GOODWE

User Manual

Hybrid Inverter

GW5048-ESA

V1.5-2022-10-30

TABLE OF CONTENTS

01 Introduction 6

1.1 Functions 6

1.2 Features 6

1.3 Battery Selection 6

1.4 Dimensions 7

02 Planning 8

2.1 Backup AC Loads 8

2.2 Inverter Operating Modes 8

2.2.1 General Mode 8

2.2.2 Off Grid Mode 10

2.2.3 Standby Mode 10

2.2.4 Economic Mode 10

03 Installation 11

3.1 Parts List 11

3.2 Location And Environmental Requirements 11

3.3 Tools Required 12

3.4 Battery Enclosure Installation 13

3.5 Mounting Wall Plate 13

3.6 Mounting the Balance of System (BoS) 13

3.7 Mounting the Inverter 14

04 Installation Planning 15

4.1 Removing the BoS Covers 15

4.2 BoS Wiring 16

4.2.1 System Wiring Diagram 17

4.2.2 Protective Earth (PE) Wiring 18

4.2.3 Solar Array Wiring 19

4.2.4 Battery Wiring 19

4.2.5 Battery Management Systems (BMS) Communications Connections 20

4.2.6 AC Wiring Connections And AC Circuit Breakers 22
4.2.7 AC Utility Connections 23
4.2.8 AC Backup Loads Connections 24
4.3 Energy Meter Connections 25
05 Operation 27
5.1 Circuit Breaker And Bypass Switch 27
5.2 Start up 28
5.3 Shut down 29
5.4 Inverter System LED Indicators 30
06 Internet Connection 31
6.1 Wi-Fi Configuration 31
6.2 SolarGo 32
6.3 CEI Auto-test function 32
07 Troubleshooting 33
08 Technical Parameters 34
09 Certifications, standards and approvals 38

Trademarks

GOODWE and other GOODWE trademarks are trademarks of GoodWe Technologies Co.,Ltd. All other trademarks or registered trademarks mentioned in this manual are owned by GoodWe Technologies Co.,Ltd.

NOTICE

The information in this user manual is subject to change due to product updates or other reasons. This guide cannot replace the product labels or the safety precautions in the user manual unless otherwise specified. All descriptions here are for guidance only.

Privacy Notice

GoodWe will use the information provided only for warranty purposes. Without this information we will not be able to process your warranty claim. If you require further information about our privacy policy please visit www.goodwe.com.

Important safety instructions - please read

This document contains important safety instructions for products produced by GoodWe. Please read all the instructions and cautionary markings on the product and on any accessories or additional equipment included in the installation. Failure to follow these instructions could result in severe shock or possible electrocution. Remember to use extreme caution at all times to prevent accidents.

Audience

These instructions are for use by qualified personnel who meet all local and governmental code requirements for licensing and training for the installation of electrical power systems with AC and DC voltage up to 600 volts. Installation, maintenance and connection of inverters must be performed by qualified personnel, in compliance with local electrical standards, wiring rules and therequirements of local power authorities and/or companies (for example VDE-AR-N4105 in Germany).
The GoodWe smart hybrid strictly conforms to all related safety rules in design and test. Safety regulations relevant to the location should be followed during installation, operation and maintenance. Improper operation may have a risk of electric shock or damage to equipment and property.

Symbol	Definition
	WARNING! Hazard to human life This type of notation indicates that the hazard could be harmful to human life.
	WARNING! Burn hazard Danger of hot surface!
	CAUTION! Hazard to equipment This type of notation indicates that the hazard may cause damage to the equipment.
	Components of this product can be recycled.
	This side up. The package must always be transported, handled, and stored in such a way that the arrows always point up.
	No more than six (6) identical packages being stacked on each other.
	Products shall not be disposed as household waste.
	Fragile - The package/product should be handled carefully and never be tipped over or slung.
	Keep dry! The package/product must be protected from excessive humidity and must be stored under cover.
	CE mark.
	This symbol indicates that you should wait at least 5mins after disconnecting the inverter from the utility grid and from the PV panel before touching any inner live parts.
	**IMPORTANT** This type of notation indicates that the information provided is important to the installation, operation and/or maintenance of the equipment. Failure to follow the recommendations in such a notation could result in annulment of the equipment warranty.

General Safety

Symbol	Definition
	WARNING: Limitations on use This equipment is NOT intended for use with life support equipment or other medical equipment or devices.
	CAUTION: Equipment damage Only use components or accessories recommended or sold by the manufacturer or its authorised agents.
	IMPORTANT Do not attempt to install this equipment if it appears to be damaged in any way. See the Warranty section for instructions on returning the equipment.

Personal Safety

Symbol	Definition
	**WARNING: Personal injury** • Use safe lifting techniques when lifting this equipment as recommended by the Occupational Safety and Health Association (OSHA) or other local codes. • Use standard safety equipment when working on this equipment such as safety glasses, ear protection, steel-toed safety boots, safety hard hats, etc. • Use standard safety practices when working with electrical equipment. (Remove all jewelry, use insulated tools, wear cotton clothing etc.). • Never work alone when installing or servicing this equipment. Have someone nearby that can assist if necessary. • Do not touch the inverter during operation. The temperature of some parts of the inverter may exceed 6o°C during operation. Let it cool for at least 5 minutes after shutdown before touching it. • Ensure that children, pets and other animals are kept away from the Inverter, solar arrays, battery bank and utility grid components. • If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Equipment Safety

Symbol	Definition
	**WARNING: Lethal voltage** • Review the system configuration to identify all possible sources of energy. Ensure ALL sources of power are disconnected before performing any installation or maintenance on this equipment. Confirm that the terminals are de-energized using a validated voltmeter (rated for a minimum 10oo VAC and 1000 VDC) to verify the de-energized condition. • Do not perform any servicing other than that specified in the installation instructions unless qualified to do so, or have been instructed to do so by GoodWe technical support personnel. • Solar arrays can be energized with minimal ambient light available. To ensure a safe disconnect from the system, install a high voltage DC rated disconnect, breaker, or accessible fuse box (depending on local code requirements).

- To avoid electric shock, disconnect the DC input and AC input of the inverter at least 5 minutes before performing any installation or maintenance.
- Completely disconnect all sources of power before proceeding with any maintenance. Do not open the upper Inverter compartment of the system!
- Do not tighten the AC and DC terminals or pull on the AC and DC wiring when the inverter is running.

WARNING: Burn hazard

- External and internal parts can become hot during operation. Do not remove the cover during operation or touch any internal parts. Be sure to allow sufficient time for internal parts to cool down before attempting to perform any maintenance.

WARNING: Fire hazard

- Do not keep combustible or flammable materials in the same room as the equipment. The GoodWe Smart Hybrid contains relays and switches which are not ignition protected.
- Ensure AC, DC and ground cable sizes conform to local codes. See product manuals for minimum size requirements. Ensure all conductors are in good condition. Do not operate the unit with damaged or substandard cabling.

CAUTION: Equipment damage

- When connecting cables from the inverter to the battery terminals, ensure the proper polarity is observed. Connecting the cables incorrectly can damage or destroy the equipment and void the product warranty.
- Thoroughly inspect the equipment prior to energizing. Verify that no tools or equipment have been inadvertently left behind.
- Ensure clearance requirements are strictly enforced. Keep all vents clear of obstructions that can prevent proper air flow around, or through, the unit.
- Sensitive electronics inside the equipment can be destroyed by static electricity. Be sure to discharge any static electricity before touching the equipment and wear appropriate protective gear.

CAUTION: Equipment damage

- Do not open the upper front cover of the inverter. Apart from performing work at the wiring terminals (as instructed in this manual), touching or changing components without authorization may cause injury to people, damage to the inverter and annulment of the warranty.
- Static electricity may damage electronic components. Take appropriate steps to prevent such damage to the inverter; otherwise the warranty may be annulled.
- Ensure the output voltage of the proposed solar array is lower than the maximum rated input voltage of the inverter; otherwise the Inverter may be damaged and the warranty annulled.
- Solar modules should have an IEC61730 Class A rating.

Battery Safety

Symbol	Definition
  	**WARNING: Explosion, electrocution or fire hazard.** • Ensure that all cables are properly sized. • Ensure clearance requirements are strictly enforced around the batteries. • Ensure the area around the batteries is well ventilated and clean of debris. • Never smoke, or allow a spark or flame near the batteries. • Always use insulated tools. Avoid dropping tools onto batteries or other electrical parts. • Never charge a frozen battery. • If a battery must be removed, always remove the grounded terminal from the battery first. Make sure all devices are de-energized or disconnected to avoid causing a spark.
	**IMPORTANT** • Use the battery types recommended by GoodWe. Follow the battery manufacturer's recommendations for installation and maintenance. • Insulate batteries appropriately against freezing temperatures. A discharged battery will freeze more easily than a charged one. • If a remote or automatic generator control system is used, disable the starting circuit and/or disconnect the generator from its starting battery while performing maintenance to prevent accidental starting.

01 Introduction

The GoodWe Smart Hybrid Inverter enables the connection of two solar arrays, a battery bank, and utility grid and provides backup power for AC loads. The energy produced by the solar array is automatically directed to the battery, utility grid and/or the AC loads depending on operating conditions for the highest performance and best economic return. The system's goal is to maximize the use of the solar energy generated while minimising the amount of energy consumed from the utility. The back-up functionality enables users to have continued supply of electricity in the event of a utility power outage. The GoodWe Smart Hybrid Inverter includes all of the following functions, components and features in a single easy-to-install product.

1.1 Functions

- High efficiency grid-tie utility interactive inverter
- Utility grid energy metering system
- Powerful backup inverter for AC loads
- Utility powered battery charger
- Dual Maximum Power Point Tracking (MPPT)
- Battery charge control
- Solar array ground fault and insulation monitoring protection
- Programmable GoodWe Smart Hybrid system controller
- Performance monitoring with WiFi and web interface

1.2 Features

- Utility grid overcurrent protection and disconnect
- Battery overcurrent protection and disconnect
- AC backup loads overcurrent protection and disconnect
- AC backup loads manual bypass switch
- Weatherproof enclosure, can be installed outdoors (IP65)

Note: The GoodWe GW5048-ESA is a transformerless inverter, all other components of the solar system must be compatible with this type of inverter architecture.

1.3 Battery Selection

IMPORTANT
Battery charger settings need to be correct for the intended battery type.
Always follow relevant standards and battery manufacturer recommendations.

When planing a battery bank, consider the following:

- The GW5048-ESA is designed to work with lithium-ion batteries only.
- The GW5048-ESA is designed to work with a nominal 48-Volt battery bank. The actual voltage of battery can vary during operation from 40 to 60 VDC depending on the battery type and number of cells in series.
- A vented enclosure for the battery bank may be required by standards. This is recommended in most cases for safety reasons and to prevent unauthorised access.
- The GW5048-ESA should be connected to a grid or microgrid when installed, and remain on-grid at least 80% of its life and operation. Prolonged use of the GW5048-ESA off-grid may result in decreased life of the batteries installed with the system.

1.4 Dimensions

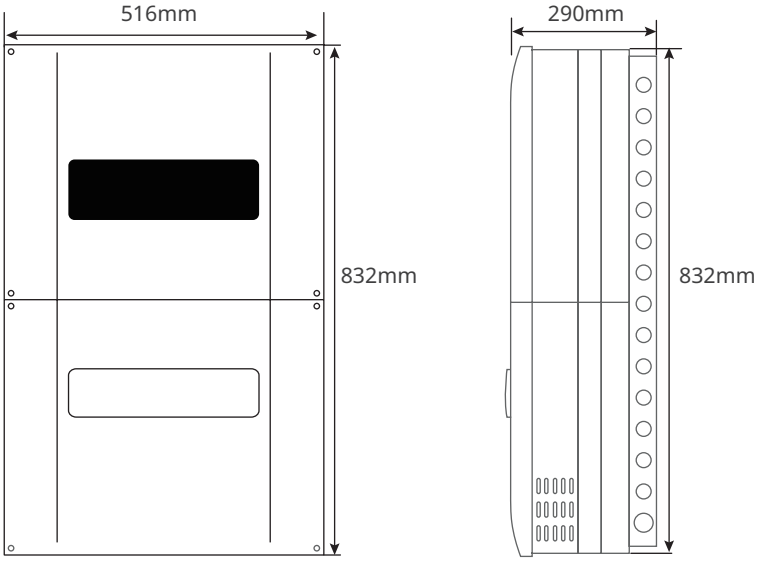


Figure 1: Dimensions

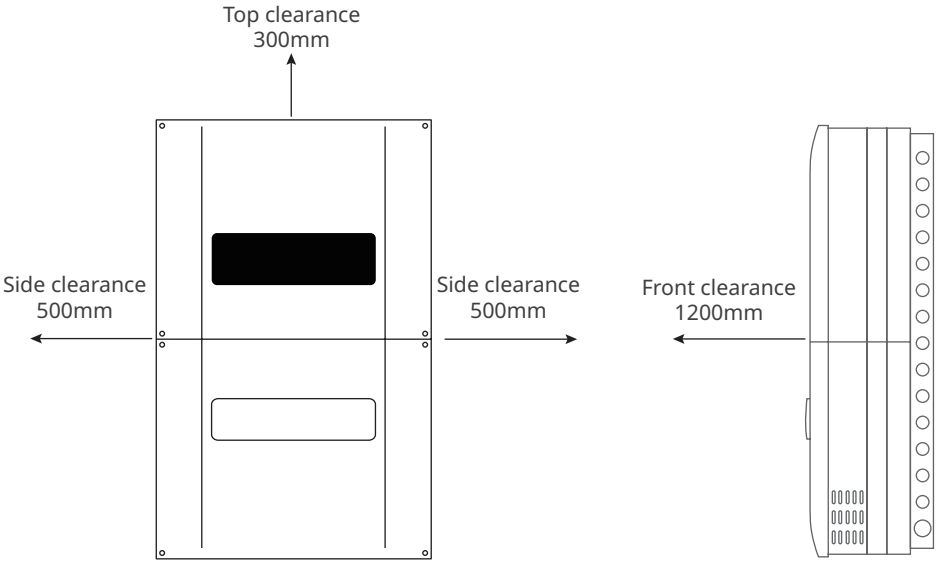


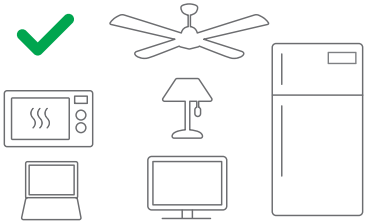
Figure 2: Minimum clearance requirements

02 Planning

2.1 Backup AC Loads

The GoodWe Smart Hybrid Inverter can provide up to 5000 Watts of continuous AC power for AC loads, which are connected to the backup loads. The system can provide a maximum of 6900 watts of AC power for up to 10 seconds to start loads, which require a higher amount of power initially. The output of the inverter is reduced if the ambient temperature exceeds 45℃ and the system will shut off if the ambient temperature exceeds 60℃.

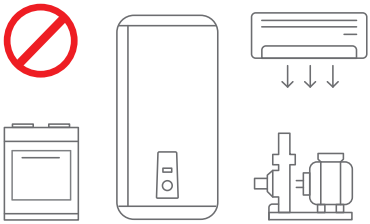
Note: The backup circuit shares the neutral line with the grid and hence MEN integrity is maintained in all modes of the inverter's operations.



Examples of ACCEPTABLE AC loads to connect to the back-up AC load circuit:

- Small plug-in appliance such as cookers, microwaves, TV, radios, computers
- Lighting (compact fluorescent or LED recommended)
- Refrigerators and freezers

Figure 3: Examples of acceptable backup AC loads



Examples of UNACCEPTABLE AC loads not to connect to the backup AC load Circuit:

- Water heaters
- Air-conditioners
- Electric cooktop ranges or ovens
- Spa/saunas
- Water pumps

Figure 4: Examples of unacceptable backup AC loads

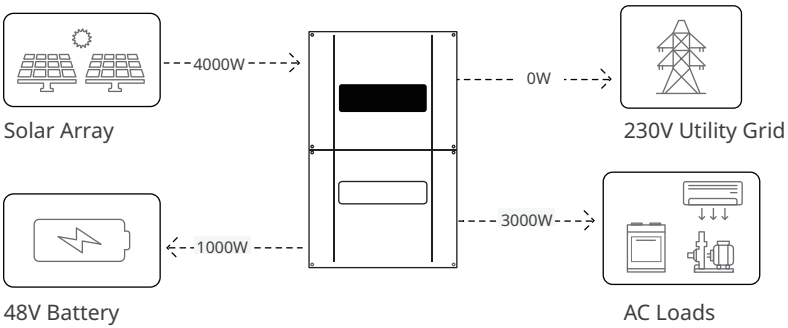
Note: These examples of different operating modes are simplified and do not include the small amount of losses involved in the energy conversion process. They should not be considered as representative of real world system performance.

2.2 Inverter Operating Modes

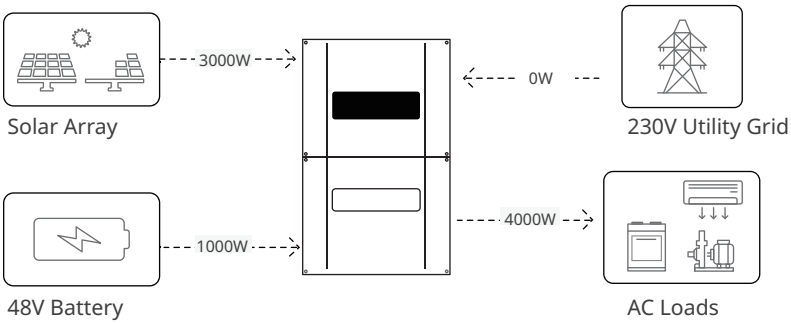
There are four working modes for the inverter: general mode (default), off-grid mode, standby mode and economic mode, which can be set by the SolarGo app or port.

2.2.1 General Mode

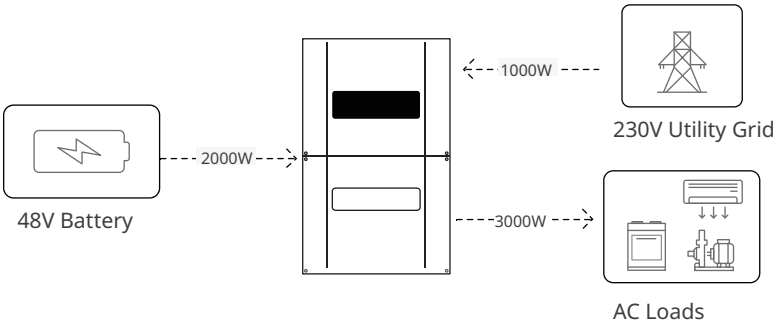
General mode: In this mode, the power generated by photovoltaic gives priority to the load power supply, the remaining power charges the battery, if the power is still remaining, then selectively grid-connected.



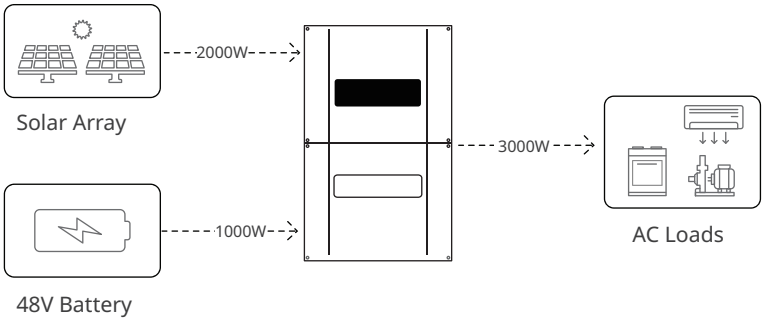
If the power generated by photovoltaic is insufficient to provide load power, the remaining energy is provided by the battery, if it is still insufficient, then the grid provided.



If there is no photovoltaic power generation, the load energy provided by the battery, when the energy provided by the battery is insufficient, then the grid provided.



If there is no grid power, it is priority that PV supplies power to the load, when the energy provided by the PV is insufficient, then the battery provided.



2.2.2 Off Grid Mode

Off grid mode: Photovoltaic and battery constitute a pure off-grid system, suitable for non-grid areas.

2.2.3 Standby Mode

Standby mode: Battery discharges only in abnormal condition of grid, similar to uninterrupted power supply. When the grid is normal, the battery does not discharge, only charges until the battery is full, when the grid is cut off, and the battery can supply power to the load.

2.2.4 Economic Mode

Economic mode: charging at valley price, discharging at peak price, charging/discharging time and power can be set by the SolarGo app.

03 Installation

The following equipment are supplied for installation of GoodWe GW5048-ESA;

- Wall mounting plate with mounting hardware kit.
- Balance of System (BoS).
- GoodWe Smart Hybrid Solar Inverter System.
- Battery Enclosure (supplied separately).

3.1 Parts List

The following parts are also supplied with the inverter.

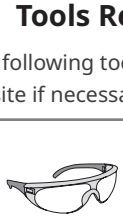
- Energy meter with CT sensor for utility connection with communication cable with RJ45 connectors.
- Amphenol MC4 connectors for solar array connections: 2 positives, 2 negatives with 26 Amp pins for 4mm wire.
- Installation and operator's manual.
- Inline fuse holder + glass fuse for connection of kWh meter.

3.2 Location And Environmental Requirements

1. Do not install the equipment in a place near flammable, explosive, or corrosive materials.
2. Install the equipment on a surface that is solid enough to bear the inverter weight.
3. Install the equipment in a well-ventilated place to ensure good dissipation. Also, the installation space should be large enough for operations.
4. The equipment with a high ingress protection rating can be installed indoors or outdoors. The temperature and humidity at the installation site should be within the appropriate range. Note that the inverter's maximum wattage will derate in temperatures above 45°C.
5. Install the equipment in a sheltered place to avoid direct sunlight, rain, and snow. Build a sunshade if it is needed.
6. Do not install the equipment in a place that is easy to touch, especially within children’s reach. High temperature exists when the equipment is working. Do not touch the surface to avoid burning.
7. Install the equipment at a height that is convenient for operation and maintenance, electrical connections, and checking indicators and labels.
8. Install the inverter away from high magnetic field to avoid electromagnetic interference.If there is any radio or wireless communication equipment below 30MHz near the inverter, you have to
   - Install the inverter at least 30m far away from the wireless equipment.
   - Add a low pass EMI filter or a multi winding ferrite core to the DC input cable or AC output cable of the inverter.

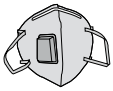
3.3 Tools Required

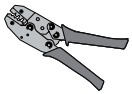
The following tools are recommended when installing the equipment. Use other auxiliary tools on site if necessary.


Goggles


Safety shoes

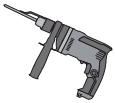

Safety gloves


Dust mask

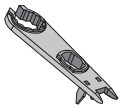

DC terminal crimping tool


Diagonal pliers


Wire stripper

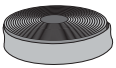

Hammer drill


Heat gun


DC wiring wrench


Marker


Level

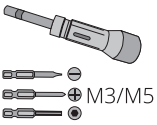

Heat shrink tube


Rubber hammer


Vacuum cleaner


Multimeter


Cable tie



Torque wrench

3.4 Battery Enclosure Installation

The battery enclosure should be installed first if the battery enclosure is supplied in the package. For more details on installation of the battery enclosure, please refer to the Battery Enclosure BCL0096 Installation Manual.

3.5 Mounting Wall Plate

Use appropriate fasteners to secure the inverter mounting plate to the mounting surface. GoodWe will not be responsible for damage to the product if it is attached with inadequate fasteners.

- Mount and secure the mounting plate to a solid surface before attaching any wiring.

Note: if this inverter is being installed without a GoodWe Battery Enclosure, it is recommended that if you wish to install the GoodWe Battery Enclosure (BCL0096) in the future you should mount the inverter 1206mm from the floor.

- Ensure the surface can hold the weight of the entire system (50 kg). Hardware is provided but some installations may require different hardware depending on the material used for the mounting surface involved.
- The top of the mounting plate can be identified by the word 'Top' stamped into the frame.

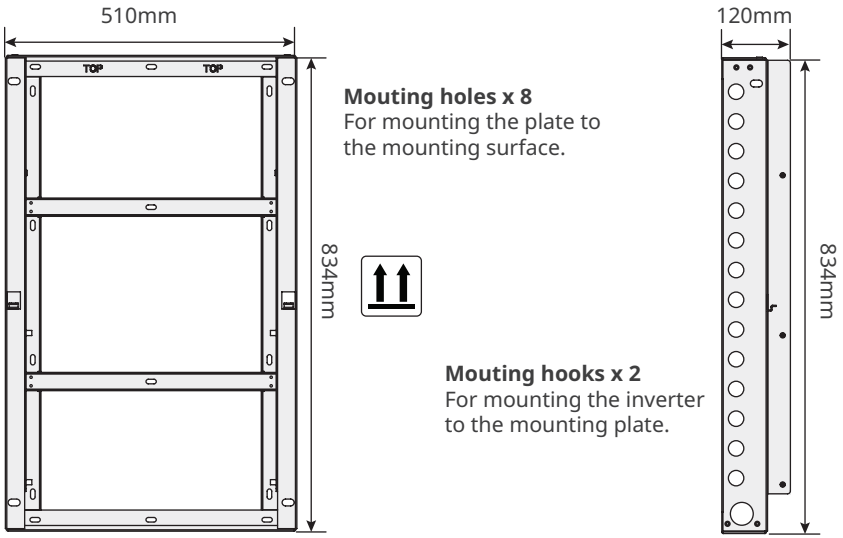


Figure 5: Mounting plate.

3.6 Mounting the Balance of System (BoS)

After attaching the mounting plate to the wall, lift the BoS and place it on the two mounting hooks. Ensure that both hooks are engaged before releasing the BoS as shown in Figure 6.

3.7 Mounting the Inverter

WARNING: Shock hazard
Do not place the inverter in a vertical position with the weight of the inverter on the connectors at the bottom of the chassis. The connectors may be damaged and/or foreign materials may enter them.

- After placing the BoS on the mounting plate, lift the inverter and place it on the BoS in a way that the male and female connectors are engaged and locked as shown in Figure 6.
- Screw the top side of the inverter to the mounting plate with the screws provided, as shown in Figure 8.
- Screw the antenna into the SMA connector on the left side of the inverter as shown in Figure 7.
- Inside the wiring compartment on the left side is a hole which will allow for the installation of a padlock to secure the inverter to the mounting plate, to prevent unauthorized removal.

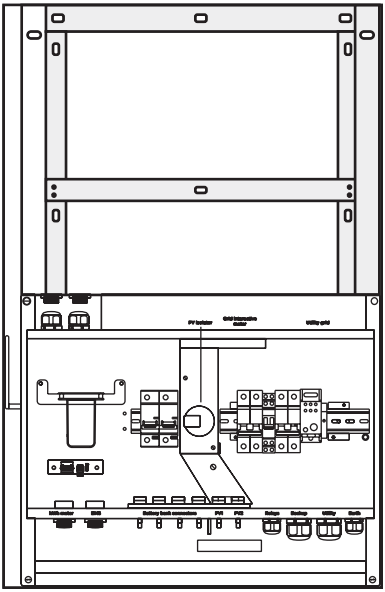


Figure 6: Mounting the BoS

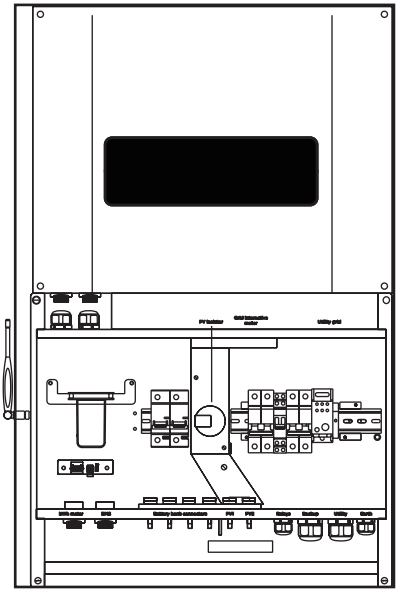


Figure 7: Mounting the Inverter

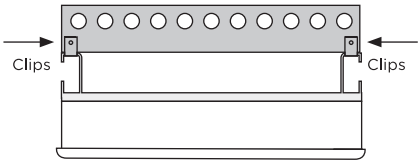


Figure 8: Top View

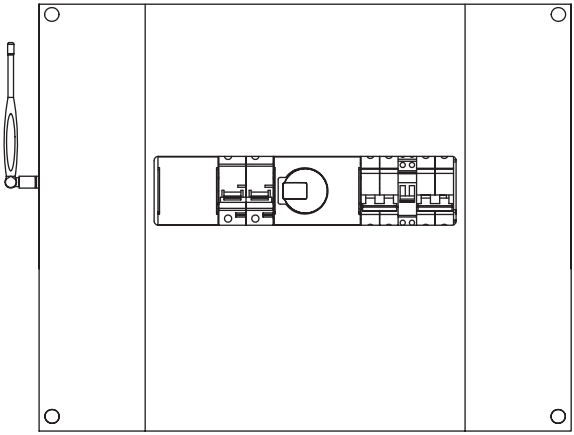
04 Installation Planning

The installer should follow the following procedure to make the system ready for start up.

4.1 Removing the BoS Covers

BoS wiring compartment cover(AC and DC connections)
Remove this cover during installation.

The solar array and battery connectors:
Flip-up weatherproof cover (circuit breaker access).
This cover comes off with the wiring compartment cover during installation.



To remove the BoS compartment cover:
Remove the hex bolts (4) from the lower half of the inverter using a 4mm hex wrench.
Carefully pull the cover plate away from the compartment.

Note: The PV isolator switch must be in the off position (horizontal) in order to remove the cover.

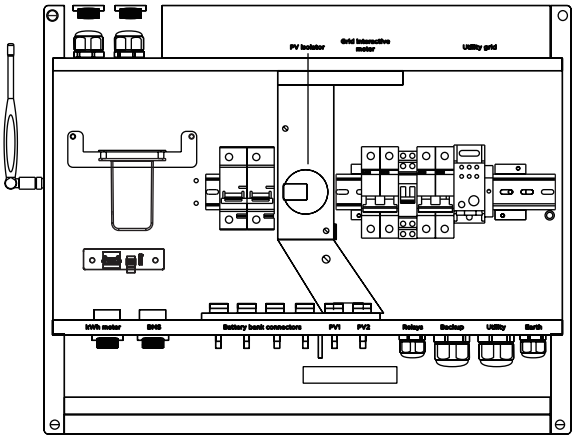


Figure 9: Removing the covers.

4.2 BoS Wiring

The section describes required wiring in BoS. The terminals and connectors inside BoS are displayed in the following figure. The following notes must be considered when wiring the BoS:

- All system wiring must comply with national and local codes and regulations.
- When wiring, ensure the polarity of connections are correct to avoid any hazard or damage to the equipment.
- The communication cables must be connected as instructed.

For more details, refer to section 4.2.5.

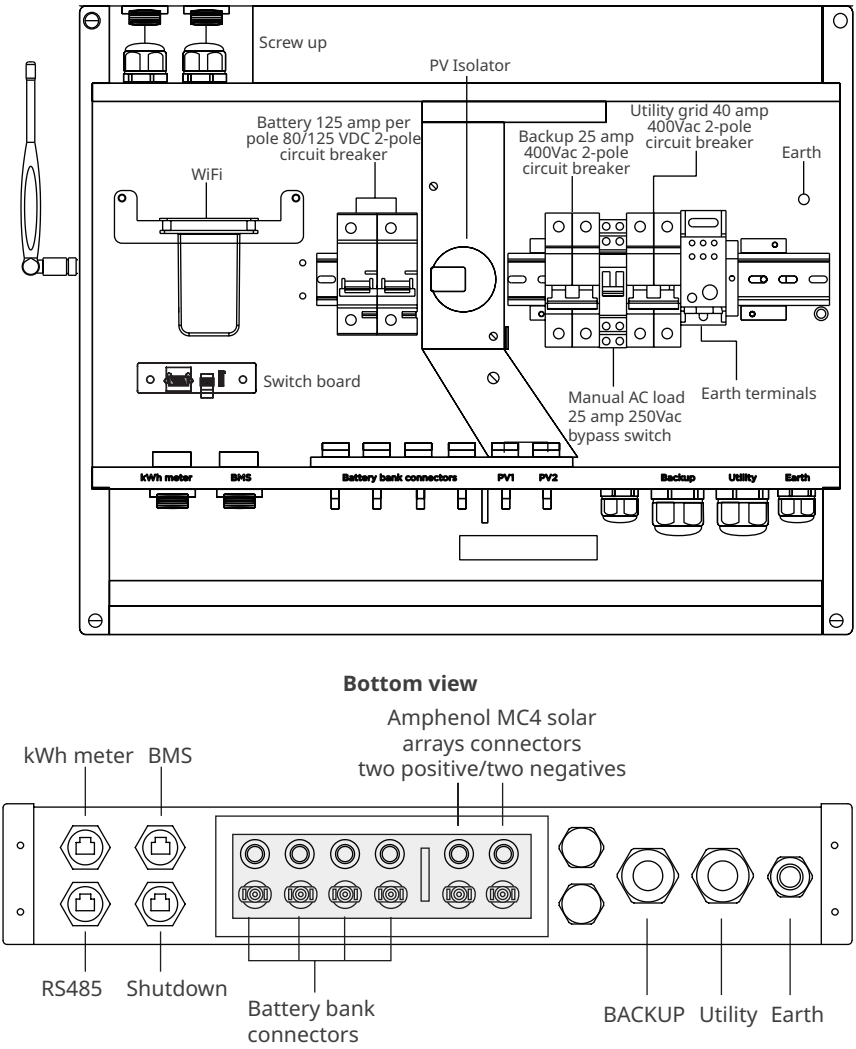


Figure 10: Terminals and connectors

4.2.1 System Wiring Diagram

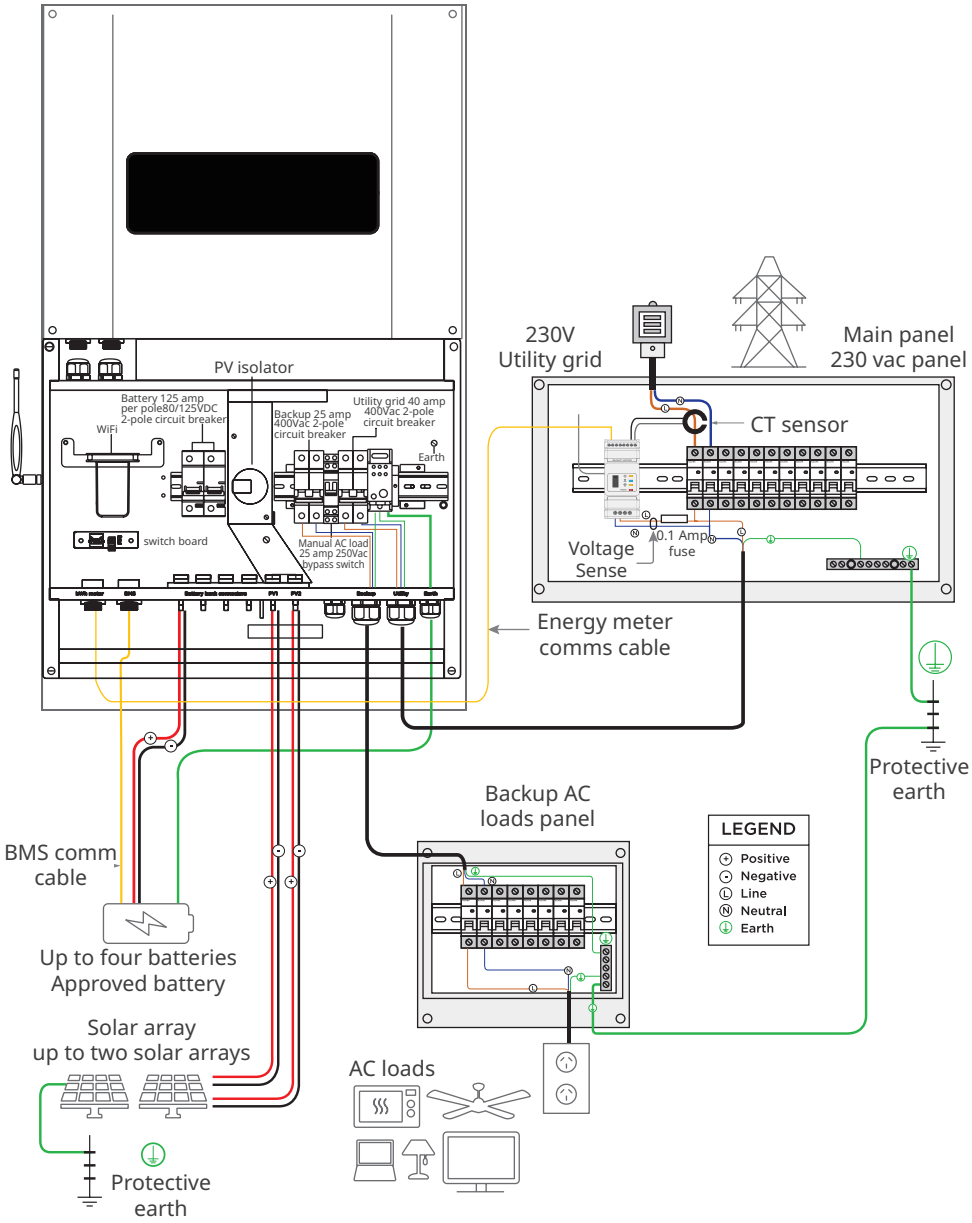


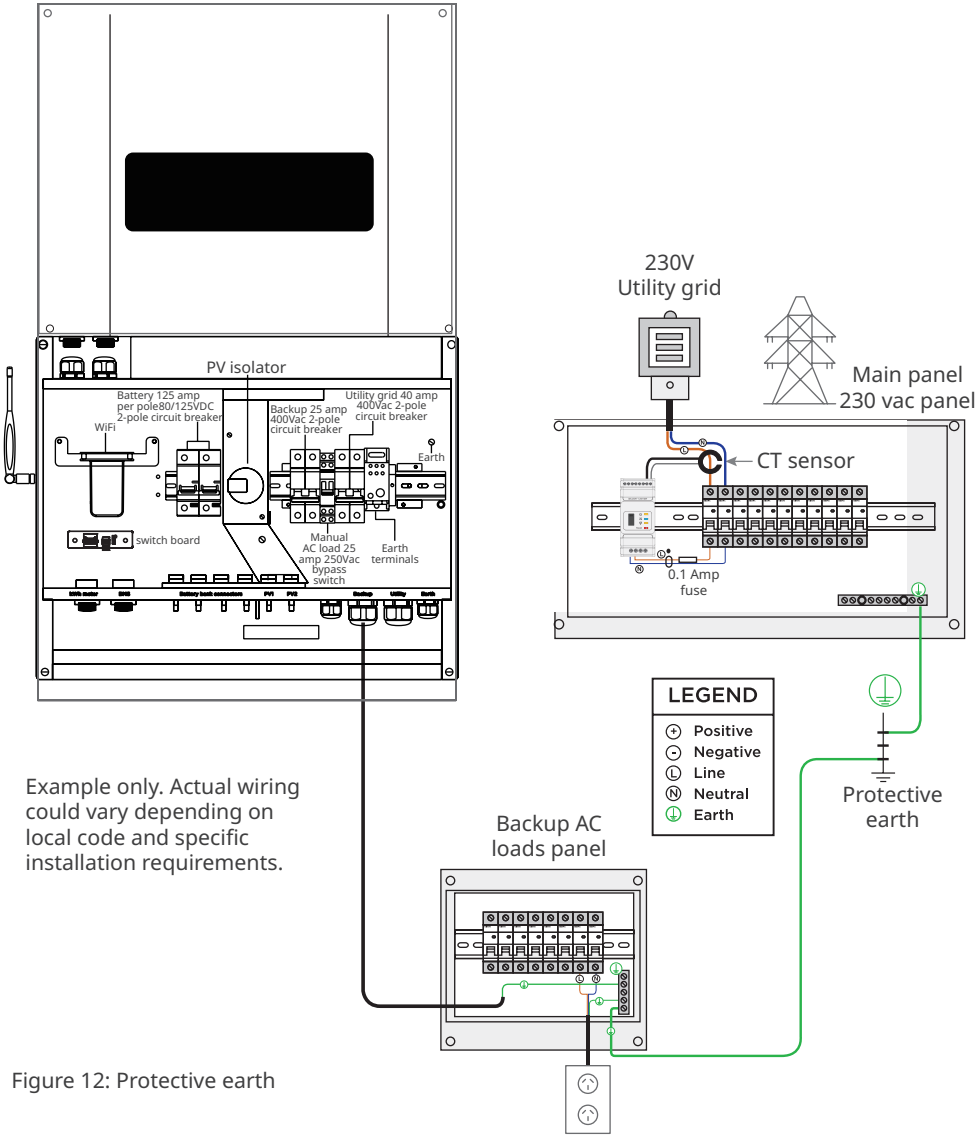
Figure 11: System wiring diagram.

4.2.2 Protective Earth (PE) Wiring

Table 1 - Earth conductor size and torque requirements

Terminal location	Maximum conductor size	Torque requirements
PE Ground	16mm^2	3.5 Nm

WARNING: Shock hazard
The unit must be connected to a properly earthed, permanent wiring system in compliance with standards (like VDE-AR-N 4105 in Germany).



Example only. Actual wiring could vary depending on local code and specific installation requirements.

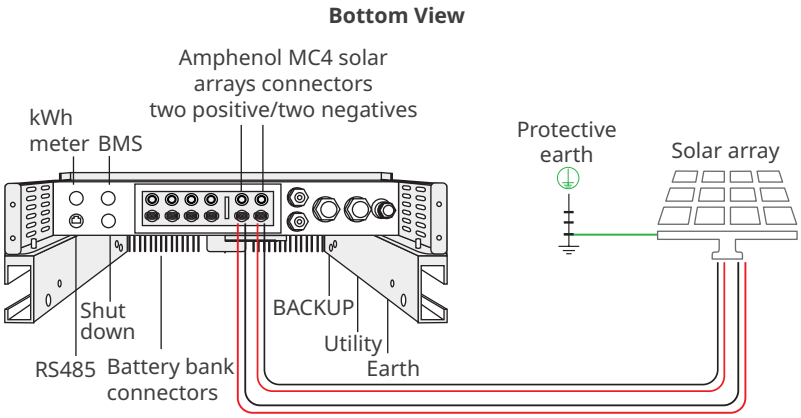
Figure 12: Protective earth

4.2.3 Solar Array Wiring

WARNING: Shock hazard
Solar arrays can be energised with minimal ambient light available. Be careful when working with the wiring and connectors to avoid shock or arcing.

Table 2 - Solar array conductor size and torque requirements

Terminal location	Conductor size
Solar 1	4mm²
Solar 2	4mm²



IMPORTANT
The frame of the solar array should be connected to protective earth per local code. Consult the local electric authority for your location.

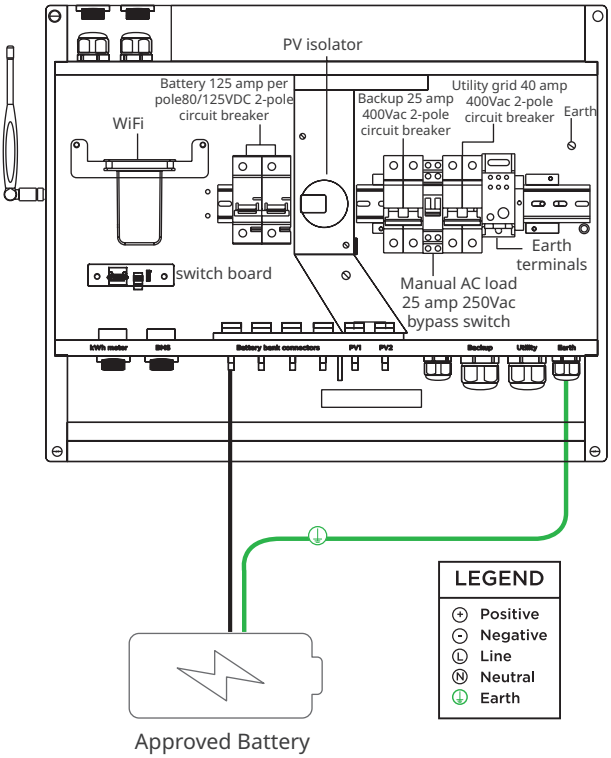
Figure 13: Solar array wiring.

4.2.4 Battery Wiring

CAUTION: Equipment damage
Never reverse the polarity of the battery cables. Always ensure correct polarity. Reversing the polarity of the battery cables will damage the inverter.

Table 3 - Battery conductor size and torque requirements

Terminal location	Maximum conductor size	Torque requirements
Each battery module's positive and negative conductors	10mm²	MC4 plug - in connectors
Battery chassis connection to protective Earth	16mm²	3.5Nm - Terminal bus bar



When installing battery cables:

- Make certain that the DC circuit breaker is switched to the off position before proceeding.
- Verify the polarity of all connections before turning DC circuit breakers on.
- Battery positive and negative cables should be no longer than 3m each, to minimize voltage loss and other effects.

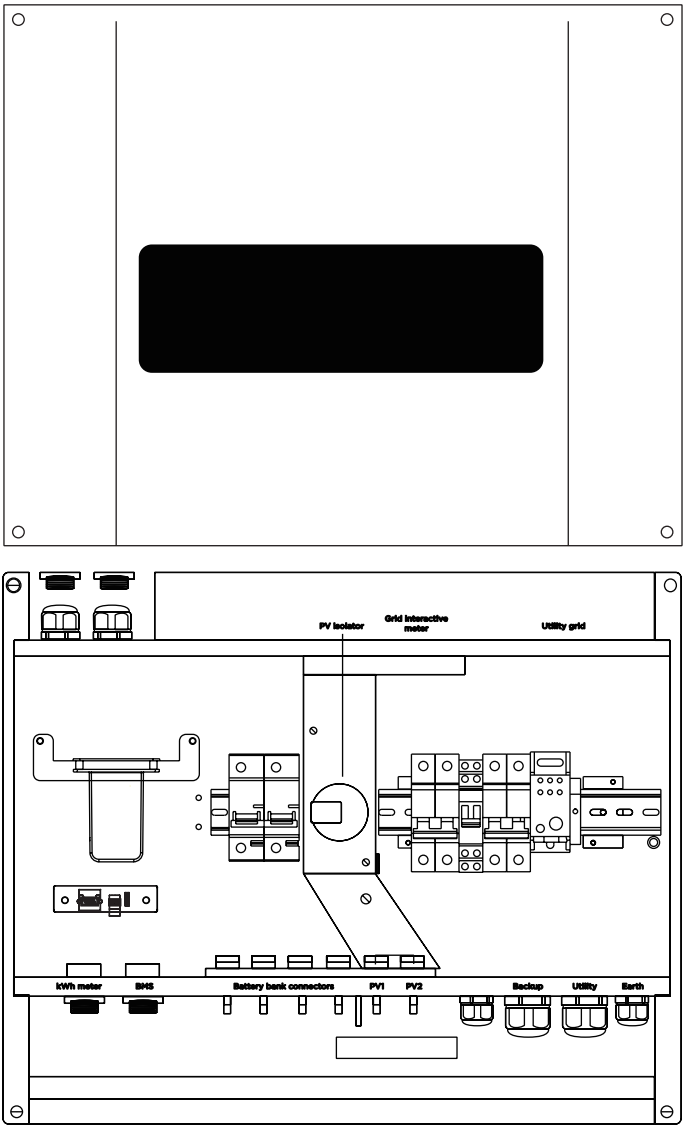
To connect the battery bank:

1. Connect the positive (+) wire from one battery module to the AmphenolMC4 'female' connector.
2. Connect the negative (-) wire from one battery module to the Amphenol MC4 'male' connector.
3. Connect an earthing wire to the protective earth terminal busbar located on the bottom of the inverter chassis. Later models of battery might require 3 additional communication wiring.

Figure 14: Battery wiring.

4.2.5 Battery Management Systems (BMS) Communications Connections

The Battery Management System (BMS) communication is required for all system installation with batteries. It can communicate only with models of batteries which have been tested and approved for use with the GoodWe Smart Hybrid Inverter. Use of other lithium-ion batteries is not permitted.



Battery management system (BMS) communication cable

Approved battery

Figure 15: BMS

4.2.6 AC Wiring Connections And AC Circuit Breakers

Table 5 - AC conductor size and torque requirements

Terminal location	Conductor size	Torque requirements
Line and neutral	16mm^2	3.5Nm
Earth	16mm^2	3.5Nm

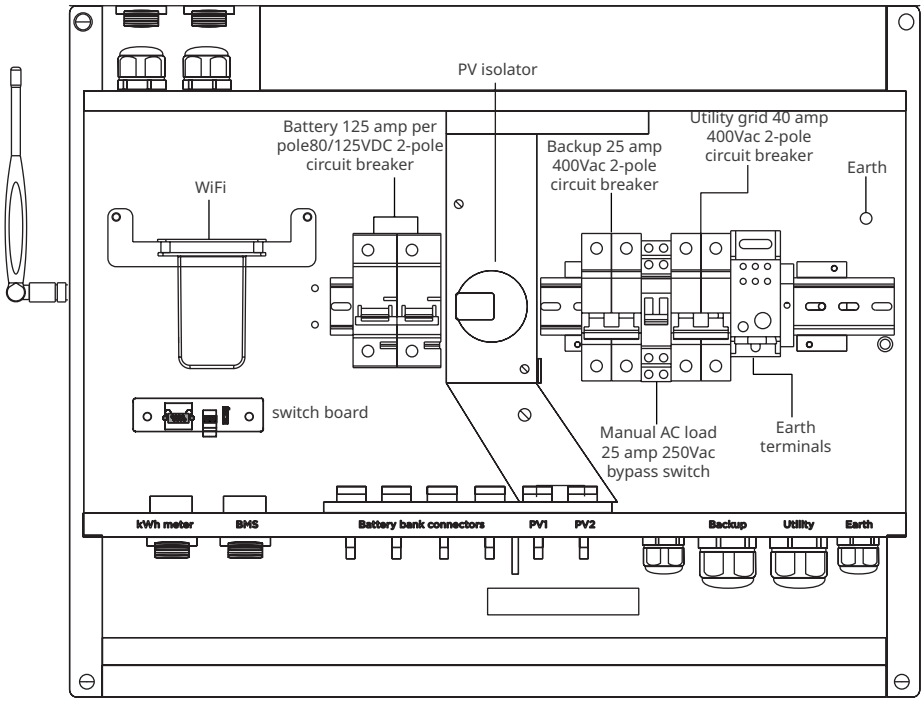
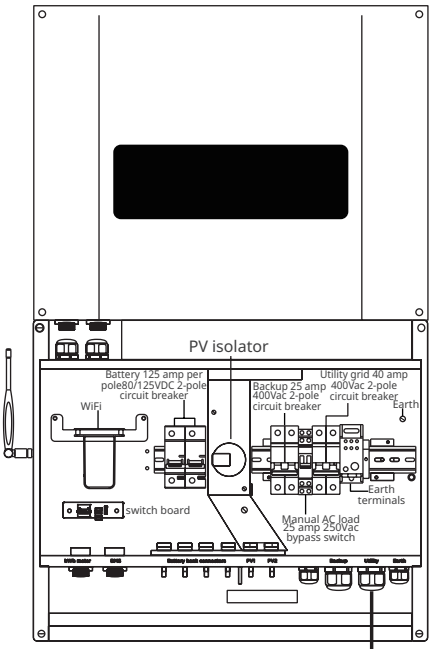


Figure16: AC terminals

4.2.7 AC Utility Connections

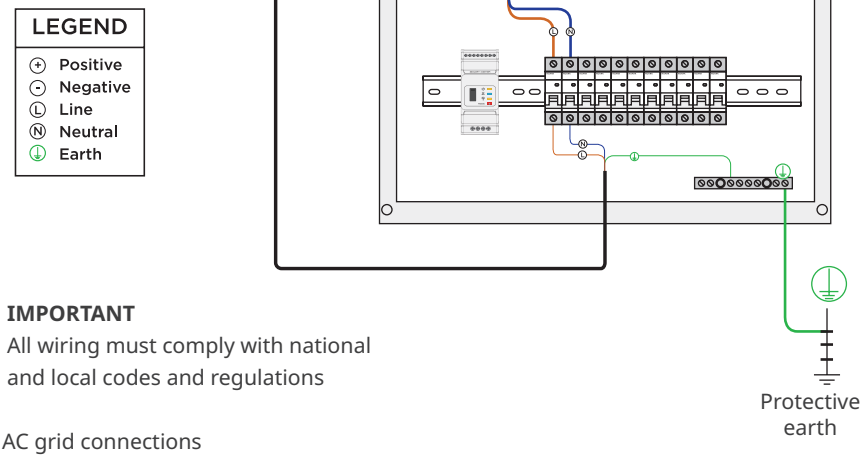


To connect the inverter to the utility grid:

1. Ensure that the main panel is connected to a primary earth protective system.
2. Connect the inverter's earth wire to the earth bus bar.
3. Connect the inverter's line wire to the line connection terminal.

In the inverter:

1. Connect the earth wire to the earth connection terminal.
2. Connect the line wire to the line connection terminal.
3. Connect the neutral wire to the neutral connection terminal.



IMPORTANT
All wiring must comply with national and local codes and regulations

Figure 17: AC grid connections

4.2.8 AC Backup Loads Connections

IMPORTANT

See Section 2.1 Backup Loads for details on what AC loads are acceptable to use with the inverter.

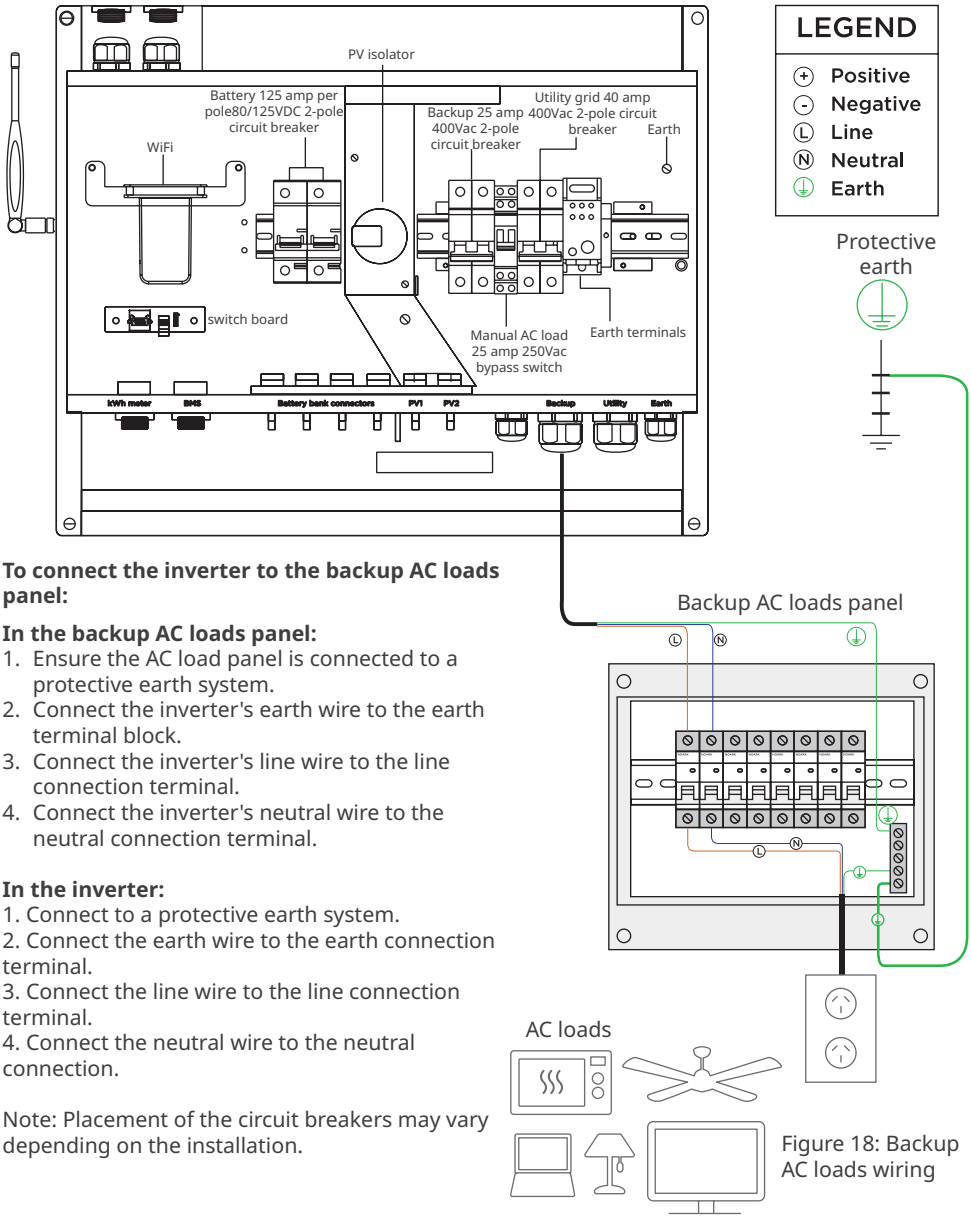


Figure 18: Backup AC loads wiring

To connect the inverter to the backup AC loads panel:

In the backup AC loads panel:

1. Ensure the AC load panel is connected to a protective earth system.
2. Connect the inverter's earth wire to the earth terminal block.
3. Connect the inverter's line wire to the line connection terminal.
4. Connect the inverter's neutral wire to the neutral connection terminal.

In the inverter:

1. Connect to a protective earth system.
2. Connect the earth wire to the earth connection terminal.
3. Connect the line wire to the line connection terminal.
4. Connect the neutral wire to the neutral connection.

Note: Placement of the circuit breakers may vary depending on the installation.

Note: For further information on how to wire the instrument power meter please refer to the sticker on the side of the instrument power meter itself.

4.3 Energy Meter Connections

The utility grid energy meter is used to measure the amount of energy which is flowing from or to the utility grid, and to allow the inverter to limit or restrict power flow back into the utility grid by adjusting the amount of power being supplied from the solar array and the battery.

The energy meter is designed to be installed inside of the main AC panel and is in addition to the utility's normal kWh meter. The energy meter uses a "split core" type current sensor which can be installed without interrupting the connection of power from the utility grid and therefore does not require the modification, rerouting or displacement of any of the utility grid wiring. An RS485 communication cable is supplied with the inverter (Ethernet patch cable). The width of the energy meter is 36 mm.

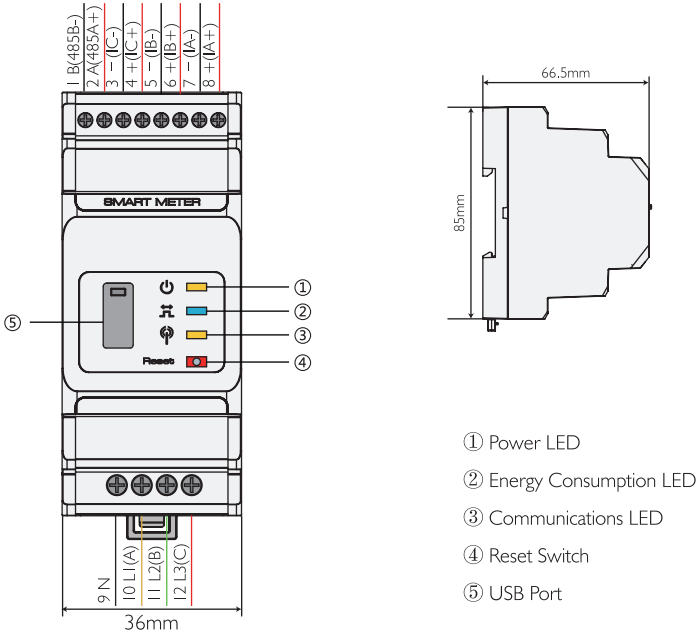


Figure 19: Energy meter features

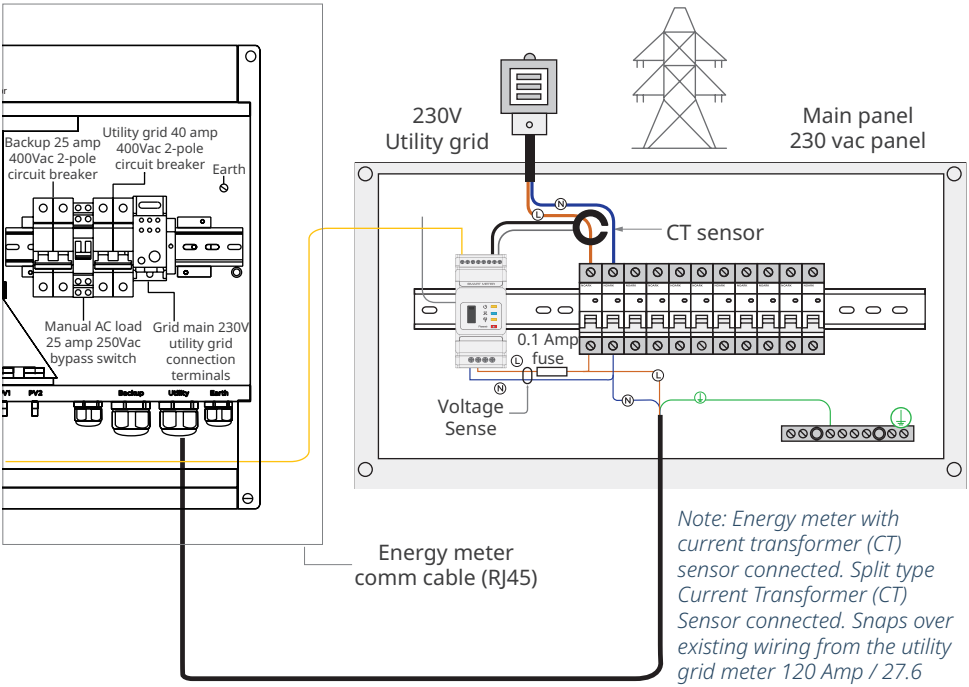


Figure 20: Energy meter wiring

Note: Energy meter with current transformer (CT) sensor connected. Split type Current Transformer (CT) Sensor connected. Snaps over existing wiring from the utility grid meter 120 Amp / 27.6 kW AC maximum continuous current rating.

To install the energy meter:

1. Install the energy meter into the main AC panel by clipping the meter onto the DIN rail. The meter requires a width of 36mm on the rail.
2. Insert the CT current sensor around the incoming line wire of the utility grid inside of the main AC panel.

Note: The correct orientation of the CT sensor via the label provided on it.

3. The black wire from the CT sensor is connected to the terminal 7 on the top of the energy meter.
4. The white wire from the CT sensor is connected to the terminal 8 on the top of the energy meter.
5. Prepare two voltage sense wires for the connection of the energy meter. The recommended wire colors are: black for neutral and red for the line conductor.
6. Connect the red wire from terminal 10 (on the bottom) to the grid's line conductor, typically at the AC circuit breaker that supplies the inverter.
7. Connect the black wire from terminal 9 (on the bottom) to the grid's neutral conductor.
8. Insert the communication cable into the RJ45 connector on the bottom of the energy meter.
9. Insert the other end of the communication cable into the RJ45 connector on the bottom of the inverter enclosure labelled 'kWh meter'.

05 Operation

5.1 Circuit Breaker And Bypass Switch

There is one DC circuit breaker for the battery connection and two AC circuit breaker for connection of the grid and backup load.

In addition, there is a bypass switch inside the BoS. The bypass switch is a three-position switch which depending on the position it is put in, determines where the power is supplied from to the loads downstream of the backup circuit.

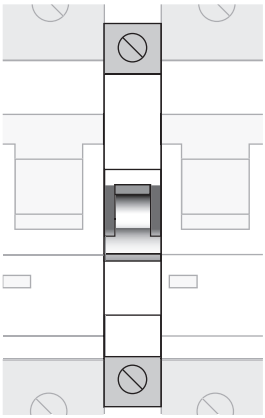


Figure 21: Bypass switch in the backup (I) position.

The default position for the bypass switch is the down (I) position. In that position, essential loads downstream of the backup protection device will be supplied power from the inverter's backup circuit. In this position, all of the downstream loads will have uninterrupted power supply even during mains power outage.

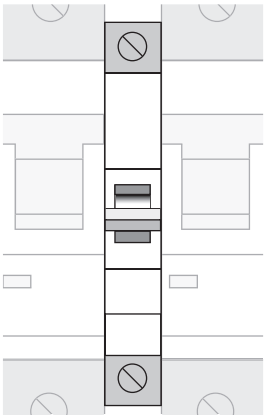


Figure22: Bypass switch in the isolate (O) position.

When the bypass switch is in the middle position (O), the loads downstream of the backup protection device will be completely isolated.

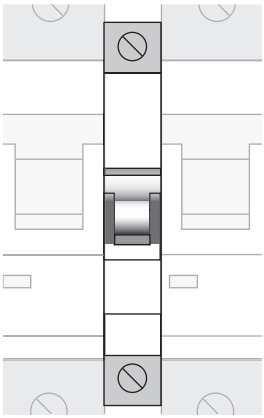


Figure 23: Bypass switch in bypass (II) position.

When the bypass switch is in the top position (II), the inverter will be bypassed and power will be supplied from the utility line directly. Typically, this position will be used in the rare event when the inverter is shut down for maintenance or another reason and the installation owner wants to run the backup loads from the grid until the inverter comes back online.

5.2 Start up

Perform the following steps to start up the system

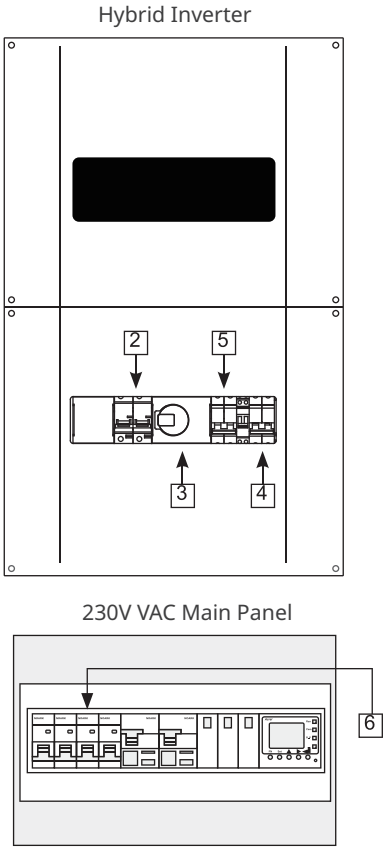


Figure 24: Starting up the system

WARNING: Shock and burn hazard
Ensure the covers are replaced before proceeding.

On the inverter

1. Access the circuit breaker panel on the inverter by opening the access panel on the front of the unit.
2. Switch the circuit breaker for the battery to the 'on' position.
3. Switch the PV isolator to the 'on' position.
4. Switch the circuit breaker for the AC grid to the 'on' position.
5. Switch the backup circuit breaker for the AC loads to the 'on' position.

On the main electrical input panel:

6. Switch the circuit breaker for the inverter to the 'on' position to activate the main panel.

5.3 Shut down

Perform the following steps to shut down the system

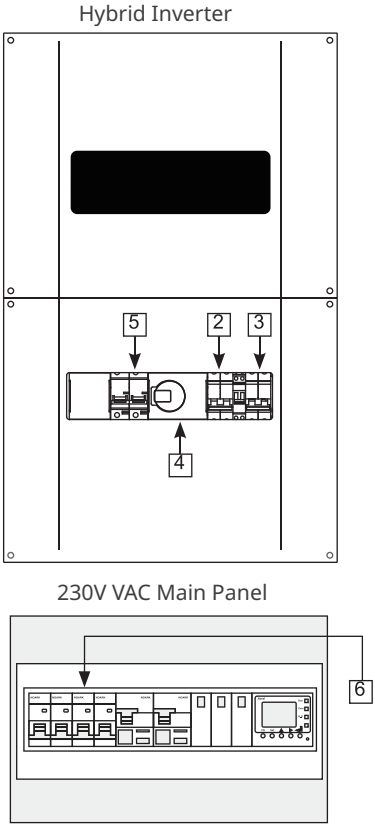


Figure 25: Shuting down the system

WARNING: Shock and burn hazard
Do not remove ANY covers while the unit is Active. Allow a minimum of 5 minutes for internal parts to cool down before removing any cover to perform maintenance.

On the inverter

1. Access the circuit breaker panel on the inverter by opening the access panel on the front of the unit.
2. Switch the backup circuit breaker for the AC loads to the 'off' position.
3. Switch the circuit breaker for the AC grid to the 'off' position.
4. Switch the PV isolator to the 'off' position.
5. Switch the circuit breaker for the battery to the 'off' position.

On the main electrical input panel:

6. Switch the circuit breaker for the inverter to the 'off' position.

5.4 Inverter System LED Indicators

Indicator	Status	Explanation
SYSTEM READY		ON = The system is ready.
		BLINK = The system is starting.
		OFF = The system is not working.
BACKUP POWEWR		ON = Back-up is ready / power available.
		OFF = Back-up is off / power not available.
SOLAR ARRAY		ON = Solar inputs #1 and #2 are active.
		BLINK 1 = Solar input #1 is active /#2 is not active.
		BLINK 2 = Solar input #2 is active /#1 is not active.
		OFF = Solar input #1 and #2 are not active.
STORAGE BATTERY		ON = The battery is charging.
		BLINK 1 = The battery is discharging.
		BLINK 2 = The battery is low / soc is low.
		OFF = The battery is disconnected/not active.
UTILITY GRID		ON = The grid is active and connected.
		BLINK = The grid is active but not connected.
		OFF = The grid is not active.
ENERGY FLOW		ON = Consuming energy from grid / buying.
		BLINK 1 = Supplying energy to grid / zeroing.
		BLINK 2 = Supplying energy to grid / selling.
		OFF = The grid is not connected or the system is not working.
COMMUNICATIONS		ON = Online
		BLINK 1 = Local connection only (no internet)
		BLINK 2 = Not connected
SYSTEM ERROR		ON = A fault has occured.
		BLINK 1 = Back-up output overload / reduce load.
		OFF = No fault.

06 Internet Connection

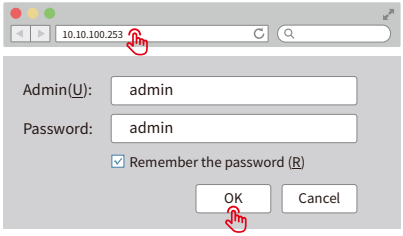
To get the best user experience and keep the system up to date, the installer needs to configure the unit to connect to internet during commissioning.
The inverter can be connected to the internet using WiFi. However, due to the location of the inverter, WiFi may have inconsistent connectivity resulting higher levels of support requests from the customers. Please note that you will need either a smart phone or tablet with WiFi capability for the initial configuration process.

6.1 Wi-Fi Configuration

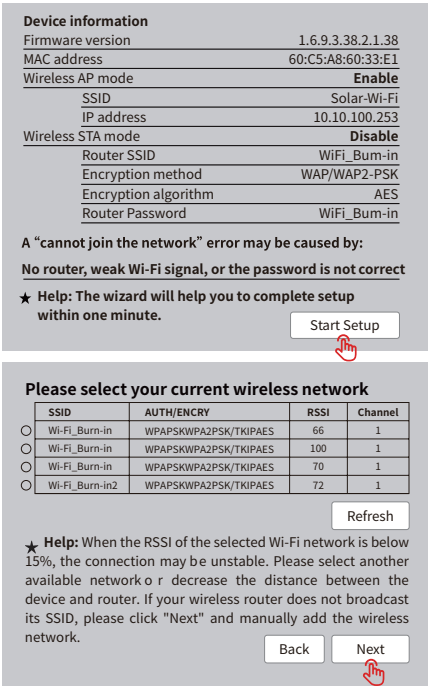
This part shows the configuration using a web page.
WiFi configuration is absolutely necessary for online monitoring and maintenance.

Preparation:
1. The inverter must be powered up with battery or grid power.
2. A router with internet access to the website www.semsportal.com is required.

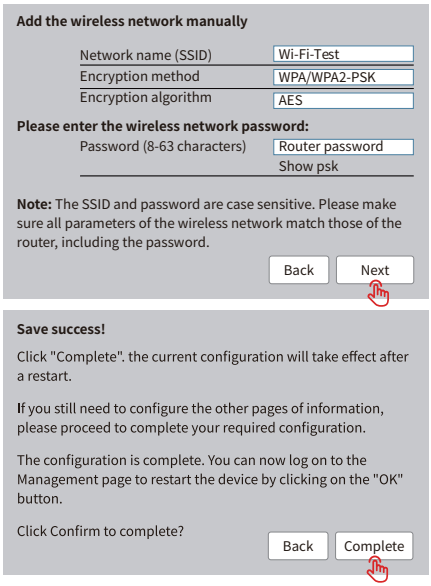
1 1. Connect Solar-Wi-Fi* to your PC or smart phone (* its name is the last 8 characters of the inverter's serial number); Password:12345678.
2. Open your browser and logon to 10.10.100.253 Admin (User): admin; Password: admin.
3. Then click "OK".



2 1. Click "Start Setup" to choose your router.
2. Then click "Next".



3 1. Fill in the password of the router, then click "Next".
2. Click "Complete".



Note:
Please make sure the password, Encryption Method / Algorithm is right the same with the router's;
If everything is right well, the WiFi LED on inverter will change from double blink to quartic blink then to solid status, which means WiFi is connected to GoodWe icloud successfully.
WiFi configuration could also be done on SolarGo, details please check on SolarGo APP.

6.2 SolarGo

SolarGo is an external monitoring and configuration application for hybrid inverters and is used on smart phones or tablets for both Andriod and iOS systems. The main functions are listed as below:
1. Configure the system to customize functions by the user.
2. Monitor and check the performance of the hybrid system.
3. Access and change the regional settings.
4. Check the inverter firmware version.
5. Set export power limit.

Search SolarGo in Google Play or Apple App Store, or scan the QR code to download the app.
Operation steps are the same for Android system and iOS system although the two interfaces are slightly different.
For more detailed opertaion instructions, please refer to SolarGo user manual in www.goodwe.com.

SolarGo App

6.3 CEI Auto-test function

The PV auto-test function of CEI is integrated into the SolarGo App to satisfy Italian safety requirements. For detailed instructions regarding this function, please refer to "SolarGo User Manual".

07 Troubleshooting

ERROR MESSAGE	DESCRIPTION
Utility Loss	Grid is disconnected or unavailable
FAC failure	Grid frequency no longer within permissible range
PV over voltage	Solar array voltage is too high
Over temperature	Over temperature on the case
Isolation failure	Ground insulation impedance is too low
Ground I failure	Excessive ground leakage current
Relay-check failure	Relay self-checking failure
DC injection failure	Excessive DC current in AC output
EEPROM R/R failure	Memory chip failure
SPI failure	Internal communication failure
DC Bus high	Excessive DC Bus voltage level
AC HCT failure	Output current sensor failure
GFCI failure	Detection circuit of ground leakage current failure
VAC failure	Grid voltage no longer within permissible range
Battery over temperature	Battery over temperature
Battery under temperature	Battery under temperature
Battery cell voltage differences	Li-ion battery cell voltage differences
Battery over total voltage	Li-ion battery over total voltage
Battery discharge over current	Battery discharge overcurrent
Battery charge over current	Battery charge over current
Battery under SOC	Battery capacity low
Battery under total voltage	Battery under total voltage
Battery communication failure	Battery communication fail
Battery output short	Battery output short
Over Load	Backup overload

08 Technical Parameters

Technical Data	GW5048-ESA
Battery Enclosure Data	
Weight (kg)	37
Dimension (W×H×D mm)	516×1205×280
Mounting Method	Wall Mounted
Ingress Protection Rating	IP54
Inverter Data	
Battery Input Data	
Battery Type*1	Li-Ion
Nominal Battery Voltage (V)	48
Battery Voltage Range (V)	40~60
Max. Continuous Charging Current (A)*1	90
Max. Continuous Discharging Current (A)*1	100
Max. Charge Power (W)	4,600
Max. Discharge Power (W)	4,600
Maximum Number of Battery Connections	4
PV String Input Data	
Max. Input Power (W)	6,500
Max. Input Voltage (V)	580
MPPT Operating Voltage Range (V)	125~550
MPPT Voltage Range at Nominal Power (V)	190~500
Start-up Voltage (V)	125
Nominal Input Voltage (V)	360
Max. Input Current per MPPT (A)	11/11 or 14/14 *7
Max. Short Circuit Current per MPPT (A)	13.8/13.8 or 17.5/17.5*7
Max. Backfeed Current to The Array (A)	0
Number of MPP Trackers	2
Number of Strings per MPPT	1
AC Output Data (On-grid)	
Nominal Apparent Power Output to Utility Grid (VA)*6	5,000

Max. Apparent Power Output to Utility Grid (VA)*2	5,000
Nominal Apparent Power from Utility Grid (VA)	9,200
Max. Apparent Power from Utility Grid (VA)	9,200
Nominal Output Voltage (V)	230
Output Voltage Range (V)	0~300
Nominal AC Grid Frequency (Hz)	50/60
AC Grid Frequency Range (Hz)	45~65
Max. AC Current Output to Utility Grid (A)	22.8
Max. AC Current From Utility Grid (A)	40.0
Max. Output Fault Current (Peak and Duration) (A)	43@0.2s
Inrush Current (Peak and Duration) (A)	60@3μs
Power Factor	~1 (Adjustable from 0.8 leading to 0.8 lagging)
Max. Total Harmonic Distortion	<3%
Maximum Output Overcurrent Protection (A)	30
AC Output Data (Back-up)	
Back-up Nominal Apparent Power (VA)	4,600
Max. Output Apparent Power (VA)*3	4,600 (6,900@10sec)
Nominal Output Current (A)	20.0
Max. Output Current (A)	20.0
Max. Output Fault Current (Peak and Duration) (A)	43@0.2s
Inrush Current (Peak and Duration) (A)	60@3μs
Maximum Output Overcurrent Protection (A)	30
Nominal Output Voltage (V)	230 (±2%)
Nominal Output Frequency (Hz)	50/60 (±0.2%)
Output THDv (@Linear Load)	<3%
Efficiency	
Max. Efficiency	97.6%

European Efficiency	97.0%
Max. Battery to AC Efficiency	94.0%
MPPT Efficiency	99.9%
Protection	
PV Insulation Resistance Detection	Integrated
Residual Current Monitoring	Integrated
PV Reverse Polarity Protection	Integrated
Anti-islanding Protection	Integrated
AC Overcurrent Protection	Integrated
AC Short Circuit Protection	Integrated
AC Overvoltage Protection	Integrated
General Data	
Operating Temperature Range (℃)	-25~+60
Relative Humidity	0~95%
Max. Operating Altitude (m)	3000
Cooling Method	Natural Convection
User Interface	LED, APP
Communication with BMS*4	RS485, CAN
Communication with Meter	RS485
Communication with Portal	WiFi
Weight (kg)	44
Dimension (W×H×D mm)	516×832×290
Noise Emission (dB)	<25
Topology	Non-isolated
Self-consumption at Night (W)	<13
Ingress Protection Rating	IP65
DC Connector	MC4 (4~6mm^2)
Environmental Category	4K4H
Overvoltage Category	DC II / AC III
Protective Class	I
Storage Temperature (℃)	-40~+85

The Decisive Voltage Class (DVC)	Battery: A PV: C AC: C Com: A
Mounting Method	Wall Mounted
Active Anti-islanding Method	AFDPF+AQDPF*5
Type of Electrical Supply System	Single Phase TN/TT System
Country of Manufacture	China

*1: The actual charge and discharge current also depends on the battery.
*2: 4600 for VDE 0126-1-1 &VDE-AR-N4105 &NRS 097-2-1, 5100 for CEI 0-21 (GW5048D-ES).
*3: Can be reached only if PV and battery power is enough.
*4: CAN communication is configured by default. If 485 communication is used, please replace the corresponding communication line.
*5: AFDPF: Active Frequency Drift with Positive Feedback, AQDPF: Active Q Drift with Positive Feedback.
*6: 4600 for VDE 0126-1-1 &VDE-AR-N4105 &NRS 097-2-1 &CEI 0-21.
*7: Subject to the nameplate.

09 Certifications, standards and approvals

VDE - AR - N 4105

IEC62109-1 Ed 1.0

IEC62109-2 Ed 1.0

IEC62040-1 Ed 1.0

Website

GoodWe Technologies Co., Ltd.

No. 90 Zijin Rd., New District, Suzhou, 215011, China

www.goodwe.com

service@goodwe.com

340-00883-00

Local Contacts