

User Manual Parallel Inverter System Solution

V1.2-2024-01-08

1 Safety Precaution

General Safety

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 in the manual are for guidance only.
- Before installations, read through the corresponding user manual to learn about the product and the precautions. Strictly follow its requirements.
- All installations should be performed by trained and knowledgeable technicians who are familiar with local standards and safety regulations.
- Use insulating tools and wear personal protective equipment when operating the equipment to ensure personal safety. Wear anti-static gloves, cloths, and wrist strips when touching electron devices to protect the inverter from damage.
- Strictly follow the installation, operation, and configuration instructions in this manual. The manufacturer shall not be liable for equipment damage or personal injury if you do not follow the instructions.

Safety for the Parallel System

WARNING

1. Power off the inverter before operations and maintenance. Otherwise, the inverter may be damaged or electric shocks may occur.
2. Do not connect 3 single-phase inverters to the three phases of the grid respectively in a parallel system. Otherwise, it will cause system error or damage to the inverters.
 - Correct Case: Connect the master inverter and its slave inverters to the same phase such as L1.
 - Error Case: Form a three-phase system by connecting the master inverter to L1, the slave inverter 1 to L2, and the slave inverter 2 to L3.
3. Ensure that wiring sequences are the same. Do not connect L and N cables reversely on the ON-GRID port. Neither does it on the BACK-UP port. Ensure all L and N cables are parallelized respectively on the BACK-UP port.
4. BACK UP function is not recommended if the PV system is not configured with batteries.
5. Prepare the cables according to the requirements in related user manuals of the products.
6. For one parallel system, ensure the conductor's materials, cross-sectional areas and lengths of AC cables between the Master Inverter and its slaves on the BACK-UP port and on the ON-GRID port, as well as the DC cables between the battery and the inverter, are the same.
7. Install the Ezlink Module and Smart Meter on the Master Inverter. It may cause abnormal communications if the Ezlink Module and Smart Meter are installed on the other inverters.

2 Packing List

Notice

1. The parallel inverters package shall be purchased separately.
2. The equipment manufacturer provides 2 communication cables with 2 meters in length by default. Prepare the Shielded Ethernet cable and RJ45 Modular Plug for crimping by yourself if the delivered communication cables can not meet the demanding. Do not crimp PIN1 and PIN 2. The length of the communication cables shall not exceed 2 meters. Otherwise it is unable for a normal communication. Do not purchase the standard Ethernet cables for parallel systems.



Ezlink Module *1



Documents *1



Communication
Cable *2

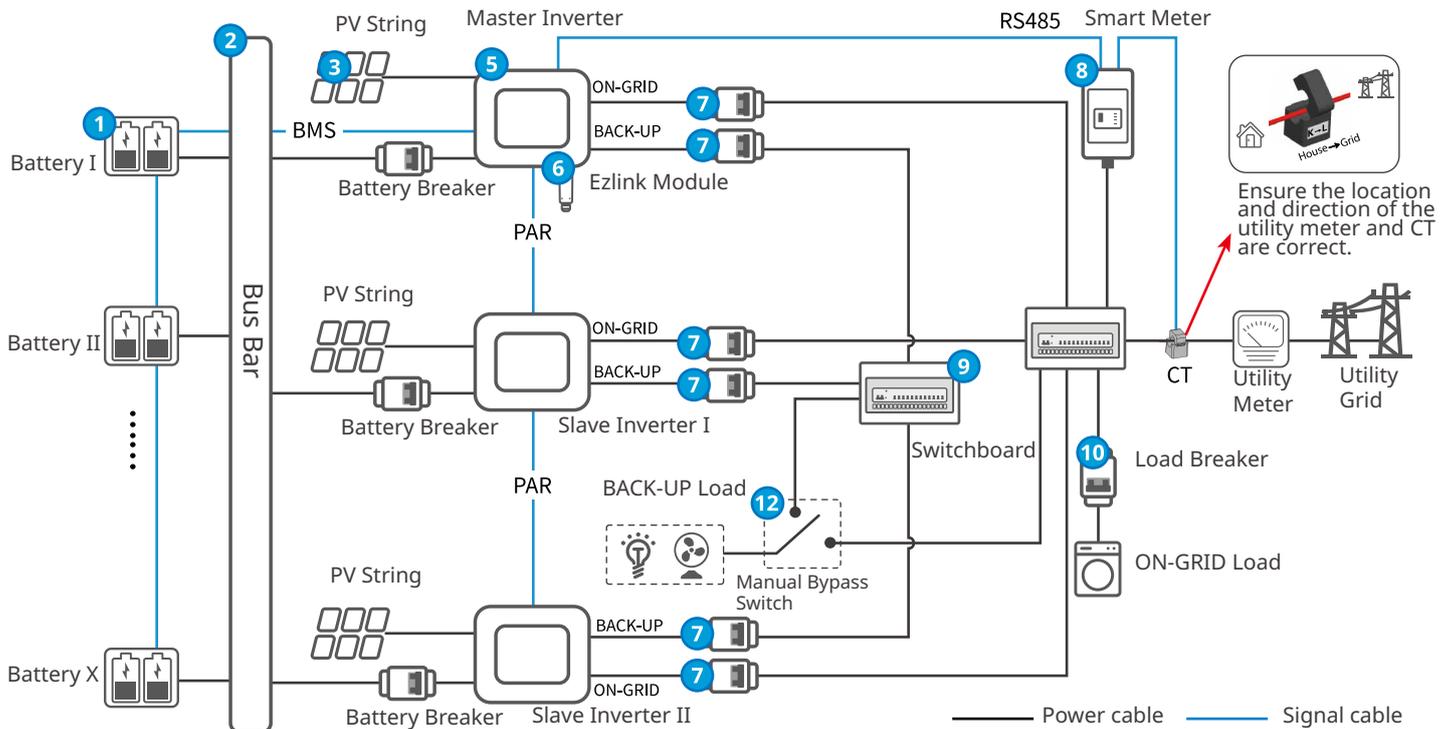
3 Networking

Notice

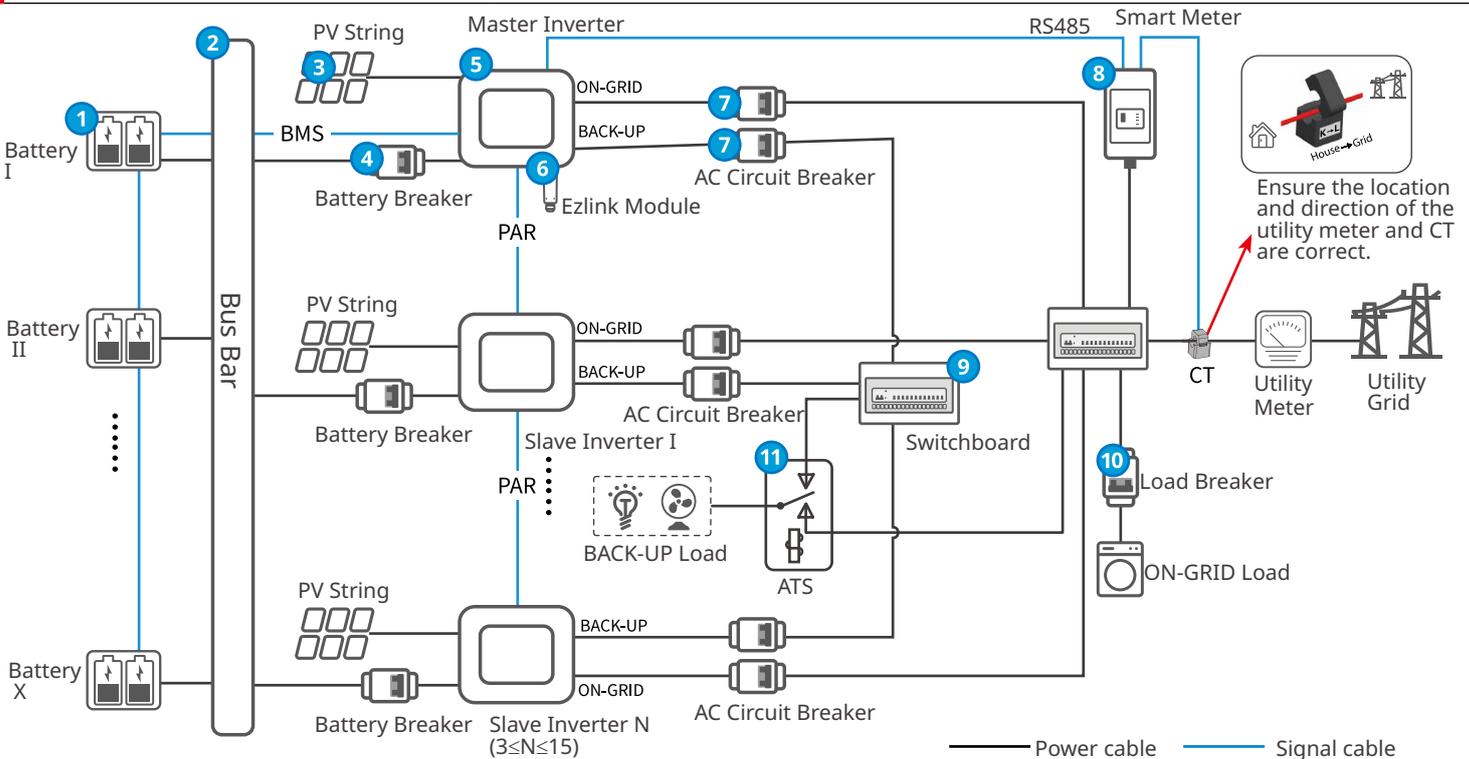
1. Do not connect a third party EMS device in the parallel system.
2. The UPS function is available when there are no more than 3 parallel inverters in the system; while it becomes unavailable when the quantity exceeds this number.
3. For scenarios with parallel batteries: select the model according to the approved battery list matched with the inverter. For requirements in the same system such as whether different models can be used, whether the capacity are the same, please refer to the related battery User Manual or ask from the manufacturer.
4. For scenarios with non-parallel batteries: select the model according to the approved battery list matched with the inverter. It is suggested the models and capacity of the battery connected to each inverter in the system shall be the same. Otherwise there might be system malfunctions.
5. The parallel system becomes more complex as the numbers of parallel inverters increase. When there are more than 6 parallel inverters in the system, please contact the after-sales service to confirm the application environment, thus ensuring a steady running.

3.1 Scenarios with Parallel batteries

No More Than 3 Parallel Inverters in the System



3-16 Pieces Parallel Inverters in the System

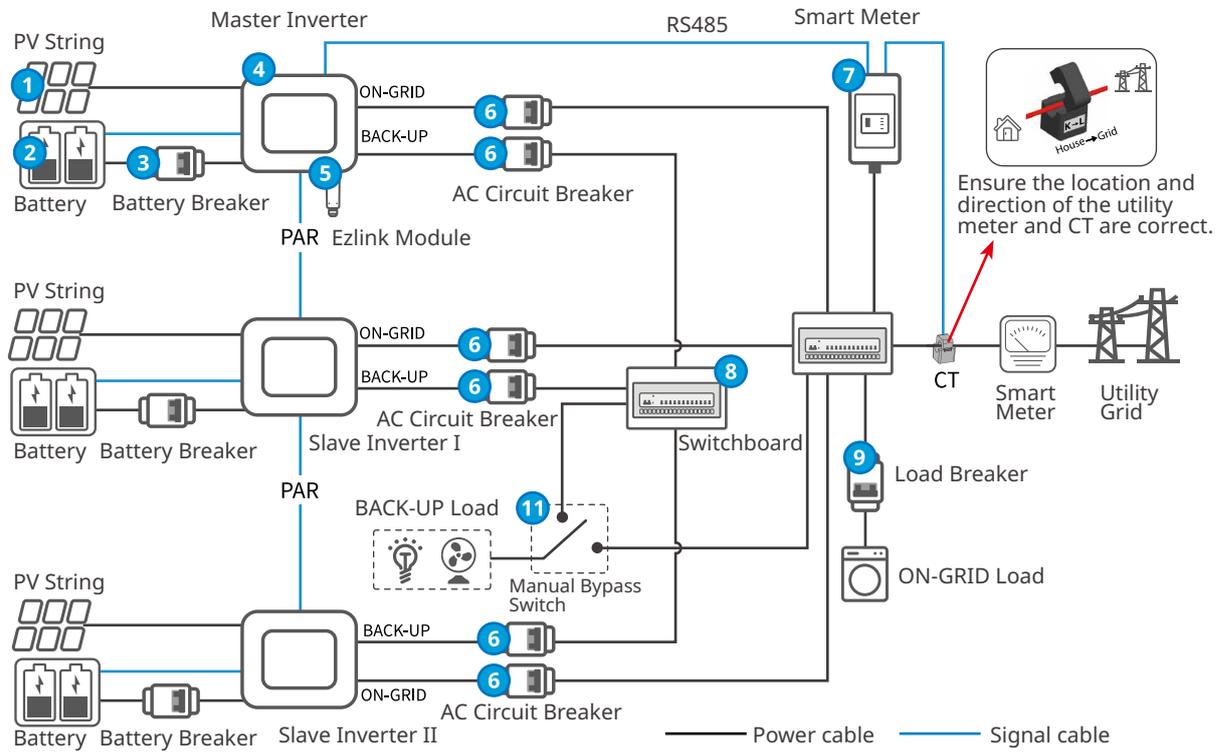


Parts Description

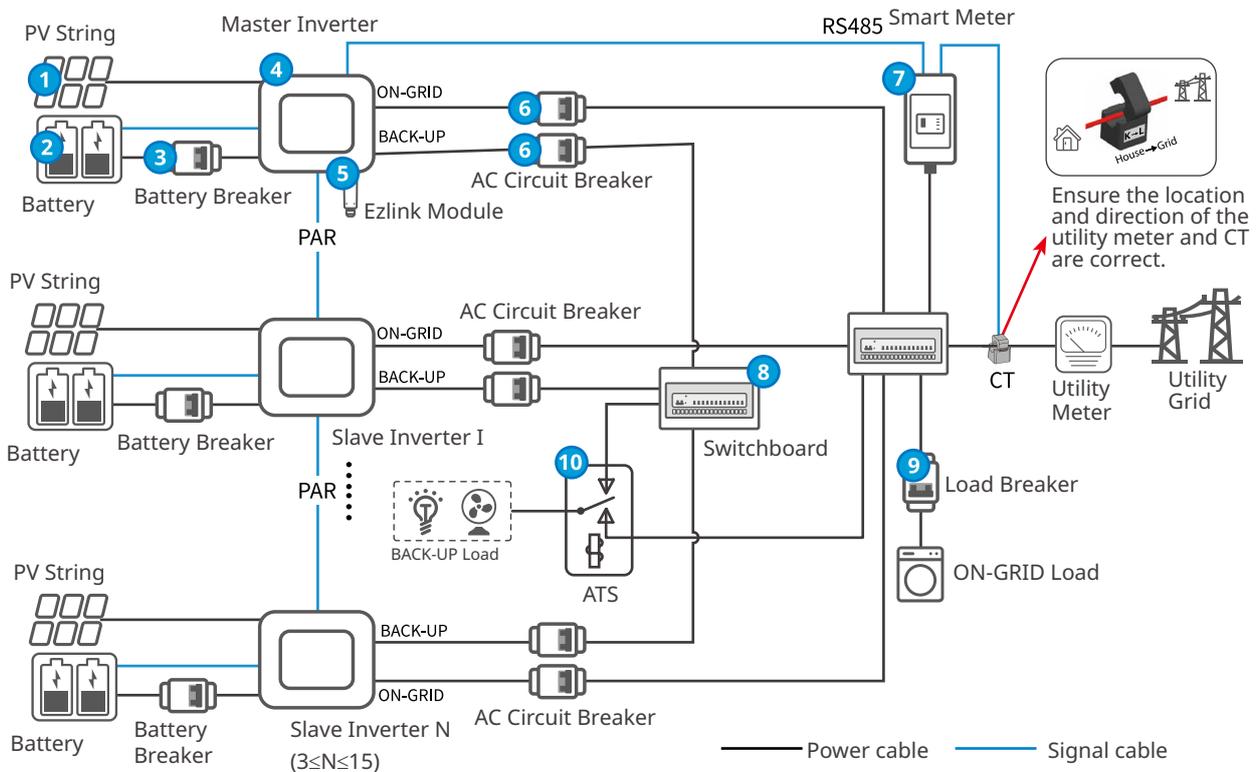
No.	Parts	Description
1	Battery	Select the battery model according to the approved battery list matched with the inverter. The models and capacity of the battery connected to each inverter in the system are decided by the manufacturer.
2	Bus Bar	(Optional) A bus bar shall be added when multiple battery packs in parallel are connected to the inverters in the system. For detailed information such as the battery pack quantity in parallel, bus bar and so on, please refer to the related battery's user manual.
3	PV String	PV string is composed of series connected PV panels.
4	Battery Breaker	The breakers shall conform to the requirements of local laws and regulations. 2P AC breakers shall be prepared by the customers. The recommended specifications are: <ul style="list-style-type: none"> For GW3000-ES-20, GW3600M-ES-20, GW5000M-ES-20 and GW6000M-ES-20: the nominal current $\geq 75A$ and the nominal voltage $\geq 60V$. For GW3600-ES-20, GW3500L-ES-BR20, GW3600-ES-BR20: the nominal current $\geq 100A$ and the nominal voltage $\geq 60V$. For GW5000-ES-20: the nominal current $\geq 125A$ and the nominal voltage $\geq 60V$. For GW6000-ES-20, GW6000-ES-BR20: the nominal current $\geq 150A$ and the nominal voltage $\geq 60V$.
5	Inverter	The G2 Version of ES Series Inverters (3.0-6.0kW) are able to be used. The inverters' model shall be the same in one parallel system.
6	Ezlink Module	<ul style="list-style-type: none"> In parallel inverter scenarios, the Ezlink module is only allowed for networking. In one system, it is available to install only one Ezlink module and one smart meter. The inverter connecting with the Ezlink module and the smart meter is the master inverter by default, and all the others are slave inverters. The master inverter issues commands to the slave inverters via the communication cables.
7	AC Circuit Breaker	The breakers' specifications for the BACK-UP and ON-GRID loads of one inverter type shall be the same. AC breakers shall be prepared by the customers. The recommended specifications are: <ul style="list-style-type: none"> For GW3600M-ES-20: the nominal current $\geq 20A$ and the nominal voltage $\geq 230V$. For GW3000-ES-20, GW5000M-ES-20, GW6000M-ES-20, GW3600-ES-20 and GW3600-ES-BR20: the nominal current $\geq 40A$ and the nominal voltage $\geq 230V$ For GW5000-ES-20, GW6000-ES-20, GW3500L-ES-20-BR20 and GW6000-ES-BR20: the nominal current $\geq 63A$ and the nominal voltage $\geq 230V$.
8	Smart Meter	When any phase's current in the grid is no more than 120A, use the delivered smart meter or purchased from the inverter manufacturer. Recommended model: GM1000. When any phase's current in the grid is more than 120A, select industrial and commercial Smart Meter and CT. For details, please contact the After-Sales service.
9	Switchboard	<ul style="list-style-type: none"> Prepare the switchboard by yourself. When there are no more than 3 parallel inverters in the system, prepare built-in AC breakers for BACK-UP and ON-GRID loads, which are used to connect the AC cables of the inverters, and then get tied to the grid. When the number of inverters in the system is $3 < N \leq 16$, prepare the switchboard with nominal current $\geq 2 \times N \times I_{max}$ (N refers to the parallel inverter quantity; I_{max} refers to the maximum output current of the inverter.)
10	Load Breaker	Depend on the actual using load.
11	Automatic Transfer Switch (ATS)	<ul style="list-style-type: none"> When the number of inverters in the system is $3 < N \leq 16$, prepare ATS by yourself. ATS function: <ol style="list-style-type: none"> when BACK-UP load is powered by the grid, to avoid un-even current under bypass mode and the load current is too big to damage the inverter, install an ATS to ensure the grid current runs through the ATS to provide the electricity to BACK-UP load. power on all inverters in the system at the same time, to ensure electricity provided to the loads simultaneously. Otherwise, it will cause overload protection. ATS specification: <ol style="list-style-type: none"> with its normally closed contact connecting with the grid. nominal current $\geq 2 \times N \times I_{max}$ (N refers to the parallel inverter quantity; I_{max} refers to the maximum output current of the inverter.)
12	Manual Bypass Switch (Optional)	<ul style="list-style-type: none"> When there are no more than 3 parallel inverters in the system, to ensure the BACK-UP load is powered by the grid during the inverter maintenance, install a manual Bypass switch by yourself. The specification of the manual Bypass switch and the BACK-UP & ON-GRID load breakers: <ul style="list-style-type: none"> For GW3000-ES-20, GW3600M-ES-20, GW5000M-ES-20, GW6000M-ES-20, GW3600-ES-20 and GW3600-ES-BR20: the nominal current $\geq 120A$ and the nominal voltage $\geq 230V$. For GW5000-ES-20, GW6000-ES-20, GW3500L-ES-20-BR20 and GW6000-ES-BR20: the nominal current $\geq 160A$ and the nominal voltage $\geq 230V$.

3.2 Scenarios with Non-parallel Batteries

No More Than 3 Parallel Inverters in the System



3-16 Pieces Parallel Inverters in the System



Parts Description

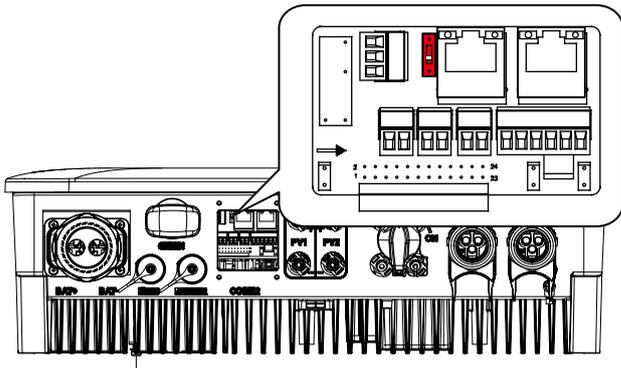
No.	Parts	Description
1	PV String	PV string is composed of series connected PV panels.
2	Battery	Select the battery model according to the approved battery list matched with the inverter. The models and capacity of the battery connected to each inverter in the system shall be the same.
3	Battery Breaker	The breakers shall conform to the requirements of local laws and regulations. 2P AC breakers shall be prepared by the customers. The recommended specifications are: <ul style="list-style-type: none"> For GW3000-ES-20, GW3600M-ES-20, GW5000M-ES-20 and GW6000M-ES-20: the nominal current $\geq 75A$ and the nominal voltage $\geq 60V$. For GW3600-ES-20, GW3500L-ES-BR20, GW3600-ES-BR20: the nominal current $\geq 100A$ and the nominal voltage $\geq 60V$. For GW5000-ES-20: the nominal current $\geq 125A$ and the nominal voltage $\geq 60V$. For GW6000-ES-20, GW6000-ES-BR20: the nominal current $\geq 150A$ and the nominal voltage $\geq 60V$.
4	Inverter	The G2 Version of ES Series Inverters (3.0-6.0kW) are able to be used. The inverters' model shall be the same in one parallel system.
5	Ezlink Module	<ul style="list-style-type: none"> In parallel scenarios, the Ezlink module is only allowed for networking. In one system, it is available to install only one Ezlink module and one smart meter. The inverter connecting with the Ezlink module and the smart meter is the master inverter by default, and all the others are slave inverters. The master inverter issues commands to the slave inverters via the communication cables.
6	AC Circuit Breaker	The breakers' specifications for the BACK-UP and ON-GRID loads of one inverter type shall be the same. AC breakers shall be prepared by the customers. The recommended specifications are: <ul style="list-style-type: none"> For GW3600M-ES-20: the nominal current $\geq 20A$ and the nominal voltage $\geq 230V$. For GW3000-ES-20, GW5000M-ES-20, GW6000M-ES-20, GW3600-ES-20 and GW3600-ES-BR20: the nominal current $\geq 40A$ and the nominal voltage $\geq 230V$ For GW5000-ES-20, GW6000-ES-20, GW3500L-ES-20-BR20 and GW6000-ES-BR20: the nominal current $\geq 63A$ and the nominal voltage $\geq 230V$.
7	Smart Meter	When any phase's current in the grid is no more than 120A, use the delivered smart meter or purchased from the inverter manufacturer. Recommended model: GM1000. When any phase's current in the grid is more than 120A, select industrial and commercial Smart Meter and CT. For details, please contact the After-Sales service.
8	Switchboard	<ul style="list-style-type: none"> Prepare the switchboard by yourself. When there are no more than 3 parallel inverters in the system, prepare built-in AC breakers for BACK-UP and ON-GRID loads, which are used to connect the AC cables of the inverters, and then get tied to the grid. When the number of inverters in the system is $3 < N \leq 16$, prepare the switchboard with nominal current $\geq 2 \times N \times I_{max}$ (N refers to the parallel inverter quantity; I_{max} refers to the maximum output current of the inverter.)
9	Load Breaker	Depend on the actual using load.
10	Automatic Transfer Switch (ATS)	<ul style="list-style-type: none"> When the number of inverters in the system is $3 < N \leq 16$, prepare ATS by yourself. ATS function: <ol style="list-style-type: none"> when BACK-UP load is powered by the grid, to avoid un-even current under bypass mode and the load current is too big to damage the inverter, install an ATS to ensure the grid current runs through the ATS to provide the electricity to BACK-UP load. power on all inverters in the system at the same time, to ensure electricity provided to the loads simultaneously. Otherwise, it will cause overload protection. ATS specification: <ol style="list-style-type: none"> with its normally closed contact connecting with the grid. nominal current $\geq 2 \times N \times I_{max}$ (N refers to the parallel inverter quantity; I_{max} refers to the maximum output current of the inverter.)
11	Manual Bypass Switch (Optional)	<ul style="list-style-type: none"> When there are no more than 3 parallel inverters in the system, to ensure the BACK-UP load is powered by the grid during the inverter maintenance, install a manual Bypass switch by yourself. The specification of the manual Bypass switch and the BACK-UP & ON-GRID load breakers: <ul style="list-style-type: none"> For GW3000-ES-20, GW3600M-ES-20, GW5000M-ES-20, GW6000M-ES-20, GW3600-ES-20 and GW3600-ES-BR20: the nominal current $\geq 120A$ and the nominal voltage $\geq 230V$. For GW5000-ES-20, GW6000-ES-20, GW3500L-ES-20-BR20 and GW6000-ES-BR20: the nominal current $\geq 160A$ and the nominal voltage $\geq 230V$.

4 Parameter Setting

Prerequisite

Confirm below items for a successful parallel networking:

1. For the installation and power on of each device in the network, please check the corresponding device's User Manual.
2. The installation and wiring of devices in the network such as the inverter, batteries, Ezlink module, smart meter and so on are correct.
3. The communication of devices in the network such as the inverter, batteries, Ezlink module, smart meter and so on are normal.
4. Before paralleling setting, the PV side or battery side of the inverter in the system is powered on and not connected to the grid. Make sure the inverter is standby.
5. Based on the number of inverters in the system, set the terminal resistors for the main inverter and its slave inverters according to the following requirements.

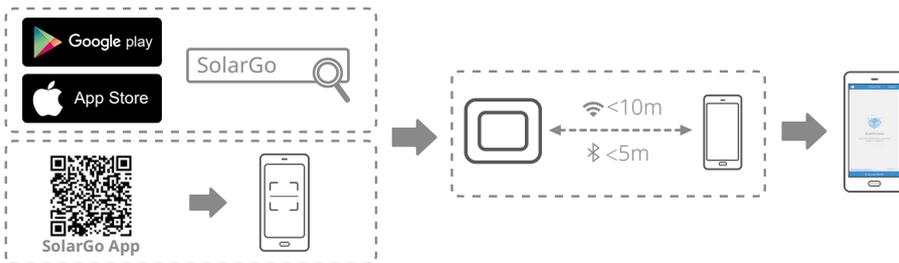


Parallel System (This setting is for inverters manufactured after 01/09/2023)

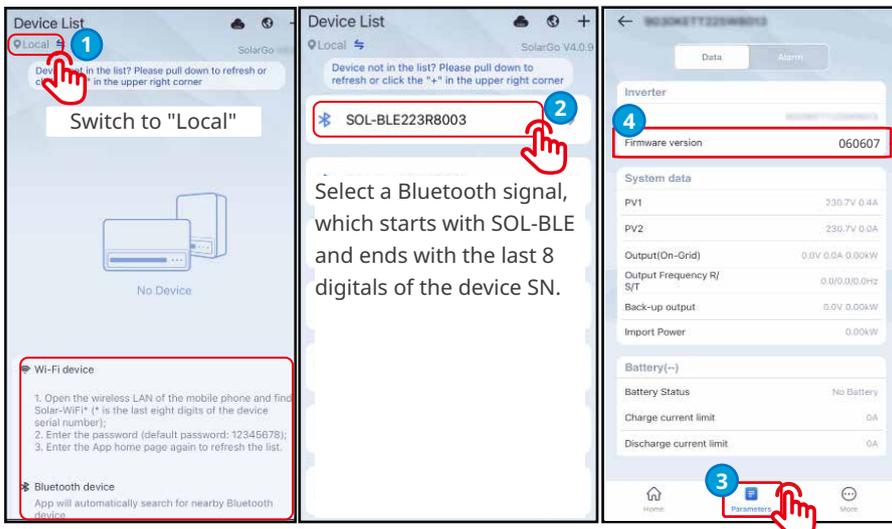


Paralleling Setting

Step 1 Download the APP.

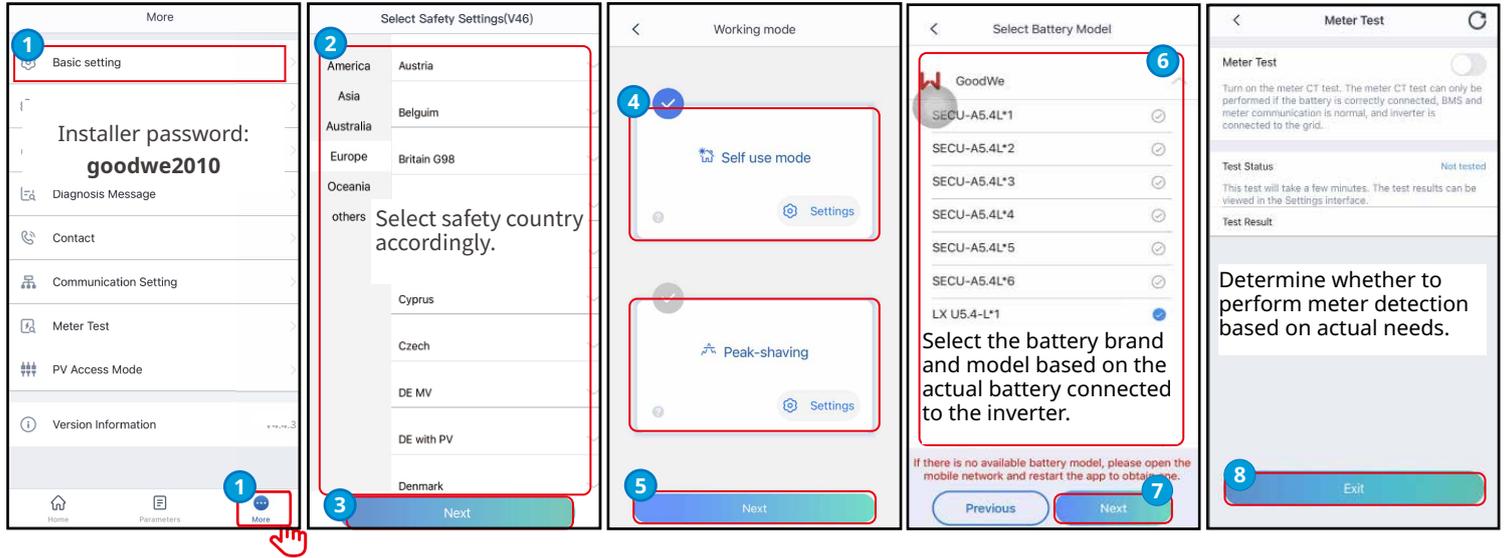


Step 2 Connect the inverter's Bluetooth, to check whether the firmware version of each inverter satisfy the requirement.



Confirm the software version of each inverter, make sure the inverter software version in the system is the same, and the software version is 060607 or above. If the inverter version does not meet the requirements, please contact the after-sales service center for upgrade.

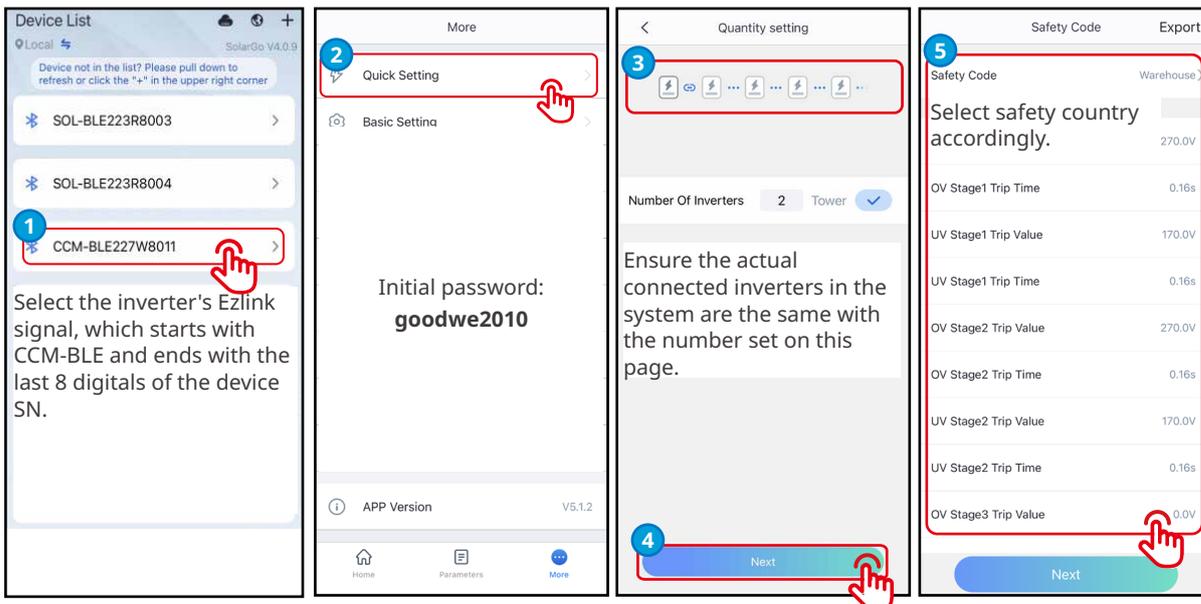
Step 3 (Optional) When the batteries connected to one inverter are different, connect the inverter's Bluetooth signal, to set single batteries' model.

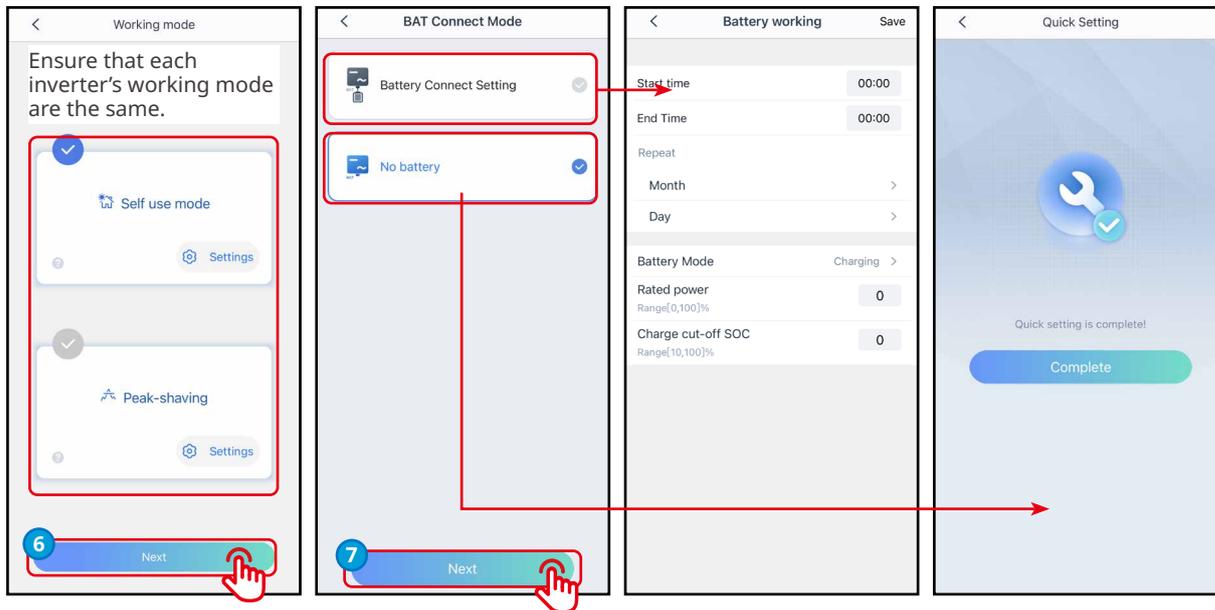


Step 4 Connect Ezlink to set the master inverter's parameter; Set the parameters for parallel network based on the hints on UI and actual applied scenarios.

Notice

- Select the Ezlink signal to set the master inverter's parameter. These parameters will be synchronized to the slave inverters automatically.
- Select the Bluetooth signal to set each inverter's parameter, when the inverters' parameters can't be the same.



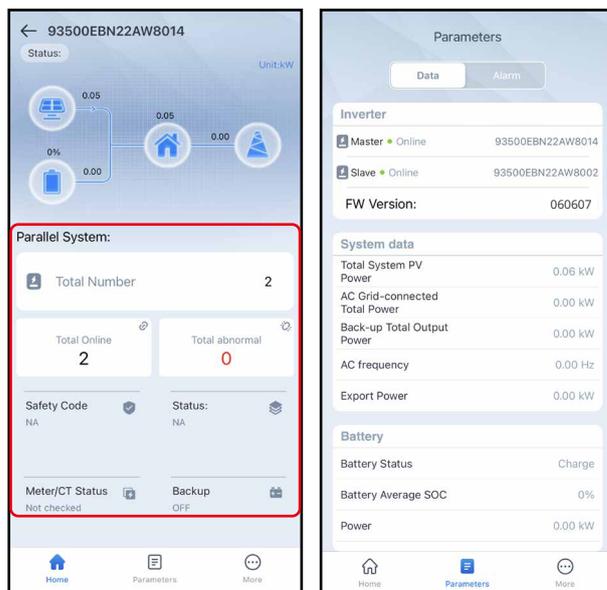


Step 5 Go to advanced settings interface through **Home>More>Advanced Setting**. If a busbar is used in the system or only one battery system is used to connect to multiple inverters, please set **Battery Ports Busbar Connection** to **Enable**.

Step 6 Check whether the parallel quantity is correct, and whether the master inverter & its slaves are working well.

Notice

- The average SOC of the battery in the parallel system is divided by the added SOC values for the master inverter and its slaves. The actual SOC value for each battery varies when economic mode is selected.
- The battery capacity equalization time is affected by the actual working condition of the parallel system, such as battery capacity, battery SOC difference, PV power generation, etc. Please refer to the actual situation for SOC equalization time.



Commissioning for the Parallel System

Notice

- To ensure that the parallel system operates normally, please set the parameters according to the following requirements after the system is connected and parallelized. For detailed operations, please refer to **SolarGo App User Manual**.
- Select the Ezlink signal to set the master inverter's parameter via SolarGo App. These parameters can be sent and synchronized to the slave inverters automatically; When the inverters' parameters can't be the same, select the Bluetooth signal to set each inverter's parameter.
- To avoid problems happening in the parallel system, it is suggested that all inverters and batteries in the parallel system shall be set with the uniform parameters. If the PV panel is shaded heavily, the shadow scan function of the inverters in the system can be different. It is recommended to connect the inverter's Bluetooth signal via SolarGo App and set the shadow scan parameters in single unit.

1. Set **the safety code, working mode** of the main inverter, and **the brand & model of the battery** in the parallel system according to the actual needs.
2. Set **the on-grid and off-grid discharge depth of the battery** according to the actual needs. (For unstable grid areas, to ensure the off-grid mode of the inverter is normal, check whether **the on-grid discharge depth** is $\leq 50\%$. If not, it is recommended to set it to below 50%.)
3. **Enable the backup power** function of the inverter, and **disable the AFCI detection function**.
4. Power on the PV side, battery side and ON-GRID side of the inverter. Turn off the BACK-UP load switch and the inverter is running in on-grid mode. Check whether the inverter generates alarms and the inverter **working status is on-grid** via SolarGo App.
5. Power off the ON-GRID side of the inverter, the PV side and the battery side. Make the BACK-UP load switch is turned off, and the inverter is running in off-grid mode. Check whether the inverter generates alarms and the inverter **working status is off-grid** via SolarGo App.
6. Power on the ON-GRID side of the inverter when the inverter is off-grid, and the inverter enters into on-grid mode. Check whether the inverter generates alarms and the inverter **working status is on-grid** via SolarGo App.



SolarGo App
User Manual

5 Troubleshooting

No.	Error	Cause	Solution
1	Communication indicator of the inverter and Ezlink indicator in error	Ezlink connection failed	<ol style="list-style-type: none"> 1. Check whether the WiFi signal is normal. If it is not, check whether the router works well. 2. Check whether Ezlink obtains IP successfully via APP. Execute the following if IP is not obtained: <ol style="list-style-type: none"> 1. Reset the communication parameters via APP. 2. Check whether the server connection is correct. 3. Log in to the website mqtt.goodwe-power.com in PC, check the analyzed IP address and obtain the connected server information.
2	Unable to log in to the parallel system interface in APP	Parallel networking failed	<ol style="list-style-type: none"> 1. Incorrect communication cable connection or unreliable cable connection cause communication failure. 2. Connect the smart meter and Ezlink module to the same master inverter to ensure the success rate of networking. 3. Check whether the inverter communication indicator is normal. If it is not, please check the individual inverter according to its own troubleshooting method. 4. If the above methods cannot solve the problem, please try to restart the inverter and get networking again.
3	Parallel IO check fail	Communication of parallel inverters in error	<ol style="list-style-type: none"> 1. Check whether the parallel communication cable is connected correctly and firmly. 2. If the communication cable connection is normal, it may be an internal communication failure. Please contact the dealer or After Sale Service.
4	Parallel Grid line reversed	AC L and N cables are connected reversely.	Check the grid wiring. Reconnect the ON-GRID AC cable to make sure the grid is wired correctly.
5	Battery indicator abnormal	Battery failure	<ol style="list-style-type: none"> 1. Check the BMS communication cable connection, and make sure it is reliable. 2. Check whether the battery type is matched via APP. If you can't solve it, please refer to the user manual of the corresponding battery for troubleshooting.
6	Device offline displayed on APP	Communication failure or equipment failure	<ol style="list-style-type: none"> 1. Check whether the quantity of parallel machines in the system is the same with the actual connected ones. 2. If it is, get the SN of the corresponding offline inverter from the equipment list, and troubleshoot the corresponding inverter according to its user manual. 3. Check whether the communication connection of the equipment is normal, with no loose, aging or wrong connection, etc.