GOODWE
YOUR SOLAR ENGINE

Installation Manual

Smart Hybrid Inverter GW5048-ESA V1.0

340-00428-00

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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 the requirements of local power authorities and/or companies (for example VDE-AR-N 4105 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 may be stacked on each other.

Symbol	Definition
	Product should not be disposed as household waste.
	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
	Signals danger due to electrical shock and indicates the time (5 minutes) to allow after the Inverter has been turned off and disconnected to ensure safety in any installation operation.
	**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 GoodWe 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 jewellery, 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 60°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-energised using a validated voltmeter (rated for a minimum 1000 VAC and 1000 VDC) to verify the de-energised 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 energised 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 Hybridcontains 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 energising. 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.

Symbol	Definition
	**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 authorisation 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-energised 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.

1. Introduction

The GoodWe Smart Hybrid Inverter enables the connection of two solar arrays,a battery bank,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 maximise 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 an 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 transformerlless Inverter, all other components of the solar system must be compatible with this type of Inverter architecture.

1.3 Specifications

Solar array	
Number of solar array inputs	2 (individual maximum power point tracking)
Maximum DC open circuit voltage	580V DC
MPPT operating range	125-550V
Starting voltage	150V DC
Maximum DC input current (for each solar array input)	11A DC
Solar array switch rating	1000V DC
Residual current and insulation monitoring	Integrated

Utility interface	
Nominal AC voltage/frequency	230V AC, 50Hz, single phase
Continuous AC power rating	4600W AC
Maximum AC power to utility grid	4600W AC (derated over 45°Cambient)
Maximum AC current to utility grid	22.8A AC
Maximum AC current from utility grid	40A AC
Nominal AC output range	180 to 270V AC, 45 to 55Hz (adjustable)
Current THD	Less than 3%
Power factor	0.8 leading to 0.8 lagging (adjustable)
AC overvoltage category	Category III
Anti-islanding and AC overcurrent protection	Integrated
Inverter topology	Transformerless (with HF transformer isolation for battery)

Battery interface	
Nominal DC voltage	48V DC
Battery compatibility	Lithium-ion
Maximum charging and discharge power (from battery)	4600W DC
Maximum charging current	85A DC
Maximum discharging current	100A DC
Battery charging method	BMS controlled
Typical charging voltage (bulk/absorption phase)	57.0V DC
Battery disconnect	Integrated 2 pole DC breaker 125A DC per pole

Backup loads output	
Nominal AC voltage/frequency	230V AC, 50Hz, single phase
Continuous AC power rating	4600W AC (derate over 45°C ambient)
Maximum AC power rating	6900W AC (10 seconds maximum)
Maximum AC current	21.7A continuous, 30A for 10 seconds maximum
Voltage THD	Less than 4.0% (with linear loads)
Backup loads AC disconnect	25A MCB
Manual backup load AC bypass switch	Integrated

Efficiency	
Maximum efficiency (to utility grid)	97.6%
European averaged efficiency	97.0%
Maximum power point tracking efficiency	99.9%
Efficiency (powering loads from battery)	94%typical
Standby losses	Less than 8W AC

General data	
Dimensions (W x H x D)	516mm x 832mm x 290mm
Mounting and weight	Inverter 32 kg, BoS 12 kg, total 44 kg
Ambient temperature range	-25 to 60°C derate above 45°C
Relative humidity	0 to 95%
DC overcurrent category	Category II
Moisture location category	4K4H
Environmental protection rating	IP65
Cooling	Natural convection
Noise emissions	Less than 25dB
Warranty	5 years

User Interface	
Front panel display	Multi-coloured LED indicators
Communications	Integrated WiFi + for smartphone and web monitoring
Remote access	Web and android/iOS application

1.4 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.

1.5 Dimensions

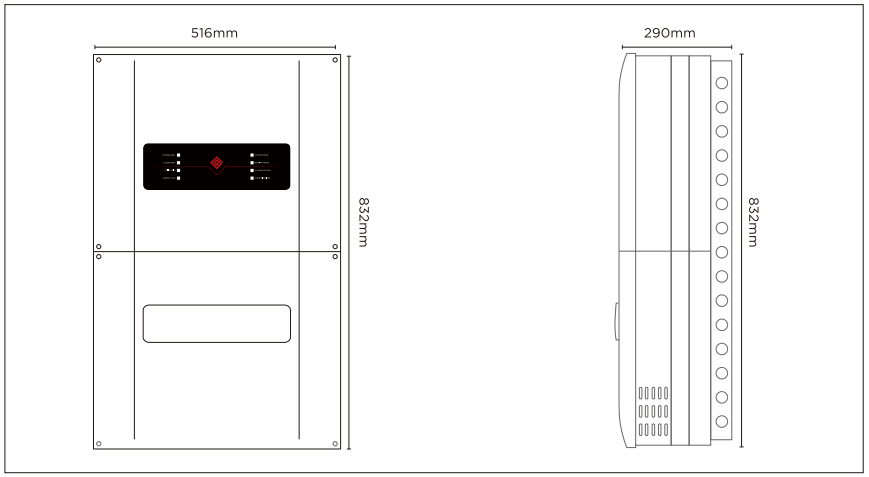


Figure 1: Dimensions.

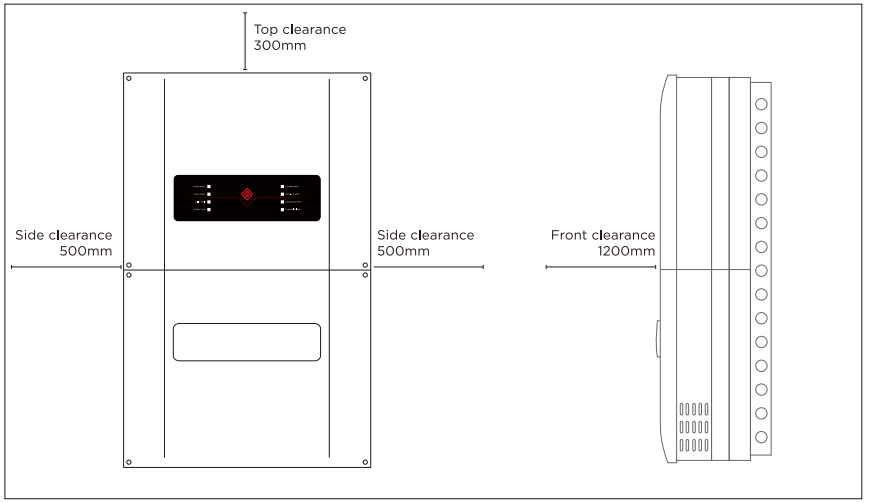


Figure 2: Minimum clearance requirements.

2. 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

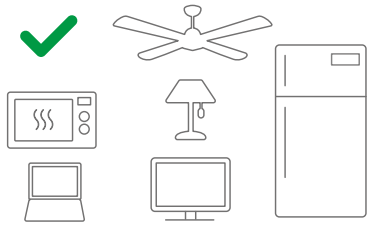


Figure 3: Examples of acceptable backup AC loads.

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

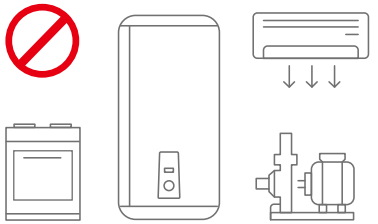


Figure 4: Examples of unacceptable backup AC loads.

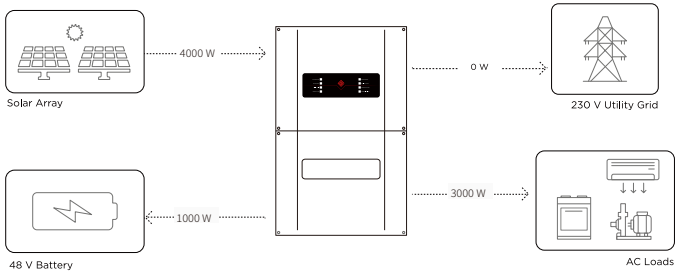
Note: (refer to page 15) These examples of different operating modes are simplified and do not include the small amount of losses involved in the energy conversion process. They should not be considered as representative of real world system performance.

2.2 Inverter operating modes

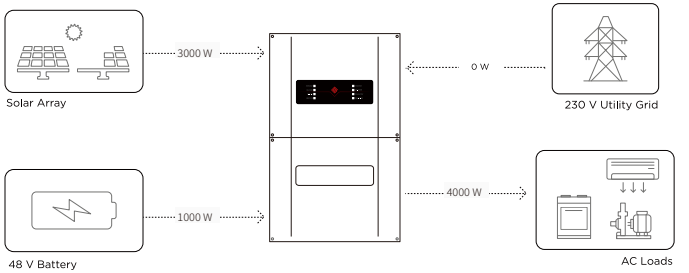
There are four working modes for GoodWe Smart Hybrid Inverter:general mode (default), off-grid mode, standby mode and economic mode, which can be set by APP or port.

2.2.1 General mode

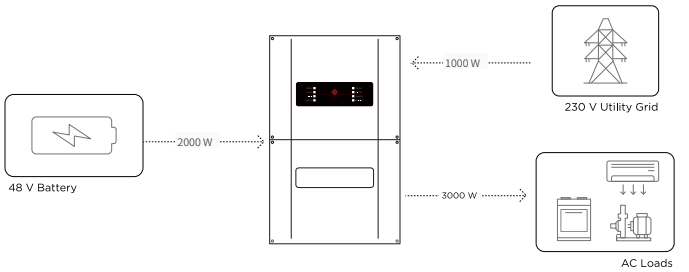
General mode:In this mode, the power generated by photovoltaic gives priority to the load power supply, the remaining power charges the battery, if the power is still remaining, then selectively grid-connected;



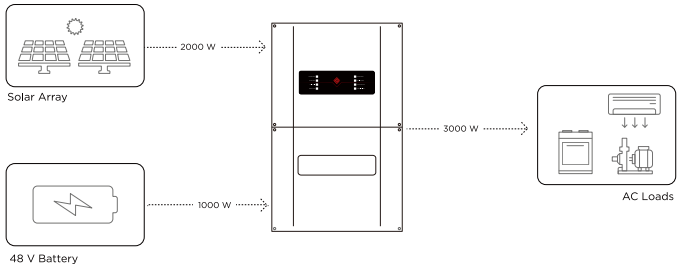
If the power generated by photovoltaic is insufficient to provide load power, the remaining energy is provided by the battery, if it is still insufficient, then the grid provided;



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 APP.

3. 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 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 'GoodWe Smart Hybrid Battery Enclosure BCL0096 installation manual.

3.2 Mounting wall plate

Use appropriate fasteners to secure the GoodWe Smart Hybrid 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.

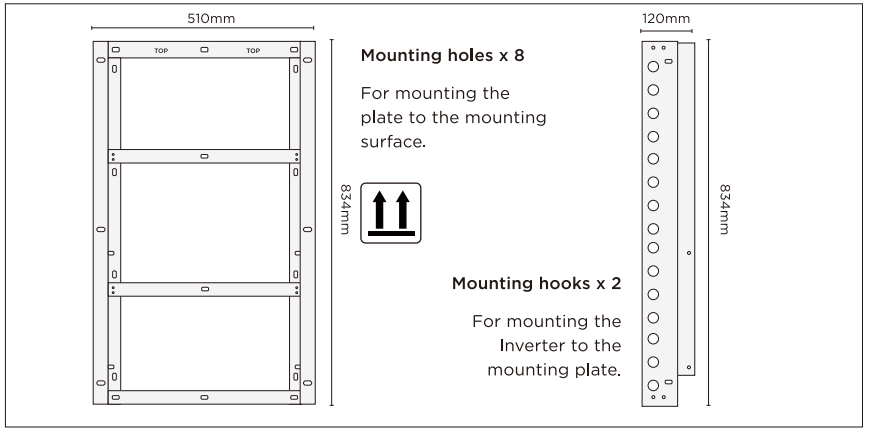


Figure 5: Mounting plate.

3.3 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.

3.4 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 unauthorised removal.

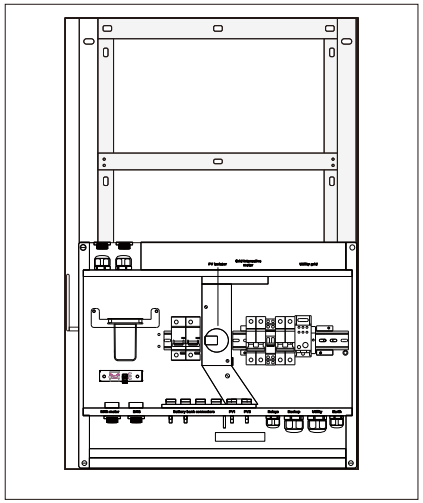


Figure 6: Mounting the BOS

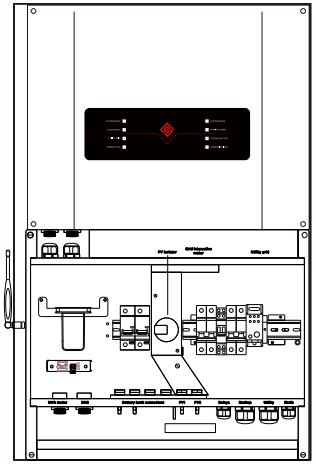


Figure 7: Mounting the Inverter

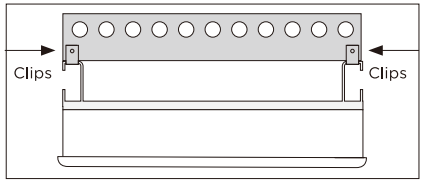


Figure 8: Top view.

3.5 Parts list

The following parts are also supplied with the GoodWe Smart Hybrid 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.

3.6 Location and environmental requirements

The GoodWe Smart Hybrid Inverter can be installed outdoors or indoors and the Inverter is rated IP65.

- The Inverter must be wall mounted in a vertical position with the connections at the bottom.
- The Inverter will perform more efficiently in locations offering plenty of air circulation.
- The recommended minimum clearance is 500mm on the side of the Inverter and 300mm on the top.
- The Inverter will function to all its specifications if operated in a range of -25°C to 60°C (-13°F to 140°F). Note that the Inverter's maximum wattage will derate in temperatures above 45°C.
- Batteries have a lower tolerance for extreme temperatures than the Inverter, refer to the battery manufacturers for more information.

3.7 Tools required

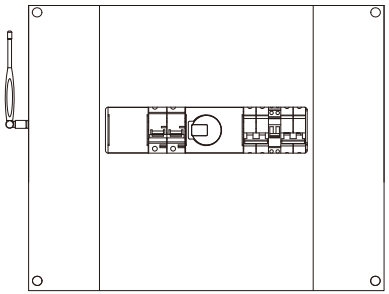
- Wire cutters/strippers.
- Drill and appropriate drill bits.
- Torque wrenches or torque screwdrivers.
- Assorted insulated screwdrivers, hex drivers or wrenches.
- DVM or Voltmeter.
- Amphenol (MC4 type) crimping kit.

4. Installation planning

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

4.1 Removing the BoS covers

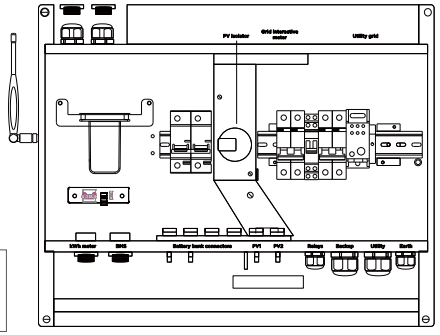
BoS wiring compartment cover (AC and DC connections) Remove this cover during installation.



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:

1. Remove the hex bolts (4) from the lower half of the Inverter using a 4mm hex wrench.
2. 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.

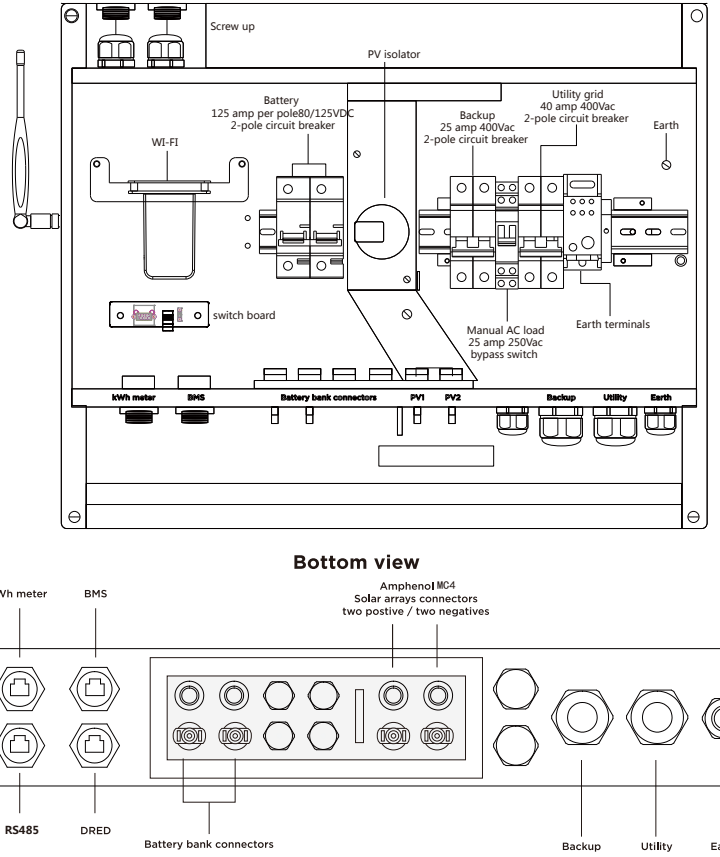


Figure 10 : Terminals and connectors.

4.2.1 System wiring diagram

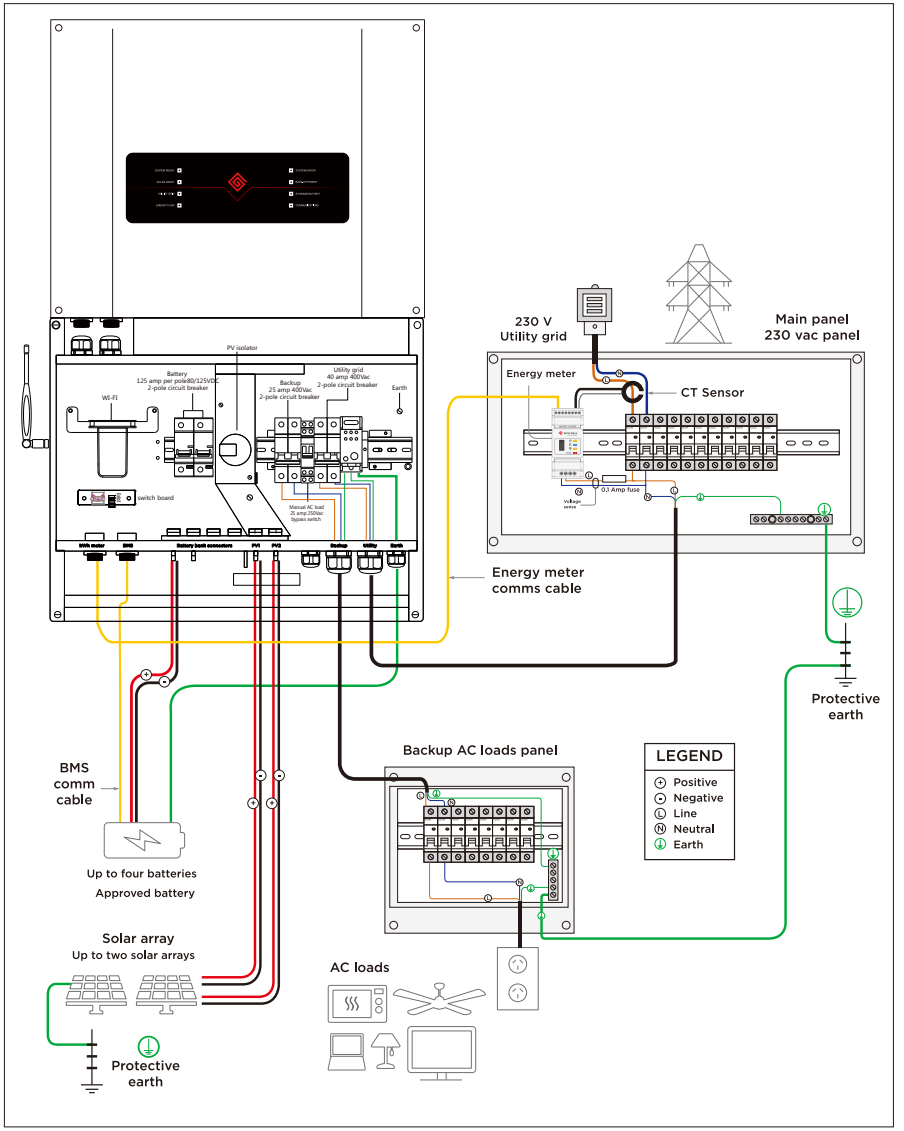


Figure 11 : System wiring diagram.

4.2.2 Protective earth (PE) wiring

Table 1 - Earth conductor size and torque requirements

Terminal location	Maximum conductor size	Torque requirements
PE Ground	16mm²	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) .

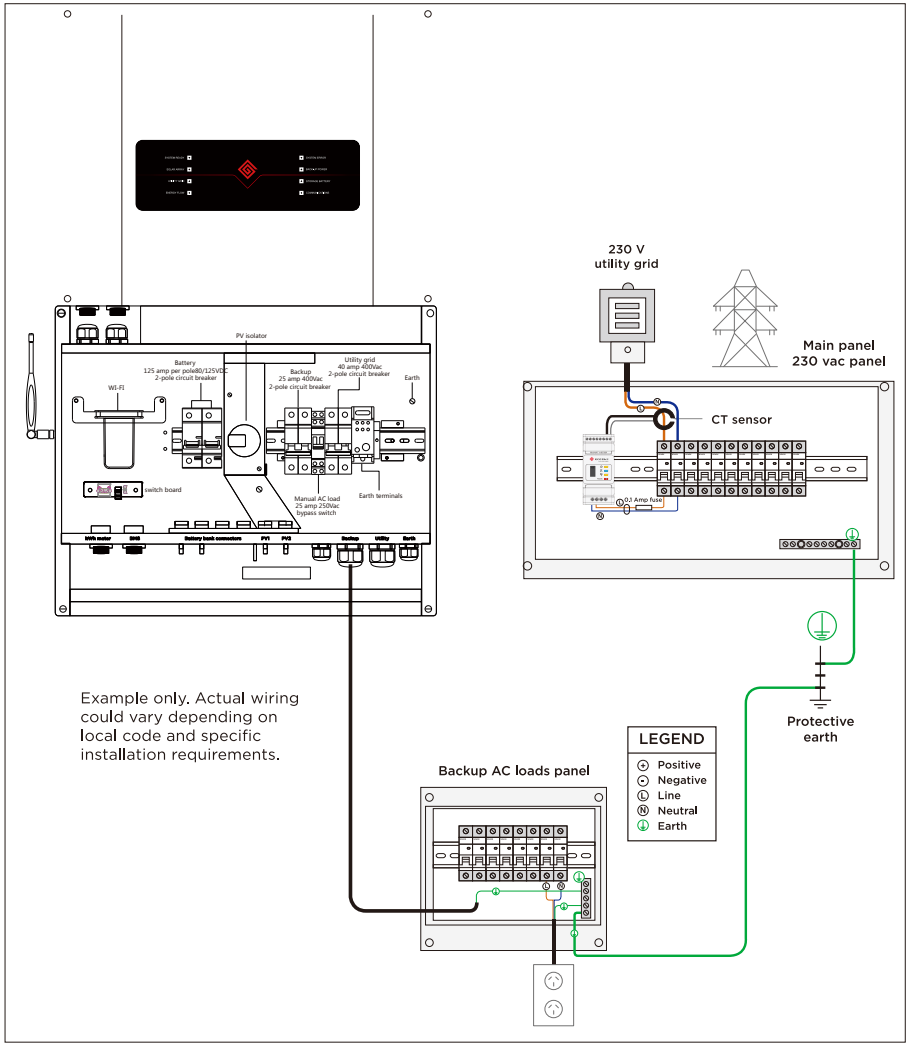


Figure 12: Protective earth.

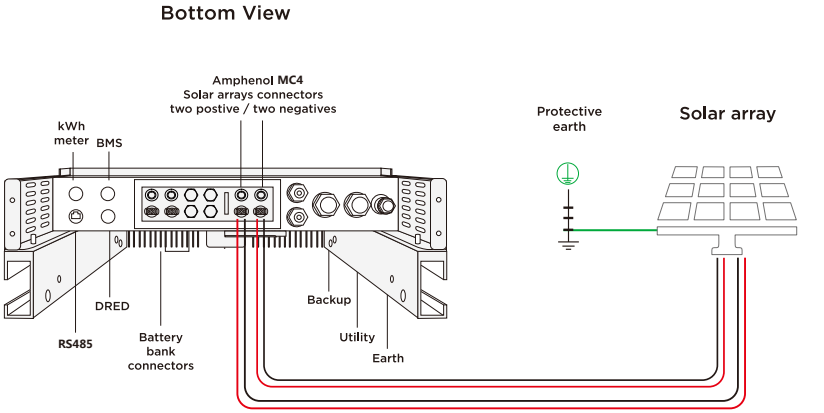
4.2.3 Solar array wiring

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	4 mm²
Solar 2	4 mm²



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 for terminal block

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

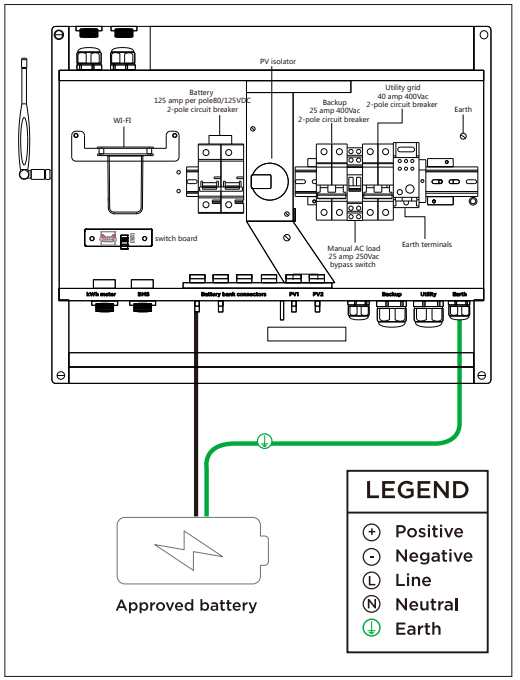


Figure 14: Battery wiring.

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 minimise voltage loss and other effects.

To connect the battery bank:

1. Connect the positive (+) wire from one battery module to the Amphenol MC4 '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 bus bar located on the bottom of the Inverter chassis. Later models of battery might require 3 additional communication 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.

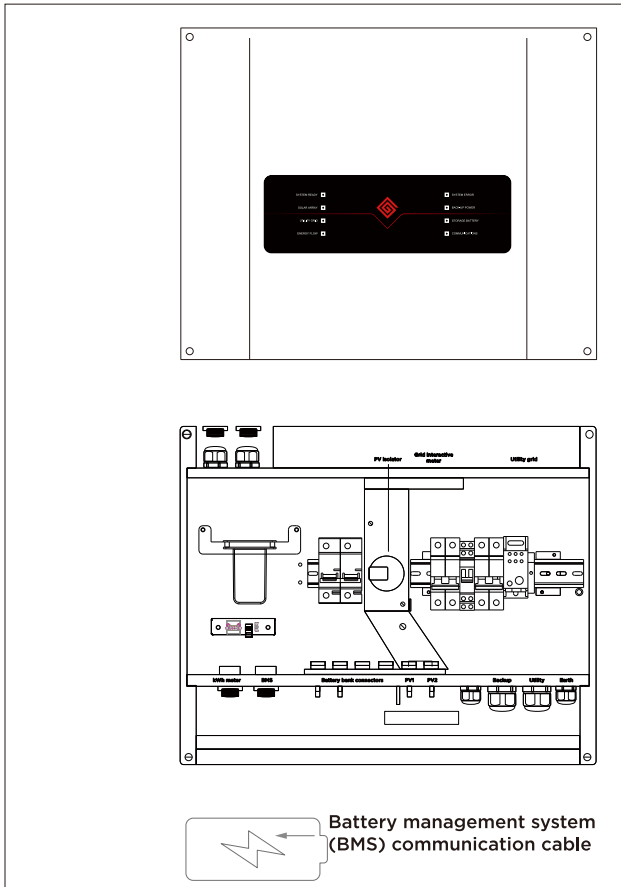


Figure 15: BMS.

Approved battery

gure : Battery wiring.

4.2.6 AC wiring connections and AC circuit breakers

Table 5 - AC conductor size and torque requirements

Terminal location	Maximum conductor size	Torque requirements
Line and neutral	16mm²	3.5 Nm
Earth	16mm²	3.5 Nm

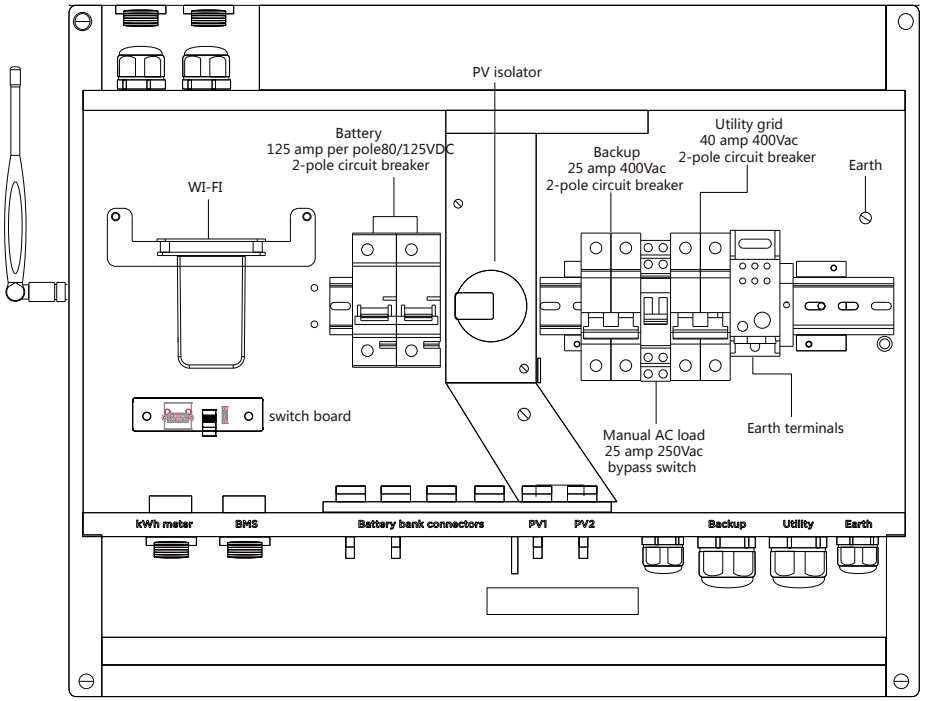


Figure 16: AC terminals

4.2.7 AC utility grid connections

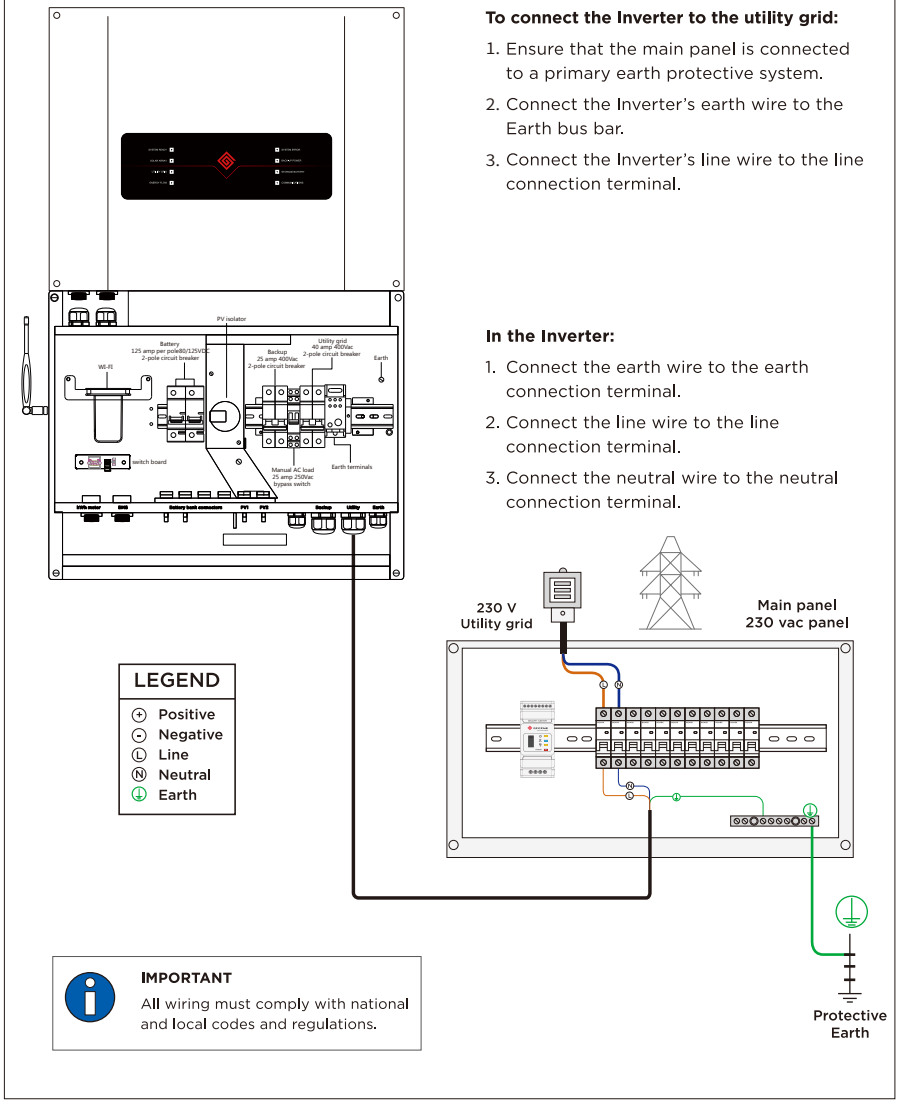


Figure 17 : AC grid connections.

4.2.8 AC backup loads connections

IMPORTANT

See Page 13 for details on what AC loads are acceptable to use with the GoodWe Smart Hybrid Inverter.

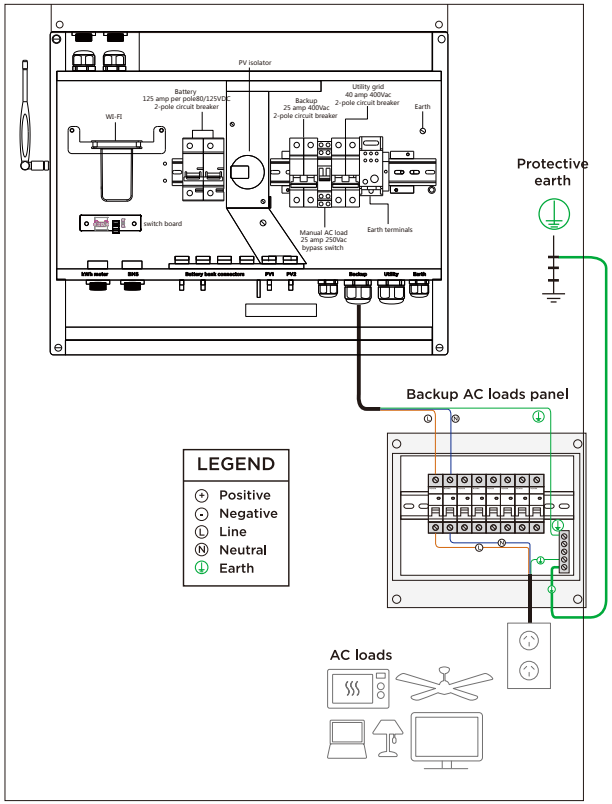


Figure 18 : Backup AC loads wiring.

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 GoodWe Smart Hybrid Inverter to limit or restrict power flow back into the utility grid by adjusting the amount of power being supplied form 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.

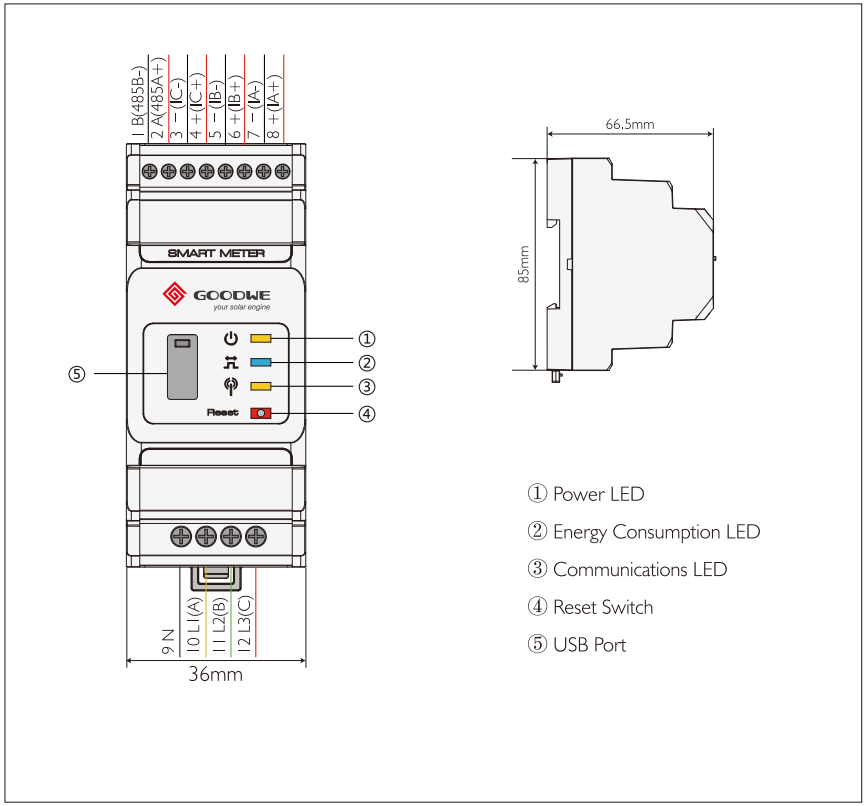


Figure 19 : Energy meter features.

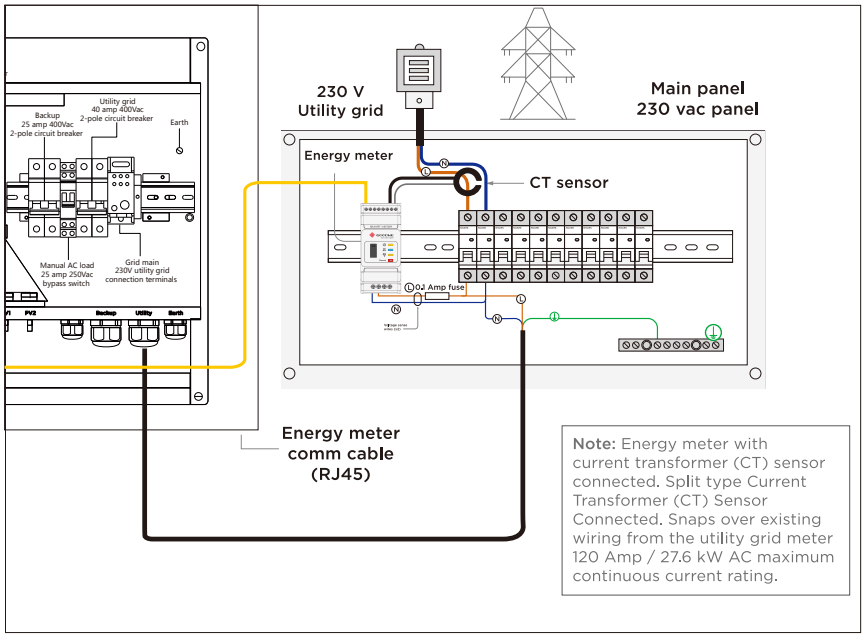


Figure 20 : Energy meter wiring.

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 #7 terminal on the top of the energy meter.
4. The white wire from the CT sensor is connected to the #8 terminal on the top of the energy meter.
5. Prepare two voltage sense wires for the connection of the energy meter. The recommended wire colours 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 GoodWe Smart Hybrid Inverter enclosure labelled 'kWh meter'.

5. Operation

5.1 Circuit breakers 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.

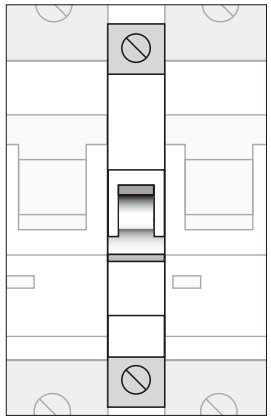


Figure 21: Bypass switch in the backup (I) position.

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.

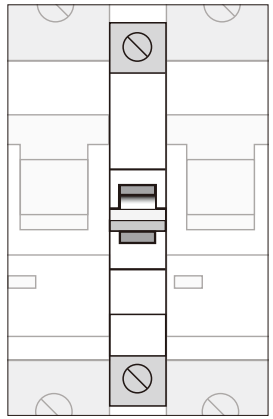


Figure 22: Bypass switch in the isolate (O) position.

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

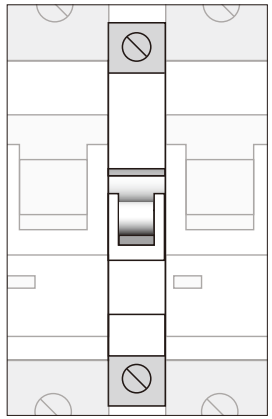
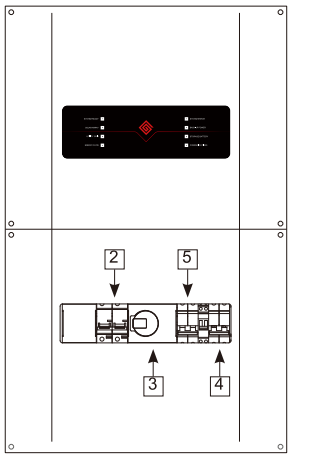


Figure 23: Bypass switch in bypass (II) position.

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.



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.

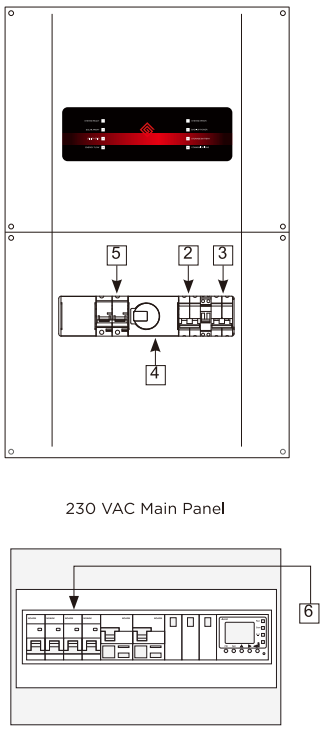
On the main electrical input panel:

6. Switch the circuit breaker for the Inverter to the ’on’ position to activate the main panel.

Figure 24: Starting up the system.

5.3 Shut down

Perform the following steps to shut 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.

Figure 25: Shutting down the system.

5.4 Inverter system LED indicators

Eight LED indicators are provided on the front panel. These LED indicators provide information about the operational status of the system.

Indicator	Status	Explanation
SYSTEM READY		ON = System is ready
		BLINK = System is starting up
		OFF = System is not operating
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
UTILITY GRID		ON = Grid is active and connected
		BLINK = Grid is active but not connected
		OFF = 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 = Grid not connected or system not operating
SYSTEM ERROR		ON = Fault has occurred
		BLINK = Overload of backup output / reduce load
		OFF = No fault
BACKUP POWER		ON = Backup is ready / power available
		OFF = Backup is off / no power available
STORAGE BATTERY		ON = Battery is charging
		BLINK 1 = Battery is discharging
		BLINK 2 = Battery is low / SOC is low
		OFF = Battery is disconnected / not active
COMMUNICATIONS		ON = online
		BLINK 1 = Local connection only (no internet)
		BLINK 2 = Not connected

Figure 26 LED indicators

6. GoodWe Smart Hybrid Inverter 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 configuation

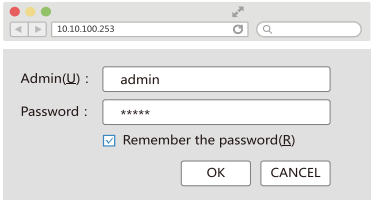
- This part shows configuration on web page
- Wi-Fi configuration is absolutely necessary for online monitoring and after-sales maintenance

PREPARATION:

1. Inverter must be powered up with only PV power
2. Need a router with available internet access to GoodWe portal www.semsportal.com

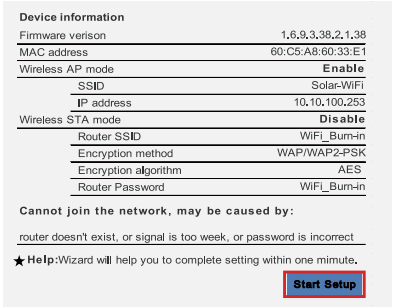
Step 1

1. Connect Solar-WiFi* to your PC or smart phone(* means the last 8 characters of the inverter serial No.)
2. Open browser and login 10.10.100.253
   Admin (U): admin; Password: admin
3. Then click "OK"



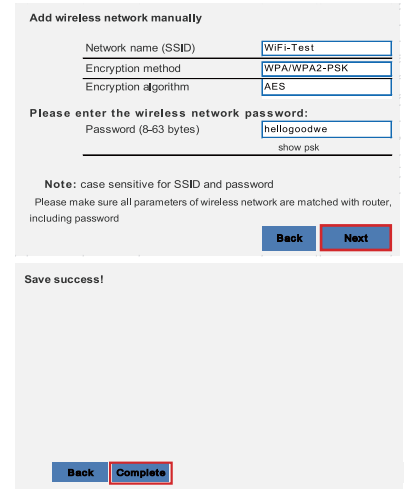
Step 2

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



Step 3

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



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

6.2 PV Master APP operation

PV Master is an external configuration application
GoodWe hybrid inverters, used on smart phones f
both Android and iOS system, main functions as b

1. Edit system configuration to make the system w
   as customer needs
2. Wi-Fi configuration

Please download PV Master OPERATION INSTRUC
from www.goodwe.com

6.3 CEI Auto-test function

PV Auto-Test function of CEI is integrated in PV Master App for Italy safety country requirements. For detailed instruction of this function please refer to ***PV Master OPERATION INSTRUCTIONS***

7 Troubleshooting

7.1 Error messages

These messages are displayed on the GoodWe portal on the dashboard:

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 over current
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

8. Certifications, standards and approvals

VDE-AR-N 4105

IEC62109-1 Ed 1.0

IEC62109-2 Ed 1.0

IEC62040-1 Ed 1.0