

SH15T / SH20T / SH25T

Multi-Hybrid System Micro-Grid without Grid Scenario Note



Summary

More detailed information for SH15-25T, that may not be included in user manual.

About This Manual

This document mainly describes the application scenarios and the system configuration for multi-inverter hybrid systems. It also describes the requirements and the parameter settings for the hybrid system. Users can visit support.sungrowpower.com to get the user manual for each component.

Validity

This manual is valid for the following model of low-power grid-connected PV string inverters:

- SH15T
- SH20T
- SH25T

It will be referred to as "inverter" hereinafter unless otherwise specified.

Target Group

This manual is intended for professional technicians who are responsible for installation and they must have the following qualifications:

- Knowledge of electronic, electrical wiring and mechanical expertise, and be familiar with electrical and mechanical schematics.
- Professional skills of installation and commissioning of electrical equipment.
- Knowledge of how to deal with hazards or emergencies that occur during installation and commissioning.
- Be familiar with local standards and relevant safety regulations of electrical systems.

Abbreviation

- EMS: Energy Management System
- CT: Current Transformer
- PV: Photovoltaic
- ESS: Energy Storage System
- PE: Protective Earth
- Com.: Communication
- MCB: Micro Circuit Breaker
- ATS: Automatic Transfer Switch

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1 Scenario Overview

The three-phase hybrid inverters are applicable to both on-grid and off-grid PV energy storage systems (PV ESS). With the integrated Energy Management System (EMS), they can control and optimize the energy flow so as to greatly increase the self-consumption of the system.

SUNGROW offers a variety of solutions especially for PV systems that are no longer allowed or intended to feed PV power into the grid due to restrictions imposed by the grid operator. These solutions will maximize self-consumption and reduce grid purchase costs to a minimum. The following tables list the application scenarios and system configurations.

1.1 Micro Grid Scenarios without Grid

These scenarios are used when generator is connected but not the grid. The following table describes the system configuration for each scenario.

Table 1. System Configuration for Each Scenario

Scenario	PV	Battery	Energy Meter	Com. device	Smart switch*	ATS	Gen.*	Grid
One Backup Port								
One Load, ≤ 4 units	○	●	●	●	×	×	●	×
All Backup Ports								
One Load, ≤ 4 units	○	●	●	●	×	×	●	×

● Required, ○ Optional, × Not required.

* The Gen. (generator) is prepared by the customer.

2 Micro Grid Scenarios without Grid

2.1 One Backup Port One Load (≤ 4 units)

At most 4 hybrid inverters with the **same model** can be configured in this scenario. All the **GRID** terminals of the hybrid inverters are connected in parallel, while the **LOAD** terminals and the battery terminals **are not** in parallel, as shown in the following figure.

In this scenario, there is no grid but only a generator, and each hybrid inverter will independently provide power to the load connected to the **LOAD** port.

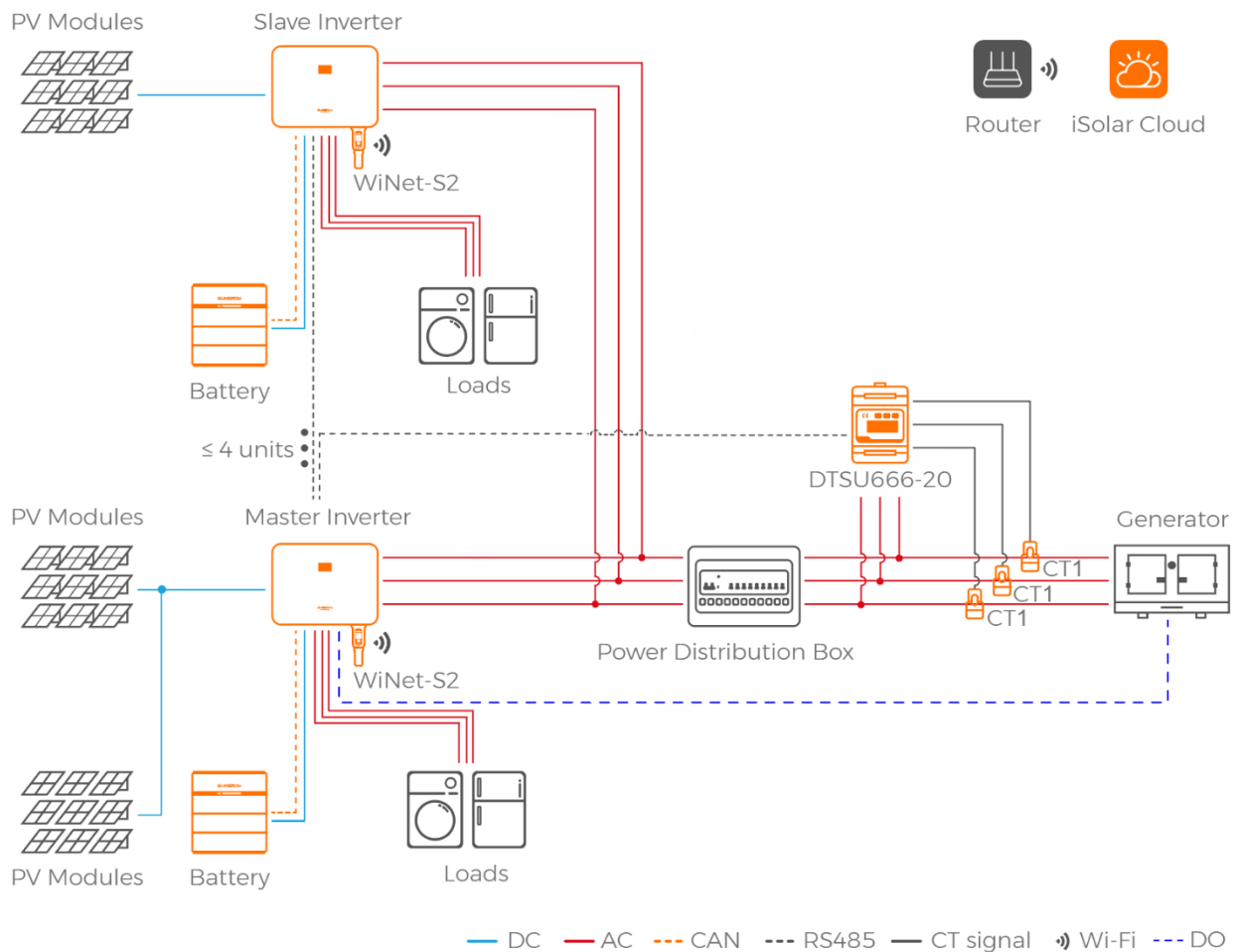


Figure 1. Micro Grid Scenarios without Grid (One Backup Port One Load)

* The system connection diagram only describes the scenario and does not contain all details. It is for your reference only.

The system supports off-grid operation. The system provides power to the loads connected to each **LOAD** port. When the load power exceeds the PV power, the battery will discharge to provide energy supplement.

2.1.1 Configuration

The following table describes the key components in the system.

Table 2. System Components

Component	Model/Type	Quantity	Description
Hybrid inverter	SH15T / SH20T / SH25T	≤4	The inverter model must be the same.
Communication device	WiNet-S2	1 pcs for each inverter	Included in inverter package.
Smart Energy Meter	DTSU666-20	1 pcs	Included in inverter package. Only one DTSU666-20 is needed in the parallel system and it must be connected to the master inverter.
Current Transformer (CT)	250 A/333 mV	3 pcs	As soon as more than 1 SHT is installed in the system, the included 100 A/333 mV CT should not be used due to maximum import current from grid for each inverter is 63A. The 250 A/333 mV CT needs to be purchased separately from SUNGROW.
RS485 communication cable for DTSU666-20	Shielded twisted pair	8 m	Included in inverter package. When the communication distance exceeds 8 m, prepare a shielded twisted pair cable with a length of less than 50 m on site.
Termination resistor	120 Ω	1 pcs	Included in inverter package. ● When meter communication cable length exceeds 10 m, parallel a 120 Ohm resistor to the wiring terminals on the meter.
AC Micro circuit breaker	Type B, 63A/400V;	1 pcs for each inverter	Not included in inverter package. Users need to purchase the MCB with the recommended specification. If type B is not available, type C can also be used. It must be installed to the GRID port on every hybrid inverter.
Battery ⁽¹⁾	SBR096-256, SBH100-400	1-4 units for each inverter	Not included in inverter package and should be purchased separately from SUNGROW. The battery model in parallel should be exactly the same
Generator with controller ⁽²⁾	/	1 pcs	Not included in inverter package and should be prepared by customer

(1) The supported battery models and battery racks in parallel for different countries may differ. For Europe, maximum 2 units with Y-connector is supported.

(2) For some old generators without DI port, user should prepare a generator controller integrated with DI port. Generator controller brand SmartGen or Deepsea is recommended.

2.1.2 Features

- 1) The **COM2** and **NO2** terminals on **COM2** port are for the DO connection. There are three Start/Stop Control modes for the generator.

When the control mode is set to **Manual control**, the generator start/stop is not performed by the inverter.

Mode	Running Description	Remark
Controlled by SOC	<p>Generator Start: When the battery SOC falls below Lower Limit of SOC to Start Genset, the inverter issues a command to start the generator through DO communication the generator starts to work. The battery will stop discharging. The generator supplies power to the loads first and then charges the battery.</p>	Select these modes when users want to control the generator through the DO communication.
	<p>Generator Stop: When the battery SOC is equal to or higher than Upper Limit of SOC to Stop Genset, the inverter issues a command to stop the generator through DO communication and the generator does not work. The load power consumption will come from PV power and the battery will discharge if the PV power is insufficient.</p>	
Forced Start/Stop	<p>Forced Start: The inverter issues a command to start the generator through DO communication and the generator starts to work. The generator supplies power to the loads first and then charges the battery.</p>	
	<p>Forced Stop: The inverter issues a command to stop the generator through DO communication and the generator will not work, unless user starts the generator manually. The load power consumption will come from PV power and battery discharging if PV is not sufficient.</p>	
Manual Control	Start/Stop the generator by external means, such as the switch on the generator.	Select this mode when users do not want to control the generator through the DO communication.

Note: When a mode other than **Manual control** is set, the user can also start/stop the generator by external means, but the control mode setting on the App will not be

modified, and the inverter will no longer control the start/ stop of the generator, requiring manual start/stop.

- 2) Generator silent mode is available, that is, enable **Forbid Genset Night-time Operation** and set the start/stop time period, the generator does not work during the period.
- 3) After the generator starts, the loads power come entirely from generator, and the battery charging power comes from the PV power first, if the PV power is insufficient, the remaining output power of the generator will be used to charge the battery.

Example:

Parameter Setting	Result
Generator Output Power = 100.00 kW	
Loads power = 90.00kW	Battery charging power comes entirely from PV power
PV Power = 40.00 kW	
Max. Battery Charge Power= 30.00 kW	
Generator Output Power = 100.00 kW	
Loads power = 90.00kW	Battery charging power = [20+(100-90)] kW
PV Power = 20.00 kW	
Max. Battery Charge Power= 30.00 kW	
Generator Output Power = 100.00 kW	
Loads power = 90.00kW	Battery charging power = (100-90) kW
PV Power = 0.00 kW	
Max. Battery Charge Power= 30.00 kW	

Note: In Microgrid System Mode, the hybrid inverter is used to charge the battery.

- 4) When the inverter is in DO control mode, **Number of Genset starts/stops on the Day** and **Number of Genset starts/stops in Total** of the generator will be collected. You can periodically maintain the generator based on the data.
- 5) Online firmware update in micro-grid scenario will cause power failure to loads.

2.1.3 Requirements

Hybrid Inverter

- 1) The hybrid inverters in parallel must be of the same model.
- 2) The inverter firmware version should be PEARL-H_B000.V000.P038-20240807 and later.
- 3) When installing the inverter, heat dissipation should be considered. See the following figures for the clearance requirements.

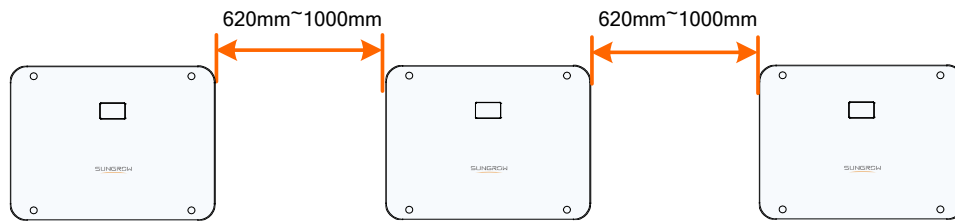


Figure 2. Clearance Requirement for Single-row Installation

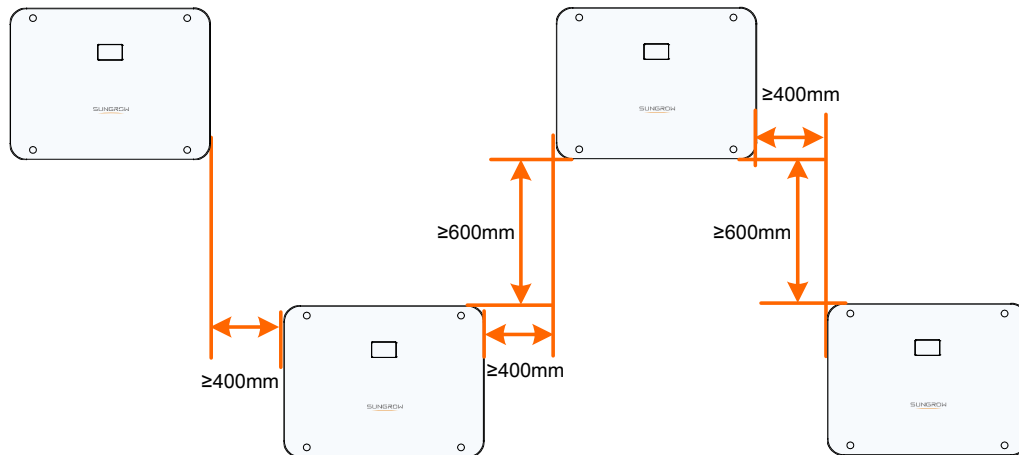


Figure 3. Clearance Requirement for Multiple-row Installation

- 4) The AC micro circuit breaker (MCB) must be installed to the **GRID** port for each inverter. All system components must be protected by appropriate circuit breakers and RCD. Refer to user manual and local regulation for the type selection.
- 5) The **BAT+** terminals on each hybrid inverter cannot be in parallel. Neither do the **BAT-** terminals.
- 6) For AC parallel connection, make sure that the phase in parallel must be the same, i.e., phase 1 (**GR**), phase 2 (**GS**), phase 3 (**GT**) and neutral (**GN**) wires from each **GRID** port should be paralleled respectively.

The following figures for the AC connection for the system and it is only for reference. Perform additional RCD installation on **GRID** port of inverter and PV sub-construction grounding for lightning protection as per local regulations.

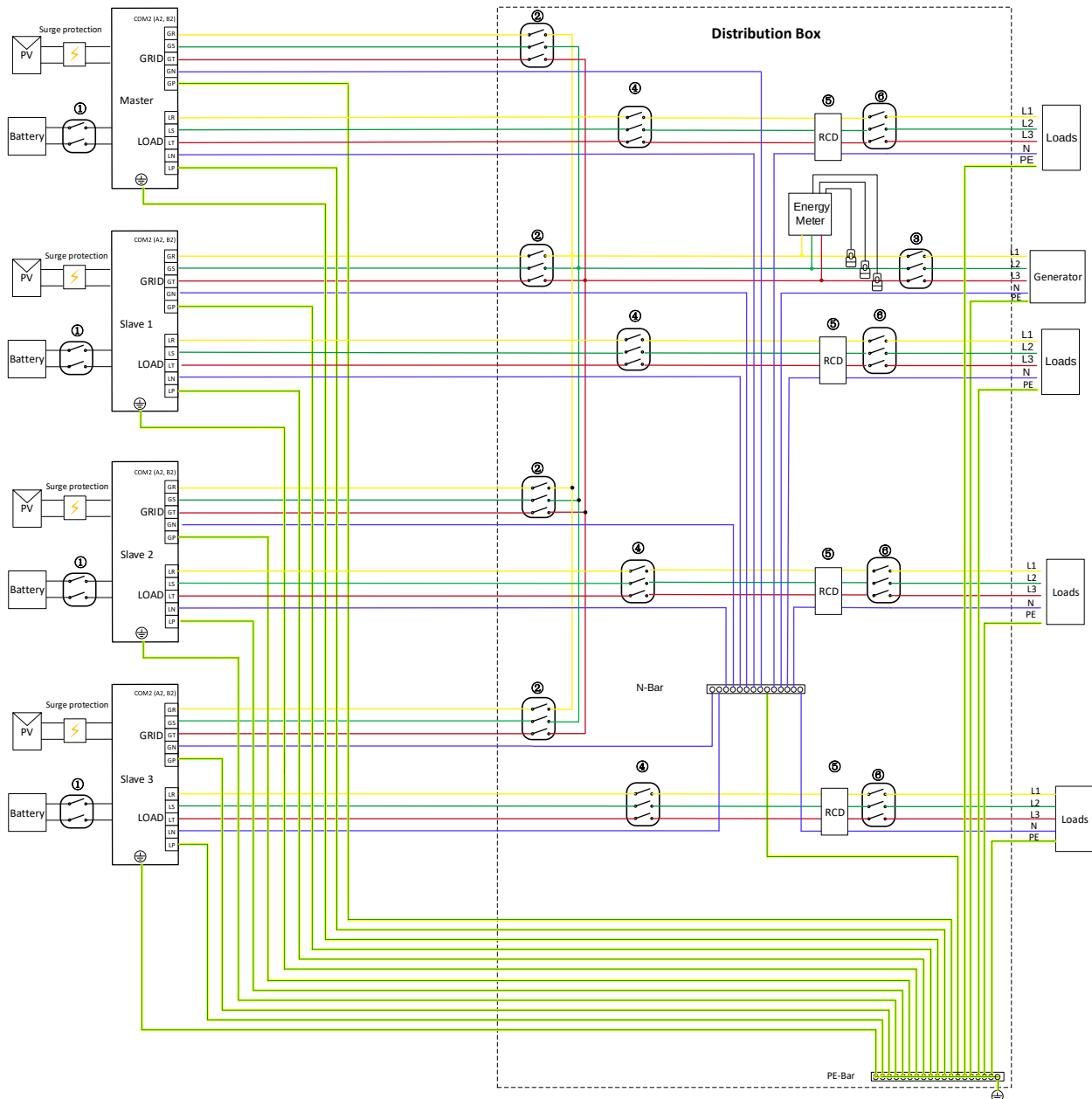


Figure 4. AC Cable Connection (For Australia and New Zealand)

- | | |
|--|---|
| ① 63 A/800 V DC breaker * | ② AC micro circuit breaker (type B / type C)
63 A/400 V |
| ③ AC breaker (Depends on the rated power of the generator) | ④ AC breaker (Depends on the power of all household loads connected to a single inverter) |
| ⑤ 30 mA RCD (Comply with local regulation) | ⑥ AC breaker (Depends on load power) |

* If the battery is integrated with a DC breaker, no additional DC breaker required.

- 7) RS485 communication cable between two inverters should be shielded twisted pair and the recommended cable cross-sectional area is 0.2-0.5 mm². The wiring terminals are on the **COM1** port, as shown in the following figure.

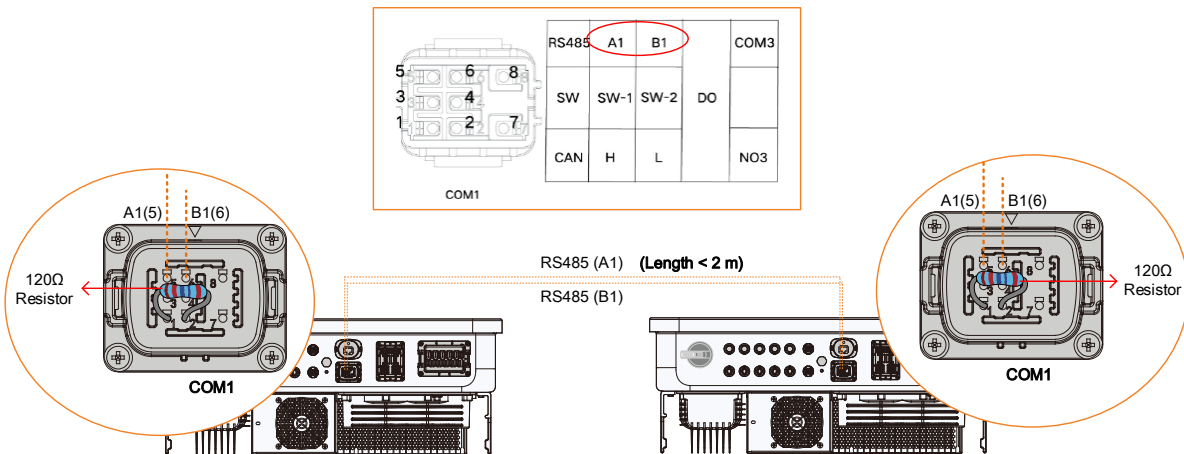


Figure 5. RS485 Connection between Inverters

- 8) Load capacity of the **parallel LOAD** port = (Load capacity of single **LOAD** port) * (number of **LOAD** ports in parallel). For detailed load capacity of the single **LOAD** port, please contact SUNGROW for details.

PV and Battery

- For system safety, it is recommended that the open circuit voltage of the PV strings does not exceed 800 V.
- When configuring PV modules, ensure that each hybrid inverter is configured evenly. Otherwise, PV power generation will be wasted.

For example:

SH25T 1	SH25T 2	System Output Capability
PV Power=30kW	PV Power=0 Battery Output Power=5kW	System Output Power=30kW (SH25T 1 Output 25kW+SH25T 2 Output 5kW), Taking power from grid 40-30=10kW.
Load Power=40kW		Wasting 5kW PV generation power
PV Power= 15kW	PV Power= 15kW	System Output Power=40kW (SH25T 1 Output 20kW+SH25T 2 Output 20kW).
Battery Output Power=5kW	Battery Output Power=5kW	
Load Power=40kW		No need to take power from grid.

- Batteries must be connected. Up to 4 battery units can be paralleled for each inverter. The battery model in parallel should be exactly the same.
- The battery power should be determined according to the total load power. If the total load power reaches 80% of the inverter rated power, it is recommended that battery power = the inverter rated power. Otherwise, during off-grid operation, the battery cannot provide sufficient power to load due to its low power. For example, for an 25kW inverter, when the total load power is $\geq 20\text{kW}$, the recommend battery specification should be not less than SBH350 (SBH350 power is about 24.6kW).

- 6) The RS485 communication cable for DTSU666-20 is connected to the wiring terminals on the **COM2** port on inverter bottom, as shown in the following figure.

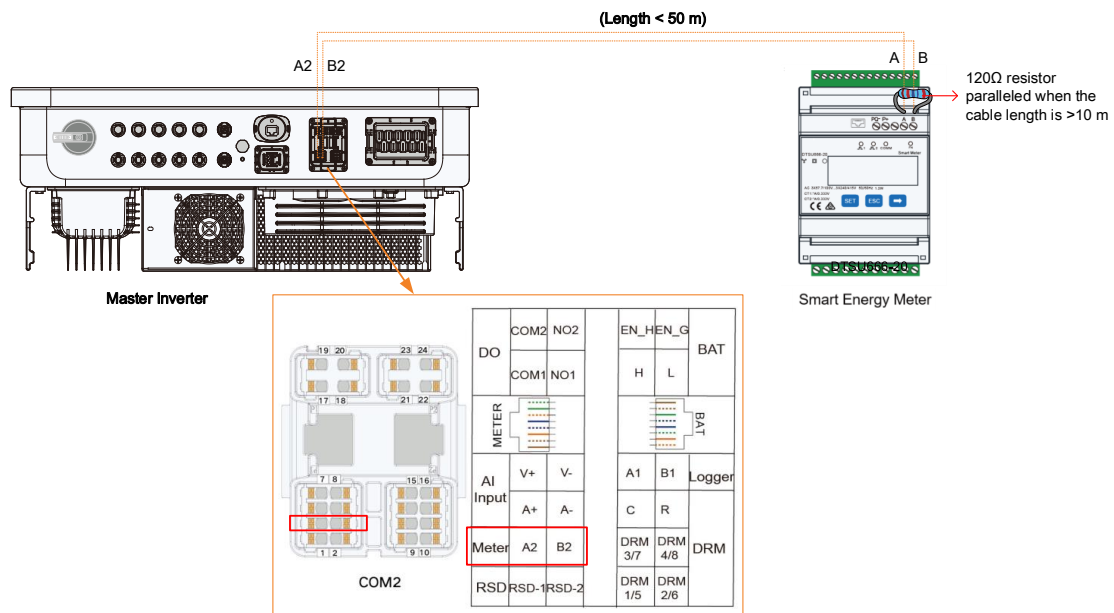


Figure 7. RS485 Connection between DTSU666-20 and the Master Inverter

Generator

- 1) The rated power of the generator must be at least equal to the total load power.
- 2) It is recommended that the rated power of the generator should be at least equal to the sum of inverter rated power and total load power.
- 3) It is recommended to choose the load-sensitive diesel generator (diesel generator with load-dependent power variation). If the generator has a constant output, please contact SUNGROW.
- 4) The generator has requirements for voltage and frequency. For details, please contact SUNGROW.
- 5) For some old generators without DI port, user should prepare a generator controller integrated with DI port.
- 6) The generator or controller should provide a DI port to connect to the DO port on the inverter. The **COM2** and **NO2** terminals on **COM2** port on the inverter are for the DO connection between inverter and generator.

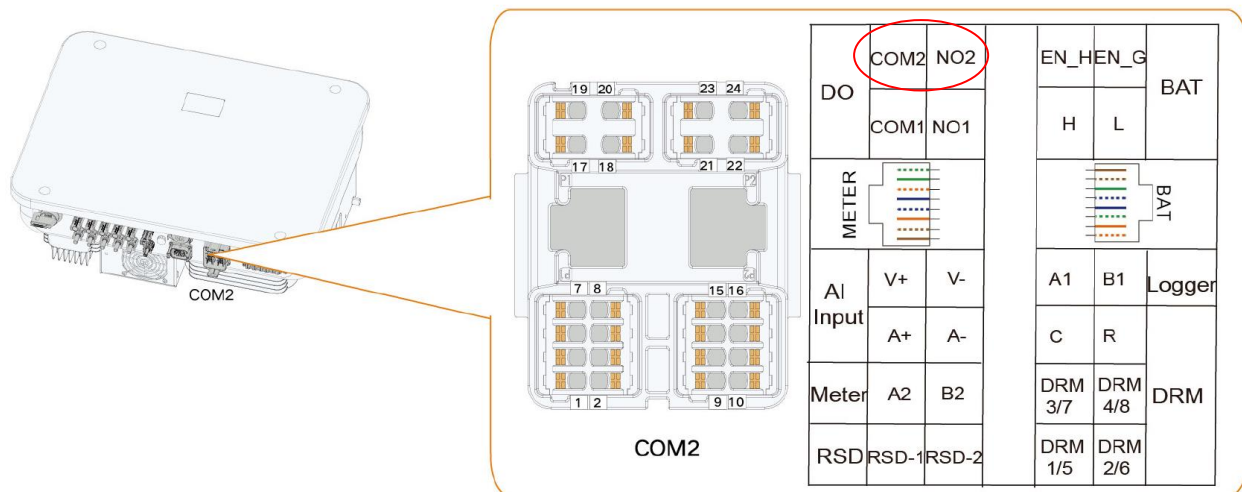


Figure 8. DO (COM2, NO2) Terminals for Communication with Generator

- 7) The cross-sectional area of the DO cable between the inverter and the generator should be $\leq 0.75 \text{ mm}^2$.
- 8) After the DO connection, set the control mode of the controller to make sure that the controller is controlled by the inverter DO, especially in existing generator retrofitting scenario. Otherwise, the DO communication and the control cannot make effect.

2.1.4 Settings

Login iSolarCloud App, see [3.1 Login the App](#). Perform the settings listed in the following table.

No.	Parameter Setting	Procedure
On the master in multi-hybrid system:		
1	Set Master-slave Mode , and set Master-Slave Setting , Total Number of Master and Slaves , Load Connection Type .	3.2 Master-Slave Setting and Feed-in Limitation
2	Set Energy Management Mode to Micro Grid System Mode.	3.6 Micro-Grid System Mode
3	Set DO Configuration to Micro Grid System Mode (If users control the generator in manual mode , no setting is required).	3.5 DO Configuration (Optional)
4	Set Microgrid System Parameters .	3.3 MicroGrid System Parameters
5	Enable Backup Mode .	3.4 Backup Mode and Parallel Off-grid SOC Balancing
On the slaves in multi-hybrid system:		
1	Enable the Master-Slave mode and set Slave 1 / Slave 2 / Slave 3 .	3.2 Master-Slave Setting and Feed-in Limitation

2.2 All Backup Ports One Load (≤ 4 units)

At most 4 hybrid inverters with the **same model** can be configured without utility grid and only generator in this scenario. Connect all **GRID** ports in parallel and all **LOAD** ports in parallel respectively. This system consists of PV strings, hybrid inverters, batteries, communication devices, generator, main household power distribution box and loads, as shown in the following figure.

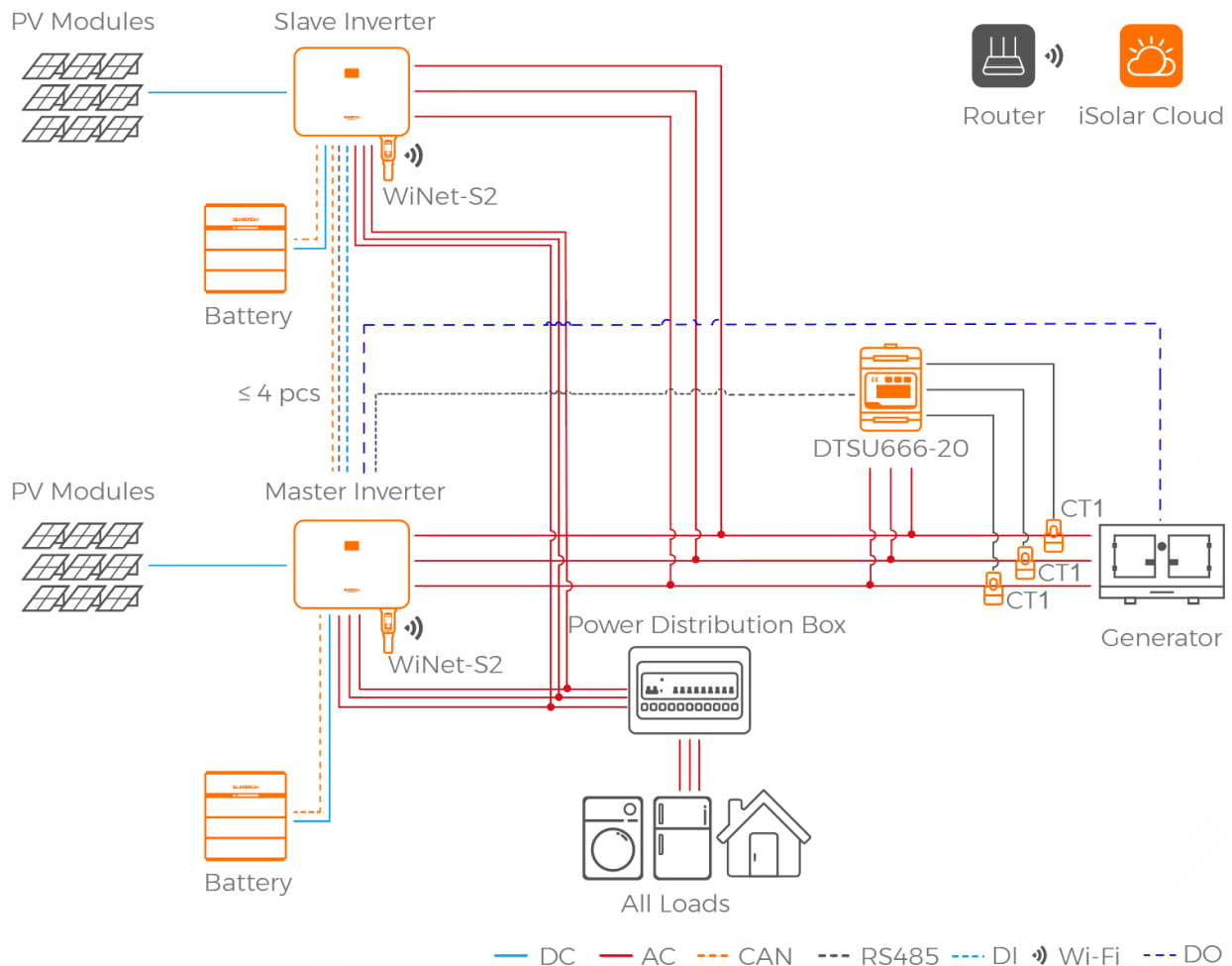


Figure 9. Micro Grid Scenario without Grid (≤ 4 units, All Backup Ports One Load)

Note: The system connection diagram only describes the scenario and does not contain all details.

2.2.1 Configuration

The following table describes the key components in the system.

Table 3. System Components

Component	Model/Type	Quantity	Description
Hybrid inverter	SH15T / SH20T / SH25T	2-4 units	The inverter model must be the same .
Communication device	WiNet-S2	1 pcs for each	Included in inverter package.

Component	Model/Type	Quantity	Description
inverter			
Smart Energy Meter	DTSU666-20	1 pcs	Included in inverter package. Only one DTSU666-20 is needed in the parallel system and it must be connected to the master inverter.
Current Transformer (CT)	250 A/333 mV	3 pcs	As soon as more than 1 SHT is installed in the system, the included 100 A/333 mV CT should not be used due to maximum import current from grid for each inverter is 63A. The 250 A/333 mV CT needs to be purchased separately from SUNGROW.
RS485 communication cable for DTSU666-20	Shielded twisted pair	8 m	Included in inverter package. When the communication distance exceeds 8 m, prepare a shielded twisted pair cable with a length of less than 50 m on site.
Termination resistor	120 Ω	2 or 3 pcs	Included in inverter package. <ul style="list-style-type: none"> For CAN communication in parallel system, a 120 Ohm resistor need to be paralleled to the H and L terminals on the first and the last inverters in communication chain. For CAN communication in parallel system, a 120 Ohm resistor need to be paralleled to the H and L terminals on the first and the last inverters in communication chain.
AC Micro circuit breaker	Type B, 63A/400V;	1 pcs for each inverter	Not included in inverter package. Users need to purchase the MCB with the recommended specification. If type B is not available, type C can also be used. It must be installed to the GRID port on every hybrid inverter.
Battery ⁽¹⁾	SBR096-256, SBH100-400	1-4 units for each inverter	Not included in inverter package and should be purchased separately from SUNGROW. The batteries connected to each hybrid inverter must have the same model and quantity.
Generator with controller ⁽²⁾	/	1 pcs	Not included in inverter package and should be prepared by customer

(1) The supported battery models and battery racks in parallel for different countries may differ. For Europe, maximum 2 units with Y-connector is supported.

(2) For some old generators without DI port, user should prepare a generator controller integrated with DI port. Generator controller brand SmartGen or Deepsea is recommended.

2.2.2 Features

- 1) The **COM2** and **NO2** terminals on **COM2** port are for the DO connection. There are three Start/Stop Control modes for the generator.

When the control mode is set to **Manual control**, the generator start/stop is not performed by the inverter.

Mode	Running Description	Remark
Controlled by SOC	Generator Start: When the battery SOC falls below Lower Limit of SOC to Start Genset , the inverter issues a command to start the generator through DO communication and the generator starts to work. The battery will stop discharging. The generator supplies power to the loads first and then charges the battery.	Select these modes when users want to control the generator through the DO communication.
	Generator Stop: When the battery SOC is equal to or higher than Upper Limit of SOC to Stop Genset , the inverter issues a command to stop the generator through DO communication the generator does not work. The load power consumption will come from PV power and the battery will discharge if the PV power is insufficient.	
Forced Start/Stop	Forced Start: The inverter issues a command to start the generator through DO communication and the generator starts to work. The generator supplies power to the loads first and then charges the battery.	
	Forced Stop: The inverter issues a command to stop the generator through DO communication and the generator will not work, unless user starts the generator manually. The load power consumption will come from PV power and battery discharging if PV is not sufficient.	
Manual Control	Start/Stop the generator by external means, such as the switch on the generator.	Select this mode when users do not want to control the generator through the DO communication.

Note: When a mode other than **Manual control** is set, the user can also start/stop the generator by external means, but the control mode setting on the App will not be modified,

and the inverter will no longer control the start/ stop of the generator, requiring manual start/stop.

- 2) Generator silent mode is available, that is, enable **Forbid Genset Night-time Operation** and set the start/stop time period, the generator does not work during the period.
- 3) After the generator starts, the loads power come entirely from generator, and the battery charging power comes from the PV power first, If the PV power is insufficient, the remaining output power of the generator will be used to charge the battery.

Example:

Parameter Setting	Result
Generator Output Power = 100.00 kW Loads power = 90.00kW PV Power = 40.00 kW Max. Battery Charge Power= 30.00 kW	Battery charging power comes entirely from PV power
Generator Output Power = 100.00 kW Loads power = 90.00kW PV Power = 20.00 kW Max. Battery Charge Power= 30.00 kW	Battery charging power = [20+(100-90)] kW
Generator Output Power = 100.00 kW Loads power = 90.00kW PV Power = 0.00 kW Max. Battery Charge Power= 30.00 kW	Battery charging power = (100-90) kW

Note: In Microgrid System Mode, the hybrid inverter is used to charge the battery.

- 4) When the inverter is in DO control mode, **Number of Genset starts/stops on the Day** and **Number of Genset starts/stops in Total** of the generator will be collected. You can periodically maintain the generator based on the data.
- 5) Online firmware update in micro-grid scenario will cause power failure to loads.

2.2.3 Requirements

Hybrid Inverter

- 1) The hybrid inverters in parallel must be of the same model.
- 2) The inverter firmware version should be PEARL-H_B000.V000.P038-20240807 and later.
- 3) When installing the inverter, heat dissipation and CAN communication cable length (less than 2 m) should be considered. For better heat dissipation and CAN communication, please follow the horizontal clearance requirement as shown in the following figure.

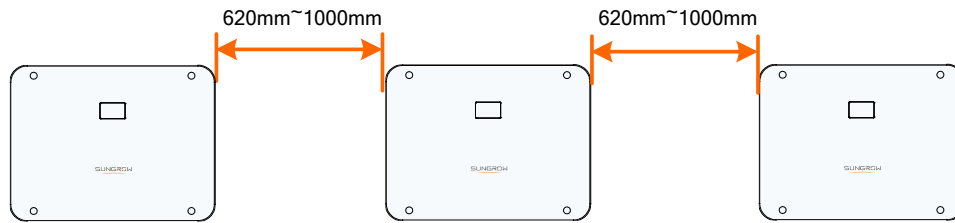


Figure 10. Clearance Requirement for Single-row Installation

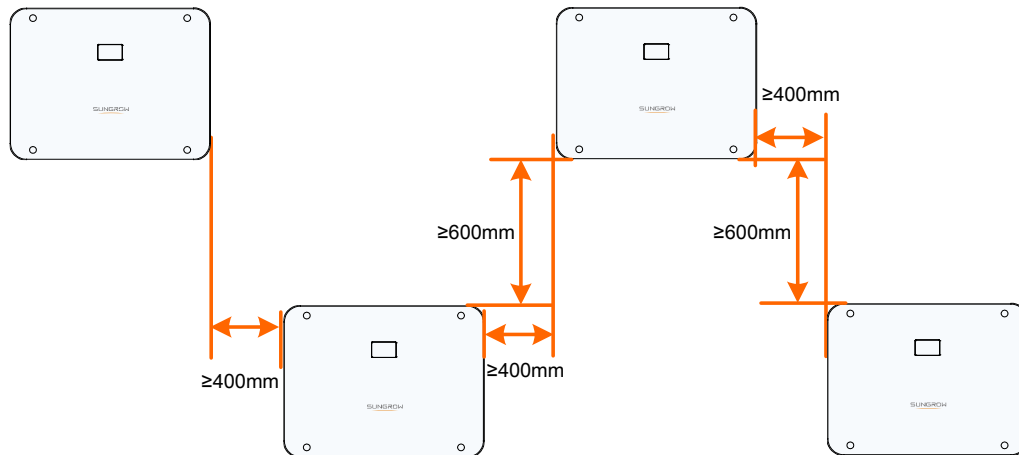


Figure 11. Clearance Requirement for Multiple-row Installation

- 4) The AC micro circuit breaker (MCB) must be installed to the **GRID** port for each inverter. All system components must be protected by appropriate circuit breakers and RCD. Refer to user manual and local regulation for the type selection.
- 5) The **BAT+** terminals on each hybrid inverter cannot be in parallel. Neither do the **BAT-** terminals.
- 6) For AC parallel connection, make sure that the phase in parallel must be the same, i.e., phase 1 (**GR**), phase 2 (**GS**), phase 3 (**GT**) and neutral (**GN**) wires from each **GRID** port should be paralleled respectively, and phase 1 (**LR**), phase 2 (**LS**), phase 3 (**LT**) and neutral (**LN**) wires from each **LOAD** port should be paralleled respectively.

The following figures for the AC connection for the system and it is only for reference. Perform additional RCD installation on **GRID** port of inverter and PV sub-construction grounding for lightning protection as per local regulations.

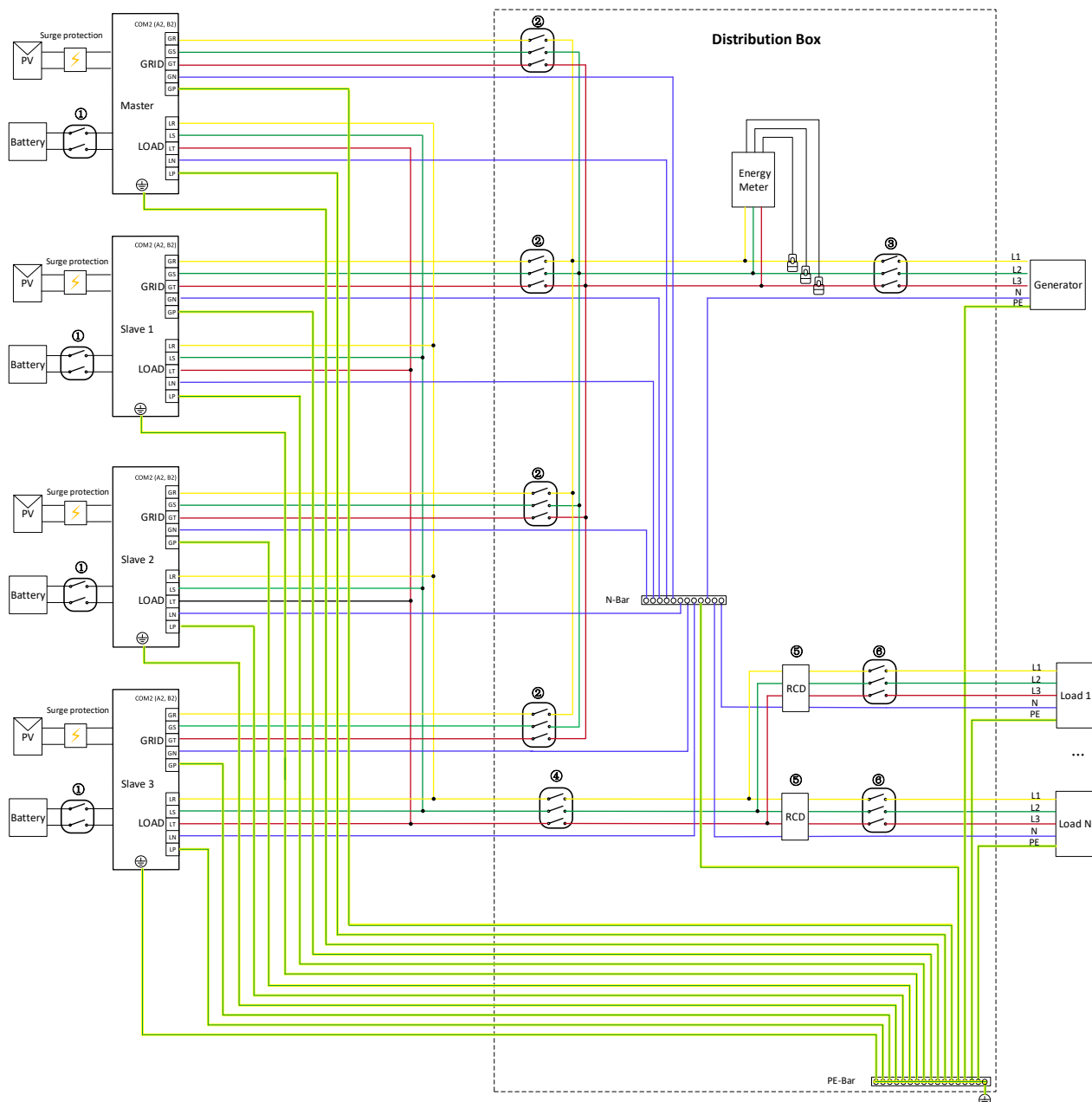


Figure 12. AC Cable Connection (For Australia and New Zealand)

① 63 A/800 V DC breaker *	② AC micro circuit breaker (type B) 63 A/400 V
③ AC breaker (Depends on the rated power of the generator)	④ AC breaker (Depends on the power of all household loads)
⑤ 30 mA RCD (Comply with local regulation)	⑥ AC breaker (Depends on load power)

* If the battery is integrated with a DC breaker, no additional DC breaker required.

- 7) To avoid current imbalance caused by inconsistent cable impedance, ensure that AC cables between the main household power distribution box and each inverter **GRID** port are of the same model, specifications, and length. Otherwise, the bypass overload may occur.
- 8) To avoid current imbalance caused by inconsistent cable impedance, ensure that AC cables between the main household power distribution box and each inverter **LOAD** port are of the same model, specifications, and length. Otherwise, the bypass

overload may occur.

- 9) CAN communication cable between two inverters should be shielded twisted pair and the recommended cable cross-sectional area is 0.2-0.5 mm². The shielding layer must be grounded, connecting to a signal grounding point or a protection earthing (PE) point (not the inverter PE point). The cable length should be less than 2 m. A 120 Ohm resistor must be paralleled to the H and L terminals on the first and the last inverters.
- 10) RS485 communication cable between two inverters: Shielded twisted pair and the recommended cable cross-sectional area is 0.2-0.5 mm². The cable length should be less than 2 m.

The wiring terminals are on the **COM1** port, as shown in the following figure.

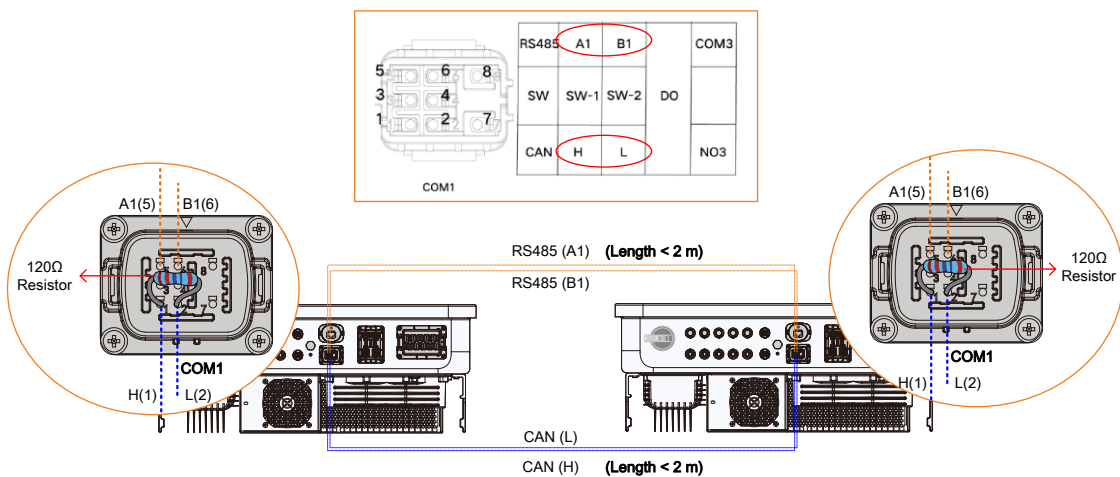


Figure 13. CAN and RS485 Connection between Inverters



Only parallel the 120 Ohm resistors to the H and L terminals on the first and the last inverters in communication chain, but not all inverters. Otherwise, the system cannot run normally.

- 11) The DI cable between inverters should be shielded twisted pair and the recommended cable cross-sectional area is 0.2-0.5 mm². The wiring terminals are on the COM1 port, as shown in the following figure.

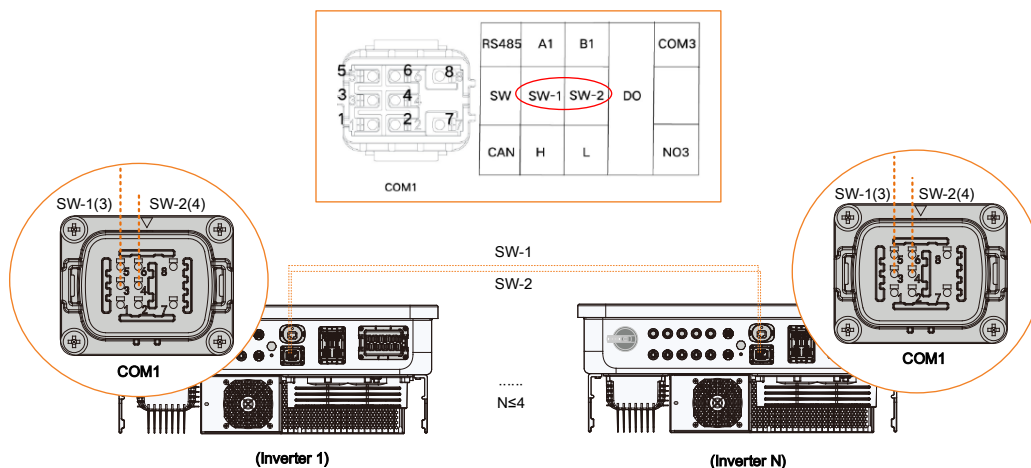


Figure 14. DI Connection between Inverters

- 12) Load capacity of the **parallel LOAD** port = (Load capacity of single **LOAD** port) * (number of LOAD ports in parallel). For detailed load capacity of the single **LOAD** port, please contact SUNGROW for details.

PV and Battery

- 1) When configuring PV modules, ensure that each hybrid inverter is configured evenly. Otherwise, PV power generation will be wasted.

For example:

SH25T 1	SH25T 2	System Output Capability
PV Power=30kW	PV Power=0 Battery Output Power=5kW	System Output Power=30kW (SH25T 1 Output 25kW+SH25T 2 Output 5kW), Taking power from grid 40-30=10kW.
Load Power=40kW		Wasting 5kW PV generation power
PV Power= 15kW	PV Power= 15kW	System Output Power=40kW (SH25T 1 Output 20kW+SH25T 2 Output 20kW).
Battery Output Power=5kW	Battery Output Power=5kW	
Load Power=40kW		No need to take power from grid.

- 2) Batteries must be connected. Up to 4 battery units can be paralleled for each inverter. For Europe, maximum 2 units in parallel with Y-connector is supported. The battery model in parallel should be exactly the same. **Also, the battery configuration for each inverter should be exactly the same**, that is, of the same capacity with the same battery model.
- 3) The battery power should be determined according to the total load power. If the total load power reaches 80% of the inverter rated power, it is recommended that battery power = the inverter rated power. Otherwise, during off-grid operation, the battery cannot provide sufficient power to load due to its low power. For example, for an 25kW inverter, when the total load power is $\geq 20\text{kW}$, the recommend battery specification should be not less than SBH350 (SBH350 power is about 24.6kW).

Meter RS485/CT

- 1) To ensure the correct energy flow, the external CTs of Smart Energy Meter should be installed in the position between the generator and hybrid inverter.
- 2) RS485 communication cable for DTSU666-20: Must be connected to the master inverter. The battery SOC balance is performed by the master inverter.
- 3) The CT ratio should be changed from 1 to 2 via iSolarCloud App since the default setting is 1 which stands for 100 A/333 mV.
- 4) When installing the CTs, ensure that the arrow on the CT points **to the inverter (current direction)**. The CT connection to DTSU666-20 and the CT location to grid phase line should be with the same phase.

CT Connection on DTSU666-20	CT Location on Generator Phase Line
IA, IA* (Yellow)	L1
IB, IB* (Green)	L2
IC, IC* (Red)	L3

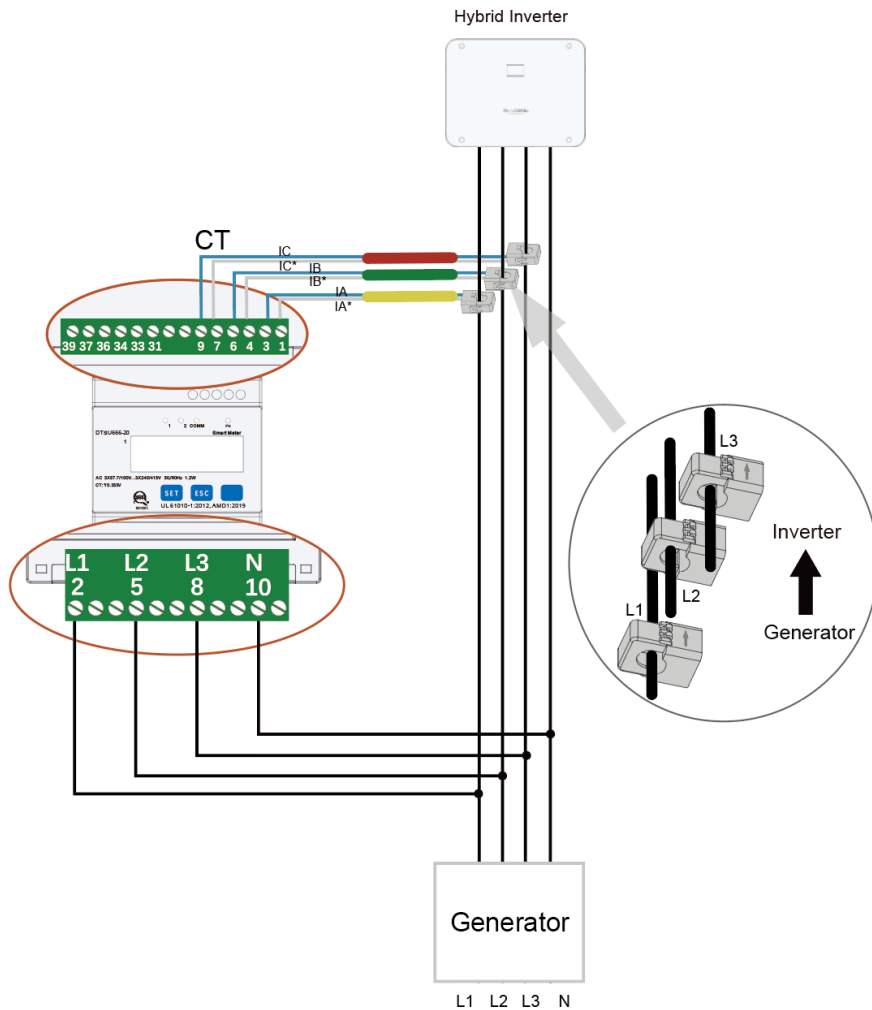


Figure 15. CT Connection to DTSU666-20 and CT Location to Generator Phase Line

- 5) RS485 communication cable for DTSU666-20: The cable length should be less than 50 m. When the length exceeds 10 m, a 120 Ohm resistor must be paralleled to the wiring terminals on the meter.
- 6) The RS485 communication cable for DTSU666-20 is connected to the wiring terminals on the **COM2** port on inverter bottom, as shown in the following figure.

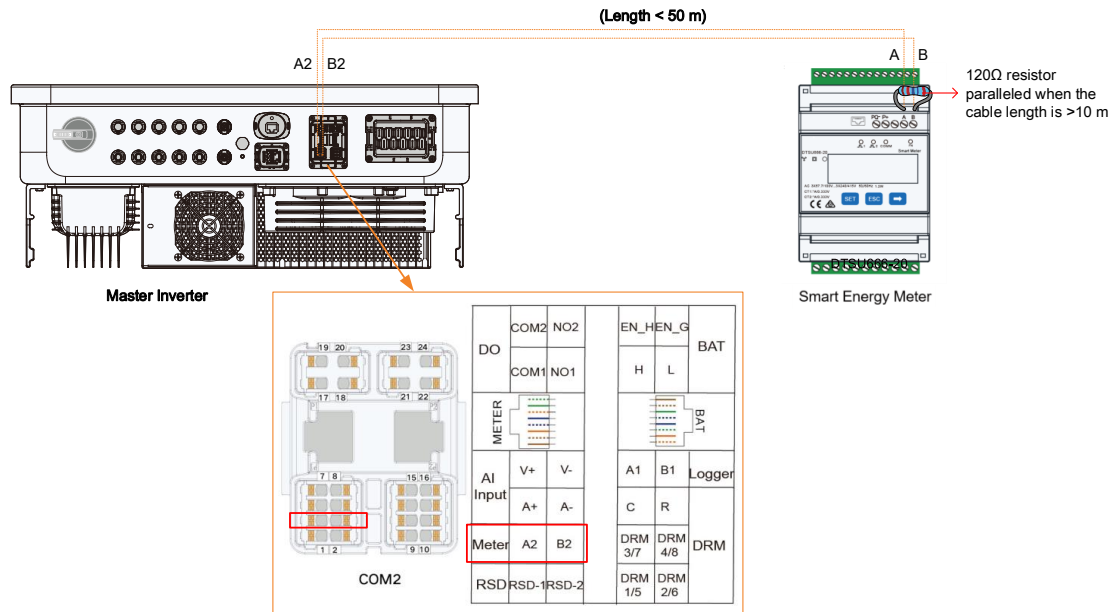


Figure 16. RS485 Connection between DTSU666-20 and the Master Inverter

Generator

- 1) The rated power of the generator must be at least equal to the total load power.
- 2) It is recommended that the rated power of the generator should be at least equal to the sum of inverter rated power and total load power.
- 3) It is recommended to choose the load-sensitive diesel generator (Diesel generator with load-dependent power variation) . If the generator has a constant output, please contact SUNGROW.
- 4) The generator has requirements for voltage and frequency. For details, please contact SUNGROW.
- 5) For some old generators without DI port, user should prepare a generator controller integrated with DI port.
- 6) The generator or controller should provide a DI port to connect to the DO port on the inverter. The **COM2** and **NO2** terminals on **COM2** port on the inverter are for the DO connection between inverter and generator.

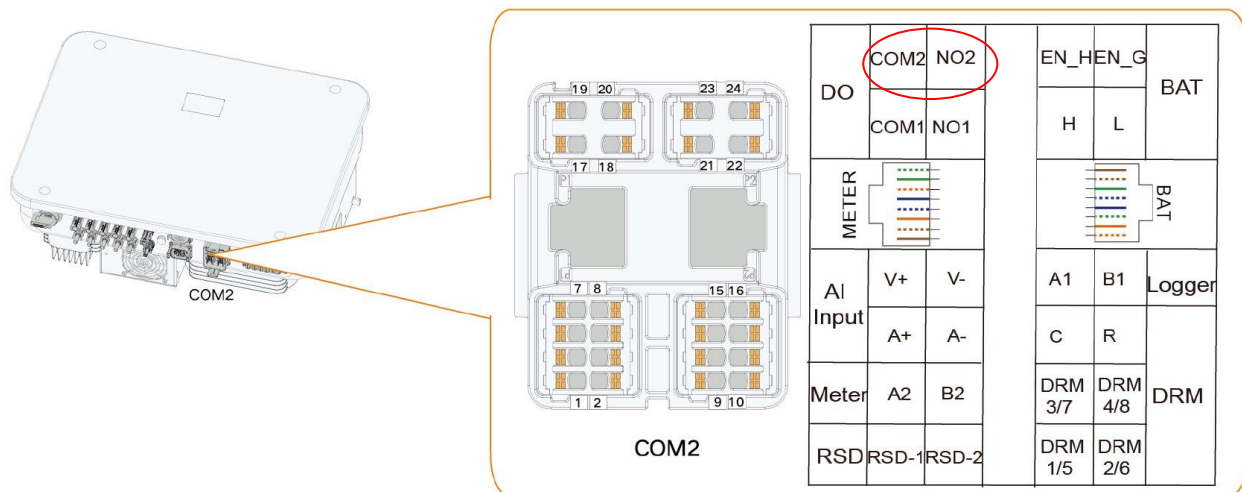


Figure 17. DO (COM2, NO2) Terminals for Communication with Generator

- 7) The cross-sectional area of the DO cable between the inverter and the generator should be $\leq 0.75 \text{ mm}^2$.
- 8) After the DO connection, set the control mode of the controller to make sure that the controller is controlled by the inverter DO, especially in existing generator retrofitting scenario. Otherwise, the DO communication and the control cannot make effect.

2.2.4 Settings

Login iSolarCloud App, see [3.1 Login the App](#). Perform the settings listed in the following table.

No.	Parameter Setting	Procedure
on the master in multi-hybrid system:		
1	Set Master-slave Mode , and set Master-Slave Setting , Total Number of Master and Slaves , Load Connection Type .	3.2 Master-Slave Setting and Feed-in Limitation
2	Set Energy Management Mode to Micro Grid System Mode.	3.6 Micro-Grid System Mode
3	Set DO Configuration to Micro Grid System Mode (If users control the generator in manual mode , no setting is required).	3.5 DO Configuration (Optional)
4	Set Microgrid System Parameters .	3.3 MicroGrid System Parameters
5	Enable Backup Mode .	3.4 Backup Mode and Parallel Off-grid SOC Balancing
On the slaves in multi-hybrid system:		
1	Enable the Master-Slave mode and set Slave 1 / Slave 2 / Slave 3 .	3.2 Master-Slave Setting and Feed-in Limitation

3 Parameter Setting

For the parameter setting described in this document, please log in iSolarCloud App via **Local Access** mode and with admin permission.

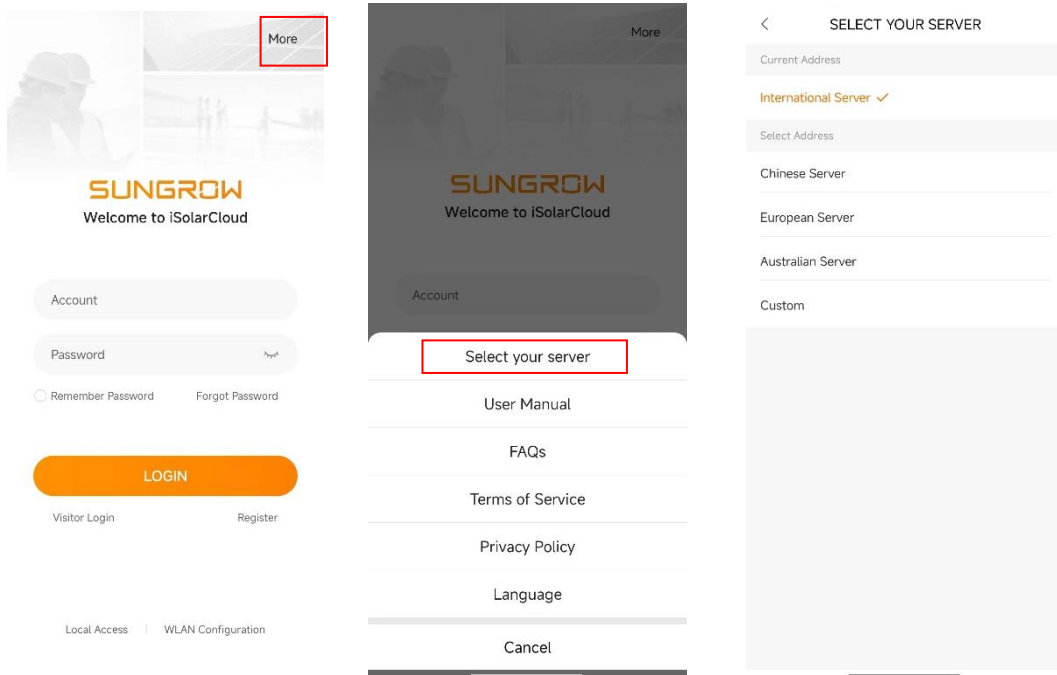


The images shown here is for reference only. Please set the parameters according to the actual situation.

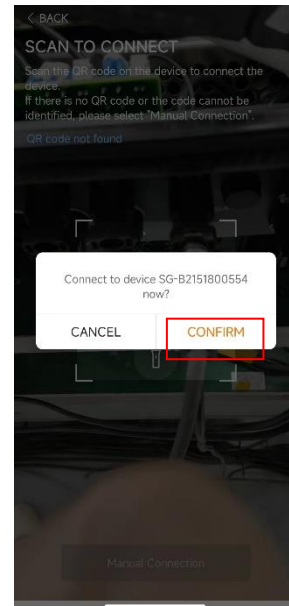
3.1 Login the App

For the parameter setting described in this document, please log in iSolarCloud App via **Local Access** mode and with **admin** permission.

1. Open the App, tap “**More**” on the upper-right corner. Select your server according to actual situation.

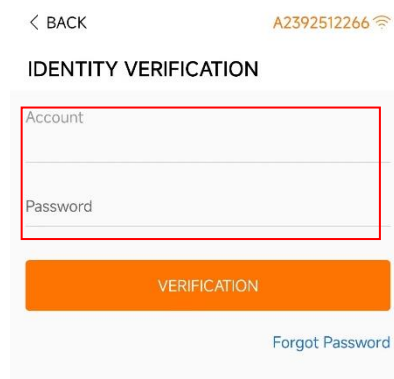


2. Tap “**Local Access**”, scan the QR code on the communication device WiNet-S2. Activate the device as prompted and confirm to connect to it.



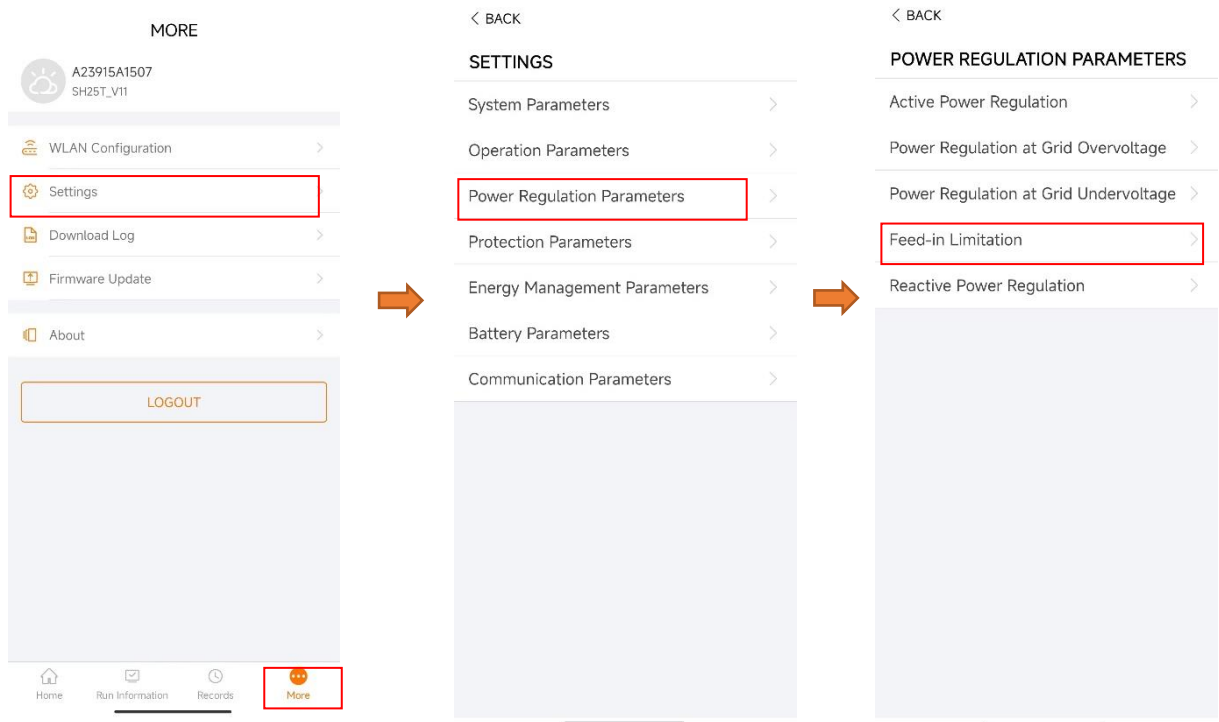
Note: Also you can enable the WLAN of your mobile phone and connect to the communication device's Wi-Fi SSID first. Then when you scan the QR code, you just tap **"CONFIRM"** on the prompt for successfully connection.

- Input the account as **"admin"** and the password. Tap **"VERIFICATION"**. You can perform the parameter settings then.

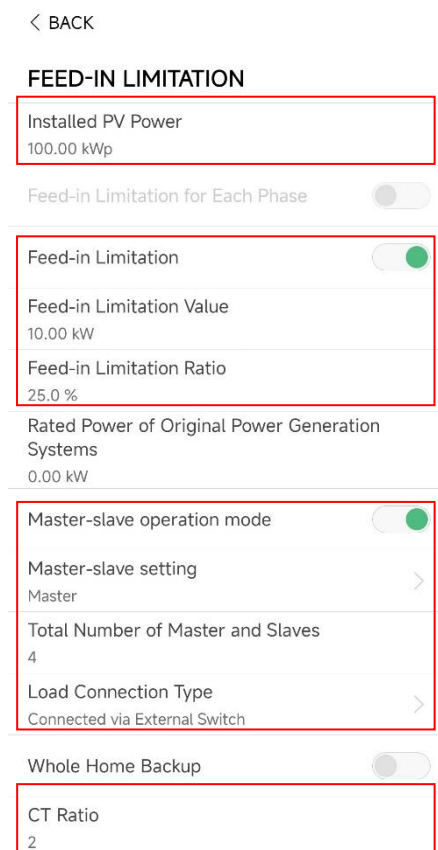


3.2 Master-Slave Setting and Feed-in Limitation

1. Tap “More” -> “Settings” -> “Power Regulation Parameters” -> “Feed-in Limitation”.



2. Set parameters on the master inverter.



Parameter	Setting/Option
Master-slave operation mode	Enable
Master-Slave Setting	Master
Total Number of Master and Slaves	Consistent with the system configuration
Load Connection Type	According to the actual connection type: <ul style="list-style-type: none"> ● One Backup Port One Load ● All Backup Ports One Load ● Connected via External Switch
CT Ratio	2

3. Set only the parameters circled for the slave inverters.

FEED-IN LIMITATION

Installed PV Power
25.00 kWp

Feed-in Limitation for Each Phase ☐

Feed-in Limitation ☒

Feed-in Limitation Value
15.00 kW

Feed-in Limitation Ratio
60.0 %

Rated Power of Original Power Generation Systems
0.00 kW

Master-slave operation mode ☒

Master-slave setting
Slave 1

Load Connection Type
All Backup Ports One Load

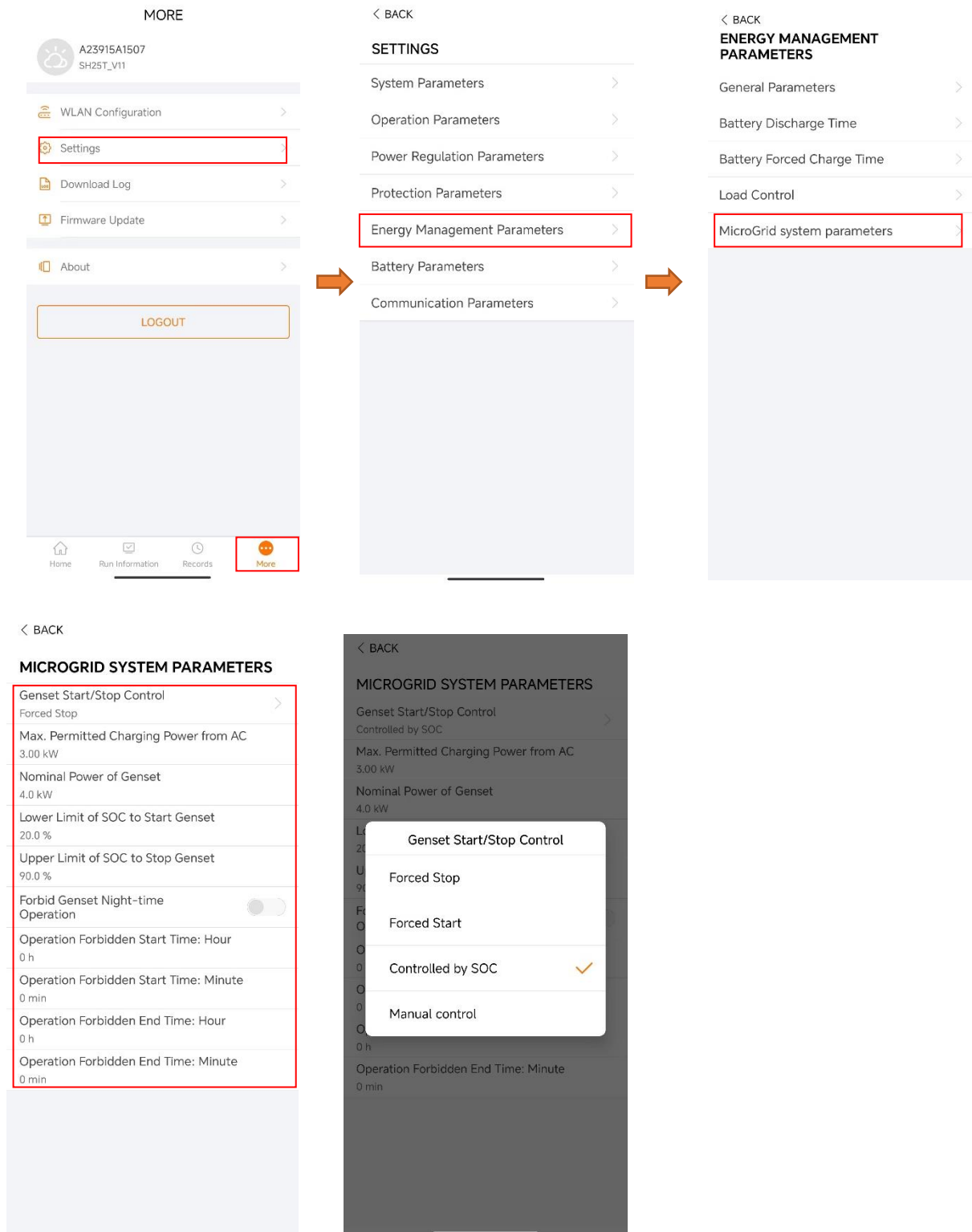
Whole Home Backup ☐

Parameter	Setting
Master-slave operation mode	Enable
Master-Slave Setting	Slave 1 / Slave 2 / Slave 3

3.3 MicroGrid System Parameters

Note: Only need to set the parameter on the Master.

Tap “More” -> “Settings” -> “Energy Management Parameters” -> “MicroGrid System Parameters”.



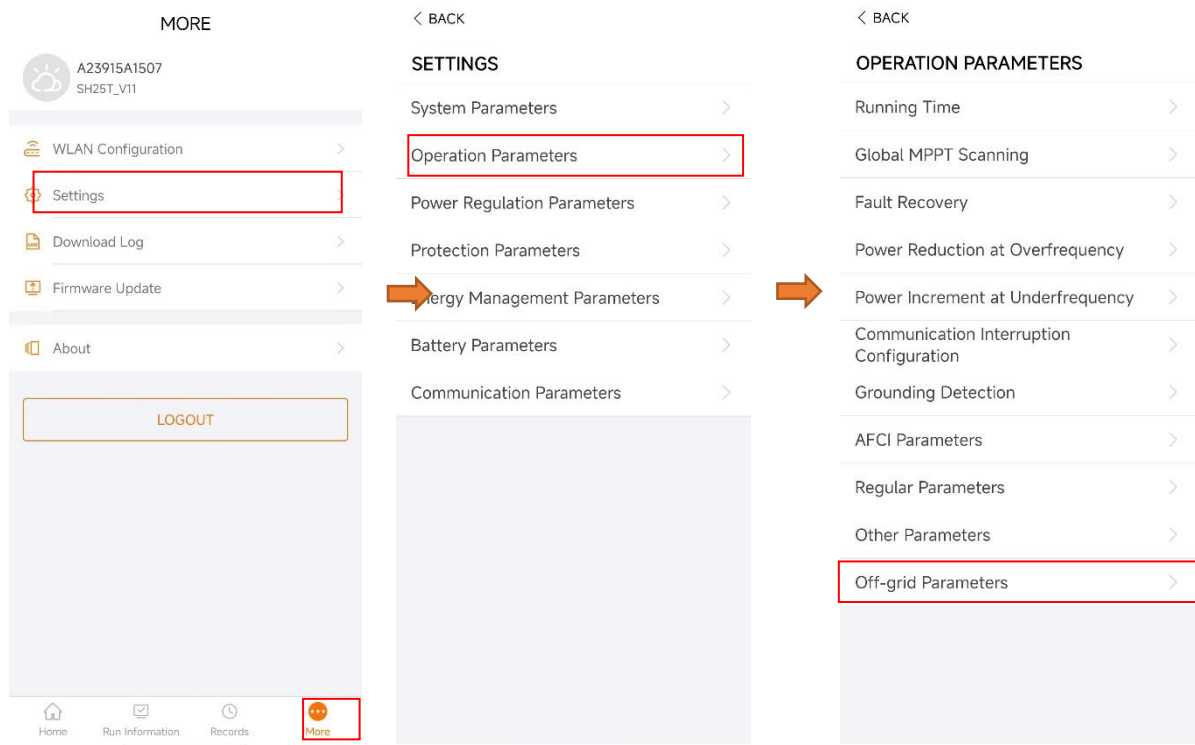
Parameter	Description	Setting/Range
Genset Start/Stop Control	3 control modes. Set as required. If a generator is connected, it is recommended to set to "Controlled by SOC".	<ul style="list-style-type: none"> ● Forced Stop (by default) ● Forced Start ● Controlled by SOC ● Manual Control
Max. Permitted Charging Power from AC	Set as the actual situation. The maximum power from generator to charge the battery in microgrid mode. This value should be less than the nominal power of the generator.	0-500.00 kW
Nominal Power of Genset	Set according to the nominal power of the generator.	0-500.00 kW
Lower Limit of SOC to Start Genset *	The Genset Start/Stop Control is set to " Controlled by SOC ", when the battery SOC is equal to or lower than the set value, the generator starts to run, supplying power to the load and charging the battery. Set it according to the load power. If the load power is large, increase the limit to protect battery from over discharging.	0-99.9% (20% by default)
Upper Limit of SOC to Stop Genset *	The Genset Start/Stop Control is set to " Controlled by SOC ", when the battery SOC is equal to or higher than the set value, the generator stops running. Set it according to the power failure frequency and duration. In the case of frequent grid failure, increase the limit to avoid frequent generator start/stop.	0-100.0% (90% by default)
Forbid Genset Night-time Operation	Mute switch of generator in microgrid mode. After this function is enabled, the generator cannot run during the specified period. The generator can only be started by external means.	<ul style="list-style-type: none"> ● Disable (by default) ● Enable
Operation Forbidden Start Time: Hour	The time period the generator cannot run.	Set as required.
Operation Forbidden Start Time: Minute		
Operation Forbidden End Time: Hour		
Operation Forbidden End Time: Minute		

* (Lower Limit of SOC to Start Genset) < (Upper Limit of SOC to Stop Genset)

3.4 Backup Mode and Parallel Off-grid SOC Balancing

Set the parameter only on the Master.

Tap “More” -> “Settings” -> “Operation Parameters” -> “Off-grid Parameters”.



Backup Mode: Enable

Reserved Battery SOC for Off-Grid:

Depending on actual requirement (No need to set up in scenarios without utility grid).

Backup Voltage:

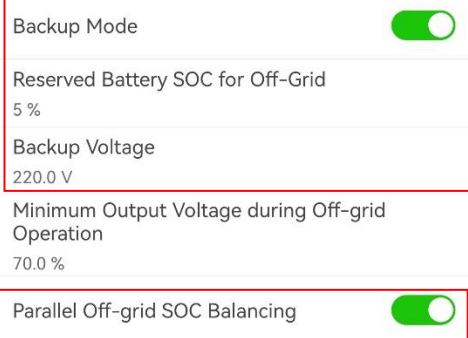
Depending on according to demand and electrical voltage. (Only the Pure Off-Grid scenario need to focus on this).

Parallel Off-grid SOC Balancing:

Enable in the scenario where all backup ports in parallel to loads.

< BACK

OFF-GRID PARAMETERS

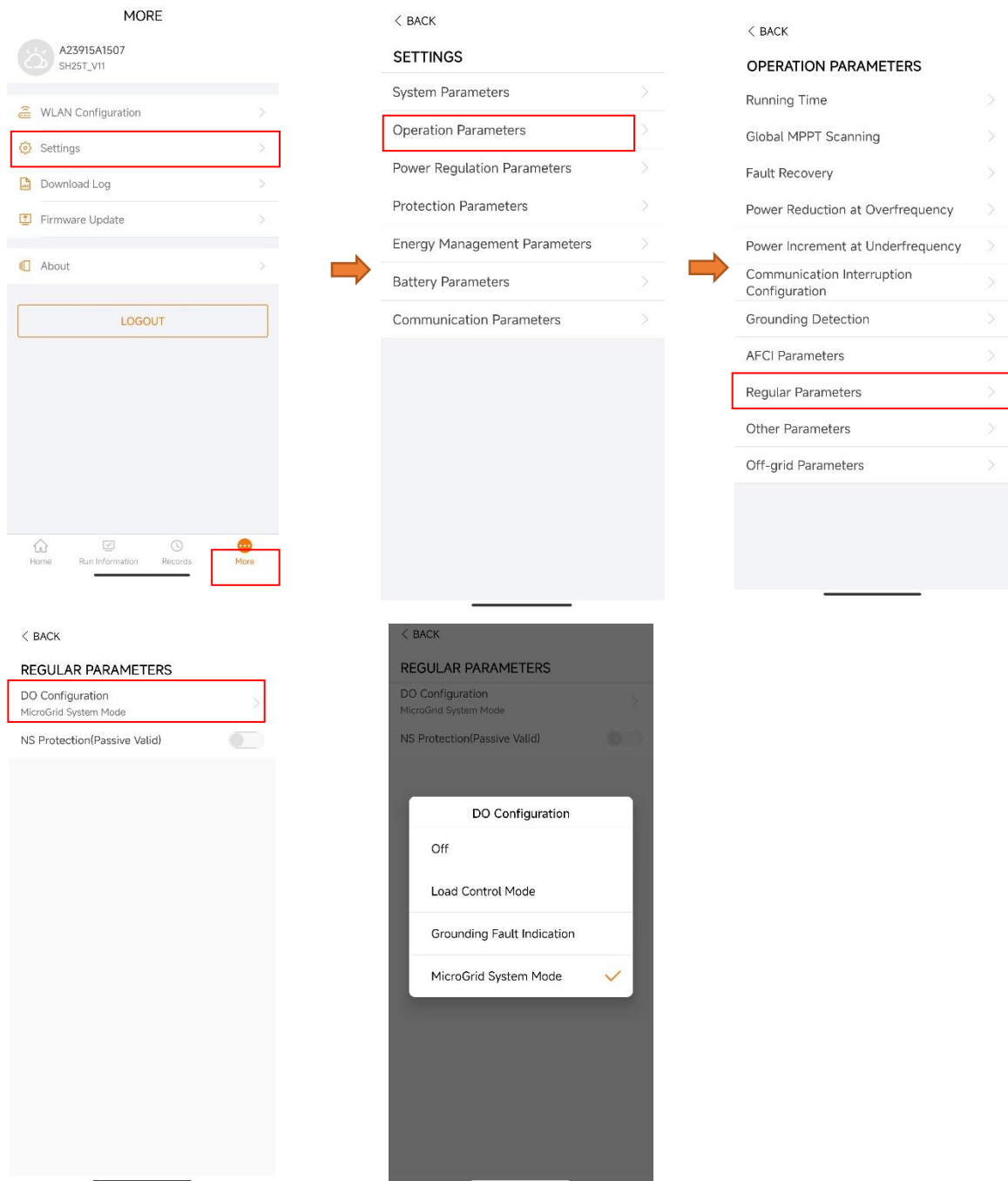


After the backup mode is enabled, the battery can always reserve at least the setting SOC when the grid is available, to make sure a certain battery capacity is guaranteed for grid outage. Once the SOC reaches this setting value and the grid is available, the battery will stop discharging even though the system may still be in the set discharge time period.

3.5 DO Configuration (Optional)

Note: After the *Grid/Microgrid Adaptation* function is enabled, the DO configuration is automatically set to *MicroGrid System Mode*. If the generator start/stop control mode is set to *Manual Control*, the generator is not controlled through the DO communication, you can manually modify the DO configuration based on the actual DO function. Only need to set it on the **Master**.

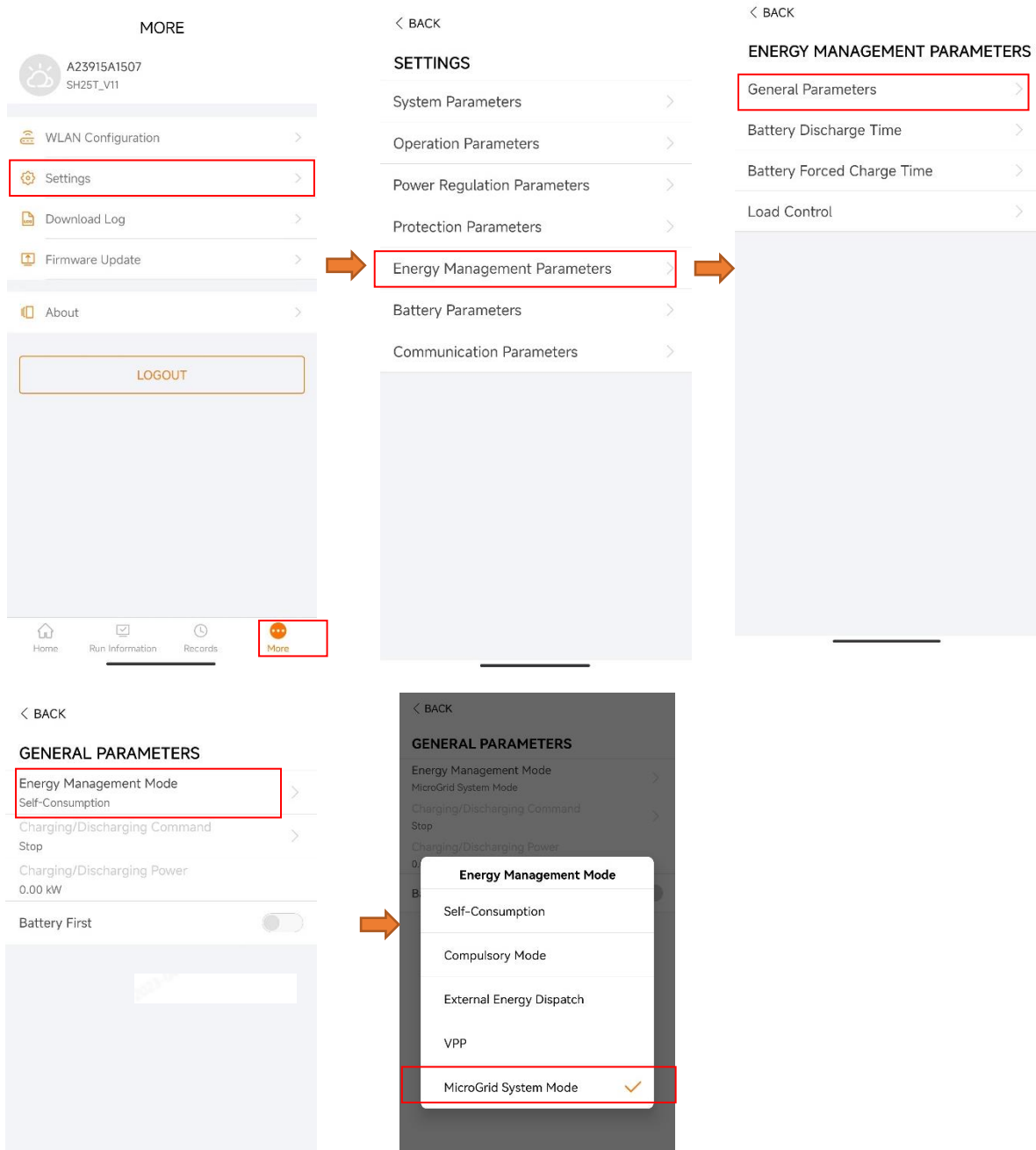
Tap “More” -> “Settings” -> “Operation Parameters” -> “Regular Parameters” -> “DO Configuration”.



3.6 Micro-Grid System Mode

Set the parameter only on the Master.

Tap “More” -> “Settings” -> “Energy Management Parameters” -> “General Parameters” -> “Energy Management Mode” -> “Micro-Grid System Mode”.



* When Grid/Microgrid Adaptation function is enabled, the Energy Management Mode will be automatically set to MicroGrid System Mode, therefore this setting cannot be set manually.

4 Troubleshooting

The specific error codes, causes and troubleshooting are shown in the following table.

Code	Description	Cause	Troubleshooting
75	Inverter Parallel Communication Alarm	The multi-hybrid parallel menu parameter settings are incorrect, or the master-slave communication line is not connected or is abnormal.	<ol style="list-style-type: none"> 1. Check whether the communication cable and the terminals are abnormal. If so, correct them to ensure reliable connection. 2. Reconnect the communication cable of the meter.
90	Inverter parallel synchronous signal abnormal	Multiple parallel parameter settings or parallel communication wiring errors	<ol style="list-style-type: none"> 1. Check whether the settings of the master and slave are incorrect. One of them is set to master inverter, while the others are set to slave inverter. Whether the number of master and slave inverters corresponds to the actual situation, and whether the slave machine ID are set in order. 2. Check whether the parallel communication connection is incorrect and whether the H and L ports between the inverters COM1 ports are connected correctly. 3. Check that 120Ω resistors are paralleled to the H and L terminals of the first and last inverters.
213	Inverter parallel GRID port wiring error	Master inverter connection to grid phase line is inconsistent with slave inverter.	<ol style="list-style-type: none"> 1. Make sure that the phase line sequence from GRID ports is consistent between the master and slave inverters. You can test this with a multi-meter between L1 of master and L1 of slaves.
214	Inverter parallel LOAD port wiring error	Master inverter connection to load phase line is inconsistent with slave inverter.	<ol style="list-style-type: none"> 1. Make sure that the phase line sequence from LOAD ports is consistent between the master and slave inverters. You can test this with a multi-meter between L1 of master and L1 of slaves.
329	AC port wiring or terminals abnormal	AC port wiring or terminals abnormal	<ol style="list-style-type: none"> 1. Check the AC port wiring. 2. Try to power off and restart the inverter. 3. If the alarm persists, contact SUNGROW.

Code	Description	Cause	Troubleshooting
514	Meter communication abnormal alarm	The meter is not connected or is damaged, or the meter communication line is abnormal.	<ol style="list-style-type: none"> 1. Check whether the communication cables are correctly connected. If so, correct them to ensure reliable connection. 2. Check the communication line for open circuits or short circuits. 3. Check whether the meter communication address has been modified (the default address is 254).
714	BMS communication Fault	BMS communication is detected in lead-acid battery mode, or BMS signal is continuously not detected in lithium battery mode, or the number of BMS online groups detected does not match the setting	<ol style="list-style-type: none"> 1. Check whether the communication cable and the terminals are abnormal. If so, correct them to ensure reliable connection. 2. Reconnect the communication cable of the meter.
994	Generator phase sequence mismatch	The alarm occurs when the system switches from off-grid to on-grid because the generator phase lines L1, L2, L3 do not correspond to the grid phase lines L1, L2, L3 respectively.	<ol style="list-style-type: none"> 1. Shut down the inverter and the generator. 2. Check the AC cables to the generator and ensure that the phase sequence is consistent with that of the grid. 3. After the inverter detects that the phase sequence is consistent, the warning will be automatically cleared.
995	Load port short-circuit	Short circuits exist on the phase line L1, L2, and L3 of the Load port.	<ol style="list-style-type: none"> 1. Shut down the inverter. 2. Use a multimeter to measure the resistance between every two phase lines and check if they conform to the actual load in the family. 3. Check AC cable connection to the Load port.
996	Generator abnormal	90s after the system control the generator to start, the generator port has no voltage.	<ol style="list-style-type: none"> 1. Check whether the generator is started. 2. Check the DO connection between the generator and the inverter. 3. Use a multimeter to check whether the generator port has voltage.