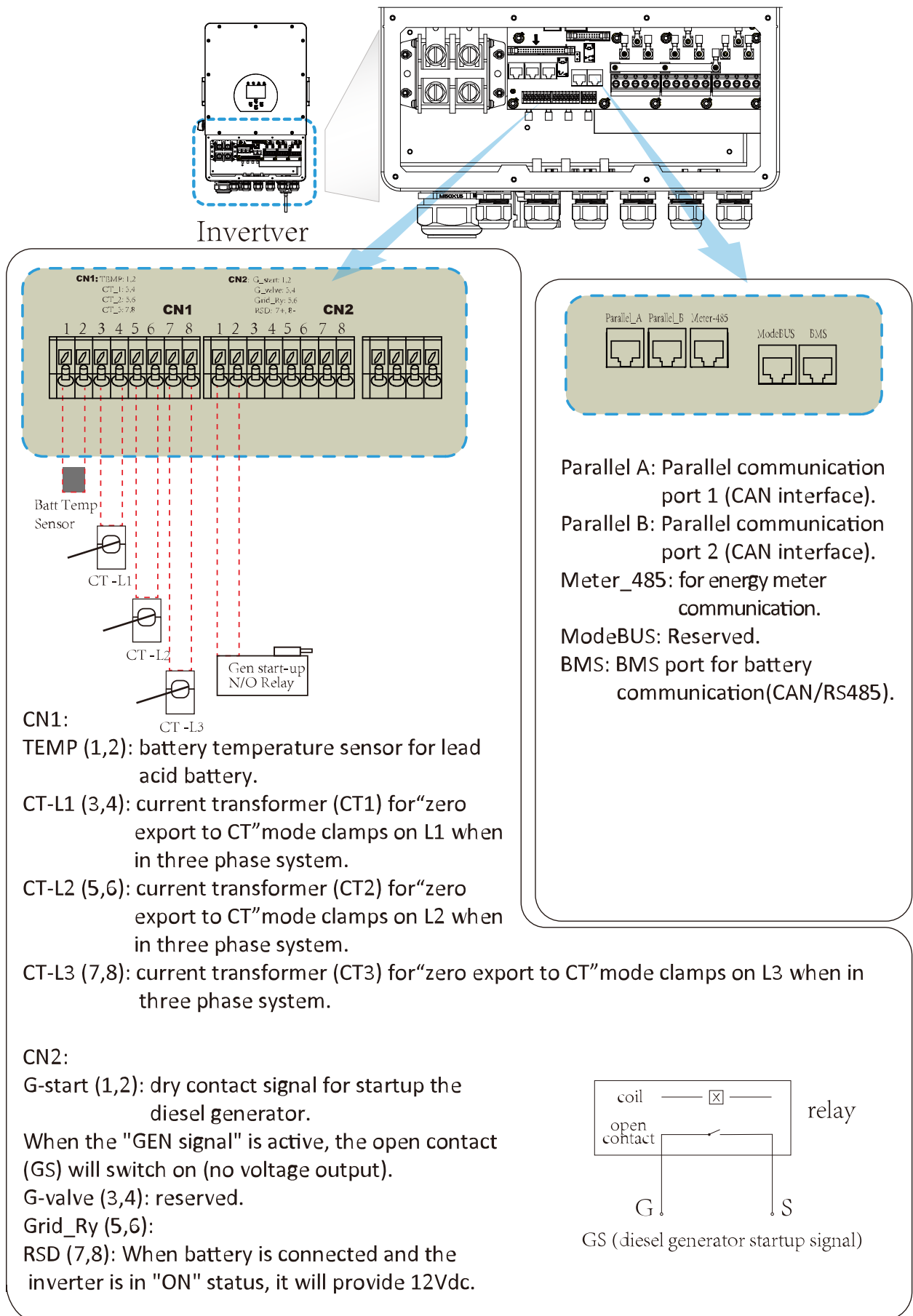
Remember that this inverter is heavy (45kg), so users must carefully handle the unit during installation, especially when mounting or removing it from a wall.

Choose the recommended drill head(as shown below) to drill 4 holes on the wall, 52-60mm deep.

1. Use a proper hammer to fit the expansion bolt into the holes.
2. Carry the inverter and hold it, ensure the hanger aims at the expansion bolt, and fix the inverter on the wall.
3. Fasten the screw head of the expansion bolt to finish the mounting.



4.4. Function Port Definition



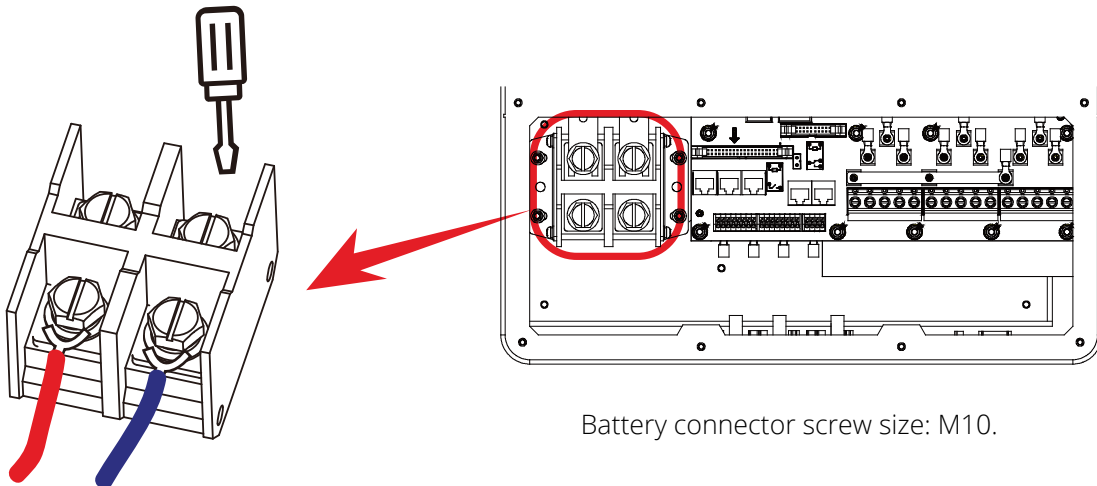
4.5. Battery Connection

For safe operation and compliance, an individual DC overcurrent protector or disconnection device is required to connect the battery and the inverter. Users are recommended to utilise a suitable fuse and DC isolator (see next page). Switching devices may not be required in some applications, but overcurrent protectors must be used. Please refer to the typical amperage in the table below for the required fuse or circuit breaker size.

Model	Wire Size	Cable (mm ²)	Torque value (max.)
8kW	1AWG	40	24.5N.m
10kW	1/0 AWG	60	24.5N.m
12kW	1/0 AWG	60	24.5N.m

Please follow the below steps to implement battery connection:

1. Please choose a suitable battery cable (appropriate rating) with the correct connector to attach to the battery terminals.
2. Use a suitable screwdriver that matches the bolt size to unscrew the bolts to fit the battery connectors. Then tighten the bolts with the connectors in place with a torque of 24.5N.m in a clockwise direction.
3. Make sure the polarity is correct at both the battery and inverter terminals.



CAUTION

Reverse Polarity.

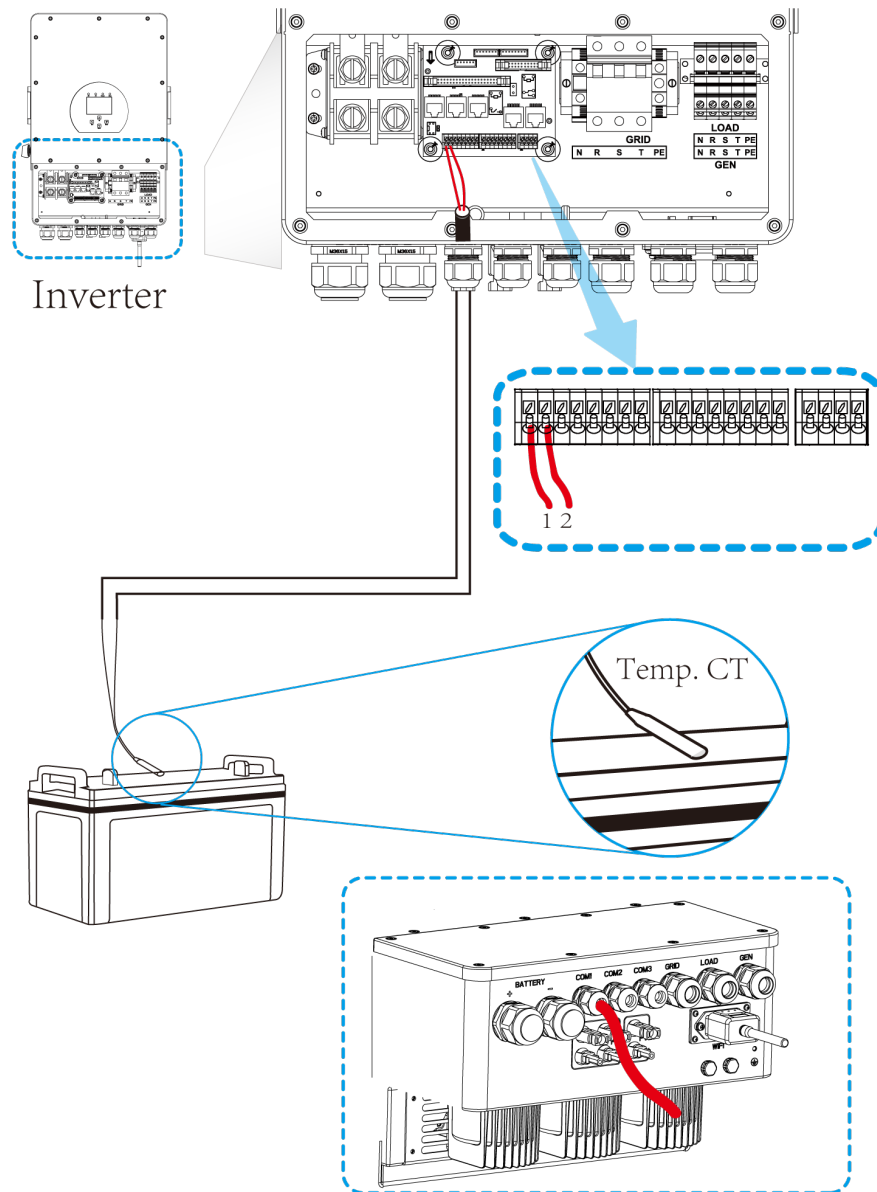
Before making the final DC connection or closing DC breaker/disconnect, be sure positive (+) must be connected to the positive (+) and negative (-) must be connected to the negative (-). A reverse polarity connection on the battery will damage the inverter.

CAUTION

All wiring/connecting must be performed by qualified personnel. In addition, connecting the battery with a suitable cable is essential for safe and efficient operation of the system

4.5.1. Temperature Sensor Connection for Lead-Acid Battery

Without a remote temperature sensor, lead-acid batteries may undercharge or overcharge depending on the ambient temperature of the installation environment. This may result in a fire hazard.



PLEASE NOTE

Depending on the battery type, the inverter should be capable of controlling the battery BMS. Therefore, you need to set the protocol of the BMS on both the battery and the inverter.

When using more than one battery, the first battery will be the master, and the other batteries will be the slaves. Please, check the battery manufacturer's specifications for proper operation.

To verify if the battery is communicating, access the Li-BMS menu as detailed in section 5.13, 'Setting Up a Lithium Battery', and check whether the values are realistic. It is important that the charge and discharge limits on that page match the numbers expected for the number of connected batteries.

4.5.2. Connecting the AC and Backup Load Connection

Before connecting to the main grid, please install a separate AC Breaker (MCB) between the inverter and the grid. In addition, it is recommended the installation of an AC Breaker between the backup load and inverter. This will ensure the inverter can be disconnected safely during maintenance and fully protect the system from over-current. The recommended AC Breaker is 20A for 8kW, 32A for 10kW and 32A for 12kW.

There are three terminal blocks marked as GRID, LOAD, and GEN. Please do not confuse input and output connections.

GEN/AUX	Generator connection.
GRID	This works like a conventional grid-tied inverter. It is both an input and output connection for non-essential load and supply.
LOAD	Connection of essential loads such as lighting, security systems, and Internet

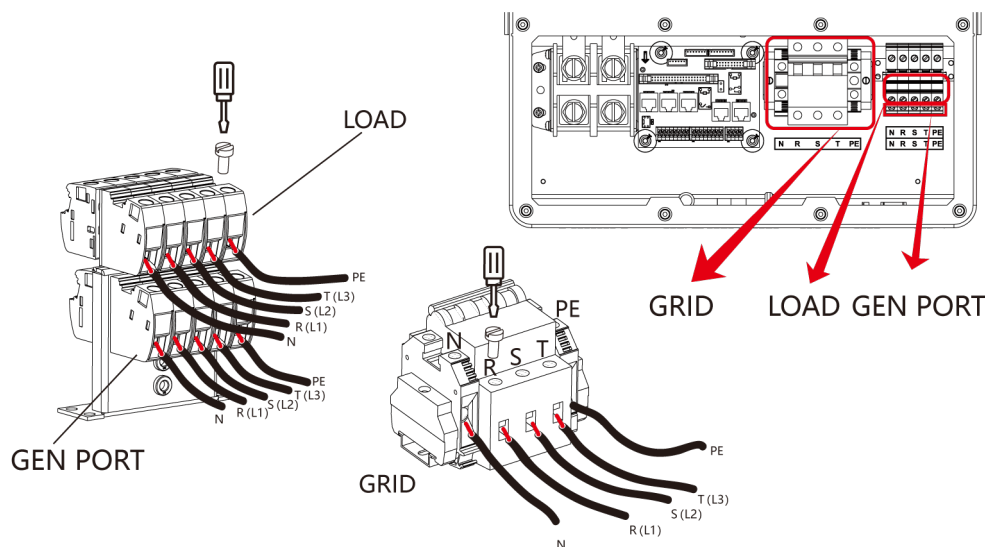
Model	Wire Size	Cable (mm ²)	Torque value (max.)
8/10/12kW	5 AWG	16	1.2N.m

CAUTION

All wiring and cable sizes must comply with your particular country's wiring regulations and Codes of Practices. Ensure that suitable disconnection devices and RCDs are fitted.

Please follow the steps below to implement GRID, LOAD, and GEN port connections:

1. Before making GRID, LOAD, and GEN port connections, make sure to turn off the AC breaker or disconnect first.
2. Remove a 10mm sleeve from each wire, unscrew the bolts, insert the cables according to the polarities indicated on the terminal block and tighten the terminal screws. Ensure the connection is complete.



3. Then, insert AC output wires according to the polarities indicated on the terminal block and tighten the terminal. Make sure to connect corresponding N wires and PE wires to related terminals as well.
4. Ensure the wires are securely connected.

5. Check that the AC power source is isolated before attempting to connect it to the inverter. Insert AC output wires according to the polarities indicated on the terminal block and tighten the terminal screws. Be sure to connect the corresponding N wires and PE wires to the correct terminals and ensure the wires are securely connected.

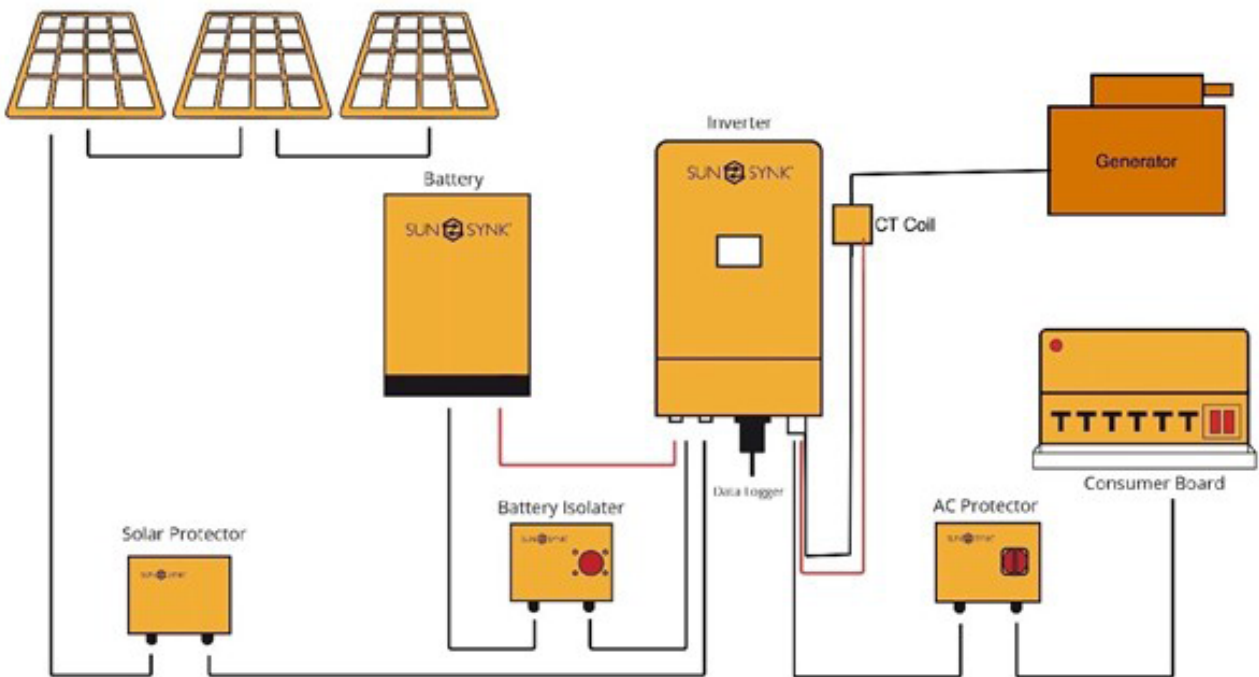
 **CAUTION**

Ensure the AC power source is disconnected before attempting to wire it to the unit.

PLEASE NOTE

Appliances such as air conditioners require 2-3 minutes to restart as they need enough time to balance refrigerant gas inside the circuit. Suppose a power shortage occurs and recovery is made in a short time. In that case, it will cause damage to your connected appliances. In order to prevent this kind of damage, please check with the manufacturer of the air conditioner to confirm if the unit is equipped with a time-delay function before installation. If it does not have that function, the inverter will trigger an 'overload' fault and cut off the output to protect your appliance. This may cause damage to the air conditioner.

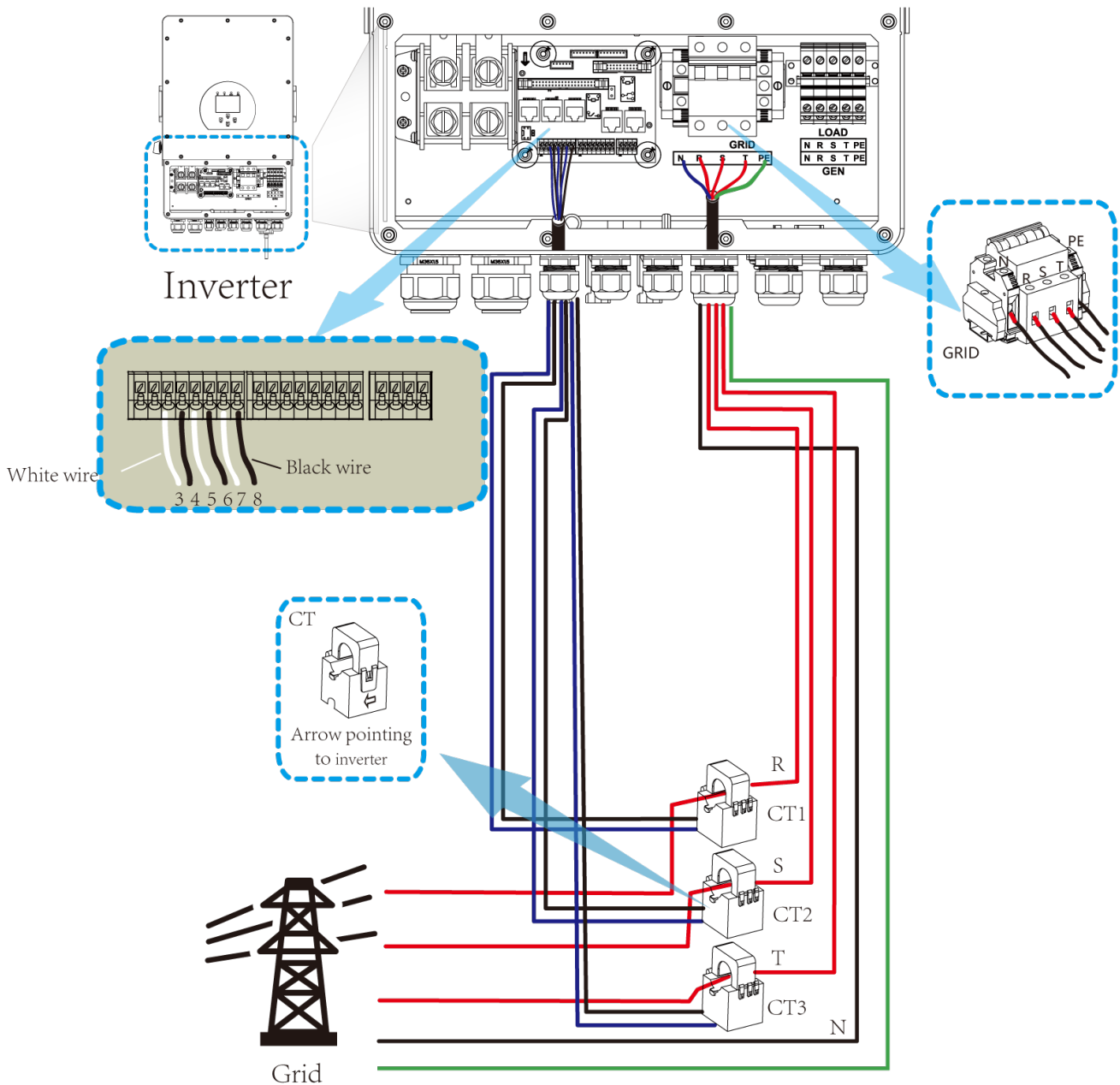
Please ensure you use suitable protection devices. Switchgear and fuses must follow the local wiring standards. A figure of the complete system is presented below.



4.6. Connecting the CT Coil

The CT coil is one of the most important parts of the Sunsynk inverter. This device reduces the power of the inverter to prevent feeding power to the grid. This feature is also known as “Zero Export”.

1. Fit the coil (sensor) around the live cable on the main fuse feeding the building and run the cable back to the inverter. If using an external meter, you can extend the cable for more than 10 metres. Please consult the meter manual on distance.
2. Connect the other end of the CT coil to the inverter terminals.

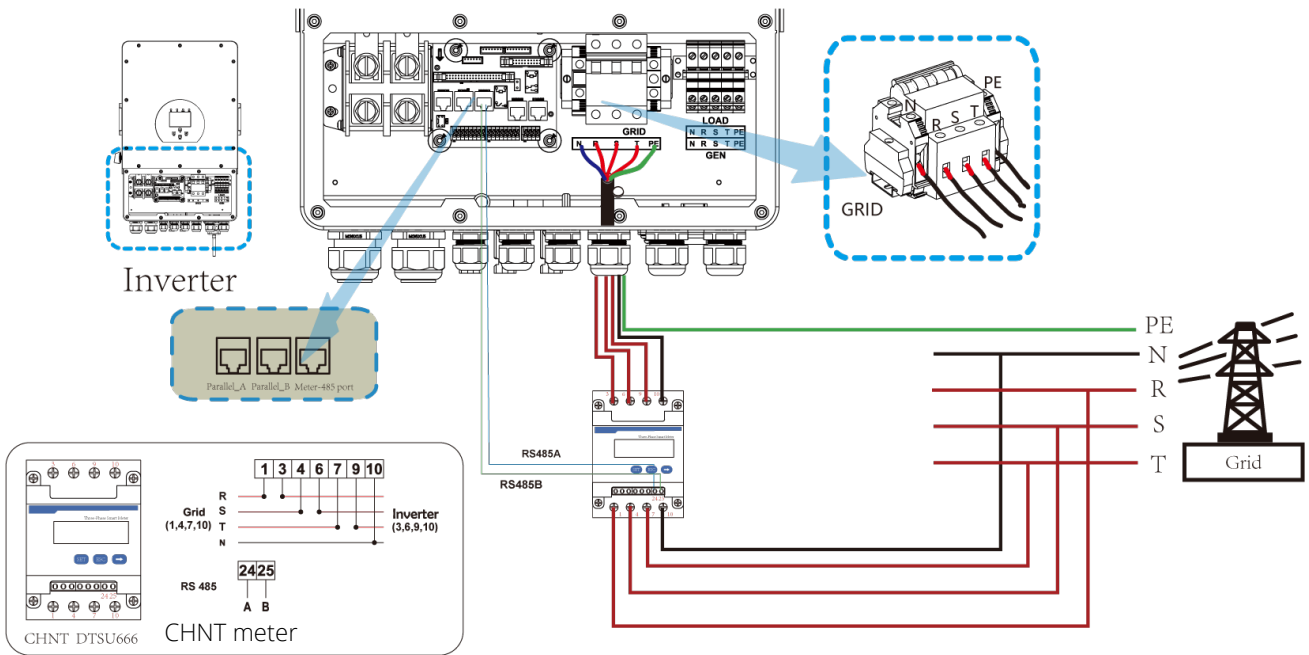


PLEASE NOTE

When the inverter is in the off-grid state, the N line needs to be connected to the earth.

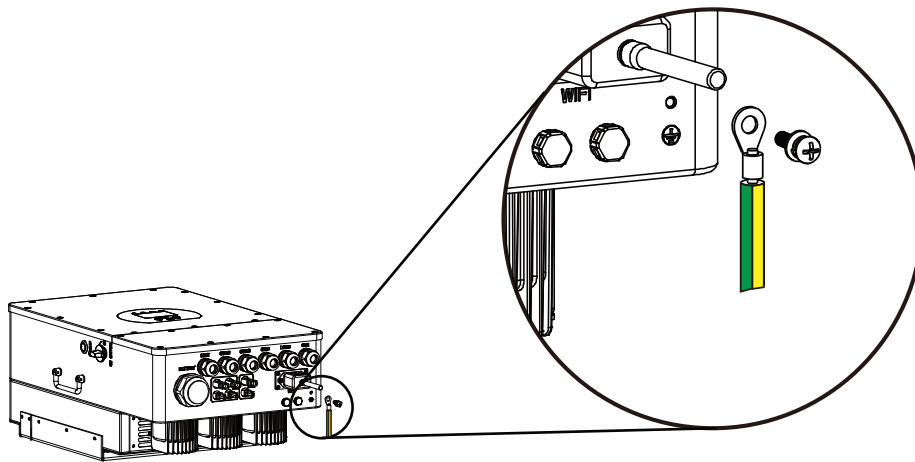
4.8. Meter Connection

4.8.1. System Connection for the CHNT Meter

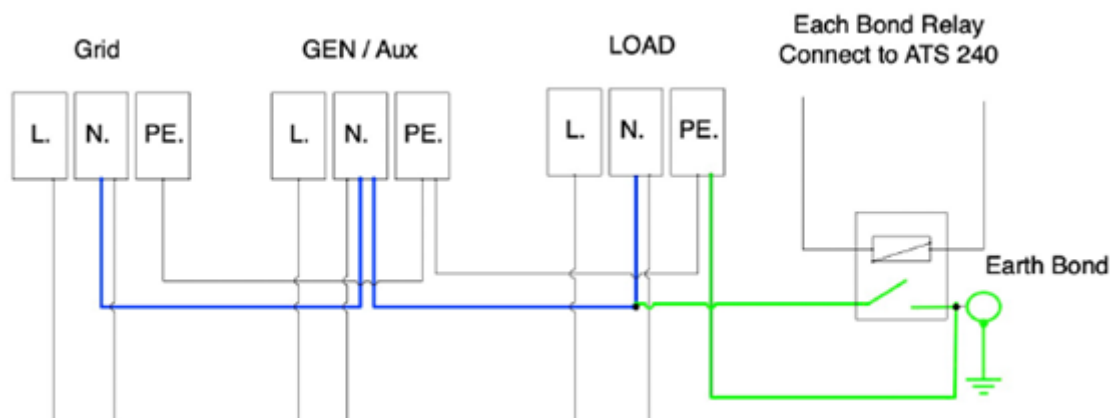


4.7. Earth Connection (MANDATORY)

An Earth Cable shall be connected to the earth plate on the grid size in order to prevent electric shock if the original protective conductor fails.



All neutrals can be linked together to maintain the neutral bond. When a Neutral Earth bond is required for an 'Off-grid' operation, then it has to be removed on 'Grid-Tied' operation.

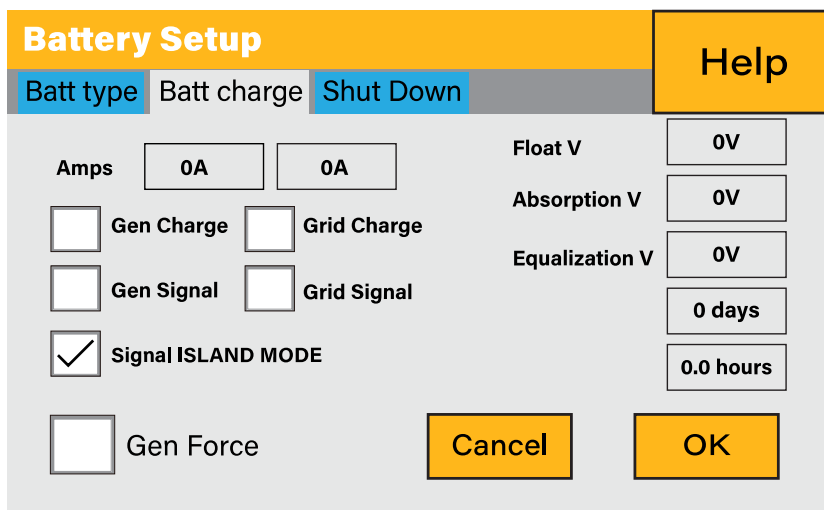


If an Earth Bond is required between neutral and earth and your system is a hybrid system, then you can have a permanent earth wire since this can cause faults with an RCD before the inverter.

Since the inverter is a true hybrid, then the bond must only be made when the inverter is operating in Islanding Mode. To accommodate this, Sunsynk provides an AC output, which is connected to the A/T/S connections whenever the inverter is running on Island Mode. Therefore, you can simply connect the coil of an AC relay to the ATS 240 connections. Next, you need to select Signal Island Mode on the battery charge menu (click on the gear icon -> battery icon), as shown in the figure below.

PLEASE NOTE

The grid power may still be present, but the inverter is not draining power from it since the unit is working in 'Island Mode'.



You can verify if there is a voltage when the inverter is disconnected from the grid by using a simple multimeter.

4.9. PV Connection

Before connecting to PV panels, install a separate DC circuit breaker between the inverter and PV modules. In addition, we request users install PV junction boxes with surge protection to protect the system from a lightning strike.

To avoid any malfunction, do not connect any PV modules with possible current leakage to the inverter. For example, grounded PV modules will cause current leakage to the inverter.

In order to reduce risk of injury, please use the recommended cable sizes as shown below:

Model	Wire Size	Cable (mm ²)
8/10/12kW	12 AWG	4

4.9.1. PV Module Selection

When selecting the PV modules, you should consider the following parameters:

1. Open-Circuit Voltage (Voc) of PV modules does not exceed the maximum PV array Voc.
2. Open-Circuit Voltage (Voc) of PV modules should be higher than the minimum start voltage of the inverter.

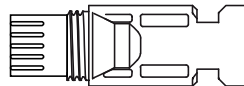
Inverter Model	8kW	10kW	12kW
PV Input Voltage	450V (140V~1000V)		
PV Array MPPT Voltage Range	140V~800V		
No. of MPP Trackers	2		
No. of Strings per MPP Tracker	1+1	2+1	2+1

4.9.2. PV Module Wiring

1. Switch the Grid Supply Main Switch (AC) OFF.
2. Switch the DC isolator OFF.
3. Assemble PV input connector to the inverter.



DC+ male connector (MC4)



DC+ female connector (MC4)

CAUTION

Before connection, please ensure the polarity of the output voltage of the PV array matches the DC+ and DC- symbols.



WARNING

Please do not connect the PV array's positive and negative poles to the ground. This can seriously damage the inverter.

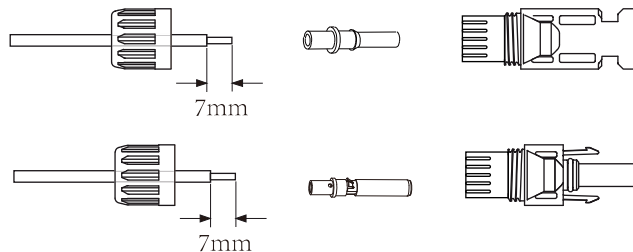
Before connecting the inverter, please make sure the PV array open-circuit voltage is within the maximum limit of the inverter.

Please utilise an approved DC cable for the PV system.

Cable type	Cross section (mm)	
	Range	Recommended value
Industry generic PV cable (model: PV1-F)	4.0~6.0 (12~10 AWG)	4.0 (12 AWG)

The correct steps in assembling the DC connector are explained below:

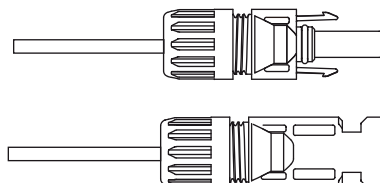
1. Strip 7mm of the plastic coating off the DC wire and disassemble the connector cap nut.



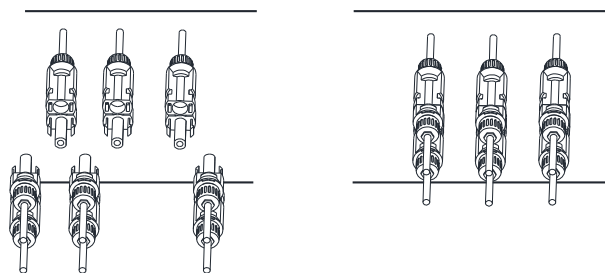
2. Crimp metal terminals with crimping pliers.



3. Insert the contact pin into the connector housing until it locks into place. Then screw the cap nut onto the connector housing. Torque to 2.5-3 N.m.



4. Finally, insert the DC connector into the positive and negative input of the inverter.



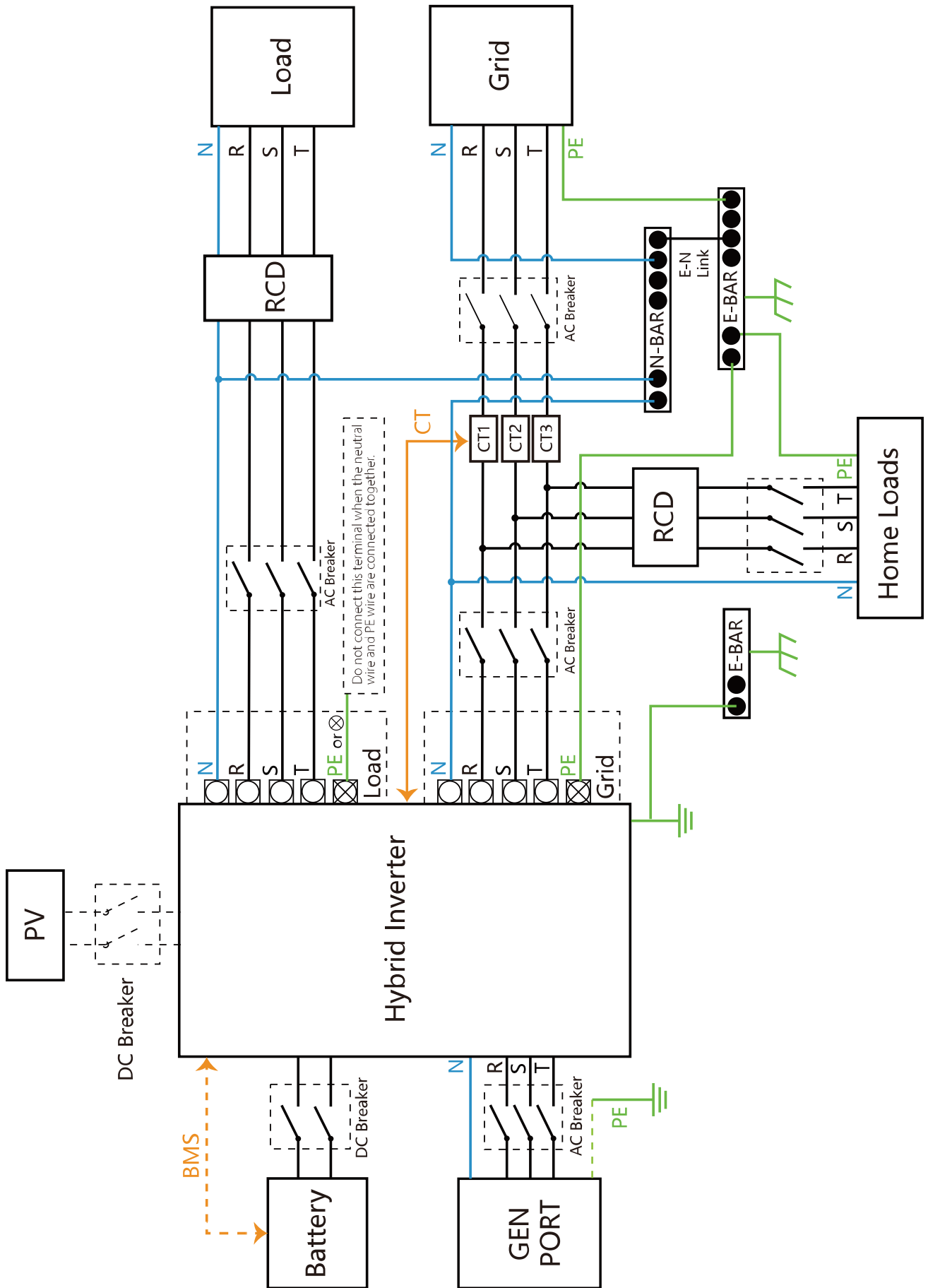
PLEASE NOTE

When sunlight falls on the solar panel, it will generate a voltage. A high voltage generated by panels in a series configuration may cause danger to life. Therefore, before connecting the DC-Input line, the solar panel's surface should be shielded from the sun's rays by some opaque material, and the DC switch should be off. This will prevent a high voltage from flowing to the inverter, thereby causing risk to persons conducting installation or maintenance.

4.10. Wiring System for the Inverter

The following diagram is an example of an application where the neutral connects with the PV in a distribution box.

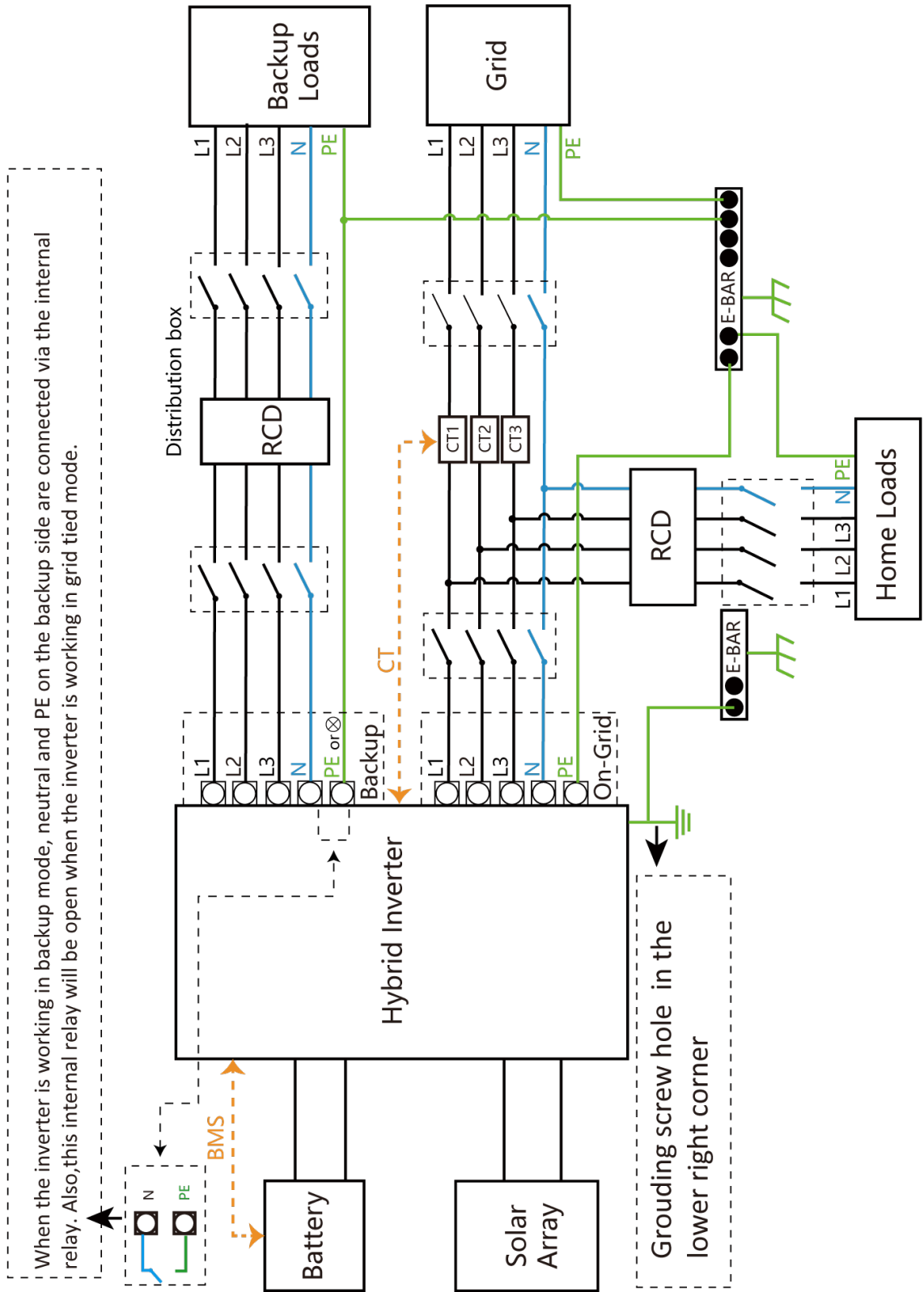
For countries such as Australia, New Zealand, South Africa, etc., please follow local wiring regulations!



This diagram is an example for an application in which neutral is separated from the PE in the distribution box.

For countries such as China, Germany, the Czech Republic, Italy, etc., please follow local wiring regulations!

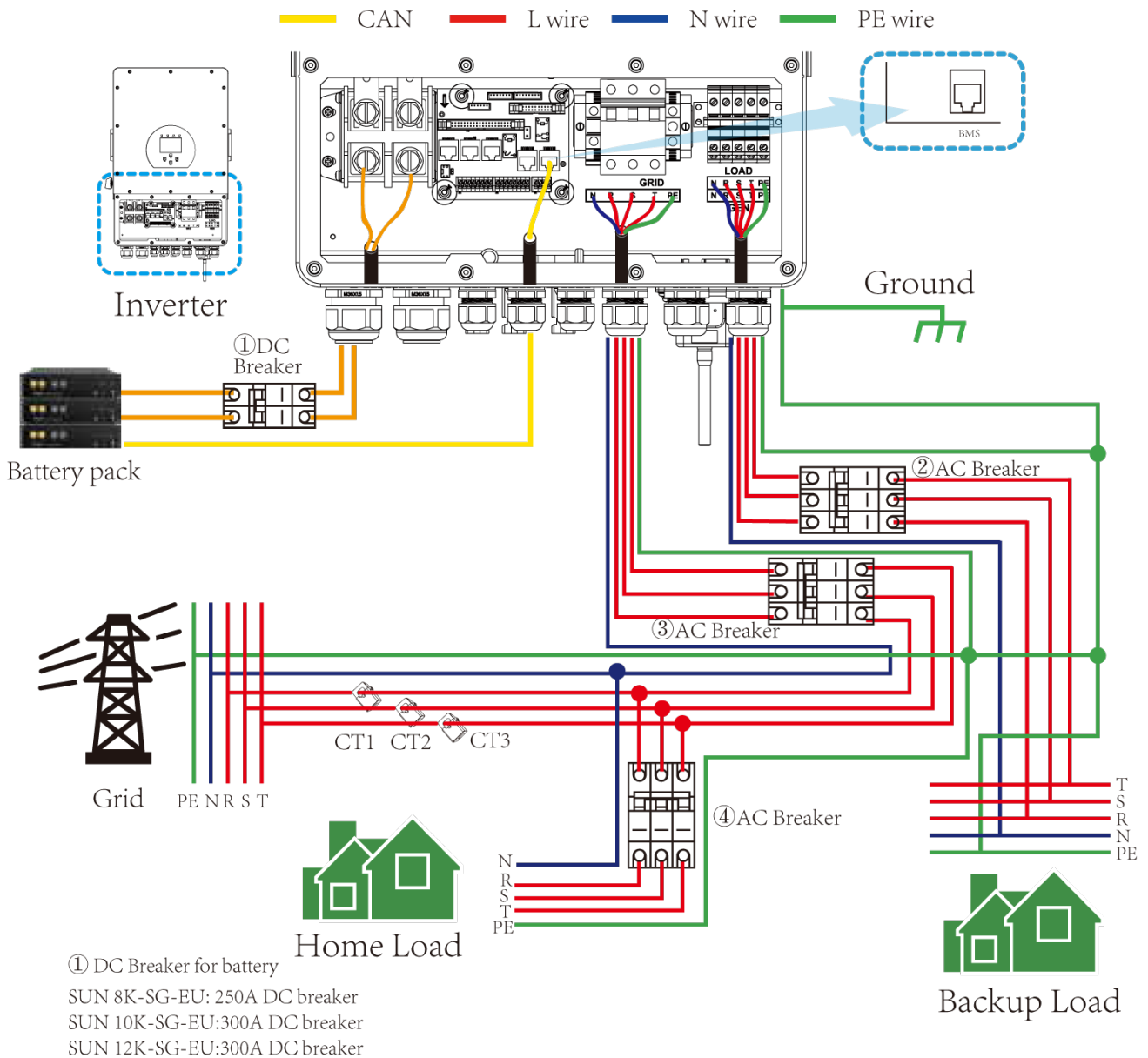
Note: Backup function is optional in German market, please leave backup side empty if backup function is not available in the inverter.



When the inverter is working in backup mode, neutral and PE on the backup side are connected via the internal relay. Also, this internal relay will be open when the inverter is working in grid tied mode.

Grounding screw hole in the lower right corner

4.11. Wiring Diagram



① DC Breaker for battery
 SUN 8K-SG-EU: 250A DC breaker
 SUN 10K-SG-EU:300A DC breaker
 SUN 12K-SG-EU:300A DC breaker

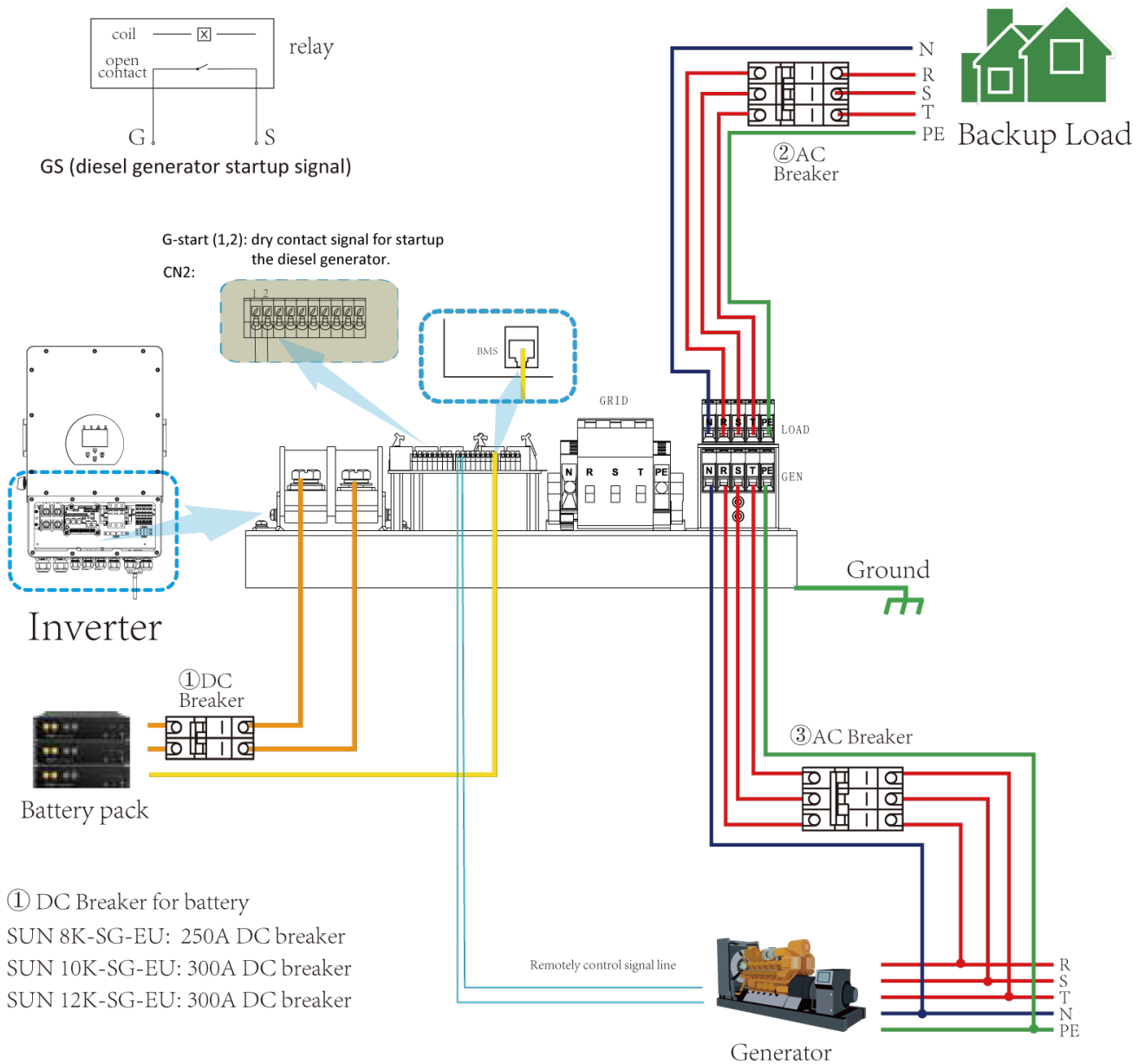
② AC Breaker for backup load
 SUN 8K-SG-EU: 20A AC breaker
 SUN 10K-SG-EU:32A AC breaker
 SUN 12K-SG-EU:32A AC breaker

③ AC Breaker for grid
 SUN 8K-SG-EU: 63A AC breaker
 SUN 10K-SG-EU: 63A AC breaker
 SUN 12K-SG-EU: 63A AC breaker

④ AC Breaker for home load
 Depends on household loads

4.12. Typical Application Diagram of Diesel Generator

— CAN
 — L wire
 — N wire
 — PE wire

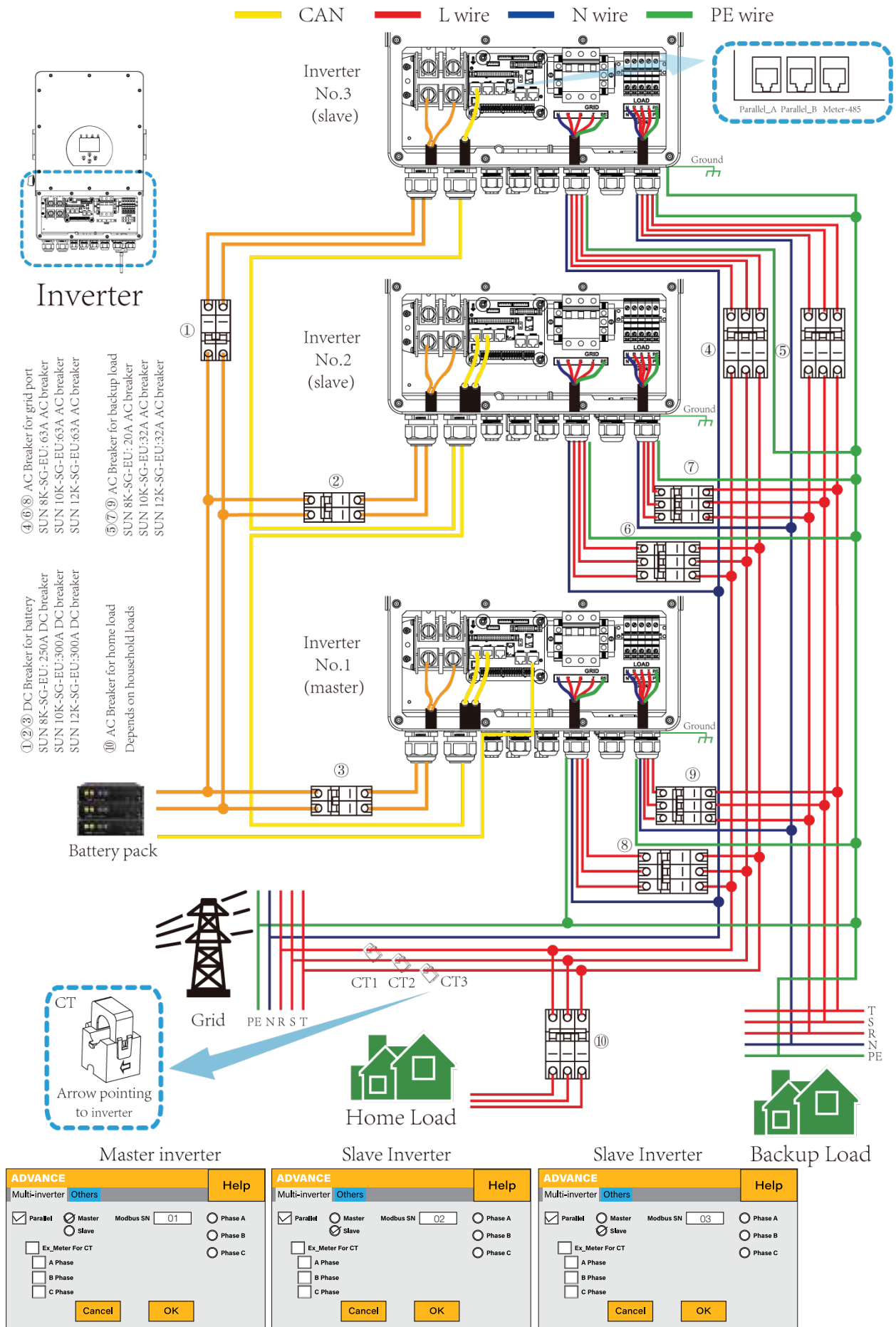


① DC Breaker for battery
 SUN 8K-SG-EU: 250A DC breaker
 SUN 10K-SG-EU: 300A DC breaker
 SUN 12K-SG-EU: 300A DC breaker

② AC Breaker for backup load
 SUN 8K-SG-EU: 20A AC breaker
 SUN 10K-SG-EU: 32A AC breaker
 SUN 12K-SG-EU: 32A AC breaker

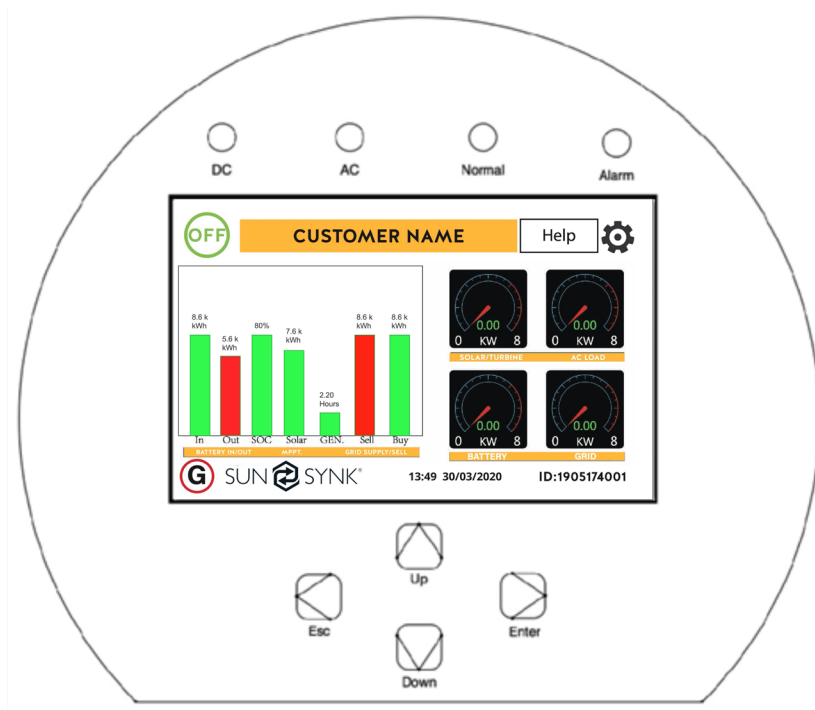
③ AC Breaker for Generator port
 SUN 8K-SG-EU: 63A AC breaker
 SUN 10K-SG-EU: 63A AC breaker
 SUN 12K-SG-EU: 63A AC breaker

4.13. Three Phase Parallel Connection Diagram



5. OPERATION

5.1. Display



LED indicator		Meaning
DC	Green LED solid light	PV connection normal
AC	Green LED solid light	Grid connection normal
Normal	Green LED solid light	Inverter functioning normally
Alarm	Red LED solid light	Fault

Function Key	Description
Esc	To exit the previous mode
Up	Increase the value of a setting
Down	Decrease the value of a setting
Enter	Confirm setting change (If not pressed each time the setting will not be saved)

5.2. Switching ON/OFF

Once the inverter has been correctly installed and the batteries have been connected, press the ON/OFF button (located on the left side of the case) to activate the system.

When the system is connected without a battery but connected with either PV or grid and the ON/OFF button is switched off, the LCD will still illuminate (display will show off). In this condition, when switching on the ON/OFF button and selecting 'No Battery', the system can still work.

5.3. Home Page

Press the Esc button any page to access the home page:

1. Customer name
2. Access the settings menu page
3. Access solar history
4. Access system status page
5. Access system status page
6. Access grid history
7. Access system flow page

What this page displays:

- Total daily power into the battery (kWh).
- Total daily power out of the battery (kWh).
- SOC (State of charge of the battery) (%).
- Total daily solar power produced in (kWh).
- Total hourly usage of the generator (Time).
- Total daily power sold to the grid (kWh).
- Total daily power bought from the grid (kWh).
- Real-time solar power in (kW).
- Real-time load power in (kW).
- Real-time battery charge power in (kW).
- Real-time grid power in (kW).
- Serial number.
- Time date.
- Fault condition.
- Access stats pages.
- Access the status page.
- Access the fault diagnostic page.

5.4. Status Page

To access the Status page, click on the BATTERY or AC LOAD dial on the Home page.

0 W	0 W 0.0 Hz	0 W 50.0 Hz
0V 0W 0V 0W 0V 0W	0V 0.0A 0V 0.0A 0V 0.0A HM: LD: 0W 0W 0W 0W 0W 0W	0V -0.1A 0V -0.1A 0V -0.1A INV_P: 0W 0W AC_T: 0W 24.9 C
Load Power	Grid Power	Inverter Power
SOC: 100% 51W BAT_V: 53.21V BAT_I: 0.97A BAT_T: 100.0C	DC_P1: 0W DC_V1: 0V DC_I1: 0.0A	DC_P2: 0W DC_V2: 0V DC_I2: 0.0A
Battery	Solar Power 1	Solar Power 2

What this page displays:

- Total solar power produced.
- MPPT 1 power/voltage/current.
- MPPT 2 power/voltage/current.
- Grid power.
- Grid frequency.
- Grid voltage.
- Grid current.
- Inverter power.
- Inverter frequency.
- Inverter voltage.
- Inverter current.
- Load power.
- Load voltage.
- Battery power charge/discharge.
- Battery SOC.
- Battery voltage.
- Battery current.
- Battery temperature.

Solar Column: Shows total PV (Solar) power at the top and then details of each of the two MPPT's below L1 & L2 voltage.

Grid Column: Shows grid total power, frequency, voltage, and current. When selling power to the grid, the power is negative. When consuming from the grid, the power is positive. If the sign of the grid and HM (home) powers are not the same when the PV is disconnected and the inverter is only taking energy from the grid and using the CT connected to Limit-2, then please reverse the polarity of the CT coil. **Important: See Section 4.6 ('Connecting the CT coil').**

Inverter Column: Showing inverter total power, frequency, L1, L2, voltage, current, and power.

Load Column: Showing total load power, load voltage, and power on L1 and L2.

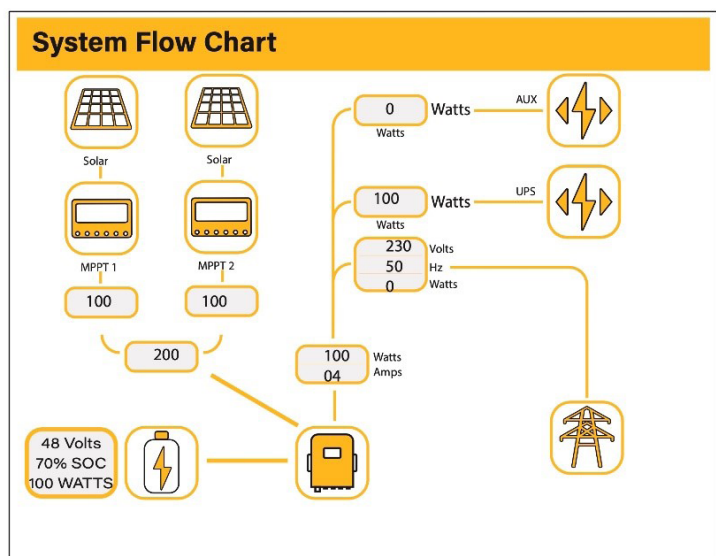
Battery Column: Shows total power from the battery, battery SOC, battery voltage, battery current (negative means charge, positive means discharge) battery temperature (shows zero if the battery temperature sensor is not connected). DC transformer temperature and AC heatsink temperature (When the temperature reaches 90°C, it will display in red, and the performance of the inverter will start deteriorating when it reaches 110°C. Subsequently, the inverter will shut down to allow it to cool and reduce its temperature.

5.5. System Flow Page

Access by clicking on the bar chart on the Home Page.

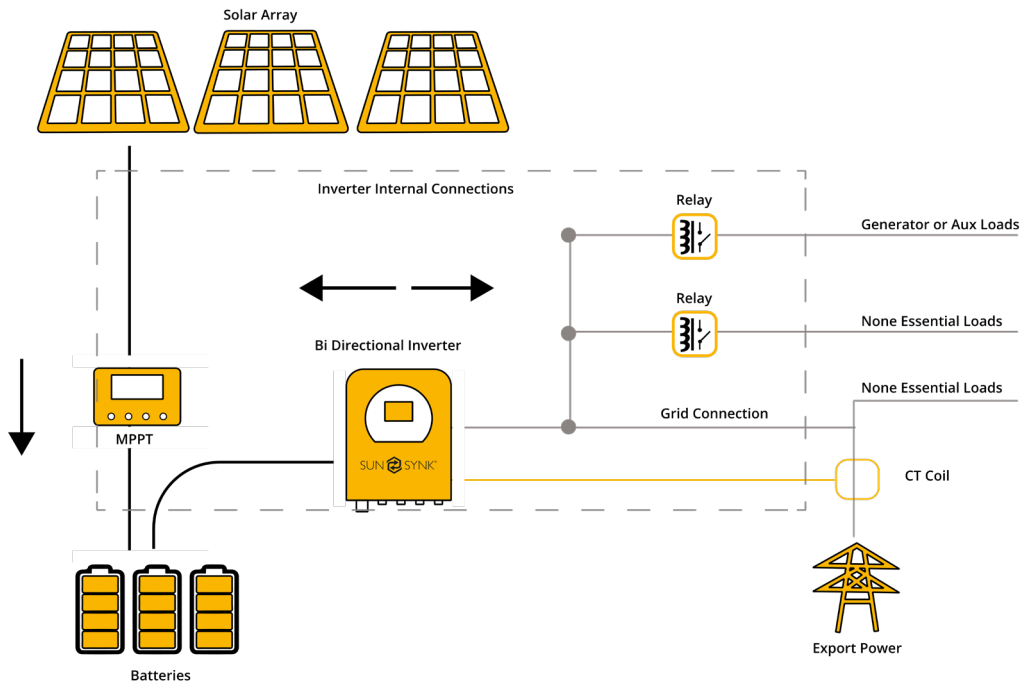
To better understand the functioning of your system, take a look at the figure at right:

1. The PV modules charge the batteries.
2. When the batteries reach a specific level (programmable), the battery power is fed into the inverter.
3. The inverter can then supply power to the grid (export or no export), load, and auxiliary or smart load.
4. CT coil controls the export power.



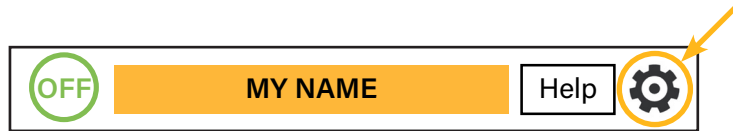
What this page displays:

- The system flow.
- MPPTs power.
- Battery status.
- Power distribution to load or grid.



5.6. Setup Page

To access Settings, click on the gear icon on the right top of the navigation menu.



Settings SUN SYNK 01/28/2022 17:02:46

BASIC	BATTERY	GRID	SYSTEM MODE
ADVANCE	AUX LOAD	FAULT CODES	LI BMS

ID:2104109061 COMM: 1001-e0f3 MCU: 1062-2002-18ft

What this page displays:

- Serial number.
- Software version.
- Time, Date, and MCU.

What you can do from this page:

- Access the Basic Setup Page (press the BASIC icon).
- Access the Battery Setup Page (press the BATTERY icon).

- Access the Grid Setup Page (press the GRID icon).
- Access the real-time programmable timer/system mode (press the SYSTEM MODE icon).
- Access the advanced settings such as Paralleling and Wind Turbine (press the ADVANCE icon).
- Access the auxiliary load/smart load settings (press the AUX LOAD icon)
- Access the fault code register (press the FAULT CODES icon).
- Set up Li BMS (press the LI BMS icon).

5.7. Set Time (Clock)

To set time, click on the BASIC icon and then on 'Time'

What this page displays:

- Time.
- Date.
- AM/PM.

What you can do from this page:

- Adjust / set time.
- Adjust / set date.
- Adjust / set AM/PM.

How to set up:

- Touch the screen on the box you wish to change.
- Change the number (increase/decrease) using the UP and DOWN buttons.
- Press OK to set the changes.

5.8. Set Company Name / Beeper / Auto dim

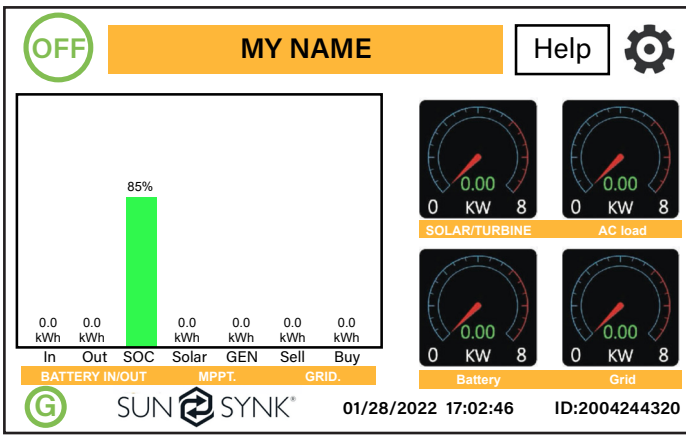
To set company name click on the BASIC icon and then on 'Display'.

What this page displays:

- Beeper status (ON/OFF).
- Installers names.

What you can do from this page:

- Set up your company name.
- Switch the beeper ON or OFF.
- Set the LCD backlight to auto dim.



How to change the name:

Change the letters in each box by moving the arrows up and down and then select OK. This will change the name on the home screen.

How to set the auto dim:

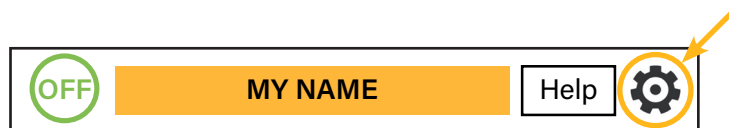
Set a number in the auto dim box to dim the LCD after a number of seconds.

How to turn the beep on or off:

Mark or unmark the beep box and the press OK to configure it as you prefer.

5.9. Factory Reset and Lock Code

To access the Settings, click on the gear icon on the right top of the navigation menu.



What this page displays:

- Reset status.
- Whether the 'lock code' is used or not.

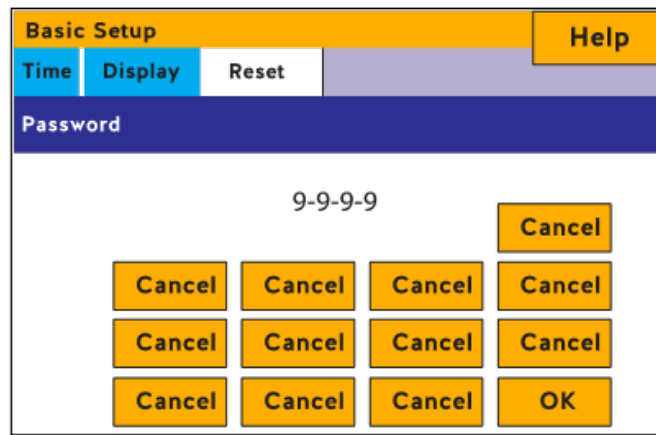
What you can do from this page:

- Reset the inverter to the factory settings.
- System diagnostics.
- Change or set the 'lock code'.

Factory Reset: Reset all parameters of the inverter

Lock out all changes: Enable this menu to set parameters before the unit is locked and cannot be reset.

***Before performing a successful 'Factory Reset' and locking the systems, the user must enter a password to allow the setting to take place. The password for 'Factory Reset' is 9999 and for lockout is 7777.**

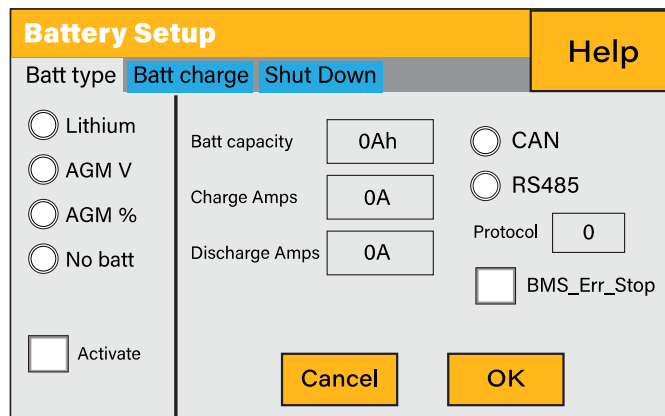


System self-check: Allows the user to conduct a system diagnosis.

Test mode (only for engineers): For engineers to conduct tests.

5.10. Battery Setup Page

To configure battery settings, click on the BATTERY icon and then on 'Batt type'.



What this page displays:

- Battery capacity in (Ah) – For non-BMS-batteries the range allowed is 0-2000Ah, while for lithium-ion, the inverter will use the capacity value of the BMS.
- Max battery charge current (Amps).
- Max battery discharge current (Amps) should be 20% of the Ah rating for AGM only. For Lithium, please refer to the battery manufacturer's documentation. Note: This is a global max. Discharge current for both 'grid-tied' and 'backup' modes of operation. If the current exceeds this value, the inverter will shut down with an overload fault.
- TEMPCO settings - The temperature coefficient is the error introduced by a change in temperature.

What you can do from this page:

- Use battery voltage for all settings (V).
- Use battery SOC for all settings (%).
- No battery: tick this box if no battery is connected to the system.

- BMS setting.
- Active battery - This feature will help recover a battery that is 100% discharged by slowly changing from the solar array. Until the battery reaches a point where it can charge normally.

5.11. Generator & Battery Page

To configure battery charging settings, click on the BATTERY icon and then on 'Batt Charge'.

What this page displays:

- Generator start voltage/SOC %.
- Grid power start voltage/SOC %.
- Float V is the voltage at which a battery is maintained after being fully charged.
- Absorption V the level of charge that can be applied without overheating the battery.
- Float V for an AGM battery is 55.20V.
- Absorption V is for an AGM battery is 57.60V.
- Equalization V for an AGM battery is 58.80V.
- Equalizing charge/overcharge to remove sulphate crystals that build-up on the plates over time on lead-acid batteries.

What you can do from this page:

- Tick 'Gen Charge' to charge the batteries from the gen I/P.
- Tick 'Grid Charge' to charge the batteries from the grid I/P.
- Tick 'Gen Signal' signal to auto-switch a relay box.
- Tick 'Grid Signal' signal to auto-switch a relay box.

PLEASE NOTE

Do not alter these settings too often on the same battery, as it may damage the battery.

Gen Charge: Uses the GEN input of the system to charge the battery bank from an attached generator.

Gen Signal: Normally open (NO) relay that closes when the Gen Start signal state is active.

Gen Max Run Time: This indicates the longest time the generator can run in one day. When the maximum running time is reached, the generator will be turned off. '24H' means the generator will run continuously.

Gen Down Time: This indicates the delay-time of the generator to shut down after it has reached the running time

Grid Charge: It indicates that the grid will charge the battery.

Grid Signal: This indicates when the grid should no longer charge the battery.

Recommended battery settings:

Battery Type	Absorption Stage	Float Stage	Voltage (every 30 days 3hr)
AGM (or PCC)	14.2V (57.6V)	13.4V (53.6V)	14.2V (57.6V)
Gel	14.1V (56.4V)	13.5V (54.0V)	
Wet	14.7V (59.0V)	13.7V (55.0V)	14.7V (59.0V)
Lithium	Follow its BMS voltage parameters		

Using a generator with a Sunsynk inverter:

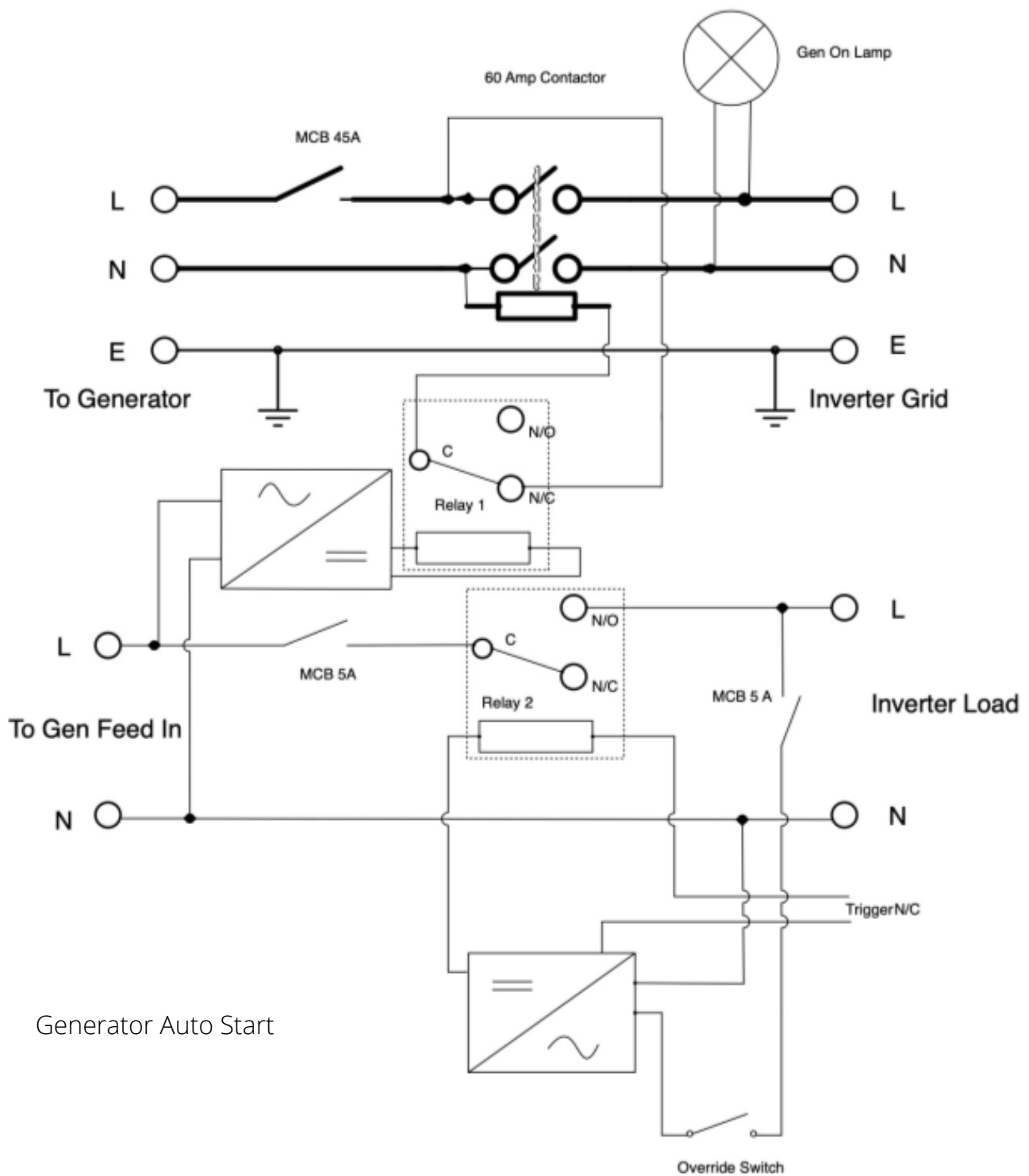
A generator can either be connected to the Grid side or to the Gen connection. When connected to the Grid Input, the inverter will consider the power coming from the generator as 'Grid Supply'. Users should ensure this power goes to the LOAD only and should not be exported to other outlets, as this will damage the generator.

An advantage of connecting the generator to the Grid Input is that it can be paralleled, whereas the GEN/AUX input cannot be paralleled. That means the inverter will extract what power it requires from 'Grid Supply' to charge its batteries.

If the generator is connected to the inverter and a generating signal exists, the inverter will switch 100% of the load to the generator and then slowly increase the charging currents to the batteries. Therefore, the generator must be able to supply both the charge current and the total load current.

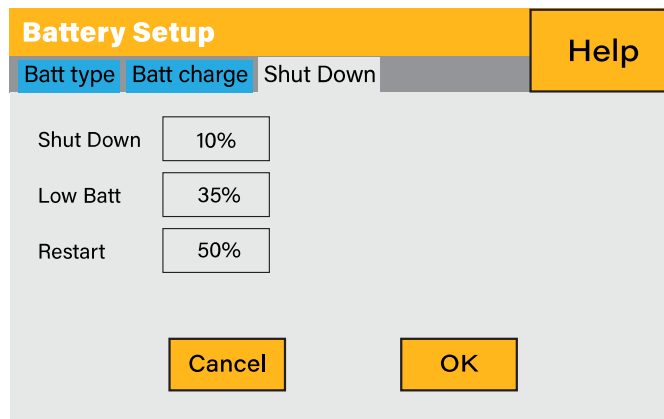
The generator can be controlled via a relay with a set of dry-contacts to enable remote control. The current on the contacts is limited to approximately 1Amp 12V.

Below is a simple reference circuit of an auto-start system that can autostart generators on a boat. (Sunsynk will be releasing a new OS E406 (Auto-Start) for better generator control).



5.12. Battery Discharge Page

To configure inverter's shutdown settings, click on the BATTERY icon and then on 'Shut Down'.



What this page displays:

- Inverter shutdown voltage set as either a voltage or %.
- Inverter low battery warning set as either a voltage or %.
- Restart voltage set as either a voltage or %.

What you can do from this page:

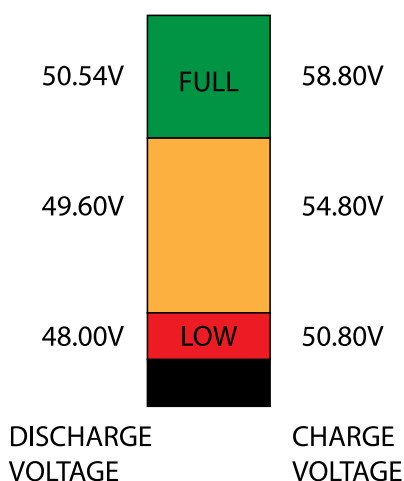
- Adjust battery shut down (voltage or %)
- Adjust low battery warning (voltage or %)
- Adjust restart (voltage or %)

PLEASE NOTE

Activating Shutdown causes the inverter to enter standby-mode. It does not entirely shut down the inverter. Total shutdown occurs at voltages below 19V.

The voltage displayed on the Sunsynk Parity Inverter will vary depending on whether the inverter is charging or discharging the batteries.

SUNSYNK PARITY INVERTER CHARGE VOLTAGE



Since the batteries are 48V, the figure on the left is x4:

- Fully Charged 50.54V (Discharge Mode)
- Fully Charged 58.50V (Charge Mode)
- 75% Charged 49.60V (Discharge Mode)
- 75% Charged 54.80V (Charge Mode)
- 25% Charged 48.00V (Discharge Mode)
- 25% Charged 50.80V (Charge Mode)
- Completely Discharged 47.50V

Setting the cut-off higher is better for the batteries.

The batteries recommended for use with the Sunsynk systems are AGM Lead Acid or Lithium Battery Banks. ('AGM' means Absorbed Glass Matt construction that allows the electrolyte to be suspended new the plate's active material. In theory, this enhances both the discharge and recharging efficiency. AGM batteries are very heavy as a result).

State of Charge

Bulk: The bulk charge is the first stage of a battery's charging process, where the charger identifies the battery and its needs and then applies a high voltage to do the bulk of the charging. It involves about 80% of the recharge. The properly sized charger will give the battery as much current as it will accept up to charger capacity (25% of battery capacity in Amp hours).

Absorption: To fully charge a battery, a period of charging at a relatively high voltage is needed. This period of the charging process is called absorption. This occurs when the charging of a battery has reached 80% of its capacity. The remaining charge equals 20% approximately. It makes the charger hold the voltage at the charger's absorption voltage (between 14.1 VDC and 14.8 VDC, depending on charger set points) and decreases the current until the battery is fully charged.

Float: The charging voltage is reduced to between 13.0 VDC and 13.8 VDC and held constant, while the current is reduced to less than 1% of battery capacity. This mode can be used to maintain a fully charged battery indefinitely.

Equalisation: This is essentially a controlled overcharge that occurs at the end of the Bulk mode and the absorption phase and is called the 'equalisation voltage'. However, technically, this phase has another function. Higher capacity wet (flooded) batteries sometimes benefit from this procedure, particularly the physically tall batteries. The electrolyte in a wet battery can stratify over time if not cycled occasionally. In equalisation, the voltage is brought up above the typical peak charging voltage well into the gassing stage and maintained for a fixed (but limited) period. This stirs up the chemistry in the entire battery, 'equalising' the strength of the electrolyte and knocking off any loose sulphating that may be on the battery plates.

5.13. Setting Up a Lithium Battery

To set up a lithium-ion battery, click on the BATTERY icon and visit the 'Batt Type' column.

What this page displays:

- This information will only display if the 'Lithium' option is selected under 'Batt Type'.
- The type of communion protocol.
- Approved batteries.

What you can do from this page:

- Set up you Lithium-ion battery.

After installing a lithium battery, check the communications page by clicking on the 'Li BMS' icon to see if the BMS information is visible. Suppose some information is not displayed correctly (it should look like the diagram below), then there will be a communication error.

LiBms:01	
Battery Voltage: 53.06V	
Battery Current: -3A	Battery charge Voltage: 58.0V
Battery Temp.: 22.0C	Charge current limit: 50A
SOC = 85% SOH = 100%	Discharge current limit: 50A
MaxCharge current limit: 0A	
MaxDischarge current limit: 0A	
Alarms: 0x00 0x00	

Therefore, if a communication error occurs:

1. Check that your data cable is the correct type.
2. Check that the data cable is plugged into the correct sockets. Usually, RS485 is employed, but some battery manufacturers use others.

PLEASE NOTE

With some types of lithium batteries, the BMS cannot be controlled by the Sunsynk inverter. In this case, treat the battery as a lead-acid type and set the charging and discharging protocol following the battery manufacturer's specifications.

It is crucial to refer to the manuals that manufacturers produce for their batteries. That way, the chance of errors occurring during installation is significantly reduced. Below is a list of batteries that have been examined, tested, and approved by Sunsynk.

Brand	Model	48V Storage Inverter	RS485 or CAN	Inverter Setup	Notes
DYNESS	B4850	✓	CAN	0	
	POWERBOXF			0	
SolarMD	SS4074	✓	CAN	0	To be used with V2 Logger http://solarmd.co.za/inverter-compatibility-solarmd/ sunsynk-and-solar-md/
	SS4037			0	
	SS202			0	
SHOTO	SDC10-Box 5	✓	CAN	0	

Brand	Model	48V Storage Inverter	RS485 or CAN	Inverter Setup	Notes
PYLON	US2000B	✓	CAN	0	
			RS485	12	
	US3000		CAN	0	
			RS485	12	
	US2000C		CAN	0	
			RS485	12	
	US3000C		CAN	0	
			RS485	12	
	UP5000		CAN	0	
			RS485	12	
US5000	CAN	0			
	RS485	12			
Force L1	CAN	0			
	RS485	12			
Force L2	CAN	0			
	RS485	12			
HUBBLE	AM-2 5.5KW	✓	CAN	0	
SACRED SUN	SSIF2P15S48100C	✓	RS485	1	Cut Line 3, 6, 8
	FCIFP48100A		RS485	1	
	SSIFP48100A		RS485	1	
UZ ENERGY	UZ-EB51.2-100ALL	✓	CAN	0	
GenixGreen	ESS-5120	✓	RS485	6	
	ESS-10240		RS485	6	
	ESS-BOX2		RS485	6	
	ESS-BOX3		RS485	6	
	ESS-BOX4		RS485	6	
Sunwoda	H4850M	✓	RS485	7	
VISION Group	V-LFP51.2V100Ah-5KW	✓	CAN	13	
	VLFP51.2V200Ah-5KW		CAN	13	
Alpha Ess	M4856-P	✓	CAN	0	
	SMILE BAT		CAN	0	
GSL ENERGY	GSL051100A-B-GBP2	✓	CAN	0	
	GSL051200A-B-GBP2		CAN	0	
	GSL051280A-B-GBP2		CAN	0	
	ZnP48100ESA1		CAN	0	
	GSL-51-100		CAN	0	
	GSL-51-200		CAN	0	
TOPBAND	TB51100F-T110	✓	CAN	0	
	TB51120-T110		CAN	0	
Weco	4K4 LV	✓	CAN	0	
	5K3 LV		CAN	0	

Brand	Model	48V Storage Inverter	RS485 or CAN	Inverter Setup	Notes
DOWELL	IPACK	✓	CAN	0	
	C3.3/IPACK		CAN	0	
	C6.5/IPACK C10		CAN	0	
Giter	G2500-48V	✓	CAN	0	
	G5040-48V		CAN	0	
CF Energy	CFE2400	✓	CAN	0	
	CFE5100		CAN	0	
	CFE5100S		CAN	0	
Batterich/ Greenrich	UP3686		CAN	0	
BYD	BYD Battery-Box LV Flex Lite		CAN	0	
Narada	48NPFC80		RS485	16	RJ45 Pin 1: GND RJ45 Pin 2: RS485_A RJ45 Pin 3: RS485_B RJ45 Pins 4, 5, 6, 7, 8: No Connection
	48NPFC100		RS485	16	
	48NPFC150		RS485	16	Single-phase Hybrid Inverter Comm version is E41E Single-phase Hybrid Inverter Comm version is 1001 - E016
	48NPFC200		RS485	16	
Deye	SUNB-5.0-C01-48-PC		CAN	0	
	SUNB-5.0-E01-48-PC		CAN	0	
	SUNB-5.0-G01-48-PC		CAN	0	
AOBOET	Uhome-LFP 5000		CAN	0	
	Uhome-LFP 2400		CAN	0	
Wattsonic	Li-LV battery series	✓	CAN	14	
KODAK	FL5.2	✓	CAN	0	
Fox ess	LD-48100P	✓	RS485	1	
PYTES Energy	E-BOX 48100R		CAN	0	
BST	MD48-100		CAN	0	
	MD48-50		CAN	0	
Highstart	HSD4870		CAN	0	
Rosen Solar Energy	LFP48V200AH		CAN	0	
ZRGF	ZR-FC48100-1630J1		CAN	0	
	ZR-FS4850-16OSJ1		CAN	0	
	ZR-FS48100-16OSJ1		CAN	0	
	ZR-PBX1		CAN	0	
BALANCELL	P26		CAN	0	
	P27		CAN	0	

Brand	Model	48V Storage Inverter	RS485 or CAN	Inverter Setup	Notes
Shanghai Green Tech Co.,Ltd.	GTEM-48V2500		RS485	12	
Unipower LD	UPI.FP4845		RS485	15	
	LD-100P210J		RS485	17	
BSL	B-LFP51.2V 100Ah		CAN	0	Float voltage 54.5V Absorption V 55.00V Disable equalisation 0 Days Shutdown 20% Low Batt 35% Restart 50%
	B-FLP51.2V 125Ah				
	B-LFP48-130E 51.2V 130Ah				
	B-LFP48-160E 51.2V 160Ah				
	B-LFP51.2V 200Ah Powerwall				
Enersol	lithium 48-100		CAN	0	BMS cable – straight RJ45 cable (no need to change pin outs on cable) Dip Switch settings is 1000 (for single battery)
Blue Nova HC	BN52V-280-14.5K HC		CAN	0	Can be used with or without BMAC
	BN52V-560-29K HC		CAN	0	https://www.bluenova.co.za/wp-content/uploads/2015/11/BN-User-Manual-HC_v102.pdf
	BN52V-840-43.6K HC		CAN	0	
	BN52V-1120-58.2K HC		CAN	0	CANH = Pin 7
	BN52V-1400-72.8K HC		CAN	0	CANL = Pin 8
Blue Nova Rack Series	BN52V-840-43.6K BR		CAN	0	BlueNova-BMAC-Manual-v4.pdf
	BN52V-1120-58.2K BR		CAN	0	
Blue Nova Rackpower	RacPower BN52-100-5.2K BP		CAN	0	
	RacPower BN52-100-5.2K DU		CAN	0	

PLEASE NOTE

When communications between the battery and inverter do not exist, do not overcharge your battery bank (current or voltage). Many lithium batteries are limited to 100A, some are lower, and some are higher. Ensure that voltage and current specifications provided by the battery manufacturer are followed.

If you are using lead acid batteries, then follow the equation of $C \times 0.25$, which means that the maximum charge or discharge you can apply to a battery is a quarter of the AH rating of the overall battery array. E.g: A 200Ah battery array composed of 4 x 200Ah batteries in series has a maximum discharge of only 50Ah ($200 \times 0.25 = 50$)

Also, ensure the cable is thick enough to support the current and that the connected fuses are of the correct rating per the battery manufacturers' recommendations.

5.14. Program Charge & Discharge Times

To set 'Charge' and 'Discharge' times, click on the 'System Mode' icon after clicking on the gear icon.

What this page displays:

- A setting to prevent the inverter exporting power to the grid - 'Zero Export'.
- The ability to limit power supply to only the household loads - 'Solar Export'.
- Set the power limits to supply only the loads connected to the LOAD port - 'Priority to Load Only'.

What you can do from this page:

- Set a real time to start and stop charging or discharging the battery.
- Choose to charge the battery from the grid or generator.
- Limit export power to the grid.
- Set the unit to charge the battery from the grid or generator ticking 'Grid' or 'Gen' and set what times this needs to occur.
- Set the time to discharge the unit to the load or export to the grid by unticking 'Grid' and 'Gen'.

The image shows two screenshots of the 'System Mode' configuration interface. The left screenshot displays a table for setting charge/discharge times, power limits, and SOC/V. The right screenshot displays settings for Zero Export, Solar Export, Limit To Load Only, Grid Trickle Feed, and Inverter Power Limiter.

Time Start	Time End	Power	SOC/V	Grid	Gen
01:00	05:00	8000	100%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
05:00	09:00	8000	100%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
09:00	13:00	8000	100%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
13:00	17:00	8000	100%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
17:00	21:00	8000	100%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
21:00	01:00	8000	100%	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Use Timer

Cancel OK

System Mode Help

System 1 System 2

Zero Export Priority Load

Solar Export

Limit To Load Only

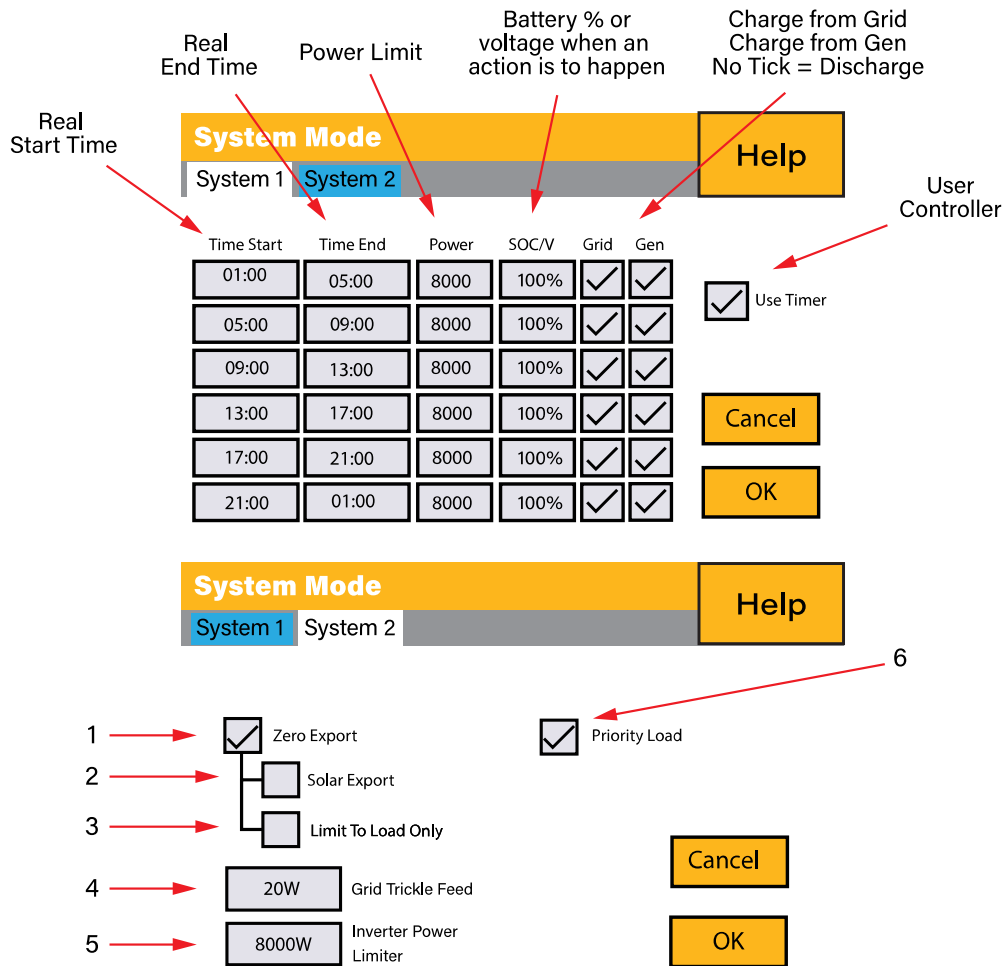
20W Grid Trickle Feed

8000W Inverter Power Limiter

Cancel OK

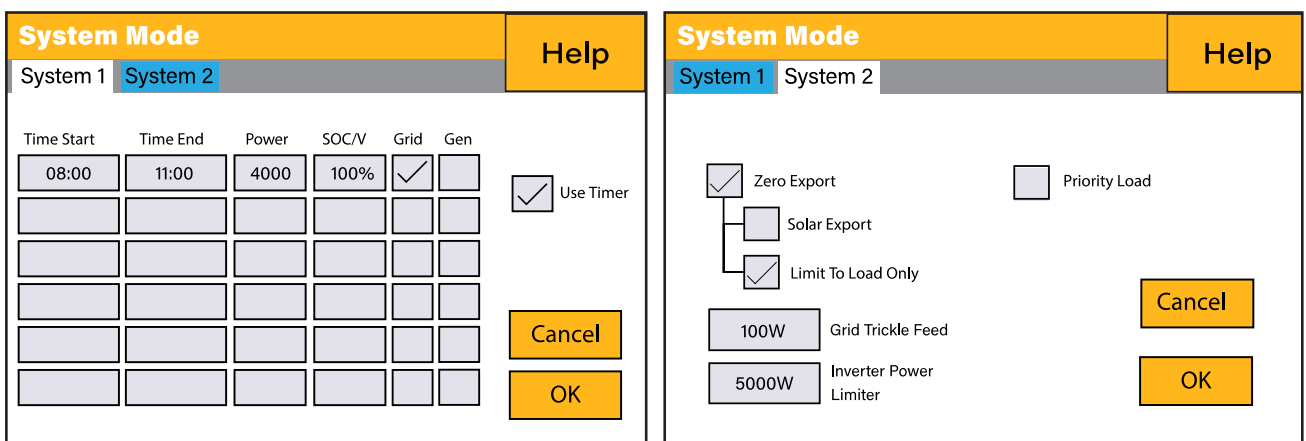
Concerning the detailed next figures:

1. Tick this box to not export power back to the grid (the CT coil will detect power flowing back to the grid and will reduce the power of the inverter only to supply the local load).
2. Tick this box if you wish to export your solar power back to the grid.
3. Tick this box if you only want to supply power to the load side of the inverter.
4. 'Zero Export Power' is the amount of power flowing from the grid to the inverter. Set this value to '20 - 100W' to instruct the inverter to always take the prescribed amount of power from the grid to minimise the tripping of sensitive pre-paid electricity meters if 'Reverse Power Detection' occurs.
5. This controls the maximum overall power, both to the 'Load' and 'Grid' ports combined. It is set to Low if an 'over-current' fault occurs.
6. Tick this box if you wish to set the solar panels to give power to the 'Load'. If you untick this box, the solar will send power to charge the batteries.



Example:

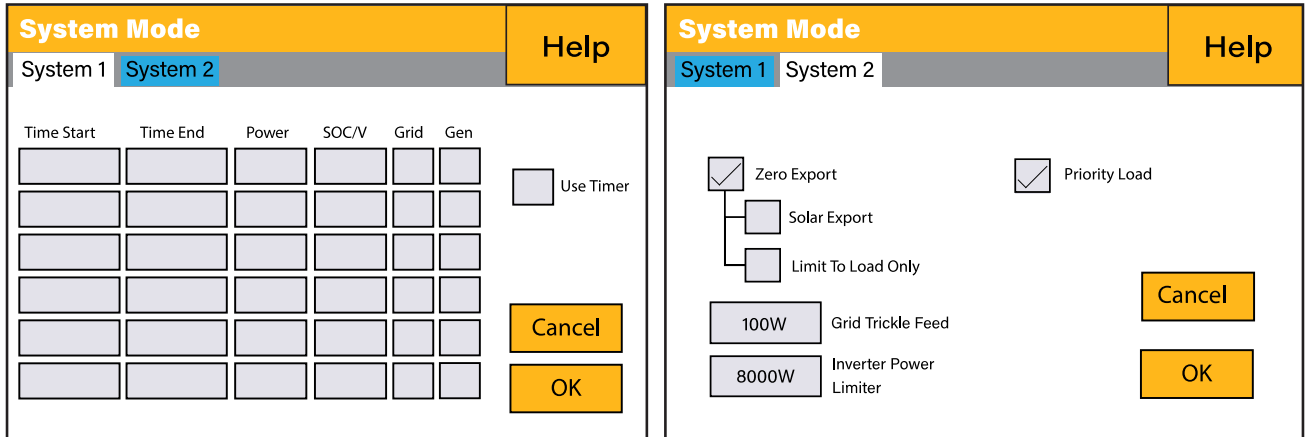
This example shows the battery being charged up to 100% by both the Grid and Solar PV from 8 a.m. to 11 a.m. and then being able to supply up to 4kW of battery-power to the 'essential' loads from the 'Load' Port until the battery SOC drops to 50%.



IMPORTANT - When charging the batteries from the Grid or Generator, please ensure you have set the correct battery-charging settings on the battery charge as shown in Section 4.10 'Battery Setup' Home Page. If the 'Use Timer' function is activated then the inverter will use the battery power according to your settings when the Grid is present. If this function is not set, the batteries WILL ONLY be used for backup when there is no utility grid power.

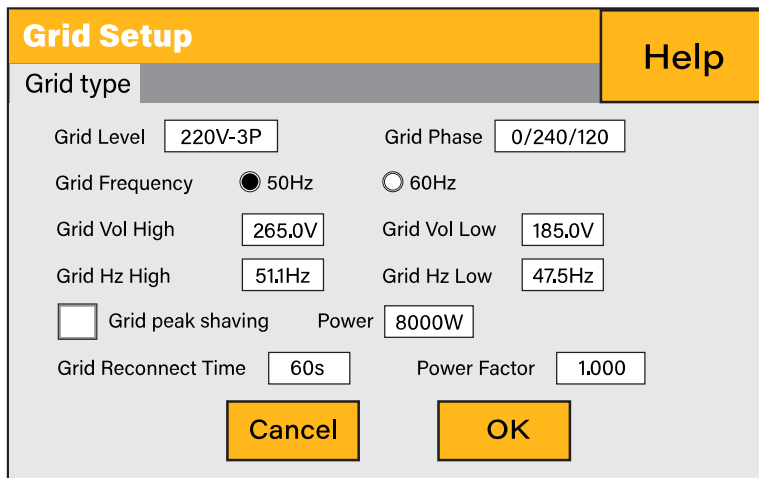
Example:

The power produced is supplying the 'Non-Essential Load' while the inverter is set at a maximum power of 8kW (Max Sell Power). The inverter is connected to the grid, but no export is performed. The unit allows small amounts of power to flow from the Grid (100W Zero Export Power) to prevent any back-flow. In this example, the solar PV is prioritised to supply the Load first and then subsequently, charge the battery.



5.15. Grid Supply Page

On the Settings Menu, click on the GRID icon.



What this page displays:

- Grid frequency setting.
- Grid type (normally 230V three-phase).

What you can do from this page:

- Change the grid's frequency setting (normally 50 Hz)
- Set the Maximum Grid Input Voltage ('Grid Vol High')
- Set the Minimum Grid Input Voltage ('Grid Vol Low')
- Set the Maximum Grid Frequency ('Grid Hz High')
- Set the Minimum Grid Frequency ('Grid Hz Low')

- Select the correct Grid Type in your local area; otherwise, the machine will not work or be damaged.
- Select the correct Grid Frequency in your local area.

5.16. Advanced Settings for Paralleling Inverters

To configure multi-inverter settings, click on the ADVANCE icon.

What this page displays:

- If the inverter operates as a master or a slave.
- Modbus Device ID – ‘Modbus SN’ that must be unique for each inverter connected to the bus/wire.

What you can do from this page:

- Set the inverter as a master or slave per bus/wire.
- Set the phase in which the inverter will be paralleled.
- Set the Modbus SN for paralleling.

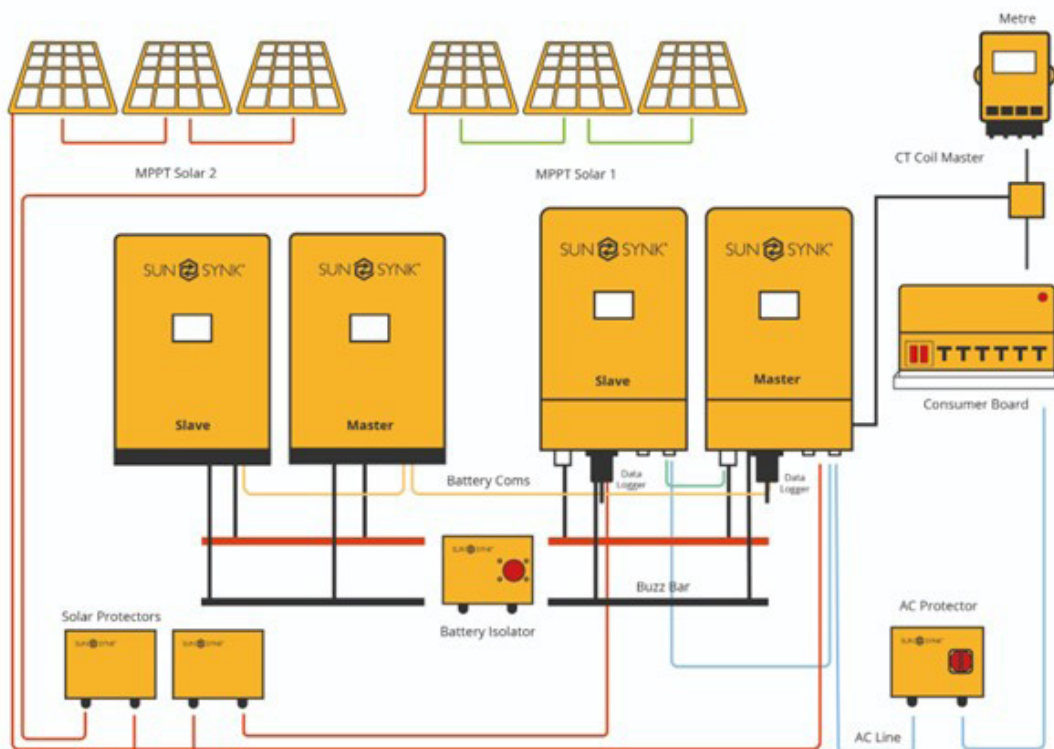
The Sunsynk inverter can be wired standalone, or it can be connected in parallel when more power is required. The maximum number of inverters that can be paralleled in a three-phase utility grid is 10. In the case where 10 inverters are operating in parallel, one will operate as the Master and the other ones as Slaves.

For stability, all the batteries need to be connected in parallel. A minimum cable size of 50mm is recommended, with fuse isolators for each inverter.

Each invert will require a fuse isolator with surge protection, and each group circuit will require an RCD. If the batteries are supplying power to the main load during the outage, then a change over switch will also be required, or a split load can be used.

- The CT coils used to limit export power must only be connected to the Master. Therefore, if six inverters are paralleled, three CT coils will be required.
- Connect a RJ45 communication cable between each inverter; the order is not important since both sockets are the same, so there is no IN or OUT.

- Each phase must only have one Master and the others set to slave.
- Each inverter must have a unique Modbus number.
- The maximum length of the communication cables is 2 meters (do not exceed this value)
- All batteries must be connected in parallel, and the MPPTs must be kept separate.
- **IMPORTANT: When configuring inverters in parallel, it is important to first check firmware versions to be the same on all inverters. It is strongly recommended to request firmware updates on all inverters to the latest and the exact same firmware version.**
- **IMPORTANT: All inverters in a parallel system must have their isolating load breaker before it goes to the parallel breaker to ensure while programming that the load outputs are isolated from each other.**
- Only once confirmed that all inverters are programmed correctly in parallel, the isolating breakers can be switched on, which then feed to the main load output breaker that feeds the loads.



PLEASE NOTE

The cables have two ends, one to be specifically connected to the BMS and another one to be connected to the inverter, do not change it. If the communication is not working correctly between inverters, then errors will appear on display. In this case, please check all settings and data cables.

PLEASE NOTE

- All inverters in a parallel system must have their own isolating load breaker before it goes to the parallel breaker to ensure while programming that the load outputs are isolated from each other.
- The grid input can also be connected in parallel.
- You cannot connect the Aux/Gen port in parallel because this causes a conflict between the generator's frequency and the grid's frequency.

Some common questions that occur when paralleling inverters:

Q1: What is the sequence to install/connect/commission?

First of all, leave the main supplies off. Next, connect all communication cables, set up all LCDs and then, last of all, turn on the main supplies.

Q2: What are the indications that the communication and the system are ok or not?

Parallel errors will be shown as fault F46 on the display.

Q3: What are the consequences of not setting one inverter in a parallel mode?

It can damage the inverter.

Q4: What are the consequences of having more than one Master Inverter or having no inverter set as 'Master'?

It can damage the inverter. There are cases in which it is possible to have more than one master. For example, as aforementioned, six inverters paralleled in a three phase utility grid (three masters).

Q5: What are the consequences for setting A, B, or C phases wrong while in parallel mode?

It can damage the inverter. Recommend checking the phase rotation with a meter before switching on.

Q6: What are the consequences of factory resetting, power cycling, or firmware updating one inverter in a parallel system?

It can damage the inverter. Inverters needs to be isolated from each other before factory reset or firmware update.

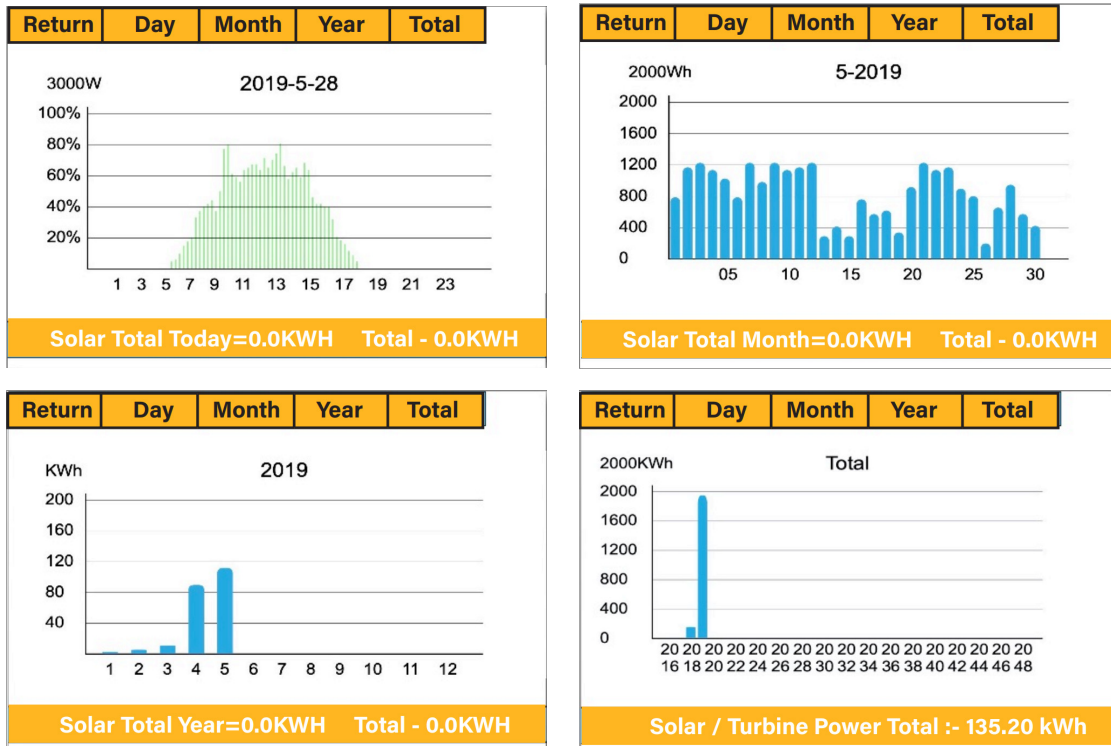
Q7: What consequences for changing ALL/ANY settings while operating in parallel mode?

It can damage the inverter and fault F46 will be indicated on the display.

If you need further help please refer to the Sunsynk website where you will find training videos and Frequently Asked Questions www.sunsynk.com. Firmware prior installation is important to be updated and all inverters in parallel or three phase system must be the same.

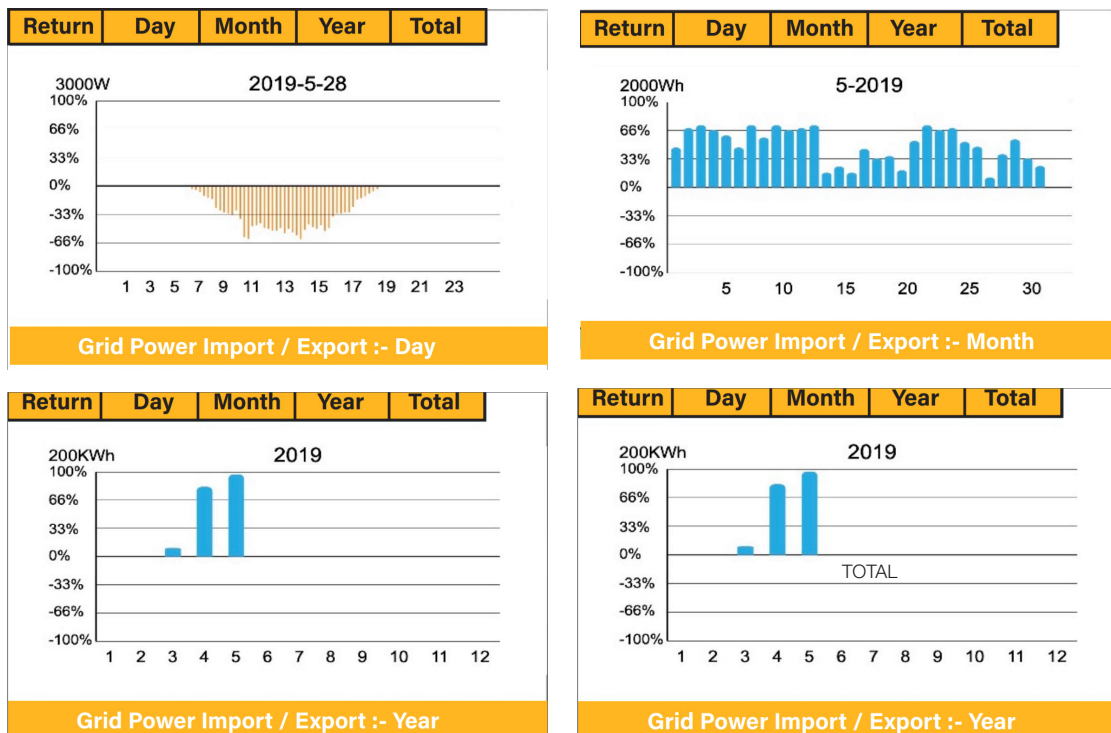
5.17. Solar Power Generated

This page shows the daily, monthly, yearly, and total solar power produced. Access this page by clicking on the 'Solar/Turbine' icon on the Home Page.



5.18. Grid Power

This page shows the Daily / Monthly / Yearly and total grid power export or consumed. Access this page by clicking on the 'Solar/Turbine' icon on the home page.



5.19. Advanced Settings for Wind Turbines

To configure wind turbine settings, click on the ADVANCE icon.

What this page displays:

- If one or both of the MPPTs are connected to a wind turbine.

What you can do from this page:

- Select the MPPT to be used as a turbine input.

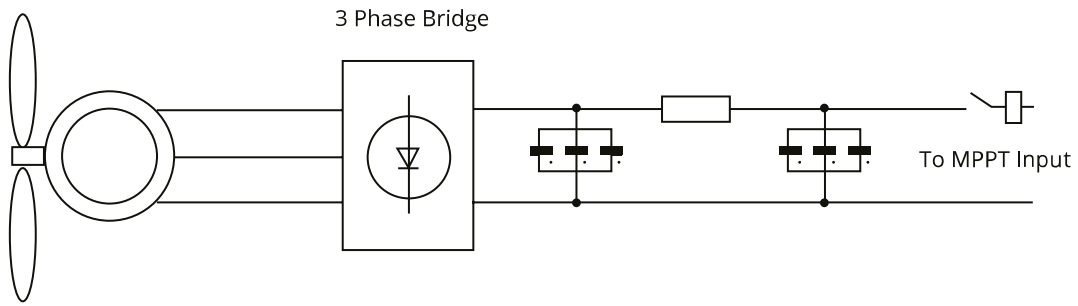
The table below shows the maximum current depending on the voltage of the wind turbine.

PLEASE NOTE

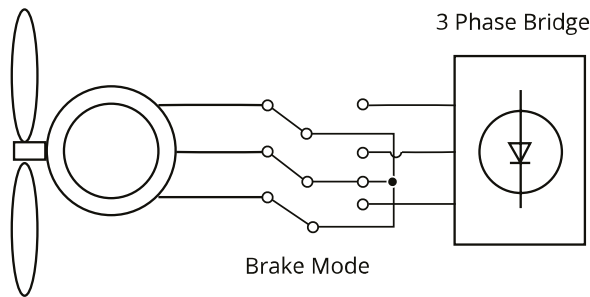
- DO NOT use a wind turbine that exceeds 400V.
- Use a self-breaking wind turbine. Once the batteries are fully charged and the inverter is not exporting any power, the load can drop. This can cause the turbine to speed up dramatically, which can be very dangerous and usually happens suddenly. Thus, it is essential to use a self-breaking turbine.

Voltage (V)	Max. Current (A)	Power (W)
150	23.33	3500
200	17.50	3500
250	14.00	3500
300	11.67	3500
400	8.75	3500

Most wind turbines are three-phase PM type. Therefore, either a wind turbine controller or a direct connection to the MPPT via a simple protection circuit will be required.



Dump Load or Diversion Load is an important part of an off-grid power system. When the battery (Battery Bank) is fully charged, and the water turbine / wind turbine / solar PV module is still generating, a dump load is a useful device to send spare electricity to. This can be done by using a switch on a smart load option or by utilising a wind turbine controller with a built-in dump load. Also, a hot water tank controlled via a smart-load can act as a good 'dump-load' however, in very windy conditions it may be necessary to shunt the output.



5.20. Advanced Settings for Auxiliary Load

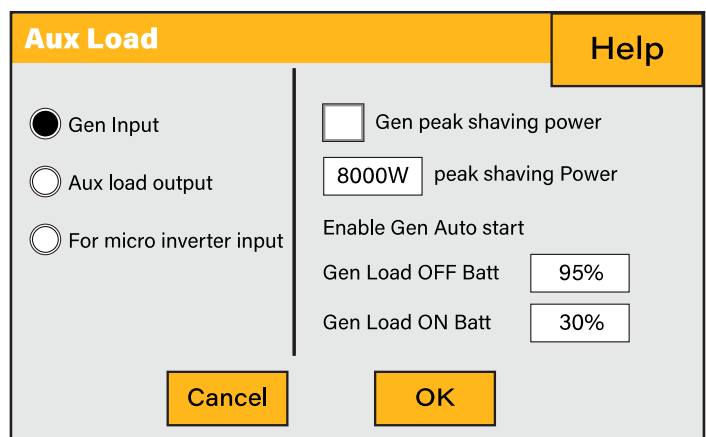
To configure Auxiliary Load (previously known as “smart load”) settings, click on the AUX LOAD icon.

What this page displays:

- Use of the Gen (Aux) input or output.

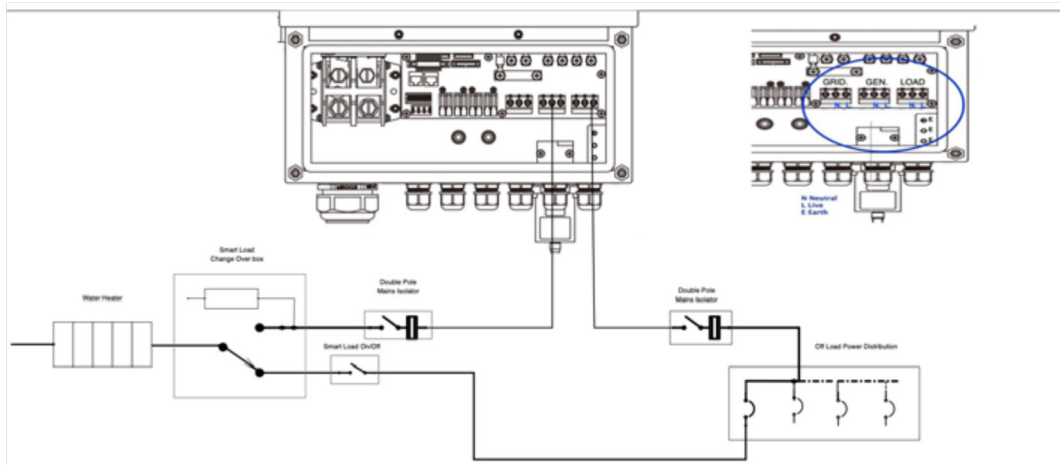
What you can do from this page:

- Set up a generator input.
- Set up an auxiliary (smart) load.
- Set up Peak Power Shaving.
- Use an additional inverter or micro inverter.



A nice feature of this page is that when the batteries are full and the inverter is still producing power from the solar PV or turbine, it is possible to direct the power generated to another load such as a water heater.

Aux Load off Battery % or Voltage	Battery level when the Aux load switches off
Aux Load on Battery % or Voltage	Battery level when the Aux load switches on.
Solar Power	Power limiter to the maximum power allowed to the Aux load.
Gen Input	Tick this box if using a Generator.
Aux Load Output	Tick this box if using an Aux or Smart Load.
For Micro inverter Input	Tick this box if intending to connect a supplementary inverter or micro inverter (Max. 4kW).
Zero Export	Tick this box to stop exporting power produced by the Aux Load.
Gen Peak Shaving	Tick this box to use peak power shaving.



5.21. Advanced Settings for Peak Shaving

To configure Peak Power Shaving function, click on the AUX LOAD icon.

What this page displays:

- Generator peak shaving is ON or OFF.
- Peak Power Shaving value.

What you can do from this page:

- Switch on the generator and/or grid peak power saving and set the power shaving value.

Aux Load
Help

Gen Input

Aux load output

For micro inverter input

Gen peak shaving power

peak shaving Power

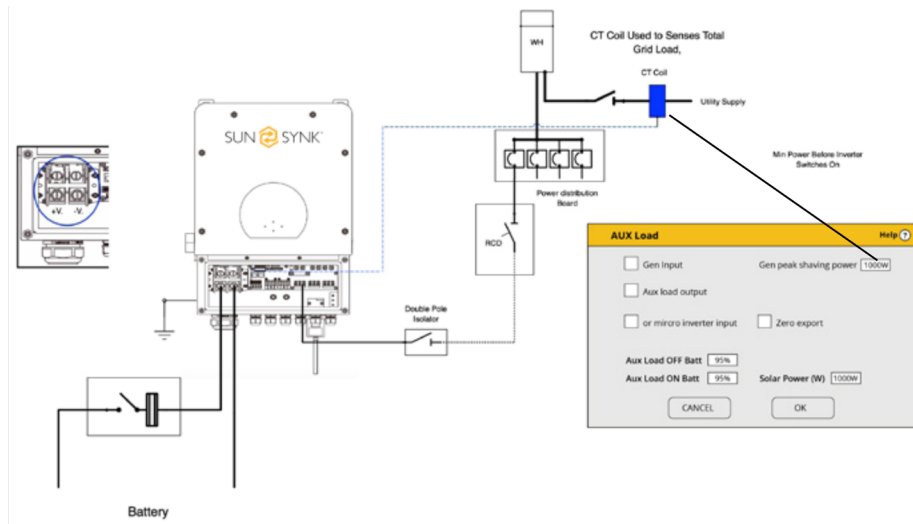
Enable Gen Auto start

Gen Load OFF Batt

Gen Load ON Batt

Cancel
OK

Peak Shaving: This is a technique used to reduce electrical power consumption during periods of maximum demand on the utility grid. This enables the user to save substantial amounts of money due to the expensive peak power charges.



5.22. Fault Codes

To check the fault codes click on the FAULT CODES icon on the settings menu.

FAULTS CODES		
Alarms Code	ID:2004244320	Occured
F56	DC_VoltLow_Fault	2022-01-26 12:45
F56	DC_VoltLow_Fault	2022-01-24 11:00
F56	DC_VoltLow_Fault	2022-01-07 18:19
F56	DC_VoltLow_Fault	2022-01-08 01:58
F56	DC_VoltLow_Fault	2021-11-09 13:22
F56	DC_VoltLow_Fault	2021-11-03 17:48
F56	DC_VoltLow_Fault	2021-10-27 16:31
F56	DC_VoltLow_Fault	2021-10-20 19:17

If any of the fault messages listed in the following table appear on your inverter and the fault has not been removed after re-starting, please contact your local vendor or service centre. The following information is required:

1. Inverter serial number.
2. Distributor or service centre of the inverter.
3. On-grid Power Generation Date.
4. The problem description (including the fault code and indicator status displayed on the LCD) with as much detail as possible.
5. Owner's contact information.

Error Code	Description	Solutions
F13	Working Mode Change	Inverter work mode changed 1.Reset the inverter. 2.Seek help from Sunsynk.
F18	AC over current fault or hardware	AC Slide over current fault. 1.Check if the backup load power is within the range of the inverter. 2.Restart, and check if it is normal.
F20	DC over current fault of the hardware	DC Over current fault 1.Check if PV module and battery connections. 2.Reset the system.
F23	AC leakage current is trans over current	Leakage current fault 1.Check the PV module and inverter cables. 2.You may have a faulty PV panel (earth short) 3.Restart inverter
F24	DC insulation impedance failure	PV isolation resistance is too low 1.Check if the connection of PV panels and inverter are firmly connected. 2.Check if the earth bond cable on inverters is connected to the ground.
F26	The bus bar is unbalanced	1.Please wait 5 minutes to see if it returns to normal. 2. Fully reset the inverter.
F35	No at: grid	Grid voltage fault 1.Check if the voltage is in the range of standard voltage in specification this can be adjusted via the grid set up page. 2.Check if grid cables are correctly connected.
F42	AC line low voltage	Grid voltage fault 1.Check if the voltage is in the range of standard voltage in specification this can be adjusted via the grid set up page. 2.Check if grid cables are correctly connected.
F47	AC over frequency	Grid frequency out of range 1.Check if the frequency is in the range of specification 2.You may need to adjust the frequency on the grid set up page.
F48	DC bus bar voltage is too low	Battery low voltage 1. Check if the battery voltage is too low. 2. If the battery voltage is too low use the PV or grid to charge the battery. 3. Check the battery BMS Important: Especially with Lithium batteries, ensure that the batteries Max. discharge current or power specification is the same or higher than the inverter specification.
F64	Heat sink high-temperature failure	Heat Sink temp is too high 1.Check if the working environment temperature is too high. 2.Turn off the inverter for 30 minutes and restart.

Fault Information	Instruction	Fault Information	Instruction
F01	DC_Inversed_Failure	F33	AC_OverCurr_Fault
F02	DC_Insulation_Failure	F34	AC_Overload_Fault
F03	GFDI_Failure	F35	AC_NoUtility_Fault
F04	GFDI_Ground_Failure	F36	AC_GridPhaseSeque_Fault
F05	EEPROM_Read_Failure	F37	AC_Volt_Unbalance_Fault
F06	EEPROM_Write_Failure	F38	AC_Curr_Unbalance_Fault
F07	GFDI_Fuse_Failure	F39	INT_AC_OverCurr_Fault
F08	GFDI_Relay_Failure	F40	INT_DC_OverCurr_Fault
F09	IGBT_Failure	F41	AC_WU_OverVolt_Fault
F10	AuxPowerBoard_Failure	F42	AC_WU_UnderVolt_Fault
F11	AC_MainContactor_Failure	F43	AC_VW_OverVolt_Fault
F12	AC_SlaveContactor_Failure	F44	AC_VW_UnderVolt_Fault
F13	Working_Mode_change	F45	AC_UV_OverVolt_Fault
F14	DC_OverCurr_Failure	F46	AC_UV_UnderVolt_Fault
F15	AC_OverCurr_Failure	F47	AC_OverFreq_Fault
F16	GFCI_Failure	F48	AC_UnderFreq_Fault
F17	Tz_COM_OC_Fault	F49	AC_U_GridCurr_DcHigh_Fault
F18	Tz_Ac_OverCurr_Fault	F50	AC_V_GridCurr_DcHigh_Fault
F19	Tz_Integ_Fault	F51	AC_W_GridCurr_DcHigh_Fault
F20	Tz_Dc_OverCurr_Fault	F52	AC_A_InductCurr_DcHigh_Fault
F21	Tz_GFDI_OC_Fault	F53	AC_B_InductCurr_DcHigh_Fault
F22	Tz_EmergStop_Fault	F54	AC_C_InductCurr_DcHigh_Fault
F23	Tz_GFCI_OC_Fault	F55	DC_VoltHigh_Fault
F24	DC_Insulation_Fault	F56	DC_VoltLow_Fault
F25	DC_Feedback_Fault	F57	AC_BackFeed_Fault
F26	BusUnbalance_Fault	F58	AC_U_GridCurr_High_Fault
F27	DC_Insulation_ISO_Fault	F59	AC_V_GridCurr_High_Fault
F28	DCIOver_M1_Fault	F60	AC_W_GridCurr_High_Fault
F29	AC_AirSwitch_Fault	F61	AC_A_InductCurr_High_Fault
F30	AC_MainContactor_Fault	F62	AC_B_InductCurr_High_Fault
F31	AC_SlaveContactor_Fault	F63	ARC_Fault
F32	DCIOver_M2_Fault	F64	Heatsink_HighTemp_Fault

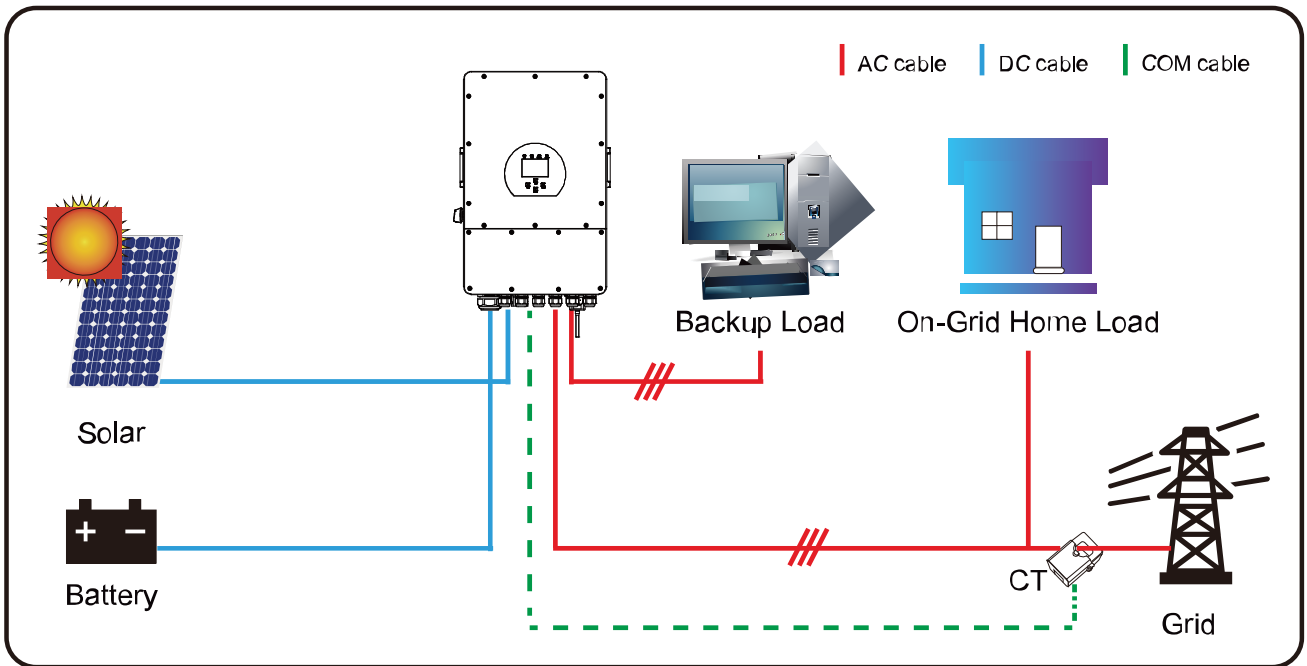
PLEASE NOTE

- The 3-Phase Hybrid Inverter is designed for grid-connected operation.
- The inverters meet the main standards concerning safety and electromagnetic compatibility. Before leaving the factory, all inverters undergo rigorous testing to ensure the inverter can operate reliably, as presented in Chapter 3, 'Technical Specifications'.

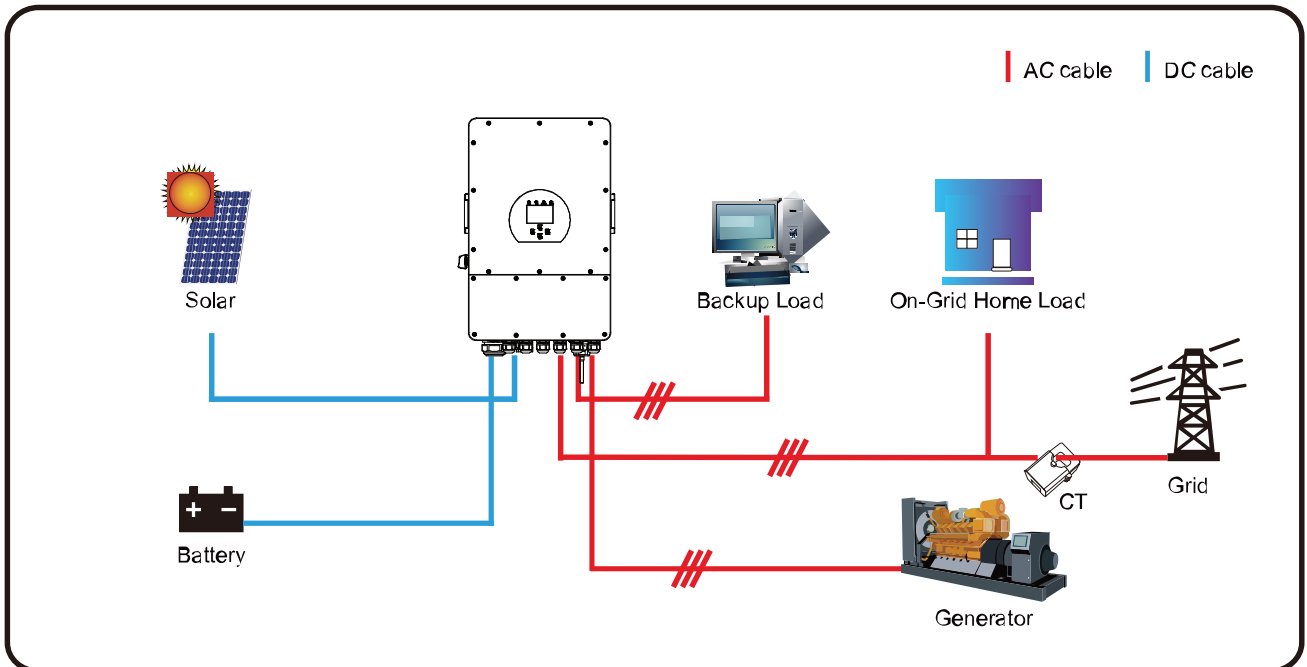
If you need further help please refer to the Sunsynk website where you will find training videos and frequently asked questions www.sunsynk.com.

5.23. Operation Modes

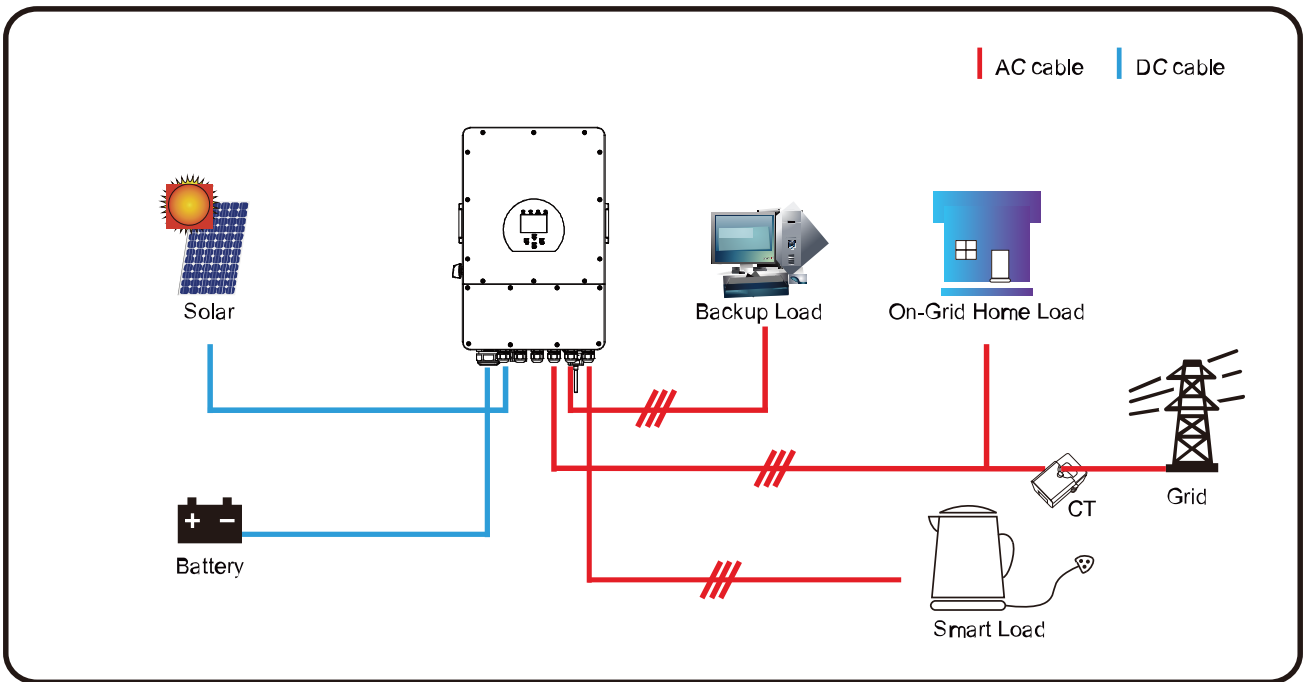
5.23.1. MODE I: Basic



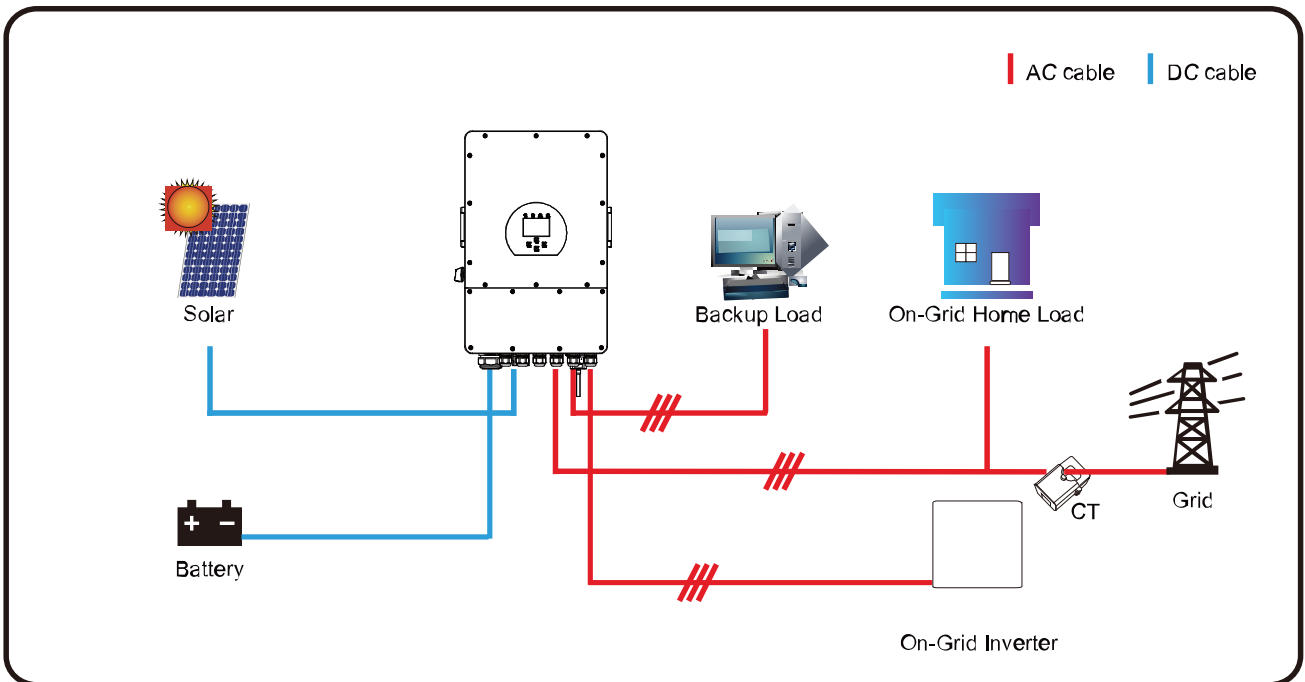
5.23.2. MODE II: With Generator



5.23.3. MODE III: With Smart-Load



5.23.4. MODE IV: AC Couple



6. COMMISSIONING

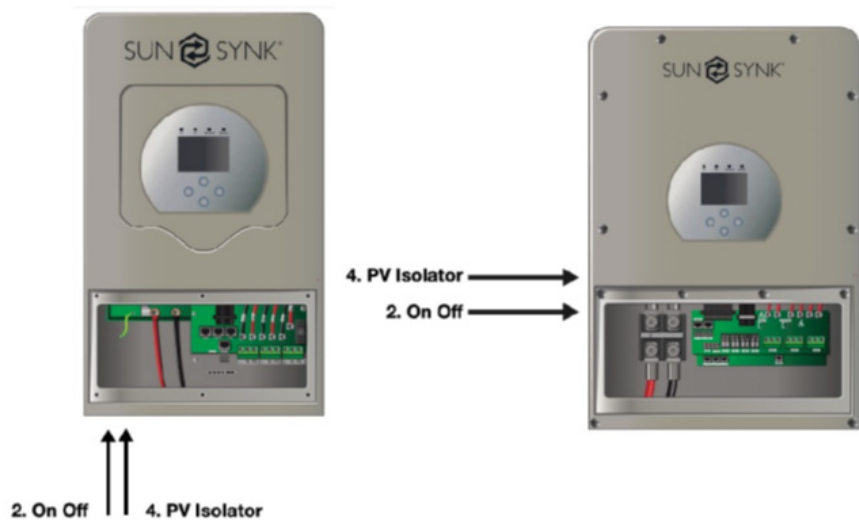
6.1. Start-Up / Shutdown Procedure

The inverter must be installed by a qualified / licensed electrical engineer in accordance with the country's wiring regulations.

Before switching on, the installation engineer must have completed the Earth Bond, RCD and earth leakage tests, checked that the solar panel Voc voltage does not exceed 480V and checked the battery voltage.

Power ON Sequence:

1. Switch on AC
2. Press Start Button
3. Switch on Battery and battery breaker
4. Switch on the DC (PV Isolator)









Shutdown Sequence:

1. Switch off AC
2. Press the start button
3. Switch off the battery and the battery breaker
4. Switch off the DC (PV isolator)

6.2. Information for Commissioning the Inverter

After you have successfully powered up the inverter, it must be programmed and set up as per the programming feature above.

 Solar	Check each bond on the solar panels	Check the VOC does not exceed 480V	Ensure both MPPTs are balanced
 GRID	Measure the supply voltage check it matches the settings of the inverter	If it falls out of the setting range it will cause the inverter shut down and alarm	See Grid Setup page
 BATTERY	Check the battery charge and discharge is within the C rating of the battery. Too high will damage the battery		Check the battery BMS is communicating with the inverter
 SYSTEM MODE	This is the heart of the system this controller everything	Ensure you are familiar with this, if you fully understand the controller you will fully appreciate the capabilities of there inverter	See section 'Program Charge / Discharge Times'
 ADVANCE	This is for paralleling systems, and wind turbine	If paralleling inverters in 3 Phase check you phase rotation before switching on the AC Load, in 3 Phase the output voltage will increase across phase to 400V	If using a wind turbine please ensure you have the correct limiting resistor, caps and rectifier
 FAULT CODES	Familiarize yourself with common fault codes		

6.3. GDFI Fault

Before the inverter connects to the Grid, it will detect the impedance (effective resistance) of the solar PV + to Ground, and the impedance of the solar PV - to ground. If any of the impedance values are less than 33kΩ, the inverter will not connect to the Grid and will report an error F24 on its LCD.

7. MAINTENANCE

The inverter is low maintenance. However, it is important that at least twice a year (for dusty environments this may need to be carried out weekly) all the cooling fans, air ducts are cleaned and dust free.

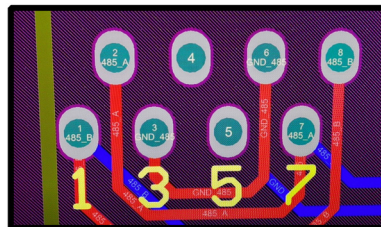
Check if there are no fault codes and Lithium battery communication is correct.

Weekly cleaning statement: Suggest micromesh filters as an available option, micro ants here are a real problem.

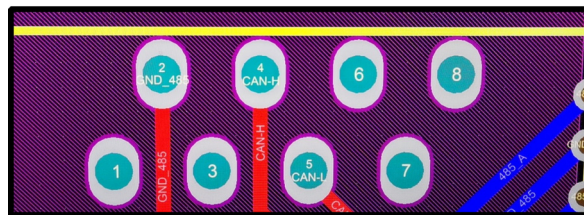
APPENDIX A

Protocol	Description
CAN	Pin 1: CAN-H Pin 5: CAN-L Pin 2, 3, 4, 6, 7, 8: NC
RS485	Pin 1: RS485B Pin 2: RS485A Pin 3, 6: GND Pin 7: RS485A Pin 8: RS485B Pin 4, 5: NC

RS485



CAN



APPENDIX B

Inverters sold in Australia will be set to the Default Australian standards.

APPENDIX C

The Sunsynk Single-Phase Hybrid Inverter inverter is compatible with the SolarMan app, via a Wi-Fi or GSM data logger (See SolarMan instruction manual).

APPENDIX D

If an external Residual Current Device (RCD) is used it should be of Type A/AC with a tripping current of 30mA or higher.

Use of RCDs

Residual Current Devices (RCDs): An RCD dedicated for an Inverter Energy System (IES) may be used to meet the mechanical cable protection requirements of AS/NZS3000 for the cable from the switchboard to the IES.

If an RCD is installed the engineer must:

1. Disconnect all live conductors (including both active and neutral conductors) and
2. Be of the type specified in the inverter manufacturer's instructions or as labelled on the inverter.

We recommend the use of an RCD on all circuits and sub-circuits connected to the Sunsynk Inverter. Below is the specifications for a Residual Current Breaker with Over-current Protection (RCBO)

Earth-leakage protection class	Type A
Earth-leakage sensitivity	30mA
Curve code	C
Network type	AC
Poles description	2P
Earth-leakage protection time delay	Instantaneous

APPENDIX E

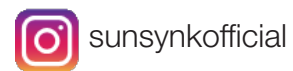
The Sunsynk inverter can be connected to the internet, but you need to add a data logger to do this.

The inverter is compatible with Solar Man data-loggers, which you can obtain from us with your distributor

1. LAN-Type Data Logger
2. Wi-Fi-Type Data Logger
3. GSM-Type Data Logger

To setup the Internet connection for the Data Logger, please refer to the App User instructions. The Data Logger should be connected to the bottom of the inverter via the connection socket marked WIFI.

For more information, training videos, software upgrades, help line, forum please refer to <http://www.sunsynk.com> - Tech Support (Do not forget to register first on the website).





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